North Bend Wind Project

Draft Environmental Assessment

Hughes and Hyde Counties, South Dakota

Western Area
Power Administration

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Prepared for:

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Western Area Power Administration

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LIST OF ABBREVIATIONS

Acronym or Abbreviation	Definition
°	degree
Ac	acre
ADLS	aircraft detection lighting system
Analysis Area	the area being analyzed, which varies depending on the type of survey performed
APE	Area of Potential Effects
APLIC	Avian Power Line Interaction Committee
Audubon	National Audubon Society
AWBP	Aransas/Wood Buffalo whooping crane population
BA	Biological Assessment
BBCS	Bird and Bat Conservation Strategy
BCC	Birds of Conservation Concern
BMP	best management practice
CFR	Code of Federal Regulations
collector system	The underground system of collection cables and breakers
CWCTP	Cooperative Whooping Crane Tracking Project
dBA	A-weighted decibels
DOT	Department of Transportation
EA	Environmental Assessment
ESA	Endangered Species Act of 1973
F	Fahrenheit
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FR	Federal Register
FSA	Farm Service Agency
gen-tie line	230-kV overhead transmission line
GIA	Generator Interconnection Agreement
km	kilometer
kV	kilovolt
m/s	meters per second
met tower	meteorological tower
mi	mile
MW	megawatt
NAAA	National Agricultural Aviation Association
NABCI	U.S. North American Bird Conservation Initiative Committee
NDGF	North Dakota Department of Game and Fish
NEPA	National Environmental Policy Act of 1969
NHPA	National Historic Preservation Act
NHD	National Hydrography Dataset
NLCD	National Land Cover Database
No Action Alternative	The alternative where the proposed Project would not be constructed
North Bend	North Bend Wind Project, LLC
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O&M	operations and maintenance

Acronym or Abbreviation	Definition
PEIS	Programmatic Environmental Impact Statement
POI	Point of Interconnection
prairie grouse	greater prairie-chicken and sharp-tailed grouse
Project	North Bend Wind Project
Project Area	47,000-acre boundary area of land where North Bend has found willing landowners to participate in the Project
Proposed Action Alternative	the alternative where the Project is constructed and operated, and that a GIA is entered to connect the Project the transmission system
ROW	right-of-way
SDBWG	South Dakota Bat Working Group
SCADA	supervisory control and data acquisition
SDDANR	South Dakota Department of Agriculture and Natural Resources
SDDOT	South Dakota Department of Transportation
SDGFP	South Dakota Department of Game, Fish and Parks
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SPCC Plan	Spill Prevention, Control and Countermeasure Plan
SPP	Southwest Power Pool
Tariff	Open Access Transmission Service Tariff
Triple H Project	Triple H Wind Project
UGP	Upper Great Plains
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S> Geological Survey
WAPA	Western Area Power Administration
WEG	USFWS Land-based Wind Energy Guidelines
WEST	Western EcoSystems Technology, Inc.
ZOI	Zone of Influence

1.0 INTRODUCTION

Western Area Power Administration (WAPA) is one of four power-marketing administrations within the U.S. Department of Energy. WAPA's mission is to "safely provide reliable, cost-based hydropower and transmission to our customers and the communities we serve." WAPA's customers include federal and state agencies, cities and towns, rural electric cooperatives, public utility districts, irrigation districts and Native American tribes. WAPA's customers, in turn, provide retail electric service to millions of consumers in the West. Transmission capacity above the amount WAPA requires for the delivery of long-term firm capacity and energy to current contractual electrical service customers of the federal government is offered in accordance with its Open Access Transmission Service Tariff (Tariff). Since October 2015, WAPA's Upper Great Plains Region (UGP) has been a transmission owner member of Southwest Power Pool (SPP) and its qualifying facilities are under the functional control of SPP. Excess transmission capacity on and interconnection to WAPA-UGP's facilities must be done in accordance with the SPP Tariff.

North Bend Wind Project, LLC (North Bend) proposes to construct the North Bend Wind Project (Project), an approximately 200-megawatt (MW) wind farm. The Project would be located within a roughly 47,000-acre area (Project Area) where North Bend has found landowners willing to participate in the Project. The Project Area is located south of the town of Harrold in Hughes County and south of Holabird in Hyde County, South Dakota, and five miles north of the Missouri River (Figure 1.1-1). As described further in Section 2.1 (Alternatives Considered but Eliminated), the location of facilities within this Project Area has been further refined based on a variety of considerations. North Bend submitted an interconnection request to SPP to connect the Project to WAPA-UGP's transmission system at its existing Fort Thompson-Oahe 230-kilovolt (kV) #2 transmission line. WAPA's decision whether to enter into an Interconnection Agreement is considered a Federal action under the National Environmental Policy Act of 1969 (NEPA). Therefore, this Environmental Assessment (EA) analyzes the potential effects of the interconnection and the associated wind project, and alternatives.

This EA tiers off the analysis conducted in the UGP Wind Energy Final Programmatic Environmental Impact Statement (PEIS), a document prepared jointly by WAPA-UGP and the United States (U.S.) Fish and Wildlife Service (USFWS) (WAPA and USFWS 2015). The PEIS is available online at: https://www.wapa.gov/regions/UGP/Environment/Pages/ProgrammaticWindEIS.aspx.

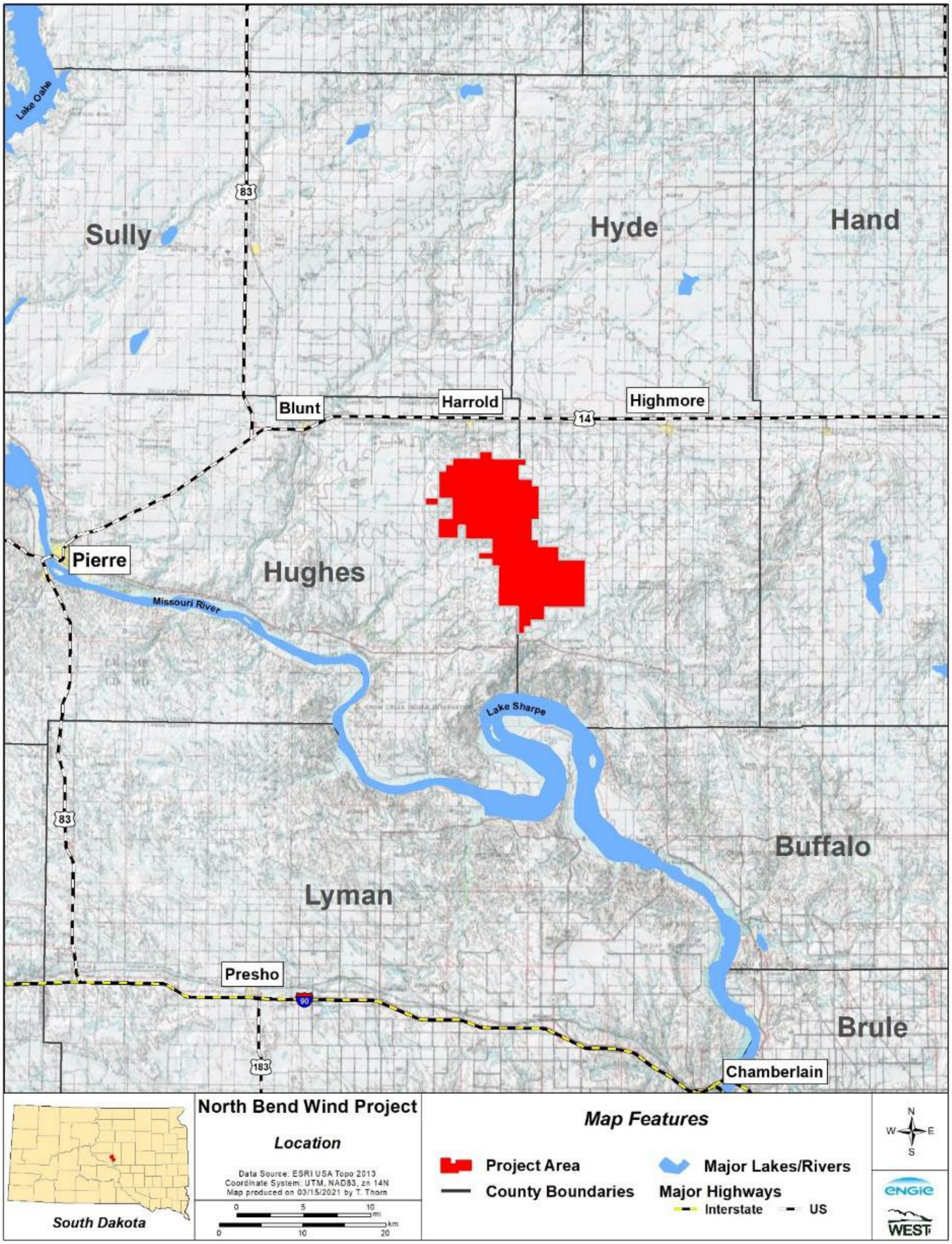

Figure 1.1-1. Location of the North Bend Wind Project.

The PEIS analyzed the common environmental impacts that may occur when wind energy projects are constructed, operated, maintained, and decommissioned. This tiered EA incorporates the common environmental impacts by reference and provides a focused review of Project-specific resources (e.g., soil type, watershed characteristics, wildlife habitat, vegetation, viewshed, public sentiment, threatened and endangered species, and cultural resources) and Project-specific design.

1.1 Purpose and Need for Federal Action

WAPA must consider and respond to North Bend's interconnection request, which would include construction of a new WAPA owned switchyard at the Point of Interconnection (POI), in accordance with the SPP Tariff and the Federal Power Act, as described in section 1.1.1 of the PEIS.

1.2 North Bend's Goals and Objectives

North Bend's goals and objectives for the proposed Project are to provide an economically sustainable, reliable, and cost-effective source of renewable energy to energy users. To accomplish these goals and objectives, the Project must be technically, environmentally, and economically feasible. For the Project to be feasible, North Bend needs:

- a reliable wind resource;
- landowners willing to participate in the Project;
- ecological conditions that allow the Project to comply with applicable environmental regulations at a reasonable cost;
- a Generator Interconnection Agreement (GIA) with WAPA and SPP to interconnect with WAPA's transmission line; and
- a customer to purchase the power that is generated by the Project.

2.0 DESCRIPTION OF PROPOSED ACTION AND NO ACTION ALTERNATIVES

This EA analyzes two alternatives, the Proposed Action and the No Action.

2.1 Alternatives Considered but Eliminated

Within the boundaries of the Project Area, the proposed layout of Project facilities was developed through an iterative process. Various turbine models were eliminated due to availability. Layout options were evaluated and eliminated based on the wind resource, the selected turbine model, and the avoidance areas and setbacks.

Avoidance areas included USFWS grassland easements and areas within the 100-year floodplains as determined by the Federal Emergency Management Agency (FEMA). Setbacks of varying distances from manmade and natural features were also applied. Manmade features include residences, structures, property lines, roads and highways, railroads, dam and ditches, towers, electric transmission and communication infrastructure, and aviation and military constraints. Natural features include streams, other waterbodies, wetlands, and archaeological sites. The layout for the Project focused on previously disturbed vegetation (cultivated cropland) to the greatest extent practicable, but due to the amount of herbaceous cover in the Project Area (about half) and the limits on land available for Project facilities because of the avoidance areas and setbacks, locating some Project facilities in grassland was unavoidable.

After applying these avoidance areas and setbacks, approximately 80% of the Project Area was deemed insufficient for development; the remaining 20% (approximately 9,400 acres) was used to develop the layout for turbines and other Project facilities.

2.2 Proposed Action Alternative

The Proposed Action alternative is for North Bend to:

1. construct and operate the Project; and
2. enter into a GIA with WAPA and SPP to connect the Project to WAPA's transmission system at a to-be constructed WAPA owned switchyard.

To accommodate the interconnection, WAPA would construct a new switching station near WAPA's existing Fort Thompson-Oahe 230-kV #2 transmission line. Hereafter, the switching station is referred to as the Point of Interconnection (POI).

The Project components would include:

- 71 wind turbines;
- 35 miles of new access roads;
- one meteorological (met) tower;
- 68 miles of underground electrical collector systems;
- a fiber optic communication system;
- a new WAPA-owned POI facility on a 22-acre South Dakota School and Public Land Trust parcel;
- a new North Bend-owned 7-acre substation near the WAPA POI facility;
- up to 500 feet of 230-kV overhead transmission line (gen-tie line) from the substation to the WAPA POI facility;
- a 10-acre temporary laydown/staging area and concrete batch plant; and
- use of an existing, adjacent five-acre operations and maintenance (O&M) facility.

Section 3.3 of the PEIS provides an overview of typical wind farm site construction activities and decommissioning, and each process would last about nine months. Project operation would continue for approximately 30 years. Construction and maintenance activities would occur annually, primarily April to November, or whenever weather conditions allow.

The proposed layout of the Project components is shown in Figure 2.2-1 and the temporary construction and long-term operational land requirements for each component are shown in Table 2.2-1. An O&M facility would not be constructed for the Project. Instead, the North Bend Project would share the existing O&M facility with the adjacent Triple H Wind Project (Triple H Project; Figure 2.2-1).

Minor shifts in Project facilities may be necessary because of geotechnical evaluations, landowner input, or to avoid newly identified cultural or tribal resources. If shifts become necessary, North Bend would notify WAPA of these shifts to determine whether additional analysis is necessary.

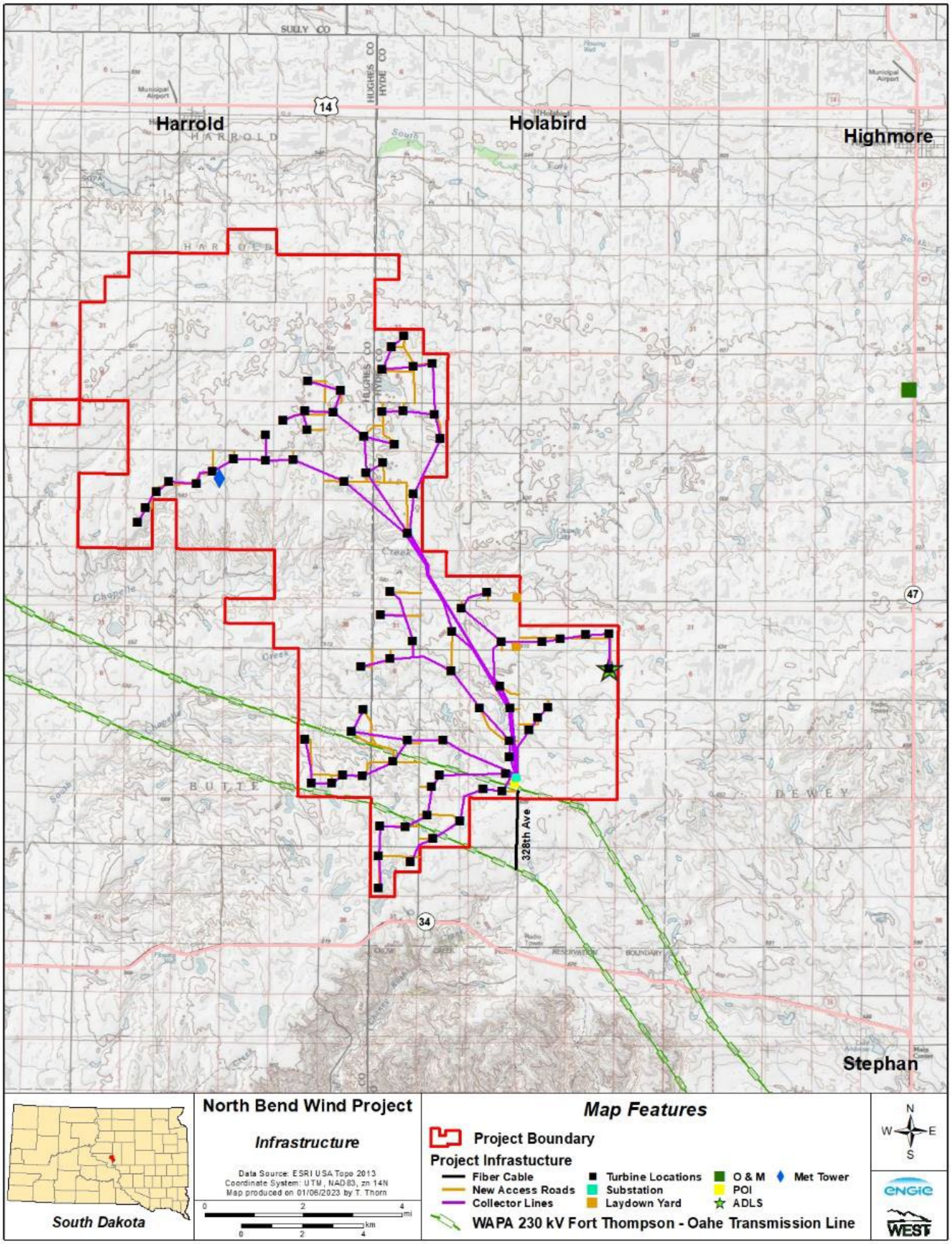

Figure 2.2-1. Proposed Layout of the Project Facilities at the North Bend Wind Project.

Table 2.2-1. Land Requirements for the North Bend Wind Project.

Project Component	Temporary Land Requirements	For Construction	Long-term Land Requirements	For Operation
	Dimensions	**Total Acres**	**Dimensions**	**Total Acres**
Turbines [a]	150-foot radius x 71 turbines (1.5301 acre/turbine) [b]	109	35-foot radius x 71 turbines (0.0879 acre/turbine)	7
New access roads	40-foot width x 35 miles [b]	102	16-foot width x 35 miles	68
Collector lines	40-foot width x 68 miles	328	Not Applicable	0
Substation	7 acres [c]	7	7 acres [b]	7
POI Facility (WAPA facility)	990-feet x 950 feet [c]	22	528-feet x 485 feet [b]	6
Met tower	50 feet by 50 feet	<0.1	20 feet by 20 feet	<0.1
Laydown/staging/batch plant area [a]	10 acres	10	Not Applicable	0
Fiber optic communication system	40-foot width x 1.6 miles	8	Not Applicable	0
Total [d]		**586**		**88**

[a] Acreages in the table reflect the actual number of proposed Project components. Since more than one location is being considered for some components, impacts that could occur from all potential locations are assessed in Section 3.0 of this EA.
[b] Temporary dimension calculations = temporary (construction) land requirements minus long-term (operation) land requirements.
[c] Area shown is the maximum size of potential disturbance.
[d] Sums may not equal totals shown due to rounding.

2.2.1 Wind Turbines

This EA is evaluating 78 turbine locations: 71 primary locations and seven alternate locations. The Project plans to install only 71 wind turbines. Up to four turbines may be located on a South Dakota School and Public Land Trust parcel in Township 110, Range 73, Section 16 on the west side of 328th Avenue (see Section 2.2.10) with the remaining turbine locations on private land. Each turbine would have a hub height of 292 feet and a rotor diameter of 417 feet (see Figure 2.2-2), with a corresponding blade length of 204 feet. The tip height of the turbine blade in the 12 o’clock position would be almost 501 feet.

Turbine towers would be painted a non-glare off-white or gray color and be marked and lit to comply with Federal Aviation Administration (FAA) regulations.

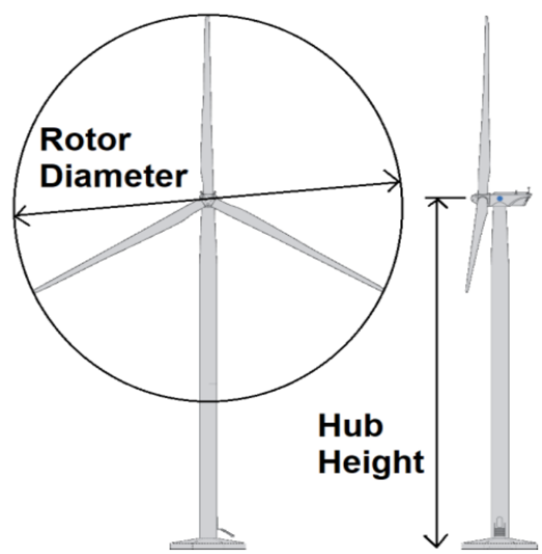

Figure 2.2-2. Turbine Hub Height and Rotor Diameter Illustration.

The wind turbine foundations are typically made of concrete and buried underground at a depth of up to 10 feet, except for approximately 12 inches that would remain aboveground to allow the tower to be bolted to the foundation. A transformer, called a "step-up transformer," would be installed at the base of each wind turbine to increase the output voltage of the wind turbine to match the voltage of the power collection system (34.5 kV).

During construction, a 150-foot radius area would be cleared to lay down the rotors and maneuver cranes during turbine assembly. After construction, a 35-foot radius area around each turbine would be maintained and graveled to prevent potential damage to the underground foundations and cabling (Figure 2.2-3).

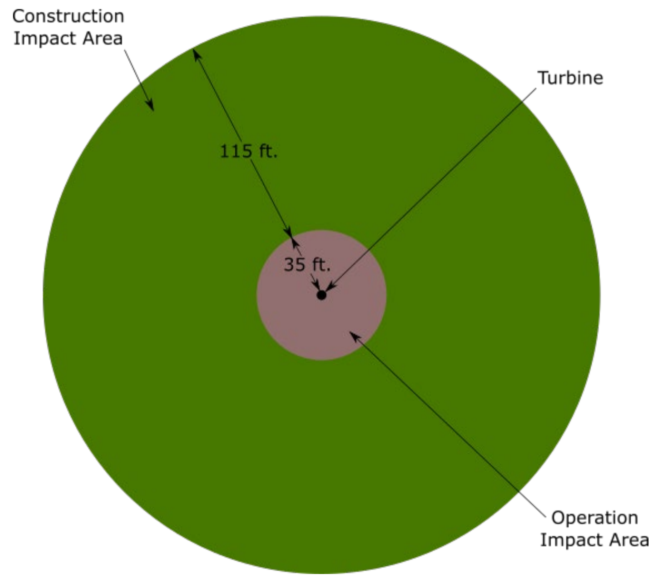

Figure 2.2-3. Turbine Construction and Operation Impact Areas.

2.2.2 Access Roads and Crane Paths

North Bend anticipates using approximately 64 miles of existing public roads, private roads, and field paths, plus constructing 35 miles of new private access roads, to reach Project components (Figure 2.2-1). Existing public and new access roads may be temporarily widened up to 40 feet before or during construction to accommodate heavy equipment, and a gravel cap would be added. After construction, these roads would be narrowed to approximately 16 feet in width or their original width, and would be all-weather, gravel surfaced (Figure 2.2-4). Roads would include appropriate drainage controls, such as culverts. Gates would be installed where access roads cross landowner fences, with landowner approval.

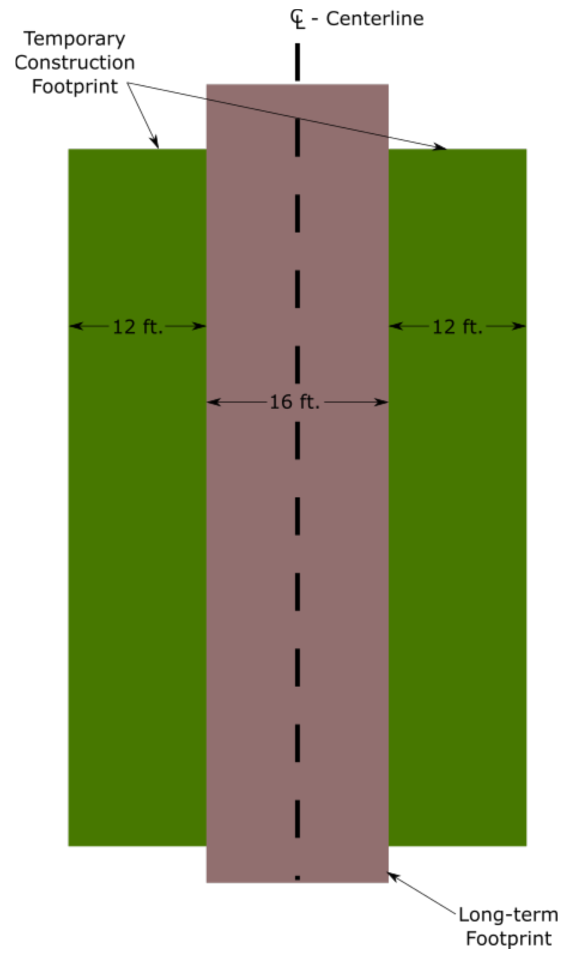

Figure 2.2-4. Access Road Long-term and Temporary Footprints.

Separate access may be required for the cranes used to erect the turbines. Because large construction cranes may spend as little as one day at each turbine site before moving on to the next, cranes are sometimes moved cross-country rather than using developed access roads. Where cranes are required to travel cross-country, workers would lay down some form of cribbing, bedding, or mats to support the weight of the crane, minimizing impacts to the underlying ground. The cribbing or mats would be removed immediately after the crane passes by to be re-used elsewhere.

Section 3.10 of the PEIS describes the common transportation operations necessary for the construction and operation of a commercial wind farm, while section 4.1.3.4 of the PEIS describes different types of roads to be considered before constructing a wind farm.

2.2.3 Meteorological Tower

North Bend proposes to construct one permanent met tower in the Project Area, as shown in Figure 2.2-1. Impacts that could occur are assessed in Section 3.0 of this EA. The permanent met tower is expected to be free-standing, with no guy wires, have a height equal to the turbine hub, and be marked with red blinking lights per FAA regulations.

2.2.4 Electrical Collector System

From the step-up transformers at each turbine, power would run through an underground system of electrical collection cables (collector lines) and breakers, referred to as a collector system, and would connect to the Project collection substation. The Project collection substation would increase the voltage to 230 kV to tie into WAPA's transmission system. Up to 68 miles of underground circuits would be installed by either trenching, plowing, or directionally boring the cables underground. The collector lines would be buried to a minimum depth of 48 inches with marking tape and tracer wire to meet the appropriate national electrical code. North Bend would register the appropriate underground facilities with the South Dakota One-Call system.

2.2.5 Fiber Optic Communication System

North Bend would install fiber optic cables (fiber cables) to link each turbine to the collection substation. The fiber cables allow the turbines, collection substation, and electrical grid to communicate as part of supervisory control and data acquisition (SCADA), a system to monitor safety and control mechanisms. The SCADA system also allows the Project to be remotely monitored, which increases Project oversight and performance, and reliability of the turbines. The electrical collection system and fiber cables would be placed in the same trench and would include occasional aboveground junction boxes.

Additionally, 1.6 miles of communications fiber cable would be installed between the POI facility and WAPA's existing Fort Thompson-Oahe 230-kV #3&4 transmission line. This fiber cable would be trenched on the west side of 328th Avenue (Figure 2.2-1). WAPA would seek easements from two private landowners on the west side of this county road for the fiber cable right-of-way.

2.2.6 Project Collection Substation

The collection substation would be located on a 7-acre South Dakota School and Public Land Trust parcel in Section 16, Township 110, Range 73, Section 16 on the west side of 328th Avenue (Figure 2.2-6). The substation would be fenced and would contain one or two transformers, circuit breakers, switching devices, auxiliary equipment, and a control enclosure containing equipment for proper control, protection, monitoring, and communications. The main purpose of the collection substation would be to increase the voltage from the collector system to match the voltage of the 230-kV transmission line, which would then transport the electricity of the entire Project to the new POI facility that WAPA would construct.

2.2.7 Interconnection Facilities

To accommodate the interconnection request, WAPA would construct a new POI facility, which would be a switchyard, sectionalizing the existing Fort Thompson-Oahe 230-kV #2 transmission line. Construction of the switchyard would result in approximately 22 acres of land disturbance. Once operational, the switchyard would occupy 6 acres and house equipment such as breakers, relays, communications and control equipment, and aboveground bus structures. The switchyard would be constructed in accordance with the GIA between WAPA, SPP and North Bend. The switchyard would be located on a 22-acre parcel owned by the South Dakota School and Public Land Trust in Township 110, Range 73, Section 16 on the west side of 328th Avenue (Figures 2.2-5 and 2.2-6). WAPA would acquire a permanent easement for the parcel. WAPA may construct a temporary tap at the same location as the proposed switchyard. The temporary tap would be constructed in accordance with a construction agreement between WAPA and North Bend. Construction of the temporary tap would enable the Project to interconnect on WAPA's existing transmission line while the switchyard is constructed.

2.2.8 Transmission Line

Up to 500 feet of 230-kV overhead transmission line would connect the Project collection substation to WAPA's new POI facility on a South Dakota School and Public Land Trust parcel in Township 110, Range 73, Section 16 on the west side of 328th Avenue. The area around the POI facility that will contain the transmission line corridor is shown in Figures 2.2-5 and 2.2-6.

2.2.9 Temporary Laydown/Staging Area and Batch Plant

North Bend would grade a temporary laydown/staging area of up to 10 acres. Two locations are under consideration (Figure 2.2-1); impacts that could occur from both potential locations are assessed in Section 3.0 of this EA. The laydown/staging area would provide parking for construction personnel, a staging area for large equipment deliveries, and potentially maintain an on-site temporary concrete batch plant during construction. The laydown/staging area would also be used to conduct maintenance on construction equipment and vehicles and to store fuel. Figure 3.3 of the PEIS shows a temporary work/staging area.

2.2.10 Project Construction, Operation, Maintenance, and Decommissioning

Sections 3.2 through 3.5 of the PEIS describe the typical activities that would occur during each of the major phases of a wind energy project's life cycle: site testing and monitoring, construction, operation, maintenance, and decommissioning. The same phases, with similar types of activities for each phase, would occur for the proposed Project. Construction is expected to begin fall 2023, when frost restrictions lift for the counties. Commercial operation is targeted for October 2023. The permitted life of the Project is 30 years. Any retrofits and/or upgrades after 30 years would require further approvals from the South Dakota Public Utilities Commission and Hughes and Hyde counties. At decommissioning, Project components would be recycled and disposed of in accordance with technologies and regulations applicable at the time of decommissioning.

The Project would be operated locally from the control room in the O&M building located south of Highmore, South Dakota. A permanent staff of approximately 8 – 10 on-site personnel would provide O&M support activities to the Project.

<u>Wind Turbines</u>

Each wind turbine would include a SCADA operations and communications system that allows automated independent and remote operation of the turbine. The SCADA data provide detailed operating and performance information for each turbine, allowing real-time control and continuous monitoring to ensure optimal operation and identification of potential problems. A local wind technician would be either on-site or available on call to respond in the event of emergency notification or critical outage.

A preventative maintenance and inspection schedule would be implemented for the Project. Maintenance of the wind turbines would include visual turbine inspections and remote activities such as turbine resets and troubleshooting, and other upkeep activities. All major components of the wind turbines would undergo routine maintenance on schedules established by the component manufacturer. Generally, routine maintenance activities occur biannually. Routine maintenance would first occur one month after commercial operation has begun. After that, maintenance would be performed at 6-month and 12-month intervals. Additional service and repairs would be done as needed. In most cases, this would involve replacing lubricating oils and coolants in transmissions and motors and using small amounts of greases, lubricants, paints, and/or coatings for corrosion control. Turbine maintenance activities would be conducted at turbine locations.

On occasion, turbines can experience malfunctions (such as equipment failure) that require non-routine maintenance work. Over the life of the turbine, some mechanical components may need repair or replacement; however, most turbine designers construct their turbines in modular fashion. Thus, it is likely that most major overhauls or repairs of turbine components would involve removing the components from the site to a designated off-site repair facility. Some repair activities may require the use of heavy equipment, such as cranes, to assist in the repairs of components such as the rotor, turbine blades, and nacelle components. Cleaning of a rotor could happen on a rare individual basis but would not be a routine practice. This practice would only occur if the rotor assembly were already lowered from the drive train assembly for maintenance work.

Vegetation management at the turbine pads would include mowing and herbicide use as needed to control invasive or noxious weeds. Mowing would occur during daytime hours. The need for mowing would be evaluated by site operations staff periodically during the growing season. Herbicides and pesticides, if necessary, would be applied in accordance with local regulations and in accordance with all U.S. Environmental Protection Agency (USEPA)-approved labeling.

Access Roads

The 35 miles of new access roads would be widened up to 40 ft during construction to accommodate heavy equipment and would be all-weather, gravel surfaced. The access roads would be narrowed to approximately 16 feet (or to their original width for existing roads) after construction. Turbine access roads on private lands would be maintained by North Bend. This could include dust control, grading, or placement of additional gravel as needed. Maintenance of county roads within the site would be the responsibility of the respective county; however, North Bend would be responsible for any road damage caused by maintenance or warranty work.

Electrical Collector System and Fiber Optic Communication System

O&M of the underground collection system and co-located fiber optic communication system would include remote monitoring of the systems, visual inspections of the aboveground junction boxes via vehicles or walking the collection line route, and collection line repair or maintenance as needed. If repairs are needed for the underground collection system or fiber optic communication system, disturbance would occur within the confined areas of previous construction disturbance (40-ft right-of-way).

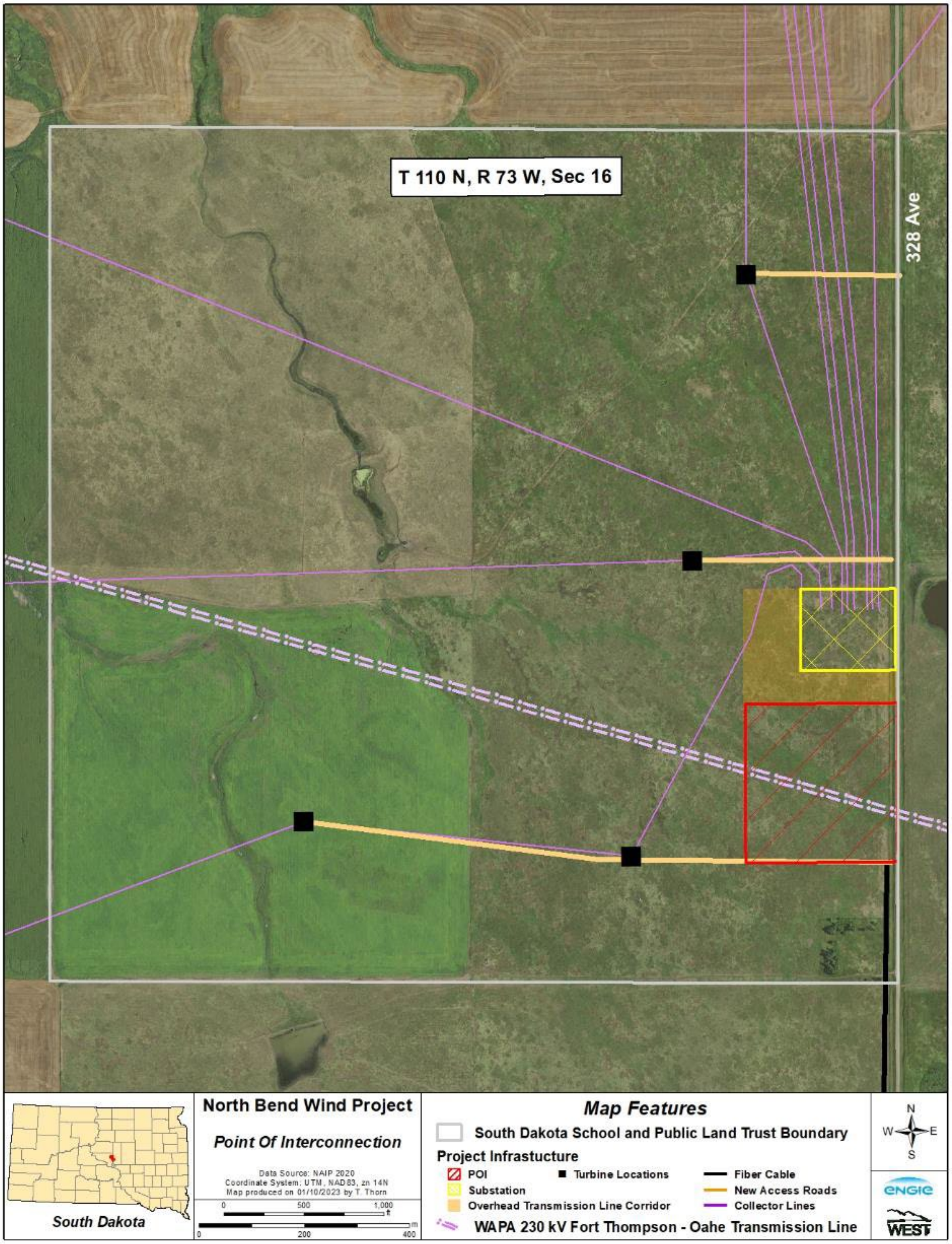

Figure 2.2-5. Location of the Point of Interconnection on a South Dakota School and Public Land Trust parcel.

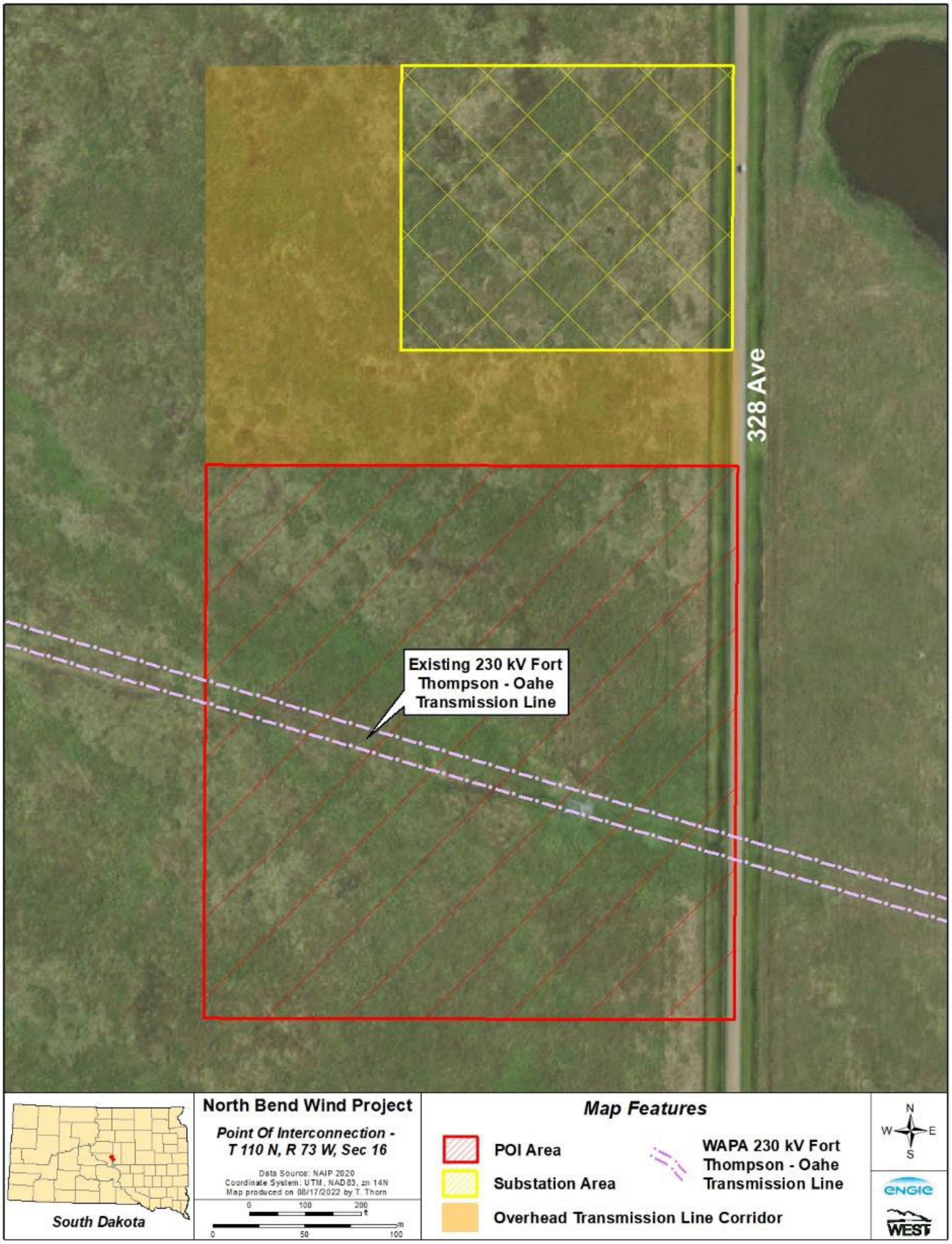

Figure 2.2-6. Point of Interconnection.

Project Collection Substation

O&M associated with the collector substation would include remote monitoring, in-person inspections, online testing, and vegetation removal within the substation site. North Bend may occasionally power-off the substation to complete testing, maintenance, and cleaning, which would otherwise be too dangerous to do when the substation is energized. Equipment replacement would occur on an as-needed basis, for example due to damage or complete failure. All repair work would happen within the existing substation site.

Transmission Line

O&M of the gen-tie line would include visual inspections of the conductor and pole structures and replacing these facilities when necessary. Inspections would occur within the existing easement; due to the short distance, inspections would occur on foot. In rare instances, inspectors may need to use a bucket truck or climb the transmission structures. Repairs and replacements would be accomplished within the easement area, using standard equipment such as bucket trucks. Bird diverters would be maintained for the life of the gen-tie line. Maintenance of vegetation within the easement may include periodic tree and bush trimming, application of herbicide, or both.

O&M Facilities

Standard maintenance and grounds keeping at the O&M facility would include beautification, weed pulling, mowing, and other general landscaping. Other than emergency calls or response to off-hour outages, the O&M activities would be limited to normal business hours.

2.2.11 Repowering/Decommissioning

The projected operating life of the Project turbines is 30 years. After the useful life of the turbines is complete, the Project would be assessed for the viability of either repowering the Project by installing new or refurbished turbines or turbine components, or complete decommissioning. At this time, the future repowering or decommissioning activities are too speculative to analyze meaningfully, and these activities are not included as part of this consultation.

2.3 No Action Alternative

Under the No Action Alternative, WAPA, SPP, and North Bend would not enter into a GIA. WAPA would not construct the interconnection facilities. For the purposes of impact analysis and comparison, it is assumed that the proposed Project would not be constructed.

3.0 AFFECTED ENVIRONMENT AND ENVIRONMENTAL EFFECTS

Chapter 4 of the PEIS discusses the affected environment, and chapter 5 discusses potential environmental consequences of wind energy development in the UGP Region, along with Best Management Practices (BMPs) to reduce impacts.

2.4 Soil and Geologic Resources

2.4.1 Affected Environment

Section 4.2.2.1 of the PEIS describes the soil orders in the UGP Region. The Analysis Area for soil and geologic resources are the soil units intersected by the construction footprint and operational footprint of all facilities and infrastructure. Project facilities would be located on 35 different soil map units (Figure 3.1-1; Table 3.1-1). Of these, one soil map unit is classified as “Prime Farmland,” five are classified as “Prime Farmland if Irrigated,” and five are classified as “Farmland of Statewide Importance” (Table 3.1-1). These soils are not highly erodible by wind or water. On a scale of 0 to 310, with 310 being the most erodible by wind, the highest rated soil map unit is 86. On a scale of 0.02 to 0.64, with 0.64 as the most erodible by water, the highest rated soil map unit is 0.43 (Table 3.1-1). In the Analysis Area, soil is primarily used to support agriculture, including cropland and livestock grazing.

Section 4.2.2.2 of the PEIS notes that geologic resources in the region include sand, gravel, and crushed stone, and that seismic activity and related hazards pose a low risk to wind energy development in South Dakota. Depth to bedrock across the site varies from approximately 25 to more than 100 feet (Martin *et al.* 2004). Nine active or abandoned gravel pits occur in the Project Area (State of South Dakota 2020).

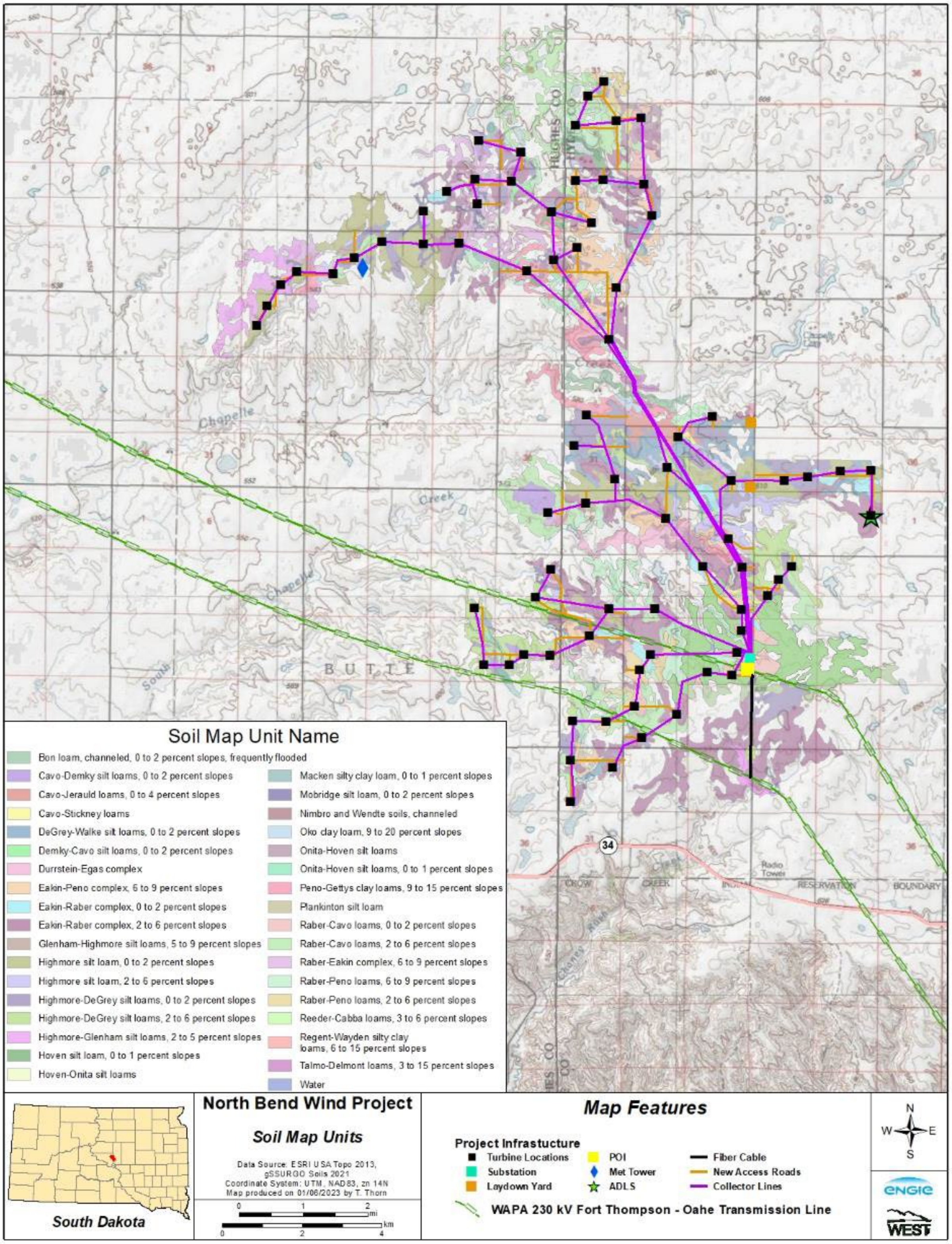

Figure 3.1-1. Soil Map Units.

Table 3.1-1. Soil Map Units.

Soil Map Unit	Farmland Status	WEI [a]	K factor [b]
Water	Not prime farmland	--	--
Nimbro and Wendte soils, channeled	Not prime farmland	86	0.24
Cavo-Demky silt loams, 0 to 2 percent slopes	Not prime farmland	48	0.37
DeGrey-Walke silt loams, 0 to 2 percent slopes	Not prime farmland	48	0.37
Demky-Cavo silt loams, 0 to 2 percent slopes	Not prime farmland	48	0.37
Durrstein-Egas complex	Not prime farmland	86	0.49
Eakin-Raber complex, 0 to 2 percent slopes	Prime farmland if irrigated	48	0.32
Eakin-Raber complex, 2 to 6 percent slopes	Prime farmland if irrigated	48	0.32
Raber-Eakin complex, 6 to 9 percent slopes	Farmland of statewide importance	48	0.28
Glenham-Highmore silt loams, 5 to 9 percent slopes	Farmland of statewide importance	48	0.32
Highmore-DeGrey silt loams, 0 to 2 percent slopes	Not prime farmland	48	0.32
Highmore-DeGrey silt loams, 2 to 6 percent slopes	Not prime farmland	48	0.32
Highmore silt loam, 0 to 2 percent slopes	Prime farmland if irrigated	48	0.32
Highmore silt loam, 2 to 6 percent slopes	Prime farmland if irrigated	48	0.32
Highmore-Glenham silt loams, 2 to 5 percent slopes	Prime farmland if irrigated	48	0.32
Hoven silt loam, 0 to 1 percent slopes	Not prime farmland	48	0.43
Hoven-Onita silt loams	Not prime farmland	48	0.32
Macken silty clay loam, 0 to 1 percent slopes	Not prime farmland	86	0.24
Mobridge silt loam, 0 to 2 percent slopes	All areas are prime farmland	48	0.32
Onita-Hoven silt loams, 0 to 1 percent slopes	Not prime farmland	48	0.28
Peno-Gettys clay loams, 9 to 15 percent slopes	Not prime farmland	48	0.20
Raber-Cavo loams, 0 to 2 percent slopes	Not prime farmland	48	0.28
Raber-Cavo loams, 2 to 6 percent slopes	Not prime farmland	48	0.28
Raber-Peno loams, 6 to 9 percent slopes	Farmland of statewide importance	48	0.28
Bon loam, channeled, 0 to 2 percent slopes, frequently flooded	Not prime farmland	56	0.20
Cavo-Jerauld loams, 0 to 4 percent slopes	Not prime farmland	48	0.32
Cavo-Stickney loams	Not prime farmland	48	0.32
Eakin-Peno complex, 6 to 9 percent slopes	Farmland of statewide importance	48	0.32
Oko clay loam, 9 to 20 percent slopes	Not prime farmland	48	0.20
Onita-Hoven silt loams	Not prime farmland	48	0.28
Plankinton silt loam	Not prime farmland	48	0.32
Raber-Peno loams, 2 to 6 percent slopes	Farmland of statewide importance	48	0.28
Talmo-Delmont loams, 3 to 15 percent slopes	Not prime farmland	86	0.24
Reeder-Cabba loams, 3 to 6 percent slopes	Not prime farmland	48	0.28
Regent-Wayden silty clay loams, 6 to 15 percent slopes	Not prime farmland	48	0.28

Source: U.S. Department of Agriculture Natural Resources Conservation Service 1975,1998, 2021b.

[a] WEI = Wind Erodibility Index; 0 is the lowest and 310 is the highest index value.

[b] K factor – indicates the susceptibility of a soil to sheet and rill erosion by water; 0.02 is the least and 0.64 is the most erodible.

2.4.2 Environmental Effects: Proposed Action Alternative

The Proposed Action would affect soil during both construction and operation due to temporary soil disturbance and permanent facilities, respectively. The maximum amount of soil disturbance would be about the same as the land requirements acreages (Table 2.2-1): 586 acres of soil disturbance during construction and 88 acres during operation.

Approximately six acres of prime farmland soils would be temporarily disturbed during construction of turbines, collection lines, and new access roads, and 0.7 acre would be permanently converted due to turbine placement and new access roads. Approximately 107 acres of soils designated as Farmland of Statewide Importance would be temporarily disturbed during construction of turbines, collection lines, and new access roads, and 15 acres would be permanently converted due to turbines placement and new access roads.

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) provided a Farmland Protection Policy Act (1970) review in their scoping letter and determined the Project would have no regulatory impact on prime or important farmland (Appendix A).

Section 5.2.1 of the PEIS describes impacts to soils expected to occur when constructing a wind energy project. Impacts include soil compaction, soil horizon mixing, soil erosion and deposition by wind, soil erosion by water and surface runoff, sedimentation, and soil contamination. The soils found within the Analysis Area do not have shallow layers of bedrock (USDA 1975, 1998). Shallow bedrock is not anticipated to impact wind turbine or other Project construction so impacts to geologic resources are not expected.

Sections 5.2.1.3 to 5.2.1.5 of the PEIS discuss soil impacts related to wind energy project operations, maintenance, and decommissioning. Operations would mainly entail periodic inspections and maintenance activities that would not increase the potential for soil erosion, surface runoff, or measurable sedimentation of nearby lakes, rivers, and streams. Soil erosion could still occur, however, along roads as surface runoff is channeled into natural drainages. Decommissioning impacts would be similar to construction impacts.

Conservation Measures

North Bend is committed to implementing the conservation measures for soil resources derived from section 5.2.3 of the PEIS, and according to easement stipulations, which would help avoid or minimize soil impacts associated with the Proposed Action, such as:

- On-site fuel storage would be inspected and fuels would be handled in accordance with the Project's Spill Prevention, Control and Countermeasures (SPCC) Plan, which was included in the final design and engineering scope of work package submitted to the South Dakota Public Utilities Commission and available for public review[1].

- A Soil Erosion and Sediment Control Plan will be prepared and submitted to the Hughes and Hyde counties Planning and Zoning Offices in the first quarter of 2023, prior to construction. The plans will be available for public review upon request to North Bend.
- During Project design, wind energy facilities were not placed in areas with unsuitable seismic, liquefaction, slope, subsidence, settling, and flooding conditions.
- Ground-disturbing construction activities would be minimized during rainy periods.
- Workers would lay down some form of cribbing, bedding, or mats to support the weight of the crane, minimizing impacts to the underlying ground where cranes are required to travel cross-country. The cribbing or mats would be removed immediately after the crane passes by to be re-used elsewhere. Crane cross-country travel would avoid identified archaeological resources and traditional cultural properties that are eligible for listing in the NHRP or are currently unevaluated for listing in the NHRP (see Section 3.11.2 below).
- New and existing roads would be surfaced with aggregate materials.
- Heavy vehicles and equipment would be restricted to improved roads to the extent practicable.
- Vehicle and equipment speed would be controlled on unpaved surfaces.
- Construction and maintenance activities would be conducted when the ground is frozen or when soils are dry and native vegetation is dormant.
- Disturbed areas not actively under construction would be stabilized using methods such as erosion matting or soil aggregation, as site conditions warrant.
- Topsoil from all excavation and construction activities would be salvaged to reapply to disturbed areas once construction is completed.
- Excess excavation materials would be disposed of in approved areas to control erosion.
- Excavation areas and soil piles would be isolated from surface water bodies using silt fencing, bales, or other accepted appropriate methods to prevent sediment transport by surface runoff.
- Earth dikes, swales, and lined ditches would be used to divert local runoff around the work site.
- Non-cropland disturbed areas would be reseeded with a native seed mix or seed mix requested by landowner and revegetated immediately following construction. North Bend would coordinate with South Dakota Department of Game, Fish, and Parks (SDGFP), USFWS, USDA NRCS, and landowners on seed mixes to be used during restoration as part of a Noxious and Invasive Weed Management Plan, which was required as a condition of the Application for Facility Permit by the South Dakota Public Utilities Commission[2].
- Disturbed soils and topsoil would be replaced over the buried cable within one day.
- Drainage patterns and surface topography would be restored to pre-existing conditions.

[1] Available online at https://puc.sd.gov/Dockets/Electric/2021/EL21-018.aspx

[2] See section 9.1.3.2 of the Application for Facility Permit, available online at https://puc.sd.gov/commission/dockets/electric/2021/EL21-018/Application.pdf

2.4.3 Environmental Effects: No Action Alternative

No Project-related impacts to soil or geologic resources would occur, but ongoing impacts related to agriculture and gravel mining are expected to continue at existing intensities. In general, agriculture, particularly cropping and overgrazing, can increase soil erosion and cause compaction, loss of soil structure, nutrient degradation, and/or increase salinity. Gravel mining can result in a loss of topsoil.

2.5 Water Resources

Section 4.3.1 of the PEIS provides an overview of the White-Little Missouri drainage basin, which includes the Analysis Area. The Analysis Area for water resources is the construction footprint, plus a 500-foot buffer.

2.5.1 Affected Environment

<u>Surface Water (Rivers/Streams, Floodplains, Wetlands)</u>

Rivers/Streams

According to the U.S. Geological Survey (USGS) National Hydrography Dataset (NHD; USGS 2020, 2021), surface water resources in the Project vicinity include:

- Chapelle Creek, which bisects the Analysis Area and flows from east to west for 0.33 miles and discharges into the Missouri River;
- South Chapelle Creek, which flows from east to west through the southern portion of the Analysis Area for 0.75 miles and discharges into the Missouri River;
- Over 15.5 miles of unnamed tributaries, which flow into Chapelle and South Chapelle creeks (located in the Analysis Area) and South Fork Medicine Knoll Creek, Woodruff Lake, and Swanson Lakes (located outside the Analysis Area; USGS 2021); and
- Numerous ponds along the creeks and tributaries, ranging in size from less than one to 7.2 acres (Figure 3.2-1).

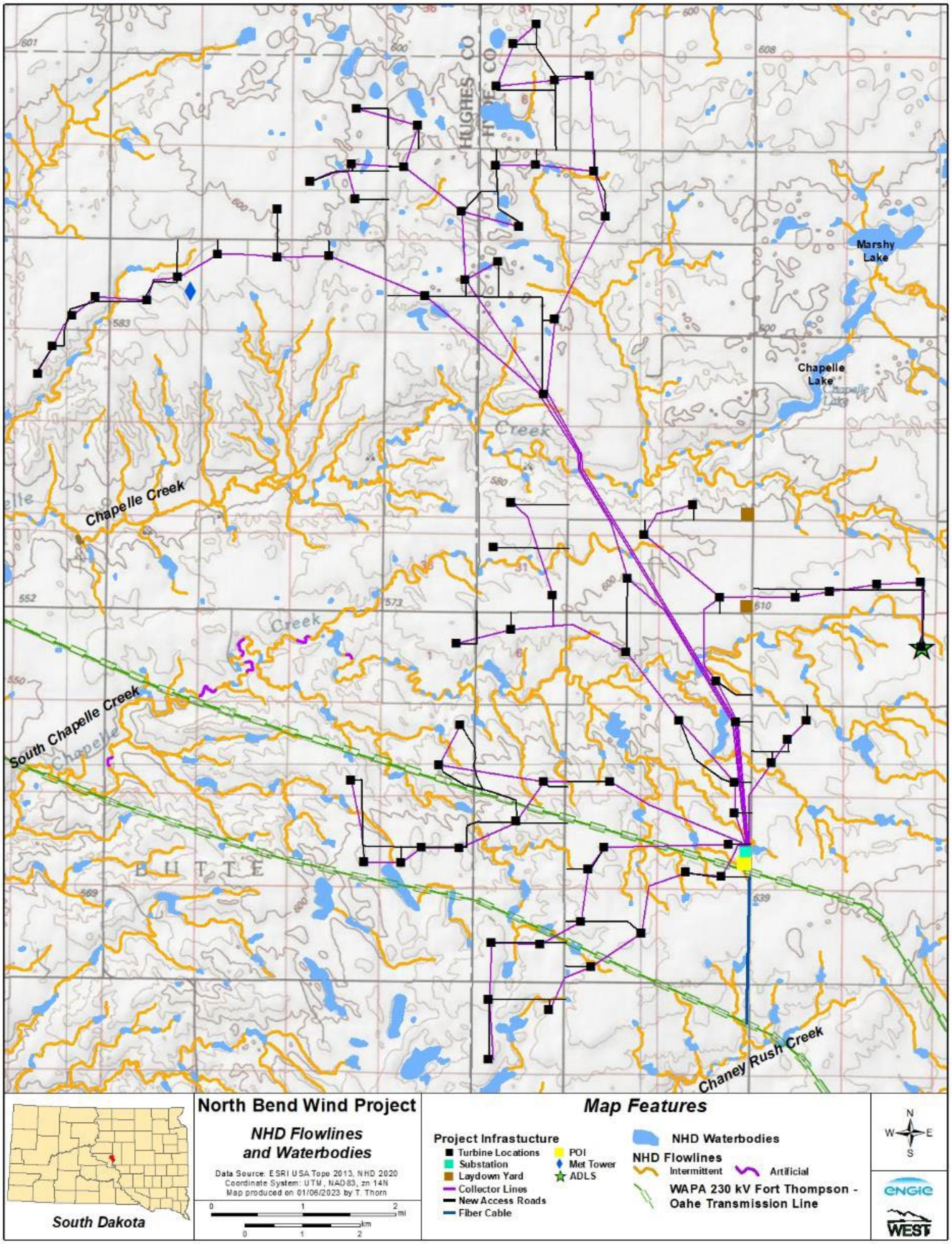

Figure 3.2-1. Surface Water Resources.

None of the surface water resources within the Project vicinity are on South Dakota's list of impaired waters (South Dakota Department of Agriculture and Natural Resources 2021).

Floodplains

Floodplains have not yet been mapped in Hyde County but have been mapped in Hughes County (FEMA 2021). In the Hughes County portion of the Analysis Area, Zone A and Zone X occur. Zone A are areas where no base flood elevations are determined. Zone X are "areas determined to be outside the 0.2% annual chance floodplain" (FEMA 2021). The majority of the Analysis Area in Hughes County is in Zone X. It is assumed that floodplains in Hyde County are also Zone A and Zone X due to similar topography and water sources; Chapelle Creek and South Chapelle Creek occur in both Hyde and Hughes counties in the Analysis Area.

Wetlands

A desktop analysis of National Wetland Inventory (NWI) maps initially identified wetlands in the Project vicinity. The wetlands were mapped by NWI in 1986, with periodic updates throughout 2021. According to NWI, there are nearly 365 acres of wetlands in the Analysis Area, and the majority are freshwater emergent wetlands (Table 3.2-1). Many of the wetlands are at the northern end of the Analysis Area and are included in USFWS Wetland Easement parcels (Figure 3.2-2). USFWS Wetland Easements are part of the National Wildlife Refuge System and are managed for the protection of wildlife and waterfowl habitat.

Table 3.2-1. Wetlands within the Project Analysis Area.

Wetland Type	Acres	Percent of Wetlands
Freshwater Emergent Wetland	293.53	80.58
Freshwater Pond	42.54	11.68
Riverine	15.21	4.17
Lake	12.73	3.49
Freshwater Forested/Shrub Wetland	0.27	0.07
Total	364.28	100

Source: U.S. Fish and Wildlife Service National Wetlands Inventory 2021.

To further refine and confirm the desktop information, potentially jurisdictional wetlands were identified during field visits in fall 2021. Jurisdictional wetlands are wetlands regulated by the U.S. Army Corps of Engineers (USACE) under Section 404 of the Clean Water Act of 1972. The study area boundaries for field visits were:

- 200-foot buffer around turbine locations,
- 100-foot buffer of access road alignments (50 feet on either side of centerline),

- 50-foot buffer of crane path alignments (25 feet on either side of centerline),
- 100-foot buffer of collection line alignments (50 feet on either side of centerline),
- 200-foot buffer of substation footprint and laydown yard, and
- 300-foot buffer of met tower locations.

A total of 32 acres of wetlands assumed to be jurisdictional were mapped in the survey area, ranging in size from 0.001 to four acres (CORE Consultants, Inc. 2021; Appendix B). All presumed-jurisdictional wetlands were classified as "palustrine emergent," meaning these wetlands have freshwater and rooted vegetation.

Groundwater (Aquifers)

Section 4.3.2 of the PEIS provides information about groundwater resources, including the Northern Great Plains Aquifer System found in central and eastern Montana, western North Dakota, and South Dakota. The Northern Great Plains Aquifer is nationally important and has supported agriculture since 1940 (Peterson *et al.* 2020). Peterson *et al.* (2020) conducted a future forecast for this aquifer, which predicted an overall decline of groundwater levels and indicated an overdraft of the aquifer when climate was about average and agriculture development was held in about the same state as 2009.

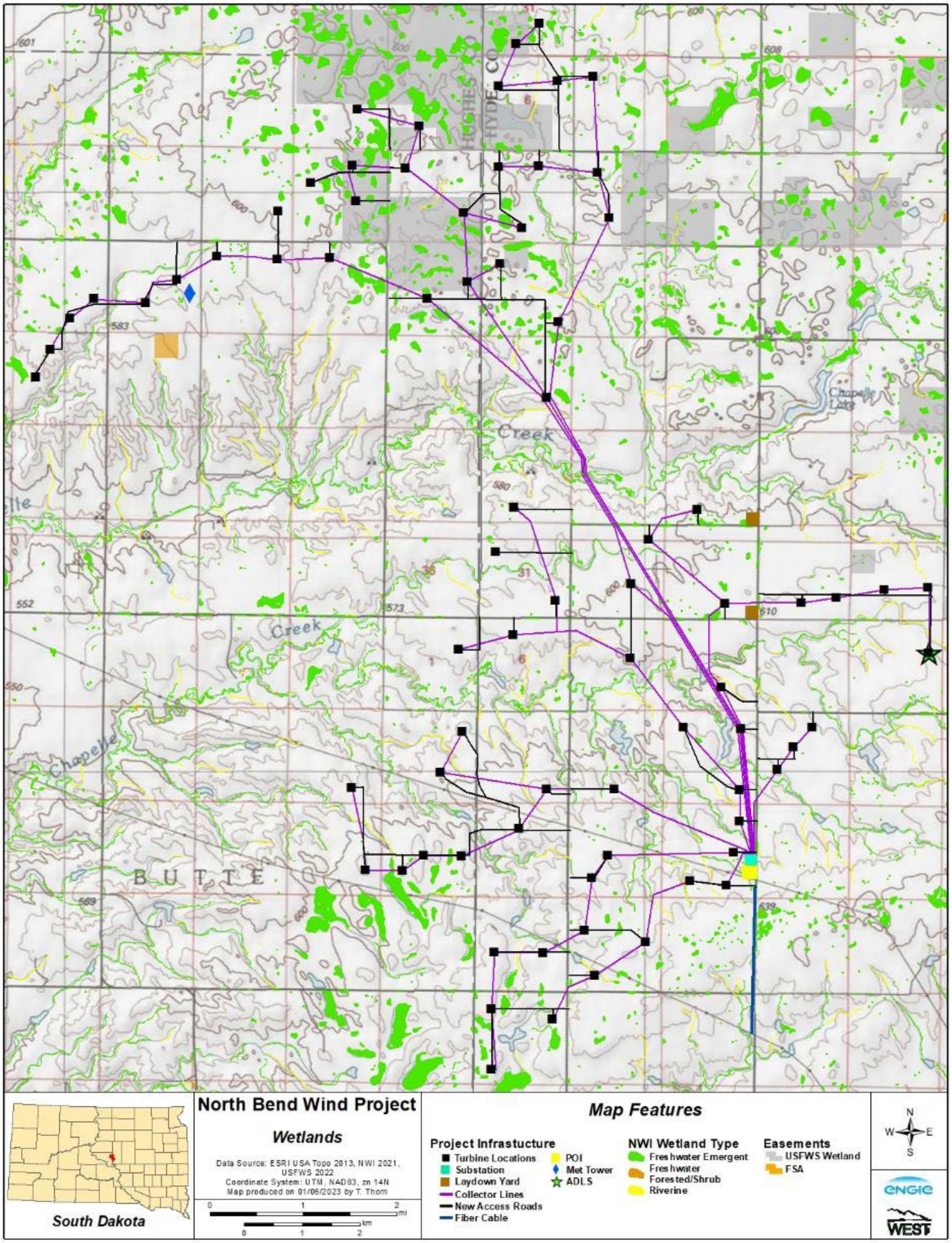

Figure 3.2-2. Wetlands, based on October 2022 USFWS NWI maps.

2.5.2 Environmental Effects: Proposed Action Alternative

Surface Water (Rivers/Streams, Floodplains, Wetlands)

Rivers/Streams

Section 5.3.1 of the PEIS describes common impacts on water resources due to wind energy development. Common impacts include the use of water resources, the degradation of water quality, and the alteration of natural flow systems.

Construction activities would impact less than one mile of creeks in total, and approximately four acres of ponds throughout the Analysis Area (Table 3.2-2). Construction activities would include construction of access roads, collection line trenches, and the POI facility. During operation of the Project, access roads and the POI facility will result in impacts to 0.2 miles of creeks and 0.1 acres of ponds.

Table 3.2-2. Impacts to Surface Waters within the North Bend Wind Analysis Area.

Feature	Creeks		Ponds	
	Construction Impacts (miles)	Operation Impacts (miles)	Construction Impacts (acres)	Operation Impacts (acres)
Access Roads	0.1	0.1	0.1	0.1
Collector Lines	0.6	0	4.1	0
POI facility	0.1	0.1	0	0
Fiber Optic Communication System	< 0.1	0	0	0
Total	**0.8**	**0.2**	**4.2**	**0.1**

The main type of construction impact is degradation of water quality in surface waters due to sedimentation resulting from soil erosion and excavating, trenching, and grading in or near surface waters. Water quality is regulated by the South Dakota Department of Agriculture and Natural Resources (SDDANR). A general permit for storm water discharges from the SDDANR has been obtained for construction activities.

During operation, less than 0.1 mile of South Chapelle Creek and intermittent tributaries and 0.1 acre of ponds would be impacted by access roads (Table 3.2-2). Total operational impacts to creeks are 0.2 miles (Table 3.2-2). The Project anticipates impacts to jurisdictional streams would be authorized under USACE Nationwide Permit 57 (USACE 2021). North Bend would coordinate with the USACE to adhere to Nationwide Permit conditions.

Floodplains

All Project infrastructure would be located outside mapped floodplains.

Wetlands

As discussed in section 5.6.1.1 of the PEIS, wetland communities could be impacted during both construction and operation of the Project. By overlaying the Project features onto the ground-truthed wetland mapping conducted in fall 2021, an estimated eight acres of palustrine emergent wetlands would be impacted during construction and 0.5 acre during operation (Table 3.2-3). Impacts to wetlands would be due to collector lines and access roads crossing wetlands (Table 3.2-3). Wetlands temporarily disturbed during construction would be restored. All USFWS documented wetlands within their wetland easements (USFWS 2022a) would be avoided. North Bend will contact the USFWS Wetland Management District office in Huron, South Dakota to verify up-to-date wetland easement locations are avoided prior to final project design.

Table 3.2-3. Anticipated Impacts to Wetlands

Project Feature	Construction Impacts (acres)	Operation Impacts (acres)
Access Roads	0.8	0.5
Collector Lines	7.0	0
Total	**7.8**	**0.5**

North Bend anticipates authorization via Nationwide Permit 57 (USACE 2007, 2021) to impact wetlands. If the Project does not meet the requirements for the Nationwide Permit, North Bend would apply for an Individual Permit.

Decommissioning impacts would be like those during construction.

<u>Groundwater (Aquifers)</u>

Changes to runoff patterns or volume of runoff have the potential to affect groundwater, but such changes, if any, would likely be negligible with no or little effect to groundwater because the volume of water reaching the aquifer would be very small and likely immeasurable.

<u>Conservation Measures</u>

North Bend is committed to implementing the conservation measures for water resources derived from section 5.2.3 of the PEIS, which would help to avoid or minimize water impacts associated with the Proposed Action, such as:

- Standard erosion control BMPs would be applied to all construction activities and disturbed areas (e.g., sediment traps, water barriers, erosion control matting) as applicable to minimize erosion and protect water quality. These measures would be outlined further in a Soil Erosion and Sediment Control Plan, which would be prepared and submitted to the Hughes and Hyde counties Zoning Offices prior to construction.

- Drainage ditches would be constructed only where necessary; appropriate structures at culvert outlets would be used to prevent erosion.
- Altering existing drainage systems would be avoided, especially in sensitive areas such as erodible soils or steep slopes.
- Catch basins, drainage ditches, and culverts would be cleaned and maintained regularly.
- Herbicide and pesticide use would be limited to non-persistent, immobile compounds and herbicides and pesticides would be applied using a properly licensed applicator in accordance with label requirements.
- Excess excavation materials would be disposed of in approved areas to control erosion and minimize leaching of hazardous materials.
- Drainage patterns and surface topography would be restored to pre-existing conditions.
- Non-cropland disturbed areas would be reseeded with a native seed mix or seed mix requested by landowner and revegetated immediately following construction. North Bend would coordinate with SDGFP, USFWS, USDA NRCS, and landowners on seed mixes to be used during restoration.
- The construction contractor would be required to get all applicable permits from SDDANR and prepare and submit a Stormwater Pollution Prevention Plan to the SDDANR before starting construction.
- To avoid potential water quality effects from petroleum products, on-site fuel storage would be inspected, and fuels would be handled in accordance with the Project’s SPCC Plan, which was included in the final design and engineering scope of work package submitted to the South Dakota Public Utilities Commission and available for public review.

2.5.3 Environmental Effects: No Action Alternative

No Project-related impacts to surface or groundwater resources would occur, but ongoing impacts, primarily related to agriculture, are expected to continue at existing intensities. In general, fertilizers and pesticides used for agriculture can potentially be transported to local streams, rivers, and groundwater, leading to degradation of water quality.

2.6 Vegetation and Land Cover

2.6.1 Affected Environment

Existing land cover in South Dakota is addressed in section 4.1.1 of the PEIS and upland plant communities are described in section 4.6.1.1 of the PEIS. Vegetation specific to the Project is described below, including general vegetation types, untilled grassland and grassland easements, and noxious weeds.

General Vegetation Types

Table 3.3-1 provides acreages of vegetation within the 8,834-acre Analysis Area. The Analysis Area for vegetation is a 500-foot buffer around the construction footprint of all facilities and infrastructure. Vegetation is primarily used for agriculture, including cropland and livestock grazing, with relatively little conversion of vegetation for development. According to 2019 National Land Cover Database (NLCD) data, 51% (4,514 acres) of the Analysis Area is cropland; 45% (3,960 acres) is herbaceous; and the remaining (less than 5%; 360 acres) is developed, water/wetlands, or shrub/scrub. (Figure 3.3-1, Table 3.3-1). The NLCD defines herbaceous as areas dominated (generally >80% of total vegetation) by grasses or non-woody vegetation. These areas are not subject to intensive management such as tilling but may be grazed.

Table 3.3-1. Land Cover within the North Bend Wind Analysis Area.

Land Cover Type [a]	*Area (Acres)*	*Percent of Analysis Area*
Cropland	4,514.5	51.1
Herbaceous	3,960.5	44.8
Developed	205.5	2.3
Water/Wetlands	150.6	1.7
Shrub/Scrub	2.9	< 0.1
Totals	**8,834.0** [b]	**100**

[a] National Land Cover Database 2019.

[b] Area calculation between software and database can vary by 1-2% between sources due to variation in data collection and analysis methodologies.

Untilled Grasslands and Grassland Easements

Untilled grasslands are of high conservation value and the Analysis Area is about 41% (3,639 acres) untilled herbaceous grassland (Bauman *et al.* 2016; Figure 3.3-1). Within the Analysis Area, approximately 20 acres of land with herbaceous vegetation (less than 0.1% of the Analysis Area) is enrolled in the USFWS Grassland Easement Program (Figure 3.3-1). No Farm Service Agency (FSA) easements are found within the Analysis Area (Figure 3.3-1).

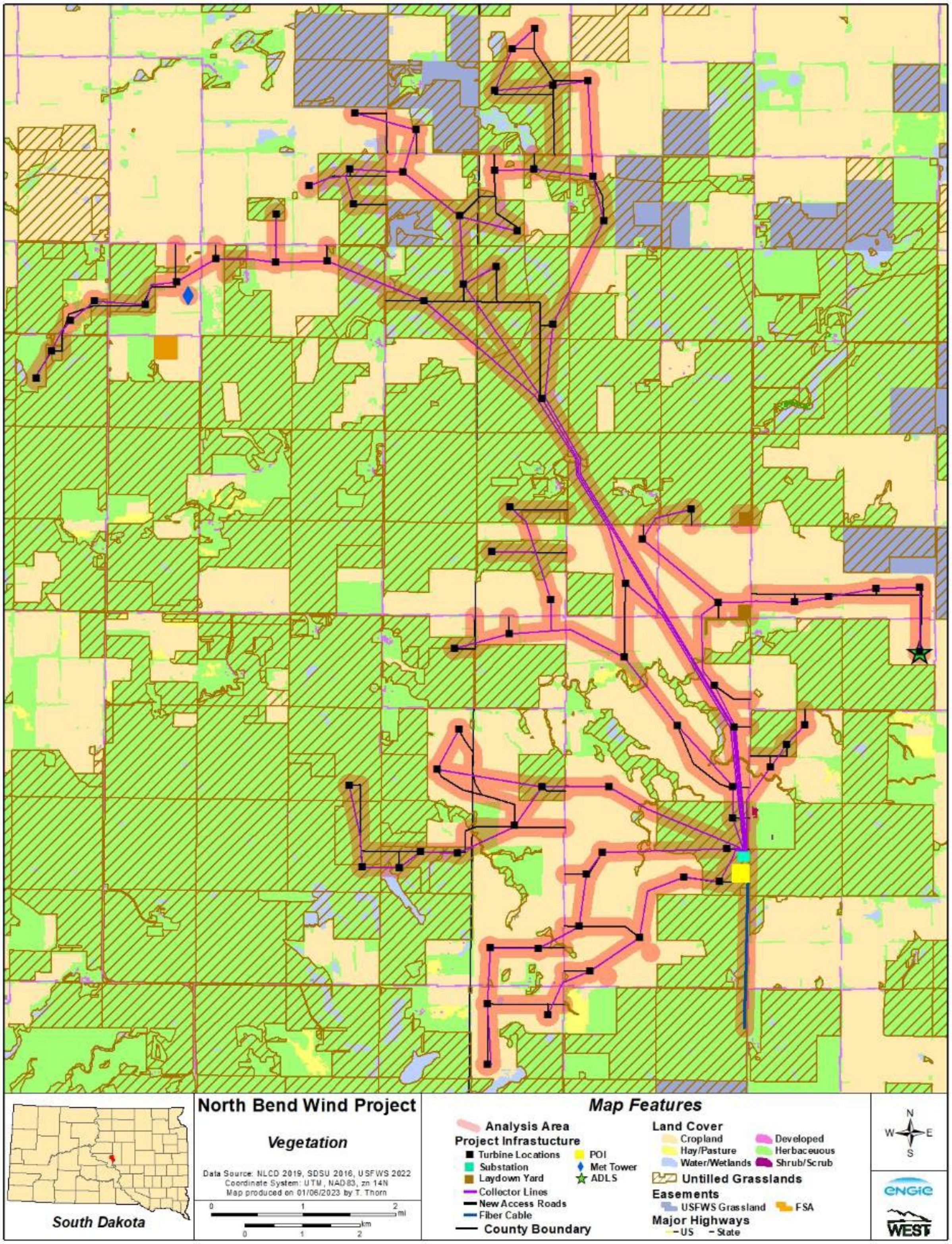

Figure 3.3-1. Vegetation.

Noxious Weeds

Table 3.3-2 provides the list of designated state and county-level noxious weeds.

Table 3.3-2. State and County Noxious Weeds.

Across South Dakota	*absinth wormwood*	*leafy spurge*
Canada thistle	perennial sow thistle	hoary cress
purple loosestrife	salt cedar	
In Hughes County	field bindweed	puncturevine
In Hyde County	yellow toadflax	bull thistle
houndstongue	absinth wormwood	musk and plumeless thistles
common mullein		

Source: South Dakota Department of Agriculture 2021a, 2021b.

2.6.2 Environmental Effects: Proposed Action Alternative

Section 5.1.1.1 of the PEIS describes common impacts to land cover from wind energy projects and Section 5.6.1.1 of the PEIS describes common impacts to upland plant communities. These types of impacts would apply to vegetation in the Analysis Area. The specific amount of vegetation that would be affected during construction and operation of the Project is shown in Table 3.3-3.

Table 3.3-3. Impacts to Land Cover within the North Bend Wind Project Analysis Area.

Land Cover Type	*Project Infrastructure*	*Construction Impacts (Acres)*	*Operation Impacts (Acres)*
Cropland			
	Turbines [a]	64	4
	New access roads	51	34
	Met tower	< 1	< 1
	Collector lines	173	0
	Substation	0	0
	POI facility	0	0
	Laydown/staging/batch plant area [b]	8	0
	Fiber optic communication system	0	0
Total		**296**	**38**
Herbaceous (un-tilled grassland)			
	Turbines [a]	45 (43) [c]	3 (3) [c]
	New access roads	47 (43) [c]	31 (29) [c]
	Collector lines	145 (137) [c]	0
	Substation	7 (7)	7 (7) [c]
	POI facility	21 (20)	5 (4) [c]
	Laydown/staging/batch plant area [b]	0 (0) [c]	0
	Fiber optic communication system	8 (8)	0
Total		**273 (258)** [c]	**46 (43)** [c]
Other [d]			
	Turbines [a]	< 1	0
	New access roads	5	3
	Collector lines	10	0
	Substation	< 1	< 1
	POI facility	1	1

	Laydown/staging/batch plant area [b]	1	0
	Fiber optic communication system	< 1	0
Total		**18**	**4**
Project-wide Total		**586**	**88**

[a] Acreage shown is for 71 turbine sites under consideration and none of the seven alternative turbine locations. The seven alternates locations would include eight acres of cropland and six acres of herbaceous grasslands.

[b] Acreage shown is for the two laydown/staging areas under consideration; only one will be developed. One potential location is in cropland, the other potential location is in herbaceous vegetation. If the herbaceous vegetation location is used, 10 (10) acres would be impacted.

[c] Number in parentheses represents the amount of herbaceous vegetation (acres) that is also classified as untilled grassland by Bauman *et al.* 2016.

[d] Other is developed, wetland, open water, hay/pasture, barren land, or shrub/scrub. Wetland and open water acreage is based on National Land Cover Database data and may differ from the U.S. Fish and Wildlife Service National Wetlands Inventory and U.S. Geological Survey National Hydrography data used in Section 3.2 - Water Resources.

General Vegetation

The Project would affect up to 296 acres of cropland, 273 acres of herbaceous vegetation, and 18 acres of other (developed, hay/pasture, shrub/scrub) land cover types during construction. If alternate turbine locations are selected, they could impact up to eight acres of cropland and six acres of herbaceous grasslands depending on the selected turbine location. During operations, up to 38 acres of cropland, 46 acres of herbaceous vegetation, and four acres of other land cover types would be permanently removed and converted to developed uses. As described in Table 3.3-2, the acreage estimates provided above are the maximum extent of disturbance if all final and alternate turbine, met, and laydown/staging areas under consideration were to be built.

Construction impacts would be relatively short-term, lasting the duration of construction (or about one growing season), and the additional time it takes for restoration of disturbed areas, which typically takes a minimum of two years. Slightly over 300 acres of cultivated crops would be impacted during construction, primarily in the form of vegetation removal (grading/blading) and trampling or mowing during trenching of the collector lines, access road construction, and turbine foundation construction (Table 3.3-3).

Untilled Grasslands and Grassland Easements

About 264 acres of untilled grassland would be temporarily disturbed by crushing or trampling from vehicles, equipment, and workers during Project construction. About 43 acres would be affected long term during Project operation due to conversion of existing vegetation into developed Project facilities. Land enrolled in the USFWS Grassland Easement Program would be completely avoided by Project facilities.

Noxious Weeds

During construction, surface disturbance, traffic, and revegetation activities could introduce and/or spread noxious weeds. If uncontrolled, noxious weeds could lead to a general reduction in vegetative condition throughout the Project and surrounding area and could degrade conditions for agriculture and wildlife. Some of the conservation measures listed below, such as vehicle washing, would minimize the introduction of noxious weeds and other measures, such as a control plan and monitoring, would minimize the spread of noxious weeds.

Operation of the Project is unlikely to result in the introduction or spread of noxious weeds, although vehicle traffic associated with maintenance activities could transport weed seed along access roads.

Conservation Measures

North Bend is committed to implementing the conservation measures for vegetation resources derived from section 5.1.2 of the PEIS, and according to easement stipulations, which would help to avoid or minimize vegetation impacts associated with the Proposed Action, such as:

- Restoration procedures would be followed as described in the Project's Application for a Facility Permit submitted to the South Dakota Public Utilities Commission in June 2021. Restoration procedures are part of a Noxious and Invasive Weed Management Plan, which was developed as a condition of the Application for Facility Permit by the South Dakota Public Utilities Commission[3].
- Excess concrete (excluding belowground portions of decommissioned turbine foundations intentionally left in place) would not be buried or left in active agricultural areas.
- Vehicles would be washed outside of active agricultural areas and laydown locations to minimize the possibility of the spread of noxious weeds.
- A Noxious and Invasive Weed Management Plan has been developed as a condition of the Application for Facility Permit by the South Dakota Public Utilities Commission[3]. This plan addresses monitoring, weed identification, and methods for preventing and treating infestations. The use of certified weed-free mulching and seed would be required.

[3] See section 9.1.3.2 of the Application for Facility Permit, available online at https://puc.sd.gov/commission/dockets/electric/2021/EL21-018/Application.pdf.

- Access roads and newly established utility and transmission line corridors would be regularly monitored for the establishment of invasive species. Weed control measures would be initiated immediately upon evidence of the introduction or establishment of invasive species.
- Fill materials that originate from areas with known invasive vegetation problems would not be used.
- Topsoil would be stripped from any agricultural area used for traffic or vehicle parking, segregating topsoil from excavated rock and subsoil, and replaced during restoration activities.
- Drainage problems caused by construction would be corrected to prevent damage to agricultural fields.
- Following completion of construction and during decommissioning, subsoil would be de-compacted.
- Access roads that are no longer needed would be recontoured and revegetated.
- A transportation plan will be prepared at least 90 days prior to the start of construction as part of South Dakota Department of Transportation's (SDDOT) Motor Carrier Services permit that identifies measures North Bend would implement to comply with state or federal requirements. This would address the transport of turbine components, main assembly crane, and other large pieces of equipment. The plan would consider specific object size, weight, origin, destination, and unique handling requirements and would evaluate alternative means of transportation (e.g., rail or barge).
- During construction, operations and maintenance, and decommissioning phases, traffic would be restricted to designated Project roads. Use of other unimproved roads shall be restricted to emergency situations.

2.6.3 Environmental Effects: No Action Alternative

No Project-related impacts to vegetation resources would occur, but ongoing impacts, such as conversion of herbaceous land cover types to cropland, are expected to continue at existing intensities.

2.7 Wildlife

2.7.1 Affected Environment

Wildlife is addressed in section 4.6.2 of the PEIS, including amphibians and reptiles, birds, significant and important bird habitats, and mammals in the UGP Region. Project wildlife surveys documented bird and bat species observations in and near the area (Western EcoSystems Technology, Inc. [WEST] 2021a; Appendix C2). Birds and bats were the focus of these surveys because they are most likely to be affected by the Project.

The following sections provide context for species and habitat conditions as a basis for comparison of environmental effects. The best available information is a combination of animals observed during Project field surveys, animal locations from other data sources, animal habitat model maps, and pertinent literature results. The information is provided in the following subsections: general wildlife; waterbirds; Birds of Conservation Concern (BCC) and Species of Greatest Conservation need (SGCN), grassland birds, and passerines; prairie grouse; bats; and eagles and other raptors.

The Analysis Areas vary, dependent on species-specific protocols and life history requirements, as specified in their respective Environmental Effects subsections. Because the Project layout went through several iterations, some species-specific survey results are not an exact match to the current Project footprints. These survey results are useful to inform the wildlife conditions in the Project Area and thus, are discussed in the sections below.

<u>General Wildlife</u>

Birds

Avian point-count surveys were conducted in and near the Project Area over a 5-year period (2016 – 2021) to characterize pre-construction avian use. Surveys in 2016 – 2017 and 2018 – 2019 were conducted in areas under consideration for development by both the North Bend Wind Project and the nearby Triple H Wind Project. Surveys were conducted once a month in locations representative of the habitats and topography of the Project Area. Project boundaries changed over time due to various logistical constraints, which altered some survey locations. Therefore, Figure 3.4-1 is provided to show how annual survey locations relate to the current Project Area. Avian use survey results are provided in the species-specific sections. A summary of avian observations by survey year is provided in Table 3.4-1 (Appendix C1).

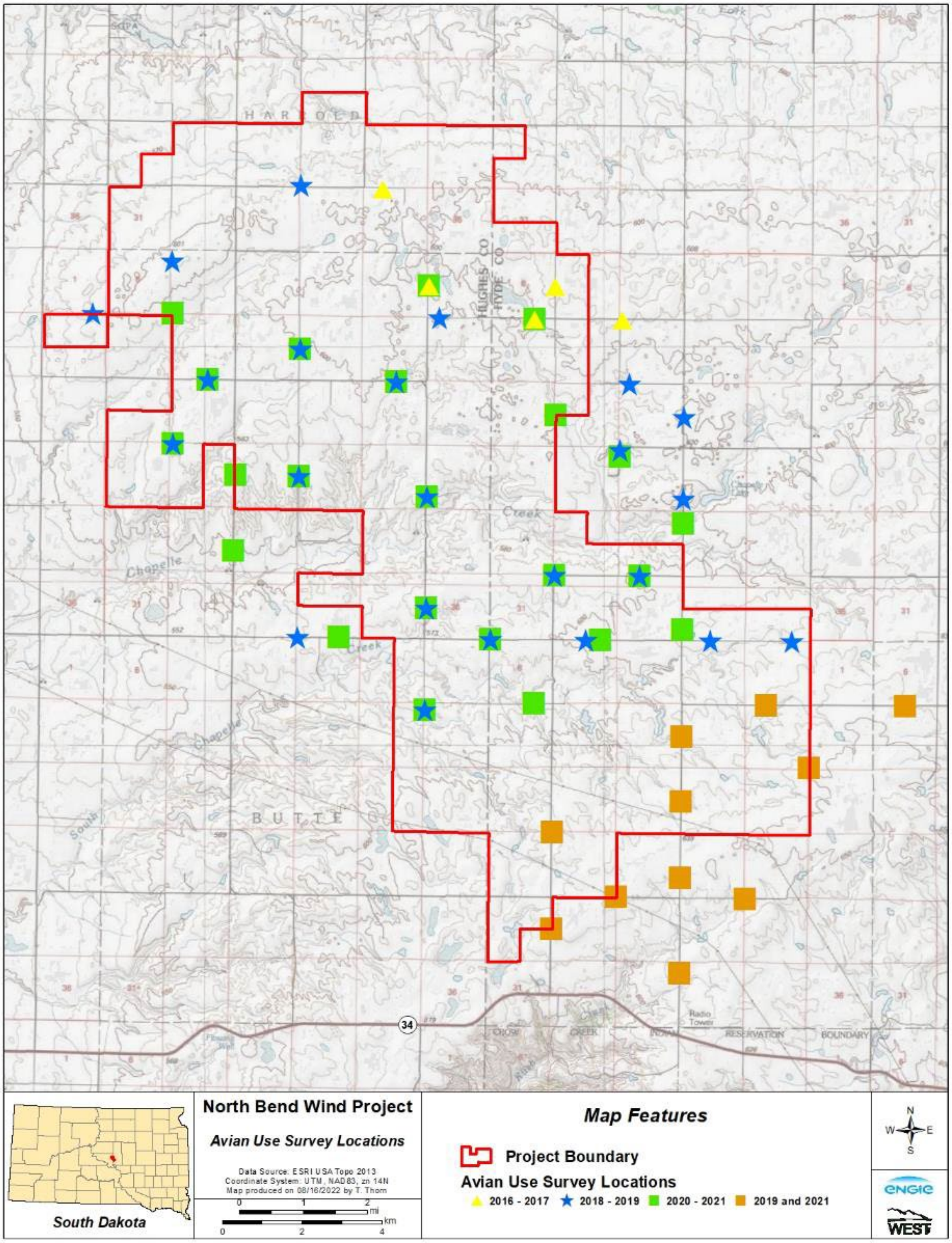

Figure 3.4-1. Avian Use Survey Locations by Year from 2016 – 2021.

Table 3.4-1. Summary of Avian Use in the Project Vicinity by Survey Year.

	Survey Year				
Species Observed	**2016 – 2017**	**2018 – 2019**	**2019 – 2020**	**2020 – 2021**	**2021 – 2022**
All Bird Species	47	40	56	71	48
Grassland Species [a]	35	38	26	38	24
Waterbird Species [b]	13	2	22	22	20
Raptor and Other Large Bird Species [c]	8	9	9	16	14

Source: 2016 – 2021 avian point-count surveys for the Project and overlap of previous boundaries of the adjacent Triple H Wind Project.
[a] Includes passerines, upland gamebirds, doves/pigeons, and/or woodpeckers.
[b] Includes loons/grebes, gulls/terns, shorebirds, waterbirds, waterfowl, and/or rails/coots.
[c] Incudes raptors and other large birds that are not waterbirds, such as large corvids, vultures, nightjars, and/or owls.

Over 400 bird species have been recorded in South Dakota (South Dakota Ornithologists' Union 2021), while between 40 and 71 bird species were observed annually in the Survey Area and vicinity during avian use surveys between 2016 and 2021 (Table 3.4-1, Figure 3.4-1). This number of species observations is comparable to Breeding Bird Atlas survey blocks (each block is three miles by three miles) in Hughes and Hyde counties (South Dakota Breeding Bird Atlas Team 2009). Of the eight survey blocks in these counties, seven blocks reported between 40 and 59 species, and one had between 60 and 72 species. The bird species observed were typical of the prairie region of central South Dakota.

Other Wildlife and Grassland Associates

Wildlife likely to be found in and near the Project Area includes relatively common wildlife species, such as pronghorn, white-tailed deer, mule deer, coyote, fox, raccoon, and other small mammals, as well as less common, more specialized species like burrowing owls and swift fox. Agricultural production areas, such as cropland, may be used on a temporary basis by birds and other wildlife for foraging or short-term shelter.

Waterbirds

Bird Conservation Regions are ecologically distinct regions in North America with similar bird communities, habitats, and resource management issues, as delineated by the U.S. North American Bird Conservation Initiative (US NABCI; 2021). Important Bird Areas are part of a program led by BirdLife International and The National Audubon Society (Audubon) to identify areas vital to birds and other biodiversity as priorities for conservation (Cornell Lab of Ornithology 2022b). Audubon also helps identify important migratory stopover habitat (Audubon 2022a). The Project Area is within the Prairie Potholes Bird Conservation Region, the most important waterfowl production area on the North American continent (US NABCI 2021, USGS 2020). The nearest Important Bird Area is the Pierre Missouri River Bottomlands, about 23 miles west of the Project Area (Audubon 2022a). The nearest important migratory stopover site for shorebirds (Audubon 2022a), Lake Andes National Wildlife Refuge, is about 100 miles southeast of the Project. The Analysis Area for waterbirds is the area surveyed throughout the Project Area during Avian Use surveys.

Waterbird species observed during all years of avian use surveys are shown in Table 3.4-2. The number of observations presented in Table 3.4-2 show variability among species and the number of individuals year to year. The variability may be due to rainfall, drought, land use practices, and general weather patterns.

Table 3.4-2. Waterbirds Observed in the Project Vicinity by Survey Year.

Species Observed	Survey Year				
	2016 – 2017	2018 – 2019	2019 – 2020	2020 – 2021	2021 – 2022
pied-billed grebe	0	0	0	1	0
great egret	0	0	0	2	0
great blue heron	0	0	1	5	0
sandhill crane	0	0	93	94	0
double-crested cormorant	1	0	0	1	15
wood duck	0	0	0	0	2
northern pintail	3	0	67	17	3
green-winged teal	0	0	0	0	2
mallard	16	0	110	37	16
snow goose	50	0	0	428	0
lesser scaup	0	0	2	0	7
ring-necked duck	0	0	1	0	0
canvasback	0	0	1	0	0
Canada goose	201	3,680	1,143	589	100
American wigeon	0	0	8	0	0
gadwall	0	0	7	2	1
Common merganser	0	0	8	0	0
northern shoveler	5	0	26	4	7
blue-winged teal	6	0	13	34	12
unidentified duck	1	0	12	62	100
unidentified waterfowl	0	0	20	0	0
upland sandpiper	2	0	17	6	4
killdeer	10	4	39	49	15
Wilson’s snipe	0	0	0	0	1
marbled godwit	6	0	14	1	7
greater yellowlegs	0	0	0	2	1
Willet	1	0	0	0	0
unidentified sandpiper	0	0	0	0	3
black tern	0	0	0	5	0
Bonaparte’s gull	0	0	1	0	0
herring gull	0	0	1	0	0
ring-billed gull	0	0	0	17	8
Franklin’s gull	95	0	37	9	153
Forster’s tern	0	0	1	0	0
American coot	0	0	1	8	0

Source: 2016 – 2021 avian point-count surveys for the Project and overlap of previous boundaries of the adjacent Triple H Wind Project.

Yellow rail, piping plover, Baird's sparrow, Sprague's pipit, chestnut-collared longspur, Wilson's phalarope, marbled godwit, and American avocet are among the many priority, non-waterfowl species breeding in this region (Peterson 1995; Rocky Mountain Bird Observatory 2009). Wetland areas also provide key spring migration sites for Hudsonian godwit, American golden-plover, white-rumped sandpiper, and buff-breasted sandpiper (NABCI 2021). Of these, chestnut-collared longspur and marbled godwit were observed during avian use surveys. Both species are also Birds of Conservation Concern (BCC; USFWS 2021a) and are discussed in the following section.

BCC, SGCN, Grassland Birds, and Passerines

The BCC that could occur in the vicinity of the Project include American golden-plover, black tern, black-billed cuckoo, bobolink, burrowing owl, chestnut-collared longspur, ferruginous hawk, Franklin's gull, Hudsonian godwit, lark bunting, lesser yellowlegs, marbled godwit, red-headed woodpecker, semipalmated sandpiper, and willet (USFWS 2021a). SGCN are identified in South Dakota's State Wildlife Action Plan (SDGFP 2014) and include marbled godwit, black tern, greater prairie-chicken, and chestnut collared longspur. The Analysis Area for BCC and SGCN species is the area surveyed throughout the Project Area during Avian Use surveys.

Both BCC and SGCN species were observed during the avian use surveys (Table 3.4-3). Species observed include marbled godwit, black tern, chestnut-collared longspur, Franklin's gull, northern harrier, bobolink, grasshopper sparrow, red-headed woodpecker, lark bunting, and greater prairie-chicken. Greater prairie-chicken is discussed in the Prairie Grouse section below.

Table 3.4-3. BCC and SGCN Observed in the Project Vicinity by Survey Year.

	Survey Year				
Species Observed	**2016 – 2017**	**2018 – 2019**	**2019 – 2020**	**2020 – 2021**	**2021 – 2022**
marbled godwit	6	0	14	1	7
black tern	0	0	0	5	0
willet	1	0	0	0	0
chestnut-collared longspur	14	1	2	26	24
Franklin's gull	95	0	37	9	153
northern harrier	4	2	11	31	203
bobolink	5	4	70	4	4
grasshopper sparrow	2	11	21	56	11
red-headed woodpecker	0	0	0	4	0
lark bunting	2	13	11	0	0
greater prairie-chicken	1	0	5	0	0

Source: 2016 – 2021 avian point-count surveys for the Project and overlap of previous boundaries of the adjacent Triple H Wind Project.

The number of observations of grassland bird species observed during the avian use surveys are shown in Table 3.4-4. Variability occurs among species and the number of observations year to year. The variability may be due to rainfall, drought, land use practices, and general weather patterns.

Table 3.4-4. Grassland Bird Species Observed in the Project Vicinity by Survey Year.

Species Observed	Survey Year 2016 – 2017	2018 – 2019	2019 – 2020	2020 – 2021	2021 – 2022
marbled godwit	6	0	14	1	7
willet	1	0	0	0	0
northern harrier	4	2	11	31	203
greater prairie-chicken	1	0	5	0	0
sharp-tailed grouse	0	0	1	6	0
western meadowlark	81	182	272	192	57
grasshopper sparrow	2	11	21	56	11
lark bunting	2	13	11	0	0
chestnut-collared longspur	14	1	2	26	24
Savannah sparrow	1	0	0	2	0
clay-colored sparrow	0	0	0	6	0

Source: 2016 – 2021 avian point-count surveys for the Project and overlap of previous boundaries of the adjacent Triple H Wind Project.

Prairie Grouse

Prairie grouse prefer “large heterogeneous grassland landscapes” (Drilling *et al.* 2018) including “areas with tall herbaceous growth” (Norton *et al.* 2010). Also, “occupied habitat can be difficult to define, but areas within five miles of active leks, especially grasslands, could generally be expected to be occupied by prairie grouse” (SDGFP 2017). Assuming the herbaceous vegetation type discussed in Section 3.3 meets the definition of prairie grouse habitat, 45 percent (3,960 acres) of the vegetation Analysis Area is prairie grouse habitat. There are 43,385.8 ac (52.9%) of herbaceous land cover within the prairie grouse Analysis Area (the Project Area plus a 1-mile buffer). Of these acres, there are 41,117.6 acres (94.8%) within five miles of active leks (NLCD 2019).

Project/Local Presence

The Project is in the occupied range of the greater prairie-chicken and sharp-tailed grouse (combined as “prairie grouse”). Surveys were conducted to document prairie grouse lek status during the breeding season (late March to early May) within the Project Area, as it was proposed at the time of the survey, and a 1-mile buffer (Figure 3.4-2; WEST 2021a). These surveys were conducted in 2016, 2018, 2019, and 2020. Of the 16 total leks surveyed, between one and 14 leks were found to be active per year over the four years of surveys (Table 3.4-5). No sharp-tailed grouse leks were found; all leks were greater prairie-chicken leks. Four of the leks remained active for three years (2018–2020). Of the 16 leks observed in the

Analysis Area, eight were active (at least two of the previous five years [SDGFP 2022a]) and the remaining eight were active during one of the last four years of surveys.

Table 3.4-5. Summary of Prairie Grouse Leks in the Project Survey Area by Survey Year.

Lek ID	*2016 Status*	*2018 Status*	*2019 Status*	*2020 Status*	*Lek Status*
6	Attended	Unattended	Unattended	Unattended	Likely Active
13	n/a	Attended	Attended	Attended	Active
14	n/a	Attended	Attended	Attended-auditory only	Active
15	n/a	Attended	Unattended	Unattended	Likely Active
16	n/a	Attended	Attended-auditory only	Potentially attended	Active
19	n/a	Attended	Attended	Attended	Active
21	n/a	Attended	Unattended	Unattended	Likely Active
22	n/a	Attended	Unattended	Attended-auditory only	Active
26	n/a	Attended	Unattended	Unattended	Likely Active
28	n/a	Attended	Unattended	Attended	Active
30	n/a	Attended	Unattended	Unattended	Likely Active
33	n/a	Attended	Attended	Attended-auditory only	Active
34	n/a	Attended	Unattended	Unattended	Likely Active
35	n/a	Attended	Unattended	Unattended	Likely Active
40	n/a	Attended	Unattended	Unattended	Likely Active
42	n/a	n/a	Attended	Attended-auditory only	Active

Source: 2016, 2018, 2019, and 2020 prairie grouse lek surveys for the Project.
ID = identification, assigned during lek surveys; n/a = not surveyed.

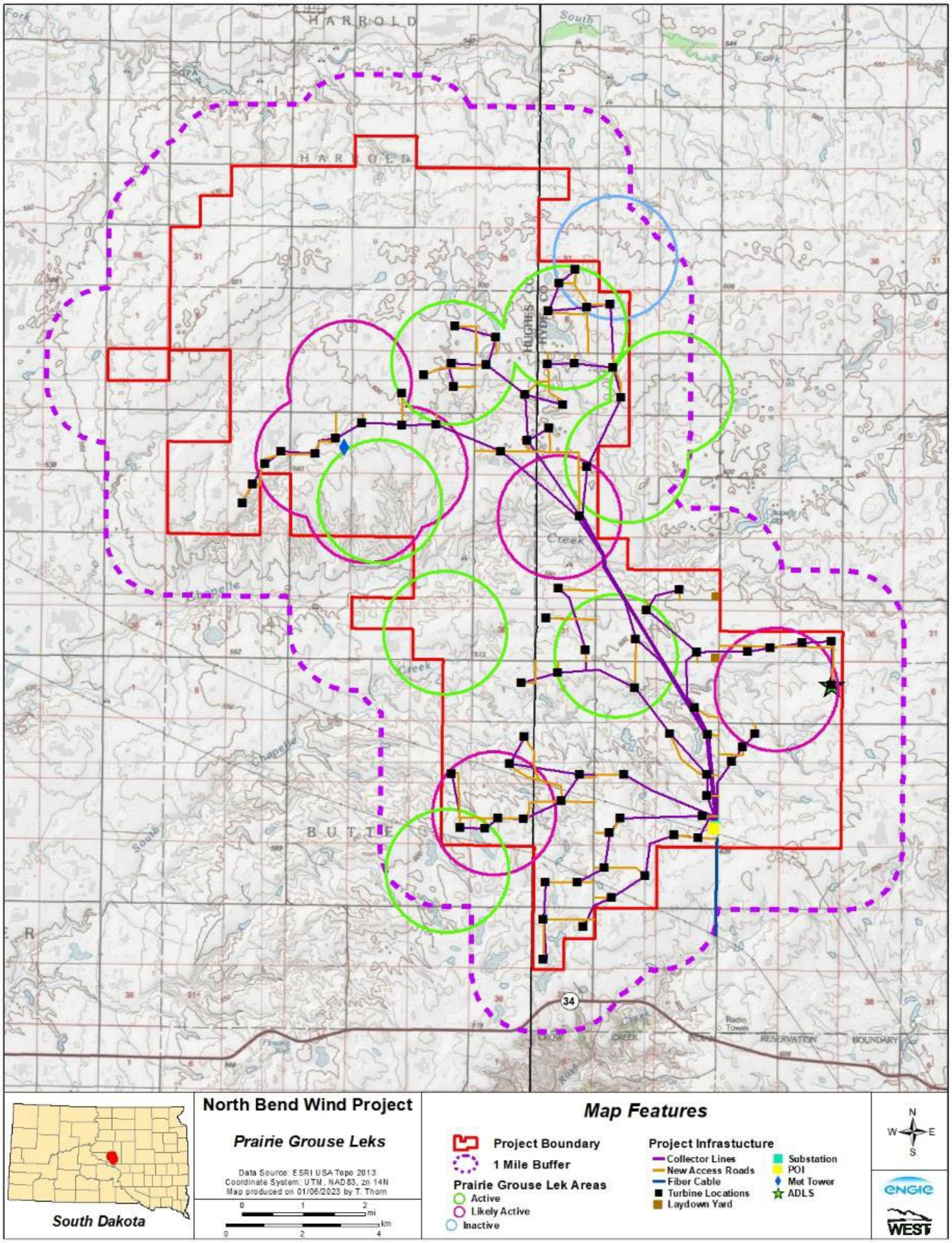

Figure 3.4-2. Potential Prairie Grouse Leks Identified During Surveys.

South Dakota Presence

Figure 3.4-3 provides a broader context for the greater prairie-chicken by showing greater prairie-chicken occurrence in South Dakota based on modeling (Runia and Solem 2018). Historically, greater prairie-chicken occurred in far eastern and southern portions of the state, but the range has been constricted to central portions of the state due to grassland conversion to cropland and reduction in grass height due to cattle grazing (Runia and Solem 2018).

Greater prairie-chickens are listed as a SGCN in South Dakota. Both prairie grouse species are considered upland game birds that are hunted in the State (SDGFP 2014).

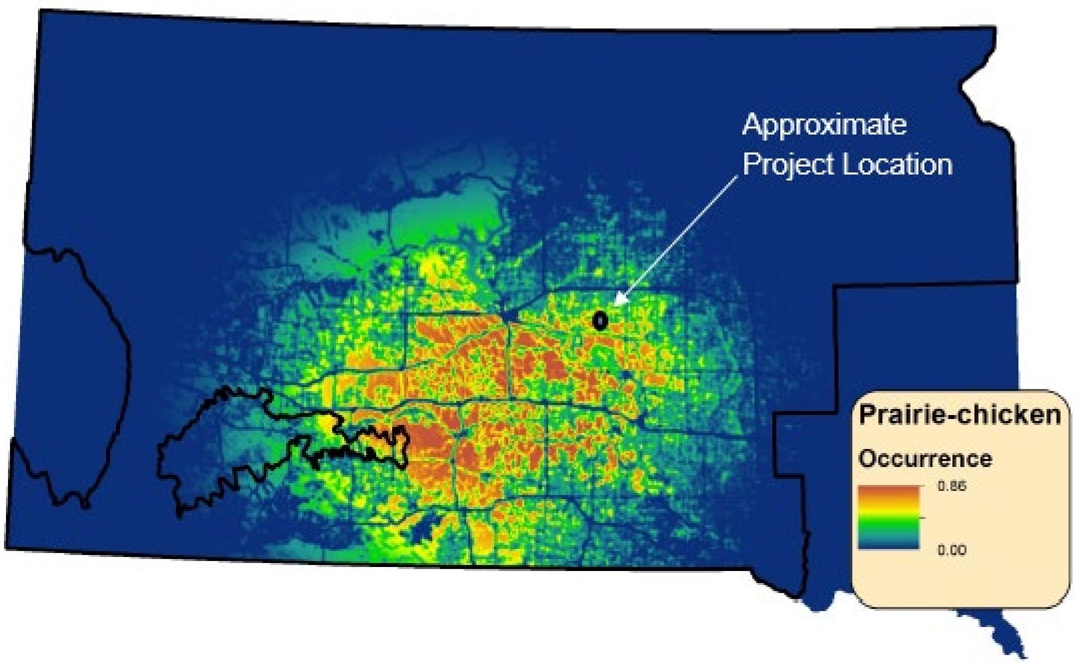

Figure 3.4-3. Occurrence Model for Greater Prairie-chicken in South Dakota (Runia and Solem 2018).

Eagles and Other Raptors

The Analysis Area for eagles and other raptors is the area surveyed throughout the Project Area during avian use surveys. During avian point-count surveys, between seven and 15 raptor or other large non-waterbird species were observed annually (Table 3.4-1). The species observed during all survey years are shown in Table 3.4-6. The number of observations show variability among species year to year. The variability between years may be due to rainfall, drought, land use practices, and general weather patterns.

Table 3.4-6. Raptors Observed in the Project Vicinity by Survey Year.

	Survey Year				
Species Observed	**2016 – 2017**	**2018 – 2019**	**2019 – 2020**	**2020 – 2021**	**2021 – 2022**
sharp-shinned hawk	0	1	1	0	0
ferruginous hawk	0	0	1	2	0
rough-legged hawk	0	1	0	8	2
red-tailed hawk	0	0	18	25	9
Swainson’s hawk	0	0	1	0	1
unknown buteo	0	3	0	2	2
northern harrier	4	2	11	31	203
golden eagle	0	3	0	0	0
bald eagle	1	1	3	0	0
unknown eagle	0	4	0	0	0
merlin	1	1	0	0	0
American kestrel	0	0	0	5	1
unidentified hawk	1	0	0	0	0
unidentified raptor	1	0	0	0	0

Source: 2016 – 2021 avian point-count surveys for the Project and overlap of previous boundaries of the adjacent Triple H Wind Project.

The Analysis Area for raptors is the Project Area plus a 2-mile buffer. Raptor nest surveys were conducted in the spring of 2016, 2018, 2019, and 2020 to gather information on eagle nest locations and nests of other raptor species in the Project Area. Aerial surveys were conducted throughout 2016 and 2018. Aerial surveys were not completed in 2019 and 2020 due to lack of landowner permission. Follow up ground surveys could not be conducted in those areas due to a lack of access.

Between three and 34 raptor nests were observed annually, some of which were revisits to nests from previous years’ surveys; 47 cumulative unique nests were observed (Table 3.4-7). Of the nests observed, between one-third and two-thirds were occupied annually. The species observed nesting varied each year (Table 3.4-7).

Table 3.4-7. Summary of Raptor Nests in the Project Vicinity by Survey Year.

Survey Year	Number of Raptor Nests Detected	Number of Nests Occupied (Species)	Notes
2016	3	2 (red-tailed hawks)	
2018	16	6 (great horned owl – 4; Swainson's hawk – 1; red-tailed hawk – 1)	Nests from 2016 revisited, 2 of 3 nests located in 2016 could not be located. One nest was a revisit, 15 new nests detected.
2019	18	11 (great horned owl – 5; ferruginous hawk – 1; red-tailed hawk – 3; unidentified raptor – 2)	9 of the 16 nests documented in 2018 were either not present or were excluded from the survey due to a lack of landowner permissions. Seven nests were revisits, 11 new nests detected.
2020	34	15 (red-tailed hawk – 7; great horned owl – 5; ferruginous hawk – 1; Canada goose – 1; unidentified raptor - 1)	2 of the 18 nests documented in 2019 were either not present or were excluded from the survey due to or a lack of permission. 16 nests were re-visits, 18 new nests detected.

Source: 2016 – 2021 avian point-count surveys for the Project and overlap of the previous boundaries of the adjacent Triple H Wind Project.

Data presented by eBird (2021) indicated the Project Area is in an area of generally low abundance of bald eagles and generally moderate abundance of golden eagles, with no clear areas of concentration outside of river corridors (Figures 3.4-5 and 3.4-6). This data is consistent with Project survey results. To date, no bald or golden eagle nests have been observed within the Analysis Areas during four years of nest surveys (Figure 3.4-4). The nearest documented golden eagle nest is 3.5 miles south of the nearest turbine location (WEST 2020). During the 2016 to 2017 survey years, one bald eagle was observed in the survey area (Table 3.4-4). During the 2018 to 2019 survey years, four bald and six golden eagle observations were recorded. During the 2019 to 2020 survey years, one bald eagle was observed. No eagles were documented during the 2020 to 2021 survey efforts. Rates of eagle observations during avian surveys for both species (bald eagle, golden eagle) were 0.02/hour, 0/hour in 2016 to 2017, 0.01/hour, 0.02/hour in 2018-19, 0.01/hour, 0/hour in 2019 to 2020, 0/hour, 0/hour in 2020-2021, and 0/hour, 0/hour in 2021 to 2022.

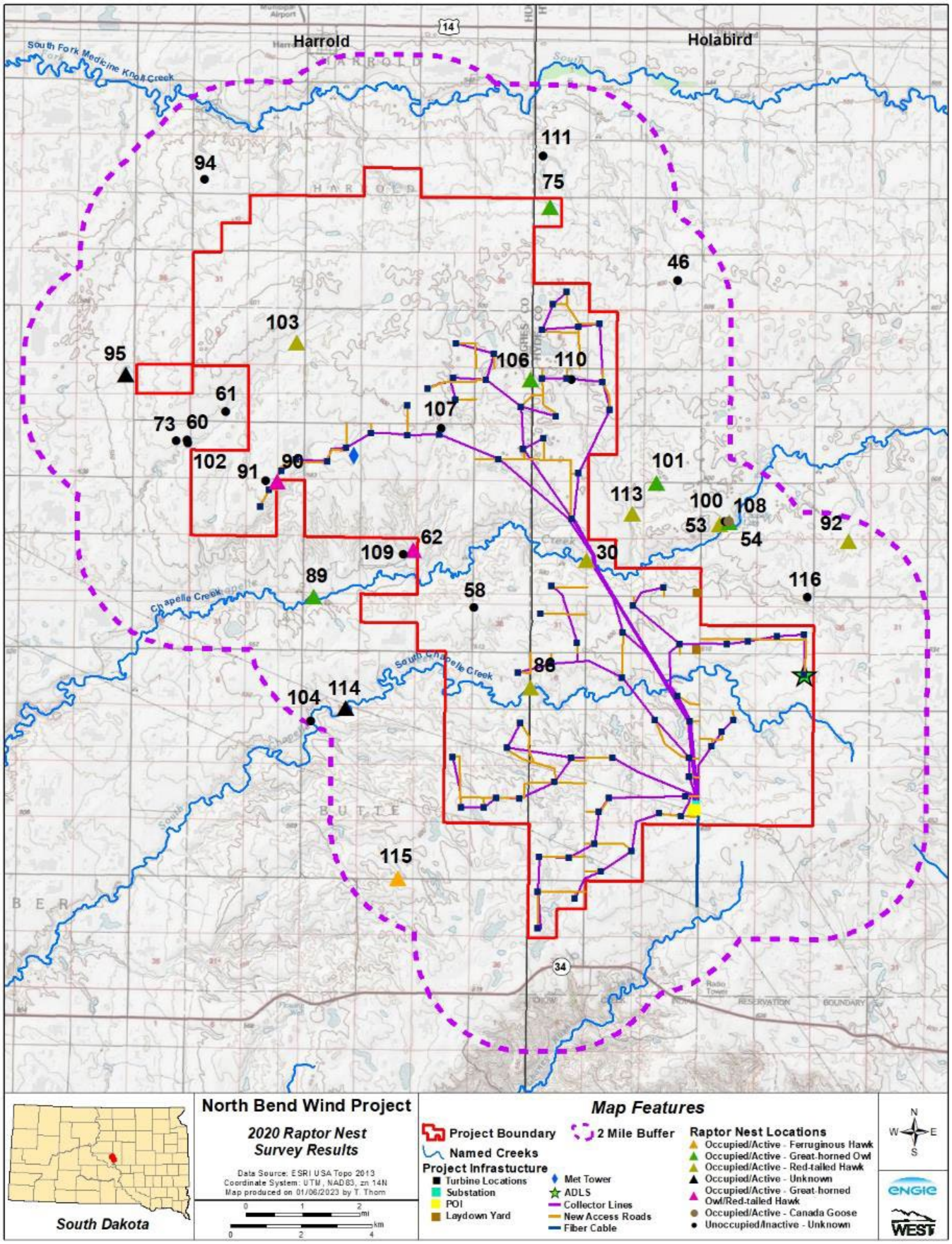

Figure 3.4-4. Location of Raptor Nests Identified during Surveys.

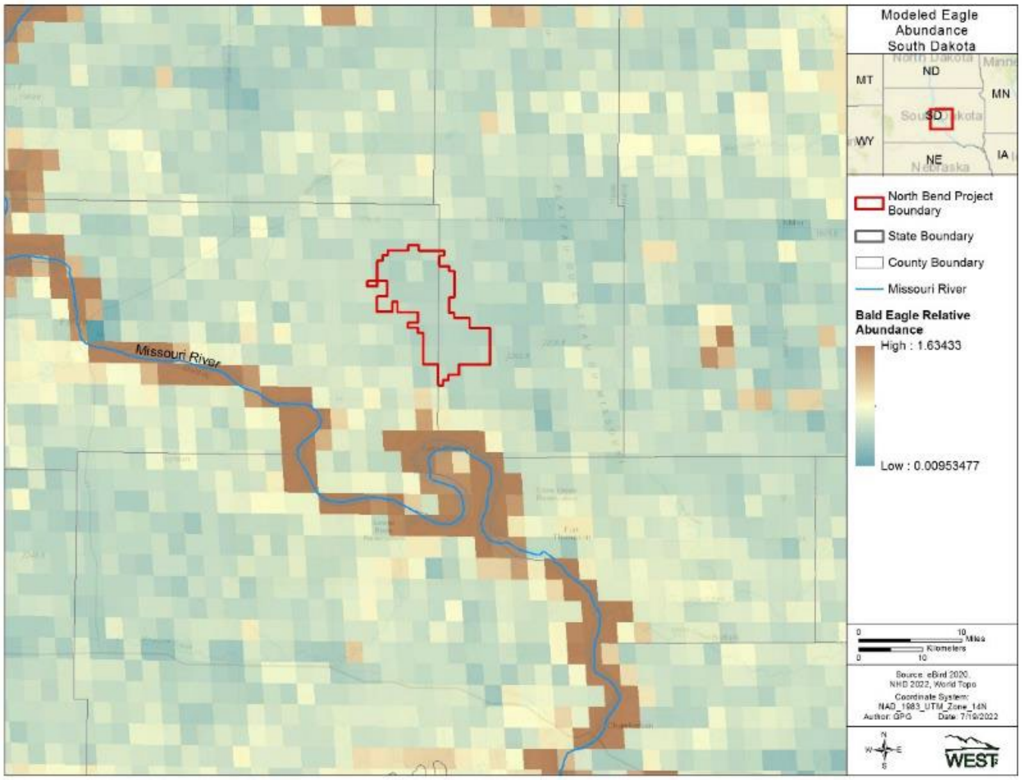

Figure 3.4-5. Bald Eagle Relative Abundance near the North Bend Wind Project (eBird 2021).

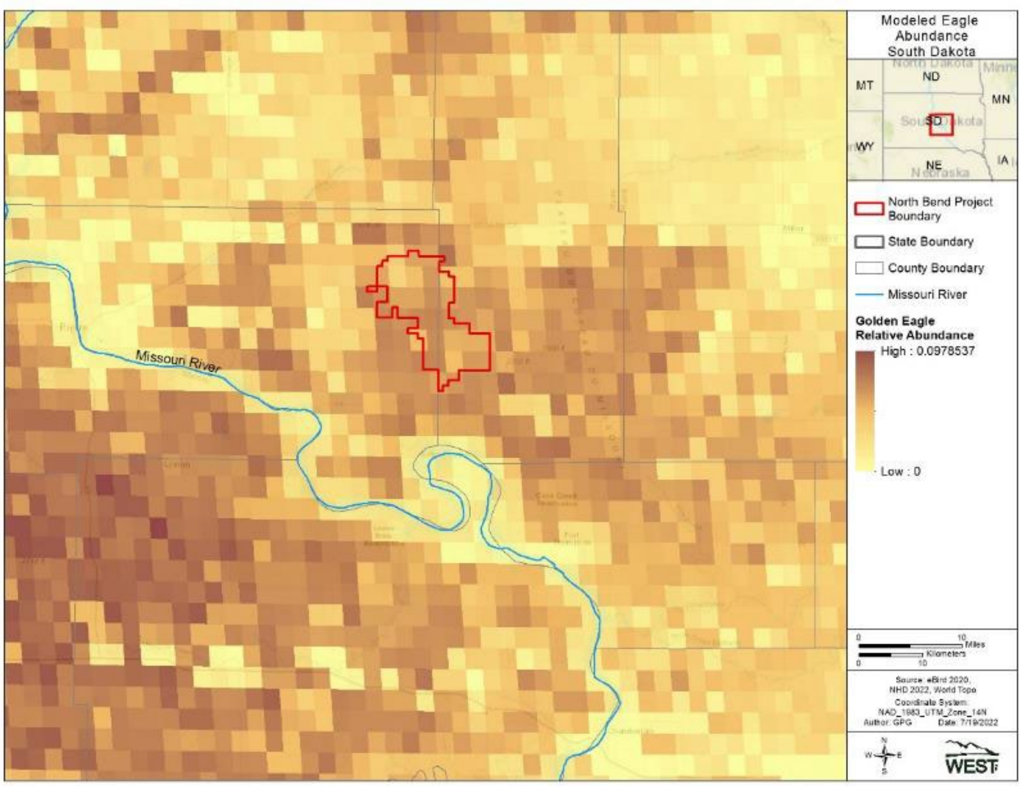

Figure 3.4-6. Golden Eagle Relative Abundance near the North Bend Wind Project (eBird 2021).

Bats

Bats are associated with features such as water, trees, and hedge rows. During fall migration (generally August – mid October), bats begin moving toward wintering areas, and many species of bats initiate reproductive behaviors (Cryan 2008). Bats return from their winter habitats in spring, typically arriving at maternity roosts by mid to late spring (generally April – June) (South Dakota Bat Working Group [SDBWG] 2004).

The desktop assessment of potentially suitable habitat for bats included reviewing a 2.5-mile buffer around the Project Area. The Analysis Area for bats in this EA was narrowed down to the Project infrastructure plus a 1,000-foot buffer. Potential suitable habitats for bats includes deciduous forest, evergreen forest, mixed forest, and woody wetlands or draws (SDBWG 2004, SDGFP 2014). Potential bat habitat in the Assessment Area is shown in Figure 3.4-7. Trees primarily occur as hedgerows and woody draws in the Project Area (Figure 3.4-7). Chapelle Creek and South Chapelle Creek may provide potential habitat for bats in the Project Area, although both Chapelle Creek and South Chapelle Creek are intermittent and would not provide a year-round source of water for bat use. Based on available habitat, bats may roost in the Project Area, but the most likely nearest roosts are four miles away in higher quality habitat along the Missouri River. Bats are most likely to forage along drainages in the Project Area. Many bats prefer to forage along forest edges and in forest openings and gaps. River and riparian corridors and drainages provide high quality foraging habitat, as these features attract concentrations of insect prey and provide open corridors in which bats may fly and effectively locate and capture insect prey (US Forest Service 2022). Use of commercial pesticides typically reduces bat foraging habitat in and adjacent to croplands.

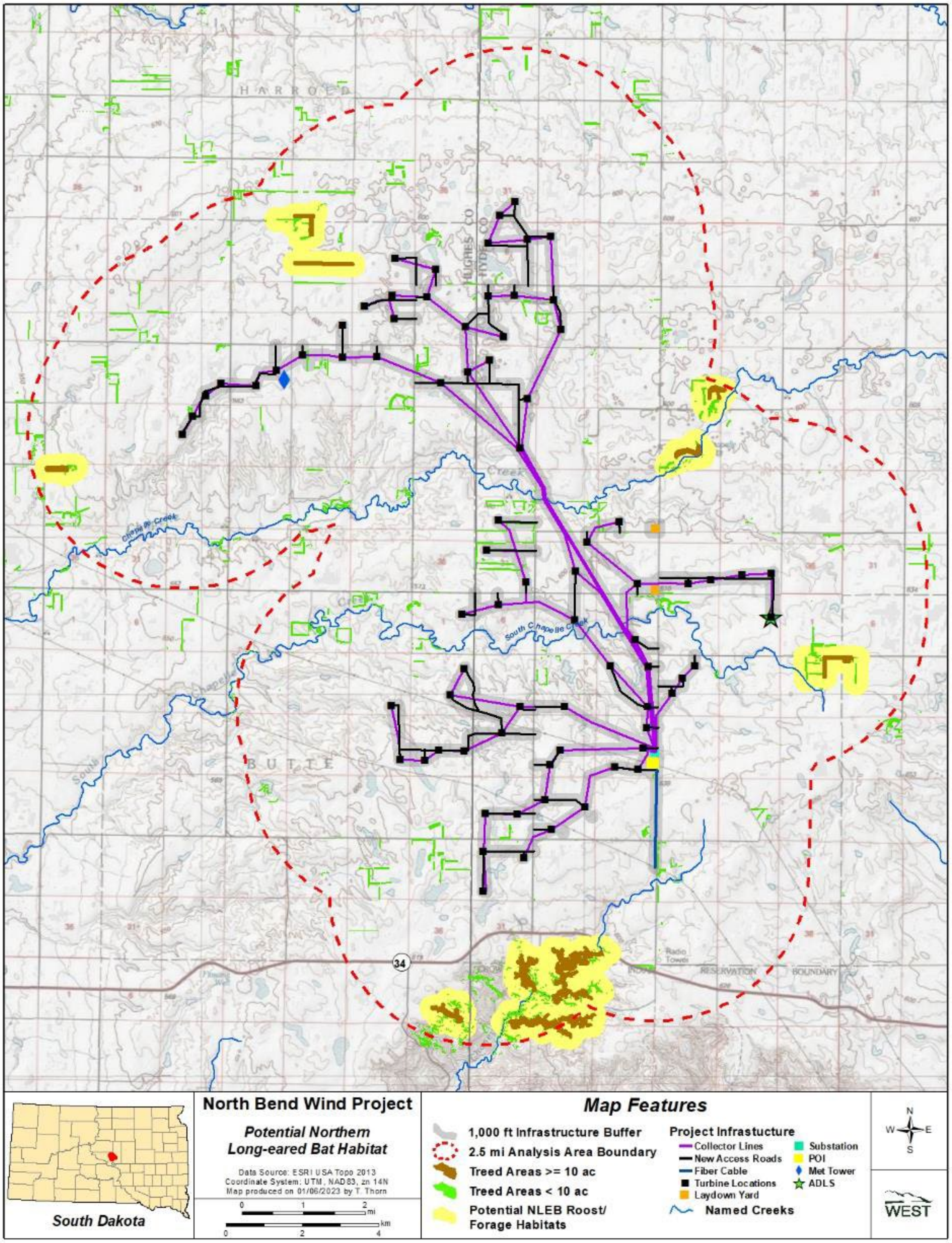

Figure 3.4-7. Bat Habitat Features and Location of Detectors Deployed during the 2016 and 2018 Bat Surveys.

Bat acoustic surveys were conducted during the summer and fall of 2016 and 2018 at three sites in the vicinity of the Project facilities (Appendix C2). The surveys followed the recommendations of the *Land-Based Wind Energy Guidelines* (WEG; USFWS 2012) and *Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document* (Kunz *et al.* 2007). The three locations surveyed included two cropland sites and one bat feature site. The cropland sites were chosen to be representative of proposed turbine locations, the majority of which are located within croplands. The bat feature site was near water, trees, hedgerows, and other habitats associated with bat use. A summary of all bat frequency observations is presented in Table 3.4-9.

Table 3.4-9. Summary of Bat Activity in the Project Area.

Year of Survey	Location Type	Number of High-Frequency Bat Passes	Number of Low-Frequency Bat Passes	Total Bat Passes
2016	Cropland	49	53	102
	Bat Feature	128	95	223
Total		**177**	**148**	**325**
2018	Cropland	5	12	17
	Bat Feature	54	79	133
Total		**59**	**91**	**150**

Source: 2016 and 2018 bat acoustic surveys for the Project.

High-frequency bats that could occur in the Analysis Area include eastern red bat and *Myotis* species, including the northern long-eared bat, which was federally listed as endangered on November 30, 2022 (USFWS 2022c) and is addressed Section 3.5. Low-frequency bats that could occur in the Analysis Area include big brown bat, silver-haired bat, and hoary bat.

2.7.2 Environmental Effects: Proposed Action Alternative

This Environmental Effects section discloses potential or anticipated Project impacts to species and habitat known or expected to occur in the Project's vicinity. The sub-section is arranged in the same fashion and order as the prior Affected Environment section (Section 3.4): general wildlife; waterbirds; BCC, SGCN, grassland birds, passerines; prairie grouse; bats; and eagles and other raptors. Project impacts are described quantitatively and qualitatively based on the best available information from surveys and literature. Analysis Areas are defined based on where impacts are reasonably likely to occur. Generally, this involves the space where the finalized layout of Project facilities overlaps known or most likely to be used species use areas.

Section 5.6.1.2 of the PEIS describes common impacts wind energy projects have on wildlife. These impacts would apply to wildlife in the Project vicinity. Impacts could occur during all Project phases of construction, operations, maintenance, and decommissioning. Impacts are broadly categorized as: 1) injury or mortality, 2) habitat modification, and 3) disturbance.

General Wildlife

Birds

Collisions with turbines would most likely involve resident birds, including breeding birds and juveniles, who forage and fly in the Analysis Area (i.e., the Project Area unless stated otherwise below for specific species), or migrant birds who seasonally move through the area. Post-construction fatality monitoring reports at wind energy facilities from the Mountain-Prairie region of North America, which includes South Dakota, show a wide variation in levels of bird mortality, ranging from 0.3 to 9.15 birds per MW per year (WEST 2021b). This same wide variation in mortality was noted for studies specific to South Dakota wind farms, as bird mortality at the Wessington Springs facility ranged between 0.89 and 8.25 bird fatalities per MW per year in 2009 and 2010, respectively (Derby *et al.* 2010, 2011). Using the studies previously mentioned, the yearly mortality rates at the Project could range between 60 birds up to 1,830 birds. Over the 30-year life of the Project, bird fatalities could range between 1,800 up to 54,900 birds.

Other Wildlife and Grassland Associates

Wildlife could be injured or die if they collide with wind turbines during operations, or if they are hit by a vehicle during construction or maintenance activities. All species in the area could be exposed to reduction, alteration, and fragmentation of habitat for the operational life of the Project due to the added infrastructure and layout of turbines and roads. Wildlife in the area could be disturbed by noise from the presence of equipment and workers during construction, or during maintenance activities for operations.

Potential for mortality from construction equipment is expected to occur but be minimal. Some individuals might be trampled or crushed, but many individuals would likely move out of harm's way to avoid the noise and activity associated with construction and because equipment is generally slow-moving or stationary for long periods. The highest risk of direct mortality to birds during construction is the potential destruction of nests of ground- and shrub-nesting species during initial site clearing. Site clearing is expected to take place prior to May 1, outside the primary nesting season for grassland species. If additional disturbance occurs after May 1, nest clearing searches would be conducted to identify and avoid active nests. Less than 500 feet of transmission line is proposed for construction and bird-flight diverters would be installed along the entire length of the transmission line, so power line collision risk has been reduced to the greatest extent practicable.

Project construction and operations could affect wildlife, including big game, game birds, general avian species, small mammals, and pollinators, through loss of cropland (food) and herbaceous (cover) habitats. Approximately 302 acres of cropland would be temporarily disturbed during construction and 38 acres would be affected long-term during Project operations. Approximately 280 acres of herbaceous habitat would be temporarily disturbed during construction, most of which (264 acres) is classified as untilled grassland. During Project operations, 46 acres of herbaceous habitat would be affected; again, most (43 acres) is classified as untilled grasslands.

Construction is expected to take approximately nine to 12 months, beginning in fall 2023; and temporarily disturbed areas would be restored after construction. In addition to habitat loss and fragmentation, construction is likely to cause temporary displacement due to noise and human activity, but these effects would be limited to the active construction areas at any one time as the Project would be constructed sequentially, not all at once. Temporary or long-term displacement would occur due to Project-related habitat disturbance.

<u>Waterbirds</u>

Sandhill cranes were one of the most observed waterbird species during avian use surveys in the Analysis Area, which consists of the Project Area for all waterbirds, in two out of three survey years (Table 3.4-2). Migrating sandhill cranes have been observed using areas near turbines at five other wind energy facilities in North Dakota and South Dakota, but three years of monitoring for avian fatalities at these facilities found no crane fatalities (Derby *et al.* 2018). However, sandhill crane collisions with wind turbines have been reported, particularly with reduced visibility (Navarrete and Griffis-Kyle 2014). Based on these data, sandhill crane fatalities due to collisions could occur at the Project, but fatalities are expected to be low because collisions are most likely during periods of reduced visibility, such as fog conditions, and sandhill cranes have been documented near turbines at wind energy facilities with no reported fatalities (Derby *et al.* 2018).

Mallards and other waterbirds recorded during the survey efforts (Table 3.4-2) are likely to be affected by the Project. Mallards were among the most common waterbird observed during avian use surveys. Mallards are the third most common fatality at wind projects throughout the Mountain-Prairie Region, accounting for 4% of fatalities (WEST 2021b). Another potential effect to waterbirds is a reduction in duck densities on wetlands within the Analysis Area, potentially resulting in a reduction in breeding pairs (Loesch et al 2013). A further potential effect on waterbirds could be loss of habitat. The Project would contribute incrementally to the continued wetland degradation and fragmentation of remaining grasslands, which threaten future suitability of the Prairie Pothole region for all waterbirds (NABCI 2021).

BCC, SGCN, Grassland Birds, Passerines

Research has indicated grassland nesting BCC and SGCN listed in Section 3.4.1.4 are negatively affected when these species' habitat (grassland, wetland, or riparian) becomes fragmented (Bakker 2020). Displacement effects of grassland birds was shown by Shaffer and Buhl (2015), who monitored changes in bird density to determine if wind facilities in mixed-grass prairies displaced breeding grassland birds. Of nine species studied, seven (western meadowlark, upland sandpiper, savannah sparrow, grasshopper sparrow, bobolink, clay-colored sparrow, chestnut-collared longspur) showed displacement, one (vesper sparrow) was unaffected, and one (killdeer) exhibited attraction. The seven species showing displacement effects in the Shaffer and Buhl (2015) study were also observed during avian use surveys; western meadowlark was among the most observed species. Grasshopper sparrow, bobolink, and chestnut-collared longspur are BCC and SGCN species that were observed during the avian use surveys.

Section 3.4.1 lists the BCC and SGCN observed during avian use surveys in the Survey Area. Fatalities due to collision with wind turbines and the met tower for any of these species could occur, but Erickson *et al.* (2014) found none of these species had been reported as fatalities at wind energy facilities in the Prairie Biome, although chestnut-collared longspur (two fatalities) and lark bunting (one) had been reported in the Intermountain West Biome and bobolink fatalities had been reported in the Eastern Biome (17 fatalities) and Northern Forest Biome (five fatalities). Grassland habitat fragmentation is a concern for marbled godwit, chestnut-collared longspur, northern harrier, bobolink, grasshopper sparrow, lark bunting, and greater prairie-chicken (Bakker 2020; North Dakota Department of Game and Fish [NDGF] 2021a, 2021b). Project facilities, primarily access roads and turbine pads, would contribute to fragmentation of some of the herbaceous land cover in the Analysis Area, which consists of the Project Area for these species (see Figure 3.3-1). Collection lines would not contribute to habitat fragmentation because herbaceous cover disturbed by trenching during installation or maintenance would be restored after installation or maintenance of the lines. Destruction or degradation of wetland habitat is the greatest threat to black tern and Franklin's gull (NDGF 2021c, 2021d). The Project would have minimal direct effects on wetlands (operation of the Project is estimated to directly affect 0.5 acre; see Section 3.2.1) and would therefore have a minimal effect on these species. Red-headed woodpecker is unlikely to be affected by the Project because destruction or degradation of riparian habitat is the greatest threat (NDGF 2021e), and the Project would have minimal direct effect on riparian habitat. No woodlots and forested riparian corridors occur in the Analysis Area based on the habitat assessment for northern long-eared bat described in Section 3.5.

The most reported grassland species found during post-construction fatality monitoring are horned lark, ring-necked pheasant, mourning dove, and western meadowlark (WEST 2021b). All these species were recorded during avian use surveys and are likely to be fatalities. Horned lark has consistently presented high numbers of fatality incidents at other wind facilities (Allison and Butryn 2020). These and other grassland birds inhabiting the Analysis Area could also be affected by grassland habitat fragmentation. As previously noted, Project facilities, primarily access roads and turbine pads, would contribute to fragmentation; 280 acres of herbaceous land cover in the Analysis Area would be directly affected (Figure 3.3-1). Collection lines would not contribute to habitat fragmentation because herbaceous cover disturbed by trenching for construction and maintenance would be restored.

The Triple H Wind Project (owned by the same parent company as the North Bend Project) is located approximately one mile east of the proposed North Bend Wind Project. As part of the facility permit granted to Triple H Wind Project from the South Dakota Public Utilities Commission, the applicant was required to undertake a minimum of two years of independently conducted post-construction avian and bat mortality monitoring (Condition 33 of the Conditional Use Permit). As of the date of this document, the Triple H Wind Project had completed one year of post-construction avian and bat mortality monitoring in 2022. North Bend will incorporate results from Triple H Wind Project as part of the North Bend Wind Project and any associated adaptive management that may be needed (Bird and Bat Conservation Strategy [BBCS], Appendix D). Because of the proximity, similar habitat conditions, and existing post-construction mortality monitoring requirements at the Triple H Wind Project, SDGFP and North Bend have agreed to collaborate in a post-construction research project to assess impacts to nesting grassland birds at the North Bend Wind Project (see Scoping Comment 29.P in Appendix A). In adhering to the requirements of the PEIS, North Bend will also conduct one year of post-construction avian and bat fatality monitoring to validate the preconstruction risk assessment and adjust operations if needed to reduce a higher-than-expected fatality rate, as detailed in the BBCS. Monitoring results will be provided in a report to WAPA. The North Bend Project is located approximately six miles west of the South Dakota Wind Energy Center, which was a study site used by Shaffer and Buhl (2015). Because of this proximity, SDGFP anticipates that grassland bird research at the North Bend Project presents a “unique and valuable opportunity” to add to wind-wildlife research efforts in the Dakotas (Morey 2021).

<u>Prairie Grouse</u>

The Analysis Area for grouse is the Project Area plus the area within one mile of the Project boundary based on guidance from SDGFP’s Conservation Plan during lekking season. There are 20,011 acres of the

Analysis Area within one mile of a lek, or actual prairie grouse known high use areas (Figure 3.4-2). Forty of the 78 turbine locations and 19 miles of access roads are within one mile of a lek.

Runia *et al.* (2021) developed models to estimate the distribution and abundance of prairie grouse in South Dakota. Results of the modeling show the relative probability of occurrence of greater prairie-chicken in south-central South Dakota (Figures 3.4-8). Based on this model, the prairie grouse Analysis Area contains areas of moderate to high relative probability of occurrence.

Greater prairie chicken lek persistence has been found to decrease near newly constructed wind turbines. Winder *et al.* (2015) found that the return rate of males to leks decreased from 80% to 50% following the construction of wind turbines within 1.9 miles of existing leks. For the proposed Project, eight active and seven potentially active leks have been observed within 1.9 miles of proposed turbines and could consequently experience a decrease in lek persistence. No active but one potentially active lek was observed within the Analysis Area beyond 1.9 miles of proposed turbines.

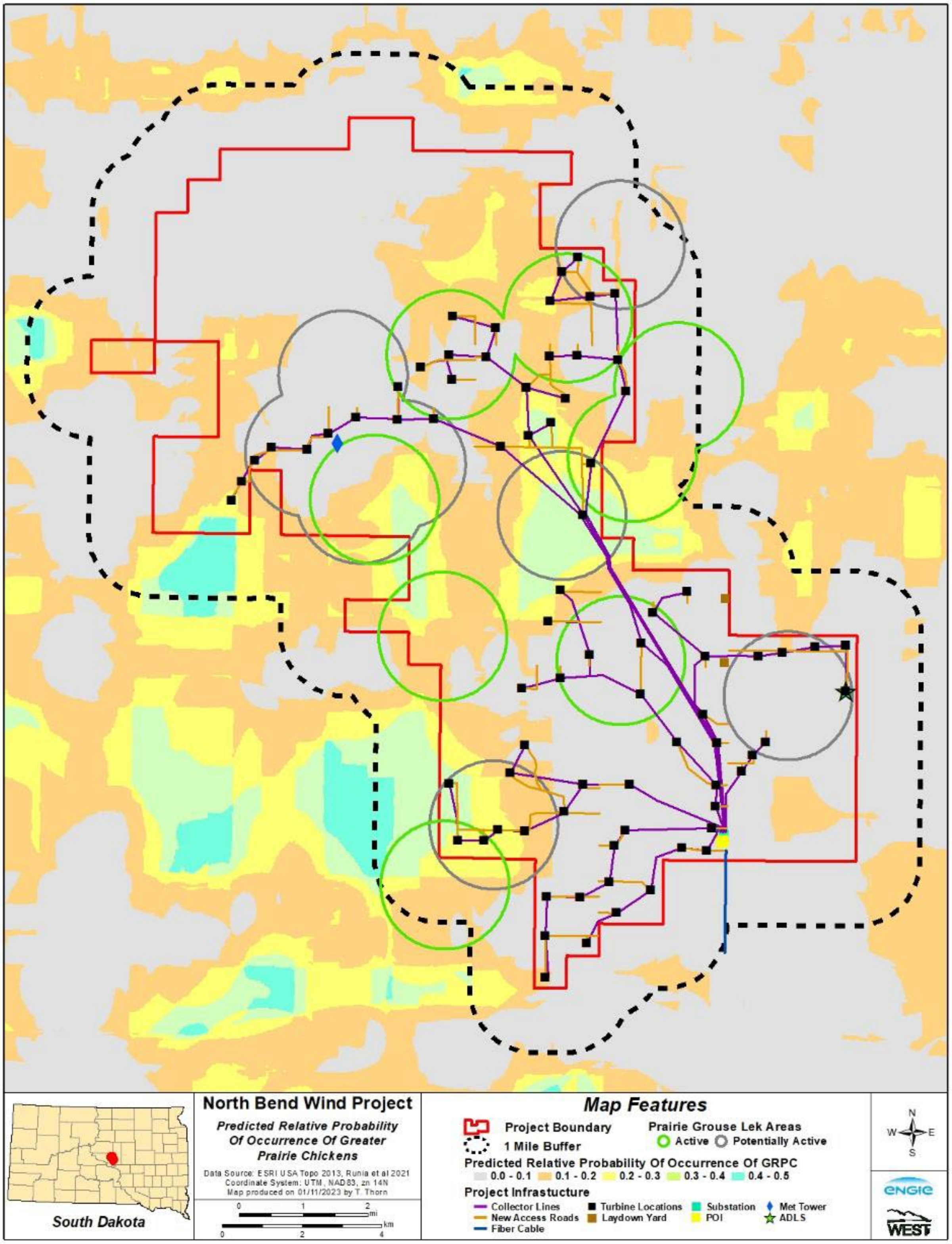

Figure 3.4-8. Predicted Relative Probability of Occurrence of Greater Prairie-chicken in South Dakota (Adapted from Runia *et al.* 2021).

Prairie grouse are indicators of high-quality grassland habitat and a robust ecological community due to their specific habitat needs (Morey 2021). Development (e.g., roads, power lines, wind turbines, buildings) in and around prairie grouse habitat and leks can fragment otherwise suitable habitat and displace birds (Pruett *et al.* 2009). Activities that fragment prairie grouse habitat could affect prairie grouse through behavior changes that effectively result in habitat loss (Doherty *et al.* 2011). Some studies indicate grouse nest site selection, nest survival, and female survival are not negatively affected by the presence of turbines (Winder *et al.* 2014a, McNew *et al.* 2014, LeBeau *et al.* 2017a, Harrison *et al.* 2017, Proett 2017). Other studies indicate proximity to turbines affects greater prairie-chicken use of space during the breeding season (Winder *et al.* 2014a) and lek abandonment (Winder *et al.* 2015). LeBeau documented female greater sage-grouse habitat use during the breeding period decreased as proximity to turbines increased (LeBeau *et al.* 2017b) and Columbian sharp-tailed grouse had lower chick survival in habitats with increasing number of turbines (Proett 2017).

Habitat fragmentation concerns for greater prairie-chickens summarized in Bakker (2020) include the following. Female greater prairie-chicken mean home range size increased approximately 2-fold in response to wind energy development, and female space use increased with distance from wind turbines (Winder *et al.* 2014b). Persistence of leks less than five miles from turbines decreased with decreasing distance to turbines but was positively related to number of attending males and grassland cover surrounding leks (Winder *et al.* 2015) in Kansas. Greater prairie-chickens were absent from patches smaller than 345 acres in southeastern North Dakota and northwestern Minnesota (Winter *et al.* 2006).

As summarized by SDGFP's *Prairie Grouse Management Plan for South Dakota* (2017), greater prairie-chicken lek persistence was about 0.5 for leks less than 0.62 mile from a turbine, about 0.9 for leks 1.86 miles from a turbine, and more than 0.95 for leks 3.73 miles or more from a turbine during the 3-year post-construction period for a study in Kansas (Winder *et al.* 2015b). The rate of lek abandonment was three times higher for leks less than 4.97 miles from a turbine compared to leks 4.97 miles or more from a turbine (22% versus 8%) supporting the USFWS's 4.97-mile buffer zone for wind energy development (Manville 2004). The increased rate of lek abandonment within 4.97 miles of wind turbines is concerning because female prairie-chicken activity centers are nearly always centered within three miles of active leks (Winder *et al.* 2015a).

There is also evidence that other forms of development within occupied habitat could have a negative impact on prairie grouse. Greater prairie-chickens were found to avoid power lines by 330 ft in Oklahoma (Pruett *et al.* 2009). A habitat-based greater prairie-chicken lek site model revealed a weak avoidance effect of roads at a 3.1-mile scale in Kansas (Gregory *et al.* 2011). A similar modeling effort in Minnesota suggests road density at a 2-mile scale was a negative predictor of lek presence (USFWS Habitat and Population Evaluation Team 2010). Significantly more roads occurred within 1,640 and 3,280 ft of inactive sharp-tailed grouse leks when compared to active leks in Minnesota (Hanowski *et al.* 2000). Female greater prairie-chickens avoided nesting near roads in the Nebraska Sandhills; 74% of nests were located 0.4 miles or more from roads (Harrison *et al.* 2017). Runia *et al.* (2021) found greater prairie-chicken probability of occurrence in South Dakota decreased significantly as development increased.

The prairie grouse Analysis Area (Project Area buffered by one-mile) contains Tier 1, 2, and 3 greater prairie-chicken habitats, as identified with the South Dakota Environmental Review Tool (SDGFP 2022a). SDGFP recommends avoiding siting project infrastructure in grassland habitat, particularly areas of the state that have been identified as potentially undisturbed grasslands and Tier 1 and 2 prairie grouse habitats (H. Morey SDGFP, personal communication, 2022). No Project infrastructure will be sited in Tier 1 habitat (Figure 3.4-10). Infrastructure that will be placed on potentially undisturbed grasslands identified as Tier 2 habitat includes seven turbines, one met tower, 3.5 miles of access roads, and 8.6 miles of collection lines (Figure 3.4-10). Infrastructure that will be placed on Tier 3 habitat includes 11 turbines, 4.4 miles of access roads, and 4.7 miles of collection lines (Figure 3.4-9).

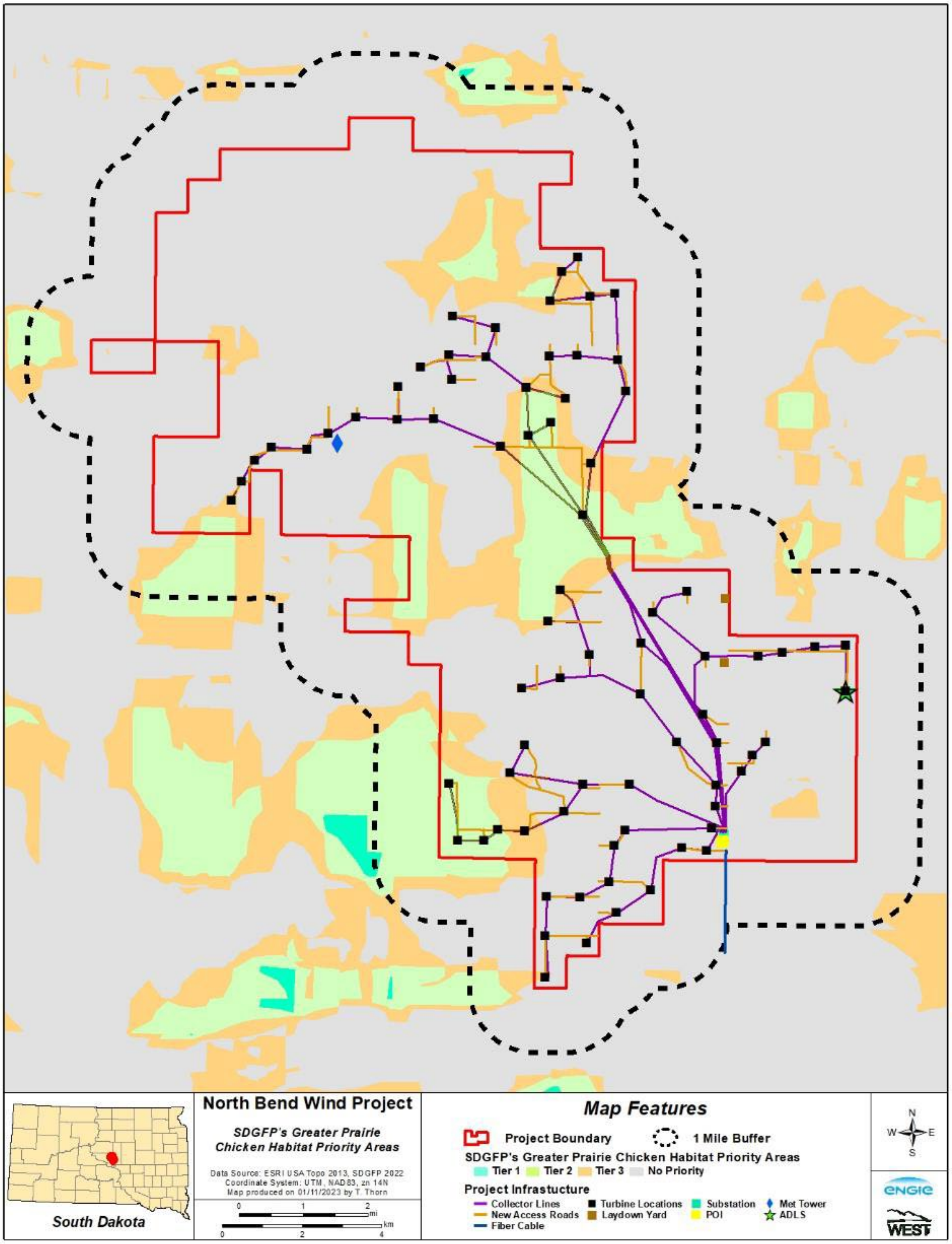

Figure 3.4-9. SDGFP Greater Prairie Chicken Habitat Priority Areas.

Of the 16 prairie grouse leks identified during prairie grouse surveys, three are at least farther than two miles from Project infrastructure. These leks are outside SDGFP's recommended development avoidance area, but still have potential for lek abandonment because these leks are within five miles of turbine locations (the USFWS' buffer zone for wind energy development). The 13 remaining lek sites are within one mile of Project roads and turbine locations and are likely to experience some level of bird displacement, decreased persistence, or lek abandonment. These impacts would occur throughout the 30 years of Project operation.

North Bend would implement some, but not all the conservation measures based on BMPs for occupied prairie grouse habitat recommended in The *Prairie Grouse Management Plan for South Dakota* (SDGFP 2017), to varying extents. The BMPs and associated Project conservation measures are:

- *Maintain existing grasslands as grasslands (e.g., do not convert to cropland), especially unfragmented tracts within occupied prairie grouse range*.
  During construction, the Project would impact up to 274 acres of grasslands, much of which would be within occupied prairie grouse range. Most of this area (228 acres) would be allowed to return to grassland habitat during operation, while 46 acres would be converted to an industrial use (Table 3.3-3).
- *Avoid activities near (~two miles) lek sites that could interrupt lekking and nesting activity from March 1–July 30. If disruptive activities cannot be avoided, limit disruptive activities to three hours after sunrise to one hour before sunset. Disruptive activities could include but are not limited to well drilling and operation (water or energy development), burying pipeline or other utilities, building roads, vehicle traffic, direct disruption by human presence, wind tower construction and operation, or low flights by aircraft or drones*.
  Since the Project would occur within two miles of lek sites, construction activities would be limited to three hours after sunrise and one hour before sunset from March 1 through July 30 to avoid interruption of lekking and nesting activities.
- *Avoid development (e.g., roads, power lines, structures, energy development) in grasslands within occupied range, especially within 1 mile of lek sites. Where development occurs within occupied range, leks within 5 miles of development should be monitored indefinitely*.
  The Project would include up to 40 turbine locations and 19 miles of access roads within one mile of a lek. Along with post-construction monitoring, lek monitoring of those leks identified during pre-construction surveys and within one mile of turbines will be monitored for two years following the operation of the wind facility. With the support of SDGFP, additional research will be conducted to quantify Breeding Grassland Bird avoidance of wind turbines in a fragmented

landscape (see Scoping Comment 29.P, Appendix L). The first of these surveys has already been completed in 2021 at the neighboring Triple H Wind Project.

Bats

Bat fatalities have been discovered at most wind energy facilities monitored in North America. In the Mountain-Prairie Region, bat fatalities range from about 0.5 to eight fatalities/MW/year (WEST 2021b). In 2012, an estimated 600,000 bats died because of interactions with wind turbines in the U.S. (Hayes 2013). Post-construction monitoring studies of wind energy facilities show that migratory tree-roosting species (e.g., eastern red bat, hoary, and silver-haired bat, all of which occur in South Dakota) compose approximately 78% of reported bat fatalities (Hayes 2013).

Most fatalities occur during the fall migration season (August–September), and most fatalities occur on nights with relatively low wind speeds (e.g., less than 20 feet per second; Arnett *et al.* 2008, 2013; Arnett and Baerwald 2013). Typically, wind farm mortality records do not show a comparable spring peak in collision mortality despite the fact bats also migrate during spring. Although reasons for this remain unclear, factors may include differing flight height during spring and fall migration, different spring and fall migration routes, or mating behavior and courtship flight during fall migration (Cryan 2008, Cryan and Barclay 2009). Migratory bats tend to be larger species that may be more inclined to forage above treetops where there are fewer obstructions, a pattern found in many acoustic studies at wind energy facilities (Norberg and Rayner 1987, Fleming 2019). Thus, migratory bats may be more likely to fly in the rotor-swept area of wind turbines when compared to smaller bat species that have different foraging and migration strategies. The SDGFP recommends that turbines be sited at least 1,000 feet from suitable bat roosting habitat to reduce the risk to bats. The Project will avoid siting all turbines within 1,000 feet of suitable bat roosting habitat.

While the seasonal timing of bat mortality has been consistent across wind projects, the magnitude of bat mortality, usually expressed as the estimated number of bats killed per MW or per turbine, has varied among projects and across regions. For example, estimated bat fatality rates have been lower at wind projects in agricultural landscapes of the Midwest versus those on forested ridges in the Appalachian Mountains (American Wind Wildlife Institute [AWWI] 2018). In addition, bat species have been documented to have different collision risks and fatality rates associated with wind facilities; therefore, areas with similar species are more likely to have similar fatality rates (AWWI 2018).

To determine potential bat fatality rates for the Analysis Area, publicly available bat fatality rates documented in Minnesota, North Dakota, and South Dakota were reviewed since these states were determined to have similar landscapes and contain a more similar bat composition to the Assessment Area than the other states in the USFWS Midwest and Prairie-Mountain Regions. Publicly available bat fatality rate estimates for the three states currently range from 0.4–37.6 bats/MW/year, with South Dakota projects, such as the nearby Wessington Springs Project, reporting lower values ranging from 0.4 to 2.8 bats/MW/year (Appendix C1). Based on the annual range of bat fatalities at regional wind projects, an estimated 21 to 2,933 bat fatalities on average could occur annually at the Project due to collisions. Over the 30-year life of the Project, bat fatalities could range between 628 to 87,984 individuals. It is expected hoary bat, silver-haired bat, and eastern red bat would be the most common fatalities at the Project, consistent with reported deaths from many wind facilities (Arnett *et al.* 2008, Arnett and Baerwald 2013).

Eagles and Other Raptors

Because of the life history attributes of low adult mortality and reproductive potential, the impact of collisions on raptors are a concern (Allison *et al.* 2019, Allison and Butryn 2020). Risk of fatality to raptors would vary seasonally, with the highest risk during the spring breeding and migration seasons and fatalities could occur during daytime or nighttime. Post-construction fatality monitoring reports at wind energy facilities from the Mountain-Prairie region of North America, which includes South Dakota, show raptor fatalities total less than 9% of all bird fatalities and range from about 0.03 to 0.2 diurnal raptor fatalities per MW per year (WEST 2021b).

A summary of eagle mortalities at wind facilities in the contiguous U.S. found at least 32 wind energy facilities experienced eagle fatalities (Pagel *et al.* 2013). The summary derived from public domain data prior to June 2012 reported 85 total fatalities, including six bald eagles and 79 golden eagles (excluding the Altamont Pass Wind Resource Area in California). Between 2013 and 2018, 49 verifiable records of bald eagle mortality were reported in the U.S. (Kritz *et al.* 2018). None of these fatalities occurred in South Dakota, although 25 fatalities occurred in the neighboring states of Wyoming, Montana, North Dakota, Minnesota, and Iowa. In 2022, ESI Energy Inc. was fined $1.8 million for killing 150 eagles since 2012 across 50 of its 154 wind energy facilities throughout the U.S., with 136 of those deaths confirmed to be the result of the eagle being struck by a wind turbine blade (US Department of Justice 2022).

Overall raptor fatality rates at the Project are expected to be comparable to rates at other wind facilities in the Mountain-Prairie region described above: six to 40 diurnal raptor fatalities annually (expected fatalities for bald and golden eagles are discussed below). It is expected the Project would have the most impact to red-tailed hawk as this species is among the top five raptor species reported at wind facilities in the Mountain-Prairie region (WEST 2021b) and was the most common raptor species recorded during avian use surveys at the Project. Other raptor species observed that could be impacted include northern harrier, rough-legged hawk, American kestrel, merlin, and sharp-shinned hawk.

The USFWS considers eagle nests within two miles of a wind energy project to be potentially impacted by the project (USFWS 2020b). Because there were no eagle nests within two miles of the Project, impacts to nesting eagles would be unlikely, at least during construction and initial operation of the Project. Of the other raptor nests located during surveys, four were within 0.5 mile of turbine locations; these included one red-tailed hawk nest (0.3 miles from a turbine location), two great horned owl nests (both were 0.2 miles from a turbine location), and a nest used by both a great horned owl and red-tailed hawk (0.2 miles from a turbine location). The USFWS recommends red-tailed hawk nests have a 0.5-mile buffer and great horned owl nests have 0.25-mile buffer at wind facilities (USFWS 2020c). These four nests were within the recommended buffers. Red-tailed hawk and great horned owl are both widespread and common raptors (Audubon 2022b), and young of both species typically fledge in June; sometimes earlier for great horned owl in South Dakota (South Dakota Birds and Birding 2022). With construction scheduled to begin in fall 2023, construction impacts to the raptor nests within the recommended buffer would be unlikely. Tolerance to disturbance varies among raptor species and individuals, but there is potential for nests near turbine locations to be abandoned during operation of the Project. The rest of the observed raptor nests were more than one mile from Project turbine locations.

Based on documented bald and golden eagle fatalities at other wind energy projects in the U.S., including the UGP Region, potential exists for bald and golden eagle fatalities at the Project. Both bald and golden eagles could be disturbed or killed by the Project because these species have been observed during avian use surveys (Table 3.4-1). Project-specific collision risk modeling predictions for eagles estimated between 0.4 bald eagles and 0.12 golden eagles per year (Appendix C3). This eagle fatality prediction is based on 617.3 hours of surveys completed with 18 risk minutes for bald eagles and four risk minutes for golden eagles (Appendix C3). The lack of eagle nests during surveys suggests breeding or nesting eagles and fledglings would not be impacted, at least during construction and initial operation of the Project. Based on observed nesting and use patterns at the Project, it is expected to be a Category 3 site (minimal risk to eagles) per the USFWS *Eagle Conservation Plan Guidance* (USFWS 2013). Therefore, North Bend has elected to not prepare a voluntary Eagle Conservation Plan or apply for an Incidental Take Permit for eagles at this time.

Conservation Measures

North Bend is committed to implementing the conservation measures for wildlife resources derived from section 5.6.2 of the PEIS, which would help to avoid or minimize wildlife impacts associated with the Proposed Action. These may include, but are not limited to, the following:

- The gen-tie line shall be designed and constructed following the recommendations in *Avian Protection Plan Guidelines* (Avian Power Line Interaction Committee [APLIC] and USFWS 2005), in conjunction with *Suggested Practices for Avian Protection on Power Lines* (APLIC 2006) and *Reducing Avian Collisions with Power Lines* (APLIC 2012), to reduce the operational and avian risks that result from avian interactions with electric utility facilities.
- Habitat disturbance would be reduced by keeping vehicles on access roads and minimizing foot and vehicle traffic through undisturbed areas.
- Employees, contractors, and site visitors would be instructed to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. Pets shall not be allowed on the Analysis Area.
- Guy wires would not be used on the permanent met tower.
- Habitat restoration of disturbed soils and vegetation would be initiated as soon as possible after construction activities are completed. Restoration would include weed-free native grasses, forbs, and shrubs, in consultation with SDGFP, USFWS, USDA NRCS, and landowners on seed mixes to be used during restoration as part of a Noxious and Invasive Weed Management Plan, which was developed as a condition of the Application for Facility Permit by the South Dakota Public Utilities Commission[4].
- Marking devices (e.g., bird flight diverters) would be placed on the newly constructed gen-tie line.
- All garbage or human waste generated on site would be promptly disposed of to avoid attracting nuisance wildlife.

[4] See section 9.1.3.2 of the Application for Facility Permit, available online https://puc.sd.gov/commission/dockets/electric/2021/EL21-018/Application.pdf

- Unnecessary lighting would be turned off at night to limit attraction of insects, bats, and/or migratory birds. Lighting guidelines, where applicable, from the WEG would be followed. This includes using lights with timed shutoff, using downward-directed lighting to minimize horizontal or skyward illumination, and avoiding steady-burning, high-intensity lights.
- One year of post-construction fatality monitoring will be conducted, as described in the BBCS (Appendix D). Additionally, North Bend is working cooperatively with SDGFP on a research project to assess grassland bird displacement within a fragmented grassland landscape.
- All turbines and ancillary structures would be removed from the site during decommissioning.
- North Bend would apply adaptive management as described in the BBCS (Appendix D). Some of the adaptive management options that could be considered include additional on-site studies; anti-perching, anti-nesting, or electrocution protection devices; prey-base management through habitat alteration; and experimentation with visual and/or auditory bird flight diverters.

2.7.3 Environmental Effects: No Action Alternative

No Project-related impacts to wildlife would occur, and ongoing impacts, mostly agriculture related, are expected to continue at existing intensities.

2.8 Threatened and Endangered Species

2.8.1 Affected Environment

Section 4.6.4 of the PEIS describes the plant and animal species that are listed as threatened or endangered under the Endangered Species Act of 1973 (ESA) that could occur within the UGP Region. Threatened and endangered species that may occur in the Project Area include whooping crane, northern long-eared bat, pallid sturgeon, piping plover, and rufa red knot (USFWS 2021b). The Analysis Area for pallid sturgeon, piping plover, and rufa red knot includes a 500-foot buffer around the construction footprint of all facilities and infrastructure. The Analysis Area for northern long-eared bat is a 2.5-mile buffer around the Project Area. The Analysis Area for whooping cranes is all land within approximately 0.5 miles of the Project infrastructure. There is no designated critical habitat for any of these species in or near the Analysis Area. The nearest designated critical habitat is for piping plover on the Missouri River upstream of Oahe Dam, approximately 29 miles west of the Analysis Area.

Whooping Crane

Status of the Species

The whooping crane was federally listed as endangered in the U.S. in 1967 (32 Federal Register [FR] 4001 [March 11, 1967]) and was designated as endangered in Canada in 1978 (Committee on the Status of Endangered Wildlife in Canada 2010). Four, non-captive whooping crane populations currently exist, but only the Aransas/Wood Buffalo whooping crane population (AWBP) is naturally occurring, self-sustaining, and protected under the ESA (Urbanek and Lewis 2020). The AWBP was estimated at 543 individuals in the most recent (2021 – 2022) available winter census data (Butler *et al.* 2022). The long-term growth rate of the AWBP has averaged 4.4%; however, low fledge rates have resulted in reduced recruitment of juveniles into the winter flock and the population has remained stable since 2017 (Harrell and Bidwell 2020). Conservation needs for whooping crane are outlined in the species Recovery Plan (CWS and USFWS 2007) and include:

- protection and enhancement of the breeding, migration, and wintering habitat of the AWBP to allow the flock to grow and reach ecological and genetic stability;
- reintroduction and establishment of self-sustaining wild flocks within the species' historic range and that are geographically separate from the AWBP to ensure resilience to catastrophic events; and
- maintenance of a captive breeding flock to protect against extinction.

Life History

The AWBP breeds in Wood Buffalo National Park in Canada and winters along the Texas coast, including in the Aransas National Wildlife Refuge (Urbanek and Lewis 2020). The AWBP migrate through South Dakota annually to northern breeding grounds and southern wintering areas. Spring and fall migration dates range from March 25 through mid-May and mid-September to mid-November.

Migrating whooping cranes are known to travel individually, in family groups, or in small flocks with four to five adults; however, larger flocks have been observed in growing frequency (Caven *et al.* 2020) and the species sometimes join flocks of sandhill cranes (Antigone canadensis) for a portion of their migration (Urbanek and Lewis 2020). Whooping cranes are known to choose stopover sites during migration that sandhill cranes are already utilizing (USFWS 2009). On average, migrating whooping cranes make 11 to 12 overnight stopovers and four multi-day stopovers during each trip (Pearse *et al.* 2020). Individuals do not appear to exhibit site fidelity to overnight stopover sites (Pearse *et al.* 2020), but some areas on the landscape have a higher intensity of stopover use than others (Pearse *et al.* 2015).

Stopover sites provide roosting and foraging areas, typically within 0.6 miles (1.0 km) of each other (Urbanek and Lewis 2020) and can include palustrine or lacustrine wetlands, prairie and wet meadows, rivers, and agricultural fields (USFWS 2021c).

Species Presence and Use in the Analysis Area

The Analysis Area for evaluating whooping crane habitat at North Bend included all lands within 0.5 miles of Project turbine locations in accordance with the species-specific minimization measures outlined in the UGP Wind Programmatic Biological Assessment (PBA) Species Consistency Evaluation Form for whooping cranes found here https://www.wapa.gov/regions/UGP/Environment/Documents/Whooping%20crane.pdf (Figure 3.5-1). Because whooping cranes may avoid suitable stopover habitat in areas near turbines (Pearse *et al.* 2021), there is an assumed loss of suitable stopover habitat near wind turbines and thus the preferred species-specific measure to adhere to within the UGP Wind PBA is avoidance of all infrastructure within 1 mile of wetlands that provide potentially suitable stopover habitat. Since Project turbines will be located within 1 mile of wetlands that provide potentially suitable stopover habitat North Bend has elected to complete the species-specific minimization measure instead, which allows for the acreage of wetlands that are potentially suitable stopover habitat located within 0.5 miles of turbines to be mitigated.

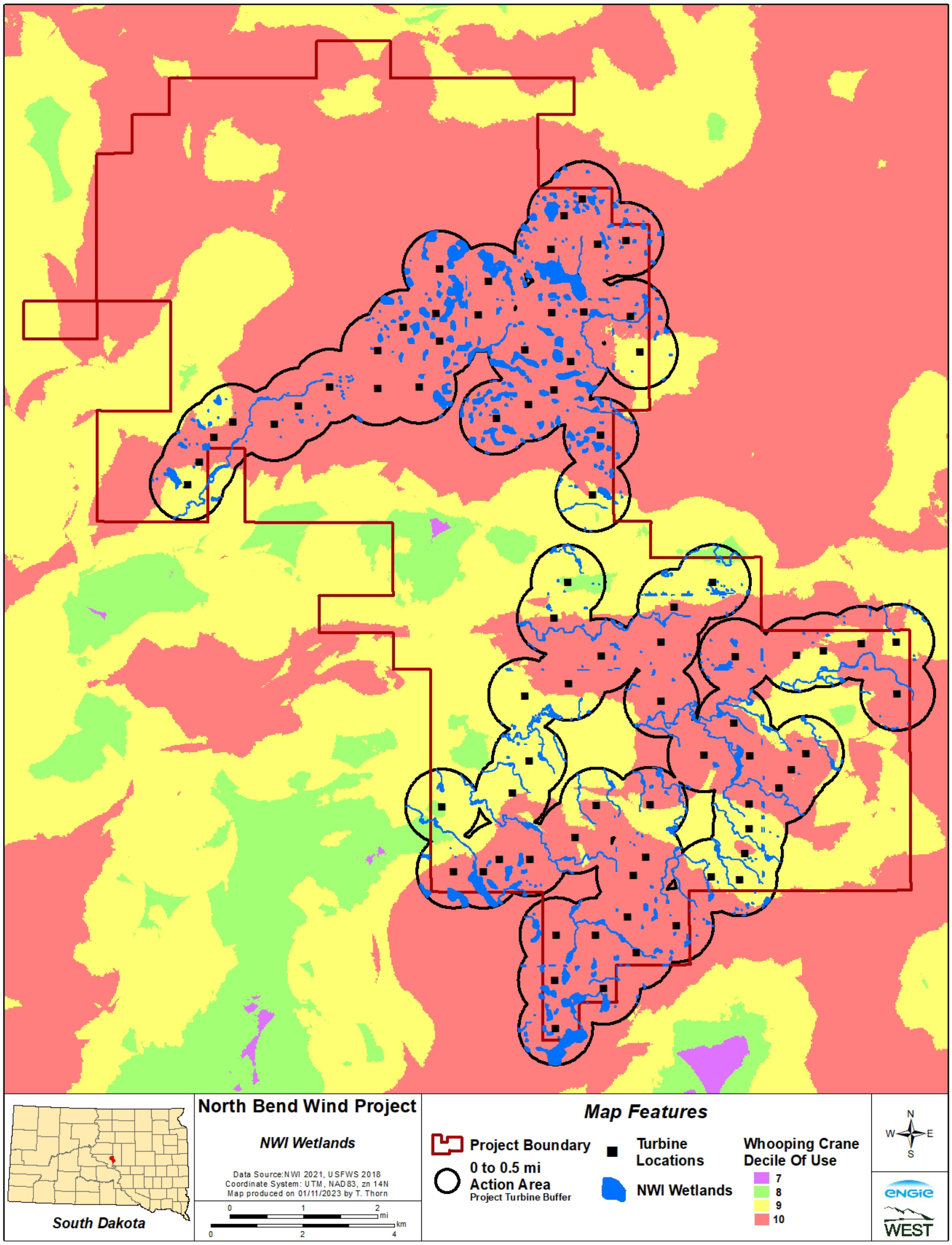

Figure 3.5-1. Whooping Crane Analysis Area, NWI Wetlands Within 0.5 Miles of Turbines, and Potentially Suitable Habitat Deciles (Niemuth *et al.*2018).

Individual Sightings

The Analysis Area is within the 50% core of the migration corridor of the AWBP whooping cranes (Pearse *et al.* 2018). The 50% band is where 50% of whooping crane observations have occurred (Pearse *et al.* 2018). The 95% core refers to the statistically determined area where historic sightings and telemetry locations of migrating whooping crane have occurred (Figure 3.5-3; Pearse *et al.* 2018), approximately 245 miles north of the nearest designated critical habitat located along the Platte River (43 FR 20938 [May 15, 1978]). This core area averages 42 miles in width; and is narrowest in northern Oklahoma (16 miles wide) and widest at the U.S./Canadian border (65 miles wide). All areas designated as critical habitat for whooping cranes in the U.S. exist within the whooping crane migration corridor (USFWS 2010).

Adult and subadult whooping cranes could occur in suitable habitat within the whooping crane Action Area during spring and fall migration. However, those observations are expected to be rare occurrences due to the small population numbers (543 individuals; Butler *et al.* 2022). No whooping cranes were observed during 1,004 hours of fixed-point avian use surveys from 2016-2022 within the Project Area (Piorkowski and Arellano 2021). However, in publicly available data (Pearse *et al.* 2020, Cooperative Whooping Crane Tracking Project [CWCTP; USFWS 2021b[5]]; eBird 2022), one whooping crane record exists within the three-mile buffer around all Project infrastructure. In this record, four adults were observed for five days in April 1997. Seventeen additional records exist within a 12-mile buffer around Project infrastructure (six confirmed sightings and 13 telemetry locations). Numerous records that include both on-the-ground and in-flight observations exist beyond the whooping crane Action Area but within 3−12 miles of proposed Project turbines, including a recent occurrence of two individuals observed approximately 1.8 miles away from turbines for nine days (April 11 – 19, 2022). This observation was approximately 7.3 miles from the nearest proposed turbine for the Project.

[5] The following disclaimer applies to the use of CWCTP data presented in this document.

"This document or presentation includes Whooping Crane migration use data from the Central Flyway stretching from Canada to Texas, collected, managed, and owned by the USFWS. Data were provided to 'Western EcoSystems Technology, Inc.' as a courtesy for their use. The USFWS has not directed, reviewed, or endorsed any aspect of the use of these data. All data analyses, interpretations, and conclusions from these data are solely those of 'Western EcoSystems Technology, Inc."

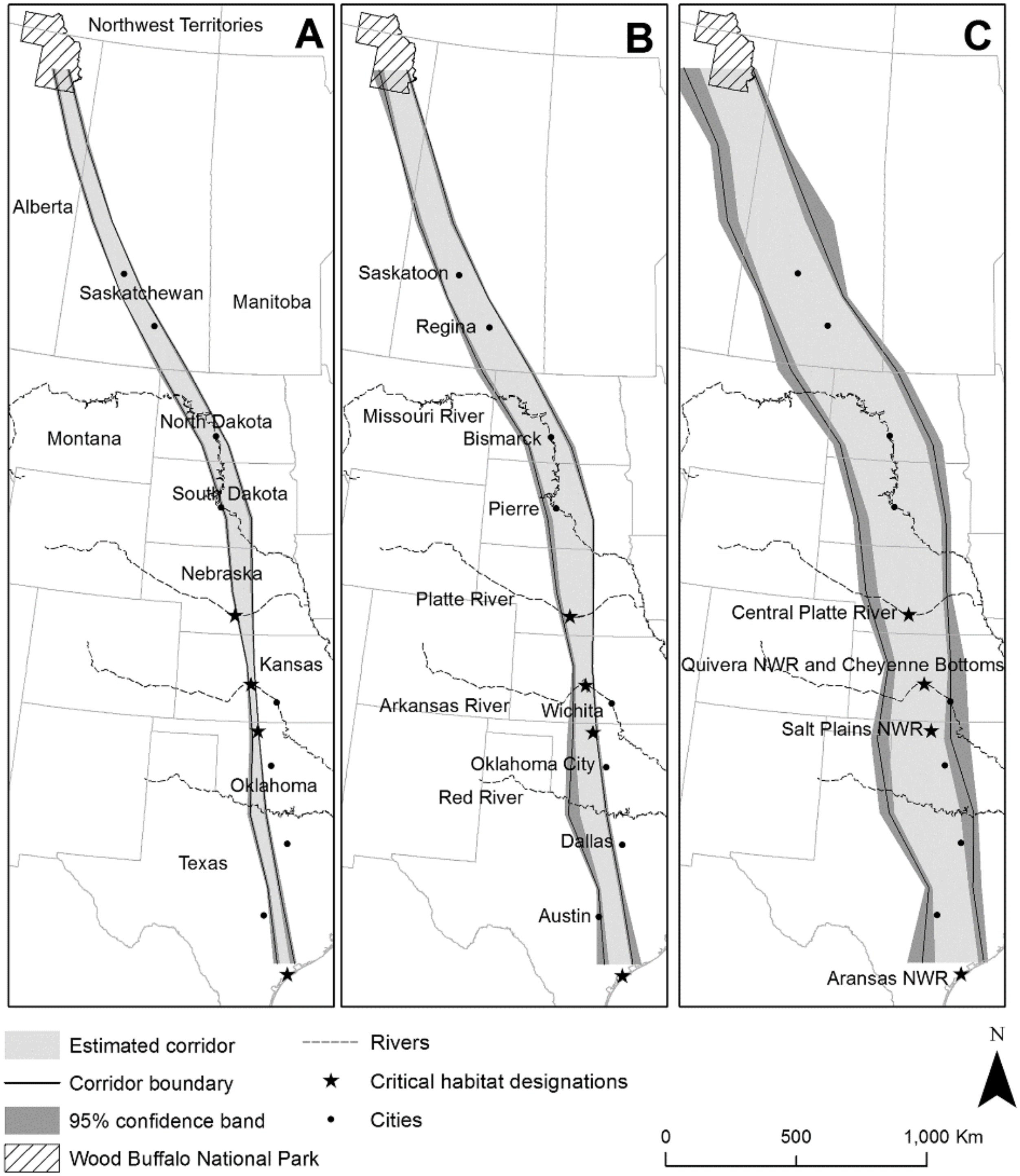

Figure 3.5-3. Migration corridors for whooping cranes of the Aransas-Wood Buffalo population, delineating 50% core (A), 75% core (B), and 95% core migration areas (C) (Adapted from Pearse *et al.* 2018). The project area is located near Pierre, SD.

Habitat

The USFWS, in evaluating the ongoing and anticipated development of wind facilities in the migration corridor stated, "suitable stopover habitat in the prairie pothole region of the Dakotas and eastern Montana does not appear to be limited at the present time" (USFWS 2009, Pearse *et al.* 2021). Wetland density within the Prairie Potholes Region, which includes the whooping crane Analysis Area, is greater than 16 potholes/square mile (40 potholes/square kilometer) in some areas (Hantrud *et al.* 1977). While the quantity, quality, and distribution of potential stopover habitat in the region likely changes from year to year (Pearse *et al.* 2018) due to variability in the amount of annual snowmelt and rainfall that fills the potholes (Dahl 2014) and changes in land use that create or remove wetlands on the landscape (Alemu *et al.* 2020), whooping crane habitat in the prairie pothole region is typically described as being abundant compared to other portions of the migration corridor (Stahkecker 1997a, 1997b, Bates 2019). This is empirically supported by evidence that suggests site fidelity was more pronounced in areas such as the southern portion of the migration corridor where core use sites were fewer, likely indicating limited available stopover habitat in those areas (Pearse *et al.* 2020).

During migration, whooping cranes must land at suitable stopover habitat to forage or roost. Foraging habitat includes emergent herbaceous wetlands and cropland, with a preference for wetlands, while roosting habitat includes open water and emergent herbaceous wetlands (Baasch *et al.* 2019). Based on USFWS NWI maps, 1,310.8 acres of wetlands occur within the 0.5-mile buffer of proposed infrastructure. Several factors affect the suitability of potential stopover habitat, including wetland size, wetland depth, presence of vegetation that might obstruct visibility for whooping cranes, proximity to existing human structures or activities, and proximity to additional foraging resources (USFWS 2007, Niemuth *et al.* 2018, Pearse *et al.* 2021). Various habitat models have been developed that consider one or more of these factors that can affect use.

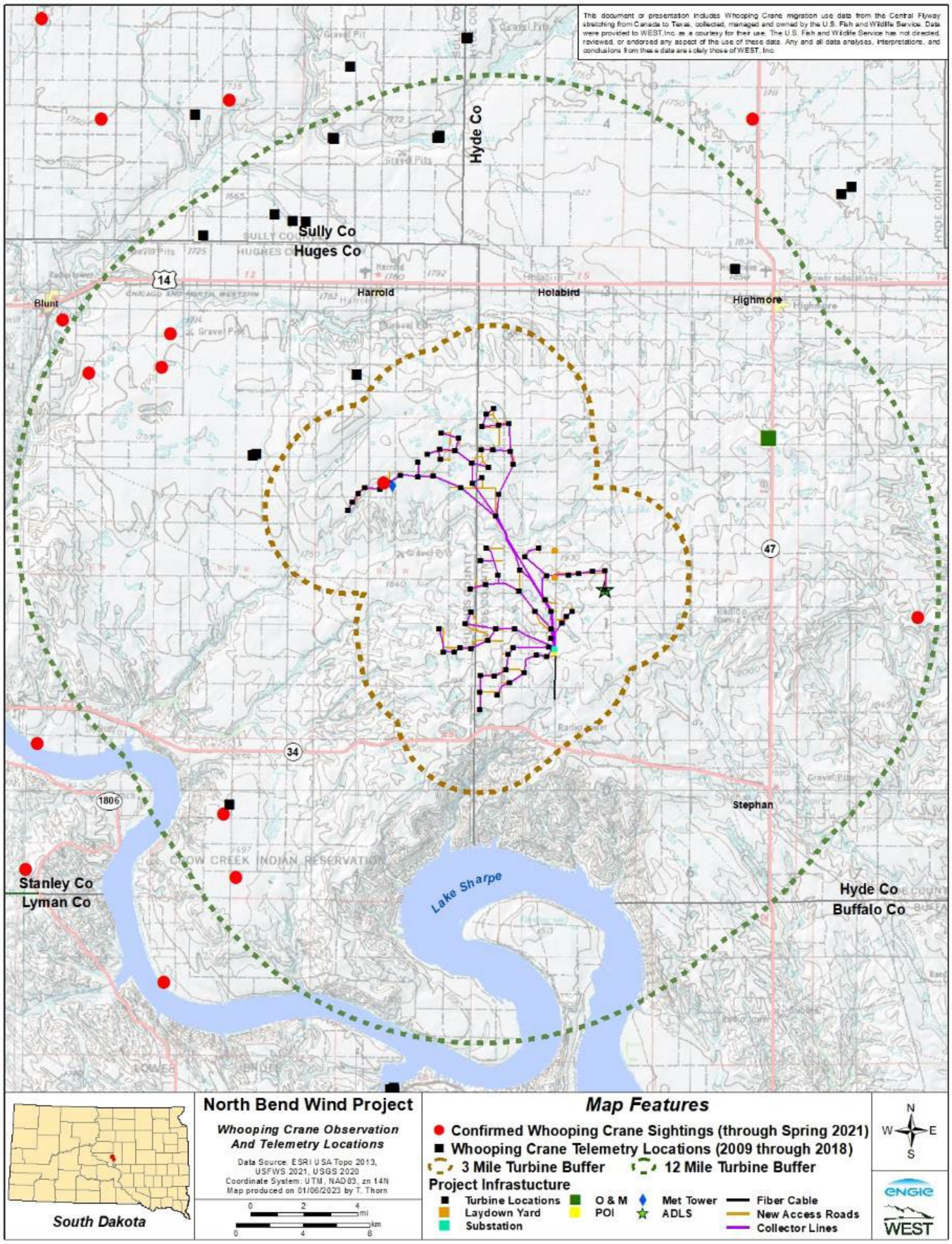

Figure 3.5-4. Whooping crane sightings with 3-mile and 12-mile buffers for the North Bend Wind Project.

Northern Long-eared Bat

Status of the Species

The northern long-eared bat was listed as threatened throughout its geographic range by the Service in 2015 (80 FR 17974-18033). The listing became effective on May 4, 2015. On January 14, 2016, the Service published a final “4(d) rule” that removed or exempted prohibitions for most incidental take of northern long-eared bats, including take associated with the operation of a wind energy facility (81 FR 1900-1922). However, on November 30, 2022, the Service published a final rule reclassifying the northern long-eared bat as endangered (USFWS 2022c). With the change in listing status, the 4(d) rule and its associated take exemptions no longer apply to the northern long-eared bat.

Life History

This medium-sized bat (3.0 to 3.7 inch long) is a generalist predator of aerial invertebrates; this species forages at night in primarily mature forested areas, along forest edges, and in small clearings, and utilizes different roost sites at different seasons (NatureServe 2013; USFWS 2022b). In winter, the northern long-eared bat typically hibernates in caves and mines singly or in small numbers (USFWS 2022b). Preferred hibernation sites have constant temperatures and high humidity with no air currents (USFWS 2022b). During the summer, they typically roost singly or in maternity colonies under bark, in crevices, or in cavities of live or dead trees, though males and non-reproductive females may roost in caves or mines (USFWS 2022). In addition, the northern long-eared bat is known to roost in buildings, barns, bat houses, behind window shutters, under bridges, and on utility poles (USFWS 2022b). Nighttime foraging consists of feeding on insects, which the bats catch while in flight using echolocation or by gleaning motionless insects from vegetation and water surfaces (USFWS 2022b).

Fidelity to night roosts and hibernation sites has been observed (Tigner and Stukel 2003). Migration routes and distances are poorly understood for northern long-eared bat. Migration distances of 35 to 55 miles are known, but the species may travel between 5 and 168 miles from winter hibernation to summer roosts (USFWS 2022). Several studies report home range size for some populations may be as high as 148 to 161 acres (Owen *et al.* 2003; USFWS 2022b).

Northern long-eared bats mate in late summer and early fall, prior to hibernation, when large numbers of bats congregate in and near the entrances of caves and mines (USFWS 2022b). Females will store sperm during hibernation and delay fertilization until spring (Racey 1982), giving birth to one pup (NatureServe 2013). The northern long-eared bat is typically active in South Dakota from May 1 – October 1, with the pupping season recognized as June 1 – July 31 (USFWS 2022b).

Species Presence and Use in the Analysis Area

The Analysis Area for evaluating effects to northern long-eared bat includes the area within a 2.5-mile buffer around Project infrastructure based on guidance from *2020-2021 USFWS Range-wide Indiana Bat Survey Guidelines* (USFWS 2020d; Figure 3.5-5).

Following the WEG, pre-construction bat acoustic surveys were completed at two bat acoustic stations in the Analysis Area in 2016 and 2018 (Section 3.4; Figure 3.4-4). These bat acoustic surveys did not identify bats by species, but rather according to the frequency of the calls; bats were grouped either as low-frequency bats or high-frequency bats. Therefore, these surveys cannot definitively say if northern long-eared bats were present in the Analysis Area, but high-frequency bats were detected (northern long-eared bat is a high-frequency bat). Over the years, a total of 236 high frequency calls were detected; none of these calls contained northern long-eared bat calls (WEST 2021a).

Suitable northern long-eared bat habitat in the Analysis Area was evaluated based on guidance from *2020-2021 USFWS Range-wide Indiana Bat Survey Guidelines* (USFWS 2020d; WEST 2021a). Suitable habitat includes the presence and connectivity of forested areas that northern long-eared bat might use for roosting, foraging, and traveling or commuting corridors. Forest patches in the Analysis Area were identified from aerial photography and were found to occur as isolated stands of trees (primarily shelterbelts/tree lines and wooded hedgerows) most often with little connectivity (Figure 3.5-5). A 1,000-foot buffer was placed around forest patches 10 acres or greater in size, and these areas were considered suitable northern long-eared bat roosting/foraging habitat (Figure 3.5-5). Northern long-eared bat presence was assumed at each patch of trees 10 acres or greater in size, therefore, no northern long-eared bat-specific surveys were completed.

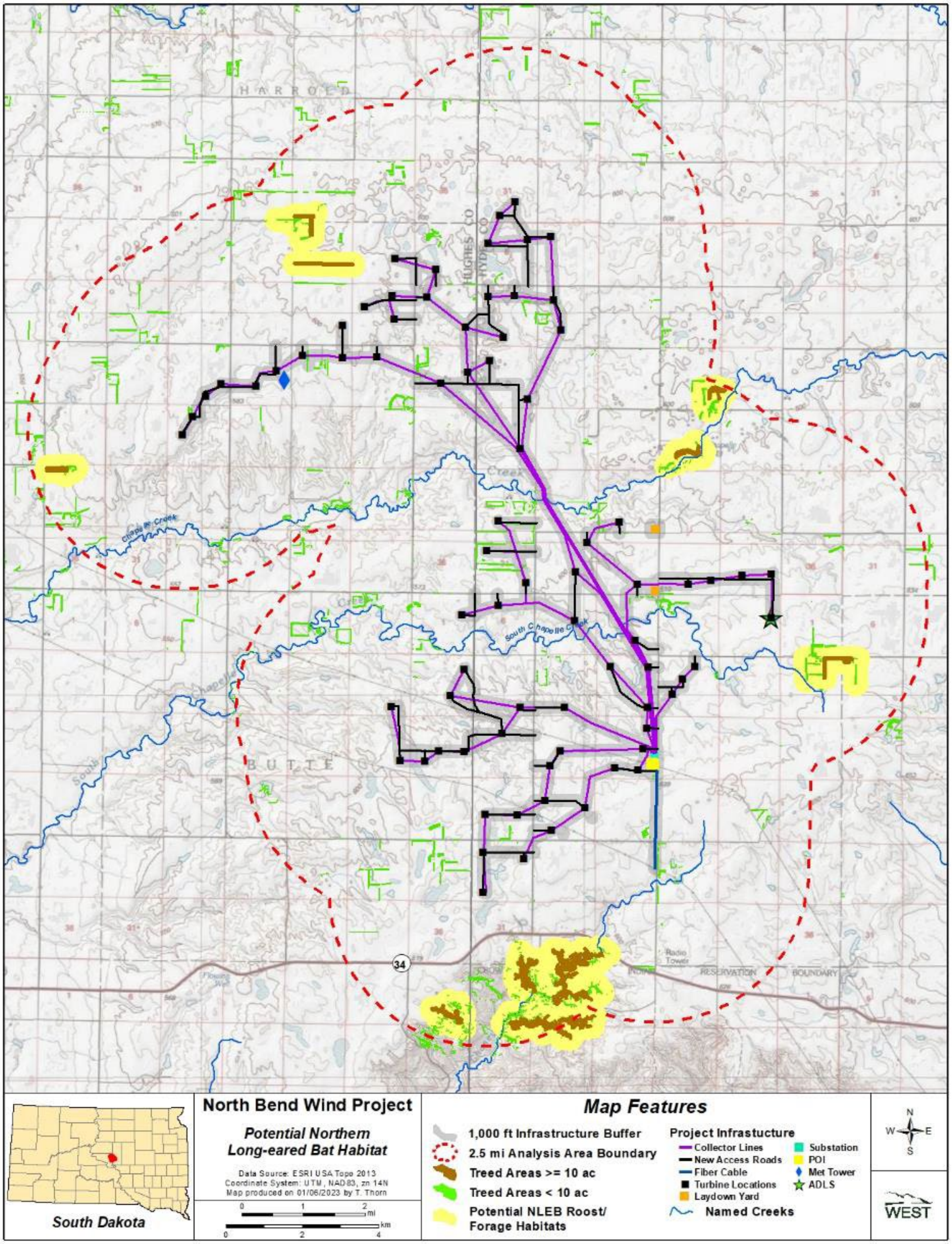

Figure 3.5-5. Northern Long-eared Bat Habitat within the 2.5-mile Analysis Area.

Pallid Sturgeon

Status of the Species

The pallid sturgeon is listed as an endangered species under the ESA. Current threats to pallid sturgeon include large river habitat alterations, water quality, entrainment, and climate change (USFWS 2014).

Life History

The pallid sturgeon is one of the largest freshwater fish in North America and can be long-lived. This species inhabits the Missouri and Mississippi Rivers and some of the rivers' connected tributaries and lakes. In South Dakota, the species is known to occur in portions of the Missouri, Big Sioux, Vermillion, and James Rivers (USFWS 2021). The pallid sturgeon is bottom-oriented and adapted to large, free-flowing, warm-water, and turbid rivers with a diverse assemblage of physical habitats (USFWS 2014). The pallid sturgeon is generally associated with deep turbid waters in the main channels of large rivers (Kallemeyn 1983, Erickson 1992, Wanner *et al.* 2007). NDGF identifies preferred habitat for pallid sturgeon as stretches of fast-flowing, turbid rivers with a 40 to 90 cubic feet per second velocity (Dyke *et al.* 2015). Habitat characteristics reported from a study in the Missouri River downstream of Fort Randall Dam reported seasonal temperatures of 44 degrees (°) Fahrenheit (F; spring), 72°F (summer), 63°F (fall), and 34°F (winter) (Wanner *et al.* 2007). Pallid sturgeon are most often found in sinuous channels with sub-climax seral-stage islands and/or midchannel sandbars (Bramblett and White 2001). Females spawn every two to three years and spawning occurs between March and July (USFWS 2014). Spawning appears to occur over firm substrates, in deeper water, with relatively fast, turbulent flows, and is driven by environmental factors such as flow, water temperature, and day length. (USFWS 2014; The Pallid Sturgeon Recovery Program 2022).

Species Presence and Use in the Analysis Area

The Missouri River, approximately 4.5 miles from the 500-ft Action Area, provides suitable habitat for pallid sturgeon (Figure 3.5-6). Chapelle Creek and South Chapelle Creek, which cross the Action Areas and flow from the Action Areas approximately 12 miles through agricultural land to the Missouri River, do not contain preferred pallid sturgeon habitat for several reasons. These creeks are not within the pallid sturgeon's range of known occurrence (USFWS 2021) and do not provide habitat features such as deep water; fast, turbulent flows; and the diverse assemblage of physical habitats required for occupancy. Hamilton (1986) reported the named tributaries to the Missouri River in Hughes County, South Dakota, to be ephemeral streams, meaning their stream flows are most often the result of temporary precipitation or runoff, and they routinely lack clearly defined stream beds. Over a 30-year period, stream flow at Medicine Knoll Creek, the largest Missouri River tributary in Hughes County, South Dakota, exceeded

1 cubic foot per second only 15% of the time, and the freezing of tributaries in the area contributed to periods of little or no streamflow (Hamilton 1986).

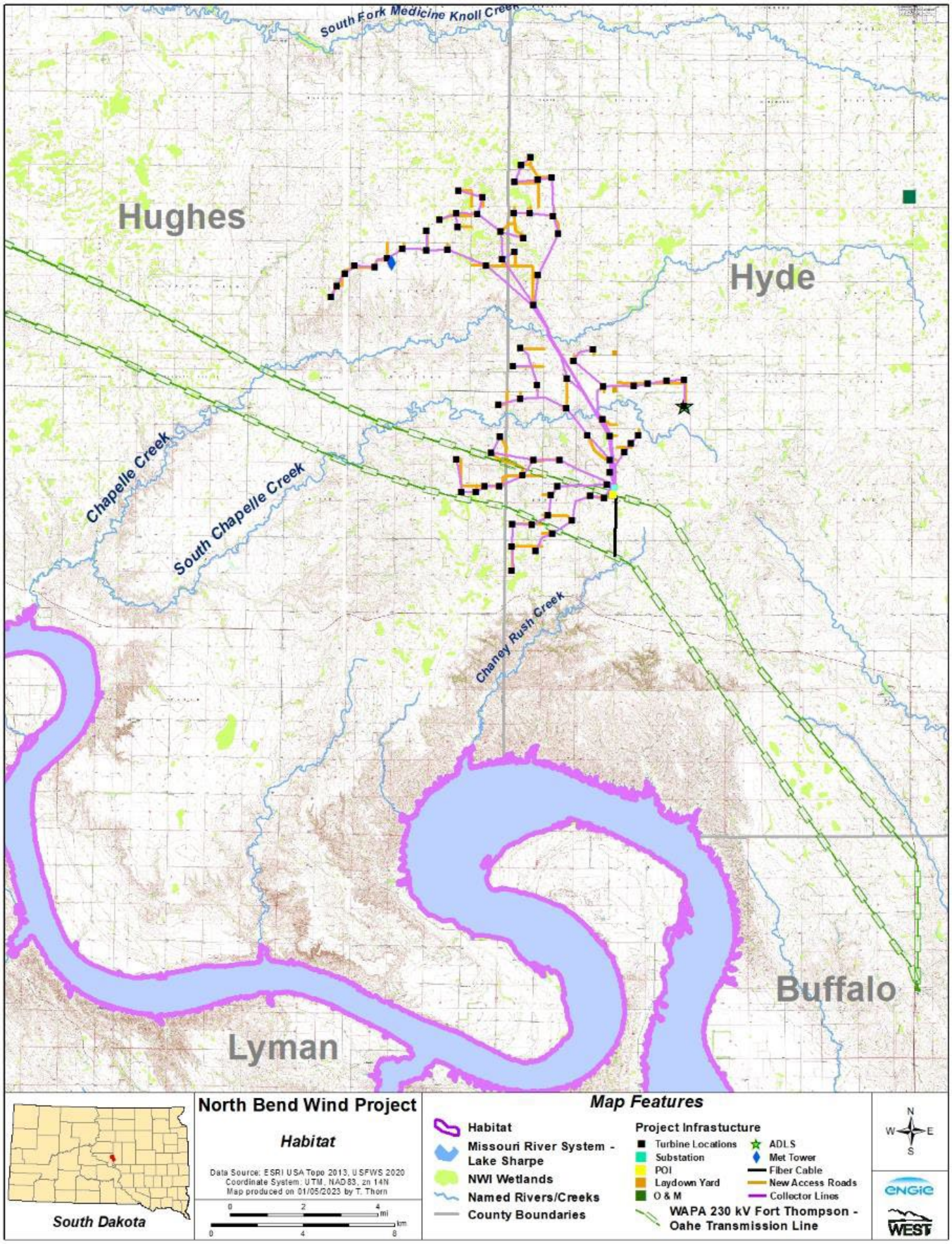

Figure 3.5-6. Pallid Sturgeon, Piping Plover, and Rufa Red Knot Habitat near the Analysis Area.

<u>Piping Plover</u>

Status of the Species

The piping plover is listed as a threatened species under the ESA (50 FR 50726 [December 11, 1985]). Current threats to piping plover include nesting habitat loss due to dam construction, water diversion, and water withdrawals; increases in the number and type of predators due to human-caused changes; decreasing nest success and chick survival; and decreases in winter habitat due to human disturbance, beach development, and sea level rise (USFWS 2021f).

Life History

The piping plover is a small migratory shorebird. The Northern Great Plains population, the interior population, occurs along the rivers and lakes in the northern Great Plains and breeds from Canada to Colorado (Elliott-Smith and Haig 2020). Suitable piping plover nesting habitat includes sandy riverbanks, sand bars, and alkali lakes. Piping plovers start to arrive on breeding grounds in early April and nest in mid-to-late April (Elliott-Smith and Haig 2020). Piping plovers nest in shallow depressions, and eggs hatch between late May and early June on exposed habitat, typically sandbars with low vegetative cover (SDGFP 2005). Fledging occurs 25 to 35 days after hatching (USFWS 2021f). In South Dakota, piping plover occur and nest between May 1 and August 15 (SDGFP 2005).

Species Presence and Use in the Analysis Area

Piping plovers are closely associated with the Missouri River in South Dakota. The amount of nesting habitat varies annually depending on water levels. Lake Oahe, approximately 30 miles from the Analysis Area, can be an important breeding area for piping plover, especially during drought conditions when there are large areas of unvegetated land exposed (SDGFP 2005). The Missouri River is approximately 4.5 miles from the Analysis Area at its closest point (Figure 3.5-5). For piping plovers nesting on the Missouri River, overland movements are likely. The extent of overland movements by this species is not known; however, the proximity of the Project to the Missouri River might increase the potential for onsite occurrence during migration, breeding, or dispersal. While piping plover seem to prefer sandy riverbanks and sand bars, the plovers are also known to nest on alkali lakes with exposed habitat (SDGFP 2005). No alkali lakes occur in the Analysis Area and most alkali lake occurrences have been reported from North Dakota. In dry years, dried up wetlands with exposed shore in the Analysis Area could provide piping plover habitat. There is limited (e.g., periodically dried up wetlands) to no suitable habitat within the Project Area to attract piping plover from the Missouri River corridor.

The nearest reported piping plover is a 2021 sighting approximately 17.5 miles from the Project (eBird 2021). Most reported observations of piping plover occur around Pierre, South Dakota, about 28 miles from the Project. No piping plover observations were made during once-a-month avian use surveys conducted over the course of four years, nor were they observed incidentally while conducting other wildlife surveys at the Project (WEST 2021a). No alkali lakes were observed within the Analysis Area; therefore, the nearest suitable piping plover habitat is the Missouri River, approximately 4.5 miles south of the Project. The nearest designated critical habitat for the species is located 29 miles from the Project boundary.

Rufa Red Knot

Status of the Species

The rufa red knot is listed as a threatened species under the ESA (79 FR 73706 [December 11, 2014]). Current threats to rufa red knot include loss of habitat, disruption of natural predator cycles on breeding grounds, reduced prey availability, and increased frequency and severity of mismatches in the timing of the annual migratory cycle relative to favorable food and weather conditions (USFWS 2021g).

Life History

The rufa red knot is a shorebird that is primarily a coastal species. However, small numbers of rufa red knots are reported annually across the interior U.S. during their spring and fall migration. These reported sightings are concentrated along the Great Lakes, but multiple reports have been made from nearly every interior State, including South Dakota (eBird 2022). Rufa red knots nest in the Arctic and winter mainly in Florida and the adjacent Gulf Coast and Caribbean; northern Brazil; and the Chilean and Argentine Tierra del Fuego (American Bird Conservancy 2022). The long-distance migrations between nesting and wintering sites can be over 9,000 miles, and the migrations occur twice each year, in spring and the autumn. During migration, the birds primarily use marine habitats, but when they occasionally appear at interior locations, rufa red knots frequent shorelines of larger lakes or freshwater marshes (Cornell Laboratory of Ornithology 2022a).

Species Presence and Use in the Analysis Area

Rufa red knot does not breed in South Dakota but could be an occasional migrant during the spring and fall. Twenty-nine sightings of rufa red knot have been reported in South Dakota since 2002 (eBird 2021). The nearest potential rufa red knot habitat is approximately 4.5 miles from the Project's boundary at Lake Sharp, part of the Missouri River (Figure 3.5-6). The nearest reported rufa red knot, detected in 2016, was approximately 16.5 miles from the closest Project turbine location. One other rufa red knot record in

Hughes County was reported in 2002 (eBird 2021). Four years of avian use surveys did not result in any rufa red knot observations in the area.

2.8.2 Environmental Effects: Proposed Action Alternative

Effects Determinations

WAPA has determined the Project may affect but is not likely to adversely affect the whooping crane, northern long-eared bat, piping plover, and rufa red knot. WAPA has also determined the Project would result in no effect to pallid sturgeon and any designated critical habitat for these five species due to the long distances to designated critical habitat (the nearest, for piping plover, is 29 miles from the Analysis Area). These determinations are discussed below by species. The North Bend Project has fulfilled ESA consultation through tiering to the PBA. Species consistency evaluation forms have been developed for the listed, candidate, or proposed species that may occur within the region (Appendix E).

Whooping Crane

Species-specific Conservation Measures

The following conservation measures would be implemented at the Project to reduce potential effects whooping crane:

- North Bend will complete one year of Tier 4a avian and bat fatality monitoring efforts that are consistent with recommendations for operations monitoring included in the WEG, the PEIS, and are consistent with monitoring programs that have been conducted at wind projects in the Midwest and upper Great Plains. This post-construction study shall consist of three primary survey components: 1) standardized carcass searches, 2) searcher efficiency trials to estimate the probability a carcass was found by technicians during a standardized search, and 3) carcass persistence trials to estimate the average length of time a carcass remained in the search area for possible detection.
- While there are no guy wires currently planned for development of infrastructure, in the event any guy wires would be installed in the future, all guy wires shall be marked with approved bird flight diverters following APLIC standards (APLIC 2012).
- Bird flight diverters consistent with APLIC standards would be placed on the top static wire of the gen-tie line.
- A whooping crane observation plan and turbine shutdown protocol would be implemented during the spring and fall migration periods for the life of the Project (Appendix F).

- Participation in an environmental awareness training program would be required for all Project staff and sub-contractors working on-site. The program includes training participants in the proper identification, response protocol, and reporting of sandhill and whooping cranes. Additionally, pamphlets or identification guides would be disseminated to operations staff and sub-contractors while conducting work on-site during the migration seasons.
- North Bend shall provide conservation funds to support habitat restoration and/or preservation efforts for whooping cranes. The Project has the potential to directly affect up to 8.3 acres of wetlands and indirectly affect up to 1,310.8 acres of wetlands identified as suitable whooping crane stopover habitat. The mitigation restoration/preservation funding is based upon the 1,310.8 acres.

Direct Effects

Direct impacts to whooping cranes from Project activities could occur because of the loss of suitable stopover habitat, collision mortality, or human disturbance.

Habitat

Direct loss of whooping crane habitat, such as filling wetland to construct Project infrastructure, in the Action Area would be minimal. The Project would temporarily affect an estimated 8.3 acres of wetlands during construction and permanently affect 0.5 acre during operation (Table 3.2-3). Most of the impacts to wetlands would be due to collector lines and access roads crossing wetlands. Construction-related impacts would be temporary, and the 7.8 acres of wetland disturbed during construction would be restored. Relative to the abundance of wetlands in the surrounding area (see discussion below), the 0.5 acre of permanent wetland impact due to Project operation is minimal on the local and landscape scales.

Habitat loss could also occur because migrating whooping cranes are expected to avoid stopover habitat near Project turbine locations (Pearse *et al.* 2021). The 1,310.8 acres of wetlands in the 0.5-mile buffer around the North Bend Project turbine locations would be effectively lost as stopover habitat due to the Project. Although the 1,310.8 acres of wetlands in the 0.5-mile buffer around Project turbine locations could be effectively lost, a minimum of 41,203 acres of wetlands are available further out than 0.5 miles around Project turbine locations for displaced whooping cranes to use as stopover habitat.

Collision

Direct effects of the Project could include whooping crane collisions with Project facilities, resulting in death or injury of whooping crane. Collision with Project facilities could occur at turbines, the gen-tie line, or the met tower. In addition, collisions could occur with equipment used during construction or decommissioning, such as mechanical cranes or vehicles.

The likelihood of whooping crane collisions with wind turbines at the Project is low because, based on best available data, migrating whooping crane appear to avoid wind energy projects (USFWS 2009). Pearse *et al.* (2021) stated the observed avoidance of wind turbines by three miles decreases the probability that collision with these structures may occur. However, avoidance of wind turbines by three miles was not observed by all whooping cranes; some whooping cranes were reported as close as 0.4 mile of a turbine (Pearse *et al.* 2021). No documented whooping crane fatalities related to turbine collisions have been recorded (USFWS 2009; W. Harrell, USFWS, pers. comm., March 5, 2021; American Wind Wildlife Institute 2020, WEST 2021b).

The likelihood of whooping crane collisions with other Project facilities, such as the gen-tie line and met tower, is also low. Collision risk with the gen-tie line at the Project is low because the power line between the substation and POI facility is short (approximately 500 feet) and it would be outfitted with bird flight diverters. Bird flight diverters increase visibility, thus reducing collision risk. Collision risk with the single met tower is expected to be low because it would be free-standing, with no guy wires, and it would be marked with red blinking lights per FAA regulations which would increase visibility. The exclusive use of underground collection lines also reduces the risk for collision mortality. A Project speed limit of 25 miles per hour (mph) would reduce the potential for collisions with personnel vehicles. No whooping crane mortality has been reported from collision with met towers/poles, other tower-like structures, or construction equipment, though some individuals have died from unknown sources of trauma (Stehn and Haralson-Strobel 2016). Whooping crane collisions with power lines have been reported in Kansas, Nebraska, North Dakota, and Texas (Stehn and Wassenich 2008, Stehn and Haralson-Strobel 2016, Harrell and Bidwell 2020). If whooping cranes do occur within the Project during migration, it is possible that, under some conditions, particularly when visual acuity is obscured due to daylight or weather conditions, individuals could fail to avoid Project facilities and collide with structures, leading to injury or death.

Based on the preponderance of the evidence (Stehn 2008, APLIC 2012), behavioral avoidance of Project infrastructure is the most likely response of migrating whooping crane. Thus, collision risk as a direct cause of mortality is considered extremely low. The extremely low likelihood for collision with a turbine is further reduced by the observation plan (Appendix F) that would be implemented at the Project. During the spring and fall migrations, staff dedicated solely to crane surveys would conduct active monitoring a minimum of two miles from the turbines for the life of the Project to alert Project personnel and curtail turbines if whooping cranes are observed (Appendix F).

Human Disturbance

Disturbance could occur from increased human presence, including vehicle traffic, noise generated during construction, operation, maintenance, or repowering/decommissioning activities. Anecdotal evidence from available literature suggests human disturbance elicits avoidance behavior in whooping cranes (Lewis and Slack 2008). While information specific to disturbances occurring at stopover sites is limited, Howe (1989) concluded the mean distance of stopover roosting sites was 0.3 miles from the nearest road and 0.8 miles from human habitation, suggesting whooping cranes selected stopover habitat away from human disturbance. In addition, Howe (1989) noted that individuals reacted with alarm to helicopters, but generally ignored fixed-wing aircraft. On-site monitoring at the Project designed to trigger operational response measures when whooping cranes are detected, and the implementation of a wildlife awareness program for operations, contracted, and sub-contracted personnel, are expected to further reduce the likelihood of disturbance to any whooping cranes that may be observed at the Project (Appendix F).

Indirect Effects

Indirect effects to whooping cranes could result from degradation of existing habitat, loss of potentially suitable habitat, or additional whooping crane behavioral responses to the operations of the Project not previously described. Degradation of suitable stopover habitat can occur from Project-related surface water runoff and deposition of eroded soils in wetland areas. These impacts are expected to be minor at the Project because, as described in Section 3.2.1, surface water and wetland effects would be minimized by the implementation of conservation measures and compliance with a general permit for storm water discharges from the SDDANR for construction activities and a permit from the USACE for wetland effects.

The loss of suitable stopover habitat within 0.5 miles of Project turbine locations described above would result in increased flight distance to search for and travel to the next available habitat, which could increase the energetic resources required for migration. While the energetic cost and impacts to whooping crane survival and reproductive success associated with potential avoidance are unknown, these are likely to be minimal given the reported long-term estimated annual rate of population growth of approximately 4% (USFWS 2007). Furthermore, no information, published reports, or studies document energetic costs as consequential in terms of the survival or the reproductive success of individuals.

Effects Determination

With implementation of whooping crane species-specific conservation measures, the Project's whooping crane observation plan (Appendix F), WAPA has concluded the Project may affect, but is not likely to adversely affect, the whooping crane.

Conservation Commitment

North Bend agrees to provide $2,529/acre for 1,310.8 acres, plus administrative fees, in conservation funds to a 3rd party entity (i.e., Ducks Unlimited) to support restoration and perpetual protection of a minimum 1,310.8 acres of wetlands. This monetary equivalency is based on existing programs (e.g. the NRCS Agricultural Conservation Easement Program) for the protection of a minimum 1,310.8 acres of wetlands within the 95% crane migration corridor of South Dakota.

<u>Northern Long-Eared Bat</u>

Species Specific Conservation Measures

North Bend committed to the following environmental avoidance or minimization measures to avoid impacts to northern long-eared bat:

- Conservative evaluation of northern long-eared bat suitable summer habitat;
- No tree removal proposed during construction;
- No siting of turbines or infrastructure within 1,000 feet of potentially suitable roosting habitat and additionally extended that avoidance buffer up to 0.5 miles from suitable roosting habitat; and
- Implementation of a Wildlife Incident and Reporting System to be developed for the Project that would notify the USFWS South Dakota Ecological Services Field Office if an injured or dead northern long-eared bat is detected.
- Turbine cut-in speeds will be increased to 16.4 ft/sec (5.0 m/sec) or greater from 0.5 hour before sunset to 0.5 hour after sunrise during the fall migration period (August 15–October 15).
- Use of feathering below the cut-in speed of 16.4 ft/sec (5.0 m/sec) will also be implemented at night during the fall migration season to eliminate turbine rotation and avoid mortality of migrating northern long-eared bats. Increased cut-in speed and feathering may be suspended from 0.5 hour after sunrise to 0.5 hour before sunset.

Direct Effects

Collision

Direct effects to northern long-eared bat could include injury or death due to collisions with Project facilities. The risk of collision has been minimized by siting Project infrastructure 0.5 from suitable northern long-eared bat roosting habitat (Figure 3.5-5). Collision risk for bats is highest during fall migration, when activity for all bat species is typically higher and bats travel from their summing habitat to hibernacula. Northern long-eared bats are not considered long-distance migrants and typically travel up to 45 or 55 miles between hibernacula (USFWS 2022b) and summer habitat. The nearest known hibernacula are 108 miles from the Project (in the Black Hills, South Dakota), which is more than twice the species known migration range from hibernacula. Although northern long-eared bats are assumed to be present in suitable habitat in the Action Area, the actual likelihood of the species' presence is minimal due to the distance to the nearest know hibernacula; therefore, the risk of collision with Project infrastructure is reduced.

Habitat

No tree removal is anticipated for construction of the Project; therefore, there would be no direct effects on northern long-eared bat habitat.

Indirect Effects

There are no anticipated Project-related indirect effects to northern long-eared bat.

Effects Determination

Based on insignificant risk of take due to all turbines being sited >0.5 miles from suitable roosting habitat, and because no trees would be removed to construct the Project, an argument could be made the Project would have no effect on northern long-eared bats. Given the species has been observed within 17 miles of the bat Action Area and given the nearest known hibernaculum to the bat Action Area is within the maximum known travel distance, <168 miles, WAPA has determined the Project may affect, but is not likely to adversely affect the northern long-eared bat.

<u>Pallid Sturgeon</u>

Species Specific Conservation Measures

No specific conservation measures were identified for pallid sturgeon. The environmental commitments identified in Section 3.2.1 to avoid or minimize water impacts associated with the Project would be applicable to avoid or minimize impacts to pallid sturgeon.

Direct Effects

The Project would not have direct effects on pallid sturgeons or their species' habitat because neither the species nor its habitat occurs in or adjacent to the Analysis Area. The nearest suitable habitat is located approximately 4.5 miles from the Analysis Area in the Missouri River.

Indirect Effects

Indirect Project effects could include changes to water quality and quantity due to the surface water connection to the Missouri River via Chapelle and South Chapelle creeks, which pass through the Analysis Area. While the Missouri River is 4.5 miles from the Analysis Area at its closest point, Chapelle and South Chapelle creeks flow from the edge of the Analysis Area for about 12 miles through agricultural land to the Missouri River. Due to this distance, any Project-related sedimentation would likely settle before reaching the Missouri River and not affect downstream habitat. Furthermore, sedimentation and any other water quality effects due to the Project would be minimized or avoided through implementation of conservation measures for water resources described in Section 3.2.1. Therefore, indirect water quality impacts to pallid sturgeon habitat are unlikely.

Indirect water quantity impacts could result from Project-related water depletions. However, the Project would not appropriate from surface water in the Analysis Area and would not conduct permanent dewatering, deep-well injection, water storage, reprocessing, or cooling for either construction or operation of the facilities. Water required for dust control, and potentially for a concrete batch plant, is expected to be obtained from an existing or new well. Therefore, indirect water quantity impacts to pallid sturgeon habitat are not expected.

Effects Determination

Due to the distance of the Project to suitable pallid sturgeon habitat, implementation of conservation measures to avoid and minimize impacts to surface water quality, and no Project-related water depletions, WAPA has determined that the proposed Project would have no effect on the pallid sturgeon.

<u>Piping Plover</u>

Species Specific Conservation Measures

The Project includes less than 500 feet of proposed overhead power line. Bird flight diverters would be installed on the gen-tie line to minimize the potential for collision. The environmental commitments identified in Section 3.4.1 to avoid or minimize wildlife impacts associated with the Project would be applicable to avoid or minimize impact to piping plovers.

Direct Effects

Because of the lack of reported piping plover sightings in and near the Analysis Area and the lack of suitable habitat except in dry years when dried up wetlands with exposed shore could provide piping plover habitat, direct Project impacts to piping plover are unlikely. Piping plover are more likely to be attracted to and use suitable habitat along the Missouri River, rather than the marginal habitat in the Analysis Area that might be available in dry years when area wetlands could have exposed shore. Because piping plover are unlikely to use the Analysis Area, collision risk is low. Habitat effects would also be low due to the minimal effect the Project would have on area wetlands. As described in Section 3.2.1, of the 1,763 acres of wetland in the Analysis Area (Table 3.2-1), the Project would temporarily affect 7.8 acres during construction and 0.5 acre during operation (Table 3.2.3). Conservation measures for water resources described in Section 3.2.1 would further reduce the potential for Project effects to piping plover habitat (wetlands) in the area.

Indirect Effects

The Project is not expected to cause indirect effects to piping plovers.

Effects Determination

Because piping plover are unlikely to occur in the Analysis Area, the Project is unlikely to affect this species. However, because there is potential for occurrence in the Analysis Area, WAPA has determined the Project may affect, but is not likely to adversely affect the piping plover.

<u>Rufa Red Knot</u>

Species Specific Conservation Measures

The Project includes less than 500 feet of proposed overhead power line. Bird flight diverters would be installed on the gen-tie line to minimize the potential for collision. Habitat restoration of disturbed soils and vegetation would be initiated as soon as possible after construction activities are completed. North Bend would apply adaptive management as described in the Bird and Bat Conservation Plan (Appendix D). North Bend will complete one year of Tier 4a avian and bat fatality monitoring efforts that are consistent with recommendations for operations monitoring included in the WEG, the PEIS, and are consistent with monitoring programs that have been conducted at wind projects in the Midwest and upper Great Plains. This post-construction study shall consist of three primary survey components: 1) standardized carcass searches, 2) searcher efficiency trials to estimate the probability a carcass was found by technicians during a standardized search, and 3) carcass persistence trials to estimate the average length of time a carcass remained in the search area for possible detection. Some of the adaptive management options that could be considered include additional on-site studies; anti-perching, anti-nesting, or electrocution protection devices; prey-base management through habitat alteration; and experimentation with visual and/or auditory bird flight diverters.

Direct Effects

Mortality due to collision with Project wind turbines is possible, but collision risk is low because rufa red knot would be a rare migrant in the Action Area. In addition, rufa red knots flying at migratory altitudes are likely to be above the rotor-swept area, but few direct measurements of flight altitudes are available for red knots (O'Connell *et al.* 2011). The birds could occur in rotor swept altitudes and may occur at those altitudes more frequently during ascent or descent from long distance flight or during short distance flights between areas used for feeding and roosting (Loring *et al.* 2018). Migrating rufa red knot, however, are more likely to be ascending or descending to feeding and roosting sites along the Missouri River/Lake Sharp, over four miles south of the Project, than in the Analysis Area since the birds seem to prefer shorelines of larger lakes, but rufa red knots could use freshwater marshes found in and near the Action Area. Based on publicly available data (WEST 2021b), there have been no known fatalities of the species at wind energy facilities in the UGP.

Habitat for rufa red knot in the Analysis Area consists of freshwater wetlands. Of the 364.28 acres of wetland in the Analysis Area (Table 3.2-1), the Project would temporarily affect 7.8 acres during construction and 0.5 acre during operation (Table 3.2.3). Therefore, the Project would have minimal habitat direct effect when considering the amount of wetland in the Project and surrounding area (Figure 3.2-2) and the proximity of more suitable habitat along the Missouri River (approximately 4.5 miles from the Project's boundary). Furthermore, conservation measures for water resources described in Section 3.2.1 would minimize Project effects to rufa red knot habitat (wetlands) in the area.

Indirect Effects

It is possible that the presence of the Project could cause migrating rufa red knot to avoid the Action Area, but there are limited data specific to rufa red knot regarding avoidance of wind turbines, especially inland. Assuming migrating rufa red knot avoid freshwater wetlands in the Action Area due to the presence of wind turbines, there is an abundance of other suitable habitat outside the Action Area, including freshwater wetlands and the shoreline of the Missouri River/Sharp Lake.

Effects Determination

Because rufa red knot are unlikely to occur in the Analysis Area and Project related habitat effects would be minimal, the Project is unlikely to affect this species. However, because there is potential for occurrence in the Project vicinity, WAPA has determined the Project may affect, but is not likely to adversely affect rufa red knot.

2.8.3 Environmental Effects: No Action Alternative

No Project-related impacts to threatened or endangered species would occur, but ongoing impacts are expected to continue. For the whooping cranes, current threats include collisions with power lines and fences, human pressures on wintering habitat, predators, disease, habitat destruction, and severe weather (USFWS 2021e). For the northern long-eared bat, the fungal disease white-nosed syndrome is the predominant threat (USFWS 2021d). For pallid sturgeon, current threats include large river habitat alterations, water quality, entrainment, and climate change (USFWS 2014). For piping plover, habitat loss due to dam construction, water diversion, and water withdrawals have reduced available nesting habitat; human-caused changes have increased the number and type of predators, decreasing nest success and chick survival; and human disturbance, beach development, and sea level rise have decreased winter habitat (USFWS 2021f). For rufa red knot, current threats include loss of habitat, disruption of natural predator cycles on breeding grounds, reduced prey availability, and increased frequency and severity of mismatches in the timing of the annual migratory cycle relative to favorable food and weather conditions (USFWS 2021g).

2.9 Socioeconomics

2.9.1 Affected Environment

Section 4.10.1 of the PEIS provides socioeconomic information on employment, unemployment, personal income, sales tax revenues, individual income tax revenues, population, vacant rental houses, State and local government expenditures, State and local government employment, and recreation. Because the information from the PEIS is somewhat dated, more recent measures of economic development applicable to the Project Area are provided in Table 3.6-1. Data are reported for Hughes and Hyde counties and South Dakota for the most recent year available. South Dakota does not currently have a state income tax; therefore, this measure is not reported. The Socioeconomics Analysis Area is defined as Hughes and Hyde counties, South Dakota with a focus on the Project Area for land use.

Table 3.6-1. Key Measures of Economic Development within Hughes County, Hyde County, and South Dakota.

Economic Development Measures (Year)	*Hughes County*	*Hyde County*	*South Dakota*
Population (2019) [a]	17,526	1,301	884,659
Annual Median Household Income (2019) [a]	$64,783	$57,788	$58,275
Percent of Population considered Minority (2019) *[a]	17.8	14.1	19.6
Percent of Population Below Poverty (2019) [a]	8.9	11.5	11.9
Rental vacancy rate (2019) [b]	N/A	N/A	6.93%
Unemployment rate (2021) [c]	2.8%	2.0%	2.9%
State and local government expenditures (2020) [d]	N/A	N/A	$1,716,775,467
State and local government employment (2021) [e]	N/A	N/A	61,100
State and Local Sales Tax Revenue: Tourism (2020) [f]	N/A	N/A	$12,557,881
Total State Tax Revenue (Fiscal Year 2020 Sales, Use, and Excise Taxes) [f]	N/A	N/A	$1,623,878,853
Recreation (2016) [g]	N/A	N/A	$1,332,592,042

N/A – not available

* Minority is calculated by adding the populations for all non-white races and the population for white-Hispanic.

[a] U.S. Census Bureau 2021a, 2021b, 2021c

[b] Department of Numbers 2021

[c] U.S. Department of Labor 2021

[d] State of South Dakota 2019

[e] South Dakota Department of Labor and Regulation 2021

[f] South Dakota Department of Revenue 2020

[g] Southwick Associates 2017

South Dakota's capital, Pierre, is in Hughes County, which is reflected in the larger population and higher annual median household income than Hyde County (Table 3.6-1). In 2018 in Hughes County, 9,320 people were employed. The largest industries were public administration (2,177 people), health care and social assistance (1,071 people), and retail trade (871 people; Data USA 2021a). By contrast, in 2018 in Hyde County, 668 people were employed. The largest industries were agriculture, forestry, fishing, and hunting (189 people), education service (117 people), and health care and social assistance (66 people; Data USA 2021b).

Most of the land in the Project Area is privately owned. No cemeteries or places of worship are located within the Analysis Area. No community facilities are located within the Project Area. Most community facilities and services near the Project Area are in the towns of Harrold and Holabird, which are approximately five miles northwest, and five miles northeast of the Project Area, respectively. Harrold and Holabird do not have police, hospital, or school facilities; those services are available in the nearby towns of Highmore, Blunt, and Pierre. These towns have hospitals, police, fire and ambulance services, schools, places of worship, and parks and recreational facilities. One hunting outfitter company is located within the Project Area and is bordered on two sides by parcels with proposed infrastructure.

One 613.41-acre parcel of state-owned land is found within the Project Area (Township 110 North, Range 73 West, Section 16). North Bend has acquired a 50-year easement for this parcel from the State of South Dakota School and Public Lands for the proposed development, construction, and operation of the Project, as approved by the Commissioner of School and Public Lands in June 2019, and amended in April and June of 2022. North Bend would construct and operate four turbines and the substation on this parcel following the stipulations in the easement. Monies from the lease would go into the permanent school trust fund, benefiting state schools (South Dakota School and Public Lands 2022). WAPA would seek a permanent easement from the State of South Dakota School and Public Lands to construct the POI facility on this parcel as well (see Section 2.2.6).

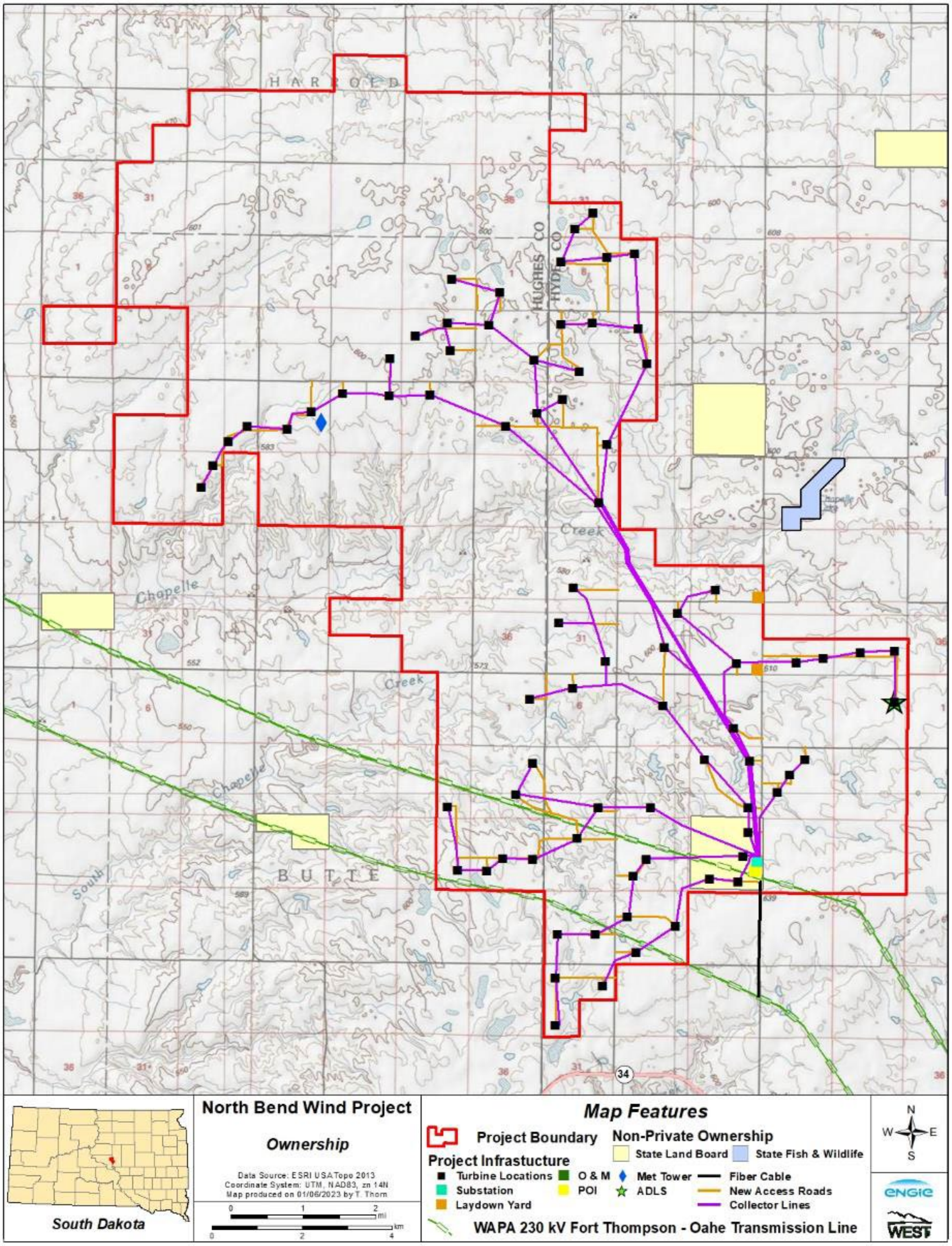

Figure 3.6-1. Land ownership within the North Bend Wind Project Area.

2.9.2 Environmental Effects: Proposed Action Alternative

Section 5.10 of the PEIS describes direct and indirect economic impacts from the construction and operation of wind energy facilities in the UGP. Direct impacts occur because of expenditures of wages and salaries, procurement of goods and services, and sales and income tax. Indirect impacts occur as Project wages, salaries, and procurement expenditures subsequently circulate through the economy, creating additional employment, income, and tax revenue. Other impacts discussed include recreation and property values.

The number of short-term construction jobs created is expected to be approximately 400 jobs over an estimated 8-month peak construction period, of which 130 jobs would be onsite at any given time. Construction of the Project would require skilled labor, such as foremen, carpenters, iron workers, electricians, millwrights, and heavy equipment operators, as well as unskilled laborers. This diverse workforce would be needed to install the Project components, such as the wind turbines, access roads, underground collection line, and substation. The estimated number of construction jobs by classification and annual employment expenditures during construction are included in Table 3.6-2.

Table 3.6-2. Anticipated Construction Jobs and Employment Expenditures.

Job Classification	*Number of Jobs*	*Estimated Annual Salary Range*
Crane operators	15	\$90,000 – \$150,000
Civil workers	70	\$75,000 – \$100,000
Construction workers	80	\$40,000 – \$70,000
Collection workers	20	\$70,000 – \$85,000
Tower erectors	100	\$65,000 – \$85,000
Substation workers	30	\$70,000 – \$95,000
Foundation workers	58	\$60,000 – \$85,000
Testing and inspections	12	\$60,000 – \$85,000
Design engineers	15	\$60,000 – \$85,000
Total	**400**	**\$590,000 – \$840,000**

It is likely that general skilled labor is available in Hughes and Hyde counties or South Dakota to serve the basic infrastructure and site development needs of the Project. Specialized labor would be required for certain components of Project construction, which may be imported from other areas. During construction, non-local workers could need temporary housing, and the vacancy rate of rental properties in the commuting radius of the Project, including Pierre, could be reduced. However, anecdotal evidence indicates that some construction workers would likely provide their own housing in recreational vehicle trailers. If needed, temporary housing for workers would likely include available facilities at several towns throughout the area, with larger towns, such as Pierre, likely having more available facilities. The

Project is not expected to have a negative effect on the economics of rental properties and could have a positive effect.

The annual salary of construction workers is expected to be above the Hughes and Hyde counties' median household incomes (Table 3.6-1). However, since the number of construction jobs is less than 10% of both Hughes and Hyde counties' populations and since the construction jobs are temporary, the Project is not expected to result in a material impact on median household income in Hughes and Hyde counties.

While the Project is expected to produce a net positive socioeconomic effect, there could be negative effects, such as increased maintenance on roads due to construction traffic. North Bend has road haul agreements in place with Hughes and Hyde counties to obtain the appropriate access and use permits, and to minimize and mitigate the impacts to area transportation prior to construction. The Hughes County agreement was signed in June of 2022. The Hyde County agreement was approved in December 2022.

Operation of the Project has the potential to create direct long-term impacts to Project landowners, employees, and Hughes and Hyde counties' tax bases (Table 3.6-3). The Project is projected to generate approximately $945,000 annually in production taxes: $284,000 annually for the State of South Dakota, $335,000 for Hughes and Hyde counties, and $335,000 annually for school districts, thus increasing the potential tax revenues (SD DOR 2022; Appendix K) in addition to the current landowners' property taxes. These increased revenues could be used to improve local government or community services, benefitting all residents. Local spending during operation would result in additional personal income, as well as increased state and local tax revenue. Private landowners who participate in the Project, as well as the South Dakota School and Public Lands Trust for state land, would receive the most direct economic benefit from easement payments for wind turbines and roads located on their properties. These payments would provide a predictable supplementary source of income for the life of the Project, which is expected to be 30 years.

The Project would generate up to eight long-term jobs, which could have a positive effect on local income levels. These long-term positions could bring additional people into Hughes and Hyde counties and positively contribute to the local economy.

Table 3.6-3. Direct Economic Benefit from the North Bend Wind Project.

Payment	*Direct Beneficiary*	*Approximate Annual Total*
Wind lease payments	Project landowners	$1,000,000
Operations and maintenance	~6-8 employees	$615,000
Taxes	School districts, Hughes and Hyde counties, and South Dakota	$954,000

The estimated number of jobs by classification and annual employment expenditures during operation are shown in Table 3.6-4. While the salary of some of the workers is likely to be greater than the median household income in Hughes and Hyde counties, the small number of workers would not have a material effect on overall county median household income. Similarly, this small number of workers would not affect rental vacancy levels.

Table 3.6-4. Anticipated Operation Jobs and Employment Expenditures.

Job Classification	*Number of Personnel* [a]	*Estimated Annual Salary* [a]
Facility Manager	1	$90,000 – 135,000
Site Engineer	1	$75,000 – $90,000
Wind Turbine Technicians	4 – 6	$50,000 – $65,000
Total	**6 – 8**	**$365,000 – $615,000**

[a] For the first 10 years of commercial operation, in 1-year intervals.

Section 5.10.1.2 of the PEIS notes that estimating the impact of wind facilities on recreation is problematic, as it is not clear how wind development impacts recreational visitation and nonmarket values. Most of the Project occurs on private property, where recreational use (including hunting) would primarily be by landowners, their families, and invited guests. North Bend's easement on state-owned land prohibits hunting on the parcel. Livestock grazing would still be allowed in portions of the Analysis Area. If granted, WAPA's permanent easement on state-owned lands would eliminate public access to the 22-acre parcel containing the POI facility.

One of the businesses operating within the Project footprint is a private shooting preserve, which offers waterfowl and upland bird hunting opportunities to paying customers (Tumbleweed Lodge 2022). Waterfowl shooting packages take customers 20 miles off-site, to the Missouri River bluffs (Tumbleweed Lodge 2022). The nearest Project turbine location to the property boundary of the private hunting lodge is 0.6 mile to the southeast and Project turbines would be visible to staff and guests of the hunting lodge when looking south and east. The hunting lodge could experience lost revenue if hunters choose not to hunt at the lodge or the area in general due to the visual presence of the wind turbines.

While individuals of the species hunted at the lodge (e.g., ring-necked pheasant, sharp-tailed grouse, greater prairie chicken, and Hungarian partridge) are likely to be impacted (see Section 3.4 Prairie Grouse), these impacts are not expected to cause a measurable reduction on the number of game bird targets available to customers. Information regarding the number of game birds released and game birds harvested on this specific private shooting preserve was not readily available, but per SDGFP requirements, all private shooting preserves are required to release a minimum of 600 rooster pheasants each season (SDGFP 2022b). Additionally, according to the SDGFP most recent year data (2020-2021), roughly 91% of all pheasants harvested on private shooting preserves state-wide were released birds (252,597 out of 276,571 total harvested). Devereux et. al (2008) observed avoidance of wind turbines by pheasants at distances out to 2,460 feet (roughly 0.47 miles), and the closest proposed wind turbine to the property boundary of the hunting lodge in question is outside that distance (approximately 3,166 feet, or 0.60 miles). At a wind turbine site in Iowa, Dupuie (2018) concluded a 100% increase in turbine density would result in a 17% decrease in average pheasant counts. The last year SDGFP conducted a roadside pheasant survey was 2019, in which 2.9 pheasants per mile were reported for the portion of the state including the Project Area (SDGFP 2019). A 17% reduction in pheasants per mile would reduce the number of birds expected by less than one pheasant per mile. For partridge, private shooting preserves state-wide released 4,729 partridge and harvested only 1,353; meaning preserves are releasing 70% more partridge targets than they are harvesting (SDGFP 2022b). Thus, the presence of the Project is not expected to reduce game bird availability at the hunting preserve.

The PEIS (section 5.10.1.3) discusses several studies that assessed the potential impacts of wind projects on property values due to deterioration in aesthetic quality, increases in noise, real or perceived health effects, and traffic congestion. For example, a survey of county tax assessors was conducted in 13 locations with recent, multiple-turbine wind developments. While not all the locations chosen had wind turbines that were visible from residential areas, and some had been constructed too recently for the full impact to be properly assessed, the study found no evidence that wind turbines decreased property values. In one area examined, it was found that designation of land parcels for wind development increased property values (ECONorthwest 2002). Another study attempted to account for all influences on change in property value and used evidence of 25,000 property sales, both within view of recent wind developments and in a comparable region with no wind projects, before and after project construction. The results of this study indicated that there were no negative impacts on property values (Sterzinger et al 2003). For most of the wind projects considered, property values tended to increase faster within areas with a view of wind turbines than in areas with no wind projects.

Lawrence Berkeley National Laboratory conducted research regarding utility-scale wind energy development's property value effects (Hoen *et al.* 2009, 2013). The Lawrence Berkeley National Laboratory authors collected data on almost 7,500 sales of single-family homes situated within 10 miles of 24 existing wind facilities in nine states. The analysis finds that if property value impacts exist, they are too small and/or too infrequent to result in any widespread, statistically observable impact, but that the possibility that individual homes or small numbers of homes have been or could be negatively impacted cannot be dismissed.

Another study also found "no unique impact on the rate of home sales near wind turbines." The study did find a negative impact to property values near other infrastructure such as major roads and electrical transmission lines (Hoen and Atkinson-Palombo 2016).

Conservation Measures

The PEIS has no conservation measures for socioeconomic effects. Specific to the Project, construction activities would be coordinated with landowners to minimize interference with farming or livestock operations. Issues that would need to be addressed include installation of gates and cattle guards where access roads cross existing fence lines, access control, signing of open range areas, traffic management (e.g., vehicle speed management), and location of livestock water sources.

2.9.3 Environmental Effects: No Action Alternative

No Project-related impacts to socioeconomics would occur under the No Action Alternative. Existing socioeconomic activities in Hughes and Hyde counties, primarily related to agriculture, would likely continue.

2.10 Environmental Justice

2.10.1 Affected Environment

Environmental justice is discussed in section 4.11 of the PEIS.

Executive Order 12898 (1994) requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations. Due to potential visual impacts (see Section 3.10), minority and low-income populations within 30 miles of the Project could be affected (Beaver Creek Archaeology [BCA] 2022). The Analysis Area for Environmental Justice is the project infrastructure plus a 30-mile radius. A 30-mile radius around the Project incorporates portions of seven counties: Hughes, Hyde, Hand, Buffalo, Lyman, Stanley, and Sully counties. Minority and income status for these counties is shown in Table 3.7-1. Two reservations are within the 30-mile radius: the Lower Brule Reservation (located in parts of Lyman and Stanley counties), approximately five miles south of the Project Area, and the Crow Creek Reservation (located in parts of Buffalo, Hughes, and Hyde counties), approximately one mile south of the Project Area. Council on Environmental Quality (1997) guidance states that minority populations should be identified where the minority population of the affected area exceeds 50%. One county in the affected area, Buffalo County, has a minority population that exceeds 50% (84.4%); in the other six counties, the minority population ranges from 2.1% - 44.7%.

Table 3.7-1. 2021 Population Data (2021 Estimates) – Environmental Justice Affected Area.

Population Characteristics	*Hughes County Census Tract 9780*	*Hyde County Census Tract 9767*	*Hand County Census Tract 9756*	*Buffalo County Census Tract 9402*	*Lyman County Census Tract 9726*	*Stanley County Census Tract 9601*	*Sully County Census Tract 9791*
Total Population[a]	17,694	1,236	3,095	1,923	3,764	3,032	1,476
Percent of Population considered Minority[a,b]	16.4	12.5	2.1	84.4	44.7	11.7	5.4
Annual Median Household Income[a]	$69,575	$59,844	$58,333	$35,000	$54,484	$71,602	$60,508
Percent of Population in Poverty[a]	9.4	11.5	9.1	32.8	23.9	7.5	7.8

[a] U.S. Census Bureau 2021a, 2021b, 2021c
[b] Minority is calculated by adding the populations for all non-white races and the population for white-Hispanic.

2.10.2 Environmental Effects: Proposed Action Alternative

Project effects on area residences and communities are described in Section 3.6 (Socioeconomics), Section 3.8 (Transportation and Aviation), Section 3.9 (Noise), and Section 3.10 (Visual Resources and Shadow Flicker). None of the effects described in these sections would be predominantly borne by a minority or low-income population, including the residences on the two reservations south of the Project. The Project effect most likely experienced by these residences would be visual effects. However, all viewers of the Project at the same distance from the Project as the two reservations would experience similar visual effects as residences of the reservations; the effects would not be disproportionate. Visual effects would depend on size and color of the wind turbines, volume of traffic near the project, observer’s visual acuity, and curvature of the earth, atmospheric refraction, air quality, time of day, and time of year (Section 3.10.1; BCA 2022).

2.10.3 Environmental Effects: No Action Alternative

No Project-related environmental justice effects would occur under the No Action Alternative.

2.11 Transportation and Aviation

2.11.1 Affected Environment

The Analysis Area for ground transportation includes roads that may be used for construction vehicles, and operational vehicles during the life of the Project. The Analysis Area for aviation includes airports serving aircraft that could travel over the Project. Table 3.8-1 lists the county roads that intersect the Project Area (Figure 3.8-1). The primary access to the Project in Hughes County is from 321 Avenue (Hughes County Highway 200) that extends south from Harrold, South Dakota. The primary access to the Project in Hyde County is from 328 Avenue (Hyde County Highway 649) that extends south from Holabird, South Dakota. Average daily traffic counts were not available for either of the Project's primary access points. There are no paved roads within the Project Area (Table 3.8-1). In 2013, average daily traffic volume along County Highway 583 through the Project Area was 14 trips (SDDOT 2021).

There are no municipal or commercial airports within the Project Area. The three closest airports include Harrold Municipal Airport, approximately three miles north of the Project Area, Bollweg Farm Airport, five miles north of the Project Area, and Highmore Municipal Airport, 11 miles northeast of the Project Area (Figure 3.8-2). The closest commercial airport is located 25 miles west of the Project Area. Military airspace and training routes do not overlie the Project Area (Department of Defense 2012). Air traffic is present in the Project Area for spray application (crop dusting) of agricultural fields and aerial inspection of WAPA's transmission line infrastructure.

Table 3.8-1. Roads within the North Bend Wind Project Area.

Road	*Surface Type*	*Surface Width (feet)*	*Number of Lanes*	*Length (miles)*
200 Street	gravel or crushed rock	18	2	0.33
201 Street	gravel or crushed rock	16	2	4.13
202 Street	primitive (trail); gravel or crushed rock	10 – 16	1 – 2	1.98
203 Street	gravel or crushed rock	20	2	2.71
204 Street	gravel or crushed rock; primitive (trail)	10 – 20	1 – 2	4.57
205 Street	primitive (trail); unimproved	10 – 12	1	0.44
207 Street	gravel or crushed rock	20	2	2.00
208 Street	primitive (trail); gravel or crushed rock	10 – 20	1 – 2	6.49
209 Street	gravel or crushed rock	10 – 24	1 – 2	3.49
212 Street	gravel or crushed rock	18	2	2.00
320 Avenue	primitive (trail); gravel or crushed rock	10 – 12	1	2.02
321 Avenue	gravel or crushed rock	30	2	5.72
322 Avenue	primitive (trail); gravel or crushed rock; unimproved	10 – 18	1 – 2	5.91
323 Avenue	gravel or crushed rock	20	2	1.50
324 Avenue	gravel or crushed rock	12 – 18	1 – 2	7.51
326 Avenue	primitive (trail); gravel or crushed rock	10 – 20	1 – 2	8.03
328 Avenue	gravel or crushed rock	24 – 26	2	3.75
330 Avenue	primitive (trail)	10	1	0.72
Gustafson Road	primitive (trail)	10	1	0.41

Source: State of South Dakota 2020

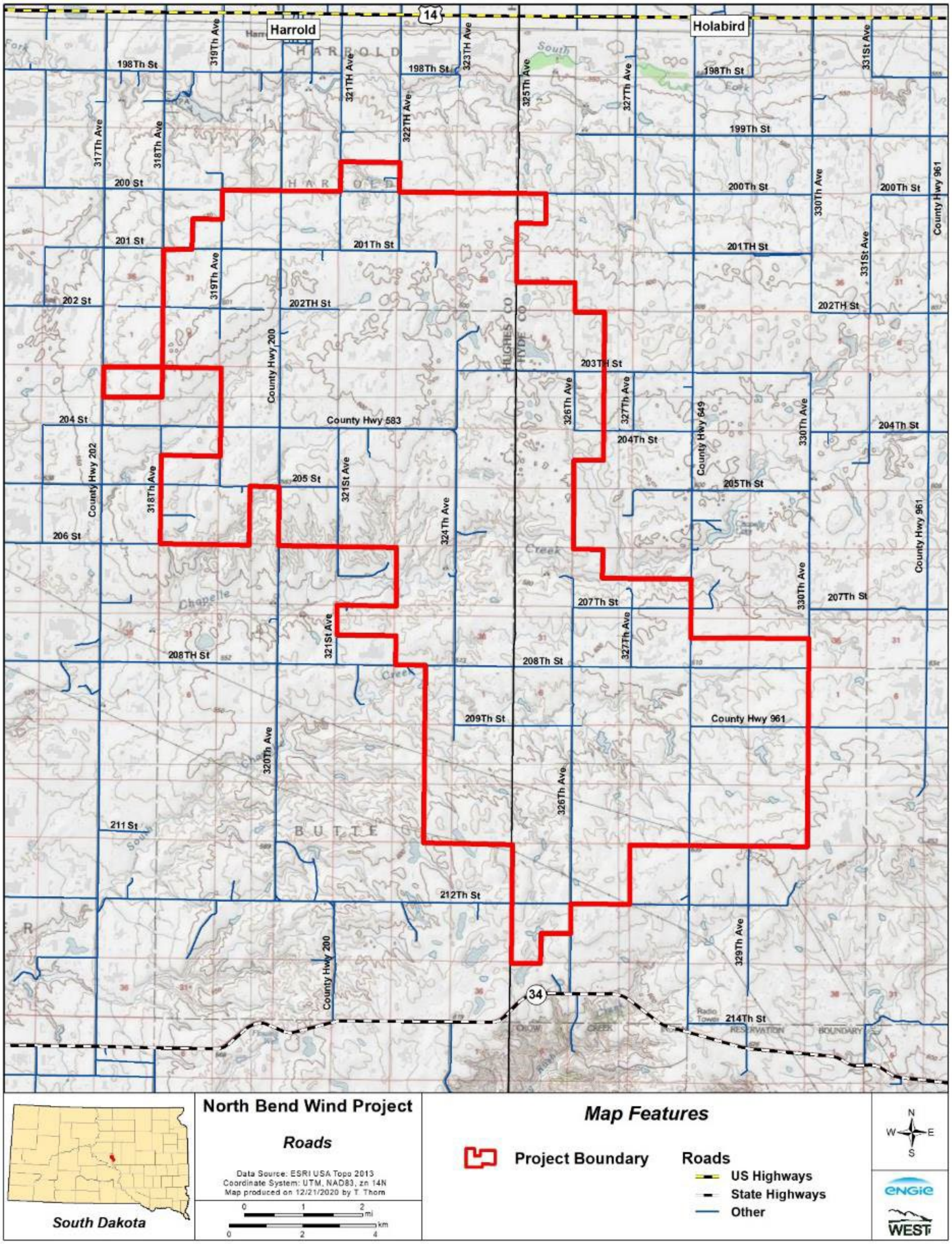

Figure 3.8-1. County Roads within the North Bend Wind Project Area.

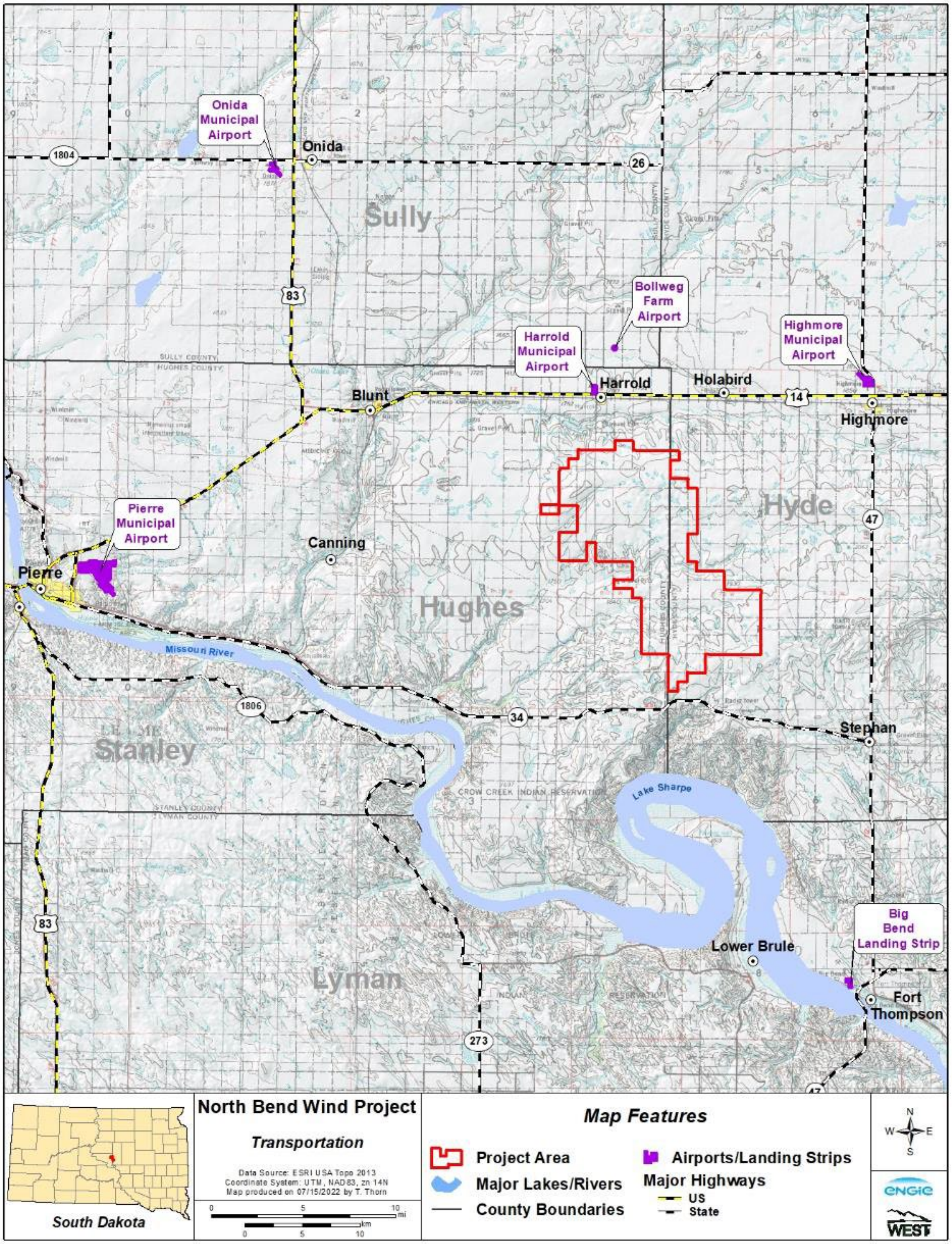

Figure 3.8-2. Airports and Landing Strips in the Area Surrounding the North Bend Wind Project.

2.11.2 Environmental Effects: Proposed Action Alternative

Section 5.1.1.2 of the PEIS describes direct and indirect transportation impacts from the construction and operation of wind energy facilities in the UGP. Direct impacts occur because of increased transportation activities during construction and operation. The primary impact to transportation would be increased traffic on Highway 200 and Highway 649, which are the routes workers would likely use to travel to and from the construction area and that would be used to transport necessary construction materials and equipment. Impacts would be temporary, lasting the duration of construction. Micro-siting of temporary and permanent access road approaches, along with crossings for underground collector system, temporary crane walks, and overhead transmission line would occur with landowners, coordination with WAPA, and through SDDOT's standard process when utility, encroachment, and approach permits are requested for work.

Prior to construction, the contractor would review the existing roads and determine the improvements that would be necessary to accommodate the truck traffic transporting the turbine sections to the construction site. The contractor would be required to coordinate with WAPA, Hughes County and Hyde County road departments, as well as SDDOT. Any improvements or repairs would be assumed solely by North Bend and would ensure roads were maintained in conditions equal to or exceeding pre-Project conditions. Oversized vehicles would be needed to transport the large turbine components to the Project site. These routes would be evaluated for adequacy by SDDOT and would require Motor Carrier Services permits. North Bend would apply for, and obtain, these permits at least 90 days before the start of construction.

Commercial air traffic would not be negatively impacted by the development and operation of the Project. Due to the height of the turbines, a notification was submitted to the FAA, as required prior to construction. Based on distance to the nearest airports (Harrold Municipal and Highmore Municipal airports) and Project implementation of FAA compliance measures, the FAA determined the Project would present no hazard to aircraft. Along with tower lighting installed and operated in accordance with FAA requirements, the Project would install an aircraft detection lighting system (ADLS), a stand-alone radar system that detects the presence of aircraft within 30 miles of a wind facility (see Figure 2.2-1 for the ADLS location) The ADLS enables a wind facility to turn turbine lighting off until it detects an aircraft, at which point the ADLS will trigger the lighting on the turbines in the path of the aircraft to turn on.

Helicopters flying within the Project vicinity for personal or business use would also have additional tower obstacles. WAPA inspects transmission line infrastructure by helicopter and the addition of nearby turbines will add to the hazards during all helicopter operations. The nearest turbine locations to the existing Fort Thompson-Oahe transmission lines would be about 700 feet. The unique operating characteristics of helicopters allow the aircraft more flexibility in movement, requiring less room for take-offs and landings than fixed-wing aircraft (FAA no date). During maintenance activities conducted by helicopter, the margins of safety will be reduced due to the proximity of the turbines.

The Project turbines could interfere with aerial applicators. Manjooran (2013) studied interactions between aerial applications to agricultural crops and the wind industry. The author noted safety and economic concerns that wind farms pose to aerial applicators. Safety concerns included collision with wind turbines, met towers, guy wires, and electrical lines, as well as turbulence and shadow flicker (shadow flicker is described in Section 3.10). At the Project, wind turbines and the met tower would be lit in compliance with FAA regulations to make these structures more visible to aerial applicators and minimize the risk of collisions. In addition, the met tower would not have guy wires, collector lines would be buried, and the overhead gen-tie line would be less than 500 feet in length; all these features minimize hazards to aerial applicators. Turbulence and shadow flicker effects are unlikely because wind turbines generally do not operate at wind speeds below 6.7 mph; spray application is likely to occur only at wind speeds less than 10 mph (Hartzler 2017). Turbine blades are unlikely to be spinning when most aerial spray applications are made, although between wind speeds of 6.7–10 mph both activities could be occurring at the same time. In this event, spray applicators should always communicate with North Bend through the landowners' contact information provided for the O&M site manager by North Bend land agents to ensure turbines are shut down. Economic concerns to aerial applicators include higher operating costs due to increased time to maneuver around turbines and the potential need to carry lighter spray loads to compensate for the extras fuel they may need. Aerial applicators may also refuse to spray fields within or near wind turbines entirely, resulting in lost customers and lost revenue. Increased business costs would likely be passed along to customers in the form of higher rates, or aerial applicators could absorb the costs and reduce revenue. Additionally, farmers may experience economic effects if aerial applicators choose to avoid spraying fields with or near wind turbines, resulting in greater crop losses due to uncontrolled pests or increased costs for hand spraying or other alternatives. While these economic impacts are speculative and cannot be quantified, the impacts are generally negative impacts.

The National Agricultural Aviation Association (NAAA) used global positioning system data to calculate the distance aerial application aircraft require to safely make turns when spraying fields in an area without obstructions using two different methods (NAAA 2021). Using one method, the aircraft required almost 1.73 miles to make the turn and be in proper alignment to fly the next pass over the field when the aircraft was fully loaded. For the second method, the NAAA used air speed and pilot experience to calculate the distance required for aircraft turns when fully loaded. Using a formula of aircraft speed x turn time = turn distance, the distance was calculated as average speed of 145 mph x 45 seconds = 1.82 miles (NAAA 2021). For both methods, as the load lightened, the turning distance was reduced to less than 0.5 miles. The number of vertical obstructions in an area could affect the navigation of turns for aerial applicators, but other factors also play a role, such as weight of the load.

One citizen expressed concern about aerial applicators during scoping. Ten turbine locations would be within 1.8 miles (the maximum turning distance of a fully loaded aircraft) of their property boundary; with the turbines being located to the east and south of the property boundary. The nearest turbine location to their property boundary would be approximately 0.6 miles. A fully loaded aircraft approaching from the north or west traveling south or east would have to navigate around turbines when making a longer turn while spraying application on specific fields. With a lighter load, it is possible no turbines would affect the turning radius. Alternative, aerial spray applicators could decline to spray this property, which could result in the negative economic effects listed earlier in this section.

Conservation Measures

North Bend is committed to implementing the conservation measures for transportation derived from Section 5.1.2 of the PEIS, which would help avoid or minimize transportation impacts associated with the Proposed Action. This may include, but are not limited to, the following:

- Existing roads would be used to the extent possible, but only in safe and environmentally sound locations. New access roads have been designed and will be constructed to the appropriate standard necessary to accommodate the road’s intended function (e.g., traffic volume and weight of vehicles) and minimize erosion. Access roads no longer needed would be recontoured and revegetated.
- A transportation plan will be prepared as part of SDDOT’s Motor Carrier Services permit at least 90 days prior to the start of construction that identifies measures North Bend would implement to comply with state or federal requirements. This would address the transport of turbine components, main assembly crane, and other large pieces of equipment. The plan would consider specific object size, weight, origin, destination, and unique handling requirements and would evaluate alternative means of transportation (e.g., rail or barge).

- North Bend has coordinated with local authorities at Hughes and Hyde counties to establish road use agreements that would be in place prior to construction and ensure that no hazards would result from increased truck traffic and that traffic flow would not be adversely impacted. The Hughes County agreement was signed June 2022. The Hyde County was approved in December 2022. These agreements would identify measures to comply with any State or Federal Department of Transportation (DOT) requirements, such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configurations. Signs would be placed along roads to identify speed limits, travel restrictions, and other standard traffic control information. To minimize impacts on local communities, consideration would be given to limiting construction vehicles on public roadways during the morning and late afternoon commute times, if needed.
- Project personnel and contractors would be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions to ensure safe and efficient traffic flow.
- During construction, operations and maintenance, and decommissioning phases, traffic would be restricted to designated Project roads. Use of other unimproved roads shall be restricted to emergency situations.

2.11.3 Environmental Effects: No Action Alternative

No Project-related impacts to transportation or aviation would occur under the No Action Alternative. Existing transportation and aviation activities, including spray applications for agriculture, would likely continue.

2.12 Noise

2.12.1 Affected Environment

Section 4.5.1 of the PEIS describes the fundamentals of acoustics in relation to wind development. Section 4.5.2 of the PEIS describes the ground vibration associated with construction activities.

Because the Project Area is comprised of rangeland, cropland, and some residences scattered throughout, background noise levels are estimated to be in the range of 33 to 47 A-weighted decibels (dBA), which is typical of rural and undeveloped areas (section 4.5.1.5 of the PEIS). Existing ambient sound levels are expected to be relatively low, although sound levels would be higher near roadways such as U.S. Highway 14, South Dakota Highway 47, and South Dakota Highway 34. Other human activity, such as agricultural operations and hunting, would seasonally contribute to sound levels in the area associated with crop harvests, livestock handling, and gunshots. Wind is prevalent in the area and a primary source of noise outside of human activities. Typically, background sound levels are quieter during the night than during the daytime (Tetra Tech 2021a).

A human's perception of sound can be measured in dBA, which are representative of the human ear's response to sound. Unwanted or offensive sound is often called noise. The sound pressure levels (in dBA) of some common sound sources are provided in Table 3.9-1.

Table 3.9-1. Typical Sound Pressure Levels Associated with Common Noise Sources.

Sound Pressure Level (dBA)	*Subjective Evaluation*	*Environment - Outdoor*	*Environment - Indoor*
140	Deafening	Jet aircraft at distance of 75 feet	
130	Threshold of pain	Jet aircraft during takeoff at 300 feet	
120	Threshold of feeling	Elevated train	Hard rock band
110		Jet flyover at distance of 1,000 feet	Inside propeller plane
100	Very loud	Power mower, motorcycle at distance of 25 feet, auto horn at distance of 10 feet, crowd noise at football game	
90		Propeller plane flyover at distance of 1,000 ft., noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately loud	Diesel truck (40 miles per hour) at distance of 50 feet	Inside an automobile at high speed, garbage disposal
70	Loud	B-757 aircraft cabin during flight	Close conversation, vacuum cleaner
60	Moderate	Air-conditioner condenser at distance of 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 television and stereo)
20		Rustling leaves	Quiet theater, whisper
10	Just audible		Human breathing
0	Threshold of hearing		

dBA = A-weighted decibels
Sources: Adapted from Egan 1988; Ramsey *et al.* Sleeper 1994

In addition to generally audible noise in the environment (typically, frequencies of 20 to 20,000 Hertz), infrasound (sound with frequencies in the range of one to less than 20 Hertz) is commonplace in the U.S. Infrasound is created from natural sources, such as wind and any other natural motions that result in the slow oscillations of air, as well as man-made sources, such as wind turbines, cars, industrial machinery, slow-moving fans, and other household appliances (Leventhall 2003, 2006). Infrasound is generally not audible. However, infrasound can be audible at very high levels (110+ dBA), and these sounds may occur from man-made sources or from natural sources, such as avalanches, ocean waves, meteors, or volcanic eruptions (Bedard 1999).

2.12.2 Environmental Effects: Proposed Action Alternative

Section 5.5 of the PEIS describes common noise impacts associated with the construction, operation and maintenance, and decommissioning of a commercial wind energy project. These impacts would apply to the proposed Project.

An acoustic assessment of the proposed Project was conducted for the specific wind turbine model proposed for the Project, the General Electric 2.82-127 (Appendix G). Substation noise impacts were based on two projected 140-megavolt ampere transformers. Impacts for construction and operation, based on this assessment, are described below.

Construction of the Project may cause short-term and unavoidable noise impacts. Sound levels would vary depending on the type and age of equipment, specific manufacturer and model, operations being performed, and overall condition of the equipment and exhaust system mufflers. Noise generated by construction would occur intermittently depending on the phase of construction and equipment in use at any given time and location. Each piece of equipment is expected to contribute to noise levels in the range of 73 to 88 dBA at 50-foot distance, and 41 to 56 dBA at a 2,000-foot distance. Construction activity would also generate traffic, such as trucks travelling to and from the site on public roads, which would also have noise effects.

Sound generated by an operating wind turbine is comprised of both aerodynamic and mechanical sound, with the dominant sound component from modern, utility scale wind turbines being aerodynamic. Aerodynamic noise results from air flowing across and around each blade of the turbine, and mechanical sound is sound generated by machinery located inside the hub of the turbine, such as gearboxes, motors, cooling systems, and pumps. Substations have switching, protection, and control equipment, and typically one or more transformers, which generate a sound generally described as a low humming.

Generally, sound generated by each individual wind turbine increases as the wind speed increases. It is important to recognize that as wind speeds increase, the background ambient sound level generally increases as well, resulting in acoustic masking effects[6]; however, this is also affected by local contributing sound sources (Tetra Tech 2021a). The net result is that the sound produced from a wind turbine operating at maximum rotational speed may be largely or fully masked due to wind generated sound in foliage or vegetation (Tetra Tech 2021a). Conversely, these acoustic masking effects may be limited during periods of unusually high wind shear or at locations that are sheltered from the prevailing wind direction.

Sound modeling software was used to determine the potential sound levels at 51 occupied or potentially occupied residences in or near the Project Area (Tetra Tech 2021a; Appendix G). This acoustic assessment evaluated 78 potential wind turbine locations. The Project substation was also included in the acoustic analysis. Acoustic analyses for three different modeling scenarios were performed. Scenarios included wind turbine operation when the blades start to rotate and generate power (referred to as cut-in speed (three m/s), at maximum rotational speed (22 m/s), and at maximum rotational speed under anomalous meteorological conditions (10-12 m/s; i.e., meteorological conditions that occur from time to time and result in the long-range propagation of sound, such as wind gradients that bend sound downwards).

The sound modeling estimated operational levels at residences within the Project range up to 35 dBA at cut-in speeds, 48 dBA at maximum rotation, and 48 dBA at maximum rotation under anomalous meteorological conditions. Modeling demonstrated that sound levels would be greater than the 45 dBA limit under Hughes County and Hyde County regulatory thresholds at two residences participating in the Project due to their proximity to multiple turbines. No non-participating residences would exceed county thresholds. The Project may also result in periodically audible sound within adjacent areas under certain operational and meteorological conditions. Both Hyde County and Hughes County ordinances allow for levels above 45 dBA if a signed waiver or easement is obtained from the owner of the residence (Hyde County Zoning Ordinance Section 9-104-A-18; Hughes County Zoning Ordinance [No. 1997-03] Article 2 Section 2-117.F.11). Both affected residences have easements, so the Project complies with both the Hyde County and Hughes County ordinances.

In addition to audible noise, wind turbines can generate infrasound from the rotation of the turbine blades. The infrasound levels from contemporary wind turbines are lower than those that have been shown to

[6] Acoustic masking is the interference in the perception of one sound by the presence of another sound. For example, at elevated wind speeds, leaf rustle and noise made by the wind itself can mask wind turbine sound, which remains relatively constant.

cause harm (Roberts 2018). Human health effects sometimes attributed to wind farm noise and infrasound include sleep disturbance, vertigo, and stress. However, reliable evidence has not provided a link between infrasound and these adverse health effects. An independent expert panel for Massachusetts (Ellenbogen *et al.* 2012) found insufficient evidence that the noise from wind turbines is directly causing human health effects. Instead, studies have linked the experience of adverse human health effects to individual perceptions and attitudes about wind farms. Thus, while studies have not reliably shown that wind farms cause direct health effects, negative attitudes about wind farms have been correlated with health effects such as sleep disturbance (Ellenbogen *et al.* 2012).

Because infrasound has many sources and can travel efficiently over long distances, its effects on human health have been extensively studied. Expert testimony filed before the South Dakota Public Utilities Commission found that peer-reviewed, published scientific research has not demonstrated a link between infrasound from wind turbines and adverse health effects, including sleep disturbance or vertigo (Roberts 2018). There currently are no regulations limiting infrasound exposure levels.

<u>Conservation Measures</u>
North Bend is committed to implementing the conservation measures for noise derived from section 5.5.2 of the PEIS would help avoid or minimize noise impacts associated with the Proposed Action. This may include, but are not limited to, the following:

- Equipment would be selected with the lowest noise levels available and no prominent discrete tones, when possible.
- All equipment would be maintained in good working order in accordance with manufacturer specifications. Suitable mufflers and/or air-inlet silencers would be installed on all internal combustion engines and certain compressor components.
- All vehicles traveling within and around the Project Area would operate in accordance with posted speed limits.
- A process for documenting, investigating, evaluating, and resolving Project-related noise complaints would be established.
- When possible, noisy construction activities would be limited to daylight hours, when nearby receptors are least likely to be disturbed.
- Noisy activities would be scheduled to occur at the same time whenever feasible, since additional sources of noise generally do not greatly increase noise levels at the site boundary. Less-frequent

but noisy activities would generally be less annoying than lower-level noises occurring more frequently.

- Stationary construction equipment (e.g., compressors or generators) would be located as far as practical from nearby receptors.
- In the unlikely event blasting or pile driving would be needed during the construction period, nearby residents would be notified in advance.

2.12.3 Environmental Effects: No Action Alternative

No Project-related impacts related to noise would occur under the No Action Alternative. Existing noise levels typical of rural and undeveloped areas would likely continue.

2.13 Visual Resources and Shadow Flicker

2.13.1 Affected Environment

Rangeland, cropland, large open vistas, and gently rolling topography generally visually dominate the Project Area landscape, along with the existing Triple H Wind Project and SD Wind Energy Center located east of the Project Area. The visual and shadow flicker Analysis Area is defined as the areas where the project will be visible to the viewer up to 11.9 miles. Turbines within this distance are still clearly visible, providing a dominant to moderate visual impact; beyond this distance impacts are expected to be negligible. Viewers of the Project would include occupants of the local residential structures in and around the Project Area (Figure 3.10-1), tourists, local or regional travelers along South Dakota Highway 14 and other area roads, and neighboring communities. The closest scenic resource to the Analysis Area includes a portion of the Native American National Scenic Byway, located 14 miles to the south of the Project Area.

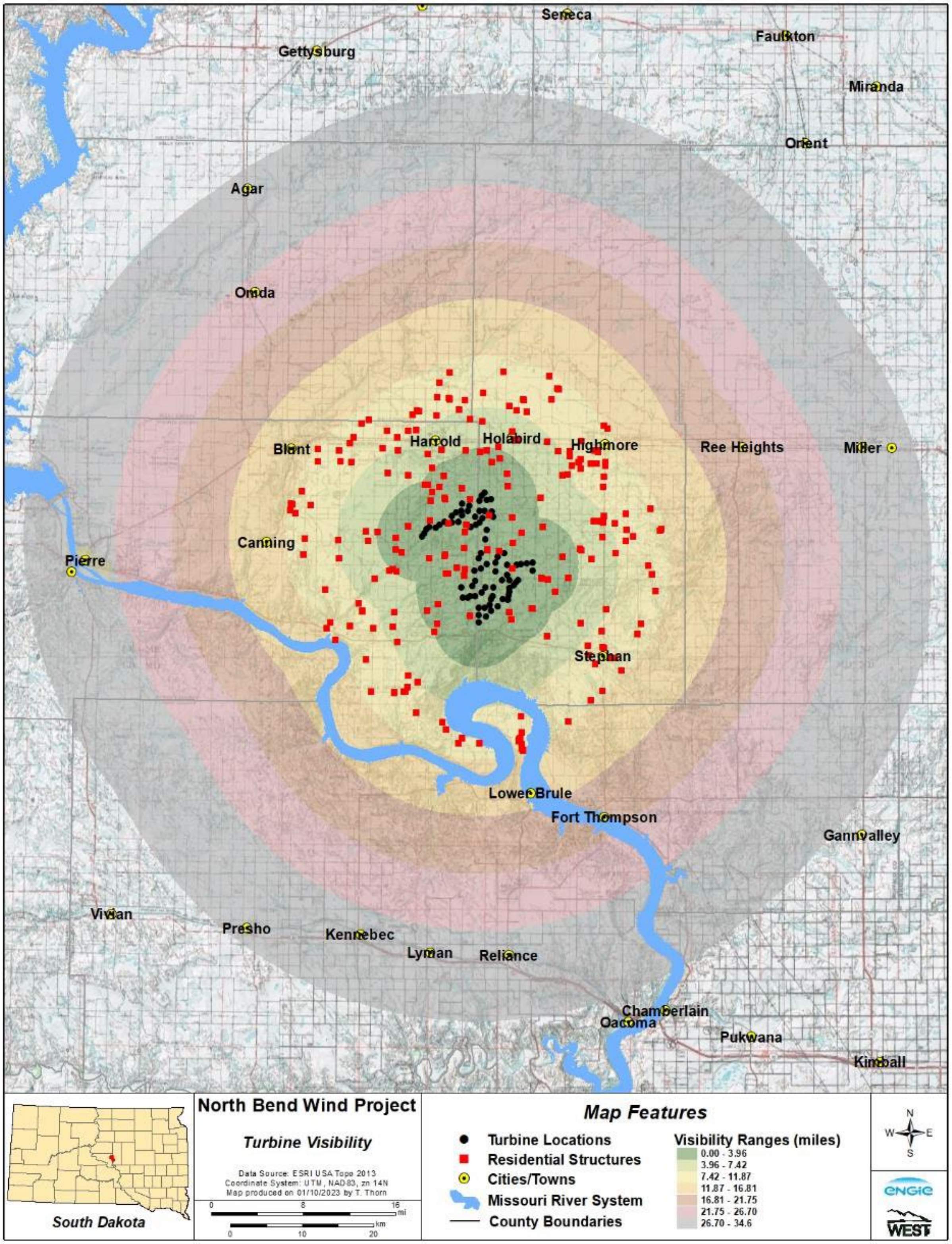

Figure 3.10-1. Residential structures within 11.9 miles of the North Bend Wind Project.

2.13.2 Environmental Effects: Proposed Action Alternative

Common visual impacts of wind energy projects, including those associated with construction and operation, are described in section 5.7.1 of the PEIS and apply to the Proposed Action. Visual impacts to the landscape would depend on the extent to which the existing landscape is already altered from its natural condition, the number of viewers (e.g., residents, travelers, visiting recreational users) within visual range of the area, and the degree of public or agency concern for the quality of the landscape. Turbine visibility is influenced by several factors: distance of the turbines from viewers, direct line of sight, topography, tree vegetation, existing overhead powerlines, existing structures, and weather and lighting conditions, and viewer attitudes.

The existing landscape is already altered from its natural condition, which historically was prairie grassland on gently rolling topography. Currently, approximately half of the Project Area is herbaceous cover, with most of it being potentially undisturbed native prairie. Project development, particularly elevated structures such as turbines, towers, and substations could have a negative impact on visual perceptions of open prairie landscapes. The other half of the Project Area has been converted to cropland, which maintains the broad openness of a prairie, but changes the character of the landscape. For example, during certain times of the year, after crops have been harvested and the soil tilled, cropland appears barren. During other times of the year, when crops are actively growing, the landscape can appear monotypic. Furthermore, the existing landscape includes manmade features, such as scattered houses, roads, and power lines. Depending on observers' physical location and the cardinal direction they were looking towards, the existing Triple H Wind Project located east of the North Bend Project Area may be a prominent existing visual feature on the landscape. The addition of the Project to a landscape already altered by similar visual effects minimizes its negative visual impact. Viewer attitudes are very subjective, and a viewer's reaction to visual changes may be influenced by several non-visual factors, such as positions on renewable energy and wind power, and participating or non-participating status in the Project.

According to the Sinclair-Thomas Matrix (Sullivan 2012), under optimal viewing conditions (flat ground, clear skies, and little vegetation), turbines have a dominant visual impact on the landscape up to approximately four miles, with lesser impacts out to 11.9 miles (BCA 2022) (Table 3.10-1). Beyond 11.9 miles, visual impacts by turbines are deemed negligible. There are three existing wind farms consisting of 129 turbines east of the North Bend Project Area. Of these turbines, 48 are located within 0–

4.0 miles from the Project Area, 65 within 4.0–7.4 miles, six within 7.4–11.9 miles, two within 16.8–21.8 miles, and eight within 21.8-26.7 miles.

Table 3.10-1. Visual Impacts of a 500-Foot Wind Turbine under Optimal Viewing Conditions at Various Distance Ranges in Miles.

Distance Range	Impact	Viewers
0 – 4.0	Dominant impact on the landscape due to large scale, movement, and proximity	Residents and visitors within the Project Area, and individuals traveling through the area
4.0 – 7.4	Major impact due to the proximity; capable of dominating the landscape	Residents and visitors within property adjacent to the Project Area, residents of the towns of Harrold, Holabird, and individuals traveling through the area
7.4 – 11.9	Clearly visible with moderate visual impact; potentially intrusive	Residents and visitors of nearby towns (e.g., Highmore, Stephan), and individuals traveling through the area
11.9 – 16.8	Clearly visible with moderate impact; becoming less distinct	Residents and visitors of nearby towns (e.g., Blunt, Canning, and Lower Brule), and individuals traveling through the area and along portions of the Native American National Scenic Byway
16.8 – 21.8	Less distinct; size is reduced, movement is still discernable	Residents and visitors of nearby towns (e.g., Ree Heights and Fort Thompson), and individuals traveling through the area
21.8 – 26.7	Low impact, movement noticeable in good light	Residents and visitors of nearby towns (e.g., Onida), and individuals traveling through the area
26.7 – 34.6	Becoming indistinct with negligible impact on the wider landscape	Residents and visitors of nearby towns (e.g., Miller, Reliance, Lyman, Kennebec, Presho, Ft. Pierre, Pierre, and Agar), and individuals traveling through the area

Source: Beaver Creek Archaeology 2022.

The synchronized red lights on the wind turbines that flash at night, as required by FAA guidelines, are visible for long distances and cause visual impacts as described in section 5.7.1.1 of the PEIS. These impacts would be minimized by the ADLS (see Section 3.8.2). The ADLS detects the presence of aircraft within 30 miles of the wind facility. If an aircraft is detected within this range, light groups within the flight path will activate. If there are no aircraft within the detection area, the lighting remains off.

The closest scenic resource, the Native American Scenic Byway, is located on the southside of the Missouri River with the nearest portion 14 miles away. This scenic byway is 350 miles long and located to the south, west, and northwest of the Project Area. This byway starts at Chamberlain, South Dakota, and meanders through four Lakota Sioux reservations along the Missouri River, ending near Cannonball, North Dakota (US Department of Transportation 2021). Depending on topography and atmospheric conditions, the Project turbines could be viewed from the scenic byway. The proposed Project would have a negligible visual contrast in the landscape due to the distance to the scenic highway (at least 14 miles), observer's visual acuity, curvature of the earth, atmospheric refraction, air quality, time of day, and time of year (BCA 2022). The minimal visual contrasts along with a low volume of traffic near the project would result in a low visual impact. A study evaluating wind turbine visibility and visual impact threshold distances in Wyoming and Colorado rated wind turbines at distances between 8 and 23 miles as "3" (Sullivan *et al.* 2012). A visibility rating of "3" describes facilities that would be visible after a brief glance, and unlikely to be missed by a casual observer. Impacts may rise to a moderate level, depending on circumstance and landscape context. Based on this study, the Project would be about at the threshold of "casual visibility" from the scenic highway, due to distance from the highway, and would not rise to a threshold of "visual preeminence," which would occur at closer distances. The wind farm would have a dominant visual impact on a local hunting lodge, which is located within 7.5 miles of the Project (Sullivan *et al.* 2012).

During the scoping process, some concern was expressed by citizens concerning visual resource and related impacts, particularly shadow flicker effects. 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. Shadow flicker becomes less noticeable with increasing distance from a wind turbine. Shadow flicker at distances greater than 10 rotor diameters (i.e., about 4,490 feet or 0.85 miles) is generally low intensity and considered imperceptible (Tetra Tech 2021b). At such distances, shadow flicker is typically only caused at sunrise or sunset, when cast shadows are sufficiently long.

Shadow flicker impacts are not regulated by state or federal law. However, Hyde County Zoning Ordinance Section 9-104-A-20 states flicker analysis needs to include potential receptors and roadways within one mile of each turbine, account for topography but not taller obstacles (structures or trees), and shall not exceed 30 hours per year within an established dwelling and 40 hours per year from any occupied structure. Hughes County does not have an ordinance regarding shadow flicker.

A shadow flicker analysis was conducted for the Project (Tetra Tech 2021b; Appendix H). Results of the analysis concluded 38 occupied or potentially occupied residences would not be impacted by shadow flicker. Of the remaining residences found within the Analysis Area, eight would have impacts between 0-10 hours per year, one would have impacts 10-20 hours per year, three would experience 20-30 hours, and one residence would potentially have impacts above 30 hours per year. The residence, located in Hughes County, is a participating residence that has a predicted shadow flicker impact of approximately 80 hours per year. This residence is surrounded by several trees and hedges that are likely to mitigate shadow flicker impact (Tetra Tech 2021b). Since the affected residence is in Hughes County, no ordinance applies. Nevertheless, North Bend has been in communication with this resident regarding shadow flicker and offered to move a turbine to mitigate the impact, but the resident indicated they would prefer to keep the turbine at its proposed location (C. Willis, North Bend, personal communication, August 24, 2021).

Conservation Measures

North Bend is committed to implementing the conservation measures for visual resources derived from Section 5.7.1.3 of the PEIS, which would help to avoid or minimize visual impacts associated with the Proposed Action. These may include, but are not limited to, the following:

- For ancillary buildings and other structures, low-profile structures would be chosen whenever possible to reduce their visibility.
- Color selections for turbines would be made to reduce visual impact and applied uniformly to tower, nacelle, and rotor, unless gradient or other patterned color schemes are used.
- Grouped structures would all be painted the same color to reduce visual complexity and color contrast.
- For ancillary structures, materials and surface treatments would repeat and/or blend with the existing form, line, color, and texture of the landscape. If the Project would be viewed against an earthen or other non-sky background, appropriately colored materials would be selected for structures, or appropriate stains/coatings applied to blend with the Project’s backdrop.
- The operator would use non-reflective paints and coatings on wind turbines, visible ancillary structures, and other equipment to reduce reflection and glare.
- Turbines, visible ancillary structures, and other equipment would be painted before or immediately after installation.
- Lighting for facilities would not exceed the minimum required for safety and security, and full-cutoff designs that minimize upward light scattering (light pollution) would be selected. If possible, site design would be accomplished to make security lights nonessential. Where necessary, security lights would be extinguished except when activated by motion detectors (e.g., only around the substation).
- Commercial messages and symbols (such as logos, trademarks) on wind turbines would be avoided and would not appear on sites or ancillary structures of wind energy projects. Similarly, billboards and advertising messages would also be discouraged.

- Restoration procedures would be followed as described in the Project's Application for a Facility Permit submitted to the South Dakota Public Utilities Commission in June 2021[7] and available to the public. Restoration of the construction areas would begin immediately after construction to reduce the likelihood of visual contrasts associated with erosion and invasive weed infestation and to reduce the visibility of affected areas as quickly as possible.
- Disturbed surfaces would be restored to their original contours as closely as possible and revegetated immediately after, or contemporaneously with, construction. Prompt action would be taken to limit erosion and to accelerate restoring the preconstruction color and texture of the landscape.
- Visual impact mitigation objectives and activities would be discussed with equipment operators before construction activities begin.
- Existing rocks, vegetation, and drainage patterns would be preserved to the maximum extent possible.
- Installation of gravel and pavement would be avoided where possible to reduce color and texture contrasts with the existing landscape.
- For road construction, excess fill would be used to fill uphill-side swales to reduce slope interruption that would appear unnatural and to reduce fill piles.
- The geometry of road ditch design would consider visual objectives; rounded slopes are preferred to V-shaped and U-shaped ditches.
- Road-cut slopes would be rounded, and the cut/fill pitch shall be varied to reduce contrasts in form and line; the slope shall be varied to preserve specimen trees and nonhazardous rock outcroppings.
- Planting pockets would be left on slopes, where feasible.
- Benches would be provided in rock cuts to accent natural strata.
- Topsoil from cut/fill activities would be segregated and spread on freshly disturbed areas to reduce color contrast and aid rapid revegetation. Topsoil piles would not be left in sensitive viewing areas.
- Excess fill material would not be disposed of downslope to avoid creating color contrast with existing vegetation/soils.
- Communication and other local utility cables would be buried.
- Culvert ends would be painted or coated to reduce color contrasts with existing landscape.

[7] See section 9.1.3.2 of the Application for Facility Permit, available at https://puc.sd.gov/commission/dockets/electric/2021/EL21-018/Application.pdf

- Signage would be minimized; reverse sides of signs and mounts would be painted or coated to reduce color contrasts with the existing landscape.
- The burning of trash would be prohibited during construction; trash would be stored in containers and/or hauled off-site.
- Litter would be controlled and removed regularly during construction.
- Inoperative Project turbines would be repaired, replaced, or removed quickly. Nacelle covers and rotor nose cones would always be in place and undamaged.
- Nacelles and towers would be cleaned regularly (yearly, at a minimum) to remove spilled or leaking fluids and the dirt and dust that accumulates, especially in seeping lubricants.
- Facilities and off-site surrounding areas would be kept clean of debris, “fugitive” trash or waste, and graffiti. Scrap heaps and materials dumps would be prohibited and prevented. Materials storage yards, even if thought to be orderly, would be kept to an absolute minimum. Surplus, broken, or disused materials and equipment of any size would not be allowed to accumulate.
- Maintenance activities would include litter cleanup and noxious weed control.
- Road maintenance activities would avoid blading of existing forbs and grasses in ditches and adjacent to roads; however, any invasive or noxious weeds would be controlled as needed.
- Interim restoration would be undertaken during the operating life of the project as soon as possible after disturbances.

2.13.3 Environmental Effects: No Action Alternative

No Project-related impacts to visual resource would occur under the No Action Alternative. The existing viewshed, dominated by open vistas, gently rolling topography, agriculture, and the existing Triple H Wind Project located east of the Project Area, would likely remain relatively unchanged.

2.14 Cultural Resources

2.14.1 Affected Environment

Cultural resources include archaeological, historic, and architectural sites or structures, or places that are significant in understanding the history of the U.S. or North America. Cultural resources may also include traditional cultural properties (TCPs), defined as sites or places of traditional cultural or religious importance to specified social or cultural groups, such as Native American tribes. Cultural resources that meet the eligibility criteria for listing on the National Register of Historic Places (NRHP) are considered “historic properties” under the National Historic Preservation Act (NHPA).

Archaeological Resources/TCPs

To identify new or previously recorded cultural resources eligible for listing on the NRHP, cultural resources surveys were conducted within a specified Area of Potential Effects (APE; Appendix I). The APE is defined as the geographic area within which the Project may directly or indirectly cause changes to the character or use of cultural resources. The APE encompassed a 2,034-acre survey area, including disturbance areas and associated buffers. A five-acre survey area was centered on each of the 78 turbine locations, and a 150-foot survey corridor was mapped over the centerline for the proposed collector lines, crane paths, and access roads (75 feet on either side of the centerline). The survey area for the substation, and laydown/staging area consisted of the construction area footprint plus a 200-foot buffer on all sides. In addition, a TCP survey was conducted concurrently with the cultural resources survey and covering the same locations. Three tribes participated in the TCP survey: the Crow Creek Sioux Tribe, the Rosebud Sioux Tribe, and the Yankton Sioux Tribe.

A records search of South Dakota Archaeological Research Center records for previously recorded archaeological sites and previous cultural resources surveys in the APE and a 1.5-mile buffer was requested in June 2021. The records search revealed one unevaluated prehistoric site and five architectural sites (one eligible bridge, two ineligible bridges, one unevaluated structure, and one ineligible structure) as well as four projects within a 1.5-mile radius of the APE. The record search revealed that the site distribution is light and none of the previously recorded cultural resources are within the APE for the existing Project layout.

Three field surveys were conducted by archaeologists from Beaver Creek Archaeology (BCA). The first, a preliminary survey covering 359 acres, was conducted in November 2020. Following completion of this preliminary survey, North Bend revised the Project layout to avoid all cultural resources by more than 50 feet. A second survey, a formal Level III cultural resource survey covering 2,034 acres, was conducted in August 2021. Cultural resource staff from the Crow Creek Sioux Tribe, the Rosebud Sioux Tribe, and the Yankton Sioux Tribe conducted tribal field surveys concurrently with BCA staff during the August 2021 field survey effort. Following the survey in August 2021, North Bend again revised the Project layout with re-routes to avoid all the documented cultural resources. These reroutes were surveyed by a BCA archaeologist and Rosebud Sioux Tribe investigator during a third survey in September 2021. The reroutes avoid all cultural resources by at least 50 feet.

During the 2020 and 2021 surveys, a total of 13 cultural resources were recorded. Eleven of the cultural resources documented consist of stone feature sites comprised of stone circles, cairns, stone arcs, and stone alignments. These sites were co-identified by BCA archaeologists and tribal representatives. Stone circles were used for various purposes, such as delineating domestic space and marking ceremonial locations. Cairns were used primarily as markers to designate the locations of burials, caches, or boundaries. Other stone features like alignments, arcs, and effigies were used in both day-to-day and ceremonial activities. Because of the significance these features have to Native American tribes, these 11 sites are recommended as eligible for the NRHP. The two other cultural resources consist of architectural sites, one of which is also comprised of a historic archaeological component. This architectural/historical site consists of a farmstead located on lightly grazed, gently rolling plains. It is comprised of six features, including four architectural features and two historic features. The four architectural features include a residence, two privies, and a well/pump house. The two historic features include a poured concrete foundation and a well. The site has been recommended as ineligible for the NRHP.

A solitary Aermotor windmill within an agricultural field was documented as an architectural site, in consultation with the South Dakota State Historic Preservation Office (SHPO). This site represents a stray agricultural utility most likely used for watering cattle at pasture. Lacking historic integrity and architectural distinction, the site is recommended as ineligible for the NRHP.

Architectural Survey and Viewshed Analysis

BCA conducted a reconnaissance architectural survey of structures within a 1.5-mile radius buffer of the proposed Project (architectural APE); i.e., the area where impacts could arise due to visual/audial changes to the landscape. Any standing structure in this area was recorded. Satellite imagery, topographic maps, and a records search provided by the South Dakota Archaeological Research Center were used to determine buildings, structures, and previously recorded sites. Field visits were conducted in July and October 2021 to take photographs and conduct a preliminary evaluation of each standing building or structure. Upon completion of the field visits, each building and structure was evaluated to determine its age and assessed for inclusion to the NRPH based on its potential significance and integrity.

Sixty-six locations that were or appeared to be architectural sites were investigated, of which 11 had no remaining standing structures, another 11 were entirely modern, leaving 44 contained recordable, historic architectural structures. These 44 locations were recorded with South Dakota SHPO. None of the architectural resources were located on state land or the Crow Creek Reservation. Five of these locations possessed buildings or structures that were either previously determined eligible, or that were recommended as NRHP-eligible or potentially NRHP-eligible, unevaluated. Unevaluated resources are those for which not enough documentation exists to make a clear determination of eligibility for listing on the NRHP. Each of the five eligible or unevaluated architectural resources are located within 1.5 miles of at least one turbine location (ranging from 0.3 to 1.5 miles). A digital viewshed analysis, visual impact analysis, and audial analysis was performed on these resources (see Appendix J for methodology).

2.14.2 Environmental Effects: Proposed Action Alternative

Archaeological Resources/Traditional Cultural Properties

WAPA anticipates the Project would not adversely affect any of the 13 cultural resources or TCPs identified during the 2020 and 2021 surveys because these cultural resources have been avoided by re-routing Project facilities. South Dakota SHPO has concurred with a determination of "No Adverse Effect" provided the following stipulations are met: 1) all archaeological properties and TCPs, which are eligible for listing in the NHRP or are currently unevaluated for listing in the NHRP, will be avoided by a minimum of a 50-foot buffer marked with construction fencing; and 2) changes in the location or nature of Project activities, such as the need to construct additional access roads or other ancillary features, will request the submission of additional documentation pursuant to 36 Code of Federal Regulations [CFR] 800.4 (2000) and 36 CFR 800.11 (2009; Appendix J). North Bend would meet these stipulations. The Crow Creek Sioux Tribe has also concurred with the determination of "No Adverse Effect to Historic Properties" (Appendix K). Neither the Rosebud Tribe nor the Yankton Sioux Tribe responded to WAPA's request for concurrence with its determination of effect.

Architectural Survey and Viewshed Analysis

The viewshed analysis found the Project would be visible from most of the area within the 1.5-mile radius buffer of the proposed Project (architectural APE), except for low drainage areas, which would not have a view of the wind turbines. However, the analysis does not indicate the extent to which each turbine would be potentially visible at a given location. In some cases, only a portion of the blade tips would be potentially visible. Factors that affect visibility from a given location include topography, vegetation, existing overhead power lines and structures located between the architectural sites and the Project. Additional factors include size and color of the turbines, the volume of traffic near the Project, the observer's visual acuity, the curvature of the earth, atmospheric refraction, air quality, time of day, and time of year.

The digital viewshed analysis resulted in finding five eligible, listed, or potentially eligible–unevaluated properties were within the APE of the project. These properties were also identified as being within the viewshed of the existing nearby Triple H Project. The architectural survey determined two farmstead barns and one farmstead house are surrounded by modern structures and views of the existing Triple H project, impacting integrity of setting at each of these locations. Another farmstead barn is surrounded by historic structures that are dilapidated due to continued neglect, impacting the integrity of its setting. At all four farmstead properties, existing vegetative screening (tree rows and shelterbelts) minimizes the visibility of the proposed turbines. One historic bridge lacks such screening from views of the North Bend Project. However, while a visual impact on a historic bridge can diminish integrity of setting, it does not in itself diminish eligibility, unless the relationship of the bridge to the topographic feature necessitating its construction is also impacted. The Project would not alter this relationship, nor would it create any physical impacts to the bridge. Therefore, the Project would not have any adverse visual effects on any eligibility-conferring aspects of architectural properties within the APE.

Regarding potential noise impacts to the five NRHP-eligible or unevaluated architectural sites, the desktop audial analysis found the site nearest to a wind turbine location to be 1,735 feet away. At this distance, the turbine would not generate sound greater than background noise. Therefore, none of the five NRHP-eligible or unevaluated architectural sites would experience an adverse noise effect from the Project.

Conservation Measures

North Bend is committed to implementing the conservation measures for cultural resources derived from section 5.9.1.6 of the PEIS, which would help to avoid or minimize cultural impacts associated with the Proposed Action. These may include, but are not limited to, the following:

- Avoidance fencing would be placed along the edge of the survey area near each of the stone features and TCPs during construction activities.
- An Unanticipated Discovery Plan has been prepared for the Project outlining procedures to follow to prepare for and address any unanticipated discoveries of cultural resources, including previously undiscovered archaeological sites and possible human remains. This Unanticipated Discovery Plan would provide direction to on-site personnel and their contractors as to proper procedures to follow if unanticipated discoveries occur during construction of the Project.
- If human remains are identified during Project construction, work would immediately halt within a minimum of 100 feet of the site and the site would be protected until South Dakota State Historical Society and the South Dakota Archaeological Research Center are consulted, in addition to any involved tribes that express interest in the Project and identify a potential impact. If confirmed or potential human skeletal remains are discovered, the Hughes County or Hyde

County Sheriff's office would also be contacted. If the remains are determined not to be part of an active crime scene or investigation, the South Dakota Chief Archaeologist would be contacted.

2.14.3 Environmental Effects: No Action Alternative

No Project-related impacts to cultural resources or TCPs would occur, but ongoing impacts are expected to continue at existing intensities. Ongoing impacts likely include loss or damage to cultural resources and TCPs due to existing land use practices, such as agriculture.

2.15 Health and Safety

Section 5.13 of the PEIS discusses health and safety issues associated with wind energy development, including occupational health impacts on workers and environmental health concerns in the area around the facilities. There are no Project-specific health or safety concerns beyond aerial spray applications, which are discussed in Section 3.8.

3.0 CUMULATIVE IMPACTS

The cumulative impacts of past, present, and reasonably foreseeable future actions on resources within the UGP Region are analyzed in section 6 of the PEIS. The contributions of cumulative impacts associated with the proposed Project are within the scope of the cumulative impacts analysis in the PEIS. Section 2.4 of the PEIS has projected wind energy development through the year 2030 for the UGP Region.

The North Bend Project would be adjacent to the existing Triple H Project. The other nearest wind energy projects are South Dakota Wind Energy Center, Titan I, Crow Lake, and Wessington Springs, all located southeast of the Project Area within approximately 60 miles (Hoen *et al.* 2018). The construction and operation of the proposed Project, in combination with operation of these other existing wind projects, as well as other private and public development occurring in the Project Area, would contribute to cumulative impacts on resources within the UGP Region. Such impacts would be like those described in the PEIS.

The analysis of the No Action alternative describes the cumulative effect of past, other present, and reasonably foreseeable actions, without the effect of the proposed action. The analysis of the proposed action includes those same effects, as well as the effects of the proposed action, and thus demonstrates the incremental difference resulting from the proposed action. A summary of the incremental effect from the Proposed Action and the summary of effect from past, present, and reasonably foreseeable actions from No Action Alternative for each resource area under the PEIS's preferred alternative (of which this Project is a part) is provided in Table 4.1-1.

Table 4.1-1. Summary of Incremental Effects from Proposed Action by Resource, and Effects from Past, Present, and Reasonably Foreseeable Actions from No Action Alternative.

Resource	***Incremental Effect of the Proposed Action Alternative***	***Effect from Past, Present, and Reasonably Foreseeable Actions from No Action Alternative***
Soil and Geologic Resources	The Project would contribute incrementally to adverse impacts to the increased potential for erosion, compaction, surface runoff, sedimentation, and soil contamination. These impacts, in turn, could contribute to adverse impacts on other resources, such as air, water, vegetation, and wildlife. These impacts would primarily be associated with Project construction and would be localized and temporary.	The No Action Alternative would result in continued impacts to soil and geologic resources from existing land uses such as cropping and grazing, which can increase soil erosion and cause compaction, loss of soil structure, nutrient degradation, and/or increase salinity.
Water Resources	The Project would contribute incrementally to water use, water quality degradation, and changes in natural flow systems on nearby surface water bodies and shallow groundwater aquifers. Adverse impacts on surface water and groundwater would be associated mainly with Project construction and would be localized and temporary.	The No Action Alternative would result in continued impacts to water resources at existing intensities. Agricultural fertilizers and pesticides can be transported to local surface and groundwater, leading to degraded water quality, and livestock use of surface water can degrade water quality.
Vegetation and Land Cover	The Project would contribute incrementally to the conversion of land from contiguous, untilled grassland to fragmented grassland or cropland and conversion of agriculture lands to developed lands. Conversion and fragmentation contribute to loss and reduced functionality of untilled grasslands and remaining grassland ecosystems. Other adverse cumulative impacts to vegetation from Project activities may include the loss of vegetation; habitat reduction or degradation; and exposure to	The No Action Alternative would result in the continuation of ongoing impacts from existing land uses, such as conversion of untilled grassland to cropland and habitat disturbance from grazing, at existing intensities. Land cover conversion would continue to contribute to the region-wide trend of habitat fragmentation.

	contaminants and damage to plants that affect plant physiology. Increased site accessibility in previously undisturbed areas can increase the risk of invasive species establishment, as well as increasing risk of wildfires. For long-term disturbance, such as access roads and turbine pads, vegetation may not be easily restorable, particularly where livestock are also present, which would contribute to the region-wide trend of habitat fragmentation.		
Wildlife	The Project would contribute to adverse cumulative impacts on area wildlife. Potential impacts could include habitat loss, habitat fragmentation, avoidance, displacement, and/or extirpation.		The No Action Alternative would result in continued impacts to wildlife from existing land use trends at local and regional scales.
Threatened and Endangered Species	The Project would contribute incrementally to cumulative impacts on threatened and endangered species that could occur in the Project Area, except for pallid sturgeon because the Project would have no effect to this species. To reduce potential impacts, the Project has agreed to adhere to the avoidance, minimization, and mitigation criteria outlined in the applicable UGP Wind PBA Species Consistency Evaluation Forms.		The No Action Alternative would result in continued impacts to threatened and endangered species from existing land use trends at local and regional scales.
Socioeconomics	The Project would contribute to beneficial impacts on employment, income, and tax revenues in the region. Impacts on property values could be adverse or beneficial and would likely not be seen beyond a local scale.		Ongoing socioeconomic impacts would continue at their existing intensities. The No Action Alternative would not add new contributions to cumulative socioeconomic impacts.
Environmental Justice	The Project would not contribute to cumulative environmental justice impacts since the impacts of the Project would not disproportionately burden minority or low-income populations.		The No Action Alternative would not alter the existing effects of nearby wind energy projects on minority or low-income populations.

Transportation and Aviation	The Project would contribute incrementally to cumulative impacts on transportation and aviation. The Project would use existing roads, resulting in increased traffic during construction and operation. Based on distance and FAA compliance measures, there would be no adverse cumulative impacts from the Project to aircraft using nearby airports.	The No Action Alternative would result in continued impacts from existing development to transportation and aviation.
Noise	The Project would contribute to noise impacts in the area. Project sound levels would be greater than the Hughes and Hyde County regulatory thresholds at two residences participating in the Project.	The No Action Alternative would result in the continuation of existing noises at their current duration and intensity.
Visual Resources and Shadow Flicker	The Project would add visual obstructions to the local and regional landscapes. The Project could contribute to decreased visibility, increased contrast with the surrounding landscape, and degradation of the visual quality of the landscape.	The No Action Alternative would result in the continuation of existing visual impacts from the five existing wind farms within 60 miles of the Project.
Cultural Resources	The Project would avoid all known NRHP-eligible cultural resources, although unanticipated discoveries could occur during construction or operation. The Project could contribute incrementally to a cumulative impact via increased pedestrian and vehicular traffic on new access roads which could result in damage, destruction, or theft of cultural resources, and could accelerate soil erosion resulting in damage to cultural resources.	The No Action Alternative would result in the continuation of cumulative cultural resource impacts via ongoing land uses such as agriculture, which have potential to damage cultural resources, along with existing wind farms, that could have visual impacts on cultural resources.
Health and Safety	The Project would contribute incrementally to cumulative impacts on health and safety, particularly to aerial spray applicators.	The No Action Alternative would result in the current continuation of health and safety impacts.

4.0 LISTING OF AGENCIES AND PERSONS CONSULTED

A public scoping meeting was held virtually on January 28, 2021. Federal, state, and local agencies were invited to the meeting to provide comments regarding the proposed Project. The public was invited through newspaper (see Appendix L) and radio announcements, and residents within and adjacent to the Project Area were notified via direct mailing. The public scoping meeting documentation is included in Appendix L. Comments received regarding the proposed Project from agencies and the public are included in Appendix A along with WAPA's responses.

4.1 Federal Agencies

The federal agencies contacted for the purpose of the EA scoping process were:

- Advisory Council on Historic Preservation
- Federal Energy Regulatory Commission, Office of Energy Projects
- U.S. DOT, Federal Highway Administration, South Dakota Division
- USACE, South Dakota Regulatory Office
- USEPA, Region 8
- U.S. Bureau of Indian Affairs, Great Plains Regional Office
- USDA NRCS, South Dakota State Office
- USDA, Rural Utilities Service, Water and Environmental Program
- USDA, South Dakota State FSA
- U.S. Department of Homeland Security, FEMA, Region VIII
- U.S. Department of the Interior, Bureau of Land Management, South Dakota Field Office
- U.S. DOT, Federal Highway Administration, Great Lakes Region
- USGS, Missouri Basin
- USFWS, South Dakota Field Office
- USFWS, Huron Wetland Management District
- U.S. House of Representatives
- U.S. Senate

4.2 State and Local Agencies

The state and local agencies contacted for the purpose of the EA scoping process were:

- South Dakota Department of Agriculture
- South Dakota Department of Environment and Natural Resources, Division of Environmental Services
- South Dakota Department of Tribal Relations
- South Dakota Public Utilities Commission
- South Dakota Office of the Governor
- SDDOT, Pierre Region
- SDGFP
- South Dakota SHPO
- South Dakota Senate
- South Dakota School and Public Lands
- South Dakota House of Representatives
- Hughes County Auditor
- Hughes County Board of Commissioners
- Hughes County Conservation District
- Hughes County Weed and Pest Board
- Hyde County Auditor
- Hyde County Board of Commissioners
- Hyde County Conservation District
- Hyde County Weed and Pest Board
- Hyde County Extension Office, South Dakota State University

4.3 Native American Tribes and Associated Bodies

Native American tribes that may attach religious and cultural significance to historic properties within the Project Area were contacted and invited to participate in the NEPA scoping and Section 106 consultation process. The following 11 tribes were contacted in January 2021:

- Apache
- Tribe of Oklahoma
- Cheyenne and Arapaho Tribes
- Crow Creek Sioux Tribe
- Cheyenne River Sioux Tribe
- Fort Belknap Indian Community
- Lower Brule Sioux Tribe
- Oglala Sioux Tribe
- Rosebud Sioux Tribe
- Standing Rock Sioux Tribe
- Santee Sioux Tribe of Nebraska
- Yankton Sioux Tribe

The Yankton Sioux Tribe, Crow Creek Sioux Tribe, and the Rosebud Sioux Tribe each participated in traditional cultural properties surveys with BCA staff during the cultural resource surveys.

4.4 Non-Governmental Organizations

The following non-governmental organizations were contacted to participate in the EA scoping process:

- American Bird Conservancy
- Ducks Unlimited, Great Plains Regional Office
- Izaak Walton League of America, South Dakota Division
- Missouri Breaks Audubon Society
- Pheasants Forever, Inc.
- Sierra Club, South Dakota Chapter
- The Nature Conservancy, Minnesota-North Dakota-South Dakota Office

5.0 LIST OF PREPARERS

Table 6-1 identifies the personnel responsible for the preparation of this EA.

Table 6-1. List of Preparers.

Name	*Agency/Firm*	*Title*
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6.0 REFERENCES

6.1 Literature Cited

Alemu, W. G., G. M. Henebry, and A. M. Melesse. 2020. Land Cover and Land Use Change in the U.S. Prairie Pothole Region Using the USDA Cropland Data Layer. Land 9(5): 166. doi: 10.3390/land9050166.

Allison, T. D. and R. Butryn. 2020. 2nd Edition: Summary of Bird Fatality Monitoring Data Contained in AWWIC. American Wind Wildlife Information Center (AWWIC) database. AWWI, Washington, D.C. November 24, 2020. Available online: https://awwi.org/wp-content/uploads/2020/11/2nd-Edition-AWWIC-Bird-Report-11-24-2020.pdf

_____, J. E. Diffendorfer, E. F. Baerwald, J. A. Beston, D. Drake, A. M. Hale, C. D. Hein, M. M. Huso, S. R. Loss, J. E. Lovich, M. D. Strickland, K. A. Williams, and V. L. Winder. 2019. Impacts to Wildlife of Wind Energy Siting and Operation in the United States. Issues in Ecology 21: 1-23.

American Bird Conservancy. 2022. Red Knot. Available online: https://abcbirds.org/bird/red-knot/

American Wind Wildlife Institute (AWWI). 2018. Bats and Wind Energy: Impacts, Mitigation, and Tradeoffs. AWWI, Washington, D. C. November 15, 2018. Available online: https://awwi.org/wp-content/uploads/2018/11/AWWI-Bats-and-Wind-Energy-White-Paper-FINAL.pdf

_____. 2020. Wind Turbine Interactions with Wildlife and Their Habitats: A Summary of Research Results and Priority Questions. Updated July 2020. Available online: https://rewi.org/wp-content/uploads/2020/07/AWWI-Wind-Power-Wildlife-Interactions-Summary-2020.pdf

Arnett, E. B. and E. F. Baerwald. 2013. Impacts of Wind Energy Development on Bats: Implications for Conservation. Pp. 435-456. In: R. A. Adams and S. C. Pederson, eds. Bat Ecology, Evolution and Conservation. Springer Science Press, New York.

_____, K. Brown, W. P. Erickson, J. Fiedler, B. L. Hamilton, T. H. Henry, A. Jain, G. D. Johnson, J. Kerns, R. R. Koford, C. P. Nicholson, T. O'Connell, M. Piorkowski, and R. Tankersley, Jr. 2008. Patterns of Bat Fatalities at Wind Energy Facilities in North America. Journal of Wildlife Management 72(1): 61-78. doi: 10.2193/2007-221.

_____, G. D. Johnson, W. P. Erickson, and C. D. Hein. 2013. A Synthesis of Operational Mitigation Studies to Reduce Bat Fatalities at Wind Energy Facilities in North America. A report submitted to the National Renewable Energy Laboratory (NREL), Golden, Colorado. Bat Conservation International (BCI), Austin, Texas. March 2013. Available online: https://www.energy.gov/sites/prod/files/2015/03/f20/Operational-Mitigation-Synthesis-FINAL-REPORT-UPDATED.pdf

Avian Power Line Interaction Committee (APLIC). 2006. Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006. Public Interest Energy Research Program (PIER) Final Project Report CEC-500-2006-022. Edison Electric Institute, APLIC, and the California Energy Commission. Washington, D. C., and Sacramento, California. Available online: https://www.nrc.gov/docs/ML1224/ML12243A391.pdf

_____. 2012. Reducing Avian Collisions with Power Lines: The State of the Art in 2012. Edison Electric Institute and APLIC, Washington, D.C. Available online: https://www.aplic.org/uploads/files/15518/Reducing_Avian_Collisions_2012watermarkLR.pdf

_____ and U.S. Fish and Wildlife Service (USFWS). 2005. Avian Protection Plan (APP) Guidelines. A joint document prepared by the Edison Electric Institute's APLIC and the USFWS.

Baasch, D. M., P. D. Farrell, A. T. Pearse, D. A. Brandt, A. J. Caven, M. J. Harner, G. D. Wright, and K. L. Metzger. 2019. Diurnal Habitat Selection of Migrating Whooping Crane in the Great Plains. Avian Conservation & Ecology 14(1): Article 6. doi: 10.5751/ACE-01317-140106.

Bakker, K. K. 2020. South Dakota Species of Habitat Fragmentation Concern: Grassland Birds. Report developed for the U.S. Fish and Wildlife Service, South Dakota Ecological Services Field Office, Pierre, South Dakota. March 3, 2020. 38 pp.

Bates, P. 2019. Abundant Whooping Crane Stopover Habitat on Some Corps of Engineer Lakes in Dakotas and Montana. Friends of the Wild Whoopers. November 22, 2019. Accessed May 2022. Available online: https://www.friendsofthewildwhoopers.org/abundant-whooping-crane-stopove-habitat-coe-lakes-in-dakotas-montana/

Bauman, P., B. Carlson, and T. Butler. 2016. Quantifying Undisturbed (Native) Lands in Eastern South Dakota: 2013. Available online: http://openprairie.sdstate.edu/data_land-easternSD/1

Beaver Creek Archaeology (BCA). 2022. A Reconnaissance Architectural Survey and Viewshed Analysis of the North Bend Wind Project in Hughes and Hyde Counties, South Dakota. Prepared for North Bend Wind Project, LLC. Prepared by Beaver Creek Archaeology, Inc. Bismarck, North Dakota. January 2022.

Bedard, A. J., Jr. 1999. Naturally Occurring Sources of Infrasound. Journal of the Acoustical Society of America 105(2): 1103-1103.

Bramblett, R. G. and R. G. White. 2001. Habitat Use and Movements of Pallid and Shovelnose Sturgeon in the Yellowstone and Missouri Rivers in Montana and North Dakota. Transactions of the American Fisheries Society 130: 1006-1025.

Butler, C. R. Sanspree, J. A. Moon, and W. Harrell. 2022. Whooping Crane Survey Results: Winter 2021-2022. Technical Memo, May 2022. https://www.fws.gov/media/whooping-crane-update-winter-2021-2022

Canadian Wildlife Service (CWS) and U.S. Fish and Wildlife Service (USFWS). 2007. International Recovery Plan for the Whooping Crane. Ottawa: Recovery of Nationally Endangered Wildlife (RENEW), and U.S. Fish and Wildlife Service, Albuquerque, New Mexico. 162 pp.

Committee on the Status of Endangered Wildlife in Canada (COSEWIC). 2010. COSEWIC Assessment and Status Report on the Whooping Crane *Grus americana* in Canada. COSEWIC, Ottawa, Canada. April 2010. x + 36 pp. Available online: https://wildlife-species.canada.ca/species-risk-registry/virtual_sara/files/cosewic/sr_Whooping%20Crane_0810_e.pdf

Cooperative Whooping Crane Tracking Project (CWCTP). 2021. Whooping Crane Sightings GIS Layer Created Based on Crane Observations through Spring 2021. U.S. Fish and Wildlife Service, Grand Island, Nebraska.

CORE Consultants, Inc. 2021. Potential Waters of the U.S. Preliminary Delineation Summary Report for North Bend Wind Hughes and Hyde Counties, South Dakota. Prepared for North Bend Wind Project, Santa Barbara, California. October 2021.

Cornell Lab of Ornithology. 2022a. All About Birds. Accessed August 2022. Available online: https://abcbirds.org/

_____. 2022b. Important Bird Areas. Accessed October 2022b. Available online at: https://www.birds.cornell.edu/landtrust/important-bird-areas/

Council on Environmental Quality. 1997. Environmental Justice Guidance under the National Environmental Policy Act. Accessed August 2022. Available online: https://ceq.doe.gov/docs/ceq-regulations-and-guidance/regs/ej/justice.pdf

Cryan, P. M. 2008. Mating Behavior as a Possible Cause of Bat Fatalities at Wind Turbines. Journal of Wildlife Management 72(3): 845-849. doi: 10.2193/2007-371.

_____ and R.M.R. Barclay. 2009. Causes of Bat Fatalities at Wind Turbines: Hypotheses and Predictions. Journal of Mammalogy, Volume 90, Issue 6, 15 December 2009. 1330-1340.

Dahl, T. E. 2014. Status and Trends of Prairie Wetlands in the United States 1997 to 2009. U.S. Department of the Interior; Fish and Wildlife Service, Ecological Services, Washington, D.C. 67 pp.

Data USA. 2021a. Hughes County, South Dakota: Economy. Data USA. Accessed August 2022. Available online: https://datausa.io/profile/geo/hughes-county-sd#economy

_____. 2021b. Hyde County, South Dakota: Economy. Data USA. Accessed August 2022. Available online: https://datausa.io/profile/geo/hyde-county-sd#economy

Department of Defense (DoD). 2012. Appendix C: Maps and Inventory of Ranges, Range Complexes, Military Training Routes, and Special Use Areas. Report to Congress on Sustainable Ranges, DoD, Washington, D. C. April 3, 2012. Available online: https://denix.osd.mil/sri/policy/reports/report-to-congress-on-sustainable-ranges/april-2012-appendix-c-maps-and-inventory-of-ranges-range-complexes-military-training-routes-and-special-use-areas-figures/

Department of Numbers. 2021. South Dakota Residential Rent and Rental Statistics. Accessed August 2022. Available online: https://www.deptofnumbers.com/rent/south-dakota/

Derby, C., A. Dahl, A. Merrill, and K. Bay. 2010. 2009 Post-Construction Monitoring Results for the Wessington Springs Wind-Energy Facility, South Dakota. Final Report. Prepared for Wessington Wind Energy Center, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. August 19, 2010.

_____., _____, K. Bay, and L. McManus. 2011. 2010 Post-Construction Monitoring Results for the Wessington Springs Wind Energy Facility, South Dakota. Final Report: March 9 – November 16, 2010. Prepared for Wessington Wind Energy Center, LLC, Juno Beach, Florida. Prepared by Western EcoSystems Technology, Inc. (WEST), Bismarck, North Dakota. November 22, 2011.

______., M. M. Welsch, and T. D. Thorn. 2018. Whooping Crane and Sandhill Crane Monitoring at Five Wind Energy Facilities. Proceedings of the North American Crane Workshop 14: 26-34.

Devereux, C. L., M. J. H. Denny, and M. J. Whittingham. 2008.Minimal Effects of Wind Turbines on the Distribution of wintering Farmland Birds, Journal of Applied Ecology 45(6): 1689-1694. http://www3.interscience.wiley.com/journal/121427776/abstract

Doherty, K. E., D. E. Naugle, H. E. Copeland, A. Pocewicz, and J. M. Kiesecker. 2011. Energy Development and Conservation Tradeoffs: Systematic Planning for Greater Sage-Grouse in Their Eastern Range. Pp. 505-516. In: S. T. Knick and J. W. Connelly, eds. Greater Sage-Grouse: Ecology and Conservation of a Landscape Species and Its Habitats. University of California Press, Berkeley, California.

Drilling, N. E., E. Dowd Stukel, R. A. Sparks, and B. J. Woiderski. 2018. The 2nd Atlas of Breeding Birds of South Dakota. SDGFP, Wildlife Division Report 2017-2. South Dakota Game, Fish and Parks (SDGFP), Pierre. In: Bakker, K. K. 2020. South Dakota Species of Habitat Fragmentation Concern: Grassland Birds. Report developed for U.S. Fish and Wildlife Service (USFWS), South Dakota Ecological Services Field Office, Pierre, South Dakota. 38 pp.

Dyke, S. R., S. K. Johnson, and P. T. Isakson. 2015. North Dakota State Wildlife Action Plan. North Dakota Game and Fish Department, Bismarck, North Dakota.

eBird. 2020, 2021, 2022. eBird: An Online Database of Bird Distribution and Abundance. eBird, Cornell Lab of Ornithology, Ithaca, New York. Accessed 2020, 2021, and August 2022. Available online: http://ebird.org/content/ebird/

ECONorthwest, 2002, Economic Impacts of Wind Power in Kittitas County. Report prepared by the Phoenix Economic Development Group. November 2002.

Egan, D. M. 1988. Architectural Acoustics. McGraw-Hill, New York. 411 pp.

Ellenbogen, J. M., S. Grace, W.J. Heiger-Bernays, J. F. Manwell, D. A. Mills, K. A. Sullivan, and M. G. Weisskopf. 2012. Wind Turbine Health Impact Study: Report of Independent Expert Panel. Prepared for Massachusetts Department of Environmental Protection, Massachusetts Department of Public Health.

Elliott-Smith, E. and S. M. Haig. 2020. Piping Plover (*Charadrius melodus*), Version 1.0. In: A. F. Poole, ed. Birds of the World. Cornell Lab of Ornithology, Ithaca, New York. doi: 10.2173/bow.pipplo.01. Available online: http://birdsoftheworld.org/bow/species/pipplo/cur/

Erickson, J. D. 1992. Habitat Selection and Movement of Pallid Sturgeon in Lake Sharpe, South Dakota. Thesis. South Dakota State University, Brookings, South Dakota.

Erickson, W. P., M. M. Wolfe, K. J. Bay, D. H. Johnson, and J. L. Gehring. 2014. A Comprehensive Analysis of Small Passerine Fatalities from Collisions with Turbines at Wind Energy Facilities. PLOS ONE 9(9): e107491. doi: 10.1371/journal.pone.0107491.

Esri. 2021, 2022. World Imagery and Aerial Photos (World Topo). ArcGIS Resource Center. Environmental Systems Research Institute (Esri), producers of ArcGIS software, Redlands, California. Accessed August 2022. Available online: https://www.arcgis.com/home/webmap/viewer.html?useExisting=1&layers=10df2279f9684e4a9f6a7f08febac2a9

Federal Aviation Administration. No date. FAA Guide to Low-Flying Aircraft. Available online: https://www.faa.gov/about/office_org/field_offices/fsdo/lgb/local_more/media/FAA_Guide_to_Low-Flying_Aircraft.pdf

Federal Emergency Management Agency (FEMA). 2021. FEMA's National Flood Hazard Layer (NFHL) Viewer. Accessed August 2022. Available online: https://hazards-fema.maps.arcgis.com/apps/webappviewer/index.html?id=8b0adb51996444d4879338b5529aa9cd

Gregory, A. J., L. B. McNew, T. J. Prebyl, B. K. Sandercock, and S. M. Wisely. 2011. Hierarchical Modeling of Lek Habitats of Greater Prairie-chickens. Pp. 21–32. *In:* B. K. Sandercock, K. Martin, and G. Segelbacher, eds. Ecology, conservation, and management of grouse. Studies in Avian Biology, No 39. University of California Press, Berkeley, California.

Hamilton, L. J. 1986. Water Resources of Hughes County, South Dakota. U.S. Geological Survey Water-Resources Investigations Report 84-419.5 Prepared in cooperation with the South Dakota Geological Survey, Hughes County, and the Oahe Conservancy Sub-District. Huron, South Dakota. Available online: https://pubs.usgs.gov/wri/1984/4195/report.pdf

Hanowski, J. M., D. P. Christian and G. J. Niemi. 2000. Landscape requirements of Prairie Sharp-tailed Grouse *Tympanuchus phasianellus campestris* in Minnesota, USA. Wildlife Biology 6: 257-263.

Hantrud, H. A. and R. E. Stewart. 1977. Use of Natural Basin Wetlands by Breeding Waterfowl in North Dakota. Journal of Wildlife Management 41: 243–253Harrell, W. and M. Bidwell. 2020. Report on Whooping Crane Recovery Activities. 2019 Breeding Season-2020 Spring Migration. U.S. Fish and Wildlife Service and Canadian Wildlife Service. November 2020.

Harrison, J. O., M. Bomberger Brown, L. A. Powell, W. H. Schacht, and J. A. Smith. 2017. Nest Site Selection and Nest Survival of Greater Prairie-chickens near a Wind Energy Facility. Condor 119: 659-672. doi: 10.1650/CONDOR-17-51.1.

Hartzler, B. 2017. Wind Speed and Herbicide Application. Integrated Crop Management. January 17, 2017. Iowa State University, Extension and Outreach, Ames, Iowa. Available online: https://crops.extension.iastate.edu/cropnews/2017/01/wind-speed-and-herbicide-application

Hayes, M. A. 2013. Bats Killed in Large Numbers at United States Wind Energy Facilities. Bioscience 63(12): 975-979. doi: 10.1525/bio.2013.63.12.10.

Hoen, B., and C. Atkinson-Palombo. 2016. Wind Turbines, Amenities and Disamenities: A Study of Home Value Impacts in Densely Populated Massachusetts. Journal of Real Estate Research 32(4): 473-504.

_____, R.H. Wiser, P. Cappers, M.A. Thayer, and G. Sethi. 2009. The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis. Journal of Real Estate Research 33(3):279-316.

_____, J.P. Brown, T. Jackson, R. Wiser, M. Thayer, and P. Cappers. 2013. A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States. Office of Energy Efficiency and Renewable Energy, U.S. Department of Energy.

Hoen, B. D., J. E. Diffendorfer, J. T. Rand, L. A. Kramer, C. P. Garrity, C.P., and H. E. Hunt, 2018. United States Wind Turbine Database (V4.0, April 9, 2021): U.S. Geological Survey, American Clean Power Association, and Lawrence Berkeley National Laboratory data release. doi: 10.5066/F7TX3DN0.

Howe, M. A. 1989. Migration of Radio-Marked Whooping Cranes from the Aransas-Wood Buffalo Population: Patterns of Use, Behavior, and Survival. U.S. Fish and Wildlife Service Technical Report 21. Patuxent Wildlife Research Center Laurel, Maryland.

Kallemeyn, L.W. 1983. Status of the Pallid Sturgeon, *Scaphirhynchus albus*. Fisheries 8: 3-9.

Kritz, K., M. Rheude, B. Millsap, M. Sadlowski, J. Pagel, M. Stuber, C. Borgman, T. Witting, U. Kirkpatrick, J. Muir, and H. Beeler. 2018. Bald Eagle Mortalities and Injuries at Wind Energy Facilities in the United States. Poster. The Wildlife Society (TWS) 25th Annual Conference, Cleveland, Ohio. October 7 – 11, 2018.

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. 2007. Assessing Impacts of Wind-Energy Development on Nocturnally Active Birds and Bats: A Guidance Document. Journal of Wildlife Management 71(8): 2449-2486. doi: 10.2193/2007-270.

LeBeau, C. W., J. L. Beck, G. D. Johnson, R. M. Nielson, M. J. Holloran, K. G. Gerow, and T. L. McDonald. 2017a. Greater Sage-grouse Male Lek Counts Relative to a Wind Energy Development. Wildlife Society Bulletin 41(1): 17-26. doi: 10.1002/wsb.725.

_____, G. D. Johnson, M. J. Holloran, J. L. Beck, R. M. Nielson, M. E. Kauffman, E. J. Rodemaker, and T. L. McDonald. 2017b. Greater Sage-grouse Habitat Selection, Survival, and Wind Energy Infrastructure. Journal of Wildlife Management 81(4): 690-711. doi: 10.1002/jwmg.21231.

Leventhall, G. 2003. A Review of Published Research on Low Frequency Noise and Its Effects. Prepared for the Department for Environment, Food, and Rural Affairs, London, United Kingdom.

-----. 2006. What Is Infrasound? Progress in Biophysics and Molecular Biology 93(1-3): 130-137. doi: 10.1016/j.pbiomolbio.2006.07.006.

Loesch, C. R., J. A. Walker, R. E. Reynolds, J. S. Gleason, N. D. Niemuth, S.E. Stephens, and M. A. Erickson. 2013. Effect of Wind Energy Development on Breeding Duck Densities in the Prairie Pothole Region. Journal of Wildlife Management 77(3): 587-598. doi: 10.1002/jwmg.481.

Manjooran, P. 2013. Clean Energy or Dangerous Skies? Interactions between the Wind Energy and Aerial Application Industries. Drake Journal of Agricultural Law 18(1): 183-209.

Manville, A. M., II. 2004. Prairie Grouse Leks and Wind Turbines: U.S. Fish and Wildlife Service Justification for a 5-Mile Buffer from Leks: Additional Grassland Songbird Recommendations. USFWS Division of Migratory Bird Management, Arlington, Virginia. 17 pp.

Martin, J. E., J. F. Sawyer, M. D. Fahrenback, D. W. Tomhave, and L. D. Schulz. 2004. Geologic Map of South Dakota. Available online: http://www.sdgs.usd.edu/pubs/pdf/G-10.pdf

McNew, L. B., L. M. Hunt, A. J. Gregory, S. M. Wisely, and B. K. Sandercock. 2014. Effects of Wind Energy Development on Nesting Ecology of Greater Prairie-Chickens in Fragmented Grasslands. Conservation Biology 28(4): 1089-1099.

Morey, H. 2021. Letter RE: North Bend Wind Project, Hughes and Hyde Counties, South Dakota, WAPA Public Scoping Comments. From South Dakota Department of Game, Fish and Parks, Pierre, South Dakota. To C. Gomer, Western Area Power Administration, Billings, Montana. March 1, 2021.

National Agricultural Aviation Association (NAAA). 2021. Safe Tower Distance for Professional Ag Aviators. Accessed August 2022. Available online: https://www.agaviation.org/safetowerdistance

National Audubon Society (Audubon). 2022a. Important Bird Areas. Audubon, New York, New York. Accessed August 2022. Available online: https://www.audubon.org/important-bird-areas

_____. 2022b. Online Guide to North American Birds. Accessed October 2022. Available online: https://www.audubon.org/bird-guide

National Land Cover Database (NLCD). 2019. National Land Cover Database 2019 - Landcover & Imperviousness (NLCD2019). Available online: https://www.mrlc.gov/data *As cited* includes:

Homer, C., J. Dewitz, S. Jin, G. Xian, C. Costello, P. Danielson, L. Gass, M. Funk, J. Wickham, S. Stehman, R. Auch, and K. Riitters. 2020. Conterminous United States Land Cover Change Patterns 2001–2016 from the 2016 National Land Cover Database. ISPRS Journal of Photogrammetry and Remote Sensing 162(5): 184-199. doi: 10.1016/j.isprsjprs.2020.02.019.

Jin, S., C. Homer, L. Yang, P. Danielson, J. Dewitz, C. Li, Z. Zhu, G. Xian, and D. Howard. 2019. Overall Methodology Design for the United States National Land Cover Database 2016 Products. Remote Sensing. 2971. doi: 10.3390/rs11242971.

Wickham, J., S. V. Stehman, D. G. Sorenson, L. Gass, and J. A. Dewitz. 2021, Thematic Accuracy Assessment of the NLCD 2016 Land Cover for the Conterminous United States: Remote Sensing of Environment 257: 112357. doi: 10.1016/j.rse.2021.112357.

and

Yang, L., S. Jin, P. Danielson, C. Homer, L. Gass, S. M. Bender, A. Case, C. Costello, J. Dewitz, J. Fry, M. Funk, B. Granneman, G. C. Liknes, M. Rigge, and G. Xian. 2018. A New Generation of the United States National Land Cover Database: Requirements, Research Priorities, Design, and Implementation Strategies. ISPRS Journal of Photogrammetry and Remote Sensing 146: 108-123. doi: 10.1016/j.isprsjprs.2018.09.006.

National Renewable Energy Laboratory (NREL). 2022. Scenario Viewer: Data Download—Standard Scenarios 2022. Accessed December 2022. Available at: https://scenarioviewer.nrel.gov/

NatureServe. 2013. Northern Myotis (*Myotis septentrionalis*). NatureServe Explorer: An Online Encyclopedia of Life [Web Application]. Version 7.1. NatureServe, Arlington, Virginia, USA. Northern myotis species report accessed June 2013. Available online: http://www.natureserve.org

Navarrete, L. and K. L. Griffis-Kyle. 2014. Sandhill Crane Collisions with Wind Turbines in Texas. Proceedings of the North American Crane Workshop 12: 65-67.

Niemuth, N. D., A. J. Ryba, A. T. Pearse, S. M. Kvas, D. A. Brandt, B. Wangler, J. E. Austin, and M. J. Carlisle. 2018. Opportunistically Collected Data Reveal Habitat Selection by Migrating Whooping Cranes in the U.S. Northern Plains. Condor 120(2): 343-356. doi: 10.1650/CONDOR-17-80.1.

Norberg, U. M. and J. M. V. Rayner. 1987. Ecological Morphology and Flight in Bats (Mammalia; Chiroptera): Wing Adaptations, Flight Performance, Foraging Strategy and Echolocation. Philosophical Transactions of the Royal Society B 316(1179): 335-427.

North Dakota Department of Game and Fish (NDGF). 2021a. Marbled Godwit Fact Sheet. NDGF, Bismarck, North Dakota. Accessed August 2022. Available online: https://gf.nd.gov/wildlife/id/shorebirds/marbled-godwit

_____. 2021b. Bobolink Fact Sheet. NDGF, Bismarck, North Dakota. Accessed August 2022. Available online: https://gf.nd.gov/wildlife/id/grassland-birds/bobolink

_____. 2021c. Black Tern Fact Sheet. NDGF, Bismarck, North Dakota. Accessed August 2022. Available online: https://gf.nd.gov/wildlife/id/shorebirds/black-tern

_____. 2021d. Franklin's Gull Fact Sheet. NDGF, Bismarck, North Dakota. Accessed August 2022. Available online: https://gf.nd.gov/wildlife/id/shorebirds/franklins-gull

_____. 2021e. Red-Headed Woodpecker Fact Sheet. NDGF, Bismarck, North Dakota. Accessed August 2022. Available online: https://gf.nd.gov/wildlife/id/songbirds/red-headed-woodpecker

Norton, M. A., K.C. Jensen, A.P. Leif, T. R. Kirschenmann, and G. A. Wolbrink. 2010. Resource Selection of Greater Prairie-Chicken and Sharp-Tailed Grouse Broods in Central South Dakota Prairie Naturalist 42: 100-108. *In:* Bakker, K. K. 2020. South Dakota Species of Habitat Fragmentation Concern: Grassland Birds. Report developed for U.S. Fish and Wildlife Service, South Dakota Ecological Services Field Office, Pierre, South Dakota. 38 pp.

Owen, S. F., M. A. Menzel, W. M. Ford, B. R. Chapman, K. V. Miller, J. W. Edwards, and P. B. Wood. 2003. Home-Range Size and Habitat Used by the Northern Myotis (Myotis septentrionalis). American Midland Naturalist 150(2): 352-359.

O'Connell, A., C. S. Spiegel, and S. Johnson. 2011. Compendium of Avian Occurrence Information for the Continental Shelf Waters Along the Atlantic Coast of the United States, Final Report (Database Section - Shorebirds). Outer Continental Shelf (OCS) Study Bureau of Ocean Energy Management (BOEM) 2012-076. Prepared for the U.S. Geological Survey (USGS) Patuxent Wildlife Research Center, Beltsville, Maryland. Prepared by the U.S. Fish and Wildlife Service (USFWS), Hadley, Maryland. U.S. Department of the Interior (USDOI), Geological Survey, and (BOEM) Headquarters. April 2011. Available online: https://espis.boem.gov/final%20reports/5193.pdf

Pagel, J. E., K. J. Kritz, B. A. Millsap, R. K. Murphy, E. L. Kershner, and S. Covington. 2013. Bald Eagle and Golden Eagle Mortalities at Wind Energy Facilities in the Contiguous United States. Journal of Raptor Research 47(3): 311-315.

Pallid Sturgeon Recovery Program. 2022. Accessed August 2022. Available online: https://pallidsturgeon.org/

Pearse, A. T., D. A. Brandt, W. C. Harrell, K. L. Metzger, D. M. Baasch, T. J. and Hefley. 2015. Whooping Crane Stopover Site Use Intensity within the Great Plains: U.S. Geological Survey Open-File Report 2015–1166, 12 p. doi: 10.3133/ofr20151166.

_____, _____, D. M. Baasch, M. T. Bidwell, J. A. Conkin, M. J. Harner, W. Harrell, and K. L. Metzger. 2020. Location Data for Whooping Cranes of the Aransas-Wood Buffalo Population, 2009-2018. U.S. Geological Survey (USGS) data release. USGS, Reston, Virginia. May 15, 2020. doi: 10.5066/P9Y8KZJ9.

_____, M. Rabbe, L. M. Juliusson, M. T. Bidwell, L. Craig-Moorel, D. A. Brandt, and W. Harrell. 2018. Delineating and Identifying Long-term Changes in the Whooping Crane (*Grus americana*) migration corridor. PLOS ONE 13(2): e0192737.

_____, K. L. Metzger, D. A. Brandt, J. A. Shaffer, M. T. Bidwell, and W. Harrell. 2021. Migrating Whooping Cranes Avoid Wind-Energy Infrastructure When Selecting Stopover Habitat. Ecological Applications: e2324. doi: 10.1002/eap.2324.

Peterson, R. A. 1995. The South Dakota Breeding Bird Atlas. South Dakota Ornithologists' Union. Northern Prairie Wildlife Research Center Online, Jamestown, North Dakota. (Version 06JUL2000).

Peterson, S. M., J. P. Traylor, and M. Guira. 2020. Groundwater Availability of the Northern High Plains Aquifer in Colorado, Kansas, Nebraska, South Dakota, and Wyoming: U.S. Geological Survey Professional Paper 1864. 57 pp., doi: 10.3133/pp1864.

Proett, M. C. 2017. The Influence of Wind Energy Development on Columbian Sharp-Tailed Grouse (*Tympanuchus phasianellus columbianus*) Breeding Season Ecology in Eastern Idaho. Thesis. Utah State University, Logan, Utah.

Pruett, C. L., M. A. Patten, and D. H. Wolfe. 2009. Avoidance Behavior by Prairie Grouse: Implications for Development of Wind Energy. Conservation Biology 23: 1253-1259.

Racey, P. 1982. Ecology of Bat Reproduction. Pp 57-104. *In:* T. Kunz, ed. Ecology of Bats. Boston University, Boston, Massachusetts.

Ramsey, C. G., H. R. Sleeper, and J. R. Hoke. 1994. Architectural Graphic Standards. Ninth Edition. American Institute of Architects. John Wiley, New Jersey. 918 pp.

Roberts, M. 2018. Before the Public Utilities Commission of the State of South Dakota, in the Matter of the Application of Dakota Range I LLC and Dakota Range II LLC for an Energy Facility Permit to Construct a Wind Energy Facility. Pre-filed Rebuttal Testimony of Dr. Mark Roberts on Behalf of Dakota Range I, LLC and Dakota Range II, LLC. South Dakota Public Utilities Commission (SD PUC) EL-18-03. May 21, 2018. Available online: https://puc.sd.gov/commission/dockets/electric/2018/EL18-003/testimony/dakotarange/rebuttal/roberts.pdf

Rocky Mountain Bird Observatory. 2009. South Dakota Breeding Bird Atlas 2. Rocky Mountain Bird Observatory, Fort Collins, Colorado, South Dakota Game, Fish and Parks, South Dakota State Wildlife Grants. April 2009. Accessed August 2022. Available online: https://rmbo.org/sdbba2/

Runia, T. and A. Solem. 2018. Wildlife Survey Report: Prairie Grouse Occurrence Models for South Dakota. South Dakota Department of Game, Fish, and Parks (SDGFP), Wildlife Division Report 2018-03. SDGFP, Pierre, South Dakota. May 2018.

_____, _____, N. D. Niemuth, and K. W. Barnes. 2021. Spatially Explicit Habitat Models for Prairie Grouse: Implications for Improved Population Monitoring and Targeted Conservation. Wildlife Society Bulletin 45(1): 36-54. doi: 10.1002/wsb.1164.

South Dakota Bat Working Group. 2004. South Dakota Bat Management Plan. Wildlife Division Report 2004-08, July 13, 2004. 97 pp. Available online: https://gfp.sd.gov/UserDocs/nav/bat-managment-plan.pdf

South Dakota Birds and Birding. 2022. Great Horned Owl. Accessed August 2022. Available online: https://www.sdakotabirds.com/species/great_horned_owl_info.htm

South Dakota Breeding Bird Atlas Team. 2009. Atlas Handbook. South Dakota Breeding Bird Atlas 2. Available online: www.rmbo.org/SDBBA2

South Dakota Department of Agriculture (SDDA). 2021a. State Noxious Weed & Pest List. SDDA, Pierre, South Dakota. Available online: https://danr.sd.gov/Conservation/PlantIndustry/WeedPest/WeedandPestInfo/StateNoxious/default.aspx

_____. 2021b. South Dakota Locally Noxious Weed Pest List: Hughes and Hyde Counties. SDDA, Pierre, South Dakota. Available online: https://danr.sd.gov/Conservation/PlantIndustry/WeedPest/docs/noxiousweeds.pdf

South Dakota Department of Game, Fish and Parks (SDGFP). 2005. South Dakota Interior Least Tern (*Sterna antillarum athalassos*) and Piping Plover (*Charadrius melodus*) Management Plan. Wildlife Division Report 2005-02.

_____.2014. South Dakota Wildlife Action Plan. Wildlife Division Report 2014-03. SDGFP, Pierre, South Dakota. Available online: http://gfp.sd.gov/images/WebMaps/Viewer/WAP/Website/PlanSections/SD%20Wildlife%20Action%20Plan%20Revision%20Final.pdf

_____. 2017. Prairie Grouse Management Plan for South Dakota, 2017–2021. Completion Report 2017–03. SDGFP, Pierre, South Dakota.

_____. 2019. Pheasant Brood Survey Report. Wildlife Survey Report 2019-09. SDGFP, Pierre, South Dakota. Available online: https://gfp.sd.gov/userdocs/docs/PBR_2019FINAL.pdf

_____. 2022a. Management of Sage-grouse in South Dakota. Wildlife Division Report Number 2022-02. SDGFP, Pierre, South Dakota.

_____. 2022b. Private Shooting Preserves. Forms & Permits, SDGFP, Pierre, South Dakota. Accessed June 2022. Available online: https://gfp.sd.gov/shooting-preserves/

South Dakota Department of Labor and Regulation. 2021. State and Local Government Employment. State of South Dakota. Accessed July 2021. Available online: https://dlr.sd.gov/

South Dakota Department of Revenue (SD DOR). 2020. Fiscal Year 2020 Annual Report. SD DOR, Rapid City, South Dakota. December 2, 2020. Available online: https://dor.sd.gov/media/dppd3hjk/2020-print-annual-report.pdf

_____. 2022. Renewable Energy Facility. Accessed October 2022. Available online at: https://dor.sd.gov/media/riuhxv2u/renewable-energy-facility.pdf

South Dakota Department of Transportation (SDDOT). 2021. Traffic Data: Non-State Highways (Counties). SDDOT, Pierre, South Dakota. Accessed May 2021. Available online: https://dot.sd.gov/transportation/highways/traffic#listItemLink_1199

South Dakota Ornithologists' Union. 2021. Distributional Checklist of South Dakota Birds. Available online: https://sdou.org/Default.aspx

South Dakota Office of School and Public Lands. 2022. Trust Fund: CPI Adjustment and Permanent Trust Funds. Office of School and Public Lands, State of South Dakota, Pierre, South Dakota. Accessed August 22, 2022. Available online: https://sdpubliclands.sd.gov/Support/

Southwick Associates. 2017. Economic Impact of Outdoor Activities Managed by South Dakota Department of Game, Fish and Parks. Prepared for South Dakota Game, Fish and Parks. Prepared by Southwick Associates. March 13, 2017. Available online: https://gfp.sd.gov/userdocs/docs/SummaryAllOutdoorRec.pdf

Stahkecker, D. A. 1997a. Availability of Stopover Habitat for Migrant Whooping Cranes in Nebraska. Proceedings of the North American Crane Workshop 7: 132-140.

_____. 1997b. Predicting Availability of Stopover Roosting Habitat for Migrant Whooping Cranes in the Northern Great Plains. U.S. Fish and Wildlife Service (USFWS) Eagle Ecological Services. 21 pp.

State of South Dakota. 2019. State of South Dakota Governor's Budget Fiscal Year 2021. Our 131st Year of a Balanced Budget, State of South Dakota. December 3, 2019. Available online: https://bfm.sd.gov/budget/fy2021/SD_Rec_2021_entire.pdf

_____.2020. South Dakota GIS Data. Accessed May 2021. Available online: https://opendata2017-09-18t192802468z-sdbit.opendata.arcgis.com/

Stehn, T. V. and T. Wassenich. 2008. Whooping Crane Collisions with Power Lines: An Issue Paper. Proceedings of the North American Crane Workshop 10: 25-36.

_____ and Haralson-Strobel, Carey. 2016. An Update on Mortality of Fledged Whooping Cranes in the Aransas /Wood Buffalo Population. Proceedings of the North American Crane Workshop 12: 43-50.

Sterzinger, G., F. Beck, and D. Kostiuk, 2003, The Effect of Wind Development on Local Property Values. Prepared by Renewable Energy Policy Project. May 2003.

Sullivan, R. G., L. B. Kirchler, T. Lahti, S. Roche, K. Beckman, B. Cantwell, and P. Richmond. 2012. Wind Turbine Visibility and Visual Impact Threshold Distances in Western Landscapes. Argonne National Laboratory, Argonne, Illinois. 47 pp. Available online: https://blmwyomingvisual.anl.gov/docs/WindVITD.pdf

Tetra Tech. 2021a. Acoustic Assessment for the North Bend Wind Project, Hyde and Hughes Counties, South Dakota. Presented to North Bend Wind Project, LLC. June 2021.

_____. 2001b. Shadow Flicker Impact Analysis for the North Bend Wind Project, Hyde and Hughes Counties, South Dakota. Presented to North Bend Wind Project, LLC. June 2021.

Tigner, J. and E.D. Stukel. 2003. Bats of the Black Hills: A Description of Status and Conservation Needs. South Dakota Department of Game, Fish, and Parks. Wildlife Division Report 2003-05. March 2003.

Tumbleweed Lodge. Tumbleweed Lodge. 2022. Waterfowl Packages. Tumbleweed Lodge, Harrold, South Dakota. Accessed August 2022. Available online: https://tumbleweedlodge.com/waterfowl-packages/

Urbanek, R. P. and J. C. Lewis. 2020. Whooping Crane (Grus americana), Version 1.0. *In:* A. F. Poole, ed. Birds of the World. Cornell Lab of Ornithology, Ithaca, New York. doi: 10.2173/bow.whocra.01. Available online: http://birdsoftheworld.org/bow/species/whocra/cur/

USA Topo. 2013. USA Topo Maps. U.S. Geological Survey (USGS) topographical maps for the United States. ArcGIS. Environmental Systems Research Institute (Esri), producers of ArcGIS software, Redlands, California.

U.S. Army Corps of Engineers (USACE). 2021. Decision Document: Nationwide Permit 57. Final Decision Document: Electric Utility Line and Telecommunications Activities. USACE 2021 Nationwide Permits. USACE, Washington, D.C. 113 pp. Available online: https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll7/id/16848

U.S. Census Bureau. 2021a. Census Tract Reference Map: Hughes County, South Dakota. 2020 Census, U.S. Census Bureau. Accessed August 2022. Available online: https://www.census.gov/quickfacts/hughescountysouthdakota

_____. 2021b. Census Tract Reference Map: Hyde County, South Dakota. 2020 Census, U.S. Census Bureau. Accessed August 2022. Available online: https://www.census.gov/quickfacts/fact/table/hydecountysouthdakota/PST045219

_____. 2021c. Census Tract Reference Map: South Dakota. 2020 Census, U.S. Census Bureau. Accessed August 2021. Available online: https://www.census.gov/quickfacts/SD

U.S. Department of Agriculture (USDA) National Agriculture Imagery Program (NAIP). 2020. 2017 NAIP Imagery. USDA, Farm Service Agency (FSA), Washington, D.C.

U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS). 1975. Soil Survey of Hughes County, South Dakota. Available online: https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/south_dakota/hughesSD1975/hughes.pdf

______. 1998. Soil Survey of Hyde County, South Dakota. Available online: https://www.nrcs.usda.gov/Internet/FSE_MANUSCRIPTS/south_dakota/SD069/0/hyde.pdf

______. 2021a. Gridded Soil Survey Geographic (gSSURGO) Database. USDA Soil Survey Staff, NRCS. Accessed August 2021. Available online: http://datagateway.nrcs.usda.gov/

______. 2021b. SSURGO Soils Data. Soil Survey Geographic (SSURGO) Database, Web Soil Data, NRCS USDA Soil Survey Staff, Washington, D.C. Updated July 31, 2019. Accessed August 2022. Available online: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/survey/geo/?cid=nrcs142p2_053631

______. 2021c. Soil Data Access (SDA) Wind Erodibility Index (WEI) Soils Report. USDA NRCS. Accessed August 2022. Available online: https://efotg.sc.egov.usda.gov/references/public/WI/NRCS_CAET_EROSION_WEI_134_OR_GREATER.html#top

U.S. Department of Justice. 2022. ESI Energy LLC, Wholly Owned Subsidiary of NextEra Energy Resources LLC, Is Sentenced after Pleading Guilty to Killing and Wounding Eagles in Its Wind Energy Operations, in Violation of the Migratory Bird Treaty Ac. U.S. Department of Justice, Office of Public Affairs. April 5, 2022. Accessed July 2022. Available online: https://www.justice.gov/opa/pr/esi-energy-llc-wholly-owned-subsidiary-nextera-energy-resources-llc-sentenced-after-pleading

U.S. Department of Labor. 2021. Bureau of Labor Statistics. Accessed August 2022. Available online: www.bls.gov

U.S. Department of Transportation (DOT). 2021. America's Byways: Native American Scenic Byway. U.S. DOT, Federal Highway Administration. Accessed August 2022. Available online: https://www.fhwa.dot.gov/byways/byways/2596

US Fish and Wildlife Service (USFWS). 2007. Whooping Cranes and Wind Farms - Guidance for Assessment of Impacts. Draft July 1, 2007.

______. 2009. Whooping Cranes and Wind Development - an Issue Paper. Regions 2 and 6, USFWS. April 2009.

______.2010. Whooping Crane (*Grus americana*) 5-Year Review: Summary and Evaluation. Available online: https://ecos.fws.gov/ServCat/DownloadFile/168680?Reference=114480

______. 2012. Land-Based Wind Energy Guidelines. March 23, 2012. 82 pp. Available online: Available online: https://www.fws.gov/sites/default/files/documents/WEG_final.pdf

_____. 2013. Eagle Conservation Plan Guidance: Module 1 - Land-Based Wind Energy, Version 2. U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management. April 2013. Frontmatter + 103 pp. Available online: https://www.fws.gov/sites/default/files/documents/eagle-conservation-plan-guidance.pdf

_____. 2014. Revised Recovery Plan for the Pallid Sturgeon (*Scaphirhynchus albus*). USFWS Mountain-Prairie Region, Denver, Colorado.

_____. 2020a. Critical Habitat for Threatened and Endangered Species. USFWS ArcGIS Online. Retrieved Accessed March 2021.

_____. 2020b. Updated Eagle Nest Survey Protocol. 4 pp. Attachment to: U.S. Fish and Wildlife Service (USFWS). 2020. Eagle Surveys. Memorandum to Regional Directors, Regions 1-12. From J. Ford, Assistant Director for Migratory Birds. USFWS, Washington, D.C. April 21, 2020.

_____. 2020c. U.S. Fish and Wildlife Service, Region 6, Wildlife Buffer Recommendations for Wind Energy Projects. USFWS, Washington, D.C. January 14, 2020.

_____. 2020d. Range-wide Indiana Bat Survey Guidelines. March 2020. 65 pp.

_____. 2021a. Birds of Conservation Concern 2021. April 2021. USFWS Migratory Bird Program, Washington, D.C. Available online: https://tethys.pnnl.gov/sites/default/files/publications/birds-of-conservation-concern-2021.pdf

_____. 2021b. Initial Project Scoping: IPaC - Information for Planning and Consultation. IPaC, Environmental Conservation Online System (ECOS), USFWS. Accessed August 2021. Available online: http://ecos.fws.gov/ipac/

_____. 2021c. Consultation Package Builder. Information for Planning and Consultation. Environmental Conservation Online System. Accessed January 21, 2022. Available online: https://ecos.fws.gov/ipac/

_____.2021d. Northern Long-Eared Bat Species Profile. Environmental Conservation Online System (ECOS), USFWS, Washington, D.C. Accessed August 2021 and 2022. Available online: https://ecos.fws.gov/ecp/species/9045

_____.2021e. Whooping Crane Species Profile. Environmental Conservation Online System (ECOS), USFWS, Washington, D.C. Accessed August 2021. Available online: https://ecos.fws.gov/ecp/species/758

_____.2021f. Piping Plover. FWS Focus, USFWS, Washington, D.C. Accessed August 2021. Available online: https://www.fws.gov/species/piping-plover-charadrius-melodus

_____. 2021g. Draft Recovery Plan for the Rufa Red Knot (*Calidris canutus rufa*). USFWS, North Atlantic-Appalachian Region, Hadley, Massachusetts. 21 pp.

_____. 2022a. National Wildlife Refuge System GIS Data and Mapping Tools. Accessed October 2022. Available online: https://www.fws.gov/service/national-wildlife-refuge-system-gis-data-and-mapping-tools

_____. 2022b. Species Status Assessment Report for the Northern long-eared bat (*Myotis septentrionalis*) Version 1.1. Available online: https://www.fws.gov/sites/default/files/documents/Species%20Status%20Assessment%20Report%20for%20the%20Northern%20long-eared%20bat-%20Version%201.1%20%282%29.pdf

_____. 2022c. Endangered and Threatened Wildlife and Plants; Endangered Species Status for Northern Long-eared Bat–Final Rule. Docket No. FWS-R3-ES-2021-0140. Available at: https://public-inspection.federalregister.gov/2022-25998.pdf?utm_source=federalregister.gov&utm_medium=email&utm_campaign=pi+subscription+mailing+list. Accessed December 2022.

U.S. Fish and Wildlife Service Habitat and Population Evaluation Team [USFWS HAPET]. 2010. Minnesota Greater Prairie-chicken Model.

U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI). 2020, 2021. National Wetlands Inventory Data. USFWS NWI, Washington, D.C. Accessed August 2022. Available online: http://www.fws.gov/wetlands/

U.S. Geological Survey (USGS). 2020, 2021. The National Map. TNM Download V2.0. Topo Map data, 3DEP products, Lidar, lfSAR, NHD (Hydrography Dataset), NAIP Plus Imagery, National Structures Dataset. Accessed August 2022. Available online: https://apps.nationalmap.gov/downloader/#/

U.S. North American Bird Conservation Initiative (NABCI) Committee. 2021. Bird Conservation Region 11 – Prairie Potholes. Available online: https://nabci-us.org/resources/bird-conservation-regions-map/#bcr11

USA Topo. 2013. USA Topo Maps. U.S. Geological Survey (USGS) topographical maps for the United States. ArcGIS. Environmental Systems Research Institute (Esri), producers of ArcGIS software, Redlands, California.

Wanner, G. A., R. A. Klumb, W. J. Stancill, and G. R. Jordan. 2007 Habitat Use and Movements of Adult Pallid Sturgeon in the Missouri River Downstream of Fort Randall Dam, South Dakota and Nebraska. Proceedings of the South Dakota Academy of Science, Vol. 86.

Western Area Power Administration (WAPA) and U.S. Fish and Wildlife Service (USFWS). 2015. Upper Great Plains Wind Energy Programmatic Environmental Impact Statement (DOE/EIS-0408). Available online: https://www.wapa.gov/regions/UGP/Environment/Pages/ProgrammaticWindEIS.aspx

Western EcoSystems Technology (WEST), Inc. 2021a. North Bend Wind Project Field Studies and Habitat Assessments Summary 2016 – 2021, Hughes and Hyde Counties, South Dakota. Confidential report prepared for North Bend Wind, LLC, Santa Barbara, California. June 30, 2021.

_____. 2021b. Regional Summaries of Wildlife Fatalities at Wind Facilities in the United States and Canada. 2020 Report from the Renew Database. Published by WEST, Cheyenne, Wyoming. June 30, 2021. Available online:

Winder, V. L., L. B. McNew, A. J. Gregory, L. M. Hunt, S. M. Wisely, and B. K. Sandercock. 2014a. Space Use by Female Greater Prairie-Chickens in Response to Wind Energy Development. Ecosphere 5(1): 1-17. doi: 10.1890/ES13-00206.1.

_____, _____, L. M. Hunt, A. J. Gregory, S. M. Wisely, and B. K. Sandercock. 2014b. Effects of Wind Energy Development on Seasonal Survival of Greater Prairie-Chickens. Journal of Applied Ecology 51: 395-405.

______, A. J. Gregory, L. B. McNew, and B. K. Sandercock. 2015. Responses of Male Greater Prairie-Chickens to Wind Energy Development. Condor 117: 284-296.

Winter, M. D., D. J. Johnson, and J. A. Shaffer. 2006. Does Body Size Affect a Bird's Sensitivity to Patch Size and Landscape Structure? Condor 108: 808-816.

6.2 Laws, Acts, and Regulations

32 Federal Register (FR) 48: 4001. 1967. Endangered Species. Native Fish and Wildlife. Office of the Secretary. 32 FR 4001. March 11, 1967.

36 Code of Federal Regulations [CFR] 800.4. 2000. 36 Code of Federal Regulations [CFR] 800.1. 2009. Title 36 – Parks, Forests, and Public Property; Chapter VIII - Advisory Council on Historic Preservation; Part 800 - Protection of Historic Properties; Subpart B - The Section 106 Process; Section 800.4 - Identification of Historic Properties. [65 Federal Register (FR) 77725, December 12, 2000, as amended at 69 FR 40553, July 6, 2004.].

36 Code of Federal Regulations [CFR] 800.1. 2009. Title 36 – Parks, Forests, and Public Property; Chapter VIII - Advisory Council on Historic Preservation; Part 800 - Protection of Historic Properties; Subpart B - The Section 106 Process; Section 800.11 - Documentation Standards. July 1, 2009.

43 Federal Register (FR) 94: 20938-20942. 1978. Title 50 - Wildlife and Fisheries, Chapter I -United States Fish and Wildlife Service, Department of the Interior, Part 17 - Endangered and Threatened Wildlife and Plants; Determination of Critical Habitat the Whooping Crane; Final Rule. Department of the Interior Fish and Wildlife Service. 50 CFR 17. 43 FR 20938. May 15, 1978. Effective June 14, 1978. Available online: https://www.govinfo.gov/content/pkg/FR-1978-05-15/pdf/FR-1978-05-15.pdf

50 Federal Register (FR) 238: 50726-50734. 1985. Endangered and Threatened Wildlife and Plants; Determination of Endangered and Threatened Status for the Piping Plover; Final Rule. 50 CFR Part 17. Department of the Interior Fish and Wildlife Service. 50 FR 50726. December 11, 1985. Available online: http://cdn.loc.gov/service/ll/fedreg/fr050/fr050238/fr050238.pdf

79 Federal Register (FR) 238: 73706-73748. 2014. Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Rufa Red Knot. Final Rule. 50 CFR Part 17. Department of the Interior Fish and Wildlife Service. 79 FR 73706. December 11, 2014. Available online: https://www.govinfo.gov/content/pkg/FR-2014-12-11/pdf/2014-28338.pdf#page=1

81 Federal Register (FR) 9: 1900-1922. 2016. Endangered and Threatened Wildlife and Plants; 4(d) Rule for the Northern Long-Eared Bat; Final Rule. 50 CFR 17. Department of the Interior, Fish and Wildlife Service. 81 FR 1900. January 14, 2016. Available online: https://www.govinfo.gov/content/pkg/FR-2016-01-14/pdf/2016-00617.pdf

87 Federal Register (FR) 56; 16442-16452. 2022. Endangered and Threatened Wildlife and Plants; Endangered Species Status for Northern Long-Eared Bat; Proposed Rule. 50 CFR 17. Department of the Interior, Fish and Wildlife Service. 81 FR 1900. March 23, 2022. Available online: https://www.govinfo.gov/content/pkg/FR-2022-03-23/pdf/2022-06168.pdf

Clean Water Act (CWA). 1972a. 33 United States Code (USC) Sections (§§) 1251-1387. October 18, 1972.

_____. 1972b. Section 404. 33 U.S. Code (USC) 1344. [June 30, 1948, Chapter 758, Title IV, Section (§) 404, as added Public Law (PL) 92–500, § 2, October 18, 1972, 86 Statute (Stat.) 884; amended PL 95–217, § 67(a), (b), December 1977, 91 Stat. 1600; PL 100–4, Title III, § 313(d), February 4, 1987, 101 Stat. 45].

Endangered Species Act (ESA). 1973. 16 United States Code (USC) Sections (§§) 1531-1544, Public Law (PL) 93-205, December 28, 1973, as amended, PL 100-478 [16 USC 1531 et seq.]; 50 Code of Federal Regulations (CFR) 402.

Executive Order 12898. 1994. Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations. President W. Clinton. 59 Federal Register (FR) 7629. February 16, 1994.

Farmland Protection Policy Act. 1970. 7 United States Code (USC) 4201-4209. [Public Law 97-98, Title XV, Section 1540, December 22, 1981, 95 Statute 1341.].

Federal Power Act. 1920. Federal Regulation and Development of Power, June 10, 1920. 16 United States Code (USC) 12 §§ 791-828c; Chapter 285, June 10, 1920; 41 Statute [Stat.] 1063.) as amended by: Chapter 129, March 3, 1921; 41 Stat. 1353.; Chapter 572, June 23, 1930; 46 Stat. 799.; Chapter 687, August 26, 1935; 49 Stat. 803.; Chapter 782, October 28, 1949; 63 Stat. 954.; Public Law (P.L.) 247, October 31, 1951; 65 Stat. 701.; P.L. 87-647, September 7, 1962; 76 Stat. 447.; P.L. 95-617, November 9, 1978; 92 Stat. 3117.; P.L. 96-294, June 30, 1980; 94 Stat. 611.; P.L. 97-375, December 21, 1982; 96 Stat. 1819.; P.L. 99-495, October 16, 1986; 100 Stat. 1243.; P.L. 102-486, October 24, 1992; 106 Stat. 3097.; P.L. 103-347, November 2, 1994; 108 Stat. 4585.; P.L. 104-66, December 21, 1995; 109 Stat. 718.

National Environmental Policy Act (NEPA). 1969. 42 United States Code (USC) 4321-4370h. Public Law 91-190, Section 2, January 1, 1970, 83 Statute 852.

National Historic Preservation Act (NHPA). 1966. Title 16 - Conservation; Chapter 1A - Historic Sites, Buildings, Objects, and Antiquities; Subchapter II - National Historic Preservation; Sections 470 et seq. Known as the National Historic Preservation Act of 1966. October 15, 1966.