Application to the South Dakota Public Utilities Commission for a Facility Permit

North Bend Wind Project
Hyde and Hughes Counties, South Dakota

June 22, 2021

NORTH BEND WIND PROJECT, LLC

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APPENDICES

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ACRONYMS AND ABBREVIATIONS

ADLS	Aircraft Detection Lighting System
Applicant	North Bend Wind Project, LLC
Application	Facility Permit Application
ARSD	Administrative Rules of South Dakota
BBCS	Bird and Bat Conservation Strategy
BBS	Breeding Bird Survey
BCC	Birds of Conservation Concern
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
CFR	Code of Federal Regulations
Ch.	Chapter
Commission	South Dakota Public Utilities Commission
CRP	Conservation Reserve Program
CUP	Conditional Use Permit
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibels
ECPG	Eagle Conservation Plan Guidance, Module 1—Land-based Wind Energy Guidelines, Version 2
EA	Environmental Assessment
ELF	extremely low frequency
ENGIE	ENGIE North America, Inc.
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FSA	Farm Service Agency
GE	General Electric
GIS	geographic information system
GPA	Game Production Area
GW	gigawatts
HUC	Hydrologic Unit Code
Hz	Hertz
IPaC	Information, Planning and Consultation
IRS	Internal Revenue Service
ISO	International Organization for Standardization
km	kilometer

kV	kilovolt
LBNL	Lawrence Berkeley National Laboratory
LNTE	Low-Noise Trailing Edge
LWES	large wind energy system
m/s	meters per second
MBTA	Migratory Bird Treaty Act
MET	meteorological
mG	milligauss
MW	megawatt
MWh	megawatt hour
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHD	National Hydrography Dataset
NLEB	northern long-eared bat
North Bend Wind	North Bend Wind Project, LLC
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NSR	noise-sensitive receptor
NWI	National Wetlands Inventory
O&M	operations and maintenance
PLSS	Public Land Survey System
PPA	power purchase agreement
Project	North Bend Wind Project
Project Area	the encompassing 46,931-acre area where the Project is located
PTC	Production Tax Credit
SCADA	supervisory control and data acquisition
SDCL	South Dakota Codified Law
SDDENR	South Dakota Department of Environment and Natural Resources
SDDOA	South Dakota Department of Agriculture
SDDOT	South Dakota Department of Transportation
SDGFP	South Dakota Department of Game, Fish and Parks
SDGS	South Dakota Geologic Survey
SDPUC	South Dakota Public Utilities Commission
SDSHS	South Dakota State Historical Society
SDSU	South Dakota State University
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office

SPCC	Spill Prevention, Control and Countermeasures
SSURGO	Soil Survey Geographic Database
SWPPP	Stormwater Pollution Prevention Plan
TWI	The Watershed Institute, Inc.
USACE	U.S. Army Corps of Engineers
USC	United States Code
USDA	U.S. Department of Agriculture
USDOE	U.S. Department of Energy
USEIA	U.S. Energy Information Administration
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WAPA	Western Area Power Administration
WEG	Wind Energy Guidelines
WEST	Western Ecosystems Technology, Inc.
WIA	Walk-In Area
WIOM	Winter Ice Operation Mode
WMD	Wetland Management District
WNS	White Nose Syndrome
WoUS	Waters of the U.S.
WPA	Waterfowl Production Area
WRP	Wetland Reserve Program

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1.0 INTRODUCTION

1.1 Project Overview

North Bend Wind Project, LLC (North Bend Wind or Applicant) respectfully submits this Facility Permit Application (Application) to the South Dakota Public Utilities Commission (Commission or SDPUC) for an Energy Facility Permit to construct and operate the North Bend Wind Project (Project), a wind energy facility as defined under South Dakota Codified Law (SDCL) 49-41B-2 (13). The total installed capacity of the wind energy facility will not exceed 200 megawatts (MW) and will include the construction of up to 71 wind turbine generators (turbines).

The Project will be located within Hyde and Hughes counties in the Public Land Survey System (PLSS) townships of Butte, Chapelle, Harrold, Holabird, Pleasant Valley, Pratt, and Webster (Figure 1 in Appendix A). The majority of the Project will be located on privately held land within an area that encompasses approximately 46,931 acres (Project Area), approximately 2 miles south of Harrold.

Project components will include:

- Up to 71 turbines;
- Access roads to turbines and associated facilities;
- Underground 34.5-kilovolt (kV) electrical collector lines connecting the turbines to the collection substation;
- Underground fiber-optic cable for turbine communications collocated with the collector lines;
- A 34.5- to 230-kV collection substation;
- A 230-kV interconnection switching station;
- A Aircraft Detection Lighting System (ADLS);
- One permanent meteorological (MET) tower; and
- Additional temporary construction areas, including crane paths, public road improvements, laydown yard/staging area, and concrete batch plant(s), as needed.

The Project will interconnect to the high-voltage transmission grid via that will interconnect to Western Area Power Administration's (WAPA) Fort Thompson-Oahe 230-kV transmission line, which crosses the southern portion of the Project Area. A new 230-kV interconnection switching station connecting to the Fort Thompson-Oahe 230-kV line will be constructed, owned, and operated by WAPA. WAPA will also construct and own a 230-kV interconnection facility connecting a new collection substation and the interconnection switching station. This up to 500-foot-long transmission interconnection will be located wholly within the Project Area, connecting the collection substation to the adjacent interconnection switching station. As defined under SDCL Chapter (Ch.) 49-41B-2.1, an electric transmission line requiring a permit from the SDPUC is defined as a transmission line and associated facilities with a design of more than 115 kV. However, if such a transmission line is less than 2,640 feet in length, does not cross any public highway, and eminent domain is not used to obtain rights-of-way, the transmission line is not a transmission facility for purposes of the referenced chapter.

The proposed interconnection of the Project to WAPA's transmission system is a federal action under the National Environmental Policy Act of 1969 (NEPA). As a result, WAPA will provide federal oversight of the preparation of an Environmental Assessment (EA), which will be tiered from the analysis conducted

in the Upper Great Plains Wind Energy Final Programmatic Environmental Impact Statement. The EA will evaluate the environmental effects of the proposed Project on resources such as wetlands, vegetation and wildlife, cultural and recreation resources, as well as other social, economic, and environmental effects. A public scoping meeting was held on January 28, 2021, and the scoping period ended March 1, 2021. A draft of the EA will be available for public review and comment at the Project's website, https://www.wapa.gov/regions/UGP/Environment/Pages/NorthBendWind.aspx.

Because the interconnection facility is an approximately 100-foot-long 230-kV transmission line, does not cross any public highway, and does not require the use of eminent domain, it does not require a permit from the SDPUC and will be permitted locally.

North Bend Wind is a wholly owned subsidiary of ENGIE North America, Inc. (ENGIE). In North America, ENGIE manages a range of energy business in the United States and Canada, including retail energy sales and energy services to commercial, industrial, and residential customers; natural gas and liquefied natural gas distribution and sales; and electrical generation. ENGIE's North America renewable portfolio consists of wind, solar, and biomass/biogas assets. ENGIE operates over 3,400 MW of wind generation and has over 2,000 MW of wind projects in various stages of development. ENGIE currently has two operational projects in South Dakota—the 153-MW Dakota Range III Wind Project located in Grant and Roberts counties and the 250-MW Triple H Wind Project located in Hyde County, South Dakota. The Triple H Wind Project is located immediately to the east of the North Bend area and was granted an Energy Facility Permit by the SDPUC on July 24, 2019, under EL19-007.

North Bend Wind anticipates sharing the operations and maintenance (O&M) facility with the Triple H Wind Project. This facility was built as part of the Triple H Wind Project and will be modified to accommodate the Project's additional capacities, as needed.

1.2 Names of Participants (Administrative Rules of South Dakota [ARSD] 20:10:22:06)

20:10:22:06. Names of participants required. *The application shall contain the name, address, and telephone number of all persons participating in the proposed facility at the time of filing, as well as the names of any individuals authorized to receive communications relating to the application on behalf of those persons.*

The Applicant is a South Dakota limited liability company. Individuals who are authorized to receive communications relating to the Application on behalf of the Applicant include:

Mr. Casey Willis, Senior Advisor, Project Development
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1.3 Name of Owner and Manager (ARSD 20:10:22:07)

ARSD 20:10:22:07. Name of owner and manager. *The application shall contain a complete description of the current and proposed rights of ownership of the proposed facility. It shall also contain the name of the project manager of the proposed facility.*

The Applicant will be the sole owner of the Project. Mr. Casey Willis, named above, is the Project Development Manager and primary contact.

1.4 Facility Permit Application Content and Organization

In accordance with SDCL Ch. 49-41B and ARSD Ch. 20:10:22 (Energy Facility Siting Rules), this Application provides information on the existing environment; potential Project impacts; and proposed avoidance, minimization, and/or mitigation measures for the following resources:

- Physical (geology, economic deposits, and soils);
- Hydrology (ground and surface water) and water quality;
- Terrestrial ecosystems (vegetation, wetlands, wildlife, threatened and endangered species);
- Aquatic ecosystems;
- Land use (agriculture, residential, recreation, noise, aesthetics, and telecommunications);
- Air quality; and
- Communities (socioeconomics, cultural resources, and transportation).

In this Application, North Bend Wind has addressed each matter set forth in SDCL Ch. 49-41B and in ARSD Ch. 20:10:22 related to wind energy facilities. Included with this Application is a Completeness Checklist (Table 1-1) that identifies where each rule requirement is addressed in this Application.

Pursuant to SDCL 49-41B-22, the information presented in this Application establishes that the Project:

- Complies with applicable laws and rules;
- Will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants in the Project Area;
- Will not substantially impair the health, safety, or welfare of the inhabitants; and
- Will not unduly interfere with the orderly development of the region, having considered the views of the governing bodies of the local affected units of government.

A Conditional Use Permit (CUP) application was submitted to Hyde County on June 11, 2021, and a CUP is anticipated to be submitted to Hughes County by mid-June 2021. The review and hearing schedule will be determined by both counties; however, it is anticipated that a decision will be rendered by both counties by the end of August 2021.

1.4.1 Completeness Check

The contents required for an application with the SDPUC are described in SDCL 49-41B and further clarified in ARSD 20:10:22:01 (1) et seq. The SDPUC's submittal requirements are listed in Table 1-1 with cross-references identifying where each rule requirement is addressed in this Application.

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11 (1) thru (12); 49-41B-35 (2)	20:10:22:05	**Application contents.** The application for a permit for a facility shall contain a list of each permit that is known to be required from any other governmental entity at the time of the filing. The list of permits shall be updated, if needed, to include any permit the applicant becomes aware of after filing the application. The list shall state when each permit application will be filed. The application shall also list each notification that is required to be made to any other governmental entity.	Section 22.1
49-41B-11(1)	20:10:22:06	**Names of participants required.** The application shall contain the name, address, and telephone number of all persons participating in the proposed facility at the time of filing, as well as the names of any individuals authorized to receive communications relating to the application on behalf of those persons.	Section 1.2
49-41B-11(7)	20:10:22:07	**Name of owner and manager.** The application shall contain a complete description of the current and proposed rights of ownership of the proposed facility. It shall also contain the name of the project manager of the proposed facility.	Section 1.3
49-41B-11(8)	20:10:22:08	**Purpose of facility.** The applicant shall describe the purpose of the proposed facility.	Section 2.0
49-41B-11(12)	20:10:22:09	**Estimated cost of facility.** The applicant shall describe the estimated construction cost of the proposed facility.	Section 3.0
49-41B-11(9)	20:10:22:10	**Demand for facility.** The applicant shall provide a description of present and estimated consumer demand and estimated future energy needs of those customers to be directly served by the proposed facility. The applicant shall also provide data, data sources, assumptions, forecast methods or models, or other reasoning upon which the description is based. This statement shall also include information on the relative contribution to any power or energy distribution network or pool that the proposed facility is projected to supply and a statement on the consequences of delay or termination of the construction of the facility.	Section 2.0
49-41B-11(2)	20:10:22:11	**General site description.** The application shall contain a general site description of the proposed facility including a description of the specific site and its location with respect to State, county and other political subdivisions; a map showing prominent features such as cities, lakes and rivers; and maps showing cemeteries, places of historical significance, transportation facilities, or other public facilities adjacent to or abutting the plant or transmission site.	Figures 1, 2, and 2a Section 4.0
49-41B-11(6); 49-41B-21; 34A-9-7(4)	20:10:22:12	**Alternative sites.** The applicant shall present information related to its selection of the proposed site for the facility, including the following: (1) The general criteria used to select alternative sites, how these criteria were measured and weighed, and reasons for selecting these criteria; (2) An evaluation of alternative sites considered by the applicant for the facility; (3) An evaluation of the proposed plant, wind energy, or transmission site and its advantages over the other alternative sites considered by the applicant, including a discussion of the extent to which reliance upon eminent domain powers could be reduced by use of an alternative site, alternative generation method, or alternative waste handling method.	Figure 3a-3b Section 5.0

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:13	**Environmental information.** The applicant shall provide a description of the existing environment at the time of the submission of the application, estimates of changes in the existing environment which are anticipated to result from construction and operation of the proposed facility, and identification of irreversible changes which are anticipated to remain beyond the operating lifetime of the facility. The environmental effects shall be calculated to reveal and assess demonstrated or suspected hazards to the health and welfare of human, plant, and animal communities which may be cumulative or synergistic consequences of siting the proposed facility in combination with any operating energy conversion facilities, existing or under construction. The applicant shall provide a list of other major industrial facilities under regulation which may have an adverse effect on the environment as a result of their construction or operation in the transmission site, wind energy site, or siting area.	Section 6.0
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:14	**Effect on physical environment.** The applicant shall provide information describing the effect of the proposed facility on the physical environment. The information shall include: (1) A written description of the regional land forms surrounding the proposed plant or wind energy site or through which the transmission facility will pass; (2) A topographic map of the plant, wind energy, or transmission site; (3) A written summary of the geological features of the plant, wind energy, or transmission site using the topographic map as a base showing the bedrock geology and surficial geology with sufficient cross-sections to depict the major subsurface variations in the siting area; (4) A description and location of economic deposits such as lignite, sand and gravel, scoria, and industrial and ceramic quality clay existent within the plant, wind energy, or transmission site; (5) A description of the soil type at the plant, wind energy, or transmission site; (6) An analysis of potential erosion or sedimentation which may result from site clearing, construction, or operating activities and measures which will be taken for their control; (7) Information on areas of seismic risks, subsidence potential and slope instability for the plant, wind energy, or transmission site; and (8) An analysis of any constraints that may be imposed by geological characteristics on the design, construction, or operation of the proposed facility and a description of plans to offset such constraints.	Section 7.0 (1) Section 7.1 (2) Section 7.1, Figure 1 (3) Sections 7.1 and 7.2, Figures 4a-4d (4) Section 7.1.1.4 (5) Section 7.2, Figures 5a-5b (6) Sections 7.2.1 and 7.2.2 (7) Sections 7.1.1.5, 7.1.1.6, and 7.2.1.4 (8) Sections 7.1.1, 7.1.2, and 7.1.3

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:15	**Hydrology.** The applicant shall provide information concerning the hydrology in the area of the proposed plant, wind energy, or transmission site, and the effect of the proposed site on surface and groundwater. The information shall include: (1) A map drawn to scale of the plant, wind energy, or transmission site showing surface water drainage patterns before and anticipated patterns after construction of the facility; (2) Using plans filed with any local, State, or Federal agencies, indication on a map drawn to scale of the current planned water uses by communities, agriculture, recreation, fish, and wildlife which may be affected by the location of the proposed facility and a summary of those effects; (3) A map drawn to scale locating any known surface or groundwater supplies within the siting area to be used as a water source or a direct water discharge site for the proposed facility and all offsite pipelines or channels required for water transmission; (4) If aquifers are to be used as a source of potable water supply or process water, specifications of the aquifers to be used and definition of their characteristics, including the capacity of the aquifer to yield water, the estimated recharge rate, and the quality of groundwater; (5) A description of designs for storage, reprocessing, and cooling prior to discharge of heated water entering natural drainage systems; and (6) If deep well injection is to be used for effluent disposal, a description of the reservoir storage capacity, rate of injection, and confinement characteristics and potential negative effects on any aquifers and groundwater users which may be affected.	Section 8.0 (1) Figures 6, 7, and 8; Sections 8.1 and 8.2 (2) Figures 6, 7, and 8; Sections 8.1, 8.2 and 8.3 (3) Figures 6, 7, and 8; Section 8.1 (4) Sections 8.1.1 and 8.3.2. (5) N/A (6) N/A
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:16	**Effect on terrestrial ecosystems.** The applicant shall provide information on the effect of the proposed facility on the terrestrial ecosystems, including existing information resulting from biological surveys conducted to identify and quantify the terrestrial fauna and flora potentially affected within the transmission site, wind energy site, or siting area; an analysis of the impact of construction and operation of the proposed facility on the terrestrial biotic environment, including breeding times and places and pathways of migration; important species; and planned measures to ameliorate negative biological impacts as a result of construction and operation of the proposed facility.	Section 9.0 Figures 9 and 10
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:17	**Effect on aquatic ecosystems.** The applicant shall provide information of the effect of the proposed facility on aquatic ecosystems, and including existing information resulting from biological surveys conducted to identify and quantify the aquatic fauna and flora, potentially affected within the transmission site, wind energy site, or siting area, an analysis of the impact of the construction and operation of the proposed facility on the total aquatic biotic environment and planned measures to ameliorate negative biological impacts as a result of construction and operation of the proposed facility.	Section 10.0

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11(2,11); 49-41B-22	20:10:22:18	**Land use.** The applicant shall provide the following information concerning present and anticipated use or condition of the land: (1) A map or maps drawn to scale of the plant, wind energy, or transmission site identifying existing land use according to the following classification system: a. Land used primarily for row and non-row crops in rotation; b. Irrigated lands; c. Pasturelands and rangelands; d. Haylands; e. Undisturbed native grasslands; f. Existing and potential extractive nonrenewable resources; g. Other major industries; h. Rural residences and farmsteads, family farms, and ranches; i. Residential; j. Public, commercial, and institutional use; k. Municipal water supply and water sources for organized rural water systems; and l. Noise sensitive land uses; (2) Identification of the number of persons and homes which will be displaced by the location of the proposed facility; (3) An analysis of the compatibility of the proposed facility with present land use of the surrounding area, with special attention paid to the effects on rural life and the business of farming; and (4) A general analysis of the effects of the proposed facility and associated facilities on land uses and the planned measures to ameliorate adverse impacts.	Section 11.0 (1) Figures 9 and 11; Section 11.1 (2) Section 11.1.2 (3) Sections 11.1–11.7 (4) Sections 11.1–11.7
49-41B-11 (2,11); 49-41B-28	20:10:22:19	**Local land use controls.** The applicant shall provide a general description of local land use controls and the manner in which the proposed facility will comply with the local land use zoning or building rules, regulations or ordinances. If the proposed facility violates local land use controls, the applicant shall provide the commission with a detailed explanation of the reasons why the proposed facility should preempt the local controls. The explanation shall include a detailed description of the restrictiveness of the local controls in view of existing technology, factors of cost, economics, needs of parties, or any additional information to aid the commission in determining whether a permit may supersede or preempt a local control pursuant to SDCL 49-41B-28.	Section 12.0
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:20	**Water quality.** The applicant shall provide evidence that the proposed facility will comply with all water quality standards and regulations of any Federal or State agency having jurisdiction and any variances permitted.	Section 13.0

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:21	**Air quality.** The applicant shall provide evidence that the proposed facility will comply with all air quality standards and regulations of any Federal or State agency having jurisdiction and any variances permitted.	Section 14.0
49-41B-11(3)	20:10:22:22	**Time schedule.** The applicant shall provide estimated time schedules for accomplishment of major events in the commencement and duration of construction of the proposed facility.	Section 15.0
49-41B-11(11); 49-41B-22	20:10:22:23	**Community impact.** The applicant shall include an identification and analysis of the effects the construction, operation, and maintenance of the proposed facility will have on the anticipated affected area including the following: (1) A forecast of the impact on commercial and industrial sectors, housing, land values, labor market, health facilities, energy, sewage and water, solid waste management facilities, fire protection, law enforcement, recreational facilities, schools, transportation facilities, and other community and government facilities or services; (2) A forecast of the immediate and long-range impact of property and other taxes of the affected taxing jurisdictions; (3) A forecast of the impact on agricultural production and uses; (4) A forecast of the impact on population, income, occupational distribution, and integration and cohesion of communities; (5) A forecast of the impact on transportation facilities; (6) A forecast of the impact on landmarks and cultural resources of historic, religious, archaeological, scenic, natural, or other cultural significance. The information shall include the applicant's plans to coordinate with the local and State office of disaster services in the event of accidental release of contaminants from the proposed facility; and (7) An indication of means of ameliorating negative social impact of the facilitydevelopment.	Section 16.0 (1) Sections 16.1–16.4 (2) Section 16.1.2 (3) Section 16.2.2 (4) Section 16.1.2 (5) Section 16.4 (6) Section 16.5 (7) Sections 16.1–16.5
49-41B-11(4)	20:10:22:24	**Employment estimates.** The application shall contain the estimated number of jobs and a description of job classifications, together with the estimated annual employment expenditures of the applicants, the contractors, and the subcontractors during the construction phase of the proposed facility. In a separate tabulation, the application shall contain the same data with respect to the operating life of the proposed facility, to be made for the first ten years of commercial operation in one-year intervals. The application shall include plans of the applicant for utilization and training of the available labor force in South Dakota by categories of special skills required. There shall also be an assessment of the adequacy of local manpower to meet temporary and permanent labor requirements during construction and operation of the proposed facility and the estimated percentage that will remain within the county and the township in which the facility is located after construction is completed.	Section 17.0
49-41B-11(5)	20:10:22:25	**Future additions and modifications.** The applicant shall describe any plans for future modification or expansion of the proposed facility or construction of additional facilities which the applicant may wish to be approved in the permit.	Section 18.0

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-35(3)	20:10:22:33	**Decommissioning.** The applicant shall provide a plan or policy statement on action to be taken at the end of the energy conversion facility's on-line life. Estimates of monetary costs, site condition after decommissioning, and the amount of land irretrievably committed shall be included in this statement.	Section 4.4.10 Section 19.0
49-41B-35(3)	20:10:22:33.01	**Decommissioning of wind energy facilities -- Funding for removal of facilities.** The applicant shall provide a plan regarding the action to be taken upon thedecommissioning and removal of the wind energy facilities. Estimates of monetary costs and the site condition after decommissioning shall be included in the plan. The commission may require a bond, guarantee, insurance, or other requirement to provide funding for the decommissioning and removal of a wind energy facility. The commission shall consider the size of the facility, the location of the facility, and the financial condition of the applicant when determining whether to require some type of funding. The same criteria shall be used to determine the amount of any required funding.	Section 19.0
49-41B 11(2,11)	20:10:22:33.02	**Information concerning wind energy facilities.** If a wind energy facility is proposed, the applicant shall provide the following information: (1) Configuration of the wind turbines, including the distance measured from ground level to the blade extended at its highest point, distance between the wind turbines, type of material, and color; (2) The number of wind turbines, including the number of anticipated additions of wind turbines in each of the next five years; (3) Any warning lighting requirements for the wind turbines; (4) Setback distances from off-site buildings, rights-of-way of public roads, and propertylines; (5) Anticipated noise levels during construction and operation; (6) Anticipated electromagnetic interferenceduring operation of the facilities; (7) The proposed wind energy site and major alternatives as depicted on overhead photographs and land use culture maps; (8) Reliability and safety; (9) Right-of-way or condemnation requirements; (10) Necessary clearing activities; (11) Configuration of towers and poles for any electric interconnection facilities, including material, overall height, and width; (12) Conductor configuration and size, length of span between structures, and number of circuits per pole or tower for any electric interconnection facilities; and (13) If any electric interconnection facilities are placed underground, the depth of burial, distance between access points, conductor configuration and size, and number of circuits.	Section 21.0 (1) Sections 4.1 and 4.2 (2) Section 4.2 (3) Section 4.2.6 and Section 12.0 (4) Section 5.2 and Section 12; Figures 3a and 3b (5) Section 11.3 (6) Section 20.3 (7) Section 5; Figures 3a-3b and Figure 11; Appendix B (8) Sections 20.1 and 20.2 (9) Section 4.3.1 (10) Sections 4.4, 6.0, 8.2.2.1 and 9.1.2.3 (11) Sections 4.2.1-4.2.10 (12) Section 4.2.10 (13) Section 4.4.4

Table 1-1. Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-7; 49-41B-22	20:10:22:36	**Additional information in application.** The applicant shall also submit as part of the application any additional information necessary for the local review committees to assess the effects of the proposed facility pursuant to SDCL 49-41B-7. The applicant shall also submit as part of its application any additional information necessary to meet the burden of proof specified in SDCL 49-41B-22.	Section 22.0
49-41-B-35; 49-41B-11	20:10:22:39	**Testimony and exhibits.** Upon the filing of an application pursuant to SDCL 49-41B-11, an applicant shall also file all data, exhibits, and related testimony which the applicant intends to submit in support of its application. The application shall specifically show the witnesses supporting the information contained in the application.	Section 23.0
49-41B-22	N/A	**Applicant's burden of proof.** The applicant has the burden of proof to establish that: (1) The proposed facility will comply with all applicable laws and rules; (2) The facility will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants or expected inhabitants in the siting area. An applicant for an electric transmission line, a solar energy facility, or a wind energy facility that holds a conditional use permit from the applicable local units of government is determined not to threaten the social and economic condition of inhabitants or expected inhabitants in the siting area; (3) The facility will not substantially impair the health, safety or welfare of the inhabitants;and (4) The facility will not unduly interfere with the orderly development of the region with due consideration having been given the views of governing bodies of affected local units of government. An applicant for an electric transmission line, a solar energy facility, or a wind energy facility that holds a conditional use permit from the applicable local units of government is in compliance with this subdivision.	Section 22.4

2.0 PURPOSE OF, AND DEMAND FOR, THE WIND ENERGY FACILITY (ARSD 20:10:22:08, 20:10:22:10)

ARSD 20:10:22:08. Purpose of facility. *The applicant shall describe the purpose of the proposed facility.*

ARSD 20:10:22:10. Demand for facility. *The applicant shall provide a description of present and estimated consumer demand and estimated future energy needs of those customers to be directly served by the proposed facility. The applicant shall also provide data, data sources, assumptions, forecast methods or models, or other reasoning upon which the description is based. This statement shall also include information on the relative contribution to any power or energy distribution network or pool that the proposed facility is projected to supply and a statement on the consequences of delay or termination of the construction of the facility.*

The total installed capacity of the Project will not exceed 200 MW. The purpose of the Project is to generate needed electricity for entities that have an interest in procuring renewable energy. North Bend Wind is actively submitting bids for power purchase agreements (PPA) through various utility, commercial, and industrial opportunities.

The Project will provide numerous local and regional economic benefits. The area where the Project is proposed is largely dependent on an agricultural economy. Local agricultural economies are sensitive to commodity prices and weather, among other things. Wind energy facilities add significant revenue to existing farming operations and create jobs in local communities.

The Project will directly benefit local workers and businesses. During construction, an approximately 200-MW wind project, such as the North Bend Wind Project, typically generates a need for up to 400 temporary construction jobs over a peak construction period of approximately 8 months, with an average of 130 people working on-site at any given time. Construction and operation of such a wind project typically results in millions of dollars being added into the local economy. These investments could potentially benefit many businesses in the community including hotels, restaurants, gas stations, auto repair companies, tire companies, grocery stores, and other local businesses. During operation, there will be O&M responsibilities that will be shared with the Triple H Wind Project. As such, the Project will add approximately eight to ten full-time personnel, such as facility managers, site managers, and turbine technicians, in addition to those who were hired to support the Triple H Wind Project. Over the estimated 30-year life of the Project, the Project is expected to directly and indirectly generate millions of dollars in annual local revenue, including taxes, lease payments, and local staff salaries.

2.1 Renewable Power Demand

The 2020 Lazard Levelized Cost of Energy Analysis (version 14.0) provides an in-depth study of the levelized cost of all types of energy production, including renewable energy resources and more traditional technologies.

Based on this analysis, wind energy is one of the most cost-effective electricity sources for customers, making it a desirable investment for utilities. New wind energy facilities are less expensive to construct than new conventional energy sources, even without the existing production tax credit program. Table 2-1 provides a comparison of the unsubsidized levelized cost of energy for both alternative and conventional energy sources. In general, alternative energy sources provide lower costs per megawatt hour (MWh) than conventional sources.

Table 2-1. Unsubsidized Levelized Cost of Energy

Energy Source	Energy Source	Levelized Cost ($/MW hour)
Alternative Energy	Solar Photovoltaic—Rooftop Residential	$150 – $227
	Solar Photovoltaic—Rooftop Commercial and Industrial	$74 – $179
	Solar Photovoltaic—Crystalline Utility Scale	$31 – $42
	Solar Photovoltaic—Thin Film Utility Scale	$29 – $38
	Geothermal	$59 – $101
	Wind	$26 – $54
Conventional Energy	Gas Peaking	$151 – $198
	Nuclear	$129 – $198
	Coal	$65 – $159
	Gas Combined Cycle	$44 – $73

Source: Lazard 2020

2.1.1 National Energy Demand

In its Annual Energy Outlook 2021, the U.S. Energy Information Administration (USEIA) estimated that electricity demand in the United States will grow slowly and will rise less than 1 percent annually from 2020 to 2050 after electricity demand returns to 2019 levels (following the impacts of COVID-19) in 2022 (USEIA 2021). A U.S. Department of Energy-Office of Energy Efficiency & Renewable Energy (USDOE) report assessed the technical feasibility of using wind energy to generate 20 percent of the nation's electricity demand using wind energy or 300 gigawatts (GW) of wind generating capacity by 2030 (USDOE 2008). The total amount of wind energy capacity in the United States had grown to approximately 111.8 GW (ACP 2021). Reaching a capacity of 300 GW will require an increase of more than 189 GW in 9 years, or 21 GW per year.

In March 2015, the USDOE released its Wind Vision report, which builds on and updates the 2008 20-percent scenario based on wind power penetration of 10 percent by 2020, 20 percent by 2030, and 35 percent by 2050, utilizing plausible variations from central values of wind power and fossil fuel costs. The projected benefits associated with achieving the Wind Vision study scenario are:

- Avoidance of air pollution and reduction in greenhouse gas emissions (avoids 250,000 metric tons of air pollutants and 12.3 gigatons of greenhouse gases by 2050);
- Conservation of water resources (estimated at 260 billion gallons by 2050);
- Increased United States energy security by diversifying electricity portfolio;
- Reduced demand on fossil fuels and reduced energy costs to consumers ($280 billion dollars in consumer savings by 2050);
- Creation of new income for rural landowners and tax revenues for local communities ($3.2 billion annually in tax revenue by 2050); and
- Generation of well-paying jobs (600,000 jobs in manufacturing, installation, maintenance and supporting services by 2050 (USDOE 2015).

The demand for renewable energy from wind is high as project costs decline and capacity increases (USDOE 2018). In many situations, wind energy and natural gas generation are being combined to produce the lowest cost baseload power, thereby driving need and demand. Wind energy is also being

used as a long-term financial hedge against the price of electricity generated from natural gas. Most, if not all, of the region's power producers' resource plans call for increasing the use of fixed cost resources with zero fuel cost, zero pollution, and zero carbon emissions as a necessity to provide cost-effective electricity to their customers. Demand is coming from power producers signing long-term PPAs with wind energy projects or purchasing wind projects outright. Corporate wind procurement reported 700 MW of new PPAs with a total of 5,444 MW for the year (ACP 2020). New demand for wind energy is also coming from non-utility buyers. Corporate and other non-utility customers such as McDonald's Corporation purchased wind energy during 2020 (ACP 2020).

Wind and natural gas are replacing aging coal and nuclear facilities that are being retired for regulatory and financial reasons. Between 2012 and 2016, net coal capacity declined by about 60 GW partly because of compliance with the U.S. Environmental Protection Agency's (EPA's) Mercury and Air Toxic Standards (USEIA 2018). Coal-fired generating capacity may decrease by an additional 109 GW between 2019 and 2025 to comply with the Affordable Clean Energy rule before leveling off near 127 GW in 2050. Like coal, more nuclear capacity is being retired than built. Nearly 19 GW of nuclear capacity are expected to be retired from 2019 through 2050 (USEIA 2021). By contrast, the USEIA projects that more than two-thirds of cumulative wind capacity additions from 2020 to 2050 will occur before the Production Tax Credit (PTC) expires (USEIA 2021).

Wind energy is an inexhaustible source of clean, renewable electric power that can help fill the identified capacity shortfall. Operation of wind turbines does not emit particulates, heavy metals, or greenhouse gases, and does not consume significant water resources. Long-term, fixed-price PPAs for wind generation reduce electric utilities' exposure to fuel price volatility and stabilize energy prices for consumers.

Beyond the market for wind energy, the public has also shown support for the use of renewable energy. In a March 2019 poll, the majority of Americans wanted more emphasis placed on the production of solar power (80 percent) and wind (70 percent; Gallup Inc. 2019). Nationally, 60 percent of Americans were in favor of reducing the use of fossil fuels such as gas, oil, and coal in the United States within the next 10 or 20 years (Gallup, Inc. 2019).

2.1.2 Regional and State Energy Demand

South Dakota also has some of the best onshore wind resources in the nation, and it ranks among the top five states in the share of its in-state electricity generation provided by wind (USEIA 2020). In 2020, South Dakota had over 20 active wind farms consisting of more than 850 wind turbines statewide of approximately 1,848 MW of installed generating capacity (SDPUC 2020). The American Clean Power's U.S. Wind Industry Fourth Quarter Market Report indicated that South Dakota installed and commissioned a total of 774 MW in 2020, ranking ninth among states in the United States for that year (ACP 2020).

South Dakota, and the Project site in particular, has an abundance of wind that allows for energy to be produced with no fuel costs. This allows for the energy to be sold at lower prices compared to other forms of energy projects that rely on purchasing coal or natural gas to create energy. This translates to cheaper power for buyers of wind power and rate payers within the Southwest Power Pool grid, in this case.

The power produced by the Project will be injected at the new substation and into WAPA's existing electrical infrastructure. The Project, at the time of filing this application, has not executed a PPA. That PPA will be a catalyst of the Project moving forward into construction and operation. ENGIE is actively

submitting competitive bids into various commercial and industrial requests for proposals to supply power from the Project. Given the market demand in South Dakota, it is highly likely that the Project will sign a PPA with a commercial or industrial partner (corporate buyers).

2.1.3 Local Benefits

The Project will add meaningful revenue to the local economy. Rural landowners and farmers on whose land the Project is listed will receive annual lease payments for each turbine sited or operational payments for land that does not receive a turbine on their properties. Because only a small portion of the land under lease will be used for the Project, farming operations can continue largely undisturbed.

The Project will be operated within Hughes and Hyde counties and the Highmore-Harrold School District. North Bend Wind anticipates that a total of $7.076 million in taxes will be distributed to the counties over the 30-year life of the Project. There are no organized townships in the Project, and the counties will take the townships' $3.032 million share as required under the Wind Farm Production and Capacity tax found in SDCL Ch. 10-35 (19-1). Assuming no changes to the current law, North Bend Wind projects that the school district will receive $8.435 million over the life of the Project. Highmore-Harrold School District received less than $130,000 state aid for education in fiscal year 2021 (SDDOE 2021). It is anticipated that with the construction of the Triple H Wind Project, no more state aid for education will be given to the school district, and the district will retain all taxes from this Project. Additional information is provided in Section 16.1.2.

Construction, operation, and maintenance of the facility are expected to create up to 400 temporary jobs during the peak construction phase with 130 jobs at any given time, and approximately eight to ten long-term facility manager, site manager, and turbine technician positions, which will benefit local businesses. Statewide and nationally, the wind industry generates well-paying jobs in the entire supply chain, including engineering, manufacturing, and construction.

The construction and operation of a new renewable energy facility in a rural area will result in positive indirect economic impacts in addition to the direct landowner, tax, wage, and donation benefits mentioned above at the local level. These local spillover benefits can include higher occupancy at hotels and more people eating at restaurants during Project construction. A local hardware and machinery supplier might be utilized for the supply of tools during operations. Landowners receiving Project-related payments may spend more in local stores. A school receiving additional tax proceeds may be able to make an improvement to facilities or hire additional staff.

2.1.4 Consequences of Delay

A delay in the Project would result in several consequences. First, there is a substantial demand for turbines in 2022. A delay in the Project would result in the loss of the turbine delivery slot that has been locked in with the turbine vendors, resulting in significant uncertainty as to when additional turbine supply windows could be locked in. Second, similar to turbine availability, the availability of construction firms with significant wind turbine construction experience is limited in 2022. North Bend Wind has not yet selected a construction contractor to construct the Project. A delay in the Project may result in the inability of the construction contractor to support the construction of the Project due to contractional obligations with other projects throughout the country.

In addition, a delay in the Project would not only defer, but also reduce, the Project's benefits to the local communities. Congress has periodically extended or modified the federal PTC over the years in a number

of different capacities. Under existing Internal Revenue Service (IRS) guidance, onshore wind projects that either started construction or met the PTC eligibility were eligible for the 80 percent PTC for a 5-year period. North Bend Wind met the eligibility criteria through the end of 2022 by equipment procurement that would be utilized at the Project site which meets the IRS PTC eligibility.

Delayed operation would also defer the local benefits of increased employment and spending in the community as well as tax revenue benefits to local school districts, the counties, and the state. Additionally, Project costs are subject to commodity flux and rise. If the Project were delayed, the construction costs might increase.

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3.0 ESTIMATED COST OF THE WIND ENERGY FACILITY (ARSD 20:10:22:09)

ARSD 20:10:22:09. Estimated cost of facility. *The applicant shall describe the estimated construction cost of the proposed facility.*

3.1 Capital and Operational Costs

The current estimated capital cost of the Project is between $265 and $285 million based on indicative construction and turbine pricing cost estimates for the proposed turbine layout. This estimate includes lease acquisition and permitting, engineering, procurement and construction of turbines, access roads, underground electrical collector system, Project collection substation, interconnection facilities, a supervisory control and data acquisition (SCADA) system, ADLS, one permanent MET tower, and Project financing.

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4.0 GENERAL SITE AND PROJECT COMPONENT DESCRIPTION (ARSD 20:10:22:11, 20:10:22:33:02, 20:10:22:35)

ARSD 20:10:22:11. General site description. *The application shall contain a general site description of the proposed facility including a description of the specific site and its location with respect to state, county, and other political subdivisions; a map showing prominent features such as cities, lakes and rivers; and maps showing cemeteries, places of historical significance, transportation facilities, or other public facilities adjacent to or abutting the plant or transmission site.*

4.1 Site Location and Overview

The Project is located within Hyde and Hughes counties in the PLSS townships of Butte, Chapelle, Harrold, Holabird, Pleasant Valley, Pratt, and Webster, approximately 10 miles southwest of Highmore. The Project will be located on private and state held land within the Project Area. Table 4-1 lists the counties, townships, sections, and ranges within the Project Area. Figure 1 (Appendix A) shows the Project's location; Figures 2 and 2a (Appendix A) show the preliminary Project layout.

Table 4-1. Project Location

County Name	Township Name	Township	Range	Sections
Hughes	Harrold	T112N	R74W	22, 25-36
Hughes	Pleasant Valley	T111N	R75W	12
Hughes	Webster	T111N	R74W	1-6, 8-26, 34-36
Hughes	Butte	T110N	R74W	1, 2, 11-14
Hyde	Holabird	T112N	R73W	30, 31
Hyde	Chapelle	T111N	R73W	5-8, 17-19, 28-35
Hyde	Pratt	T110N	R73W	2-11, 14-20, 30

4.2 Wind Farm Facility

The Project will consist of up to 71 turbines with an aggregate nameplate capacity of up to 200 MW. The Project will generate utility scale electric power for residential, commercial, and industrial consumers. A detailed view of the Project configuration is shown in Figures 2 and 2a in Appendix A. As discussed further in Sections 11.3 and 12.0, proposed turbine locations meet all applicable state and county setback and noise requirements.

The long-term operational facilities for the Project will also include underground electric collector lines, a collection substation, a SCADA system, access roads to each turbine, and one permanent MET tower. The Project will interconnect to the existing high-voltage transmission grid via the proposed substation located at the southeastern end of the Project. Figures 2 and 2a (Appendix A) show the proposed layout of the Project facilities. At this time, the location of the temporary construction laydown/staging area, approximately 3- to 5-acre temporary batch plant(s), if required, and the permanent MET tower have not been determined. North Bend Wind will grade a temporary laydown/staging area of up to approximately 10 acres within the Project Area on land under lease. On-site temporary batch plant(s), if required, will be approximately 3 to 5 acres and will be located within the Project Area on leased land. The final location of the proposed MET tower will be determined once the layout is final. The permanent MET tower is expected to be a free-standing 40-foot-by-40-foot area and will be located within the Project Area on land under lease.

The Project's layout is based on a detailed analysis of the Project Area and has been sited to avoid or minimize potential impacts. North Bend Wind requests that the permit allow turbines to be shifted within 250 feet of their currently proposed location, as long as specified noise and shadow flicker thresholds are not exceeded, county siting standards are complied with, and conditions specified in the Energy Facility Permit can be complied with. If turbine shifts are greater than 250 feet, exceed the noted thresholds, or do not meet the other limitations specified, North Bend Wind will either use an alternate turbine location or obtain SDPUC approval of the proposed turbine location change.

As a result of final engineering, shifts in the access roads and collector system, as well as the location of temporary facilities (e.g., laydown yard/staging area and any required concrete batch plant[s]), may also be necessary to accommodate turbine shifts and specifically to accommodate the needs of the landowners. Therefore, North Bend Wind requests that the permit allow those facilities to be shifted, as needed, so long as they are located on leased land, and the conditions specified in the Energy Facility Permit can be complied with.

4.2.1 Wind Turbines

4.2.1.1 Wind Turbine Generators

Figures 2 and 2a (Appendix A) show 78 primary and alternative turbine locations, of which up to 71 turbines will be constructed. The Project is considering turbine model layout consisting of 71 General Electric (GE) turbines. The turbine proposed for the Project is the GE 2.82-127 model, which has a rated power of 2.82 MW. The configuration illustrated in Figure 2 (Appendix A) complies with the SDPUC rules and Hyde and Hughes county provisions with respect to setbacks and noise. Detailed schematics of turbine models are not typically available until contract negotiations with vendors is underway. Table 4-2 provides the turbine characteristics for the GE 2.82-127 turbine model being considered for the Project.

Table 4-2. Wind Turbine Characteristics

Characteristic	GE 2.82-127
Nameplate capacity	2,820 kW
Hub height [1]	89 m (292 ft)
Rotor Diameter	127 m (417 ft)
Total height[2]	151.2 m (496 ft)
Cut-in wind speed[3]	3 m/s (6.7 mph)
Rated capacity wind speed[4]	8 m/s (17.8 mph)
Cut-out wind speed[5]	30 m/s (67 mph)
Wind Swept Area	12,668 m^2 (136,357 ft^2)
Maximum rotor speed	15.7 rpm

GE = General Electric
ft = feet
kW = kilowatts
m = meters
m/s = meters per second
rpm = rotations per minute
1 Hub height = the turbine height from the ground to the top of the nacelle
2 Total height = the total turbine height from the ground to the tip of the blade in an upright position
3 Cut-in wind speed = wind speed at which turbine begins operation
4 Rated capacity wind speed = wind speed at which turbine reaches its rated capacity
5 Cut-out wind speed = wind speed above which turbine shuts down operation

The GE 2.82-127 model contains emergency power supplies to allow operation of the control systems, braking systems, yaw systems, and blade pitch systems, and to shut the turbine down safely in the event

grid power is lost. Turbine blades convert linear energy from wind into rotational energy, which the hub transfers to the gear box or directly to the generator located within the nacelle. The transferred mechanical force is converted to electrical energy by the generator. Mechanical and/or ultrasonic anemometers and weathervanes, located on the turbine nacelle, continuously collect real-time wind speed and direction data. Based on the data collected, the turbine yaw system constantly rotates the hub, blades, and nacelle into the wind, while the blade pitch system continuously adjusts the pitch of the blades to optimize the output of the generator. The pitch system also protects the turbine from over-speed events in high winds by pitching the blades perpendicular to the wind, and aero-brakes the turbine to a stop in normal shutdown conditions. The mechanical braking system, located within the nacelle, is used to stop the turbine's rotation in the event of a storm or other turbine fault. The mechanical brake and lock-out system is used to lock the blade rotor to prevent the blades from spinning during maintenance periods or when the turbine is otherwise out of service. The gear box adjusts shaft speeds to maintain generator speed in low and high wind speeds. Electrical energy produced by the generator is transmitted through insulated cables in the power rail to a safety switch and then to a transformer located internally in the tower or externally on the base of the tower.

The Project's design includes safety and control mechanisms. These mechanisms are generally monitored using a SCADA system. Each turbine is connected to the SCADA system via fiber-optic cable, which allows the turbines to be monitored in real time by the O&M staff. The SCADA system also allows the Project to be remotely monitored, thus increasing Project oversight and the performance and reliability of the turbines. Not only will the local O&M office have full control of the turbines, but a 24/7 remote operations facility will also have control of the individual turbines. These two teams will coordinate to ensure that the wind turbines operate safely and efficiently.

Another mechanism for safety and control is the turbines themselves. Each turbine monitors the wind speed and direction to ensure that its current position is most efficient to produce electricity. This data is also used for feathering the blades; applying the brakes in high wind speeds or when there is ice build-up on the blades; and to alert the turbine when the wind is strong enough to begin turning the generator and producing electricity at the "cut-in" wind speed. The Project will utilize Winter Ice Operation Mode (WIOM), which provides stall mitigation during blade icing events. WIOM optimizes pitch controls, improves power output, and reduces the effects of icing on blade stall, which in turn reduces potential blade vibrations.

Operations, maintenance, and service arrangements between the turbine manufacturer and North Bend Wind will be structured to provide timely and efficient operation and maintenance. The computerized data network will provide detailed operating and performance information for each turbine. North Bend Wind will maintain a computer program and database for tracking each turbine's operational history.

4.2.1.2 Wind Turbine Towers

The towers will be conical tubular in shape; painted a non-glare white, off-white, or gray; and marked and lit to comply with Federal Aviation Administration (FAA) requirements. The turbine tower, where the nacelle is mounted, will consist of three to four sections manufactured from certified steel plates. Welds will be made with automatically controlled power welding machines and are ultrasonically inspected during manufacturing per American National Standards Institute specifications. All surfaces will be sandblasted and multi-layer coated for protection against corrosion. Access to the turbine will be through a lockable steel door at the base of the tower. Within the tower, access to the nacelle will be provided by a ladder connecting four platforms and equipped with a fall-arresting safety system.

4.2.1.3 Wind Turbine Foundations

North Bend Wind plans to use a spread foundation design. Foundations for the towers will be approximately 2,700 square feet, with a depth of up to 10 feet. Except for approximately 12 inches that will remain aboveground to allow the tower to be appropriately bolted to the foundation, the tower foundation will be underground. A specific foundation design will be chosen based on soil borings conducted at each turbine location.

The excavated area for the turbine foundations will typically be approximately 75 feet in diameter (37.5-foot radius). During construction, a larger area up to 150-foot radius may be used to lay down the rotors and maneuver cranes during turbine assembly. For purposes of calculating temporary impacts in this Application, North Bend Wind has assumed approximately 113.6 acres of total temporary disturbance from work/staging areas for turbines. After construction, a 35-foot radius around each turbine will be maintained and graveled to prevent potential damage to the underground foundations and cabling that extends to each turbine. The resulting total long-term operational disturbance from the turbines will be reduced to approximately 6.27 acres, which will remain for the life of the Project.

4.2.1.4 Generator Step-up Transformers

The 71 GE 2.82-127 turbines used for the North Bend Wind Project turbines will possess a 34.5-kV generator step-up transformer. The transformer will be located at the base of each turbine. The step-up transformer will be installed to raise the voltage of the electricity generated by the turbine to the power collection line voltage of 34.5 kV at the base of each turbine. The external transformers will require small, concrete slab foundations within the gravel area at the turbine base for support. The exact dimensions of the transformers, concrete pad, and concrete slab will depend on transformer manufacturer specifications and site-specific engineering requirements.

4.2.2 Meteorological Towers

North Bend Wind proposes to construct one permanent MET tower within the Project Area. The final location of the proposed MET tower will be determined once the layout is final. The permanent MET tower is expected to be free-standing and will be equal to the selected turbine hub height.

4.2.3 Access Roads and Crane Paths

Where practicable, existing public roads, private roads, and field paths will be utilized to access Project components. The existing roads may require improvements before, during, or following construction. Where necessary, new access roads will be constructed between existing roadways and Project components. The new and improved access roads will be all-weather, gravel surfaced, and generally up to 16 feet in width. During construction, some of the access roads will be widened to accommodate movement of the turbine erection crane, with temporary widths of up to 40 feet.

The final access road design will depend on geotechnical information obtained during the engineering phase and consultation with the landowners. It is anticipated that the access road network for the Project will include approximately 32.3 miles of new private access roads (Figures 2 and 2a in Appendix A). For purposes of calculating access road impacts in this Application, North Bend Wind has assumed approximately 157.3 acres of temporary disturbance and 62.67 acres of disturbance during the life of the Project for new private access roads.

Separate access may be required for the cranes used to erect the turbines. Large construction cranes may spend as little as one day at each turbine site before moving on to the next. Cranes are sometimes moved cross-country rather than by using the developed access roads. In such cases, temporary crane paths will be constructed between turbine locations. There are a number of reasons for such cross-country movement. The first is time, since taking a more direct route saves time. The second is cost: breaking down the crane is time-consuming and can add costs to a project that cannot be otherwise avoided if the crane needs to pass under an overhead utility line or due to other obstacles. Cross-country walking of the crane enables it to be moved without complete de-rigging and disassembly. However, North Bend Wind generally tries to avoid walking cranes on county roads or state highways since that could impede traffic and potentially damage roads. The third reason for cross-country movement is topography: cranes cannot walk on inclines greater that 10 to 12 percent, and many crane walk routes are designed around topography. Finally, cranes cannot cross a property that is not under easement. Where cranes are required to travel cross-country, workers will lay down some form of cribbing, bedding, or mats to support the weight of the crane without impacting the underlying ground. The cribbing or mats will be removed immediately following passage of the crane, to be re-used elsewhere. Following completion of construction, the temporary crane paths will be removed, and the area will be restored pursuant to the contractual easement obligations with landowners.

4.2.4 Temporary Laydown/Staging Area/Temporary Concrete Batch Plant

North Bend Wind will grade a temporary laydown/staging area of up to approximately 10 acres within the Project Area on land under lease. The potential location for the laydown/staging area will be identified prior to construction. The laydown/staging area will provide parking for construction personnel and a staging area for large equipment deliveries; it will also provide an area to potentially maintain an on-site temporary concrete batch plant during construction. If temporary batch plant(s) are required for the Project to prepare concrete for foundations onsite, they will be strategically placed to avoid sensitive resources and will temporarily impact up to 3 to 5 acres within the Project Area on land under lease.

The laydown/staging area will also be used to conduct maintenance on construction equipment and vehicles and to store fuel. On-site fuel storage will have secondary containment and will be inspected regularly, with containment being remediated promptly in accordance with the Project's Spill Prevention, Control and Countermeasures (SPCC) Plan. Fuel-handling activities and spill remediation will also adhere to the procedures outlined in the Project's SPCC Plan.

4.2.5 O&M Facility

The O&M facility that would support North Bend Wind was constructed in support of the Triple H Wind Project. Its location is provided on Figure 2 and 2a (Appendix A). The O&M building is approximately 5,000 square feet and houses the equipment used to operate and maintain the Project. Ambient conditions within the O&M facility will need to be maintained to meet equipment operating requirements and/or to support the presence of maintenance personnel. Heating of all occupied structures will be provided by propane that will be stored on site. Although the electric power demands of the O&M building and the operating equipment will be supplied from the grid, emergency power generation will also be available on-site via a diesel engine/generator set.

4.2.6 Aircraft Detection Lighting System

An ADLS system maximizes the use of nighttime obstruction lighting at wind projects when there is aircraft activity in the vicinity. The ADLS utilizes a radar system that can detect the presence of aircraft within 30 miles of a wind facility. If an aircraft is detected within this range, the lights operate as normal at night. If there are no aircraft within the detection area, the lighting remains off.

An ADLS system was installed in conjunction with the Triple H Wind Project located immediately to the east of North Bend. That facility is now operational in support of the Triple H Wind Project and utilizes a radar system produced by Terma. The radar and tower associated with the system are located within the Triple H Wind Project O&M facility located along Highway 47. ENGIE, in conjunction with Terma, reviewed the radar coverage of the existing system to see if there was sufficient coverage to support the North Bend Wind layout. While the facility could cover a portion of the North Bend Wind site, it was determined that a separate, standalone ADLS facility site would be needed to order to provide sufficient coverage for the entire Project. ENGIE is working with Terma on determining an appropriate location for the facility, which will require FAA approval.

The ADLS system consists of a tower up to 200 feet tall equipped with an 18-foot antenna mounted on the top of the tower. The size of the tower and its foundation is dependent on the surface location where it is proposed and the topography in proximity. In addition, an outdoor cabinet will be located at the base of the tower that contains equipment associated with the system. This system is connected directly to each turbine to control the lighting system in the towers. The ADLS system will be connected by a collection cable run to the closest turbine. If the system is shut down due to an event such as a power outage, the default operational mode involves having the lighting operate as it would normally, per the FAA requirements.

4.2.7 Electrical Collector System

The proposed collector system layout based on the proposed turbine configuration is shown on Figures 2 and 2a (Appendix A).

From the step-up transformers at each turbine, which raise the voltage to 34.5 kV, power will run through an underground system of collection cables, collector buses, and feeder breakers, referred to as a collector system, that connects to the Project collection substation. The Project collection substation will raise the voltage to 230 kV to tie into the grid. Up to 63 miles of underground circuits will be installed by trenching, plowing, or where required, directionally boring the cables underground to avoid sensitive environmental conditions or meet other requirements. Generally, the electrical collector lines will be buried to a minimum depth of 38 inches with marking tape and tracer wire to meet the appropriate national electrical code. North Bend Wind will register the appropriate underground facilities with the South Dakota One-Call system.

4.2.8 Fiber Optic Communication System

When installing the collector system, North Bend Wind will also install fiber optic communication systems connecting each of the Project's turbines to the Project collection substation to provide for communication among the turbines, collection substation, O&M facility, and electrical grid as part of SCADA (see Section 4.2.1.1). If underground, the electrical and fiber optic cables will be placed in the same trench wherever possible and will include occasional aboveground junction boxes.

4.2.9 Project Collection Substation

The collection substation will be located in the southern portion of the Project Area and will consist of two substation transformers; circuit breakers; switching devices; auxiliary equipment; a control enclosure containing equipment for proper control, protection, monitoring and communications; and associated equipment and facilities. The principal function of the collection substation is to increase the voltage from 34.5 kV at the collector system to the voltage of the 230-kV transmission line, which will transport the electricity of the entire Project to the grid via the proposed substation.

Up to 5 acres of land will be leased from South Dakota School and Public Lands Department to facilitate construction and operation of the collection substation (Figure 2 in Appendix A). The collection substation will be located within a fenced area. The fence will be designed in accordance with industry standards to provide safety and security. As discussed in Section 4.2, North Bend Wind requests that the permit allow Project facilities, including the collection substation, to be modified as needed provided that the new locations are on land leased for the Project, cultural resource impacts are avoided, and conditions specified in the Energy Facility Permit are met.

4.2.10 Interconnection Facilities and Switching Station

The interconnection switching station will be located within the Project Area adjacent to the 230-kV transmission line. The switching station will serve as the electrical interconnection between the Project and the grid. The switching station will consist of 230-kV circuit breakers; disconnect switches; bus conductors; auxiliary equipment; and a control enclosure containing equipment for proper control, protection, monitoring, and communications. The switching station will be located within a fenced area. The fence will be designed in accordance with industry standards to provide safety and security.

WAPA, the owner and operator of the 230-kV transmission line, will be responsible for the construction and operation of the switching station. North Bend Wind determined the location of the interconnection switching station as identified in Figure 2 (Appendix A). WAPA is estimating that the interconnection switching station will utilize approximately 20 acres.

WAPA will construct a 230-kV interconnection facility connecting the collection substation and the interconnection switching station. As discussed in Section 1.1 of this Application, because the interconnection facility is a 230-kV transmission line up to 500-foot-long, does not cross any public highways, and does not require the use of eminent domain, it does not require a permit from SDPUC and will be permitted locally.

4.3 Land Requirements

Temporary construction and long-term operational land requirements are identified below. Table 6-1 in Section 6.0 presents impact calculations.

- Temporary construction land requirements:
  - 150-foot radius at each wind turbine location, which includes a 60-foot-by-80-foot crane pad area at each turbine;
  - Access roads initially will be up to 40 feet wide to accommodate transportation of heavy construction equipment during construction;
  - 40-foot-wide crane paths (contingent upon turbine selection);

  - 40-foot-wide construction workspace to install collector and communication systems;
  - 10-acre temporary laydown/staging area/concrete batch plant(s);
  - 5-acre Project collection substation area;
  - 20-acre Project interconnect switching station area; and
  - 100-foot-by-100-foot MET tower workspace.
- Operational impacts during the life of the Project:
  - 35-foot-radius at each wind turbine location;
  - 16-foot-wide long-term operational access roads;
  - 2.5-acre Project collection substation footprint;
  - 20-acre interconnect switching station footprint; and
  - 40-foot-by-40-foot MET tower footprint.

4.3.1 Right-of-way or Condemnation Requirements (ARSD 20:10:22:33.02 and 20:10:22:35)

North Bend Wind has not requested nor would seek to utilize eminent domain powers to acquire easements for the Project. All land rights required for the wind energy facility and transmission line were obtained through voluntary easements with property owners. Private land and public road rights-of-way will be used for all facilities.

4.4 Wind Farm Facility Construction, Restoration, Operation and Maintenance Procedures

North Bend Wind plans to commence construction as early as within 30 days of receiving all required federal, state, and local approvals and major contracts. Construction is expected to require a period of approximately 12 months or less. North Bend Wind anticipates that the majority of civil construction will begin in early 2022. Turbine deliveries will occur through the summer of 2022. Energization of the Project substation will occur by end of 2022, or earlier per contractual requirements, with a reduction in construction activities over the winter.

4.4.1 Mobilization and Site Preparation

The first step in construction will be to survey, stake, and prepare the workspace for clearing. North Bend Wind will then have the workspace cleared and graded, as necessary, to provide for construction access and the safe movement of equipment and personnel during construction. Silt fence and other erosion control measures will be installed in accordance with the Project's Stormwater Pollution Prevention Plan (SWPPP) and applicable permit conditions. Environmentally sensitive areas will be marked for avoidance. North Bend Wind will implement appropriate safety measures before excavation begins, including notification through the South Dakota One-Call system to ensure third-party utilities and adjacent pipelines are properly marked. Equipment and vehicles will be transported to the Project Area and staged at the temporary laydown/staging area. During construction activities, dust control measures will be applied to manage dust along access roads, the laydown/staging area, and other construction workspaces.

Potable water and sanitary facilities will be established to support the construction crews at the Project site. Potable water will be provided from off-site facilities, and sanitary facilities will be provided in the form of portable latrines by an outside vendor. Some construction areas and the laydown/staging area will be fenced to prevent access by wildlife or unauthorized personnel as needed.

4.4.2 Roadwork

North Bend Wind will construct one gravel access road to each turbine location. Access roads will initially be up to 40 feet wide to accommodate transportation of heavy construction equipment during construction. Before gravel is placed on the access roads, topsoil will be removed and stockpiled in the temporary construction workspace, subsoil will be compacted, and a geotextile matting will be installed. North Bend Wind will install temporary culverts and field approaches where needed to maintain adequate access and drainage throughout construction.

After construction has been completed, temporary access roads will be converted to narrower, long-term operational access roads up to 16 feet wide. These long-term operational access roads will be maintained to facilitate access to the turbine for ongoing operation and maintenance. The temporary portion of the access roads will be restored after use by removing the gravel and geotextile fabric, decompacting the subsoil, and replacing the stored topsoil.

A similar process will be used to develop crane paths. North Bend Wind will clear, grade, and segregate the topsoil along the crane paths and compact the subsoil. Once construction is complete, crane paths will be restored by decompacting the subsoil, replacing the topsoil, and seeding in accordance with landowner or local agency requests.

Public roads may also need improvements to allow for the safe and efficient access of flatbed trailers carrying the turbine tower components to the Project Area. North Bend Wind is in the process of identifying the best haul route to the Project Area and where existing road improvements may be required. Final haul routes will be selected in consultation with the Hyde County Road Department and Hughes County Highway Department during the development of a Project-specific road use agreement. North Bend Wind will work with the appropriate federal, state, and/or local agencies to obtain the permits required for these improvements. See Section 16.4 for more information.

4.4.3 Installation of Turbine Foundations

North Bend Wind will next initiate the construction of the turbine foundations by clearing, removing, and stockpiling the topsoil and subsoil from each turbine site. Topsoil and subsoil will be stored separately in a semicircle around the foundation. Foundations will be constructed by excavating an approximately 75-foot-diameter hole, placing reinforcing steel and pouring concrete into the excavation. Next, the subsoil and topsoil will be replaced over most of the concrete foundation, leaving only the center of the foundation above the surface grade.

North Bend Wind will clear, grade, and develop a 150-foot radius around each turbine location, including a 60-by-80-foot crane pad area extending from the access road to the turbine foundation, that will be used to erect the turbine tower. After construction, a 35-foot radius around each turbine will be maintained and graveled to prevent potential damage to the underground foundation and cabling that extends to each turbine. The remaining temporary construction area around each wind turbine will be restored and returned to its pre-construction use pursuant to the contractual easement obligations.

4.4.4 Installation of Electrical Collector and Communication Systems

To install the underground collection lines and fiber optic cables, North Bend Wind will trench, plow, or where needed, directionally bore the cables underground to avoid sensitive environmental areas or to address other needs. Trenching and plowing are anticipated to be the primary methods of installation. Typical collector lines will be installed at least 42 inches below grade. Generally, the electrical collection lines will be buried with marking tape and tracer wire per appropriate national electrical code, and the Project will register the appropriate underground facilities with the South Dakota One-Call system. Lines are typically plowed in using bulldozers and associated plowing equipment. Where trenching is appropriate, topsoil will be segregated according to applicable permit conditions. The cables will be placed into the trench and backfilled. During backfilling, subsoil will be replaced first and then the topsoil will be replaced.

4.4.5 Tower Deliveries and Erection

The first sections of the turbine to be delivered and erected are the base and mid-sections of the tower. These will be transported to the Project Area by semi-truck and then assembled by crane in the crane pad area. The typical process includes the following steps:

1. The two tower sections are assembled, and the base is bolted to the foundation.
2. The top tower section is erected, and then the nacelle is raised and bolted to the top.
3. The blades are connected to the hub, collectively called the rotor assembly, which is then connected to a shaft that passes into the nacelle.

Each turbine requires 4 to 5 days to erect, from offload to pre-assembly and staging of components. Once installed, North Bend Wind will mark and light the turbines to comply with FAA requirements and the requirements of other permits.

4.4.6 Construction of Project Collection Substation

The Project collection substation area will require initial civil and grading work to prepare for construction and to create positive drainage for the facilities. The collection substation will be constructed, and all associated safety, electrical, and controls equipment will be installed using applicable utility standards. Power and control cables will be routed, and additional pre-operational testing could begin once the system(s) are energized. Once the Project is fully operational, all systems will then be re-checked. Final site civil work will be completed. Once all final checks have been completed, the facility will be turned over to operations for in-service operation.

4.4.7 Installation of Permanent Meteorological Tower

Similar to turbines, one permanent MET tower will be erected using a crane. The base will be erected and bolted to the foundation. A 100-by-100-foot square temporary workspace will be required for foundation installation and stacking the MET tower. The foundation will be a 10-by-10-foot square within a 40-by-40-foot footprint, and long-term operational access roads will be required. North Bend Wind will paint the MET tower to meet applicable regulations and best practices to improve visibility. North Bend Wind will also notify local airports about the Project and new towers in the area to reduce the risk to crop dusters. The permanent MET tower will be free-standing with no guy wires and will be equipped with FAA-approved lighting and markings.

4.4.8 Restoration Procedures

Once construction is complete, the construction workspace will be cleaned up and restored. All temporary construction workspaces, such as the crane paths, temporary access roads, the temporary laydown/staging area, and extra workspace areas (e.g., crane pad), will be restored by removing gravel (where applicable), decompacting the subsoil, and replacing stored topsoil to pre-construction conditions pursuant to the contractual easement obligations. Temporary and long-term operational stabilization measures, such as slope breakers and mulching and seeding with the appropriate seed mix, will then be implemented. North Bend Wind will compensate landowners for damages from Project construction to crops, tile, fences, or other property.

North Bend Wind will develop and implement a Noxious and Invasive Weed Management Plan that will identify and establish the procedures to prevent the introduction and spread of noxious and invasive weeds during construction and ongoing operations. Additional information regarding noxious weeds is available in Section 9.1.

4.4.9 Operation and Maintenance

The expected life span of the Project is approximately 30 years. As described in Section 4.2.1, all proposed turbine models have SCADA communication technology to control and monitor the Project. The SCADA communications system permits automatic, independent operation and remote supervision, allowing the simultaneous control of the wind turbines at all times. An O&M crew will be on-site during normal working hours to monitor turbine operation from the O&M facility and to conduct maintenance activities.

All major components of turbines will undergo routine maintenance according to the schedules established by the component manufacturer. Examples of such activities include lubrication filter replacements, gear oil changeouts, adding coolant, greasing, and applying paints or coatings for corrosion control. Over the life of the turbine, some mechanical components may also need repair or replacement.

Other activities include the regrading and gravel replacement on access roads, routine electrical inspections, and the application of herbicides to control noxious and invasive weeds. North Bend Wind will also conduct routine preventative maintenance testing of on-site emergency power generators and maintain fuel levels of on-site propane and fuel tanks.

Access doors to individual turbine towers will be secured against unauthorized entry at all times. Doors to the O&M facility and equipment enclosures will also be locked, and physical barriers such as fences will be maintained around the Project collection substation and external tower transformers to prevent unauthorized entry.

4.4.10 Decommissioning

The anticipated Project life is approximately 30 years beyond the date of initiating commercial operation. At the end of commercial operation, North Bend Wind will be responsible for removing wind facilities and the turbine foundations to a depth of 4 feet below grade. In this case, a decision may be made on whether to continue operation with existing equipment or to retrofit the turbines and power system with upgrades based on newer technologies.

North Bend Wind will be responsible for all costs to decommission the Project and associated facilities. North Bend Wind has outlined its decommissioning plan similar to the Triple H Wind Project and

anticipates similar SDPUC conditions. The cost to decommission will depend on the prevailing rates for salvage value of the equipment and labor costs. Because of the uncertainties surrounding future decommissioning costs and salvage values, North Bend Wind will review and update the cost estimate of decommissioning and restoration for the Project every 5 years after Project commissioning. See Section 19.0 of this Application for more detail on decommissioning.

5.0 ALTERNATIVE SITES AND SITING CRITERIA (ARSD 20:10:22:12)

***ARSD 20:10:22:12. Alternative sites**. The applicant shall present information related to its selection of the proposed site for the facility, including the following:*

(1) The general criteria used to select alternative sites, how these criteria were measured and weighed, and reasons for selecting these criteria;
(2) An evaluation of alternative sites considered by the applicant for the facility;
(3) An evaluation of the proposed plant, wind energy, or transmission site and its advantages over the other alternative sites considered by the applicant, including a discussion of the extent to which reliance upon eminent domain powers could be reduced by use of an alternative site, alternative generation method, or alternative waste handling method.

In addition to access to electric transmission facilities and sufficient wind, a wind energy project must be located in an area where landowners are willing to grant various easements and leases on commercially reasonable terms and conditions and where land use provides sufficient space for optimum turbine spacing. Access to electric transmission must be available so that the power generated by the wind project can be relatively easily delivered into the grid.

The following sections describe the criteria that were considered in determining the development potential of the site, identifying the appropriate Project Area to develop, and designing the Project's proposed configuration within the Project Area. Included is a summary of how North Bend Wind has voluntarily followed the U.S. Fish and Wildlife (USFWS) Land-Based Wind Energy Guidelines (WEG; USFWS 2012) and the USFWS Region 6 Wildlife Buffer Recommendations for Wind Energy Projects (USFWS 2020a) to minimize risks to species of concerns.

5.1 Site Evaluation Process and Project Area Refinement

Development of a wind energy project is an iterative process that involves: (1) site identification; (2) project area refinement; and (3) micrositing of project infrastructure. The identification of the Project Area was primarily driven by:

- Available wind energy resource;
- Ready access to transmission interconnection;
- Land use and environmental compatibility with wind development; and
- Landowner support for wind energy development.

Each of these factors is discussed further below.

5.1.1 Wind Resource

Strong wind speeds—key for development of a competitive, economically viable wind project—occur in the region and in the immediate area of the Project. Wind resources in the Project Area are significantly better than an average site in the upper Great Plains, making the Project very competitive on a regional basis. Areas with an annual average wind speed around 6.5 meters per second (m/s) and over 80 meters in height are generally considered to have a wind resource suitable for development. According to the USDOE (2017), wind resources within the Project's region range from 7.0 to 9.0 m/s at a 100-meter hub

height, making it a highly suitable wind resource for economical, sustainable, and reliable production of power. North Bend Wind's proposed hub height is 89 meters.

5.1.2 Ready Access to Transmission Interconnection

The Fort Thompson-Oahe 230-kV transmission line is located within the Project Area. This transmission line provides direct access to available transmission minimizes the interconnection infrastructure needed and helps reduce overall Project costs. No state-permitted transmission line is required to implement this Project; however, the proposed interconnection of the Project to WAPA's transmission system is a federal action under NEPA where WAPA is providing federal oversight of the preparation of an EA.

5.1.3 Land Use and Environmental Compatibility

The Project Area was selected following a review of the surrounding land use and regional constraints. The Project is compatible with the existing primarily agricultural land uses consisting of cropland, grassland pasture, and grass hay land. Wind development is particularly compatible with agricultural land because the existing uses can continue around the wind energy facility and transmission line. As a result, wind development allows landowners to diversify their operations with minimal disruption to existing agricultural uses.

Once the initial site location had been selected, the Project Area was modified over time based on landowner interest and to avoid environmental concerns based on consultations with federal, state, and local agencies.

North Bend Wind conducted an evaluation of the Project Area under easement to determine turbine layouts after applicable setbacks and constraints were applied (Appendix B). After all setbacks were applied, 21.1 percent of the original easement area was available to place turbines, representing a decrease of almost 80 percent in area. This area was further evaluated for the current Project layout configuration.

5.2 Site Configuration Alternatives

Figure 2 (Appendix A) shows 78 turbine locations, of which only up to 71 locations will be used. The proposed layout reflects an optimal turbine model to best capture wind energy within the Project Area, while avoiding negative impacts to residences, known cultural resources, wetlands, grasslands, and sensitive species and their habitats.

As discussed in Section 4.2, final engineering could result in minor turbine location adjustments. However, the final Project layout will comply with all applicable federal, state, and local requirements, including the state and local requirements and/or commitments listed in Table 5-1 below. The buildable area for turbines, after considering the setbacks in Table 5-1 as well as additional environmental setbacks, is visually depicted on the siting constraints maps provided as Figures 3a and 3b (Appendix A).

Table 5-1. North Bend Wind Turbine Siting Requirements/Commitments

Category	Requirement/Commitment
State Requirements	
Setbacks	Turbines shall be set back at least 500 feet or 1.1 times the height of the tower, whichever is greater, from any surrounding property line. However, if the owner of the wind turbine tower has a written agreement with an adjacent land owner allowing the placement of the tower closer to the property line, the tower may be placed closer to the property line shared with that adjacent land owner (SDCL 43-13-24).
Hyde County	
Setbacks	1. The setback from any established dwelling shall be 2,640 feet or 4.9 times tower height, whichever is greater; an exception may be granted in the event that all adjoining property owners sign an opt out from the setback requirement. The opt out may result in a setback of no less than 1,400 feet minimum from an established dwelling or one point one (1.1) the system height; whichever is greater. 2. The setback from any county gravel roads, section line roads, highways and minimum maintenance roads shall be not less than 750 feet or 1.4 times the tower height, whichever is greater. 3. Distance from the exterior boundary of the proposed wind project shall be not less than 500 feet or 1.1 times the system height, whichever is greater, unless appropriate opt out has been obtained from all adjoining property owners.
Noise	Noise level produced by the large wind energy system (LWES) shall not exceed 45 decibels of sound at the perimeter of occupied residences existing at the time the permit application is filed, unless a signed waiver or easement is obtained from the owner of the residence. The level, however, may be exceeded during short-term events such as utility outages or windstorms.
Turbine Spacing	The turbines shall be spaced no closer than is allowed by the turbine manufacturer in its approval of the turbine array for warranty purposes. Minimum spacing is actually rotor diameter, which is greater than manufacturer requirements.
Flicker	Flicker at any receptor shall not exceed 30 hours per year within an established dwelling and 40 hours per year from any occupied structure.
Height from Ground Surface	The minimum height of blade tips at their lowest possible point shall be 25 feet above grade.
Hughes County	
Setbacks	1. Distance from currently occupied residences, business and public buildings shall be not less than two thousand six hundred forty feet (2640) or 4.9 times the tower height, whichever is greater, unless written permission is granted by the affected property owner. The written permission shall be in a form that is acceptable for recording with the Register of Deeds. The written permission may result in a setback of no less than one thousand four hundred feet (1400) and must be filed with the Hughes County Register of Deeds. For the purposes of this section only, the term “business” does not include agricultural uses. 2. Distance from right-of-way of public roads shall be not less than one point one (1.1) times the system height. 3. Distance from any property line shall be not less than one point one (1.1) times the system height, unless appropriate easement has been obtained from adjoining property owner and recorded with the Register of Deeds
Noise	Noise level produced by the large wind energy conversion systems shall not exceed 45 dBA, average A-weighted sound pressure at the perimeter of occupied residences existing at the time the permit application is filed, unless a signed waiver or easement is obtained from the owner of the residence and recorded with the Register of Deeds.
Turbine Spacing	The turbines shall be spaced no closer than is allowed by the turbine manufacturer in its approval of the turbine array for warranty purposes. Minimum spacing is actually rotor diameter, which is greater than manufacturer requirements.
Height from Ground Surface	The minimum height of blade tips at their lowest possible point shall be 25 feet above grade.

5.3 Lack of Reliance on Eminent Domain Powers

North Bend Wind does not have eminent domain powers to acquire easements for the Project. As a result, selection of an alternative site will not reduce reliance on eminent domain powers. Private land rights and public road rights-of-way will be used for all facilities. All private land rights required for the wind energy facility were obtained through voluntary leases with property owners. North Bend Wind will obtain necessary road permits from road authorities prior to construction. Further, North Bend Wind will coordinate with federal, state, and local agencies to obtain appropriate permits for the Project.

6.0 ENVIRONMENTAL INFORMATION (ARSD 20:10:22:13)

ARSD 20:10:22:13. Environmental information. *The applicant shall provide a description of the existing environment at the time of the submission of the application, estimates of changes in the existing environment which are anticipated to result from construction and operation of the proposed facility, and identification of irreversible changes which are anticipated to remain beyond the operating lifetime of the facility. The environmental effects shall be calculated to reveal and assess demonstrated or suspected hazards to the health and welfare of human, plant and animal communities which may be cumulative or synergistic consequences of siting the proposed facility in combination with any operating energy conversion facilities, existing or under construction. The applicant shall provide a list of other major industrial facilities under regulation which may have an adverse effect on the environment as a result of their construction or operation in the transmission site, wind energy site, or siting area.*

Sections 7.0 through 11.0, 13.0, 14.0, and 16.0 provide descriptions of the existing environment at the time of Application submittal, the potential changes to the existing environment that are anticipated as a result of Project construction and operation, and the irreversible changes that are anticipated to remain beyond the operational lifetime of the facility. These sections also identify the avoidance, minimization, and mitigation measures that will be implemented for the Project.

Impacts are quantified where possible based on either publicly available information or field survey data. For purposes of analyzing environmental resource impacts, both temporary construction and long-term operational impacts were evaluated. For this reason, impacts to environmental resources are based on a worst-case scenario.

Two operating energy conversion facilities are located in proximity to the Project Area (Figure 1 in Appendix A):

- Triple H Wind Project consists of 92 turbines and will be an approximately 250-MW facility located immediately adjacent to the Project to the west of State Highway 47. Triple H Wind commenced operation December 2020 (Docket # EL 19-007).
- The South Dakota Wind Energy Center is a 40.5-MW facility located approximately 4 miles east of the Project Area. This NextEra Energy Resources wind farm consists of 27 turbines and has been in operation since 2003.

Although the SDPUC has siting authority for wind farms with a capacity of 100 MW or more, and one of these facilities fall below that threshold, North Bend Wind has reviewed the cumulative effects associated with the operation of the wind projects listed above and the currently proposed Project.

The Project, in combination with the 40.5-MW South Dakota Wind Energy Center and Triple H Wind, will result in the construction and operation of up to 173 wind turbines and associated access roads, collector lines, and other facilities in Hughes and Hyde counties. The South Dakota Wind Energy Center turbines are in short east-west oriented strings, with the strings approximately 2 miles long (Figure 1 in Appendix A). Triple H wind turbines are west-east oriented strings with the strings approximately 2 to 4 miles long.

Table 6-1 presents both the temporary construction impacts and long-term operational impacts by Project component and is limited to the final Project layout not including Project interconnection switching

station, temporary batch plant locations, and the laydown area location. See Section 4.0 for additional information on Project components.

Table 6-1. Summary of North Bend Wind Ground Disturbance Impacts

Project Component[1]	Construction Impacts (Temporary)		Operational Impacts (Long-Term)	
	Dimensions	Total Acreage	Dimensions	Total Acreage
Turbine Foundations[2] (includes crane pad area adjacent to turbine foundation)	150-foot radius x 71 turbines	114.89	35-foot radius x 71 turbines	6.24
Access Roads[3,4]	40 feet wide x 32.3 miles	157.3	16 feet wide x 32.3 miles	62.67
Electrical Collector and Communication Systems	40 feet wide x 63.0 miles	305.38	N/A	-
Temporary Laydown/Staging Area	10 acres	10	N/A	-
Batch Plant(s), if Required	5 acres x 2 locations	10	N/A	-
Project Collection Substation[5]	5 acres	5	2.5 acres	2.5
Interconnection Switching Station[5, 6]	20 acres	20	20 acres	20
One Permanent MET Tower	100 feet by 100 feet	0.23	40 feet by 40 feet	0.04
	Total	**559.2**	**Total**	**90.85**

1 The O&M facility acreage is not included because this component is built as part of the Triple H Wind Project.
2 Ground disturbance impacts are based on installing 71 turbines.
3 Separate crane paths up to 40 feet wide may be required. Following completion of construction, any temporary crane paths will be removed, and the area restored pursuant to the contractual easement obligations.
4 Access road calculations are based on routes to up to 71 turbines.
5 Total impact may be overestimated due to overlap of components.
6 The 230-kV interconnection switching station will be constructed, owned, and operated by WAPA.

As discussed in Sections 7.0 through 11.0, 13.0, 14.0, and 16.0 of this Application, impacts to the physical environment, hydrologic resources, terrestrial and aquatic ecosystems, and socioeconomic and community resources have been avoided or minimized during the siting and design of the Project. Furthermore, implementation of the mitigation measures identified in this Application will minimize potential impacts of the Project on all resources. Because of the measures that North Bend Wind will implement to minimize the potential impacts of the Project on all resources, the construction and operation of the Project will not cause any irreversible change that would exist beyond the operating lifetime of the facility.

7.0 EFFECT ON PHYSICAL ENVIRONMENT (ARSD 20:10:22:14)

***ARSD 20:10:22:14. Effect on physical environment**. The applicant shall provide information describing the effect of the proposed facility on the physical environment. The information shall include:*

(1) A written description of the regional land forms surrounding the proposed plant or wind energy site or through which the transmission facility will pass;
(2) A topographic map of the plant, wind energy, or transmission site;
(3) A written summary of the geological features of the plant, wind energy, or transmission site using the topographic map as a base showing the bedrock geology and surficial geology with sufficient cross-sections to depict the major subsurface variations in the siting area;
(4) A description and location of economic deposits such as lignite, sand and gravel, scoria, and industrial and ceramic quality clay existent within the plant, wind energy, or transmission site;
(5) A description of the soil type at the plant, wind energy, or transmission site;
(6) An analysis of potential erosion or sedimentation which may result from site clearing, construction, or operating activities and measures which will be taken for their control;
(7) Information on areas of seismic risks, subsidence potential and slope instability for the plant, wind energy, or transmission site; and
(8) An analysis of any constraints that may be imposed by geological characteristics on the design, construction, or operation of the proposed facility and a description of plans to offset such constraints.

7.1 Geological Resources

7.1.1 Existing Geological Resources

7.1.1.1 Regional Landforms/Physiography

The North Bend Wind Project Area lies entirely within the Great Plains Province, the second largest physiographic province in the United States. The Great Plains span 450,000 square miles of flat high plains, bordered to the west by the Rocky Mountains and the east by the Central Lowlands (NPS 2018).

The Project Area lies within the Coteau du Missouri division of the Great Plains Province (USGS 1986). The Coteau du Missouri is a north-south trending 25- to 80-mile-wide highland extending through South Dakota occupying a belt of territory between the Missouri River Trench and James River Lowland physiographic divisions (Speck 1988; Helgerson and Duchossois 1987). The James River Lowland division, located east of the Project Area, is approximately 500 feet lower in elevation than the Coteau du Missouri. The Missouri River Trench is located southwest and south of the Project Area and bisects the Coteau du Missouri from the main piece of the Missouri Plateau. Topographic highs within the Coteau du Missouri include Ree, Wessington and Orient Hills while topographic lows are found in the Great Ree Valley associated with the James River Lowlands (Helgerson and Duchossois 1987).

The Project Area is in south-western Hyde County and east-central Hughes County traversing portions of the Ree Hills. The Ree Hills have the highest elevation in Hyde County with an elevation of 2,190 feet above mean sea level located east of the Project Area. Hughes County highest elevation of 2,055 feet above mean sea level is located southwest of the Project Area. The Missouri River Trench and Lake Sharpe impoundment of the Missouri River is located in extreme southwestern Hyde County and borders the southern boundary of Hughes County with a full pool level of 1,420 feet above mean sea level

(Helgerson and Duchossois 1987; Lakes Online 2021). This represents a topographic variation in Hyde County of approximately 770 feet and approximately 635 feet in Hughes County. Figure 4a (Appendix A) shows that the topographic relief within the Project Area ranges from approximately 1,800 to 2,145 feet above mean sea level, which represents a variation of approximately 345 feet (U.S. Geological Survey [USGS] 7.5-minute topographic quadrangles Chapelle Lake, Chapelle Lake NW, Chapelle Lake SE, Chapelle Lake SW and De Grey NE; USGS 2021a).

7.1.1.2 Surficial Geology

The surficial geology of Hyde and Hughes counties consists of late Wisconsin age glacial deposits, which form a mantle up to 500 feet thick over the Pierre shale bedrock and consist primarily of till and outwash. In the Project Area, these surficial deposits generally range from 50 feet in thickness up to 150 feet in thickness. Recent deposits include alluvial sediments in stream valleys and colluvium along the Coteau du Missouri escarpment (Helgerson and Duchossois 1987). Figures 4a through 4d (Appendix A) illustrate the surficial geology present within the Project Area, which consists of:

- Upper Wisconsin Ground moraine till (Qltg): Consists of a compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature that is characterized by smooth, rolling terrain. Composite thickness of upper Wisconsin till may be up to 300 feet (Martin et al. 2004). Ground moraine till is the predominant surficial geology that covers most of the Project Area.
- Upper Wisconsin End moraine till (Qlte): Consists of compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature that is characterized by a ridge-like accumulation of glacial drift typified by lineations and potholes. Composite thickness of upper Wisconsin till may be up to 300 feet (Martin et al. 2004). End moraine till is only present in the very northwestern and southeastern portions of the Project Area.
- Upper Wisconsin Stagnation moraine till (Qlts): Consists of a compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature that is characterized by hummocky terrain with abundant sloughs resulting from stagnation of ice sheets. Composite thickness of upper Wisconsin till may be up to 300 feet (Martin et al. 2004). Stagnation moraine till is only present in the top third of the Project Area.
- Quaternary Alluvium (Qal): Contains clay- to boulder-sized clasts with locally abundant organic material reaching a thickness of up to 75 feet (Martin et al. 2004). Quaternary Alluvium bisects the center of the Project Area along Chapelle Creek.

7.1.1.3 Bedrock Geology

Upper Cretaceous age Pierre shale is the shallowest bedrock encountered. The shale outcrops in the extreme southwest portion of Hyde County near the Missouri River. In the rest of Hyde and Hughes counties and in the Project Area, the shale lies beneath thick glacial deposits as shown in Figures 4b through 4d (Appendix A; Helgerson and Duchossois 1987). Pierre shale is a blue-gray to dark-gray, fissile to blocky shale with persistent beads of bentonite, black organic shale, and light-brown chalky shale. It contains minor sandstone, conglomerate, and abundant carbonate and ferruginous concretions (Martin et al. 2004).

7.1.1.4 Mineral Resources/Economic Deposits

Commercial mineral deposits within the Project Area are limited to sand, gravel, and construction aggregate enterprises. Information from the South Dakota Department of Environment and Natural Resources (SDDENR) Minerals and Mining Program mapping shows six active sand and gravel permits within the Project Area and four active permits within 2 miles of the Project Area (SDDENR 2021a; Figure 4a in Appendix A). Two inactive reclaimed sites are also located within the Project Area and are associated with the active permit sites near Chapelle Creek.

A review of the online information from the SDDENR Oil and Gas Initiative Program Geographic Information System (GIS) website shows that the Project Area does not lie within an oil and gas field (SDDENR 2021b). The nearest identified oil and gas fields are the Lantry field in Dewey County, located over 85 miles northwest of the Project Area and the Faith field located in Meade County, over 115 miles northwest of the Project (SDDENR 2021b). There are no active oil and gas wells within Hyde or Hughes counties (SDDENR 2021b). There is one plugged and abandoned oil and gas well within the western portion of the Project Area, north of the intersection of 318th Avenue and 204th Street. No other active or historical economic mineral deposits have been identified within the vicinity of the Project.

7.1.1.5 Seismic Risks

The risk of seismic activity in the Project Area is extremely low to negligible. Probabilistic hazard data and maps portray peak horizontal acceleration and horizontal spectral response acceleration for 0.2, 1.0, and 5.0 second periods with a probability of exceedance of 2 percent, 5 percent, and 10 percent in 50 years (Rukstales and Peterson 2019). Probabilistic maps take into account a geologic and seismic information, including: the past history of earthquakes on a given fault; the past history of small earthquakes; how much ground shaking past earthquakes produced; the location and distribution of faults in a given region; how the Earth and rocks respond to ground shaking; how rapidly the Earth is deforming in response to tectonic forces; and where deformation is occurring (USGS 2021b). The peak acceleration is the largest increase in velocity recorded by a particular station during an earthquake.

According the USGS's 2018 Update of the U.S. National Seismic Hazard Model probabilistic map for National Earthquake Hazards Reduction Program default site class D (V_{s30} equal 260 m/s; Rukstales and Peterson 2019), the USGS estimates a 2 percent chance exists for an earthquake to occur within the Project Area in the next 50 years (i.e., a recurrence interval of 2,475 years) that could result in a peak horizontal acceleration between 6 and 10 percent gravity (0.06 and 0.01 gravity). The USGS estimates a 5 percent chance exists for an earthquake to occur within the Project Area in the next 50 years (i.e., a recurrence interval of 975 years) that could result in a peak horizontal acceleration between 3 and 5 percent gravity (0.03 and 0.05 gravity). The USGS also estimates a 10 percent chance exists for an earthquake to occur within the Project Area in the next 50 years (i.e., a recurrence interval of 475 years) that could result in a peak horizontal acceleration between 2 and 3 percent gravity (0.02 and 0.03 gravity). For reference purposes, 1 to 2.5 percent gravity earthquakes can be felt outdoors, sleepers are wakened, liquids are disturbed and possibly spilled, small unstable objects can be displaced or upset, doors swing open and close, and shutters and pictures move. Five to 10 percent gravity earthquakes can make it difficult to stand, is noted by car drivers, hanging objects quiver, some cracks occur in non-reinforced masonry, waves occur on ponds, small slides and caving in can occur along sand or gravel banks, large bells ring, and concrete culverts can be damaged (USGS 2021c; Seismic Research Centre 2020).

The Federal Emergency Management Agency (FEMA) Earthquake Hazard Maps denote seismic design categories which reflect the likelihood of experiencing earthquake shaking of various intensities. These seismic design categories have assumed normal Site Class "D" soils, which are the most commonly found (FEMA 2020). The Project is located within seismic design category A which has a "very small probability of experiencing damaging earth-quake effects" and has no listed potential effects of shaking (FEMA 2020).

According to the South Dakota Geologic Survey (SDGS), no earthquakes have been recorded in Hughes County and one earthquake has been recorded in Hyde County between 1872 and 2021. This 4.4 Richter scale magnitude earthquake occurred on March 1983 along the southern boundary of Hyde County adjacent to Buffalo County (SDGS 2021). A review of the geologic mapping and information provided by the USGS Earthquake Hazards Program Unified Hazard Tool indicates that there are no active or inactive faults in the vicinity of the Project (USGS 2021d).

7.1.1.6 Subsidence Potential

The potential for subsidence within the Project Area is negligible. The Pierre Shale bedrock is buried beneath an approximate 50- to 150-foot-thick layer of glacial deposits across the Project vicinity (Helgerson and Duchossois 1987; Figures 4b through 4d). Additionally, the bedrock does not exhibit karst topography or contain subsurface geologic layers or members that are identified as susceptible to dissolution by water (Schultz et al. 1980). North Bend Wind is not aware of any documented historic underground mining operations within the Project vicinity, which could indicate a potential subsidence risk.

7.1.2 Impacts to Geological Resources

The geologic conditions within the Project Area are appropriate for the construction of the Project and will result in negligible impacts on geologic resources. Excavation, bearing, and groundwater conditions are anticipated to be conducive to construction and operation of the Project facilities. Excavation and trenching will be required to install the wind turbines and associated collection and communications systems. North Bend Wind will clear vegetation and grade construction workspaces, access roads, and crane paths.

The depth to bedrock ranges from 50 feet to 150 feet in the Project Area (Figures 4b through 4d). Project construction activities are primarily limited to the upper 10 feet; therefore, excavation required for the installation of the turbines, collection and communication systems are unlikely to encounter or impact the underlying bedrock.

Operational impacts to bedrock or surface geology are limited to temporary impacts associated with maintenance activities that may require excavation. Given the limited potential for large, seismically induced ground movements, there is minimal risk of earthquake-related impacts on the Project.

Construction and operation of the Project will not interfere with the operation of sand and gravel pit operations located in or near the Project Area (Figure 4a in Appendix A). All sites within the Project Area are either recorded as reclaimed or have recorded reclamation activities at their sites (SDDENR 2021a). The Project has been sited to avoid active operations and will cross reclaimed sites operated by the Hyde County Highway Department near Chapelle Creek. Additional active operations are located further west of the collection system. North Bend Wind will coordinate the installation of the collection lines between turbines 32 and 38 with the sand and gravel operators to avoid interference during operations. North Bend

Wind will directionally bore the cables underground between Chapelle Creek and the reclaimed sand and gravel sites to avoid environmental sensitive conditions.

7.1.3 Mitigation Measures for Geological Resources

As discussed in Section 7.1.2, the Project is not anticipated to impact bedrock because the depths of excavation are shallower than the estimated depth of bedrock in the Project Area. Therefore, blasting is not anticipated.

It is not anticipated that the Project will negatively impact the sand and gravel operations in the Project Area. North Bend Wind will work with local sand and gravel operators to supply materials for constructions as well.

Geologic hazards, such as seismicity, are considered to be extremely low to negligible in the Project Area. Given the limited potential for large, seismically induced ground movements, there is minimal risk of earthquake-related impacts on the Project. No additional mitigation beyond designing the Project to currently accepted industry specifications will be required.

7.2 Soil Resources

7.2.1 Existing Soil Resources

Soil characteristics within the Project Area were assessed using the Soil Survey Geographic Database (SSURGO; NRCS 2021a). The SSURGO database is a digital version of the original county soil surveys developed by the Natural Resources Conservation Service (NRCS) for use with GIS. It provides the most detailed level of soils information for natural resource planning and management. The majority of the details were gathered at a scale of 1:12,000. Soil maps are linked in the SSURGO database to information about the component soils and their properties (NRCS 2021a).

Table 7-1 lists the soil types located within the Project Area, which are also displayed on Figure 5 (Appendix A).

Table 7-1. Soil Map Units within the Project Area

Map Unit Symbol	Map Unit Name	Slope Gradient	Acres in Project Area	Percent of Project Area
Au	Nimbro and Wendte soils, channeled	1	85.38	0.18
BeE	Betts loam, 15 to 40 percent slopes	28	72.42	0.15
Bn	Bon loam, channeled, 0 to 2 percent slopes, frequently flooded	1	199.73	0.43
Bo	Bon loam, 0 to 2 percent slopes, rarely flooded	1	199.67	0.43
Bu	Bullcreek clay, 0 to 6 percent slopes	3	7.12	0.02
CaA	Canning loam, 0 to 3 percent slopes	2	57.37	0.12
CaB	Canning loam, 3 to 6 percent slopes	4	68.47	0.15
CdA	Cavo-Demky silt loams, 0 to 2 percent slopes	1	1122.67	2.39
CrA	Cavo-Jerauld loams, 0 to 4 percent slopes	2	325.67	0.69
Cs	Cavo-Stickney loams	1	187.73	0.40
DeA	DeGrey-Walke silt loams, 0 to 2 percent slopes	1	443.69	0.95
Df	DeGrey-Walke silt loams, 0 to 2 percent slopes	1	1055.16	2.25
DkA	Demky-Cavo silt loams, 0 to 2 percent slopes	1	224.08	0.48
DnB	Oahe-Delmont loams, 2 to 6 percent slopes	4	23.61	0.05
Du	Durrstein-Egas complex	1	393.59	0.84
EpC	Eakin-Peno complex, 6 to 9 percent slopes	8	1366.88	2.91
ErA	Eakin-Raber complex, 0 to 2 percent slopes	1	1145.25	2.44
ErB	Eakin-Raber complex, 2 to 6 percent slopes	4	7715.46	16.44
ErC	Raber-Eakin complex, 6 to 9 percent slopes	8	1927.42	4.11
GeE	Gettys clay loam, 15 to 40 percent slopes	28	310.92	0.66
GhC	Glenham-Highmore silt loams, 5 to 9 percent slopes	7	133.30	0.28
HdA	Highmore-DeGrey silt loams, 0 to 2 percent slopes	1	1257.48	2.68
HdB	Highmore-DeGrey silt loams, 2 to 6 percent slopes	4	702.34	1.50
HeA	Highmore silt loam, 0 to 2 percent slopes	1	1032.84	2.20
HeB	Highmore silt loam, 2 to 6 percent slopes	4	608.06	1.30
HgA	Highmore-DeGrey silt loams, 0 to 2 percent slopes	1	2505.63	5.34
HgB	Highmore-DeGrey silt loams, 2 to 6 percent slopes	4	1257.62	2.68
HkA	Highmore silt loam, 0 to 2 percent slopes	1	1968.93	4.20
HkB	Highmore silt loam, 2 to 6 percent slopes	4	659.53	1.41
HlB	Highmore-Glenham silt loams, 2 to 5 percent slopes	4	1046.15	2.23
Hn	Hoven silt loam, 0 to 1 percent slopes	1	860.09	1.83
Ho	Hoven-Onita silt loams	1	421.63	0.90
HuB	Hurley silt loam, 0 to 6 percent slopes	3	4.66	0.01
JbD	Java-Betts loams, 9 to 15 percent slopes	12	106.63	0.23
JgC	Java-Glenham loams, 2 to 9 percent slopes	6	385.79	0.82
JlA	Jerauld silt loam, 0 to 2 percent slopes	1	150.44	0.32
JsA	Jerauld-Slickspots complex, 0 to 4 percent slopes	2	9.96	0.02
Ma	Macken silty clay loam, 0 to 1 percent slopes	1	333.68	0.71
Mar	Marsh	1	7.70	0.02
MoA	Mosher silt loam, 0 to 2 percent slopes	1	253.60	0.54
OaA	Oahe-Delmont loams, 0 to 2 percent slopes	1	9.34	0.02
OcB	Oko clay loam, 2 to 5 percent slopes	4	39.72	0.08
OcC	Oko clay loam, 5 to 9 percent slopes	7	100.80	0.21
OdC	Oko-Jerauld complex, 2 to 9 percent slopes	7	334.21	0.71

Table 7-1. Soil Map Units within the Project Area

Map Unit Symbol	Map Unit Name	Slope Gradient	Acres in Project Area	Percent of Project Area
OkC	Oko clay loam, 6 to 9 percent slopes	8	22.24	0.05
OkD	Oko clay loam, 9 to 20 percent slopes	15	49.33	0.11
OnA	Mobridge silt loam, 0 to 2 percent slopes	1	1084.35	2.31
OoA	Onita-Hoven silt loams, 0 to 1 percent slopes	1	382.43	0.81
OpC	Opal clay, 6 to 9 percent slopes	8	151.02	0.32
OrD	Opal-Lakoma clays, 9 to 15 percent slopes	12	647.02	1.38
Os	Onita-Hoven silt loams	1	177.01	0.38
Ow	Orthents, gravelly	30	7.72	0.02
OxD	Orton-Talmo loams, 9 to 25 percent slopes	17	16.21	0.03
PeD	Peno-Gettys clay loams, 9 to 15 percent slopes	12	1599.14	3.41
PgD	Peno-Gettys clay loams, 9 to 15 percent slopes	12	869.94	1.85
Pk	Plankinton silt loam	1	167.14	0.36
PrA	Promise clay, 0 to 3 percent slopes	1	8.70	0.02
PrB	Promise clay, 3 to 6 percent slopes	4	112.02	0.24
Ps	Prosper loam	1	5.26	0.01
RaA	Raber-Cavo loams, 0 to 2 percent slopes	1	28.18	0.06
RaB	Raber-Cavo loams, 2 to 6 percent slopes	4	2371.78	5.05
RbC	Raber-Peno loams, 6 to 9 percent slopes	7	1028.06	2.19
RcA	Raber-Cavo loams, 0 to 2 percent slopes	1	851.50	1.81
RcB	Raber-Cavo loams, 2 to 6 percent slopes	4	3082.69	6.57
RdC	Raber and Oko stony soils, 3 to 15 percent slopes	9	119.73	0.26
ReA	Ree loam, 0 to 2 percent slopes	1	33.96	0.07
ReB	Ree loam, 2 to 5 percent slopes	4	57.35	0.12
RmA	Ree-Mosher complex, 0 to 2 percent slopes	1	101.53	0.22
RpB	Raber-Peno loams, 2 to 6 percent slopes	4	682.02	1.45
RpC	Raber-Peno loams, 6 to 9 percent slopes	7	1680.00	3.58
Sf	Schamber-Orton complex	28	159.99	0.34
TdD	Talmo-Delmont loams, 3 to 15 percent slopes	12	79.98	0.17
W	Water	--	227.11	0.48
Wd	Wendte silty clay, channeled	1	5.53	0.01
Totals			**46,931**	**100**

7.2.1.1 Prime Farmland

Prime farmland is defined by the U.S Department of Agriculture (USDA) as land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, and oilseed crops and is also available for these uses (the land could be cropland, pasture, woodland, or other lands). Urbanized land and open water cannot be designated as prime farmland. Prime farmland typically contains few or no rocks, is permeable to water and air, is not excessively erodible or saturated with water for long periods, and is not subject to frequent or prolonged flooding during the growing season. Soils that do not meet the above criteria may be considered prime farmland if the limiting factor is mitigated (e.g., by draining or irrigating).

The NRCS also recognizes farmlands of statewide importance, which are defined as lands other than prime farmland that are used for production of specific high-value food and fiber crops (e.g., citrus, tree nuts, olives, fruits, and vegetables). Farmlands of statewide importance have the special combination of soil quality, location, growing season and moisture supply needed to economically produce sustained high quality or high yields of specific crops when treated and managed according to acceptable farming methods. Farmland of statewide importance is similar to prime farmland but with minor shortcomings such as greater slopes or less ability to store soil moisture. The methods for defining and listing farmland of statewide importance are determined by the appropriate state agencies, typically in association with local soil conservation districts or other local agencies.

Approximately 50 percent of the Project Area is classified as not prime farmland, approximately 16 percent is classified as farmland of statewide importance, and approximately 3 percent of the Project Area is classified as prime farmland (Table 7-2; Figure 5b in Appendix A). The remaining land within the Project Area is considered prime farmland if irrigated (31 percent).

Table 7-2. Summary of Farmland Types Affected by the Project

Farmland Categorization	Acres in Project Area	Percent of Project Area	Construction Impacts[1] (Temporary, Acres)	Operational Impacts[1] (Long-Term, Acres)
Prime Farmland	1,289.28	3	6.7	0.7
Farmland of Statewide Importance	7,486.96	16	108.3	13.5
Prime Farmland if Irrigated	14,402.70	31	190.0	26.0
Not Prime Farmland	23,752.41	50	254.2	50.7

1 Does not include laydown/staging areas, batch plants, MET tower footprint (locations not yet determined).

7.2.1.2 Drainage Class

The drainage class identifies the natural drainage condition of the soil. It refers to the frequency and duration of wet periods and provides a guide to the limitations and potentials of the soil for field crops, forestry, range, wildlife, and recreational uses. The class roughly indicates the degree, frequency, and duration of wetness, which are factors in rating soils for various uses (NRCS 2021a). Approximately 82 percent of the Project Area is classified as well drained, 12 percent of the Project Area is moderately well drained and the remaining 6 percent are a combination of excessively drained, poorly drained, and very poorly drained.

7.2.1.3 Erosion Potential

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation and the Revised Universal Soil Loss Equation to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter, and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. The soils in the Project Area are moderately susceptible to erosion and have K factors ranging from 0.1 to 0.49, with the majority between 0.2 and 0.37.

A wind erodibility group consists of soils that have similar properties affecting their susceptibility to wind erosion. Soils assigned to group 1 are the most susceptible to wind erosion and those assigned to group 8 are the least susceptible. The soils in the Project Area have limited susceptibility to wind erosion, i.e., groups ranging from 4 to 8, with the majority being in group 6.

7.2.1.4 Steep Slopes

The slope gradient of a soil influences several characteristics such as the ability of a soil to retain water and the potential for accelerated erosion or subsidence (NRCS 2021a). The slope gradient of a soil is used to assess soils with high water erosion potential and is a factor used to identify soils that may have revegetation concerns. Slopes in the Project Area range from zero to 30 percent, with the majority of slopes from zero to 4 percent.

7.2.2 Impacts to Soil Resources

Construction activities such as clearing, grading, trench excavation and backfilling, as well as the movement of construction equipment within the construction workspace, may result in impacts to soil resources. Potential impacts on soil resources include soil erosion, soil compaction, reduction of soil fertility and changes to other soil characteristics. Clearing removes protective cover and exposes soil to the effects of wind and precipitation, which may increase the potential for soil erosion and movement of sediments into sensitive environmental areas. Grading and equipment traffic may compact soil, reducing porosity and percolation rates, which could result in increased runoff potential. Contamination from release of fuels, lubricants and coolants from construction equipment could also impact soils. The majority of these impacts are temporary and related to construction activities; however, there will be long-term operational impacts associated with aboveground facilities.

Table 7-2 provides a summary of farmland types identified within the temporary and long-term operational footprints associated with aboveground facilities, such as the wind turbines, Project collection substation, interconnection switching station and long-term operational access roads. Land impacted by the installation of these facilities will be converted to impervious surfaces, thereby altering the soil composition at these locations.

7.2.3 Mitigation Measures for Soil Resources

Wind facilities are predominantly designed with turbines situated at higher elevations to minimize obstructions to wind. The current layout sites access roads away from steep slopes to the degree possible. The underground collector lines also avoid crossing steep ravines. Geotechnical soil borings will be conducted at wind turbine foundation prior to construction to determine the soil suitability to support turbine foundations. This information will help dictate final design parameters of the turbine and structure foundations.

Construction of the Project will require coverage under the SDDENR General Permit for Storm Water Discharges Associated with Construction Activities. To maintain compliance with provisions of this General Permit, North Bend Wind will prepare a SWPPP to identify potential sources of stormwater pollution from the Project Area and specify best management practices (BMPs) to control erosion and sedimentation and minimize negative impacts caused by stormwater discharges from the Project. The SWPPP will be prepared prior to construction of the Project. The SWPPP will be implemented from the initiation of construction and used through site restoration efforts. Once construction has been completed, North Bend Wind will backfill graded and excavated areas with the stored native material and return surface conditions to pre-construction conditions. During Project operation, stormwater volume, stormwater flow and erosion, and sediment impact to surface water and groundwater resources are not anticipated to change from pre-construction conditions.

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8.0 EFFECT ON HYDROLOGY (ARSD 20:10:22:15)

ARSD 20:10:22:15. Hydrology. *The applicant shall provide information concerning the hydrology in the area of the proposed plant, wind energy, or transmission site and the effect of the proposed site on surface and groundwater. The information shall include:*

(1) A map drawn to scale of the plant, wind energy, or transmission site showing surface water drainage patterns before and anticipated patterns after construction of the facility;

(2) Using plans filed with any local, state, or federal agencies, indication on a map drawn to scale of the current planned water uses by communities, agriculture, recreation, fish, and wildlife which may be affected by the location of the proposed facility and a summary of those effects;

(3) A map drawn to scale locating any known surface or groundwater supplies within the siting area to be used as a water source or a direct water discharge site for the proposed facility and all offsite pipelines or channels required for water transmission;

(4) If aquifers are to be used as a source of potable water supply or process water, specifications of the aquifers to be used and definition of their characteristics, including the capacity of the aquifer to yield water, the estimated recharge rate, and the quality of ground water;

(5) A description of designs for storage, reprocessing, and cooling prior to discharge of heated water entering natural drainage systems; and

(6) If deep well injection is to be used for effluent disposal, a description of the reservoir storage capacity, rate of injection, and confinement characteristics and potential negative effects on any aquifers and groundwater users which may be affected.

8.1 Groundwater Resources

8.1.1 Existing Groundwater Resources

Depths to groundwater vary considerably in South Dakota. The Project is located in an area covered by glacial deposits that range up to 500 feet thick with an approximate average thickness of 100 feet. These glacial deposits contain almost all of the shallow groundwater in areas east of Missouri River. Other sources of groundwater in this region are recent alluvial deposits along major rivers and their tributaries, ancient river channels buried beneath glacial deposits and bedrock (Agnew et al. 1959).

The Project Area is located within the Northern Great Plains aquifer system and underlies most of North Dakota and South Dakota, about one-half of Montana, and about one-third of Wyoming (USGS 1996). The major aquifers of the Northern Great Plains aquifer system are sandstones of Tertiary and Cretaceous age and carbonate rocks of Paleozoic age. These aquifers and the regional confining units that separate some of them form one of the largest confined aquifer systems in the United States (USGS 1996). The Project is located within an area underlain by several confining units of the aquifer system.

The regional direction of flow in the deep confined aquifers follows long flow paths and is from southwest to northeast. Most of the recharge to the aquifer system is either from precipitation that falls on outcrop areas where the aquifers have been folded or faulted upward and subsequently exposed by erosion or from snowmelt that runs into streams that cross aquifer outcrops and seep downward through the stream beds into the aquifers. Some local recharge is by seepage of excess irrigation water. Much of the discharge from the aquifer system is through upward leakage of water into shallower aquifers where the hydraulic head in the shallower aquifer is less than that of a deeper aquifer (USGS 1996).

The SDDENR developed a detailed map that identifies the shallowest occurrence of aquifer material in Hughes and Hyde counties (Figure 6 in Appendix A; Rich 2012; Jensen 2019). This map indicates that

the majority of the Project Area is underlain by the Dakota Sandstone aquifer at depths below land surface ranging from 900 feet along the Missouri River to 1,750 feet in the south-central part of Hyde County (Rich 2012). The Dakota Sandstone consists of interbedded sandstone, siltstone, and shale with a maximum thickness of approximately 300 feet. This aquifer is overlain by thick confining units consisting largely of shales, which due to their low permeability, limit the downward movement of water from the ground surface to the Dakota Sandstone aquifer. The areas along Chapelle Creek in the central portion of the Project Area and South Chapelle Creek along the southern portion of the Project Area are mapped as containing sand, gravel, and alluvium; and small areas along these creeks are mapped as alluvial aquifer material which consists of clay and silt with minor amounts of sand and gravel (Rich 2012; Jensen 2019). Area identified as sand and gravel on the map generally occur near the surface (Rich 2012; Jensen 2019).

A USGS study of aquifers in Hyde and Hand counties identified four glacial aquifers within Hyde County: Tulare aquifer, Highmore aquifer, Elm Creek aquifer, and Bad-Cheyenne River aquifer (USGS 1976). A USGS study for Hughes County identified four major glacial aquifers in Hughes County: Gray Goose aquifer, Missouri aquifer, Highmore-Blunt aquifer, and Chappelle Creek Aquifer (USGS 1986). As mapped the Project will not cross within any glacial aquifers in Hyde County and will potentially cross within the Highmore-Blunt aquifer (Township 112N, Range 74W) and the Chapelle Creek aquifer (Township 111N, Range 74W; USGS 1986). The southernmost extent of the Highmore-Blunt aquifer may just reach the northernmost edge the Project Area located south of Harrold. The Chapelle Creek aquifer follows Chapelle Creek which crosses the central portion of the Project Area. Chapelle Creek aquifer underlies an area of approximately 20 square miles and may yield as much as 100 gallons of water per minute to large capacity wells which have been reported to be up to 25 feet deep. Depths to water in wells along the creek range from 4 to 20 feet below land surface (USGS 1986). Within uplands, the aquifer is 100 to 150 feet above the valley bottom and is mostly unsaturated during dry years.

8.1.2 Impacts to Groundwater Resources

Construction of the Project is not anticipated to have long-term impacts on groundwater resources. As discussed in Section 1.0, disturbances associated with Project construction activities are primarily limited to the upper 3 to 6 feet with excavations for turbine foundations reaching up to 10 feet, which are above the water table of most of the aquifers in the Project Area (Section 8.1.1). Construction activities such as trenching and backfilling and dewatering that encounter shallow surficial aquifers may result in negligible to minor short-term and very localized fluctuations in groundwater levels depending on the proximity and connectivity of groundwater and extent of the excavated area. Once the construction activity has been completed, the groundwater levels typically recover quickly.

Water usage at the existing O&M facility will be similar to a household volume and any impacts to local groundwater supplies would be negligible.

Because turbine structures and their associated facilities are typically located at higher elevations where water tables tend to be deeper, minimal trench dewatering is anticipated. In addition, although the Project Area may be located within the extent of the Highmore-Blunt and Chapelle Creek aquifers, the Project operating facilities are not sited within the mapped extents of the aquifers. The introduction of contaminants into groundwater due to accidental release of construction-related chemicals, fuels or hydraulic fluid during construction would have the potential to have an adverse effect on groundwater quality, most notably near shallow water wells (Section 8.1.2). Spill-related effects are primarily associated with fuel storage, equipment refueling, and equipment maintenance.

Routine operation and maintenance are not expected to affect groundwater resources. During operations, potential negligible to minor short-term groundwater quality degradation is possible from maintenance equipment, vehicle spills, and maintenance activities that may require excavation. Although there is potential for dewatering of shallow groundwater aquifers and potential changes in groundwater quality (such as increases in total suspended solids concentrations) during trenching, excavation, and backfilling maintenance activities, these changes are expected to be temporary and short term. Shallow groundwater aquifers generally recharge quickly because they are receptive to recharge from precipitation and surface water flow.

8.1.3 Mitigation Measures for Groundwater Resources

Given the depths of construction activities of up to 10 feet for turbine foundations, excavations are not likely to intercept the water table. If construction dewatering were to be required, it will be conducted in accordance with the General Permit for Temporary Discharge Activities (Permit No.: SDG070000) and Temporary Permit to Use Public Waters from the SDDENR and through the implementation of industry-accepted BMPs to minimize sediment withdrawal during dewatering activities and erosion and sediment release at the discharge point. Regarding potential impacts to wells, in the case that water supply wells are located near potential construction dewatering locations, provisions will be made to ensure that an adequate supply of water is provided until construction dewatering activities have ceased, if required (Section 8.2).

Project construction will require coverage under the General Permit Authorizing Stormwater Discharges Associated with Construction Activities (Permit No.: SDR10000), administered by the SDDENR. One condition of the permit is the development and implementation of SWPPP that identifies potential sources of stormwater pollution at the construction site and specifies the structural and non-structural controls that must be in place to minimize the negative impacts to receiving waters caused by stormwater discharges associated with the construction activities.

On-site fuel storage will have secondary containment and will be inspected regularly, with containment being remediated promptly in accordance with the Project's SPCC Plan. Fuel-handling activities and spill remediation will also adhere to the procedures outlined in the Project's SPCC Plan.

8.2 Surface Water Resources

The Project Area is situated along Chapelle Creek and south of South Fork Medicine Knoll Figure 7 (Appendix A). The Project Area is located within the Medicine Knoll and Fort Randall Reservoir Hydrologic Unit Code (HUC) 8 watersheds of the Fort Randall Reservoir HUC-6 watershed (USGS 2021e). As noted in Sections 7.1 and 8.2, the Project Area is in east Hughes County and southwest Hyde County, located on late Wisconsin age glacial deposits. The Ree Hills have the highest elevation in Hyde County and are drained by South Fork Medicine Knoll, South Chapelle, Chapelle, Elm, Campbell, and West Fork Elm creeks (NRCS 1998). Relief within Hughes County is nearly level to sloping but becomes steeper along the Missouri River and larger creeks. All of Hughes County is drained by the Missouri River (NRCS 1975).

The U.S. Army Corps of Engineers (USACE) has the authority to regulate the discharge of dredged and fill material into jurisdictional waters of the U.S. (WoUS). Impacts to WoUS are reviewed, permitted, and mitigated through the Clean Water Act (CWA) Section 404 permitting process. The information provided in this section was compiled through desktop studies. A field investigation to delineate wetlands, watercourses, and other waterbodies will be conducted in the summer to fall of 2021 to confirm and

characterize wetlands and other water resources where Project infrastructure (temporary and long-term operational) is proposed.

8.2.1 Existing Surface Water Resources

8.2.1.1 Waterbodies

The National Hydrography Dataset (NHD) represents United States drainage networks and related features, such as rivers, streams, canals, lakes, ponds, glaciers, coastlines, dams, and stream gauges (USGS 2021f). NHD waterbodies, a subset of these data, are mapped in Figure 7 (Appendix A). Some 207 NHD waterbodies, covering a total of 554 acres are located within the Project Area. The closest named waterbodies to the Project Area include Woodruff Lake and Chapelle Lake.

8.2.1.2 Watercourses

Watercourses can typically be categorized as perennial, intermittent, or ephemeral based primarily on the periods of time in which they hold flowing water. Perennial streams, while under normal conditions, have flowing water year-round. Conversely, an ephemeral stream's flow is typically limited to brief periods of time in response to precipitation events. Intermittent streams, therefore, can be described as somewhere in between the two other categories and normally possess flowing water during the wet season(s). All 119.55 miles of NHD watercourses within the Project Area are mapped as intermittent streams as shown on Table 8-1 and Figure 7 (Appendix A). Streams in the Project Area include Chapelle Creek, South Chapelle Creek, and their unnamed tributaries.

Table 8-1. NHD-Mapped Waterbodies in the Project Area

Stream Classification	Length in Project Area (Miles)
Intermittent	119.55
Perennial	-
All Stream Types	**119.55**

8.2.1.3 Wetlands

Wetlands are defined in the USACE Wetland Delineation Manual, as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration to support and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Wetlands have the following general diagnostic characteristics: hydrophytic vegetation, hydric soil, and wetland hydrology (Environmental Laboratory 1987).

The Project Area lies within the 276,000-square-mile Prairie Pothole Region, which extends from Alberta, Saskatchewan and Manitoba, Canada, south into eastern North Dakota and South Dakota and extends east and south into Minnesota and Iowa. This region is defined by the abundance of shallow wetlands known as potholes, glacial potholes, kettles, or kettle lakes, which can be temporarily or semi-permanently inundated (Prairie Pothole Joint Venture 2017).

North Bend Wind conducted desktop land cover analysis to identify potential wetlands in the Project Area (Appendix C). Wetlands and other WoUS within the Project Area were identified by reviewing digital National Wetlands Inventory (NWI) data as well as aerial imagery. According to NWI data (USFWS 2019a), approximately 5 percent of the Project Area is mapped as wetland (Figure 8 Appendix A). Wetlands including those from the Palustrine (inland wetlands), Riverine (rivers) and Lacustrine (lake)

Systems are located in the Project Area. The wetland classification and total area of wetland by type occurring with the Project Area are shown in Table 8-2.

Table 8-2. NWI-Mapped Wetlands in the Project Area

Wetland Type (Cowardin Class)	Area (acres)	Percentage of Project Area
Lacustrine, Littoral, Aquatic Bed, Semipermanently Flooded (L2ABF)	172.10	0.37
Lacustrine, Littoral, Aquatic Bed, Semipermanently Flooded, Diked/Impounded (L2ABFh)	42.69	0.09
Lacustrine, Littoral, Aquatic Bed, Semipermanently Flooded, Excavated (L2ABFx)	2.41	0.01
Palustrine Aquatic Bed, Semipermanently Flooded (PABF)	5.83	0.01
Palustrine Aquatic Bed, Semipermanently Flooded, Diked/Impounded (PABFh)	303.20	0.65
Palustrine Aquatic Bed, Semipermanently Flooded, Excavated (PABFx)	35.62	0.08
Palustrine, Emergent, Persistent, Forested, Seasonally Flooded (PEM1/FOC)	1.67	<0.01
Palustrine, Emergent, Persistent, Temporary Flooded (PEM1A)	361.35	0.77
Palustrine, Emergent, Persistent, Temporary Flooded, Partially Drained/Ditched (PEM1Ad)	51.51	0.11
Palustrine, Emergent, Persistent, Temporary Flooded, Partially Diked/Impounded (PEM1Ah)	1.06	0.00
Palustrine, Emergent, Persistent, Seasonally Flooded (PEM1C)	1,174.04	2.50
Palustrine, Emergent, Persistent, Seasonally Flooded, Partially Drained/Ditched (PEM1Cd)	48.64	0.10
Palustrine, Emergent, Persistent, Seasonally Flooded, Partially Diked/Impounded (PEM1Ch)	4.03	0.01
Palustrine, Emergent, Persistent, Seasonally Flooded, Excavated (PEM1Cx)	33.21	0.07
Palustrine, Emergent, Persistent, Semipermanently Flooded, Diked/Impounded (PEM1Fh)	1.50	<0.01
Palustrine, Forested, Temporary Flooded, Diked/Impounded (PFOAh)	0.16	<0.01
Palustrine, Forested, Temporary Flooded, Excavated (PFOAx)	0.18	<0.01
Palustrine, Forested, Seasonally Flooded (PFOC)	0.72	<0.01
Palustrine, Scrub/Shrub, Temporary Flooded (PSSA)	0.19	<0.01
Riverine, Intermittent, Streambed, Seasonally Flooded (R4SBC)	82.60	0.18
Riverine, Unknown Perennial, Unconsolidated Bottom (R5UBH)	3.37	0.01
All Wetland Types	**2,326.07**	**4.96**

8.2.1.4 Floodplains

Floodplains perform many natural functions, including the storage of excess water and reduction of flow velocity during times of flood, groundwater recharge, provision of habitat and removal of excess sediment, nutrients, and other pollutants. The placement of fill into floodplains reduces the effectiveness of these functions. The FEMA maintains materials developed to support flood hazard mapping for the National Flood Insurance Program. Flood hazard mapping provides states, local communities and Tribes with flood risk information and tools that they can use to increase their resilience to flooding and better protect people and property through collaboration with state and local entities.

FEMA has not completed a study to determine flood hazard in Hyde County (FEMA 2021); therefore, a flood map for the Project Area has not been published at this time for the eastern portion of the Project. There are floodplains located throughout the Hughes County portion of the Project that are associated

with intermittent waterbodies; however, there are no turbines sited in Hughes County within a floodplain (FEMA 2021).

8.2.1.5 National Park Service Nationwide Rivers Inventory

Pursuant to Section 5(d) of the National Wild and Scenic Rivers Act, the NPS maintains the Nationwide Rivers Inventory (NRI), a listing of more than 3,400 free-flowing river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance. The NRI includes river segments that potentially qualify as national wild, scenic, or recreational river areas (NPS 2021a). Under a 1979 Presidential Directive and related Council on Environmental Quality procedures, all federal agencies must seek to avoid or mitigate actions that will adversely affect one or more NRI segments. There are no NRI-listed rivers within the Project Area; the closest NRI segment listed is the White River in Lyman County, approximately 36 miles south of the Project Area (NPS 2021b).

8.2.1.6 Impaired Waters

CWA Section 303(d) requires that each state review, establish, and revise water quality standards for all surface waters within the state. Waters that do not meet their designated beneficial uses because of water quality standard violations are listed as impaired. The list, known as the 303(d) list, is based on violations of water quality standards. States establish priority rankings for waters on the 303(d) list and develop the total maximum daily load of a pollutant that the water can receive and still safely meet water quality standards.

The ultimate receiving water of the waterbodies within the Project Area is the Missouri River. While there are no 303(d)-listed waterbodies within the Project Area, the Missouri River is impaired for sediment (SDDENR 2020). A total maximum daily load was established for the Missouri River in 2001.

8.2.2 Impacts to Surface Water Resources

8.2.2.1 Wetlands and Waterbodies

The turbines and the MET tower will be constructed on higher elevation portions of the Project Area to maximize the wind resource and as such, generally avoid direct impacts to wetlands and waterbodies, which tend to be in lower topographic positions. Prior to construction, North Bend Wind will conduct wetland and waterbody delineations within the Project Area according to the USACE Wetlands Delineation Manual, Great Plains Regional Supplement (Environmental Laboratory 1987). Access roads, collector systems, ADLS, collection substation, and the interconnection switching station will be designed to avoid or minimize impacts to wetland and waterway features whenever feasible. Temporary impacts associated with crane paths will also be minimized. Installation of underground utilities is expected to avoid impacts by boring under water features as necessary and will minimize impacts to wetlands and waterbodies or where possible make them coincident with other impacts (e.g., crane paths). Where crossings of streams and drainageways cannot be avoided by access roads, appropriately designed crossings (i.e., culverts, low-water crossings) will be constructed to maintain existing drainage. Temporary impacts may also result from construction matting to access certain locations.

North Bend Wind anticipates that there will be no long-term impacts on emergent wetlands. Any temporarily impacted wetlands will be restored to pre-construction conditions and the herbaceous vegetation will be allowed to vegetate naturally in these areas. The impacts on scrub-shrub wetlands and

forested wetlands will be of a longer duration than emergent wetlands because the woody vegetation will require a longer time to reestablish in the construction workspace after restoration.

Construction of the Project will result in new impervious surfaces (turbine foundations, long-term operational access roads, interconnection switching station, collection substation) in the Project Area. The creation of impervious surfaces reduces the ability of soils to infiltrate precipitation to groundwater, potentially increasing the volume and rates of stormwater runoff. Infiltration will be inhibited within these newly created impervious surfaces and incremental increases in stormwater runoff may be exhibited immediately adjacent to these surfaces. Implementation of stormwater BMPs is anticipated to adequately mitigate any increases in runoff resulting from construction. In addition, the dispersed nature of the Project facilities will not provide enough of a concentration of increased impervious surfaces in any specific location to change drainage patterns. As such, the Project is not anticipated to cause significant changes in drainage and runoff patterns or volume.

Clearing and grading of stream banks, topsoil disturbance, in-stream trenching, trench dewatering, backfilling, and development of access roads and crane paths could result in increased sedimentation and erosion, modification to hydrological flow, releases of chemical and nutrient pollutant from sediments, and introduction of chemical contaminants such as fuel and lubricants. Coverage under the General Permit for Storm Water Discharges Associated with Construction Activities, administered by the SDDENR, will be required for the Project. Section 13.0 discusses the development and implementation of a SWPPP and BMPs in accordance with the General Permit. Erosion and sediment controls that will be implemented during Project construction and operation are expected to avoid negative impacts to water quality.

8.2.2.2 Floodplains

As discussed in Section 8.2.1.4, floodplains have not been mapped by FEMA in Hyde County. Although the federal government has not officially mapped floodplains in Hyde County, it is unlikely the Project will impact floodplains. There are floodplains located throughout the Hughes County portion of the Project that are associated with intermittent waterbodies; however, there are no turbines sited in Hughes County within a floodplain (FEMA 2021). Wind turbines, the MET tower, access roads, ADLS, collection substation, and interconnection switching station will be located at higher elevations. If impacts to floodplains are unavoidable, they will be temporary in nature and land will return to preconstruction contours and elevations upon Project completion.

8.2.2.3 NRI-Listed Rivers

There are no NRI-listed rivers within the Project Area. Construction and operation of the proposed facility anticipates no impacts to these resources; therefore, no mitigation is required for impacts to NRI-listed rivers.

8.2.2.4 Impaired Waters

As of the 2020 South Dakota Integrated Report for Surface Water Quality Assessment, there are no 303(d)-listed waterbodies within the Project Area. Construction and operation of the proposed facility anticipates no impacts to these resources; therefore, no mitigation is required for impacts to 303(d)-listed waterbodies.

Sections 8.0 and 13.0 discusses the development and implementation of a SWPPP and BMPs in accordance with General Permit for Storm Water Discharges Associated with Construction Activities issued by the SDDENR. As such, it is unlikely that sediment from Project activities will reach the Missouri River.

8.2.3 Mitigation Measures for Surface Water Resources

Wetlands and waterbodies will be avoided to the extent possible during the construction phase of the Project. If wetland or waterbody impacts cannot be avoided, North Bend Wind will submit a permit application to the USACE for dredge and fill within WoUS under Section 404 of the CWA.

Project construction will require coverage under the General Permit Authorizing Stormwater Discharges Associated with Construction Activities (Permit No.: SDR10000), administered by the SDDENR. One condition of the permit is the development and implementation of SWPPP that identifies potential sources of stormwater pollution at the construction site and specifies the structural and non-structural controls that will be in place to minimize the negative impacts to receiving waters caused by stormwater discharges associated with the construction activities. The Project is not expected to cause significant changes to existing hydrology or stormwater runoff. Increased sedimentation and impacts to drainage patterns due to stormwater runoff from the Project during construction and operation will be minimized by the installation of BMPs. The use of BMPs during construction will minimize the transport of sediment offsite, control erosion, and minimize sedimentation during precipitation events. To limit the risk of contamination to wetlands and streams due to accidental spilling of fuels or other hazardous substances, construction equipment will be refueled in areas away from wetlands or drainage areas and a spill kit will be available at the construction site.

If needed, construction dewatering will be conducted in accordance with the General Permit for Temporary Discharge Activities (Permit No.: SDG070000) and Temporary Permit to Use Public Waters from the SDDENR and through the implementation of industry-accepted BMPs to minimize sediment withdrawal during dewatering activities and erosion and sediment release at the discharge point. Regarding potential impacts to wells, in the case that water supply wells are located near potential construction dewatering locations, provisions will be made to ensure that an adequate supply of water is provided until construction dewatering activities have ceased.

8.3 Water Uses and Rights

8.3.1 Existing and Planned Water Uses and Rights

The Project Area is located within the Mid Dakota Rural Water System service area (SDARWS 2021). North Bend Wind reviewed the SDDENR Water Rights and Well Completion Report databases to identify where there are existing water uses within the Project Area (SDDENR 2021c,d). Private wells that supply water for domestic purposes are located throughout the Project Area. Water Right Permits are required for water use exceeding 25,920 gallons per day or a peak pump rate of 25 gallons per minute or for non-domestic uses regardless if it is appropriated from surface or groundwater resources. If appropriating from surface waters, a Water Rights Permit is required for dams that impound more than 25 acre-feet of water at the primary spillway elevation.

Water Rights Permits within the Project Area are listed in Table 8-3 (SDDENR 2021c). In South Dakota, all water (surface and ground water) is the property of the people of the state and whether a Water Rights

Permit is required depends on the type of water use. The only type of water use which does not require a water right permit is domestic use that does not exceed a peak pump rate of 25 gallons per minute.

Table 8-3. Water Rights Permits Located within the Project Area

Permit	Section	Township	Range	Status[1,2,3]
379-3	29	111N	73W	Cancelled

1 Permit = A water permit has been issued for the project which allows the holder to construct the project and put the water to beneficial use within a time frame specified on the water permit.
2 License = An inspection of the permitted water use system was conducted and a water license issued for the portion of the project that was developed.
3 Incorporated = If two or more permits cover one water use system, they are incorporated together into one water license. Any development under the individual permits is combined into a single water license.

Based on a review of the SDDENR Well Completion Report databases (SDDENR 2021d), there are 24 wells located within and within 1,000 feet of the Project Area (Table 8-4; Figure 9 in Appendix A).

Table 8-4. Wells Located within and within 1,000 Feet of the Project Area

Feature ID (FID)	T/R/S[1]	Well Depth (feet)	Use Type
36128	112N / 74W / 31	1,555	Domestic
74437	112N / 74W / 27	10	Domestic
74373	112N / 74W / 27	1	Plugged
48795	112N / 74W / 33	33	Domestic
13807	111N / 74W / 2	2,240	Domestic
73040	112N / 74W / 35	2,120	Domestic
73607	111N / 74W / 1	2,105	Domestic
48714	111N / 74W / 26	23	Stock
48715	111N / 74W / 26	30	Domestic
71629	111N / 74W / 34	1,960	Domestic
48717	111N / 74W / 33	35	Stock
03826	110N / 74W / 12	77	Test hole
03825	110N / 74W / 12	90	Test hole
69445	111N / 74W / 29	1,960	Domestic
26087	111N / 73W / 29	2,080	Stock
48903	111N / 73W / 30	14	Domestic
48902	111N / 73W / 29	32	Domestic
03081	111N / 73W / 28	22	Test hole
03061	110N / 73W / 7	257	Test hole
03065	110N / 73W / 15	72	Test hole
03063	110N / 73W / 15	122	Test hole
37273	110N / 73W / 19	1,777	Domestic

1 T/R/S = Township / Range / Section; Source: SDDENR 2021d

Based on a review of SDDENR's Pending Applications to Appropriate Water and Future Use Reviews, there are no pending water right applications in Hughes or Hyde counties (SDDENR 2021e).

8.3.2 Impacts on Current or Planned Water Uses

The Project will not appropriate from surface water in the Project Area and will 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 typically obtained from an existing or new well. North Bend Wind will seek and comply with the conditions of the applicable permits for water appropriation.

Water use associated with Project operations at the existing O&M facility will be negligible and will not create undue burden, so no mitigation is proposed.

Potential construction-related impacts on wells could include localized decreases in groundwater recharge rates through changes to overland water flow, contamination, decreased well yields, decreased water quality (such as increased turbidity or odor in the water), interference with well mechanics or complete disruption of the well. These impacts could result from trenching, equipment traffic or hazardous materials spills. However, North Bend Wind does not anticipate impacting residential domestic wells because wind turbines will be set back a minimum of 2,640 feet from non-participating residences and 1,400 feet from participating residences. Furthermore, excavation will only occur up to 10 feet and known wells in the Project Area are generally drilled deeper than 30 feet (Table 8-4).

If required, construction dewatering will be conducted in compliance with South Dakota law. As stated above, residential domestic wells will not be impacted by construction dewatering due to the minimum setback of 2,640 feet from non-participating residences and 1,400 feet from participating residences.

The Project will not impact surface water availability or use for communities, agriculture, recreation, fish, or wildlife. As discussed in Section 8.2.2.1, the Project anticipates minimal impacts to wetlands and waterbodies. Following construction, temporary impacts to wetlands and waterbodies will be restored to pre-construction conditions.

8.3.3 Mitigation Measures for Existing and Planned Water Uses and Rights

In the case that water supply wells are located near potential construction dewatering locations, provisions will be made to ensure that an adequate supply of water is provided until construction dewatering activities have ceased. These impacts are expected to be minor and temporary. Surface water availability for communities, schools, agriculture, recreation, fish, or wildlife will not be impacted.

9.0 EFFECT ON TERRESTRIAL ECOSYSTEMS (ARSD 20:10:22:16)

ARSD 20:10:22:16. Effect on terrestrial ecosystems. *The applicant shall provide information on the effect of the proposed facility on the terrestrial ecosystems, including existing information resulting from biological surveys conducted to identify and quantify the terrestrial fauna and flora potentially affected within the transmission site, wind energy site, or siting area; an analysis of the impact of construction and operation of the proposed facility on the terrestrial biotic environment, including breeding times and places and pathways of migration; important species; and planned measures to ameliorate negative biological impacts as a result of construction and operation of the proposed facility.*

This section discusses the existing terrestrial ecosystem, the Project's potential impacts to it and potential avoidance, minimization, and mitigation techniques to minimize impacts. Terrestrial ecosystem wildlife and vegetation data was identified and gathered through literature searches, federal and state agency reports and consultations, natural resource databases and field studies. Biologists from Western Ecosystems Technology, Inc. (WEST) conducted field surveys on behalf of North Bend Wind within and surrounding the Project Area to provide site-specific information on terrestrial resources. The results of these surveys are summarized in the vegetation and wildlife sections below.

9.1 Vegetation

9.1.1 Existing Terrestrial Ecosystem

The Project Area is located within the Northwestern Glaciated Plains and Northwestern Great Plains Level III Ecoregions. The Northwestern Glaciated Plains is a transitional region between the more level, moister, more agricultural Northern Glaciated Plains to the east and the generally more irregular, dryer, Northwestern Great Plains to the west and southwest. The Northwestern Great Plains encompasses the Missouri Plateau section of the Great Plains and made up of semiarid rolling plains punctuated by occasional buttes and badlands (Bryce et al. 1996). In addition to direct conversion of the native ecosystem, human activity has also altered or interrupted the natural disturbance processes of this ecosystem. Through the suppression of fire and alteration of historical grazing practices (relative to historical bison (*Bison latfrons*) herd grazing), invasive plants and woody plants not part of the grassland ecosystem have been able to take root and out-compete the grassland-obligate vegetation (SDGFP 2018).

Based on desktop review completed by WEST, land cover types were digitized using ArcGIS (version 10.4) within the current Project Area. Using USDA National Agriculture Imagery Program (USDA 2019) aerial imagery in combination with 2011 South Dakota Land Cover Patterns (National Land Cover Database; NLCD 2016), USDA National Agricultural Statistics Service National Cropland Layer (USDA NASS 2018) cropland classification, and field inspections, lands within the current Project Area were digitized and assigned one of eight cover types (excluding NWI wetlands). NWI data was used to represent water within the Project Area. Those water features visible on the aerial imagery but not in the NWI data were digitized as "water".

Based on this desktop review and dataset (Appendix C), approximately 49.11 percent of the Project Area is mapped as grassland/herbaceous and approximately 42.99 percent is mapped as cultivated crops. Croplands included fields were corn (*Zea mays*), spring wheat (*Triticum aestivum*), and sunflower (*Helianthus sp.*). Herbaceous grassland vegetation was divided into grassland pastures or grass hay.

Grassland pastures typically were characterized by a mixture of native cool and warm season grasses including western wheatgrass (*Pascopyrum smithii*), green needle grass (*Nassella viridula*), needle-and-thread (*Hesperostipa comata*), blue grama (*Bouteloua gracilis*), sideoats grama (*Bouteloua curtipendula*), and little blue stem (*Schizachyrium scoparium*) (WEST 2018). Grass hay fields typically contained fewer species such as smooth brome grass (*Bromus inermis*) and intermediate wheatgrass (*Thinopyrum intermedium*) and could possibly have been older Conservation Reserve Program (CRP) fields that were hayed in 2017. Trees typically included shelterbelts with a mixture of evergreen and deciduous species, near residences or along field borders. Developed lands included roads, ranches and residential areas, feed lots, and stock yards (WEST 2020).

This particular classification activity does not differentiate between potential native grasslands and areas where soils have been manipulated and/or introduced grasses have been planted. Other digitized land cover within the Project Area includes NWI wetlands, grass hay, developed land, and trees and water (Table 9-1).

Table 9-1. Digitized Land Cover within the Project Area

Land Cover Type	Acres	Percent of Project Area
Herbaceous - Grassland	23,046.03	49.11
Cultivated Crops	20,174.56	42.99
Developed	927.68	1.98
Wetlands	2,379.59	5.07
Open Water	6.81	0.01
Hay/Pasture - Grassland	56.59	0.12
Barren Land	4.02	0.01
Trees	331.55	0.71
Shrub/Scrub	4.45	0.01
Total	**46,931.27**	**100**

Cropland and developed land uses are discussed further in Section 11.0. See Section 8.2.1.3 for a detailed discussion of NWI wetlands mapped within the Project Area.

9.1.1.1 Grasslands

Grasslands are important and valuable communities, providing habitat to a diverse range of taxa, including highly specialized, habitat-specific birds, rare and economically-important pollinators, and a wide range of mammals. Once covering millions of acres across North America, it is estimated by some that mixed grass prairies have declined by 68 percent (Banchard 2001). Aside from direct impacts, the primary concern associated with turbine development in grasslands is habitat fragmentation created by the development of access roads. Fragmented habitat not only supports edge-generalist species such white-tailed deer (*Odocoileus virginianus*) and American robins (*Turdus migratorius*), but simultaneously deters many species that require large areas of undisturbed land to breed (NDGF 2020).

Based on WEST data, less than 50 percent (.62 acres) of the Project Area is mapped as grassland pasture and grassland herbaceous. However, these data do not distinguish between untilled, native grassland and other pastureland, fallow fields, or similarly vegetated areas. Instead, a GIS layer created by South Dakota State University (SDSU) to quantify undisturbed grasslands of eastern South Dakota was utilized (Bauman et al. 2016). Based on the data, approximately 21,543 acres of potentially undisturbed grassland are present within the Project Area. Because this GIS layer was created based on a tiered, desktop

analysis, it remains likely that some areas mapped as "potential native grassland" have, in fact, been tilled.

Within the Project Area, 2,759 acres of the land is under easement with USFWS to protect the grasslands and native prairie (Figure 9 in Appendix A).

9.1.1.2 Noxious and Invasive Weeds

Noxious and invasive weeds are regulated by state (SDCL 38-22) and federally (7 Code of Federal Regulations [CFR] 360) rules and regulations designed to stop the spread of plants that are detrimental to the environment, crops, livestock, and/or public health. According to the South Dakota Department of Agriculture (SDDOA), there are 9 listed species of noxious weeds that have the potential to occur and are regulated within Hyde and Hughes counties (SDDOA 2021a). In addition, there are seven statewide listed species with infestations listed for Hyde and Hughes counties (Table 9-2; SDDOA 2021b).

Table 9-2. State and Local Noxious Weeds of South Dakota

Common Name	Scientific Name	State Weed Status	County
Puncturevine	*Tribulus terrestris*	Local noxious weed	Hughes
Bull Thistle	*Cirsium vulgare*	Local noxious weed	Hyde
Common Mullein	*Verbascum thapsus*	Local noxious weed	Hyde
Houndstongue	*Cynoglossum officinale*	Local noxious weed	Hyde
Musk Thistle	*Carduus nutans*	Local noxious weed	Hyde
Plumeless Thistle	*Carduus acnthoides*	Local noxious weed	Hyde
Yellow Toadflax	*Linaria vulgaris*	Local noxious weed	Hyde
Palmer Amaranth	*Amaranthus palmeri*	Local noxious weed	Hyde
Field Bindweed	*Convolvulus arvensis*	Local noxious weed	Hughes
Absinth wormwood	*Artemisia absinthium*	State noxious weed	Hughes and Hyde
Canada Thistle	*Cirsium arvense*	State noxious weed	Hughes and Hyde
Leafy Spurge	*Euphorbia esula*	State noxious weed	Hughes and Hyde
Perennial Sow Thistle	*Sonchus arvensis*	State noxious weed	Hughes and Hyde
Hoary cress	*Cardaria draba*	State noxious weed	Hughes
Purple loosestrife	*Lythrum salicaria*	State noxious weed	Hughes
Salt cedar	*Tamarix aphylla, T. chinensis, T. gallica, T. parviflora and T. ramosissima*	State noxious weed	Hughes

Source: SDDOA 2021a,b

9.1.1.3 Forest and Woodlands

Based on WEST data, the land cover Trees classification comprises less than 1 percent, or 331.55 acres, of the Project Area. Typical trees include shelterbelts with a mixture of evergreen and deciduous species located along field borders and near residences. As part of the Northern Long-eared Bat (NLEB) Habitat Assessment (Appendix C), WEST conducted a desktop assessment of potential suitable habitat, which included deciduous forest, evergreen forest, mixed forest, and woody wetlands. The NLEB Habitat Assessment resulted in eight patches covering 4,285.70 total acres within the Project Area and 4.0-kilometer buffer. A discussion regarding the NLEB Habitat Assessment can be found in Section 9.2.1.3.

9.1.2 Impacts to Vegetation

The Project will result in long-term operational impacts to approximately 90.85 acres and temporarily impact approximately 559.2 acres. Table 9-3 identifies the acreages of NLCD and WEST-digitized land cover classes that will be directly affected by construction and operation of the Project. Long-term operational impact acreages will be limited to locations where vegetation will be removed and replaced by wind turbine foundations, the MET tower, collector substation, switching station, and the long-term operational access roads. Overall, approximately 48.9 percent of the Project's construction and 39.4 percent of the Project's operations related impacts will occur in vegetation types that have experienced prior disturbance or alteration, including Cropland and Developed land cover types.

Table 9-3. Summary of Impacts to National and WEST-Digitized Land Cover

Landcover Type	Long-Term Operational Impacts (acres)[1]	Temporary Construction Impacts (acres)[2]
Cropland	31.70	262.63
Grassland Pasture	--	--
Grassland/Herbaceous	52.91	269.50
Wetlands	2.13	15.55
Developed	4.05	10.75
Open Water	--	0.02
Trees – WEST-digitized	0.05	0.76
Project Total	90.85	559.2

1 Estimated value; impact value does not include features not yet sited including the MET tower.
2 Estimated value; impact value does not include features not yet sited including the batch plants, the laydown/staging area, or MET tower construction workspace.

9.1.2.1 Grasslands

Based on the WEST-digitized land cover classification, Project construction activities have the potential to impact vegetation categorized as grassland/herbaceous and grassland pasture (Table 9-3). A subset of this category, areas of potentially undisturbed grassland, as mapped by SDSU and described in Section 9.1.1.1 of this Application, could be impacted.

The Project has been designed to avoid impacts to USFWS grassland easements and the delineated features associated with the USFWS wetland easement program. North Bend Wind will continue to coordinate with USFWS to confirm that impacts to the delineated features within USFWS wetland easement programs are avoided. No project facilities are located on easements that were "top leased" with USFWS grassland easements (Figure 9 in Appendix A). The phrase "top leased" refers to the circumstance in which a lease is executed covering land upon which a current lease already exists. The South Dakota state law principle of "first in time - first in rights" applies here. The USFWS grassland easement program is further discussed in Section 11.2.1.5.

Other areas, such as tilled, degraded grasslands dominated by non-native vegetation are anticipated to be impacted during construction. Impacts will likely be both short-term (i.e., collector lines or temporary road construction) and long term (i.e., turbine foundations, turbine access roads) in nature.

9.1.2.2 Noxious and Invasive Weeds

Noxious weeds have the potential to spread through a variety of mechanisms. They are often carried on vehicles' undercarriage and tires and thrive in highly disturbed areas, rapidly out-competing native

vegetation, particularly when exposed soil conditions are present (Sheley 2011). Areas of disturbance due to construction will occur in the Project Area and it is anticipated that concentrated pockets of noxious and invasive weed populations are present. With construction activities potentially taking place nearby, the threat of these species spreading via work crews, vehicles or other vessels exists.

9.1.2.3 Forest and Woodlands

Areas mapped as trees in the Project Area include shelterbelts with a mixture of evergreen and deciduous species, typically located along field borders and near residences. North Bend Wind sited the Project to avoid impacts to forested areas, especially those greater than 10 acres in size that are related to NLEB habitat (Appendix C). No major tree clearing activities are anticipated.

9.1.3 Mitigation Measures for Vegetation

9.1.3.1 Grasslands

North Bend Wind has worked with the USFWS to adjust the site layout to minimize impacts to native grassland areas that are presently under conservation easements with the USFWS. Best efforts were made to utilize cropland for turbine placement and existing disturbed corridors (e.g., roads, transmission lines, fence rows) to reduce habitat fragmentation and direct impacts to the vegetation. In areas where impacts to undisturbed grasslands cannot be avoided, North Bend Wind will employ BMPs such as revegetation and erosion control measures and will restore areas of disturbed soils as soon as possible after construction activities have been completed.

9.1.3.2 Noxious and Invasive Weeds

North Bend Wind will develop and implement a Noxious and Invasive Weed Management Plan that will identify and establish the procedures to prevent the introduction and spread of noxious and invasive weeds during construction and ongoing operations. This plan will be based on the construction schedule and the potential for weeds to be spread during that timeframe. During restoration, North Bend Wind will utilize seed mixes free of noxious and invasive weeds. North Bend Wind will coordinate with SDGFP, USFWS, USDA NRCS, and landowners on seed mixes to be used during restoration. Therefore, the Project may have a beneficial impact in the Project Area by reducing and controlling the spread of noxious and invasive species that are already present.

9.2 Wildlife

The USFWS has developed a series of guidance documents, the USFWS Land-Based-WEG (USFWS 2012) and the Eagle Conservation Plan Guidance (ECPG; USFWS 2013), to provide a structured, scientific process for addressing wildlife conservation concerns related to wind facilities.

9.2.1 Existing Wildlife

9.2.1.1 Initial Site Assessment

In accordance with WEG Tiers 1 and 2, a landscape-level site analysis was conducted utilizing desktop resources to identify potential sensitive species or habitats that could be located near the Project. Resources reviewed included South Dakota Natural Heritage Program, SDGFP Wildlife Action Plan,

USFWS Information, Planning and Consultation (IPaC), NLCD mapping, aerial imagery, eBird, USGS Breeding Bird Survey (BBS), NatureServe, and USGS Gap data, among other sources.

In 2016, baseline wildlife studies at the Project were initiated to address the questions posed under Tier 3 of the USFWS Land-Based WEG (USFWS 2012) and Stage 2 of the USFWS ECPG (USFWS 2013). Studies conducted at the Project from 2016 to 2020 include avian use surveys, raptor and eagle nest surveys, prairie grouse lek surveys, acoustic monitoring for bats and NLEB summer habitat analysis, whooping crane (*Grus americana*) stop-over habitat analysis, and land cover characterization study (Appendix C). Wildlife species associated with grasslands and tilled agricultural landscapes are expected to be the most common species within the Project Area.

Migratory Birds

The Migratory Bird Treaty Act (MBTA) is the cornerstone of migratory bird conservation and protection in the United States. The MBTA implements four treaties that provide for international protection of migratory birds. Under the MBTA, it is illegal "to pursue, hunt, take, capture, kill … possess, offer for sale, sell … purchase … ship, export, import …transport or cause to be transported… any migratory bird, any part, nest or eggs of any such bird …" (16 United States Code [USC] 703). The word "take" is defined by regulation as "to pursue, hunt, shoot, wound, kill, trap, capture or collect or attempt to pursue, hunt, shoot, wound, kill, trap, capture or collect" (50 CFR 10.12). The USFWS maintains a list of all species protected by the MBTA at 50 CFR. This list includes over 1,000 species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds and passerines (USFWS 2015a). There has been varying guidance on the prohibition of incidental take under the MBTA. On January 7, 2021, the USFWS published a final regulation defining the scope of the MBTA as only prohibiting the intentional injury of birds; unintentional (incidental) injury or death of migratory birds is not prohibited. This regulation went into effect on March 8, 2021.

In an effort to characterize potential use of the Project Area by breeding birds, the two nearest USGS BBS routes, the Crow Creek BBS and Fort Thompson BBS, were analyzed. Each route is approximately 24.5 miles (39.4 kilometer [km]) long, with survey points located every half-mile. Standard survey protocol dictates that all birds seen or heard are tallied for a 3-minute period at each point along the route.

In 2011, 2,242 individual birds of 80 species were observed along the two routes surveyed (1,146 individuals of 64 species in Crow Creek and 1,096 birds of 53 species in Fort Thompson; Pardieck, et al. 2020). The most abundant species observed were the brown-headed cowbird (*Molothrus ater;* 290 individuals), western meadowlark (*Sturnella neglecta;* 244 individuals), common grackle (*Quiscalus quiscula;* 196 individuals), dickcissel (*Spiza americana;* 174 individuals), red-winged blackbird (*Agelaius phoeniceus;* 156 individuals), mourning dove (*Zenaida macroura;* 134 individuals), and cliff swallow (*Hirundo rustica;* 108 individuals). In 2019, 845 individuals of 58 species were observed along Crow Creek BBS (Pardieck, et al. 2020). The most abundant species observed were the western meadowlark (116 individuals), brown-headed cowbird (120 individuals), red-winged blackbird (88 individuals), mourning dove (49 individuals), ring-necked pheasant (43 individuals) and the common grackle (40 individuals). Fort Thompson did not have 2019 data available for review.

Raptors

Following a desktop assessment of potential raptor roosting habitat, prey base and species distributions, a total of 13 diurnal raptors (excluding bald and golden eagles), one vulture, and six owls were determined to have the potential to occur within the Project Area (WEST 2016). Turkey vultures (*Cathartes aura*) are

also summer residents. Of these species, five species have the potential to nest near or within the Project Area (Table 9-4). Within the Project Area, trees and woodland areas occur around wetlands, streams, and houses, providing potential nesting opportunities for many of these species. Raptors may also nest on man-made structures, such as power poles associated with power lines and structures associated with transmission lines, both of which are present in the Project Area. Ground-nesting raptors may nest in the grassland areas located throughout the Project Area.

Table 9-4. Raptors with Potential to Occur within Project Area

Species	Scientific Name	Nesting Potential
Diurnal Raptors (*Accipitriformes* and *Falconiformes)*		
American Kestrel	*(Falco sparverius)*	X
Bald Eagle	*(Haliaeetus leucocephalus)*	X
Broad-Winged Hawk	*(Buteo platypterus)*	
Cooper's Hawk	*(Accipiter cooperii)*	
Ferruginous Hawk	*(Buteo regalis)*	X
Golden Eagle	*(Aquila chrysaetos)*	X
Merlin	*(Falco columbarius)*	
Northern Goshawk	*(Accipiter gentilis)*	
Northern Harrier	*(Circus hudsonius)*	X
Osprey	*(Pandion haliaetus)*	
Prairie Falcon	*(Falco mexicanus)*	
Red-Tailed Hawk	*(Buteo jamaicensis)*	X
Rough-Legged Hawk	*(Buteo lagopus)*	
Sharp-Shinned Hawk	*(Accipiter striatus)*	
Swainson's Hawk	*(Buteo swainsoni)*	X
Owls (*Strigiformes*)		
Burrowing Owl	*(Athene cunicularia)*	X
Eastern Screech-Owl	*(Megascops asio)*	X
Great Horned Owl	*(Bubo virginianus)*	X
Long-Eared Owl	*(Asio otus)*	X
Northern Saw-Whet Owl	*(Aegolius acadicus)*	
Short-Eared Owl	*(Asio flammeus)*	X
Vultures (*Cathartiformes*)		
Turkey Vulture	*(Cathartes aura)*	X

The remaining 10 species are all potential visitors during migration, winter, or post-breeding dispersal (Jennings et al. 2005). Several factors influence the migratory pathways of raptors, the most significant of which is geography. Two geographical features used by raptors during migration are ridgelines and shorelines of large bodies of water (Liguori 2005). The up-drafts formed as the wind hits the ridges and thermals created over land (but not water) make for energy -efficient travel for raptors over long distances (Liguori 2005). It is for this reason that raptors often follow corridors or pathways (e.g., along prominent ridges with defines edges) during migration. Topography in the Project Area is relatively flat to gently rolling hills and none of the features of the Project Area are likely to concentrate raptors. However, the Project Area is located within the Central Flyway avian migratory corridor used by raptors and wetland and water impoundments may provide some stopover and/or foraging habitat for raptors that migrate through the area.

Specific foraging habitat that could attract both migrating and breeding raptors include grassland areas that are utilized by the likes of prairie dogs and other small colonial mammals. Black-tailed prairie dog (*Cynomys ludovicianus*) towns provide hunting opportunities for eagles and several raptor species likely

to occur within the Project Area, including the ferruginous hawk (*Buteo regalis*), red-tailed hawk (*Buteo jamaicensis*), northern harrier (*Circus hudsonius*), and Swainson's hawk (*Buteo swainsoni*).

Prairie Grouse

The Project Area occurs within the occupied range of the greater prairie-chicken (*Tympanuchus cupido*) and sharp-tailed grouse (*T. phasianellus*) hereafter referred to as prairie grouse for both species combined (Sibley 2014). These two species of gamebirds are native to the Great Plains of North America and thus prefer large expanses of grasslands with tall residual grass or shrubs that can provide cover while nesting and short or sparse grass on slightly elevated ground for leks (area where prairie grouse congregate during spring for mating), which provides maximum visibility for female grouse while simultaneously enabling a clear view of avian and mammalian predators. Areas with tall structures such as trees are generally avoided due to perceived vulnerabilities associated with perching raptors (Johnson et al. 2011; Connelly et al. 1998).

Prairie grouse are found throughout much of South Dakota with the highest concentrations extending from the south-central through the northwestern portions of the state. Neither prairie grouse species have regulatory protection in South Dakota and are legal game species that are routinely hunted. Prairie grouse hunting typically occurs on large expanses of grassland between September and January, but can occur in cropland or field edges in grassland-dominated landscapes. Hunters are limited to three grouse per day and require a small game or any combination license to hunt. Hunting limitations and regulations are defined by statute and enforced by the SDGFP. According to the SDGFP 2019 harvest season report, an estimated 30,053 prairie grouse were harvested within the state in 2019 of which approximately 90 were from Hyde and Hughes counties (SDGFP 2021g).

Surveys conducted in 2016, 2018, 2019, and 2020 by WEST verified the presence of prairie grouse leks during the breeding season within and surrounding the Project Area (Section 9.2.1.3). Grasslands within and adjacent to the Project Area have the potential to support prairie grouse. The Project Area is outside of the range for the greater sage-grouse (*Centrocercus urophasianus*).

Bats

Based on range maps (BCI 2021), eight bat species are possible residents and/or migrants in the Project Area (Table 9-5). Two of the eight species are included due to range (BCI 2021) but is unlikely to occur in the Project Area based on habitat restrictions: the Townsend's big-eared bat (*Corynorhinus townsendii*) and the western small-footed myotis (*Myotis ciliolabrum*). The six remaining species that have potential to occur in the Project Area based on range maps (Table 9-5) have been documented as fatalities at wind energy facilities. These species include big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), little brown bat (*Myotis lucifugus*), northern long-eared bat (*Myotis septentrionalis*), and silver-haired bat (*Lasionycteris noctivagans)*.

Table 9-5. Bat Species with the Potential to Occur in the Project Area Based on Range Maps

Species	Scientific Name	Habitat	Likelihood of Occurrence
Big Brown Bat	*Eptesicus fuscus*	Common in most habitats; abundant in deciduous forests and suburban areas with agriculture; maternity colonies beneath bark or in tree cavities, buildings, barns, or bridges.	Probable
Eastern Red Bat	*Lasiurus borealis*	Abundant tree bat; roosts in trees; solitary, prefers forested environments.	Probable
Hoary Bat	*Lasiurus cinereus*	Usually not found in human-made structures; roosts in trees along forest borders; very wide-spread. Found in a wide variety of habitats.	Probable

Table 9-5. Bat Species with the Potential to Occur in the Project Area Based on Range Maps

Species	Scientific Name	Habitat	Likelihood of Occurrence
Little Brown Bat	*Myotis lucifugus*	Especially associated with humans, often uses man-made structures for nursery colonies. Roosts in tree cavities and crevices and forages over meadows, farmland and cliff faces.	Probable
Northern Long-Eared Bat	*Myotis septentrionalis*	Found roosting beneath exfoliating bark and in tree cavities. Hibernates in caves and underground mines.	Possible
Silver-Haired Bat	*Lasionycteris noctivagans*	Common bat in forested areas, particularly old growth forest; maternity colonies in tree cavities or hollows; hibernates beneath exfoliating bark, in wood piles and in cliff faces.	Probable
Townsend's Big-Eared Bat	*Corynorhinus townsendii*	Commonly found in arid desert scrub and pine forests; maternity colonies in mines, caves, and buildings.	Unlikely
Western small-footed myotis	*Myotis ciliolabrum*	Hibernated in caves or mines. Rears young in cliff-face crevices, erosion cavities and beneath rocks on the ground.	Unlikely

9.2.1.2 Special Status Species

Federally-Listed Species

At the time of review six wildlife species were listed as federally threatened or endangered under the Endangered Species Act (ESA 1973) have been verified to occur or have the potential to occur in Hughes and Hyde counties (WEST 2016). This included four federally listed avian species, one federally listed bat species, and one federally listed fish species. As of January 2021, the least tern has been removed from the list of species protected under the Endangered Species Act. The remaining five species are described in Table 9-6.

Table 9-6. Federally Threatened or Endangered Wildlife Species with the Potential to Occur in the Project Area

Species	Scientific Name	Federal Status[1]	Likelihood of Occurrence
Mammals			
Northern Long-eared Bat	*Myotis septentrionalis*	T[3]	Possible
Birds			
Whooping Crane	*Grus americana*	E	Possible
Red Knot	*Calidris canutus rufa*	T	Possible
Piping Plover	*Charadrius melodus*	T	Possible
Fish[2]			
Pallid Sturgeon	*Scaphirhynchus albus*	E	Unlikely

1 E = endangered, T = threatened
2 See Aquatic Resources Section 10.1.2 for discussion
3 The status of NLEB is currently under court-ordered review (Barclay and Damon LLP 2020)
Sources: Jennings et al. 2005; WEST 2016

Northern Long-eared Bat

The NLEB is found in the United States, from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through parts of South and North Dakota (USFWS 2020b). This species hibernates in caves and abandoned mines during winter. During the summer, individuals may roost alone or in small colonies beneath exfoliating bark or in cavities or crevices of both live and dead trees (USFWS 2020b; BCI 2021).

South Dakota contains 21 known NLEB hibernacula, all within the Black Hills in western South Dakota, nine of which are abandoned mines (USFWS 2015b). NLEBs, including some pregnant females, have been captured during the summer along the Missouri River in South Dakota (Swier 2006; Kiesow and Kiesow 2010). Acoustic data recorded by bat monitoring stations operated by the SDGFP also detected the NLEB sporadically throughout the state (across 16 counties) in 2011 and 2012 (USFWS 2015b).

Under the final Section 4(d) rule, incidental take of NLEB is prohibited within a hibernaculum, as a result of tree removal activities within 0.25 mile of a known hibernaculum, or as a result of tree removal activities where the activity cuts or destroys a known, occupied roost tree or other trees within a 150-foot radius from the roost tree during the pup season from June 1 through July 31 within the USFWS White Nose Syndrome (WNS) zone. The WNS zone now covers the entire U.S. portion of the NLEB range (USFWS 2020b), which includes the Project Area. Lethal take by operating wind turbines is specifically excluded from the incidental take prohibition. As evidenced during site visits, suitable NLEB habitat features in the form of tall trees, abandoned buildings, and riparian areas are present throughout and near the Project Area. Although WNS (caused by the fungus *Pseudogymnoascus destructans*) is the primary threat to NLEB populations (USFWS 2016a), there is additional concern about the impacts of wind facilities on bat species.

Whooping Crane

The whooping crane (*Grus americana*) is a federally and state endangered migratory species that prefers stopovers in croplands interspersed with palustrine wetlands. The only self-sustaining wild population, with an estimated 506 whooping cranes (including 39 juveniles and 192 adult pairs) as of the winter of 2019-2020, over-winters in the Texas Gulf Coast at the Aransas National Wildlife Refuge (USFWS 2020c). The cranes then migrate north through Oklahoma, Kansas, Nebraska, South Dakota and North Dakota to breed in the Northwest Territories of Canada (University of Wisconsin-Madison 2020). Between the years 2010 and 2016, 95 percent of whooping crane sightings occurred within a 182-mile wide migration corridor along this route (Pearse et al. 2018). The Project Area is within the distance bands where 75 to 80 percent of observations have occurred, based on confirmed sightings (CWCTP 2017).

Whooping cranes occasionally migrate with sandhill cranes (*Grus canadensis*), so stop-over sites used by sandhill cranes may be used to identify potential whooping crane stop-over areas (CWS and USFWS 2007). The Project Area provides potentially suitable habitat for both sandhill and whooping cranes because it is primarily composed of herbaceous cover and cropland with interspersed streams and areas of open water. There has been one confirmed whooping crane within the Project Area along the western portion of the Project Area (WEST 2020; Figure 10 in Appendix A). In the spring of 2010, during crane monitoring at the Titan Wind Project located approximately 7.4 miles east of the Project Area in Hand County, a group of five whooping cranes spent 3 days approximately 2 miles from the Titan I Wind Facility. The closest they ever were on the ground from a turbine was 1.2 miles (Stehn 2011).

Whooping cranes generally migrate at altitudes between 1,000 to 6,000 feet, well above turbine height (Stehn and Wassenich 2007); thus, for the most part, whooping cranes are unlikely to collide with turbines. However, whooping cranes ascend and descend for roosting and feeding, or in inclement weather, and may fly at lower altitudes, sometimes within rotor-swept areas.

Red Knot

The rufa red knot (*Calidris canutus rufa*) is a federally listed threatened shorebird species that breeds in the tundra of the central Canadian Arctic and winters in Tierra del Fuego at the southern tip of South America (USFWS 2021a). Outside of its breeding grounds, it uses marine habitats such as estuaries and bays (USFWS 2021a). The red knot is a potential but infrequent migrant through the Project Area during spring and fall as four red knots were observed approximately 7.8 miles northwest of the Project Area in May 2016 (eBird 2016).

Piping Plover

The piping plover (*Charadrius melodus*) is a federally and state threatened migratory shorebird that nests and forages along shorelines of small lakes, large beaches, river islands or industrial pond shorelines. Wide beaches with sparse vegetation are preferred nesting habitat, while wintering habitat includes ocean beaches (NatureServe 2021a). The piping plover Northern Great Plains Distinct Population Segment occupies sand and gravel bars and beaches along major rivers and around lakes, reservoirs, ponds, and alkali wetlands (USFWS 2015c).

Critical Habitat is designated along the Missouri River/Oahe Reservoir in Hughes County (USFWS 2002); this is the closest critical habitat to the Project (within about 44 miles to the west of the Project Area). Very little information is available about historical levels of breeding piping plovers prior to the 1980s. The 1988 Recovery Plan (USFWS 1988) documents historical breeding, which primarily occurs along the sandbars of the Missouri River. According to Aron (2005) the Oahe Reservoir supported approximately 19 percent of all Missouri River piping plovers from 1994 through 2004, although surveys of off-river sites have found few birds nesting in alkali lakes in central South Dakota (USFWS 2009). While this suggests that the state's alkali lake system could support additional breeding piping plovers, the Project Area is located outside of the major alkaline lakes nesting areas of plovers (USFWS 2009).

Inland nesting piping plovers are infrequently seen at suitable migration stopover points, indicating that they may fly non-stop to their Gulf of Mexico wintering areas (Johnson et al. 1997). Within South Dakota, reports of migratory piping plovers are not common, but the species does occur east and west of the Project Area (eBird 2016). Piping plovers are not known to breed within the Project Area, but they do breed in the vicinity of the Project Area along the Missouri River (Aron 2005).

State-Listed Species

Eight species ranked by the state of South Dakota as threatened or endangered are listed as occurring in Hughes and Hyde Counties (SDGFP 2016), including two federally listed avian species (whooping crane and piping plover), discussed in the federally listed species section above and one federally listed fish species (pallid sturgeon), discussed in Section 9.2.1.2. Of the remaining four species, two are mammals (swift fox [*Vulpes velox*] and northern river otter, one is a fish (sicklefin chub), and one is a reptile (false map turtle). The northern river otter, sicklefin chub and false map turtle are discussed in Section 9.2.1.2 under aquatic species.

The swift fox (*Vulpes velox*), is a state-threatened species that relies on open, rolling mixed-grass and short grass prairies with little or no shrubs. It also inhabits areas of mixed agricultural use, but population densities are lower in these areas. Prairie dog towns are a preferred habitat of swift fox, as they use burrows made by other mammals or dig their own burrows in sandy soils on high ground (NatureServe 2021b). Major threats to this species include loss of suitable native short and mixed-grass prairie due to conversion to agricultural and development. Herbaceous and agricultural areas within the Project Area

might provide suitable habitat for the swift fox; however, they are not known to occur in Hyde and Hughes counties.

Bald and Golden Eagle Protection Act

Under authority of the Bald and Golden Eagle Protection Act (BGEPA; 16 USC 668-668d), bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) are afforded additional legal protection. The BGEPA prohibits the take, sale, purchase, barter, offer of sale, purchase or barter, transport, export, or import, at any time or in any manner of any bald or golden eagle, alive or dead or any part, nest, or egg thereof (16 USC 668). The BGEPA also defines take to include "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb" (16 USC 668c) and includes criminal and civil penalties for violating the statute. The term "disturb" is defined as agitating or bothering an eagle to a degree that causes or is likely to cause, injury to an eagle or either a decrease in productivity or nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior (50 CFR 22.3).

The bald eagle occurs in South Dakota as a resident utilizing suitable areas year-round, with verified and potential occurrences reported for Hughes and Hyde County (eBird 2016; NatureServe 2021c). Preferred nesting, foraging, and roosting bald eagle habitats include large, mature trees near water with abundant fish and waterfowl prey, especially in areas with little disturbance. Preferred perch sites include tall trees and snags located near nesting and foraging areas that provide good vantage points, while nests and foraging activities are usually associated with permanent water bodies (Buehler 2019). There are multiple lakes and rivers within and/or adjacent to the Project that provide suitable nesting and wintering habitat for bald eagles. Furthermore, the Project Area is approximately 5 miles northeast of the Missouri River, which serves as a migration corridor and provides suitable nesting and wintering habitat for bald eagles.

Observations of golden eagles have been reported in South Dakota year round, with the majority of sightings in the vicinity of the Project reported during the winter season (National Audubon Society 2021). The golden eagle usually hunts on the rimrock terrain of open grassland areas and nests on cliffs near open foraging areas such as grassland or shrubland (Kochert et al. 2002). No golden eagles were documented during the survey efforts (WEST 2020).

Birds of Conservation Concern

The USFWS lists 33 Birds of Conservation Concern (BCC) within the Prairie Potholes Bird Conservation Region 11 (USFWS 2021b) which includes the Project Area. These species are protected under the MBTA, but they do not receive any additional protection as BCC but have been identified as vulnerable to population declines in the Bird Conservation Region by the USFWS (2021).

Species of Greatest Conservation Need

In addition to the federally and state-listed species noted above, there are several species identified as Species of Greatest Conservation Need (SGCN) by the SDGFP's Wildlife Action Plan (SDGFP 2018) that have the potential to occur in the Project Area. Species were placed on this list by meeting one or more of the criteria including:

- State or federally listed species for which the state has a mandate for recovery.
- Species that are regionally or globally imperiled and South Dakota represents an important portion of their remaining range or, the species is regionally or globally secure and for which South Dakota represent an important portion of their remaining range.

- Species with characteristics that make them vulnerable, including species that are indicative of or depend on a unique or declining habitat in South Dakota, require large home ranges/use multiple habitats, depend on large habitat patch sizes, depend on an ecological process that no longer operates within the natural range of variation, are limited in their ability to recover on their own due to low dispersal ability or low reproductive rates, have a highly localized or restricted distribution (endemics) or concentrate their populations during some time of the year.

Only bird and bat SGCN are presented in Table 9-7, since these are the two groups most likely to be impacted by a wind facility. One SGCN bat has the potential to occur in the Project Area (Table 9-7), while 20 bird SGCN have the potential to occur in the Project Area (SDGFP 2021a; WEST 2016). An SGCN designation does not afford these species any regulatory protections, although most of the avian species are protected under other state or federal regulation (MBTA, BGEPA, ESA).

Table 9-7. Birds and Bats Listed As South Dakota SGCN With the Potential to Occur in the Project Area

Common Name	Scientific Name	Spring	Summer	Fall	Winter
Mammals					
Northern long-Eared Bat	*Myotis septentrionalis*		X		
Birds					
American White Pelican	*Pelecanus erythrorhynchos*		X		
Baird's Sparrow	*Ammodramus bairdii*	X		X	
Bald Eagle	*Haliaeetus leucocephalus*	X	X	X	X
Black Tern	*Chlidonias niger*		X		
Burrowing Owl	*Athene cunicularia*		X		
Chestnut-Collared Longspur	*Calcarius ornatus*		X		
Ferruginous Hawk	*Buteo regalis*	X	X	X	X
Golden Eagle	*Aquila chrysaetos*	X	X	X	X
Greater Prairie Chicken	*Tympanuchus cupido*	X	X	X	X
Interior Least Tern	*Sternula antillarum athalassos*		X		
Lark Bunting	*Calamospiza melanocorys*		X		
LeConte's Sparrow	*Ammodramus leconteii*	X		X	
Marbled Godwit	*Limosa fedoa*	X		X	
Northern Goshawk	*Accipiter gentilis*				X
Osprey	*Pandion haliaetus*	X		X	
Piping Plover	*Charadrius melodus*		X		
Sprague's Pipit	*Anthus spragueii*	X	X	X	
Whooping Crane	*Grus americana*	X		X	
Willet	*Catoptrophorus semipalmatus*		X		
Wilson's Phalarope	*Phalaropus tricolor*		X		

Sources : SDGFP 2021a; WEST 2016

South Dakota Natural Heritage Program

The South Dakota Natural Heritage Program maintains documentation of reported rare species. These include species that have a federal/state protection status (i.e., endangered, threatened, candidate, or proposed listing status) or state conservation status, which is a rarity ranking of breeding and non-breeding species (South Dakota Natural Heritage Program 2021).

9.2.1.3 Studies Conducted to Date

Project-specific wildlife surveys began in April 2016 and are ongoing (Table 9-8). These wildlife surveys were conducted to satisfy the Tier 3 studies as recommended by the USFWS Land-Based WEG, Stage 2 of the ECPG and the USFWS and SDGFP guidance. Throughout this time, the Project Area evolved through both expansions and contractions. In 2016, baseline wildlife studies were completed within a previous defined wind resource area encompassing 39,099.3 acres based on a 200-MW project. In 2017, this wind resource area was expanded to encompass 110,142.3 acres based on up to three separate 250 MW phases. North Bend Wind refined the wind resource area for the Project which is primarily located along the western portion of previously surveyed areas. In order to incorporate areas previously outside of the Project Area, some surveys required multiple years to gather the required data over the specified area. Appendix C includes a summary of all studies conducted to date.

Table 9-8. Summary of Studies Conducted to Date at the Project Area

Survey Type	Dates	Survey Area Covered
Bird Surveys		
2016 – 2017 Avian Use Survey	April 18 - March 28	2016 Project Area
2018 – 2019 Avian Use Survey	January 23 - January 14	2019 Project Area
2019 – 2020 Avian Use Studies	April 5 - March 31	2020 Project Area
2020 – 2021 Avian Use Surveys	April 6 - March 13	2020 Project Area
2021 Avian Use Surveys	February 25 - May 21	2021 Acquired Lands
2016 Raptor Nest Surveys	March 28 - April 1	2016 Project Area and 2-mile buffer
2018 Raptor Nest Surveys	March 9 - May 28	2016 Project Area and 2-mile buffer
2019 Raptor Nest Surveys	March 26 - April 17	2019 Project Area and 2-mile buffer
2020 Raptor Nest Surveys	March 2 - April 20	2020 Project Area and 2-mile buffer
2016 Sharp-tailed Grouse and Greater Prairie Chicken Lek Surveys	March 29 - April 30	2016 Project Area and 1-mile buffer
2018 Sharp-tailed Grouse and Greater Prairie Chicken Lek Surveys	March 27 - May 6	2017 Project Area and 1-mile buffer
2019 Sharp-tailed Grouse and Greater Prairie Chicken Lek Surveys	April 19 - May 17	2020 Project Area and 1-mile buffer
2020 Sharp-tailed Grouse and Greater Prairie Chicken Lek Surveys	March 25 - May 8	2020 Project Area and 1-mile buffer
Bat Surveys		
2016 General Bat Acoustic Survey	May 26 - October 21	Two locations within current Project Area
2018 General Bat Acoustic Survey	April 25 - October 25	Two locations within current Project Area
Threatened and Endangered Species Habitat Surveys		
Whooping Crane Stopover Habitat	Desktop, October 2020	Current Project Area and 10-mile buffer
Northern Long-eared Bat Habitat Assessment	Desktop	Current Project Area and 2.5-mile buffer

Raptor and Eagle Nest Surveys

During the 2016 aerial survey, three raptor nests were documented within the Project and 2-mile buffer (Figure 3 in Appendix C). Two nests were occupied by a red-tailed hawk, while the remaining nest was inactive. No eagle nests were located during the survey within the Project Area or the 2-mile survey area. During aerial and ground surveys in 2018, 21 raptor nests were identified. All three of the previously documented nests from 2016 were re-visited; one was confirmed occupied with a great-horned owl (*Bubo virginianus*) and two could not be relocated. No potential eagle nests were identified within the Project

area or 2-mile buffer. Fourteen of the 21 nests were classified as unoccupied nests of unknown raptor. The remaining occupied nests included five great-horned owls, one Swainson's hawk (*Buteo swainsoni*), and one red-tailed hawk (Figure 4 in Appendix C).

In 2019, two surveys were conducted on March 26 and April 16-17 (Figure 5 in Appendix C). Twenty-two nests were documented during surveys (Figure 6 in Appendix C) and 13 previously identified nests were either not present or excluded from surveys due to safety considerations. Twelve nests were determined to be occupied with adults in the nest, perched in the same tree, or eggs in the nest. Ten nests were considered unoccupied as no activity was recorded during either survey in accordance with the ECPG. Of occupied nests, five were occupied by great horned owl, one by ferruginous hawk (*Buteo regalis*), four by red-tailed hawk, and two by unidentified raptors (eggs were present in the nest or adults were not identified). No eagle or potential eagle nests were identified within the Project area or 2-mile buffer.

Three surveys for the Project Area were conducted on March 2-3, March 12 and 20, and April 20, 2020. Thirty-seven nests were documented during surveys of which twenty nests were previously identified within the Project and associated 2-mile buffer, and four previously identified nests were either not present or excluded from surveys due to safety considerations. Of the 21 occupied nests, eight were occupied by red-tailed hawks, six by great horned owls, and two by ferruginous hawks. One occupied nests could not be identified to species (i.e., unknown raptor). Sixteen nests were considered unoccupied as no activity was recorded during either survey in accordance with the ECPG. No eagle or potential eagle nests were identified within the Project area or 2-mile buffer.

Prairie Grouse Lek Surveys

WEST conducted surveys to document prairie grouse leks during the 2016, 2018, 2019, and 2020 breeding seasons within the Project Area. The objective of the prairie grouse lek survey was to collect pre-construction data that can be used to help site the wind turbines to minimize impacts on prairie grouse. A combination of aerial and ground-based surveys was used to search for breeding prairie grouse locations. Surveys were conducted three times from late March to the end of the first week of May each year and included their respective Project areas and 1.6-km (1.0-mi) buffer.

WEST identified a total of 20 prairie grouse leks during aerial and ground lek surveys within the Project Area and its 1-mile survey area during the 2016, 2018, 2019, and 2020 breeding season (Figure 6 in Appendix C). Four lek locations were active in 2016, seven in 2018, three in 2019 surveys, and eight in 2020; of these identified and potential leks, one was a sharp-tailed grouse lek and 19 were greater prairie chicken leks.

Northern Long-eared Bat Habitat Assessment

A desktop assessment of the presence of potentially suitable habitat for the NLEB was conducted within the Project Area. During the summer, suitable habitat for this species consists of forested areas where bats might roost, forage and commute between roosting and foraging sites. NLEB primarily forage or travel in forest habitat and are typically constrained to forest features (Boyles and Willis 2009). Therefore, habitat suitability was evaluated based primarily on the presence of forested areas that NLEB might use for roosting and foraging.

Forested patches were sorted by size into the following groups: fewer than 15 acres: small forest patches; 10 to 50 acres: potential NLEB roost/foraging habitat; and more than 50 acres: large potential roost/foraging habitat. All polygons representing forested habitats were buffered by 500 feet and

dissolved to group any habitat patches within 1,000 feet of each other. This buffer, representing all forested habitats within 1,000 feet of each other, was then purged of small isolated patches by selecting only those connected habitats containing forested patches at least 10 acres in size. This selection of habitat patches was then buffered by 1,000 feet to represent the potential foraging area for NLEB. This results in nine patches covering 2,961.0 total acres within the Project Area and a 2.5-mile buffer. Patch sizes range from 237.8 acres to 534.7 acres (Figure 8 in Appendix C).

Whooping Crane Stopover Habitat Assessment

Potential stop-over habitat for whooping cranes was evaluated using a model developed by Niemuth et al. (2018). They used whooping crane sightings, landscape data, and statistical models to provide a better insight into habitat use within the Dakotas. Figure 9 in Appendix C displays the results of this model along with whooping crane sightings in the region through fall of 2019, and telemetry data from 2009 through 2018. The entire Project Area is contained within the 50th percentile of all sightings along the migration corridor (Niemuth et al. 2018, Pearse et al. 2018).

Results of predictive model indicates potential stopover habitat varies across the Project Area. The south and southwestern portion of the Project Area has lower potential habitat quality, while the northcentral portion of the Project Area potentially contains relatively high quality. Though whooping cranes have been documented within the Project Area and a 10-mile buffer, most telemetry and sighting data indicated whooping crane are infrequently using the habitat within 10 miles of the Project Area. Although there is potential migratory stopover habitat within and around the Project Area based on the Niemuth et al. (2018) model, only 16 whooping cranes have been confirmed within 10 miles of the Project. In comparison, it appears that more confirmed habitat use has been to the northeast, east, and south of the Project. The widespread availability of suitable stopover habitat indicates that if cranes are displaced from suitable habitat by development of the Project, they are likely to find similar habitat nearby.

The Cooperative Whooping Crane Tracking Project emphasizes that the whooping crane observation data are incidental sightings and not accurate documentations of absence in areas where no observations are recorded, nor are observation locations representative of all sites used by tracked cranes since only the location of the first observation is logged in the database.

More recently Pearse et al. (2020) reported low stopover site fidelity based on 58 marked whooping cranes tracked from 2010 to 2016. The authors suggested that past use of stopover habitat was a poor indicator of future use and that use of potential stopover habitat was likely related to other factor including length of migration bout and informed landscape and habitat features.

Acoustic Bat Survey

WEST conducted acoustic monitoring surveys to estimate levels of bat activity at the Project from May 26 to October 21, 2016 and April 25 to October 25, 2018 (Appendix C). Studies of bat activity followed the recommendations of the USFWS Land-based WEG (USFWS 2012) and Kunz et al. (2007).

In 2016 surveys, the AnaBat units recorded approximately 54 percent of bat passes as high frequency (e.g., eastern red bats, and little brown bats [*Myotis lucifugus*]) and 46 percent of bat passes as low frequency (e.g., big brown bats, hoary bats, and silver-haired bats). Bat activity varied between seasons, with lower activity in the summer and higher activity in fall. At this station, bat pass rates peaked during the first half September. Higher activity during the late summer and early fall may be due to the presence of migrating bats passing through the area.

During the 2018 surveys, approximately 39 percent and 61 percent of bat passes recorded at the representative habitat and bat feature, respectively, in the Project Area were classified as low frequency bats. Bat activity recorded at the Project Area at ground representative stations during the fall migration period (0.39 bat passes per detector-night) was lower than activity at most facilities in the Midwest.

Avian Use Surveys

There are ongoing avian use point count surveys in the Project Area. The Project Area has shifted numerous times during development due to various logistic constraints. As such, avian point count surveys are ongoing. The analysis provided in this Application provides interim survey results of ongoing avian use efforts focused on the minimum convex polygon of the current turbine array as described in the ECPG.

For the purposes of this interim summary, only surveys beginning April 2020 through July 2020 are included and the summary results are preliminary. An updated avian use summary will be drafted late July 2021 and will include both historical data, if available, and data from July 2020 through May 2021. Avian use surveys were conducted at 23 survey points. There were 76 fixed-point surveys completed for large and small birds each. Fifty-eight unique species were recorded during surveys, including 30 unique large bird and 28 unique small bird species. For large birds, the most common species recorded included Canada goose (466 observations, 20 groups), mourning dove (*Zenaida macroura*; 72, 43) and killdeer (*Charadrius vociferous*; 38, 38). Six diurnal raptor species were identified within the Project Area, with northern harrier (24, 24) and red-tailed hawk (17, 17) being the most abundant. For small bird species, western meadowlark (163, 163), brown-headed cowbird (101, 22), and grasshopper sparrow (*Ammodramus savannarum*; 55, 55) were the most common. No eagle, state-, or federal-listed species have been observed while conducting surveys within the Project area during this effort.

9.2.2 Impacts to Wildlife

The primary wildlife-related concerns associated with the construction and operation of wind energy facilities and transmission lines are generally associated with birds and bats. These impacts may be direct, such as those resulting from collision into MET towers or wind turbines during operations or habitat loss. Indirect impacts include displacement, habitat degradation, or fragmentation. Permanent habitat loss due to construction of wind turbines will be minimal across the Project Area and localized. The sections below further describe potential impacts on birds, bats, and other wildlife that have the potential to occur in the Project Area based on recent published research and project-specific survey results.

9.2.2.1 Federal and State-Status Terrestrial Species

This section discusses potential impacts to federally and state-listed species that have the potential to occur within the Project Area.

Northern Long-eared Bat

The Project Area is located on the western fringe of the NLEB range and within the WNS zone and therefore must comply with the section of the NLEB 4(d) rule applying to areas impacted by WNS (USFWS 2016b). North Bend Wind has completed an NLEB habitat assessment and avoided suitable habitat by 1,000 feet pursuant to USFWS guidance (Appendix C). Given the Project's location, the presence of limited suitable habitat, and recorded occurrences of NLEB in the general vicinity of the Project, it is possible that this species occurs in the Project Area during migration and/or summer. However, incidental take of NLEB by wind turbines is exempted by the 4(d) rule.

Whooping Crane

Generally, risk regarding whooping cranes is considered low due to low population numbers and the little amount of time they spend flying during migration within the rotor swept and transmission line heights. However, the Project Area provides potentially suitable habitat for whooping cranes since it is primarily composed of herbaceous cover and cropland with interspersed streams and areas of open water. Additionally, the Project Area is located within the 50 percent migration corridor. When comparing the TWI model results between an expanded version of the Project Area and the 10-mile buffer, the areas were found to be similar in that features scoring 11 or 12 were most common (Appendix C). The lack of a concentration of high-scoring features within the Project Area relative to the surrounding landscape infers whooping cranes may not be more attracted to the Project Area and risky areas near wind turbine blades and transmission lines.

Red Knot

The rufa red knot is a potential but infrequent migrant through the Project Area during spring and fall. However, the potential of occurrence within the Project Area is considered unlikely given the lack of confirmed observations and lack of suitable stopover habitat within the Project Area.

Piping Plover

Although unlikely, the potential for occurrence of breeding piping plovers exists based on limited suitable habitat present during low water years on lands within and around the Project Area. Outside of the breeding period, this species may migrate over the Project Area.

Swift Fox

Based on a compilation of recent records and areas with established populations (Stratman 2015) and because the Project Area falls slightly outside of the species distribution (SDGFP 2021a), it is unlikely that this species will occur in the Project Area. However, if swift foxes were to be present in prairie dog colonies within or immediately adjacent to areas disturbed by Project development, direct and indirect impacts will be limited by the avoidance measures identified for burrowing owls that also use prairie dog towns.

Birds

Mortality or injury due to collisions with turbines or other infrastructure is the most probable direct impact to birds from wind energy facilities and associated facilities. Collisions may occur with resident birds foraging and flying within the Project Area or with migrant birds seasonally moving through the area. Project construction could affect birds through loss of habitat, construction disturbance, or fatalities from construction equipment. Impacts from decommissioning of the facility are anticipated to be similar to construction in terms of noise, disturbance, and equipment used. Potential mortality from construction equipment is expected to be relatively low, as equipment used in wind energy facility construction generally moves at slow rates or is stationary for long periods (e.g., cranes). The highest risk of direct mortality to birds during construction is most likely the potential destruction of nests of ground- and shrub-nesting species during initial site clearing.

Post-construction fatality monitoring reports from the Midwest region of North America show a wide variation in levels of bird mortality, ranging from 0.27 to 8.25 birds/MW/year (WEST 2017a). 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 8.25 and 0.89 bird fatalities/MW/year in 2009 (Derby et al. 2010) and 2010 (Derby et al. 2011), respectively.

The majority of bird species commonly observed during the WEST avian surveys completed to date are not of conservation concern. The majority of sandhill cranes were recorded flying above the rotor-swept area, indicating these individuals were migrating over the Project Area rather than using habitats within the Project. Despite their abundance, potential impacts to sandhill cranes are estimated to be low based on all available data regarding crane and wind energy facility interactions in North America; however, the risk of collision cannot be entirely ruled out.

While overall risk to raptors is expected to be low, based on species composition of the most common raptor fatalities at other western wind energy facilities and species composition of raptors observed in the area between 2016 and 2019, the majority of the fatalities of diurnal raptors will likely consist of red-tailed hawks. It is expected that risk to raptors will be unequal across seasons, with the lowest risk in the winter and highest risk during the spring. Raptor fatality rates are expected to be comparable to other wind energy facilities in South Dakota and the Midwest region.

9.2.2.2 Prairie Grouse

Human-induced influences that fragment grouse habitat could affect population growth rates, persistence or occupancy through negative behavioral responses affectively leading to habitat loss (Doherty et al. 2011). Currently, the state of the science related to wind power project effects on prairie grouse is developing; thus, management recommendations for future wind power projects are limited. The effects of wind energy development have been studied on three species of grouse within the United States including the greater prairie-chicken, Columbian sharp-tailed grouse (*T. phasianellus columbianus*) and greater sage-grouse. Although the Project Area is outside of the range of the greater sage-grouse, due to the lack of peer-reviewed studies that investigate the effects of turbines on plains sharp-tailed grouse, the subspecies found within the Project Area, grouse studies in general were used to provide a framework for impact analysis.

Generally, these studies indicate grouse nest site selection, nest survival, and female survival are not negatively affected by the presence of turbines (Winder et al. 2014a,b; McNew et al. 2014; Proett 2017; LeBeau et al. 2017a; Harrison et al. 2017). However, studies have indicated greater prairie-chicken space use during the breeding season in Kansas was negatively affected by proximity to turbines (Winder et al. 2014a) and lek abandonment was high for smaller leks within cropland habitats within 8 km of turbines (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).

Given the location of leks within the Project Area and the likely presence of suitable nesting and brooding habitat in proximity to turbines, transmission line infrastructure, or associated structures, the potential for either direct or indirect impacts exist. Siting turbines within agricultural fields and avoiding disturbance or fragmentation to large blocks of grassland habitats help reduce potential impacts to prairie grouse and their breeding habitat within the Project Area. In addition, North Bend Wind will employ BMPs as described in SDGFP's Prairie Grouse Management Plan for South Dakota 2017−2021.

9.2.2.3 Eagles

Exact numbers of bald and golden eagle mortalities at wind energy facilities are difficult to determine for a variety of reasons including, until recently, the lack of a centralized database, and legal proceedings that prevent the release of information. Eagle mortalities at wind facilities in the contiguous United States (excluding the Altamont Pass Wind Resource Area in California) were summarized through June 2012 from public domain data by Pagel et al. (2013). They found that 32 wind energy facilities had experienced eagle fatalities (85 total fatalities—6 bald eagles and 79 golden eagles). More recently, Kritz et al. (2018) updated the findings of Pagel et al. and found 49 verifiable records of bald eagle mortality in the United States between 2013 and 2018. None of these fatalities occurred in South Dakota, although 25 occurred in the neighboring states of Wyoming, Montana, North Dakota, Minnesota, and Iowa.

To date, bald and golden eagles have been recorded within the Project Area during fixed-point surveys however no nests have been located during 4 years of nest surveys. The presence of a eagles incidentally within a project may indicate an elevated level of risk for eagle collision with turbines and nesting disturbance during construction and operation of the Project; however, at the time of this application there are no identified eagle nests within the Project Area.

9.2.2.4 Bats

Bat fatalities have been discovered at most wind energy facilities monitored in North America, ranging from zero (Chatfield and Bay 2014) to 40.2 bat fatalities per MW per year (Hein et al. 2013). In 2012, an estimated 600,000 bats died as a result of interactions with wind turbines in the United States (Hayes 2013). Proximate causes of bat fatalities are primarily due to collisions with moving turbine blades (Grodsky and Drake 2011; Rollins et al. 2012), but to a limited extent may also be caused by barotrauma (Baerwald 2008). The underlying reasons for why bats enter the proximity of turbines are still largely unknown (Cryan and Barclay 2009). To date, post-construction monitoring studies of wind energy facilities show that (1) migratory tree-roosting species (e.g., eastern red bat, hoary and silver-haired bat) compose approximately 78 percent of reported bat fatalities; (2) the majority of fatalities occur during the fall migration season (August and September); and (3) most fatalities occur on nights with relatively low wind speeds (e.g., less than 6.0 m/s [19.7 feet per second]; Arnett et al. 2008, 2013; Arnett and Baerwald 2013).

Approximately 19.3 percent and 49.7 percent of bat passes recorded at the representative habitat and bat feature, respectively, in the Project Area were classified as low-frequency bats. These low frequency species may become casualties because they typically fly at higher altitudes (Aldridge and Rautenbach 1987; Norberg and Rayner 1987; Fenton and Bogdanowicz 2002). Given that hoary bats, eastern red bats, and silver-haired bats are among the most commonly found bat fatalities at many facilities (Arnett et al. 2008, Arnett and Baerwald 2013), it is expected that these three species will likely be the most common fatalities at the Project.

Overall activity by low-frequency (e.g., big brown bats, hoary bats, and silver-haired bats) and high-frequency (e.g., eastern red bats and *Myotis* species) bats peaked during the first half of September. There was some variation between years in the composition of high frequency and low frequency activity. In 2016, there were more high frequency bat passes recorded while in 2018 more low frequency bat passes were recorded. Generally, there was less activity in 2018 than in 2016.

Given that over two-thirds of bat fatality studies in the Midwest report fewer than five bat fatalities/MW/year (WEST 2017b), it is possible that similar fatality rates might be recorded at the

Project. However, some studies indicate that facilities in agricultural settings in the Midwest can produce higher levels of bat fatalities (Jain 2005; Baerwald 2008; Gruver et al. 2009).

9.2.3 Mitigation Measures for Wildlife

North Bend Wind has sited the layout to avoid or minimize impacts to federally and state-protected species, avoid impacts to high quality prairie habitat, and to realign linear corridors, such as the access roads, collector system, crane pathways, and transmission lines to follow existing disturbed corridors (e.g., roads, fence rows) in an effort to reduce fragmentation. Pending completion of pre-construction avian and bat studies, North Bend Wind will prepare a Bird and Bat Conservation Strategy (BBCS) that will be implemented during construction and operation of the Project. The BBCS will consist of North Bend Wind's corporate standards for minimizing impacts to avian and bat species during construction and operation of wind energy projects and will be developed in a manner that is consistent with the USFWS Land-Based WEG (USFWS 2012). It will include North Bend Wind's commitments to wind project siting, construction practices and design standards, operational practices, permit compliance, and construction and operation worker training.

In addition, North Bend Wind has implemented or will implement the following mitigation measures to avoid or minimize potential impacts to wildlife in the Project Area during Project design, construction, operation, and decommissioning including prairie grouse BMPs outlined in SDGFP's Prairie Grouse Management Plan for South Dakota 2017−2021.

Design

- Maximize infrastructure siting in previously-disturbed habitat to avoid habitats associated with protected wildlife and plant species, localized areas of concentrated bird and bat use and breeding/brood-rearing areas.
- Minimize siting turbines in native prairie and native plant communities. Previously disturbed lands, including existing roads, will be used, where practical, to minimize wildlife habitat fragmentation.
- All turbines will be sited away from SDGFP South Dakota Game Production Areas and USFWS Waterfowl Production Areas (WPA); to reduce risk to waterfowl and waterbirds and grassland-associated birds.
- Prairie dog towns will be avoided to the extent possible to minimize disturbance to potential swift fox, burrowing owl, and other species (i.e., raptors).
- Avoid or minimize disturbance of wetlands during Project construction. A wetland delineation will be conducted prior to construction to identify the limits of wetland boundaries in the vicinity of Project activities.
- Turbine towers will be designed and constructed to discourage bird nesting and wildlife attraction; no perching structures will be placed on the nacelles of the turbines.
- Guy wires will not be used on permanent MET towers.
- Wind turbines will be illuminated as required by FAA regulations.
- Lighting guidelines will be followed where applicable, from the USFWS Land-Based WEG (USFWS 2012). This includes using lights with timed shutoff, downward-directed lighting to

minimize horizontal or skyward illumination and avoidance of steady-burning, high-intensity lights. Hoods/shields will be installed on exterior lights at the O&M facility, collector switchyard and interconnection substation to minimize skyward light. All unnecessary lighting will be turned off at night to limit attraction of migratory birds.

- Turbines will be sited more than 1,000 feet (305 meters) from the edge of connected patches of forested habitat to avoid potential impacts to bats, including NLEBs, during the summer.
- Construct wind turbines using tubular monopole towers.
- Turbine doors will not have exterior lights installed at the entrance.
- Consult with the appropriate natural resource agencies to avoid scheduling construction activities during important periods for wildlife courtship, breeding and nesting that are applicable to sensitive species within the Project Area.
- Minimize the size of areas in which soil will be disturbed or vegetation will be removed.

Construction

- Reduce habitat disturbance by keeping vehicles on access roads and minimizing foot and vehicle traffic through undisturbed areas; traffic will be restricted to Project-specific roads and use of unimproved roads will be restricted to emergency situations.
- Speed limits will be set to ensure safe and efficient traffic flow; signs will be placed along roads, as necessary, to identify speed limits, travel restrictions and other standard traffic control information.
- Educate and instruct employees, contractors and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons.
- Prior to construction, all supervisory construction personnel will be instructed on the BBCS and wildlife resource protection measures, including: (1) applicable federal and state laws (e.g., those that prohibit animal collection or removal) and (2) the importance of these resources and the purpose and necessity of protecting them and ensure this information is disseminated to applicable contractor personnel, including the correct reporting procedures.
- Sound water and soil conservation practices will be maintained during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. The includes the preparation and implementation of a SWPPP. The SWPPP will include standard sediment and erosion control devices and practices (e.g., silt fences, straw bales, netting, mulching. temporary seeding, soil stabilizers, check dams, grassed waterways) to minimize soil erosion during and after construction.
- Stormwater management practices will be implemented to minimize open water resources that may attract birds and bats.
- North Bend Wind will initiate habitat restoration of disturbed soils and vegetation as soon as possible after construction activities are completed. Restore areas of disturbed soil using weed-free native grasses, forbs and shrubs, in consultation with landowners, land managers and appropriate agencies.

- Noxious weeds will be controlled in all superficially disturbed areas using mowing and/or herbicides.
- If site evaluations show that proposed construction activities will pose a significant risk to avian or bat species of concern, establish buffer zones around known raptor nests, bat roosts and biota and habitats of concern.

Operation

- Conduct post-construction mortality monitoring for a minimum of 1 year. The monitoring will include searcher efficiency and carcass removal trials and the overall mortality rate will be adjusted based on the trial results. This protocol is based on guidelines from the USFWS Land-Based WEG (USFWS 2012) and the National Wind Coordinating Collaborative Comprehensive Guide to Studying Wind Energy/Wildlife Interactions (Strickland et al. 2011). Estimates of mortality will use the most appropriate and up-to date statistical analysis modeling available.
- Turn off unnecessary lighting at night to limit attraction of migratory birds. Follow lighting guidelines, where applicable, from the USFWS Land-Based WEG (USFWS 2012). This includes using lights with timed shutoff, downward-directed lighting to minimize horizontal or skyward illumination and avoidance of steady-burning, high- intensity lights.
- Instruct employees, contractors and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons.
- With the exception of bird and bat carcasses, all carrion discovered on site during regular maintenance activities will be disposed of in an appropriate manner to prevent the attraction of eagles and other raptors. All discoveries of bird and bat carcasses will follow protocol as described in the BBCS.
- North Bend Wind will encourage landowners to appropriately and regularly dispose of livestock carcasses to prevent the attraction of eagles and other raptors to the Project Area.

Decommissioning

- North Bend Wind will remove all turbines and ancillary structures from the Project Area.
- North Bend Wind will salvage and reapply topsoil excavated during decommissioning activities to disturbed areas during final restoration activities.
- North Bend Wind will reclaim areas of disturbed soil using weed-free native shrubs, grasses and forbs. Restore the vegetation cover, composition and diversity to values commensurate with the ecological setting.

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10.0 EFFECT ON AQUATIC ECOSYSTEMS (ARSD 20:10:22:17)

ARSD 20:10:22:17. Effect of aquatic ecosystems. *The applicant shall provide information of the effect of the proposed facility on aquatic ecosystems, and including existing information resulting from biological surveys conducted to identify and quantify the aquatic fauna and flora, potentially affected within the transmission site, wind energy site, or siting area, an analysis of the impact of the construction and operation of the proposed facility on the total aquatic biotic environment and planned measures to ameliorate negative biological impacts as a result of construction and operation of the proposed facility.*

10.1 Existing Aquatic Ecosystem

10.1.1 Surface Water and Wetland Resources

The Project Area is located within the Medicine Knoll and Fort Randall Reservoir HUC 8 watersheds of the Fort Randall Reservoir HUC-6 watershed. No significant, open water communities are present within the Project Area. Chapelle Lake is the closest open water community located approximately 1.3 miles northeast of the Project Area. Instead, aquatic resources are dominated by wetlands, which cover approximately 1,781.88 acres (3.8 percent) of the Project according to NWI data. Based on the data, wetlands found in the Project Area consist of 13 vegetation classes, including those from the palustrine (inland wetlands), riverine (rivers) and lacustrine (lake) systems. Streams within the Project Area are primarily intermittent watercourses. Given the pervasiveness of wetlands within the Prairie Pothole region, aquatic biota with the Project Area is likely representative of the region.

Chapelle Lake, located northeast of the Project Area, is approximately 33 acres in size. According to the SDGFP (2021b), Chapelle Lake is a managed fishery for northern pike (*Esox lucius*) and yellow perch (*Perca flavescens*). Given the lake's small size, deepwater habitat is likely limited.

10.1.2 Federal and State Special Status Aquatic Species

Pallid Sturgeon

The pallid sturgeon (*Scaphirhynchus albus*) is a federally and state endangered fish species adapted to sandy areas with fine substrates, floodplains, backwaters, chutes, sloughs, islands, sandbars, and main channel waters within large river ecosystems (USFWS 2019b). Major threats to this species are habitat alteration caused by channelization and dam construction, leading to the replacement of estuarine and flooded areas by permanent lakes and alteration of water flow and temperature (USFWS 2019c). Commercial fishing and environmental contaminants may have also played a role in the pallid sturgeon's decline. Although potential/ verified occurrence of the pallid sturgeon has been reported for all counties that are contiguous with the Missouri River, its geographic range falls outside the Project Area (USFWS 2019c). The pallid sturgeon can be found in the Missouri River, approximately 5 miles south of the Project.

Northern River Otter

The northern river otter (*Lontra canadensis*) can be found in various aquatic environments such as marshes, rivers, streams, and lakes. They require abundant riparian vegetation and prey, good water quality, limited disturbance, and year-round access to open water (SDGFP 2020a). In 2020, the river otter was taken off South Dakota's state threatened species list. Water development, fluctuating water levels in

reservoirs, shoreline development, pesticide residue runoff and other contamination of wetlands, accumulation of toxic substances in otter prey, and alteration of riparian vegetation resulting in habitat loss and degradation, are considered major threats to the northern river otter (SDGFP 2020b). Waterbodies within the Project may provide habitat for northern river otters.

Sicklefin Chub

The sicklefin chub (*Macrhybopsis meeki*), adapted to gravel and sand runs of large rivers with low to moderate gradients, such as the Missouri River, has experienced population declines as the result of habitat alteration caused by channelization, water diversion, and dam construction (Sheehy 2021). Construction impacts, such as erosion and increased sedimentation into streams, should be avoided to minimize possible impacts to the sicklefin chub. No large rivers run through the Project, although the Missouri River is immediately adjacent to the Project; therefore, it is unlikely that the sicklefin chub will occur in the Project.

False Map Turtle

The false map turtle (*Graptemys pseudogeographica*) occupies large rivers and associated oxbows, lakes, ponds, reservoirs, sloughs, and wetlands. This species needs areas with abundant vegetation and soft substrates, and sites that are protected from shore predators for basking (Bandas and Higgins 2004). The greatest threats to survival are destruction of nesting habitat and nests by camping tourists, agricultural practices, and pollution. In South Dakota, numbers are decreasing due to several possible factors, including water pollution, river channelization, impoundments, reduction of suitable nesting sites, and unlawful shooting.

10.2 Impacts to Aquatic Ecosystems

10.2.1 Surface Water and Wetland Resources

Temporary and long-term operational impacts to surface waters and wetlands are discussed in Sections 8.2.1.1 and 8.2.1.2. Construction activities in the vicinity of these waterbodies and wetlands may temporarily increase sedimentation due to erosion and from changes in runoff patterns and water volumes due to increased impervious surfaces. This could temporarily degrade the water quality of aquatic habitat supporting these species. North Bend Wind will not impact Chapelle Lake during construction or operation of the Project.

10.2.2 Federal and State Special Status Aquatic Species

Pallid Sturgeon

The pallid sturgeon has been documented within the Missouri River downstream of the Oahe Dam to within Lake Sharpe (Missouri River Working Groups 2013), located approximately 5 miles south of the Project. There is some potential for the pallid sturgeon to occur in the bays immediately south of the Project where tributaries originating in the Project confluence with the Missouri River. No large rivers run through the Project and it is unlikely the pallid sturgeon will occur within the Project; however, it could be indirectly affected if Project activities result in impacts to bays and backwater areas where tributaries confluence with the Missouri River. Avoiding activities, such as erosion and increased sedimentation to streams during construction, that result in habitat modification along the Missouri River would minimize any potential adverse effect to the pallid sturgeon.

Northern River Otter

Suitable habitat for the northern river otter may be found in the Project Area. Project siting and development along waterbodies has minimized ground disturbance and construction activity impacts by using already disturbed areas for placement of structures, avoiding removal of riparian vegetation, and avoiding construction of access roads adjacent to wetland and riparian habitats. With appropriate siting of infrastructure, any key features for otters can be avoided and negative effects can be minimized.

Sicklefin Chub

No suitable habitat is present within the Project Area, and therefore, the sicklefin chub will not be affected by the development and operation of the Project.

False Map Turtle

Although the wetlands and streams within the Project represent potential habitat for the false map turtle, impacts have been minimized by proper siting of infrastructure and avoiding wetlands and waterbodies to the extent possible; therefore, it is unlikely that the false map turtle will be negatively impacted as a result of Project activities.

10.3 Mitigation Measures for Aquatic Ecosystems

As described in Section 8.2.3, for surface water and wetlands, BMPs will be designed and utilized to control sedimentation and erosion during the construction phase of the Project. Access roads, collector systems, ADLS, collection substation, and the interconnection switching station will be designed to avoid or minimize impacts to wetland and waterway features whenever feasible. Prior to construction, North Bend Wind will conduct wetland and waterbody delineations within the Project Area. Where crossings of streams and drainageways cannot be avoided by access roads, appropriately designed crossings (i.e., culverts, low-water crossings) will be sited and constructed to maintain existing drainage and avoid sensitive species habitat as much as possible. Any temporarily impacted wetlands will be restored to pre-construction conditions and the herbaceous vegetation will be allowed to vegetate naturally in these areas. In areas where impacts cannot be avoided, North Bend Wind will employ BMPs such as revegetation and erosion control measures and will restore areas of disturbed soils as soon as possible after construction activities have been completed.

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11.0 LAND USE (ARSD 20:10:22:18)

ARSD 20:10:22:18. Land use. *The applicant shall provide the following information concerning present and anticipated use or condition of the land:*

(1) A map or maps drawn to scale of the plant, wind energy, or transmission site identifying existing land use according to the following classification system:
- *a. Land used primarily for row and nonrow crops in rotation;*
- *b. Irrigated lands;*
- *c. Pasturelands and rangelands;*
- *d. Haylands;*
- *e. Undisturbed native grasslands;*
- *f. Existing and potential extractive nonrenewable resources;*
- *g. Other major industries;*
- *h. Rural residences and farmsteads, family farms, and ranches;*
- *i. Residential;*
- *j. Public, commercial, and institutional use;*
- *k. Municipal water supply and water sources for organized rural water systems; and*
- *l. Noise sensitive land uses;*

(2) Identification of the number of persons and homes which will be displaced by the location of the proposed facility;

(3) An analysis of the compatibility of the proposed facility with present land use of the surrounding area, with special attention paid to the effects on rural life and the business of farming; and

(4) A general analysis of the effects of the proposed facility and associated facilities on land uses and the planned measures to ameliorate adverse impacts.

11.1 Land Use and Ownership

11.1.1 Existing Land Use and Ownership

The Project Area is predominantly located on private land with infrastructure proposed on School and Public Lands owned by the State of South Dakota (Figure 9 in Appendix A). Refer to Section 11.2 for additional information on South Dakota owned public lands associated with the Project. Occupied farm sites and rural residences occur within the Project Area, and other scattered rural residences are adjacent to the Project Area. Occupied farmsteads and rural residence locations were originally identified using satellite imagery and verified with field surveys. There are 20 occupied structures in the Project Area which, and as defined in Section 11.3.2, all are noise-sensitive receptors.

As discussed in Section 9.1.1 and Table 9-1, land use within the Project Area is predominantly agricultural, consisting of a mix of cultivated crops and grassland/herbaceous land. Other digitized land cover within the Project Area includes barren land, scrub/shrub, pasture/hay, emergent herbaceous wetlands, developed areas, and open water (Table 9-1). NWI wetlands are listed in Table 8-2. Developed lands included roads, ranches, and residential areas. Trees typically included a mixture of deciduous species near residences or along field borders. Figure 11 in Appendix A provides Project land use based on the classification system specified in ARSD 20:10:22:18(1).

The USDA NRCS and Farm Service Agency (FSA) administer a number of conservation-based programs for private landowners. The CRP conserves soil and water resources and provides wildlife habitat by removing enrolled tracts from agricultural production, generally for a period of 10 years. An offspring of the CRP program is the Conservation Reserve Enhancement Program with similar management

constraints and goals. These tracts cannot be hayed, tilled, seeded, or otherwise disturbed (including disturbance associated with power line or other project construction) without authorization from the USDA. The FSA does not distribute the location of CRP lands without written authorization from landowners; however, as of the date this report was produced, 5,726 acres of land in Hyde County and 17,895 acres of land in Hughes County are enrolled in the program (FSA 2020).

Another NRCS conservation program is the Wetland Reserve Program (WRP), a voluntary program to restore and protect wetlands on private property. The NRCS provides technical and financial support to help landowners with wetland restoration efforts. The program allows landowners to choose permanent conservation easements, 30-year easements, or 10-year restoration cost-share agreements (NRCS 2021b). No construction is permitted on WRP land; however, there are no WRP wetlands identified in the Project Area.

Other NRCS programs include the following:

- The Farm and Ranch Land Protection helps purchase development rights to keep productive farm and ranchland in agricultural use.
- The Grasslands Reserve protects, restores and enhances grassland including rangeland, pastureland, shrublands and certain other lands.
- The Healthy Forests Reserve Program assists landowners in restoring, enhancing, and protecting forestland resources or private lands.

Desktop analysis confirmed that there was no land enrolled in these NRCS programs within the Project Area (NCED 2021).

Croplands included fields where corn (*Zea mays*), spring wheat, sunflowers (*Helianthus annuus*) or other row crops were grown. The herbaceous grassland vegetation does not differentiate between planted and native grass, though it is likely that the herbaceous areas and hay/pasture areas include both native and introduced plant species.

The SDSU 2013 study quantifying undisturbed grasslands of eastern South Dakota identified approximately 21,543 acres of potentially undisturbed grassland present within the Project Area (approximately 46 percent of the Project Area). Comparing potentially undisturbed grassland present within the Project Area with the WEST land cover map, the Potentially Undisturbed Lands were primarily digitized as grassland pastures.

Based on the 2017 Census of Agriculture in South Dakota, both the number and land in farms in Hyde County decreased by 10 percent and 7 percent, respectively, from 2012 to 2017 (USDA 2017a). The number and land in farms in Hughes County also decreased from 2012 to 2017, by 8 percent and 19 percent, respectively (USDA 2017a).

Forage (hay/haylage), corn for grain, sunflower seed, soybeans for beans, and wheat for grain are the top crops grown in Hyde County by acreage. Pastureland in Hyde County supports cattle and other livestock operations; cattle and calves are the top livestock raised in the county by number. There are no irrigated lands (center-pivot) or major industries in the Project Area (USDA 2017b).

Sunflower seed, corn for grain, wheat for grain, forage (hay/haylage), and soybeans for beans are the top crops grown in Hughes County by acreage. Pastureland in Hughes County supports cattle and other livestock operations; cattle and calves are the top livestock raised in the county by number. Irrigated lands represent 3 percent of farmland in Hughes County.

11.1.2 Land Use Impacts

The Project will result in conversion of a small portion of the land within the Project Area from existing agricultural land uses into a renewable energy resource during the life of the Project. It is estimated that approximately 559.2 acres of land will be temporarily impacted by Project construction. Approximately 90.85 acres of land will have long-term operational impacts (0.19 percent of the total land within the Project Area; Table 9-3). Temporary impacts associated with construction staging and laydown areas and underground collector lines will also occur. Following construction, the areas will be returned to pre-construction land uses, which primarily consist of croplands and grassland pasture. North Bend Wind initiated consultation with the USDA, and a determination of no impact on prime or important farmland was issued on January 21, 2021 (Appendix I).

There are 20 occupied structures within the Project Area. As designed, the Project layout of turbines, access roads, collector lines, and associated facilities will not cause displacement of residences or businesses due to construction or operation of the Project. As currently designed, the closest participating residence to a turbine is approximately 1,834 feet, and the closest non-participating residence to a turbine is approximately 2,734 feet. As discussed in Section 19.0, the Project will be decommissioned at the end of its operating life. Disturbed surfaces will be graded, reseeded, and restored to their pre-construction conditions, unless otherwise agreed to by the landowner.

11.1.3 Mitigation Measures for Land Use

During construction, the construction workspace located on cropland and grasslands will be removed from productivity; however, following construction, these areas will be restored and returned to its prior use. Fencing or grazing deferment in pasturelands within or adjacent to the construction workspace may also be necessary to prevent livestock from injury by entering the construction area. North Bend Wind will work with landowners on the following issues: 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. Additionally, the following BMPs will be implemented:

- Excess concrete will not be buried or left in active agricultural areas.
- Vehicles will be washed outside of active agricultural areas to minimize the possibility of the spread of noxious weeds.
- Topsoil will be stripped from any agricultural area used for traffic or vehicle parking, segregated, and replaced during restoration activities.
- Drainage problems caused by construction will be corrected to prevent damage to agricultural fields.
- Subsoil will be decompacted following completion of construction and during decommissioning.

11.2 Recreation, Public Facilities, and Conservation Easements

11.2.1 Existing Recreation, Public Facilities, and Conservation Easements

The Project Area is predominantly located on private land. Of the 46,931 acres in the Project Area, one 648-acre parcel is managed by the South Dakota Office of School and Public Lands and 5,472 acres are associated with USFWS grassland and wetland easements. The parcel managed by the South Dakota Office of School and Public Lands is described in more detail in Section 11.2.1.3. While there are several USFWS conservation easements in the Project Area, these are private lands (see Section 11.2.1.5).

11.2.1.1 Recreational Resources

Recreational opportunities in Hyde and Hughes counties include hunting, biking, hiking, boating, fishing, camping, swimming, horseback riding, cross country skiing, snowmobiling, and nature viewing. Chapelle Lake and Woodruff Lake, both managed public fisheries, are approximately 0.5 mile northeast and 1.5 miles northwest of the Project Area, respectively (SDGFP 2021c). The North Bend Lakeside Use Area boat ramp is located approximately 5 miles south of the Project Area along Lake Sharpe (SDGFP 2021d). The West Bend Recreation Area offers fishing, boating, camping, and birdwatching and is located 9 miles southwest of the Project (SDGFP 2021e,f).

11.2.1.2 Public Facilities

No schools, churches or cemeteries occur within the Project Area, although several schools, churches, and cemeteries are located just outside the Project Area in the city of Highmore, town of Harrold, and community of Stephan.

11.2.1.3 South Dakota Office of School and Public Lands

The South Dakota Office of School and Public Lands manages over 750,000 acres of land in the state (SDGFP 2021e). These lands are available to the public for hunting and fishing. One 647.67-acre school and public lands area is located within the Project Area in Hyde County (Figure 9; SDGFP 2021c; South Dakota School & Public Lands 2021).

11.2.1.4 SDGFP Lands

Game Production Areas (GPAs) are managed to provide wildlife habitat, improve wildlife production, and provide public hunting and trapping opportunities. The SDGFP owns and manages the Chapelle Lake and Woodruff GPAs located approximately 0.5 mile northeast and 1.5 miles northwest of the Project Area, respectively (Figure 9 in Appendix A; SDGFP 2021c).

SDGFP contracts with private landowners to provide general hunting access through the Walk-in Area (WIA) program. The WIA program leases private land with valuable hunting areas for unlimited public hunting access (foot-traffic only) in exchange for an annual payment and immunity from non-negligent liability (SDGFP 2021e). There are no WIAs within the Project Area, however a WIA is located approximately 2 miles west of the Project (Figure 9 in Appendix A; SDGFP 2021c).

Figure 9 (Appendix A) shows the locations of GPAs and School and Public Lands in the Project vicinity, which are all public lands open for hunting.

11.2.1.5 USFWS Lands

The Project is located within the USFWS Huron Wetland Management District (WMD). The Huron WMD consists of 59 WPAs, totaling 17,683 fee-owned acres in Beadle, Sanborn, Jerauld, Hand, Hyde, Hughes, Sully, and Buffalo counties (USFWS 2019d). These areas are part of the National Wildlife Refuge System and are managed for the production of waterfowl, but other game and nongame wildlife thrive on them as well. USFWS WPAs are managed to protect breeding, forage, shelter and migratory habitat for waterfowl or wading birds, such as ducks, geese, herons, and egrets. WPAs provide opportunities for viewing wildlife and intact ecosystems and also provide hunting opportunities. There are no WPAs located within the Project Area (Figure 9 in Appendix A); however, the Hyde County WPA is located 1.8 miles east of the Project Area.

The Huron WMD also works with private landowners to administer the wetland easement and grassland easement programs. A grassland easement is a legal agreement that pays landowners to keep their land in grass. Land covered by a USFWS grassland easement may not be cultivated and mowing, haying and grass seed harvesting must be delayed until after July 15 each year. This restriction is to help grassland nesting species, such as ducks and pheasants, complete their nesting before the grass is disturbed. Grazing is not restricted. Similarly, the wetland easement program pays landowners to permanently protect wetland basins. Protected basins covered by a wetland easement cannot be drained, filled, leveled, or burned. When these protected basins dry up naturally, they can be farmed, grazed, or hayed. A USFWS wetland easement protects the protected basin within a parcel; however, the upland area outside the protected basin is not covered by the easement. The wetland easements help provide crucial habitat for many types of wildlife including ducks, pheasants, and deer. Hunting and trapping are allowed on both grassland and wetland easements, and the easements do not affect landowners' mineral rights (USFWS 2019e,f).

As shown in Figure 9 (Appendix A), the Project Area encompasses:

- 2,759 acres of grassland easements;
- No top lease grassland easements; and
- 2,713 acres of wetland easements.

Section 22.2.1 summarizes coordination between North Bend Wind and the USFWS regarding conservation easements and Project facilities. North Bend Wind is avoiding all non-top lease grassland conservation easements and will avoid the protected basins associated on the wetland easements.

11.2.2 Impacts to Recreation, Public Facilities, and Conservation Easements

11.2.2.1 Recreational Resources

Access to nearby state game areas, recreation areas, and managed fish areas will not be restricted as a result of Project construction or operation. Chapelle Lake and Woodruff Lake, both managed public fisheries, are approximately 0.5 mile northeast and 1.5 miles northwest of the Project Area, respectively (SDGFP 2021c). The North Bend Lakeside Use Area boat ramp is located approximately 5 miles south of the Project Area along Lake Sharpe and the West Bend Recreation Area is located 9 miles southwest of the Project (SDGFP 2021d). The Project will not impact access or use of the recreational resources in the area.

11.2.2.2 Public Facilities

The Project will not impact public facilities in the area.

11.2.2.3 South Dakota Office of School and Public Land Areas

The collection substation, switching station as well as 4 turbines and associated access roads and collector lines are proposed on the School and Public Lands parcel located within the Project Area. If North Bend Wind constructs turbines within the School and Public Lands parcels, access to these parcels will be temporarily restricted within active construction areas. As currently proposed, the facilities will impact use at a portion of the parcel during operations. .

11.2.2.4 SDGFP Lands

The Project avoids direct impacts to all GPAs and WIAs.

Chapelle Lake and Woodruff Lake GPAs located approximately 1.4 miles northeast and 5.5 miles northwest of the Project Area, respectively. There are no WIAs within the Project Area; however, a WIA is located approximately 6.5 miles northwest of the Project.

Operation of the wind facility could disrupt movements of terrestrial wildlife, particularly during migration. However, based on the abundance of suitable habitat in the Project Area, impacts to white-tailed deer are anticipated to be negligible. Therefore, impacts to the availability or distribution of deer for hunting in the Project Area is anticipated to be negligible. See Section 9.2 for a discussion on the potential impacts of the Project on waterfowl and other bird species that are hunted in the Project Area.

11.2.2.5 USFWS Lands

The Project has been designed to avoid impacts to USFWS grassland easements and the delineated features associated with the USFWS wetland easement program. No Project facilities are located on easements that were “top leased” with USFWS grassland easements (Figure 9 in Appendix A). The Project will not impact the Hyde County WPA, which is located 1.8 miles east of the Project Area.

11.2.3 Mitigation Measures for Recreation, Public Facilities and Conservation Easements

11.2.3.1 Recreational Resources

The Project will not impact recreational resources in the area; therefore, no mitigation is required.

11.2.3.2 Public Lands

The Project will not impact public facilities in the area; therefore, no mitigation is required.

11.2.3.3 South Dakota Office of School and Public Land Areas

North Bend Wind will ensure that adequate safety measures are established for recreational visitors to School and Public Lands during construction and operation. These may include access control and traffic management. North Bend Wind will work with SDGFP to address safety issues associated with the School and Public Lands.

11.2.3.4 SDGFP Lands

The Project avoids GPAs and WIAs, so no mitigation is required.

11.2.3.5 USFWS Lands

The Project avoids WPAs; as such, no mitigation is required.

North Bend Wind coordinated with the USFWS regarding the exact boundaries of the USFWS wetland, grassland, and conservation easements (Figure 9 in Appendix A). North Bend Wind's layout reflected in this Application balances setbacks, constructability, noise, shadow flicker, cultural resources, sensitive habitat, and other factors.

Following construction, disturbed areas will be returned to pre-construction land uses. In addition, impacts on USFWS easements will be reduced using BMPs to minimize the delivery of sediment due to erosional processes. BMPs for sediment and erosion control will be implemented within wetland conservation easements to minimize impacts to protected basins on wetland easements.

11.3 Acoustics

A pre-construction wind turbine Acoustic Assessment was conducted for the Project in June 2021 and is included in Appendix D. The acoustic modeling analyses demonstrates that received sound levels will be greater than 45 dBA at 2 noise-sensitive receptors (NSRs; 0 non-participating) for the GE 2.82-127 Low Noise Trailing Edge (LNTE) scenario under worst-case anomalous conditions. It is expected that received sound levels at NSRs will be consistent with sound generated at similar wind energy projects successfully sited throughout the state of South Dakota employing the same or similar criteria.

The following sections provide information on the existing sound levels within the Project Area; the potential effects of the Project's construction and operation; and potential avoidance, minimization, and mitigation measures.

11.3.1 Existing Acoustic Levels and Regulatory Framework

County and township (section line) roads characterize the existing roadway system and the Project Area is accessible via State Highway 34, U.S. Highway 14, and other local two-lane paved and gravel county roads. The land within the Project Area is primarily agricultural with scattered farmstead residences. Current land use within the Project Area is primarily agricultural, supporting both crops and livestock grazing. Potential NSR locations within the Project Area and in the vicinity of proposed turbine locations were included in the acoustic analysis (Figure 11 in Appendix A).

Ambient acoustic environment refers to the all-encompassing sound in a given environment or community. Hughes and Hyde counties would generally be considered rural agricultural areas. Existing ambient sound levels are expected to be relatively low, although sound levels will be higher near roadways such as State Highway 34 or U.S. Highway 14. Other human activity such as agricultural operations will seasonally contribute to sound levels in the area associated with crop harvests, sowing and spraying. Background sound levels are expected to vary both spatially and temporally, depending on natural sounds and proximity to area sound sources such as roadways. Typically, background sound levels are quieter during the night than during the daytime, except during periods when evening and nighttime insect noise may contribute to the soundscape, predominantly in the warmer seasons.

11.3.1.1 Acoustical Terminology

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

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

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

11.3.1.2 Regulations

A review was conducted of noise regulations applicable to the Project at the federal, state, county, and local levels. There are no federal or state environmental noise requirements specific to this Project. Hyde County proposed regulations for wind energy facilities under Zoning Ordinance Section 9-104-A-18 limiting noise levels to 45 dBA at the perimeter of occupied residences existing at the time the permit application unless a signed waiver is obtained from the landowner or the land is leased. Hughes County proposed regulations for wind energy facilities under Zoning Ordinance (No. 19967-03) Article 2 Section

2-117 limiting noise levels to 45 dBA at the perimeter of occupied residences existing at the time the permit application unless a signed waiver is obtained from the landowner or the land is leased. The noise level may be exceeded during short-term events such as utility outages or windstorms.

Sound levels resulting from the Project at all identified NSRs located in the vicinity of the Project were assessed against the 45 dBA limit to determine whether compliance was achieved. The noise limits are absolute and independent of the existing acoustic environment; therefore, a baseline sound survey was not required to assess conformity.

11.3.2 Impacts from Acoustics

11.3.2.1 Construction and Decommissioning

Potential noise associated with the construction and decommissioning of the Project includes site clearing, grading, foundation work, and wind turbine generator installation. All reasonable efforts will be made to minimize the impact of noise resulting from construction activities. Sounds generated by construction activities are typically exempt from state and local noise oversight if they occur within weekday, daytime periods. While most heavy construction work is anticipated to occur during daylight hours, some construction operations may be conducted outside of normal working hours. In these cases, the necessary construction efforts generally require activities that must be completed in their entirety once initiated (i.e., pouring concrete). All construction- and decommissioning-related noise producing activities will be undertaken as to comply with applicable state and county regulatory obligations and ordinances. The list of construction equipment that may be used on the Project and estimates of near and far sound source levels are presented in Table 11-1.

Table 11-1. Estimated Maximum Sound Pressure Levels from Construction Equipment

Equipment	Estimated Sound Pressure Level at 50 feet (dBA)	Estimated Sound Pressure Level at 2,000 feet (dBA)
Crane	85	53
Forklift	80	48
Backhoe	80	48
Grader	85	53
Man basket	85	53
Dozer	83–88	51–56
Loader	83–88	51–56
Scissor Lift	85	53
Truck	84	52
Welder	73	41
Compressor	80	48
Concrete Pump	77	45
Concrete Batch Plant	83	51

Source: FHWA 2006; Bolt et al. 1977

11.3.2.2 Operation

When in motion, the turbines generate sound primarily from aerodynamic flow across and around the blades. Secondary contributors to turbine sound are associated with the mechanical and electrical equipment within the nacelle including gearboxes, motors, cooling systems, and pumps. Sound level is strongly dependent on the speed of the tip of the blade, the design of the blade, and on atmospheric conditions such as the degree of turbulence. Blade sound increases with wind speed until full-rated

electrical power is achieved due to the interaction between the incident turbulence eddies and the blade surface. The prevalence of this inflow turbulence sound varies depending on site-specific and variable atmospheric conditions. The second mechanism is the shedding of vortices that form at the tip of each blade. This depends on the strength of the vortex and the design of the blade tip. Finally, sound may be generated by turbulent flow over the trailing edge of the blade. As air flows over the face of the blade, a turbulent boundary layer develops, but remains attached to the trailing edge. Eddies extending past the trailing edge causes sound emission scattering, resulting in the characteristic wind turbine broadband swooshing sound. This turbulent boundary layer sound (trailing edge noise) usually defines the upper limit of wind turbine sound levels and is considered the greatest contributor to aerodynamic sound.

One of the primary blade design features affecting sound emissions is the shape of the trailing edge of the blades. Sound reduction elements are being accessed for the chosen turbine model (GE 2.82-127) to incorporate into the Project design, including the use of LNTE blades. The addition of blade serrations has been demonstrated to reduce sound levels by 2 to 3 dBA below standard blades.

11.3.2.3 Acoustical Model Inputs

Sound propagation modeling was conducted using the Computer-Aided Noise Abatement (CadnaA) program (version 2020), a comprehensive three-dimensional acoustic modeling computer simulation software, with calculations made in accordance with the International Organization for Standardization (ISO) standard 9613-2 "Attenuation of Sound during Propagation Outdoors." The engineering methods specified in this standard consist of full (1/1) octave band algorithms that incorporate geometric spreading due to wave divergence, reflection from surfaces, atmospheric absorption, screening by topography and obstacles, ground effects, source directivity, heights of both sources and receptors, seasonal foliage effects, and meteorological conditions. For compliance assessment purposes, operational broadband sound pressure levels were calculated assuming that all wind turbines are operating continuously and concurrently at the maximum manufacturer-rated sound level. The acoustic assessment was performed using the May 4, 2021 site layout with 78 potential turbine locations (sound sources) to calculate the sound levels at the 51 NSRs. The following wind turbine model was evaluated in the acoustic analysis:

- GE 2.82-127 with LNTE – Wind turbine equipped with LNTE blade technology, a rotor diameter of 417 feet, and a hub height of 89 feet.

11.3.2.4 Acoustical Modeling Results

Acoustic modeling was completed for turbine operation for the following conditions thereby describing the full range of expected receive sound levels at receiver locations: (1) initial cut-in wind speeds, (2) maximum rotation, and (3) maximum rotation during anomalous meteorological conditions.

The maximum calculated sound level, based on assumptions incorporated into the CadnaA model and the turbine layout, is 48 dBA at two participating NSR in the GE 2.82-127 LNTE scenario (Table 5 in Appendix D). When turbines are at maximum rotational power during anomalous meteorological conditions, the acoustic model suggests sound levels will be greater than 45 dBA at 2 NSRs (all participating) for the GE 2.82-127 LNTE scenario.

North Bend Wind has committed to using the GE 2.82-127 LNTE scenario for the Project. There are 3 non-participating NSRs located within 1 mile from the closest turbine. Anomalous meteorological sound level results for these NSRs are shown in Table 11-2. Figure A-1 in Appendix D provides the NSR locations reviewed as part of this analysis.

Since the Project meets the county requirements for noise levels at non-participating NSRs, the Project will not impact occupied residences or other NSRs during construction or operation of the facility. Project participants and have agreed to waive the noise level requirements as outlined in the county's regulations.

11.3.3 Mitigation Measures for Acoustics

North Bend Wind considered acoustics when siting turbines to minimize impacts to area residents. Project operational sound has been calculated and compared to the 45 dBA noise requirements for both counties. Modeling shows that any landowners experiencing sound levels above the limits will experience them only in very limited circumstances. Even then, those landowners are Project participants and have agreed to these terms after having the circumstances discussed with them. North Bend Wind does not anticipate that sound mitigation will be necessary; however, North Bend Wind will establish a process for documenting, investigating, and resolving Project-related sound complaints.

With respect to the short-term construction-related sound, mitigation measures will include (1) maintaining all equipment in good working order in accordance with manufacturer specifications (e.g., suitable mufflers and/or air-inlet silencers should be installed on all internal combustion engines and certain compressor components); and (2) enforcing speed limits for all vehicles and construction equipment traveling within and around the Project Area.

North Bend Wind has committed to using the GE 2.82-127 scenario to further reduce the noise levels generated by the Project.

Table 11-2. Anomalous Meteorological Acoustic Modeling Results for Non-Participating Landowners

NSR ID	UTM Coordinates (meters)		Distance from Nearest Turbine (meters)	Received Sound Levels (dBA)
	Easting	Northing		GE 2.82-127
5	452007	4912597	833 (2,733 ft)	45
6	456096	4911237	1,591 (5,220 ft)	37
15	446161	4905997	1,169 (3,826 ft)	41
25	440535	4919291	926 (3,038 ft)	43
26	443100	4918873	559 (1,834 ft)	48
27	445446	4917655	1,055 (3,461 ft)	42
28	445621	4918665	665 (2,182 ft)	45
29	445637	4918675	656 (2,152 ft)	45
36	445432	4912472	1,333 (4,373 ft)	40
37	445356	4911623	1,561 (5,121 ft)	41
46	446148	4922207	860 (2,822 ft)	44
47	448547	4915128	901 (2,956 ft)	42
48	448560	4915214	950 (3,117 ft)	42
49	450247	4915029	701 (2,300 ft)	44
51	448812	4920035	612 (2,008 ft)	47

Note: Predicted sound levels greater than the 45 dBA threshold criteria are identified in red.
Non-participating NSRs identified within 1 mile of Project turbines are identified in blue.

11.4 Visual Resources

11.4.1 Existing Visual Resources

The term "visual resources" refers to the composite of basic terrain features, geologic features, hydrologic features, vegetation patterns, and anthropogenic features that influence the visual appeal of an area.

Private lands crossed by the Project are not subject to known federal, state, or county visual management standards. Sensitive viewsheds are generally associated with scenic resources and can include state or national parks, monuments, and recreation areas or historic sites and landmarks. Recreational users in the Project Area and vicinity may include hunters accessing private land, GPAs, WPAs, WIAs, and School and Public Lands. There are 20 occupied residences within the Project Area and other scattered rural residences adjacent to, but outside, the Project Area. Travelers through the Project vicinity include local or regional traffic along State Highway 34, U.S. Highway 14, or other local roads. There are no designated scenic byways in the Project Area (Federal Highway Administration 2021).

The South Dakota Wind Energy Center is located approximately 3.6 miles east of the Project Area while the Triple H Wind Project is located adjacent to the Project, west of the county line and 326th Avenue (Figure 1 in Appendix A). The South Dakota Wind Energy Center wind farm consists of 27 turbines and became operational in 2003. The Triple H Wind Project consists of 92 turbines and became operational in 2020. Additionally, the Titan Wind Project, consisting of 10 turbines, is located approximately 2 miles northeast of the Project Area (Figure 1 in Appendix A) and became operational in December 2009.

11.4.2 Impacts to Visual Resources

Visual impacts can be defined as the human response to visual contrasts resulting from introduction of elements into a viewshed. Such visual contrasts interact with viewer perceptions of the landscape and may cause a negative, positive, or neutral response to the changes in the viewed landscape.

The Project will add additional vertical lines of wind turbines into the generally strongly horizontal landscape found in the Project Area. The total hub height of the turbines will be up to 89 meters, and the total turbine height from the ground to the tip of the blade in an upright position will be up to 496 feet. These structures could produce visual contrast by virtue of the design attributes of form, color, and line. Marker lighting could also cause visual impacts at night.

Nearby viewers include the rural residences dispersed throughout the Project Area; recreational and public land users; and drivers, primarily those using State Highway 34, U.S. Highway 14,and other local roads. For these nearby viewers, the large size, and strong geometric lines of both the individual turbines themselves, and the array of turbines could dominate views. The presence of the wind farms within the viewsheds of GPAs, WPAs, WIAs, School and Public Lands may diminish the natural quality of those areas, and the experience of the persons utilizing those areas and may be perceived as a negative impact. However, the operation of the Project will not generate a significant increase in traffic or noticeable increase in day-to-day human activity and is located adjacent to existing wind farms; therefore, the Project Area will retain the rural sense and remote characteristic of the vicinity. Furthermore, the proposed land use will not involve any ongoing industrial use of non-renewable resources or emissions into the environment.

Although the turbines are high-tech in appearance, they are compatible with the rural, agricultural heritage of the area. The large sweep of the moving rotors may command visual attention. Structural

details, such as surface textures, could become apparent, and associated structures such as the O&M facility, Project collection substation, and other structures could also be visible. Shadow flicker, a subset of visual impacts, is discussed in Section 11.5 of this Application.

As previously discussed, North Bend Wind has collocated linear Project features such as access roads and collector and communication systems with existing disturbances where possible. This is consistent with the South Dakota Bat Working Group's and SDGFP's (Undated) Siting Guidelines for Wind Power Projects in South Dakota for reducing impacts to visual resources. Similarly, operation of the Project will not introduce new visual components into the Project vicinity. The Project vicinity includes wind turbines from the South Dakota Wind Energy Center and the Triple H Wind Project as well as existing electrical transmission lines.

The magnitude of visual impacts associated with the Project will depend on several factors, including:

- Distance of the proposed Project facilities from viewers;
- Duration of views (highway travelers vs. permanent residents);
- Weather and lighting conditions;
- The presence and arrangements of lights on the turbines and other structures; and
- Viewer attitudes toward renewable energy and wind power.

At the end of the Project's operating life, the facility will be decommissioned (see Section 19.0) and all wind turbines, electrical cabling, electrical components, access roads, transmission line structures, and any other associated facilities will be removed in accordance with applicable state and county regulations, unless otherwise agreed to by the landowner. As such, no visual impacts will remain beyond the operating life of the Project.

11.4.3 Mitigation Measures for Visual Resources

In general, opportunities to mitigate visual effects for wind projects are limited, given the size and physical characteristics of the wind turbines and the open expanse of the agricultural landscape environment in which they are located. Therefore, screening, such as implementing berms, fences, or vegetation, will not be a viable option. However, all turbines will be uniform in shape, color, size of rotor blades, nacelle and towers. Since the turbines will be viewed against a sky background, a light color, such as white or light gray, will be used for the structures in accordance with FAA requirements (as noted in Section 11.4.2). The use of the light-colored turbines will help to minimize contrast with the sky under most conditions. The Project will also incorporate the use of an ADLS system to maximize the use of nighttime obstruction lighting when there is aircraft activity in the surrounding vicinity (Section 4.2.6). No other mitigation measures over those already described are proposed.

11.5 Shadow Flicker

A shadow flicker analysis for the Project was finalized in June 2021 and is included in Appendix E. The analysis of potential shadow flicker impacts from the Project on nearby receptors shows that shadow flicker impacts within the area of study are expected to be minor and well within acceptable ranges for avoiding nuisance and/or health hazards. All of the non-participating receptor locations had modeled shadow flicker impacts below the Hyde County ordinance threshold of 30 hours per year. The following

sections provide information from the report on the potential shadow flicker effects of the Project and potential avoidance, minimization, and mitigation measures.

11.5.1 Shadow Flicker Overview

A turbine's moving blades can cast a moving shadow on locations within a certain distance of a turbine. These moving shadows are called shadow flicker and can be a temporary phenomenon experienced at nearby residences or public gathering places. The impact area depends on the time of year and day (which determine the sun's azimuth and altitude angles) and the wind turbine's physical characteristics (height, rotor diameter, blade width, and orientation of the rotor blades). Shadow flicker impact to surrounding properties generally occurs during low angle sunlight conditions, typically during sunrise and sunset times of the day. However, when the sun angle gets very low (less than 3 degrees), sunlight passes through more atmosphere and becomes too diffused to form a coherent shadow. Shadow flicker will not occur when the sun is obscured by clouds or fog, at night or when the source turbine(s) are not operating. In addition, shadow flicker occurs only when at least 20 percent of the sun's disc is covered by the turbine blades.

Shadow flicker intensity is defined as the difference in brightness at a given location in the presence and absence of a shadow. Shadow flicker intensity diminishes with greater receptor-to-turbine separation distance. Shadow flicker intensity for receptor-to-turbine distances beyond 2,000 meters (6,562 feet) is very low and generally considered imperceptible. In general, increasing proximity to turbines may make shadow flicker more noticeable, with the largest number of shadow flicker hours, along with greatest shadow flicker intensity, occurring nearest the wind turbines.

Shadow flicker impacts are not regulated in applicable state or federal law. There are no shadow flicker restrictions in the Hughes County Zoning Ordinances. However, the Hyde County Zoning Ordinance Section 9-104-A-20 establishes that flicker at any receptor shall not exceed 30 hours per year within an established dwelling and 40 hours per year from any occupied structure.

11.5.2 Shadow Flicker Impacts

An analysis of potential shadow flicker impacts from the Project was conducted using the WindPro software package. The WindPro analysis was conducted to determine shadow flicker impacts under realistic impact conditions (actual expected shadow). This analysis calculated the total amount of time (hours and minutes per year) that shadow flicker could occur at receptors surrounding the Project turbines.

A total of 51 residential structures were identified within and near the Project Area as occupied or potentially occupied residences and are considered potential shadow-flicker receptors. A receptor in the model is defined as a 1-meter-square area (approximate size of a typical window), 1 meter (3.28 feet) above ground level. Approximate eye level is set at 1.5 meters (4.94 feet). Figure 11 in Appendix A shows the locations of all 51 identified residential structures, along with the potential turbine locations considered.

Table 11-3 summarizes the predicted shadow flicker impacts for the top 10 worst-case impact receptors from the turbine model layout scenario. Unlike the acoustic analysis described in Section 11.3, shadow flicker analysis for noise-reducing blades and standard blades are the same. The analysis assumes that the receptors all have a direct in-line view of the incoming shadow flicker sunlight and does not account for trees or other obstructions that may block sunlight. In reality, the windows of many houses will not face the sun directly for the key shadow flicker impact times. For these reasons, shadow flicker impacts are

expected to be less than estimated in this conservative analysis, and shadow flicker is not expected to be a significant environmental impact.

All of the non-participating receptor locations had modeled shadow flicker impacts below the ordinance threshold of 30 hours per year. The maximum predicted shadow flicker impact at any occupied residence receptor is 79 hours and 44 minutes per year (Receptor 26). This is approximately 1.8 percent of the potential available daylight hours. Note that the only receptor (#26) that has expected shadow flicker greater than 30 hours per year is a participating residence that is surrounded by several trees and hedges that are likely to mitigate shadow flicker impact. There are 3 non-participating receptors located within 1 mile from the closest turbine. Expected shadow flicker results for these receptors are shown in Table 11-4.

Table 11-3. WindPro Top 10 Expected Shadow Flicker Impacts

Receptor ID	Receptor Type	Receptor Project Participation Status	Expected Shadow Flicker Hours per Year (Hours/Year)
GE Layout			
26	Residential	Participant	79:44
51	Residential	Participant	27:14
29	Residential	Participant	26:28
28	Residential	Participant	25:51
49	Residential	Participant	13:59
15	Residential	Non-Participant	9:38
37	Residential	Participant	7:43
5	Residential	Non-Participant	6:59
47	Residential	Participant	6:34
48	Residential	Participant	6:25

Table 11-4. WindPro Predicted Expected Shadow Flicker for Non-Participating Landowners

Receptor ID	UTM Coordinates (meters)		Distance from Nearest Turbine (Meters)	WindPro Predicted Expected Shadow Flicker (Hours per Year)
	Easting	Northing		GE Layout
5	452007	4912597	833 (2,733 ft)	6:59
6	456096	4911237	1,591 (5,220 ft)	0:00
15	446161	4905997	1,169 (3,826 ft)	9:38
25	440535	4919291	926 (3,038 ft)	2:07
26	443100	4918873	559 (1,834 ft)	79:44
27	445446	4917655	1,055 (3,461 ft)	0:00
28	445621	4918665	665 (2,182 ft)	25:51
29	445637	4918675	656 (2,152 ft)	26:28
36	445432	4912472	1,333 (4,373 ft)	2:57
37	445356	4911623	1,561 (5,121 ft)	7:43
46	446148	4922207	860 (2,822 ft)	4:56
47	448547	4915128	901 (2,956 ft)	6:34
48	448560	4915214	950 (3,117 ft)	6:25
49	450247	4915029	701 (2,300 ft)	13:59
51	448812	4920035	612 (2,008 ft)	27:14

Note: Non-participating NSRs identified within 1 mile of Project turbines are identified in blue.

Table 11-5 summarizes the shadow flicker impact prediction statistics. The predicted shadow flicker impact for all 51 receptors is included in Appendix E.

Table 11-5. Statistical Summary of WindPro Expected Shadow Flicker Impacts—Number of Modeled Receptors

Cumulative Shadow Flicker Time (Expected)	Number of Modeled Receptors
	GE Layout
Total	51
= 0 Hours	38
> 0 Hours < 10 Hours	8
≥ 10 Hours < 20 Hours	1
≥ 20 Hours < 30 Hours	3
≥ 30 Hours	1

At a distance of 2,640 feet or greater for non-participants and 1,400 feet or greater for participants (the Project setbacks for residences), receptors will typically experience shadow flicker only when the sun is low in the sky and only when the factors described above are present. If a receptor does experience shadow flicker, it most likely will be only during a few days per year from a given turbine, and for a total of only a fraction (typically less than 1 percent) of annual daylight hours.

11.5.3 Mitigation Measures for Shadow Flicker

North Bend Wind considered shadow flicker when siting wind turbines to minimize impacts to area residents. Flicker mitigation will be addressed as situations arise wherein a residence is experiencing inordinately more flicker than anticipated in the modeling, although it is highly unlikely more flicker than modeled will occur. If shadow flicker concerns are reported to North Bend Wind, Project representatives will implement the following procedures:

- Log the contact in North Bend Wind's complaint database to track resolution efforts;
- Prepare site-specific assessment of shadow flicker impacts, noting the time of day, season and expected duration of future flicker impacts;
- Meet with the landowner to discuss site-specific assessment, educate landowners on landowner driven mitigation strategies (e.g., modification of interior lighting) and discuss concerns;
- Assess the residence to determine if on-site mitigation measures, including but not limited to installation of exterior or interior screening, are appropriate for the level of impact and effectively address the concern;
- Work with the landowner to develop a mitigation plan; and
- Implement the mitigation plan.

11.6 Telecommunications

11.6.1 Existing Telecommunications

North Bend Wind has conducted a microwave beam path analysis (Appendix F), which identified one path intersecting the wind farm facility within the vicinity of the Project Area (Comsearch 2020). The analyses were performed using Comsearch's proprietary microwave database, which contains all non-government licensed, proposed, and applied paths from 0.9 to 23 GHz[1]. Table 11-6 lists all microwave paths that intersect the general area of interest.

Table 11-6. Summary of Microwave Path that Intersects the Project Area

Status	Callsign 1	Callsign 2	Band	Path Length (km)	Licensee
Proposed	CROWCREE	LOWERBRU	Lower 6GHz	24.02	New Cingular Wireless PSC-ND,SD,NE,IA,MT

Source: Comsearch 2020

Comsearch provided the Fresnel Zones within the area of interest. These zones show the narrow area of signal swath and should be avoided, if possible. A description of Fresnel Zones is provided in Appendix F.

North Bend submitted a Project notification letter to the National Telecommunications and Information Administration in October 2019 for the agency to review potential impacts to federal telecommunication. A copy of the letter received in January 2020 is available in Appendix I and discussed further in Section 22.2.

11.6.2 Telecommunication Impacts

Because of their height, modern turbines have the potential to interfere with existing communications systems licensed to operate in the United States. Based on Comsearch's analysis, turbines have been sited in a manner that avoids all identified microwave beam paths and communication systems (Appendix F). Corona associated with the Project's transmission line is expected to be low enough so that no radio or television interference is anticipated outside of the Project Area. The construction and operation of the Project will not result in interference to microwave, radio, or navigation signals.

11.6.3 Mitigation Measures for Telecommunications

North Bend Wind is committed to taking all reasonable steps to ensure that the Project will not interfere with radio or television reception in the area. In the event the Project wind turbines or its operation causes interference to communication systems, North Bend Wind will take the steps necessary to correct the problem. If interference is identified during or after construction of the Project, North Bend Wind will address the interference on a case-by-case basis.

The Project has been sited to avoid impacts microwave beam paths, and therefore, no mitigation is proposed at this time.

[1] Note that this analysis does not include unlicensed microwave paths or federal government paths that are not registered with the Federal Communications Commission.

11.7 Radar and Military Airspace Impacts

11.7.1 Existing Radar and Military Airspace

North Bend Wind conducted an initial aviation constraints study in 2020 to evaluate the feasibility of the Project against federally aviation and airspace criteria (Appendix G). The FAA uses this criterion in evaluating the aeronautical compatibility and regulatory compliance of projects when submitted to their office for regulatory review under Federal Aviation Regulation Part 77 as specified in Title 49 USC 44718. The study determined the feasibility of the wind turbines up to 650 feet above ground level.

According to this review, the nearest public-use airport subject to federal regulatory criteria is Highmore Municipal Airport, which is located approximately 8 miles northeast of the Project Area near the city of Highmore (Appendix F).

11.7.2 Impacts to Radar and Military Airspace

In addition to providing vertical above mean sea level limits within the Project Area, the aviation constraints analysis included the following findings:

- The Project will not impact Imaginary Surfaces.
- The Project will not impact Traffic Pattern Airspace.
- The Project will not impact Minimum Enroute Altitudes.
- Impact is anticipated to Joint Use Long Range Radar. Further study may be advised. For additional follow-up with the U.S. Department of Defense see Section 22.2.6.
- No impact is expected to NEXRAD weather radar. Further weather radar study is not necessary.
- The Project will not impact Minimum Vectoring Altitudes.
- The Project area could be in the line of sight of FAA/DoD radar, particularly the Air Route Surveillance Radar at Gettysburg (QJB). See correspondence in Appendix I.
- No part of the Project is located inside any Military Operations Airspace.
- The Project will not impact any navigational aids.
- The Project will not impact Instrument Approach Procedures.
- The Project will not impact Minimum Safe Altitudes.
- The Project will not impact Approach Circling Areas.
- The Project will not impact Instrument Flight Rules or Visual Flight Rules (VFR) Departures.
- The Project has potential VFR Flyways running through it which may cause wind turbine generators to be a hazard. FAA filing will be required to determine if this is the case, which is unlikely.
- The Project will not impact Private Airports.

11.7.3 Mitigation Measures for Radar and Military Airspace

Previous Determinations of No Hazard were determined at the Project Area for a prior array at 599 feet. North Bend Wind currently has pending Form 7460 filings with the FAA for the current array at a height of 499 feet. If taller turbines are used, or if the Project layout changes from what has been provided to the FAA, North Bend Wind will re-file with the FAA.

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12.0 LOCAL LAND USE CONTROLS (ARSD 20:10:22:19)

ARSD 20:10:22:19. Local land use controls. *The applicant shall provide a general description of local land use controls and the manner in which the proposed facility will comply with the local land use zoning or building rules, regulations or ordinances. If the proposed facility violates local land use controls, the applicant shall provide the commission with a detailed explanation of the reasons why the proposed facility should preempt the local controls. The explanation shall include a detailed description of the restrictiveness of the local controls in view of existing technology, factors of cost, economics, needs of parties, or any additional information to aid the commission in determining whether a permit may supersede or preempt a local control pursuant to SDCL 49-41B-28.*

The Project will be constructed in Hyde and Hughes counties on agricultural land. Per the Hyde County Zoning Ordinance, a wind energy facility located in the Agricultural Zoning District must obtain a CUP. North Bend Wind submitted a CUP application on June 11, 2021, for the wind turbines under Section 9-104 of the ordinance.

Per the Hughes County Zoning Ordinance, individual building permits are required for each tower and multiple tower systems require a CUP. North Bend Wind will submit a CUP application inmid-June 2021 for the wind energy facility and will submit and obtain building permits prior to construction to comply with Article 2 Section 2-117.F of the ordinance.

North Bend Wind will comply with all terms and conditions of the county permits. North Bend Wind's current configuration has been designed to comply with county setbacks and other applicable requirements, as outlined in Table 12-1 below and displayed on Figure 3b in Appendix A.

Section 9-104 of the Hyde County Zoning Ordinance, the Requirements for Siting LWES, outlines a number of general provisions including, but not limited to, mitigation measures, setbacks, electromagnetic interference, lighting, turbine spacing, feeder lines, towers, and sound. Article 2 Section 2-117.F of the Hughes County Zoning Ordinance, Requirements for Siting Large WECS, outlines similar provisions, including access roads, setbacks, electromagnetic interference, lighting, turbine spacing, collector cables, tower height and appearance, and noise.

North Bend Wind will comply with all provisions and setback requirements. Table 12-1 outlines the local, state, and voluntary Project setbacks.

Table 12-1. Wind Turbine Setback Requirements for the Project

Turbine Setback Requirement	Requirements
Hyde County	
9-104.A.9 (a) Any established dwellings and/or maintained by governmental entity	2,640 feet or 4.9 times tower height, whichever is greater.
9-104.A.9 (b) County gravel roads, section line roads, highways and minimum maintenance roads	750 feet or 1.4 times the tower height, whichever is greater.
9-104.A.9 (c) Exterior boundary of the proposed wind project	500 feet or 1.1 times the system height, whichever is greater.
Noise requirement at the perimeter of occupied residences	Distance from receptors must meet the noise standard of 45 dBA.
Hughes County	
2-117.F.2 (a) Occupied off-site residences, businesses and public buildings	2,640 feet or 4.9 times tower height, whichever is greater.
2-117.F.2 (a) Residence of the landowner on whose property the tower(s) are erected	1.1 times the system height.
2-117.F.2 (b) ROW of public roads	1.1 times the system height.
2-117.F.2 (c) Any property line	1.1 times the system height.
Noise requirement at the perimeter of occupied residences	Distance from receptors must meet the noise standard of 45 dBA.
South Dakota	
SDCL 43-13-24 Property lines	500 feet or 1.1 times the height of the tower, whichever is greater.
Local	
9-104.A.20 Shadow Flicker	Flicker at any receptor shall not exceed 30 hours per year within an established dwelling and 40 hours per year from any occupied structure.

13.0 WATER QUALITY (ARSD 20:10:22:20)

ARSD 20:10:22:20. Water quality. *The applicant shall provide evidence that the proposed facility will comply with all water quality standards and regulations of any federal or state agency having jurisdiction and any variances permitted.*

Groundwater and surface water resources are discussed in Section 8.0. As discussed in Section 8.2.2, the excavation and exposure of soils during the construction and decommissioning of wind turbines, access roads, underground collector lines, and other Project facilities may temporarily cause sediment runoff during precipitation events. This sediment may temporarily increase the total suspended solids loading in receiving waters. However, erosion control BMPs will prevent sediment transport that might otherwise increase sediment loading in receiving waters.

As discussed in Sections 8.1.3 and 8.2.3, construction of the Project will require coverage under the General Permit for Storm Water Discharges Associated with Construction Activities issued by the SDDENR. A condition of this permit is the development and implementation of a SWPPP. The SWPPP will be developed during civil engineering design of the Project and will prescribe BMPs to control erosion and sedimentation. The BMPs may include, but are not limited to, silt fence, wattles, erosion control blankets, temporary stormwater sedimentation ponds, revegetation, and/or other features and methods designed to control stormwater runoff and mitigate erosion and sedimentation. The BMPs will be implemented to reduce the potential for impacts to drainage ways and streams by sediment runoff. Because erosion and sediment control will be in place for construction, operation, and decommissioning of the Project, impacts to water quality are not expected to be significant.

Section 9-104.A.8 of the Hyde County Zoning Ordinance and Article 2 Section 2-117.F.g of the Hughes Zoning Ordinance require LWES to develop a Soil Erosion and Sediment Control Plan prior to construction and submit the plan to the County Zoning Offices. The ordinances outline several components required in the plan including, but not limited to, plans for revegetation, grading, minimizing area of disturbance, and maintaining downstream quality. North Bend Wind will submit a copy of the SWPPP to the County Zoning Offices.

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14.0 AIR QUALITY (ARSD 20:10:22:21)

ARSD 20:10:22:21. Air quality. *The applicant shall provide evidence that the proposed facility will comply with all air quality standards and regulations of any federal or state agency having jurisdiction and any variances permitted.*

14.1 Existing Air Quality

The entire State of South Dakota is in attainment for all National Ambient Air Quality Standards (NAAQS) criteria pollutants (EPA 2021). In accordance with EPA requirements, the SDDENR operates an ambient air monitoring network of samplers. The nearest air monitoring location to the Project is located approximately 25 miles to the west in Pierre, Hughes County (SDDENR 2021f). The primary emission sources that exist within the Project Area include agriculture-related equipment and vehicles traveling along State Highway 34 and U.S. Highway 14.

14.2 Air Quality Impacts

Temporary construction impacts include fugitive dust emissions and short-term emissions from diesel trucks and construction equipment. Temporary impacts will result if a batch plant is required. Any air quality effects resulting from construction will be short term and limited to the time of construction activities and will not result in NAAQS exceedances for particulate matter or significantly contribute to greenhouse gas emissions.

There will be no direct air emissions from operating wind turbines because no fossil fuels will be combusted. Wind power is a low-carbon energy source—when a wind turbine generates electricity, it produces zero carbon emissions. The development of clean wind energy avoids significant carbon dioxide (CO_2) pollution. In 2019, the electricity generated from wind turbines avoided an estimated 198 million tons of CO_2 emissions (AWEA 2021). This reduction is equal to roughly 43 million cars' worth of CO_2 emissions. Wind power also significantly reduces the amount of sulfur dioxide (SO_2) and nitrogen oxides (NOx) in the air, air pollutants known to create smog and trigger asthma attacks.

Negligible amounts of dust, vehicle exhaust emissions, and combustion-related emissions from diesel emergency generators will occur during maintenance activities. These emissions will not cause exceedances of air quality standards or have any negative impacts on climate change. Operation of the Project and interconnection substations could produce minute amounts of ozone and nitrogen oxides emissions as a result of atmospheric interactions with the energized conductors. Impacts on ambient air quality from these minor emissions during operation will be negligible. The Project collector substation will employ sulfur hexafluoride-filled circuit breakers. Sulfur hexafluoride is a greenhouse gas, and therefore, equipment leaks could contribute to air quality impacts.

14.3 Mitigation Measures for Air Quality

A general air quality permit may be required if the Project elects to install a concrete batch plant. Approval of that application typically takes up to 30 days. If a batch plant is required, it will be permitted by North Bend Wind's balance-of-plant contractor or concrete batch plant operator through the SDDENR.

Additionally, BMPs will be implemented during construction to suppress fugitive dust emissions and equipment will undergo routine inspection and preventative maintenance to minimize leaks.

General mitigation measures applicable to multiple phases of Project development include:

- Using surface access roads, on-site roads, and parking lots with aggregates or that maintain compacted soil conditions to reduce dust generation;
- Staging construction activities to limit the area of disturbed soils exposed at any particular time; and
- Watering unpaved roads, disturbed areas (e.g., scraping, excavation, backfilling, grading and compacting), and loose materials generated during Project activities as necessary to minimize fugitive dust generation.

15.0 TIME SCHEDULE (ARSD 20:10:22:22)

ARSD 20:10:22:22. Time schedule. *The applicant shall provide estimated time schedules for accomplishment of major events in the commencement and duration of construction of the proposed facility.*

The Project is scheduled to be operational by late fall of 2022. To remain on track, Hughes County CUP, Hyde County CUP, and SDPUC facility permits are anticipated to be received in 2021, while pre-construction engineering, layout finalization, and construction are anticipated to begin in early 2022 (Table 15-1). However, the possibility for delays as result of conditions beyond the Applicant's control exist. Land-leasing and environmental permitting are ongoing.

Table 15-1. Preliminary Permitting and Construction Schedule for the Project

Milestone	Date
Land Leasing	Completed 2021
Environmental Studies	Ongoing 2021
County CUPs	June 2021
SDPUC Facility Permit	June 2021
Pre-construction Engineering	Summer 2021
Construction	Early 2022
Commercial Operation Date	Fall 2022

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16.0 COMMUNITY IMPACT (ARSD 20:10:22:23 and ARSD 20:10:22:24)

ARSD 20:10:22:23. Community impact. *The applicant shall include an identification and analysis of the effects the construction, operation, and maintenance of the proposed facility will have on the anticipated affected area including the following:*

(1) A forecast of the impact on commercial and industrial sectors, housing, land values, labor market, health facilities, energy, sewage and water, solid waste management facilities, fire protection, law enforcement, recreational facilities, schools, transportation facilities, and other community and government facilities or services;

(2) A forecast of the immediate and long-range impact of property and other taxes of the affected taxing jurisdictions;

(3) A forecast of the impact on agricultural production and uses;

(4) A forecast of the impact on population, income, occupational distribution, and integration and cohesion of communities;

(5) A forecast of the impact on transportation facilities;

(6) A forecast of the impact on landmarks and cultural resources of historic, religious, archaeological, scenic, natural, or other cultural significance. The information shall include the applicant's plans to coordinate with the local and state office of disaster services in the event of accidental release of contaminants from the proposed facility; and

(7) An indication of means of ameliorating negative social impact of the facility development.

16.1 Socioeconomic and Community Resources

16.1.1 Existing Socioeconomic and Community Resources

The Project Area is located in northeastern South Dakota in Hyde County and Hughes County. Hyde and Hughes counties had an estimated population of 1,301 and 17,526 in 2019, respectively (U.S. Census Bureau 2020a). The largest city in Hyde County is the city of Highmore which, in 2019, had an estimated population of 726 (55.8 percent of Hyde County; U.S. Census Bureau 2020b). Highmore is located approximately 9.6 miles northeast of the Project Area. The largest city in Hughes County is the city of Pierre, which had an estimated population of 13,867 in 2019 (79.1 percent of Hughes County; U.S. Census Bureau 2020b). Pierre is located approximately 25 miles west of the Project Area.

There are two additional communities in Hughes County located within 15 miles of the Project Area; the populations of communities in the Project vicinity are listed in Table 16-1 and shown on Figure 1 (Appendix A).

Table 16-1. Populations of Communities in the Project Vicinity

Community, County	2020 Population	Distance and Direction from Project Area
Highmore, Hyde County	726	9.6 miles northeast
Pierre, Hughes County	13,961	25 miles west
Harrold, Hughes County	124	1.5 miles north
Blunt, Hughes County	354	12.4 miles northwest

Source: U.S. Census Bureau 2020b

The median household income in Hyde and Hughes counties reported in the 2019 American Community Survey were $57,788 and $64,783, respectively (U.S. Census Bureau 2020c). In comparison to the state

as a whole, the median household income for the state was slightly higher than Hyde County and slightly lower than Hughes County at $58,275 (U.S. Census Bureau 2020c). The unemployment rate in Hyde and Hughes counties in January 2021 were 2.5 percent and 2.7 percent, respectively, which were lower than the unemployment rate in South Dakota for the same month (3.3 percent) (South Dakota Department of Labor and Regulation 2021).The most common job groups in Hyde County are management, administration, education, and library occupations, while the most common job groups in Hughes County are administration, management, business, and financial (Data-USA 2021). The most common employment sectors in Hyde County are farming, fishing, forestry, education, library, and management (Data-USA 2021). The most common employment sectors in Hughes County are farming, fishing, forestry, legal, and law enforcement (Data-USA 2021).

16.1.2 Socioeconomic and Community Resource Impacts

16.1.2.1 Impacts to Economics

The Project is anticipated to provide positive short-term and long-term impacts to the local economy. Impacts to social and economic resources from construction activities will be short-term. Increased patronage of local commercial businesses, such as restaurants, grocery stores, hotels, and gas stations, will result in increased business from construction-related workers. Local contractors and suppliers will also likely benefit from construction of the Project. Total wages and salaries paid to contractors and workers in Hyde and Hughes counties will contribute to the total personal income of the region. Additional personal income will be generated for residents in the counties and state by circulation and recirculation of dollars paid out by North Bend Wind for business expenditures and for state and local taxes. Expenditures made for equipment, fuel, operating supplies, and other products and services benefit businesses in the counties and the state.

During construction, a typical 200-MW wind project such as North Bend Wind typically generates an immediate need for up to 400 temporary construction jobs over the peak 8-month construction period, with as many as 130 at any given time. Construction and operation of a typical 198-MW wind project results in the injection of millions of dollars into the local economy both immediately and throughout the life of the project. These investments will be seen throughout the community, including at hotels, restaurants, gas stations, auto repair companies, tire companies, grocery stores, and countless other local businesses. During operation, the Project will employ approximately 8 to 10 full-time personnel as facility managers, site managers and turbine technicians. These numbers would be in addition to that related to the recently constructed Triple H Wind Project. A breakdown of the typical construction and operation jobs for a 200-MW wind energy project are shown below in Section 17, Table 17-1.

Long-term beneficial impacts to the state and local tax base as a result of the operation of the Project will contribute to improving the local economy in this area of South Dakota. In addition to the creation of jobs and personal income, the Project will pay capacity and production taxes which will benefit the state, Hyde and Hughes counties, school districts and the communities in the Project Area with wind turbines. Direct Project economic impacts over 30 years of operation (based on a 200-MW project) are projected as follows:

- Landowners Payments: Approximately $1 million per year
- Production Tax Payments: Approximately $967,166 per year (tax allocation details provided below)

- Full-Time Jobs: Approximately 8 to 10 full-time jobs totaling approximately $500,000 to $650,000 per year

The yearly tax projection is based on the Wind Farm Production and Capacity tax defined in SDCL Ch. 10-35-16 through 21. The estimates are based on North Bend Wind operating 200 MW of nameplate capacity and an operations profile designed by North Bend Wind's experienced development team. The actual amount paid will be based on current law and real operations of the year in question. Allocations to taxing jurisdictions are projected below with conservative production measures.

The total projected annual capacity and generation tax is projected to be around $967,166 per year totaling approximately $29,014,976 over 30 years distributed as follows:

- State of South Dakota: Approximately $293,205 per year totaling $8,796,141 over 30 years
- Counties (no townships, county benefit): Approximately $336,981 per year totaling $10,109,418 over 30 years
- Highmore-Harrold School District: Approximately $5,385,449 over the first 10 years of Project operation

The above direct payment information does not include any multiplying factor of additional income earned in Hyde and Hughes counties or the local area, which is expected to multiply total economic impact of the Project.

16.1.2.2 Impacts to Property Values

No negative impacts to property values are anticipated from the Project. A review of academic literature pertaining to wind project development and its impact on property values was completed for a similar project in Clark County, South Dakota (Crocker Wind Farm, LLC; Docket No. EL17-055). The report summarized the results of two Hedonic Price Model studies (Hoen et al. 2009, 2013) conducted by the Environmental Energy Technologies Division of the Lawrence Berkeley National Laboratory (LBNL) and included a review of additional studies providing supportive and critical views (Thayer 2017). The 2009 LBNL study determined that there was no significant impact to sale values of properties over time due to proximity of wind-energy project development. The 2013 follow-up study examined changes in property values of 51,276 home sales from 27 counties in nine states within 10 miles of 67 individual wind energy projects. This study found no statistical evidence for differences in home values from pre- to post-construction.

The 2009 and 2013 LBNL studies evaluated wind farms in a variety of landscapes, including agricultural areas. The studies examined 36 unique counties in the United States. It noted that 21 of the 36 unique counties are considered more than 50 percent rural, whereas only four counties (Benton, Washington; Walla Walla, Washington; DeKalb, Illinois; and Atlantic, New Jersey) are less than 22 percent rural. Sixteen unique counties have a percentage rural greater than or equal to 59 percent, the raw average of the South Dakota counties. According to the U.S. Census Bureau's 2010 Census, Hyde County is 100 percent rural and Hughes County is 98.72 percent rural (U.S. Census Bureau 2010). Additionally, Hyde County's land cover is 58 percent pasture grassland and Hughes County's land cover is 41 percent pasture grassland (NLCD 2016).

Because none of the previous academic research or literature on the impact of large-scale wind farms on nearby property values included South Dakota wind projects, to predict what might occur near South

Dakota wind facilities requires the transfer of existing research from similar areas. The LBNL studies were constructed with transferability specifically in mind since they used a wide range of community types so that the results will be applicable to the maximum number of alternative sites.

The range of counties studied in the LBNL studies include counties like those in South Dakota. Hyde County is similar to some of the LBNL counties, which implies that the LBNL studies are a reasonable transfer source. In general, the South Dakota counties have lower average population per square mile, and lower median income and median home values than the average county, in either the 2009 or 2013 LBNL studies. The South Dakota counties are very similar to their Minnesota and Iowa counterparts, especially Cottonwood and Jackson counties in Minnesota and Franklin and Sac counties in Iowa.

Table 16-2 provides a more detailed examination among the three South Dakota counties, Cottonwood and Jackson counties in Minnesota, and Franklin and Sac counties in Iowa. Two additional measures of similarity are presented—mean size of farms and the percent of the workforce employed in agriculture, broadly defined. In addition, the calculated averages are weighted by population. As is evident, the percent employed in agriculture is very close between the comparison group and the South Dakota counties. Mean farm size is larger in the South Dakota counties but the percent rural is larger in the comparison group. This group-wise comparison suggests that the LBNL studies do include information from counties similar to those evaluated in South Dakota.

Given the information about the types of facilities planned and the previous research on like counties, the LBNL studies are a reasonable source for a benefit transfer (or damage transfer) effort to South Dakota. This leads to the overall conclusion that this Project in Hyde and Hughes counties will not significantly reduce the sales prices of properties in the vicinity of the Project Area.

Table 16-2. Additional Comparative Demographic Data for Counties with Wind Farms in Iowa, Minnesota, and South Dakota

County	State	Population	Percent Rural	Mean Size of Farms[1]	Percent Agriculture Employment[2]
Sac	IA	9,719	60	429	9.1
Franklin	IA	10,124	100	409	12.5
Cottonwood	MN	11,437	62	450	3.7
Jackson	MN	9,911	69	402	11.0
Weighted Average[3]			**72.2**	**423.3**	**8.9**
Clark	SD	3,739	100	894	25.4
Codington	SD	28,015	22	557	4.9
Grant	SD	7,147	55	639	16.7
Weighted Average[3]			**36.3**	**606.7**	**9.3**

1 Acres
2 Includes agriculture, fishing, forestry, and hunting
3 Weighted by population

Similarly, the SDPUC has previously concluded that there is "no record evidence that property values will be adversely affected." *In the Matter of the Application of Dakota Range I, LLC and Dakota Range II, LLC for a Permit of a Wind Energy Facility in Grant County and Codington County, South Dakota for the Dakota Range Wind Project*, Docket No. EL18-003, Final Decision and Order Granting Permit to Construct Wind Energy Facility, Notice of Entry Para. 55 (July 23, 2018). The SDPUC found similarly in the Crocker Wind Farm docket: "There was no credible showing that there will be quantifiable or qualitative effect on property value." *In the Matter of the Application by Crocker Wind Farm, LLC for a Permit of a Wind Energy Facility and a 345 kV Transmission Line in Clark County, South Dakota, for*

Crocker Wind Farm, Docket No. EL17-055, Final Decision and Order Granting Permit to Construct Facilities and Notice of Entry, ¶ 60 (June 12, 2018).

MaRous & Company recently completed a market impact study for the Dakota Range Wind Project III (MaRous & Company 2019). This study concluded that there is no market data indicating the Dakota Range Wind Project III project would have a negative impact on either rural residential or agricultural property values in the surrounding area. Further, the study found that market data from South Dakota supports the conclusion that the project would not have a negative impact on rural residential or agricultural property values in the surrounding area. Finally, for agricultural properties that host turbines, the additional income from the wind lease may increase the value and marketability of those properties.

16.1.3 Mitigation Measures for Socioeconomic and Community Impacts

As noted above, the Project will positively impact the local community. As such, no mitigation measures are proposed.

16.2 Commercial, Industrial and Agricultural Sectors

16.2.1 Existing Commercial, Industrial and Agricultural Sectors

The Project Area is primarily private-owned agricultural (predominantly cropland and grassland/pasture). No commercial, industrial, mining or institutional land uses are located within the Project Area. Therefore, no mitigation measures are proposed.

In 2017, Hyde County's 174 farms encompassed a total of 505,694 acres (average farm size of 2,906 acres) and produced $64.9 million in agricultural products (USDA 2017b). Fifty-nine percent of sales were from crop sales and 41 percent was livestock sales. The majority of crop acreage was hay and haylage, corn, and sunflowers. Cattle and calves were the largest livestock component in the County. Hyde County ranked 55th of the 66 South Dakota counties in total value of agricultural products sold.

In 2019, Hughes County's 315 farms encompassed a total of 435,033 acres (average farm size of 1,381 acres) and produced $70.3 million in agricultural products (USDA 2017c). Sixty-two percent of sales were form crop sales and 38 percent was livestock sales. The majority of crop acreage was sunflowers, corn, and wheat. Cattle and calves were the largest livestock component in the county. Hughes County ranked 52nd of the 66 South Dakota counties in total value of agricultural products sold.

16.2.2 Impacts to Commercial, Industrial and Agricultural Sectors

Less than 1 percent of the existing agricultural land within the Project Area will be removed from long-term crop and forage production by the Project, primarily the area around wind turbine foundations, access roads, and interconnection facilities. Landowners will be compensated by North Bend Wind for losses to crop production during construction. Agricultural activities can occur up to the edge of access roads and turbine pads. The buried underground collection system will not alter agricultural activities.

Approximately 262.63 acres of agricultural land (including cropland and pastureland identified in Table 9-3) will be temporarily impacted by Project construction for collection lines and workspace around each turbine foundation. It is estimated that approximately 31.7 acres of agricultural land will be impacted long-term, which constitutes 0.07 percent of the total land within the Project Area. Approximately 26.0 acres of prime farmland, if irrigated, will be impacted long-term, which constitutes approximately 0.05

percent of the total land within the Project Area. Areas disturbed due to construction that will not host long-term operational Project facilities will be restored and will returned to its prior agricultural use.

16.2.3 Mitigation Measures for Commercial, Industrial and Agriculture Sectors

The mitigation measures for impacts to agricultural lands are described in Section 11.1.3.

16.3 Community Facilities and Services

16.3.1 Existing Community Facilities and Services

Table 16-1 identifies communities within the vicinity of the Project Area which will have facilities and services such as hospitals, police, fire and ambulance services, schools, churches and parks, and recreational facilities. Electrical service in the Project Area is provided by Oahe Electric Cooperative and Dakota Electric Cooperative, Inc. (SDPUC 2021). The Project is partially located within the Mid-Dakota Rural Water System.

16.3.2 Impacts to Community Facilities and Services

Given the short-term duration of the construction activities, the Project is not likely to increase the need for public services, including police and fire protection. No significant increase in the permanent population of local communities will be expected from construction and operation of the facility. Existing community facilities and services should be adequate to support the workforce during construction. In addition, the construction workforce will not create any measurable negative impact to the local government, utilities, or community services.

It is expected that the Project will have no significant impact on the security and safety of the local communities and the surrounding area during Project construction and operation periods. Additional risk for worker or public injury may exist during the construction phase, as it would for any large construction project. In response, work plans and specifications will be prepared to address worker and community safety during Project construction. The Project's general contractor will identify and secure all active construction areas to prevent public access to potentially hazardous areas.

16.3.3 Mitigation Measures for Community Facilities and Services

During Project construction and operation, North Bend Wind will work with local and Hyde and Hughes counties' emergency management to develop procedures for response to emergencies, natural hazards, hazardous materials incidents, and potential incidents. The Project will register each turbine location and O&M facility with the rural identification / addressing (fire number) system and 911 systems.

16.4 Transportation

16.4.1 Existing Transportation

16.4.1.1 Ground Transportation

In general, the existing roadway infrastructure in and around the Project Area is characterized by state, county, and township roads that generally follow section lines. Various local roads provide access to the Project and include both two-lane and gravel roads. In the agricultural areas, many landowners use

private, single-lane farm roads and driveways on their property. The length of roads within the Project Area by jurisdiction are summarized in Table 16-3.

Table 16-3. Summary of Roadways within the Project Area

Road Type	Miles within Project Area
Federal Highways	--
State Highways	--
Local Roads	72.42
Total	**72.42**

16.4.1.2 Aviation

As discussed in Section 11.7.1, Harrold Municipal Airport is located approximately 6 miles north of the Project Area (Figure 1 in Appendix A). One other airport, Highmore Municipal, is located approximately 11 miles northeast of the Project Area near the City of Highmore. There are no other public airports in proximity to the Project Area. North Bend Wind has not identified any private airstrips within the Project Area.

Air traffic may be present near the Project Area for crop dusting of agricultural fields. Crop dusting is typically carried out during the day by highly maneuverable airplanes or helicopters. The installation of wind turbines will create a potential for collisions with crop-dusting aircraft. The turbines will be visible from a distance and lighted according to FAA guidelines. North Bend Wind received Determinations of No Hazard for a preliminary array and has since submitted the current array to the FAA, which is currently under review. See Section 16.4.2.2 for more details.

16.4.2 Impacts to Transportation

16.4.2.1 Ground Transportation

During the construction phase, temporary impacts are anticipated on some public roads in the vicinity of the Project Area; however, local traffic will continue to have safe access though the area. Roads will be affected by the transportation of equipment to and from the Project. Construction traffic will use the existing county and state roadway system to access the Project and deliver construction materials and personnel. During the construction phase, several types of light, medium, and heavy-duty construction vehicles, as well as private vehicles used by construction personnel, will travel to and from the Project Area. North Bend Wind estimates that there will be up to approximately 45 large truck trips per day per foundation and up to 100 small-vehicle (pickups and automobiles) trips per day in the area during peak construction periods. Some roads may also be temporarily expanded along specific routes as necessary to facilitate the movement of equipment. North Bend Wind expects to enter into road use agreements with Hughes and Hyde counties. Construction activities will increase the amount of traffic using local roadways, but such use is not anticipated to result in adverse traffic impacts. Operation and maintenance activities will not noticeably increase traffic in the Project vicinity.

After construction is complete, traffic impacts during the operation phase of the Project will be minimal. A small maintenance crew driving through the area in pickup trucks on a regular basis will monitor and maintain the wind turbines and collector lines, as needed. There will be a slight increase in traffic for occasional turbine, collector substation repair, and/or collector line repair, but traffic function will not be impacted as a result.

16.4.2.2 Aviation

North Bend Wind will coordinate with the Harrold Municipal Airport, the FAA and South Dakota Department of Transportation (SDDOT) prior to construction to understand potential impacts.

North Bend Wind currently has Form 7460 filings under review by the FAA for the current array at a height of 599 feet. If taller turbines are used or if the Project layout changes from what has been previously provided to the FAA, North Bend Wind will re-file with the FAA.

The installation of wind turbine towers in active croplands will create a potential collision risk with crop dusting aircraft. North Bend Wind will notify local airports about the Project including locations of MET towers in the area to minimize impacts and reduce potential risks to crop dusters.

16.4.3 Mitigation Measures for Transportation

16.4.3.1 Ground Transportation

Given the increased road use in the Project Area during construction, North Bend Wind will coordinate with local road authorities to establish road use agreements that will be in place prior to construction to ensure the safe and efficient use of roads and to minimize and mitigate the overall impact. Existing roads will be used when possible, but only in safe and environmentally sound locations. In locations where new access roads are necessary, they will be designed and constructed to the appropriate standard necessary to accommodate their intended function (e.g., traffic volume and weight of vehicles) and minimize erosion. Access roads that are not needed during operations will be decompacted, recontoured, and revegetated.

When the Project is in the process of making road improvements, local traffic will either be directed safely through the work area or around on alternate routes, if needed. If practical, roads will be designed to allow two-way traffic so construction and local traffic will be able to use the roads during construction of the Project. Some delays or detours are expected during this phase to enable the installation of road improvements, but the Project will have plans in place to enable the traffic to move safely. Delays and detours will be similar in nature to what can occur during peak farming operations or other road improvements. Additional coordination will occur during peak harvest time to ensure farmers are able to utilize the public roads as well. Local Project management and support staff will be available on-site to address concerns or challenges that occur during construction. The Project will implement the following to minimize any adverse traffic impacts: improved roads to handle two-way traffic during construction, proper signage, Project-based speed limits, state/local road requirements, dust control, safety personnel on site, and road agreements.

Project personnel and contractors will 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, O&M, and decommissioning phases, traffic will be restricted to designated Project roads. Use of other unimproved roads will be restricted to emergency situations.

The cost estimate to repair roads back to pre-construction conditions will be completed as part of final engineering and will depend on the plans for road upgrades as well as the turbine delivery plan. North Bend Wind will enter road agreements with Hughes and Hyde counties and the impacted townships prior to construction and are expected to provide detailed engineering and financial security. Pursuant to SDCL 49-41B-38, North Bend Wind will furnish an indemnity bond to secure the restoration and repair of roads after construction.

16.4.3.2 Aviation

North Bend Wind will mark and light the turbines and the permanent MET tower to comply with FAA requirements, Hyde County Zoning Regulations under Section 9-104, and Hughes County Zoning Regulations under Article 2-103. North Bend Wind will notify local airports about the Project and new towers in the area to reduce the risk to crop dusters. North Bend Wind will work with landowners on coordinating crop dusting activities. The permanent MET tower will be free-standing with no guy wires. Temporary MET towers that are already installed in the Project Area have supporting guy wires that are marked with safety shields (colored balls) and painted red and white for increased visibility.

16.5 Cultural Resources

16.5.1 Existing Cultural Resources

Cultural resources are the material remains of human activity and can include sites, buildings, districts, and landscapes. Cultural resources are finite and non-renewable; once destroyed, they and the information they provide are lost. Federal laws and regulations provide the standards for cultural resources identification, evaluation, and mitigation of impacts. If a cultural resource site meets the criteria for listing on the National Register of Historic Places (NRHP), it is considered significant and termed a "historic property." The Project layout was designed, in part, to consider impacts to cultural sites that may meet the criteria for historic properties.

Beaver Creek Archaeology, on behalf of North Bend Wind, performed a Level I Record Search for the Project Area and 1.5-mile buffer (the Research Area) using data provided by the South Dakota State Archaeological Research Center. Due to the sensitivity of this data, the Level I Cultural Resource Inventory and Preliminary Field Review of the North Bend Wind Project in Hughes and Hyde Counties, South Dakota Report is provided as a confidential appendix to the SDPUC (Appendix H).

The record search indicated that four previous archaeological surveys have been conducted within the sections where the proposed Project is located. The Level I records search revealed one site and five architectural structures located within the Research Area. These cultural resources are located outside the Project Area (Table 16-4) and thus will not be affected by Project construction as currently planned. During the 2020 preliminary field review, 12 cultural resources were identified and recorded. Current plans show North Bend Wind as being more than 100 feet from all aforementioned eligible sites; as such, no additional avoidance measures or field review of the site locations would be necessary unless plans are adjusted.

Table 16-4. Previously Recorded Cultural Resources

SHPO ID	Affiliation	Description	NRHP Status
39HE70	Period Unknown	2 stone circles, 2 cairn	Unevaluated
HE00000009	Architectural	Bridge No. 35-010-366	Eligible
HE00000011	Architectural	Bridge No. 35-030-363	Not Eligible
HE00000032	Architectural	Paul Knox Farmstead: Barn	Not Eligible
HU00000614	Architectural	Bridge No. 33-440-102	Not Eligible
HU00000616	Architectural	Chad Husted Farmstead: Barn	Unevaluated

SHPO = State Historic Preservation Office; ID = Identification
Source: Beaver Creek Archeology, Inc. 2020

Beaver Creek Archaeology concludes that undocumented cultural resources may exist within the Project Area. North Bend Wind anticipates completing archaeological pedestrian survey of the Project Area of

Potential Effect in the fall of 2021. The survey will follow procedures outlined by the South Dakota State Historical Society (SDSHS) and State Historic Preservation Office (SHPO; SDSHS 2012). A cultural resources inventory report will be drafted after this survey is completed and submitted to SDPUC and South Dakota SHPO for review.

16.5.2 Impacts to Cultural Resources

North Bend Wind is committed to avoidance of all potentially significant cultural resources (those that are listed, eligible or potentially eligible for listing, or unevaluated for listing in the NRHP). This includes previously documented resources and any resources that are identified in further surveys. As outlined in Section 4.2, potentially significant resources may require minor shifts in turbine locations or elimination of turbines from consideration. Access roads and collector line locations will be modified to avoid any potentially significant cultural resources identified in the forthcoming surveys.

16.5.3 Mitigation Measures for Cultural Resources

If there are minor modifications to the Project layout based on final engineering design, North Bend Wind will conduct supplemental archaeology survey and commit to avoiding any NHRP-eligible sites that are identified. The Project will avoid impacts to potentially significant cultural resources. Avoidance buffers (50 to 100 feet) will be placed around cultural resources that fall within this category (NRHP-listed, -eligible, -potentially eligible, or unevaluated) to ensure that the Project has no adverse impacts on these resources. All sites will be fenced along the avoidance buffer perimeter to reduce the likelihood that they will be inadvertently disturbed during construction. Therefore, no significant impacts on cultural resources are anticipated from the Project.

An Unanticipated Discovery Plan will be prepared for the Project outlining procedures to follow in order to prepare for and address any unanticipated discoveries of cultural resources, including previously undiscovered archaeological sites and possible human remains. This Unanticipated Discovery Plan will 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 construction of the Project, work will immediately halt within a minimum of 100 feet of the site and the site will be protected until SDSHS 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 County Sheriff's office will also be contacted. If the remains are determined not to be part of an active crime scene or investigation, the South Dakota Chief Archaeologist will be contacted.

17.0 EMPLOYMENT ESTIMATES (ARSD 20:10:22:24)

ARSD 20:10:22:24. Employment estimates. *The application shall contain the estimated number of jobs and a description of job classifications, together with the estimated annual employment expenditures of the applicants, the contractors, and the subcontractors during the construction phase of the proposed facility. In a separate tabulation, the application shall contain the same data with respect to the operating life of the proposed facility, to be made for the first ten years of commercial operation in one-year intervals. The application shall include plans of the applicant for utilization and training of the available labor force in South Dakota by categories of special skills required. There shall also be an assessment of the adequacy of local manpower to meet temporary and permanent labor requirements during construction and operation of the proposed facility and the estimated percentage that will remain within the county and the township in which the facility is located after construction is completed.*

As discussed in Section 16.1.2, the Project is expected to employ approximately 400 temporary construction workers during an estimated 8-month peak construction period to support Project construction, of which up to 130 would be onsite at any given point. It is likely that general skilled labor is available in the surrounding counties or the state to serve the basic infrastructure and site development needs of the Project. Specialized labor will be required for certain components of Project construction. It is likely that this labor will be imported from other areas of the state or from other states, as the relatively short duration of construction makes special training of local or regional labor impracticable.

The estimated number of construction jobs by classification and annual employment expenditures during construction are included in Table 17-1; however, the number of jobs during the peak of construction may be higher.

Table 17-1. Estimated Construction Jobs and Employment Expenditures for Wind Project

Job Classification	Number	Estimated Annual Salary
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

The estimated number of jobs by classification and annual employment expenditures during operation are included in Table 17-2. Annual estimated employment expenditures are anticipated to be the same for each of the first 10 years of commercial operation.

Table 17-2. Estimated Annual Operation and Employment Expenditures

Job Classification	Number	Estimated Annual Salary
Facility Managers	1	$90,000 – $135,000
Site Engineer	1	$75,000 – $90,000
Wind Turbine Technicians	6 – 8	$50,000 – $65,000
Administrative	0	$40,000 – $55,000

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18.0 FUTURE ADDITIONS AND MODIFICATIONS (ARSD 20:10:22:25)

ARSD 20:10:22:25. Future additions and modifications. *The applicant shall describe any plans for future modification or expansion of the proposed facility or construction of additional facilities which the applicant may wish to be approved in the permit.*

The North Bend Wind Project as proposed is a standalone project that will be built as described in this Application.

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19.0 DECOMMISSIONING OF ENERGY FACILITIES (ARSD 20:10:22:33)

ARSD 20:10:22:33.01. Decommissioning of wind energy facilities -- Funding for removal of facilities. *The applicant shall provide a plan regarding the action to be taken upon the decommissioning and removal of the wind energy facilities. Estimates of monetary costs and the site condition after decommissioning shall be included in the plan. The commission may require a bond, guarantee, insurance, or other requirement to provide funding for the decommissioning and removal of a wind energy facility. The commission shall consider the size of the facility, the location of the facility, and the financial condition of the applicant when determining whether to require some type of funding. The same criteria shall be used to determine the amount of any required funding.*

A Decommissioning Plan and estimated cost analysis is being prepared for the Project and will be included as an addendum to this filing. Overall, the net decommissioning cost will be based on two scenarios:

- GE 2.82-MW turbine model assuming salvage and no resale; and
- GE 2.82-MW turbine model assuming no salvage and no resale.

Based on ENGIE's 2020 Meridian Wind Project estimate, which was of similar size to this Project, the cost of decommissioning for this Project is estimated to be approximately $87,000 per turbine. If salvage value is not taken into account, the cost of decommissioning is estimated to increase to approximately $158,000 per turbine. A detailed reclamation cost estimate for the North Bend Wind Project will be provided as an appendix to the Decommissioning Plan which will be filed in the future.

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20.0 RELIABILITY AND SAFETY (ARSD 20:10:22:33:02 (08))

ARSD 20:10:22:33.02. Information concerning wind energy facilities. *If a wind energy facility is proposed, the applicant shall provide the following information:*
(8) Reliability and safety;

20.1 Reliability

Reliability (availability) as related to wind energy is defined as the percentage of time that a turbine will be functioning at full capacity during appropriate wind conditions at a site with specified wind resource characterization for a specified period of time, such as the life of the facility (Hill et al. 2008). The Project is located in one of the windier areas of South Dakota and has been determined to be economically viable as based on the PPAs that have been executed by the Project.

20.2 Safety

The Project is located in a rural setting. Construction and operation of the Project will have minimal impacts on the security and safety of the local populace. North Bend Wind and its construction team will coordinate with first responders, including but not limited to air ambulance, local sheriff's office(s), and local fire services to develop an emergency management plan during construction and operation of the Project. North Bend Wind will also be in contact with local first responders to offer information about the Project and to answer any questions response teams may have regarding Project plans and details. The following security measures will be taken to reduce the chance of physical and property damage, as well as personal injury, at the site:

- The turbines will be set back from occupied homes as described in this Application and the applicable regulations identified herein. Distances from participating homes are considered to be safe based on developer experience and are consistent with prior Facility Permits. Setbacks from non-participating residences exceed industry standards and any impacts from turbines is negligible.
- Security measures will be taken during the construction and operation of the Project including temporary (safety) and long-term operational fencing, and warning signs and locks on equipment and wind power facilities.
- Regular maintenance and inspections will be implemented to minimize the potential for blade failures.
- Turbines will sit on steel-enclosed tubular towers within which all electrical equipment will be located, except for the pad-mounted transformer where applicable.
- Access to the interior of the tower is only through a solid steel door that will be locked when not in use.
- The permanent MET tower will be free-standing.
- Where necessary or requested by landowners, North Bend Wind will construct gates or fences.

- The foundation and tower design of the wind turbine will be certified by a professional engineer to be within accepted professional standards.
- Safety training will be conducted, and standardized practices will be implemented for construction crews and on-site personnel.
- The Project will register each turbine location and the O&M facility with a rural address identifier as outlined in the South Dakota Rural Addressing Procedural Handbook.
- North Bend Wind will coordinate with South Dakota One-Call and pipeline companies prior to commencement of construction activities and will register Project underground facilities with the One-Call program following construction.
- Icing conditions of the wind turbines will be monitored; if severe icing conditions are identified, control systems will either automatically or manually shut down until icing is no longer a concern.

The Project will have minimal waste as a result of operation, and all required permits for handling contaminants will be obtained. North Bend Wind has been and will continue to be in contact with local first responders to offer information about the Project and to answer any questions response teams may have regarding Project plans and details.

20.3 Electromagnetic Fields and Stray Voltage

The frequency of transmission line electromagnetic fields (EMF) in the United States is 60 Hz and falls in the extremely low frequency (ELF) range of the electromagnetic spectrum (any frequency below 300 Hz). For the lower frequencies associated with power lines, the electric and magnetic fields are typically evaluated separately. The intensity of the electric field is related to the voltage of the line, while the intensity of the magnetic field is related to the current flow along the conductors.

Concerns about health effects of EMF from power lines were first raised in the late 1970s. Since then, considerable research has been conducted to determine if exposure to magnetic fields, such as those from high-voltage power lines, causes biological responses and health effects. Initial epidemiological studies completed in the late 1970s showed a weak correlation between surrogate indicators of magnetic field exposure (such as wiring codes or distance from roads) and increased rates of childhood leukemia (Wertheimer and Leeper 1979). Toxicological and laboratory studies have not shown a biological mechanism between EMF and cancer or other adverse health effects. In 2007, the World Health Organization (WHO) concluded a review of health implications from magnetic fields and concluded, "…virtually all of the laboratory evidence and the mechanistic evidence fail to support a relationship between low-level ELF magnetic fields and changes in biological function or disease status" (WHO 2007).

Natural and human-made electromagnetic fields are present everywhere in our environment. Natural electric fields in the atmosphere range from background static levels of 10 to 120 volts per meter to well over several kilovolts per meter produced by the build-up of electric charges in thunderstorms. The earth itself has a magnetic field that ranges from approximately 300 to 700 milligauss (mG). In addition to the presence of the earth's steady state electric field, an average home experiences additional magnetic fields of 0.5 mG to 4 mG caused by the general wiring and appliances located in a typical home.

Impacts from stray voltage are typically related to improper grounding of electrical service to the farm (distribution lines) or on-farm electrical wiring. Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses or residences and they are typically grounded properly. Transmission lines can induce stray voltage on a distribution circuit that is parallel to and immediately under the transmission line. Appropriate measures, such as proper grounding, will be taken to prevent stray voltage problems.

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21.0 INFORMATION CONCERNING WIND ENERGY FACILITIES (ARSD 20:10:22:33.02 and 20:10:22:35)

***ARSD 20:10:22:33.02. Information concerning wind energy facilities**. If a wind energy facility is proposed, the applicant shall provide the following information:*

(1) Configuration of the wind turbines, including the distance measured from ground level to the blade extended at its highest point, distance between the wind turbines, type of material, and color;
(2) The number of wind turbines, including the number of anticipated additions of wind turbines in each of the next five years;
(3) Any warning lighting requirements for the wind turbines;
(4) Setback distances from off-site buildings, right-of-ways of public roads, and property lines;
(5) Anticipated noise levels during construction and operation;
(6) Anticipated electromagnetic interference during operation of the facilities;
(7) The proposed wind energy site and major alternatives as depicted on overhead photographs and land use culture maps;
(8) Reliability and safety;
(9) Right-of-way or condemnation requirements;
(10) Necessary clearing activities;
(11) Configuration of towers and poles for any electric interconnection facilities, including material, overall height, and width;
(12) Conductor configuration and size, length of span between structures, and number of circuits per pole or tower for any electric interconnection facilities; and
(13) If any electric interconnection facilities are placed underground, the depth of burial, distance between access points, conductor configuration and size, and number of circuits.

Refer to the Completeness Checklist in Section 1.4.1 of this Application for ARSD requirement details. Requirements specific to ARSD 20:10:22:33.02 (1-13) and ARSD 20:10:22:35 (1-7) are addressed in various sections of this Application, as indicated in Table 21-1 below.

Table 21-1. Information Concerning Wind Energy Facilities (ARSD 20:10:22:33.02)

Information Request	Section
(1) Configuration of wind turbine	Section 4.1 and Section 4.2
(2) Number of wind turbines	Section 4.2
(3) Warning light requirements for wind turbines	Section 4.2.6 and Section 12.0
(4) Setback distances	Section 5.2 and Section 12.0; Figures 3a-3b
(5) Noise levels during construction and operation	Section 11.3
(6) Electromagnetic interference	Section 20.3
(7) Proposed site and major alternatives	Section 5; Figures 3a-3b and Figure 11; Appendix B
(8) Reliability and safety	Sections 20.1 and 20.2
(9) Right-of-way or condemnation requirements	Section 4.3.1
(10) Clearing activities	Sections 4.4, 6.0, 8.2.2.1 and 9.1.2.3
(11) Configuration of interconnection towers and poles	Sections 4.2.1–4.2.10
(12) Conductor and structure configurations	Section 4.2.10
(13) Underground electric interconnection facilities	Section 4.4.4

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22.0 ADDITIONAL INFORMATION IN APPLICATION (ARSD 10:22:36)

ARSD 20:10:22:36. Additional information in application. *The applicant shall also submit as part of the application any additional information necessary for the local review committees to assess the effects of the proposed facility pursuant to SDCL 49-41B-7. The applicant shall also submit as part of its application any additional information necessary to meet the burden of proof specified in SDCL 49-41B-22.*

22.1 Permits and Approvals

The Applicant is responsible for undertaking all required environmental review and will obtain all permits and licenses that are required following issuance of the Energy Facility Permit. The potential permits or approvals that have been identified as being required for the construction and operation of the Project are shown in Table 22-1.

Table 22-1. Permits and Approvals

Regulatory Authority	Permit/Approval	Status
Federal Approvals		
USACE	CWA Section 404 and Section 10 Permit(s)	Not anticipated—To be determined once layout is finalized.
EPA (Region 8) in coordination with the South Dakota Department of Health	SPCC Plan	To be completed in conjunction with final engineering and design.
FAA	Form 7460-1 Notice of Proposed Construction or Alteration (Determination of No Hazard)	Under review - future revisions may be required depending on layout and/or determination expiration.
	Notice of Actual Construction or Alteration (Form 7460-2)	To be submitted as required during construction.
State of South Dakota Approvals		
SDPUC	Application for Energy Facility Permit	Will be submitted spring 2021.
SDSHS	Cultural and Historic Resources Review and Review of State and NRHP and Archeological Survey	Will be completed in 2021.
SDDENR	Section 401 Water Quality Certification	Not anticipated unless Individual Section 404 Permit is needed from USACE.
	National Pollutant Discharge Elimination System General Stormwater Permit for Construction Activity	SWPPP would be prepared and Notice of Intent will be submitted after final design is complete.
	Temporary Water Use Permit for Construction Activities	If necessary, will be obtained prior to construction.
	Water Rights Permit for Non-irrigation Use	If necessary, will be obtained prior to construction.
	Temporary Discharge Permit	If necessary, will be obtained prior to construction.
SDDOT	Utility Permit	If necessary, will be obtained prior to construction.

Table 22-1. Permits and Approvals

Regulatory Authority	Permit/Approval	Status
	Oversize/Overweight Permit for State Highways	If necessary, will be obtained prior to construction.
	Highway Access Permit	If necessary, will be obtained prior to construction.
Local Approvals		
Hughes County Zoning Administrator	Conditional Use Permit	Will be obtained prior to construction
Hughes County Planning and Zoning Department	Building Permit	If necessary, will be obtained prior to construction.
Hyde County Zoning Administrator	Conditional Use Permit	Will be obtained prior to construction.
Hyde County Planning and Zoning Department	Building Permit and Soil Erosion and Sediment Control Plan	Will be obtained prior to construction.
	Oversize/Overweight and Approach Permit	Will be obtained prior to construction.

22.2 Agency Coordination

Throughout Project planning and NEPA scoping, North Bend Wind has coordinated with various federal, state, and local agencies to identify agency concerns regarding the Project. A summary of agency comments and coordination is provided below. Agency correspondance is provided in Appendix I.

22.2.1 USFWS

As part of the coordination for the NEPA process that is currently underway, the Project coordinated closely with USFWS Ecological Services. The USFWS initially submitted comments on January 5, 2017 however an updated response letter was provided on February 24, 2021. This updated letter was in response to a January 28, 2021 agency meeting, as well as North Bend Wind's December 15, 2020 report, *North Bend Wind Project Field Studies Summary 2016 – 2020 Hughes and Hyde Counties, South Dakota*, which was provided to their office just prior to that meeting. In addition to new recommendations, the USFWS also notes that the majority of the 2017 comments are still applicable to this Project; however, the least tern, as of January 2021, has been removed from the list of species protected under the Endangered Species Act. North Bend Wind is continuing conversations with the USFWS to meet minimize impacts to species.

22.2.2 SDGFP

A coordination letter was submitted to the SDGFP as part of the NEPA scoping process. The SDGFP responded on March 1, 2021 highlighting important habitats and species of concern (Appendix I). North Bend Wind continues to coordinate with SDGFP regarding the Project.

22.2.3 SDDENR

A coordination letter was submitted to the SDDENR as part of the NEPA scoping process. The SDDENR responded on February 10, 2021 stating that any construction activity that disturbs an area of one or more acres of land must have authorization under the General Permit for Storm Water Discharges Associated with Construction Activities and Surface Water Discharge Permit may be required if any construction dewatering would result from the Project (Appendix I).

22.2.4 South Dakota State Historical Society

North Bend Wind completed a file search (see Section 16.5.1). BCA, on behalf of North Bend Wind is currently consulting with the SDSHS regarding the results of the field surveys from the fall of 2020 as well as the additional field surveys that are ongoing.

22.2.5 FAA

Form 7460 filings have been submitted for the current array at a height of 499 feet and are under review. Given that the current filing is in the same general area of the prior filing, it is anticipated that Determinations of No Hazard will be issued by the FAA. If taller turbines are used or if the Project layout changes from what has been previously provided to the FAA, North Bend Wind will re-file with the FAA.

22.2.6 Hughes County

North Bend Wind has consulted with Hughes County representatives through meetings, telephone calls, and electronic communications. The primary topics of these coordination efforts are summarized below.

- Project introduction summary and status update presentations to County Commissioners and Board of Adjustment; and
- Coordination with Hughes County regarding the North Bend Wind CUP application; the application will be submitted by mid-June 2021.

22.2.7 Hyde County

North Bend Wind has consulted with Hyde County representatives through meetings, telephone calls, and electronic communications. The primary topics of these coordination efforts are summarized below.

- Project introduction summary and status update presentations to County Commissioners and Board of Adjustment; and
- Coordination with Hyde County regarding the North Bend Wind CUP application; the application was submitted on June 11, 2021.

22.3 Local Community Input

A public scoping meeting was held on January 28, 2021 as part of the NEPA scoping process regarding the North Bend Wind Project. As stated in Table 5-1 and Section 12.0, North Bend Wind will comply with all adopted Hyde and Hughes county setbacks in addition to voluntary environmental setbacks on other infrastructure and natural resources.

A poll was conducted by Mason-Dixon Polling & Strategy of Jacksonville, Florida from August 22 through September 9, 2018 (Appendix J). A total of 173 registered voters in Hyde County were interviewed by telephone. Those interviewed were selected randomly from a telephone-matched voter registration list that included both land line and cell phone numbers. The poll found that 74 percent of the interviewed voters support the building of new wind turbines in Hyde County, 22 percent opposed, and 4 percent were undecided.

22.4 Applicant's Burden of Proof (49-41B-22)

As described in Section 1.4, North Bend Wind has addressed the matters set forth in SDCL Ch. 49-41B and in ARSD Ch. 20:10:22 (Energy Facility Siting Rules), related to wind energy facilities.

North Bend Wind's burden of proof is set forth in SDCL 49-41B-22. North Bend Wind has established that:

- The Project will comply with all applicable laws and rules;
- The Project will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants or expected inhabitants in the Project Area. An applicant for an electric transmission line, a solar energy facility, or a wind energy facility that holds a conditional use permit from the applicable local units of government is determined not to threaten the social and economic condition of inhabitants or expected inhabitants in Project Area;
- The Project will not substantially impair the health, safety or welfare of the inhabitants; and
- The Project will not unduly interfere with the orderly development of the region with due consideration having been given the views of governing bodies of affected local units of government. An applicant for an electric transmission line, a solar energy facility, or a wind energy facility that holds a CUP from the applicable local units of government is in compliance with this subdivision.

23.0 TESTIMONY AND EXHIBITS (ARSD 20:10:22:39)

ARSD 20:10:22:39. Testimony and Exhibits. *Upon the filing of an application pursuant to SDCL 49-41B-11, an applicant shall also file all data, exhibits, and related testimony which the applicant intends to submit in support of its application. The application shall specifically show the witnesses supporting the information contained in the application.*

North Bend Wind is submitting testimony and exhibits in support of this Application. The individuals identified in Table 23-1 are providing testimony is support of the Application. North Bend Wind reserves the right to provide supplemental and/or rebuttal testimony, as needed to further support this Application.

Table 23-1. List of Individuals Providing Testimony

Individual	Company	Subject Matter
Casey Willis, Senior Advisor, Project Development	ENGIE North America, Inc.	Overall development of the North Bend Wind Project; permitting/environmental
Dave Mebane, Land Agent	ENGIE North America, Inc.	Landowner relationships
Tricia Pellerin	Tetra Tech, Inc.	Sound and noise impact analysis
Ted Guertin	Tetra Tech, Inc.	Shadow flicker analysis
Marty Piorkowski	WEST, Inc.	Biology/wildlife
Manuela Elizondo	Tetra Tech, Inc.	Physical environment, hydrology, aquatic ecosystems, visual, water quality, and air quality
Blake Crosby	ENGIE North America, Inc.	Project construction
Wade Burns	Beaver Creek Archaeology	Archaeological surveys

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