BURNS McDONNELL

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

Prevailing Winds, LLC

Prevailing Winds Wind Energy Facility
Burns & McDonnell Project No. 91343

June 2016

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Bon Homme and Charles Mix Counties, South Dakota

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prepared by

Burns & McDonnell Engineering Company, Inc.
Centennial, Colorado

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LIST OF ABBREVIATIONS

Abbreviation	**Term/Phrase/Name**
ADT	Average Daily Traffic
AMSL	above mean sea level
Applicant	Prevailing Winds, LLC
ARSD	Administrative Rules of South Dakota
AWEA	American Wind Energy Association
BCC	Birds of Conservation Concern
BCI	Bat Conservation International, Inc.
BCR	Bird Conservation Region
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
CadnaA	Computer Aided Design for Noise Abatement
CMWS	composite mean wind speeds
CO_2	carbon dioxide
COD	commercial operation date
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibels
DOE	U.S. Department of Energy
EA	Environmental Assessment
EERE	Office of Energy Efficiency & Renewable Energy
EIA	U.S. Energy Information Administration

Abbreviation	Term/Phrase/Name
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FONSI	Finding of No Significant Impact
GE	General Electric
GLO	General Land Office
GW	gigawatt
HDR	HDR, Inc.
Hz	hertz
IPaC	Information for Planning and Conservation
IRS	Internal Revenue Service
ISO	International Organization for Standardization
ITP	integrated transmission plan
Ksat	saturated hydraulic conductivity
kV	kilovolt
kW	kilowatt
L_p	sound pressure
L_w	sound power level
LWES	Large Wind Energy Systems
m/s	meters per second

Abbreviation	**Term/Phrase/Name**
MATS	Mercury and Air Toxics Standards
MBTA	Migratory Bird Treaty Act
Mnioka	Mnioka Construction, LLC
mph	miles per hour
MW	megawatt
MWh	megawatt-hour
NAAQS	National Ambient Air Quality Standards
NDVER	non-dispatchable variable energy resource
NEPA	National Environmental Policy Act
NESC	National Electric Safety Code
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NWCC	National Wind Coordinating Collaborative
NWI	National Wetland Inventory
NWR	National Wildlife Refuge
O&M	operations and maintenance
OPPD	Omaha Public Power District
OSHA	Occupational Safety and Health Administration
PEIS	Programmatic Environmental Impact Statement
PGA	peak ground acceleration

Abbreviation	**Term/Phrase/Name**
PMU	phasor measurement units
POI	point of interconnection
PPA	Power Purchase Agreement
Prevailing Winds	Prevailing Winds, LLC
PTC	Production Tax Credit
PVS	property value survey
RD	rotor diameter
REPP	Renewable Energy Policy Project
rpm	revolutions per minute
RPS	renewable portfolio standard
RUSLE	Revised Universal Soil Loss Equation
SCADA	supervisory control and data acquisition
SDARC	South Dakota Archaeological Research Center
SDCL	South Dakota Codified Laws
SDDENR	South Dakota Department of Environment and Natural Resources
SDDLR	South Dakota Department of Labor and Regulation
SDDOA	South Dakota Department of Agriculture
SDDOT	South Dakota Department of Transportation
SDGFP	South Dakota Game, Fish, and Parks
SDGS	South Dakota Geological Survey
SDPUC	South Dakota Public Utilities Commission
SHPO	State Historic Preservation Office

Abbreviation	**Term/Phrase/Name**
SPP	Southwest Power Pool
SWPPP	Storm Water Pollution Prevention Plan
T&GO	Transmission and Generator Operators
TMDL	total maximum daily load
TO	transmission operator
TPWD	Texas Parks and Wildlife Department
TSS	total suspended solids
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USLE	Universal Soil Loss Equation
WEST	Western EcoSystems Technology, Inc.
Western	Western Area Power Administration
WNS	white-nose syndrome

1.0 INTRODUCTION

Prevailing Winds, LLC (Applicant or Prevailing Winds) is proposing to develop a wind energy facility near Avon, South Dakota, in Bon Homme and Charles Mix Counties, with the potential to construct up to 100 wind turbines with a nameplate capacity of up to 201 megawatts (MW) of wind energy (Project). Prevailing Winds, a South Dakota limited liability company, is wholly owned by 160 South Dakota investors for the specific purpose of developing a wind energy project in this location. The Project is located on the Dry Choteau Creek Coteau, an upland divide that rises 300 to 350 feet above the Choteau Creek Valley along its western boundary and then gradually descends for several miles to the east. The Project would interconnect at a new Western Area Power Administration (Western)-owned switching station to be constructed within the Project Area adjacent to Western's Fort Randall to Utica Junction 230-kilovolt (kV) double-circuit transmission line, or alternatively at Western's existing Utica Junction 230-kV switching station, approximately 22 miles east of the Project Area. The Project Area is comprised of approximately 36,000 acres of agricultural land (Figure 1 in Appendix A). Project components would include:

- Up to 100 wind turbines
- Access roads to each wind turbine
- Underground electrical power collector system
- A collector substation
- An operations and maintenance (O&M) facility
- 230-kV interconnection facilities

This Application does not include an offsite transmission line. If the Project were to interconnect to Western's Utica Junction 230-kV switching station east of the Project Area, Prevailing Winds would file a separate Application for construction of an offsite 230-kV transmission line from the Project Area to Western's Utica Junction 230-kV switching station.

Prevailing Winds was formed in 2014 by the same local group of investors that successfully developed the B&H Wind Project (now Beethoven Wind). The local investors' goal is to build on B&H Wind's success and create additional sources of income for area landowners and economic growth for the local communities through wind energy. Development activities have begun with the preparation of an interconnection request with Western and acquisition of the remaining B&H Wind assets. By acquiring B&H Wind's assets, Prevailing Winds now has existing meteorological towers with over 5 years of continuous data, past Western interconnection studies, leased land, and the models used to study the wind resource in the area.

2.0 FACILITY PERMIT APPLICATION

This Application provides information on the anticipated environmental and other impacts by the Project on the following resources:

- Physical (geology, economic deposits, soils)
- Hydrology (water)
- Terrestrial ecosystems (vegetation, wetlands, wildlife, threatened and endangered species)
- Aquatic ecosystems
- Land use (agriculture, residential, displacement, sound, aesthetics, electromagnetic interference, safety and health, real estate values)
- Water quality
- Air quality
- Communities (socioeconomics, transportation and emergency response, cultural resources)

In addition to this Application, it is anticipated that Western will prepare an Environmental Assessment (EA) for the Project interconnection and Project site in accordance with the applicable requirements and standards of the National Environmental Policy Act (NEPA). The EA would tier off of the analysis conducted in the *Upper Great Plains Wind Energy Final Programmatic Environmental Impact Statement* (PEIS), prepared jointly by Western and the U.S. Fish and Wildlife Service (USFWS) (Western and USFWS, 2015). The PEIS assesses environmental impacts associated with wind energy development and identifies management practices to address impacts. The EA for the Prevailing Winds Project would focus on site-specific issues that are not already addressed in sufficient detail in the PEIS. Prevailing Winds anticipates that preparation of the EA will begin in late 2016 and that Western will approve the EA and issue a Finding of No Significant Impact (FONSI) in early 2017.

The Project would have an aggregate nameplate capacity of up to 201 MW. Depending on the turbine model used, the Project may consist of up to 100 wind turbines. The Applicant would consider energy output, financial data, site impacts, and other factors in selecting the turbine to be used for the Project. At the time of filing of this Application, the General Electric (GE) 2.3-116 turbine model offers the best combination of attributes for the Project. Based on these factors, the Applicant developed a hypothetical turbine layout based on the GE 2.3-116 turbine model (87 turbines) to analyze and identify potential Project impacts. Other wind turbine models or manufacturers are also under consideration, as discussed further in Chapters 6.0 and 8.0. Unless otherwise stated, the analysis presented in this Application is based on this hypothetical GE 2.3-116 turbine layout.

Following is a summary of the potential impacts that could result from construction and operation of the Project. The Project is not expected to have significant impacts on the environment. Approximately 51 acres of permanent disturbance, representing less than 0.2 percent of the total acreage within the Project Area, would be broadly dispersed throughout the Project Area. Therefore, the Project is not expected to cause major changes in runoff patterns or volume of runoff, nor is it expected to have adverse impacts on existing hydrology.

The Applicant anticipates that the Project would avoid locating facilities in wetland areas. Wind turbines and access roads would generally be located in upland areas, avoiding low-lying wetlands and drainage ways. As the design details for Project infrastructure are finalized, any wetland impacts would be identified, and, prior to construction, necessary authorizations (e.g., Section 404 permit) would be acquired.

Significant impacts (i.e., activities not in compliance with Federal or State wildlife conservation policies or activities affecting the biological viability of wildlife species populations) are not anticipated for this Project. The majority of land proposed to be directly affected by construction of the Project is cropland. Construction of Project facilities in cropland or grassland is not expected to negatively affect terrestrial ecosystems. Best Management Practices (BMPs) would be utilized to avoid or reduce impacts to the vegetation and water resources of the Project Area during construction.

Seven animal species listed as threatened, endangered, or proposed endangered under the Federal Endangered Species Act (ESA) have been documented in Bonne Homme and/or Charles Mix Counties, including: pallid sturgeon, Topeka shiner, interior least tern, whooping crane, northern long-eared bat, red knot, and piping plover. Five of these species have the potential to occur in the Project Area during some portion of the year: interior least tern, whooping crane, northern long-eared bat, red knot, and piping plover. The interior least tern, red knot, whooping crane, and piping plover could migrate through the Project Area during the spring and fall but are otherwise not expected to occur in the Project Area. The Project Area is located outside of the defined national whooping crane migration corridor, and there have been no confirmed whooping crane sightings within the Project Area as of fall 2010. The Project Area is within the defined range of the northern long-eared bat, and the species could be present during the summer breeding period. The pallid sturgeon and Topeka shiner are federally listed fish species but have not been found within the Project Area. There are no known occurrences of federally listed plant species within the Project Area.

Existing land uses are not anticipated to be significantly changed or impacted by the Project. Sound from the Project construction activities would be temporary and generally limited to daytime hours. Once the Project were operational, sound from the turbines and other facilities would be limited to 45 A-weighted decibels (dBA) at sound receptors (occupied residences as identified in State rules and County ordinances).

Construction activities for this Project would be short-term, and, therefore, no long-term negative impact to the socioeconomics of the area is expected. Short-term construction effects likely would be beneficial to businesses in the region.

During Project construction, fugitive dust emissions would increase due to vehicle and equipment traffic in the area. The additional particulate matter emissions would not exceed the National Ambient Air Quality Standards (NAAQS). The wind turbines would not produce air emissions during operation.

Cultural resource Level 1 records review and site survey from public rights-of-way for the Project Area identified previously recorded archaeological and historic resources located within or near the Project Area. Additional cultural resource evaluation is in progress for the Project. The Applicant would physically avoid identified cultural resources.

Mitigation measures proposed for the Project include:

- Wind turbines will be illuminated as required by Federal Aviation Administration (FAA) regulations and recommendations
- Existing roads will be used for construction and maintenance where possible
- Access roads created for the Project will be located to limit cuts and fills
- Temporarily disturbed uncultivated areas will be reseeded with certified weed-free seed mixes to blend in with existing vegetation
- BMPs will be used during construction to control erosion and prevent or reduce impacts to drainage ways and streams by sediment runoff from exposed soils
- The Project will use tubular towers for wind turbines instead of lattice tower structures, to reduce potential avian and visual impacts
- Direct impacts to eligible or potentially eligible sites for the National Register of Historic Places (NRHP) will be avoided
- The Applicant plans to avoid impacts to wetlands to the extent practicable
- The Applicant plans to avoid impacts to native grasslands to the extent practicable

- The Applicant will meet or exceed setbacks, conditions, and siting standards required by State and local governing bodies where the wind turbines are located

In this Application, the Applicant has addressed each matter set forth in South Dakota Codified Laws (SDCL) Chapter 49-41B and in Administrative Rules of South Dakota (ARSD) Chapter 20:10:22 (Energy Facility Siting Rules) related to wind energy facilities. Included with this Application is a Completeness Checklist (Table 3-1) that sets forth where in the Application each rule requirement is addressed.

Pursuant to SDCL 49-41B-22, the information presented here establishes that:

- The proposed wind energy facility complies with applicable laws and rules
- The facility will not pose a threat of serious injury to the environment or to the social and economic condition of inhabitants in, or near, the Project Area
- The facility will not substantially impair the health, safety, or welfare of the inhabitants
- The facility will not unduly interfere with the orderly development of the region, having given consideration to the views of the governing bodies of the local affected units of government

3.0 COMPLETENESS CHECKLIST

The contents required for an application with the South Dakota Public Utilities Commission (SDPUC) are described in SDCL 49-41B and further clarified in ARSD 20:10:22:01(1) et seq. The SDPUC submittal requirements are listed in Table 3-1 with cross-references indicating where the information can be found in this Application.

Table 3-1: Completeness Checklist

SDCL	ARSD	Required Information	Location
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.	Chapter 4.0
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.	Chapter 5.0
49-41B-11(8)	20:10:22:08	**Purpose of facility.** The applicant shall describe the purpose of the proposed facility.	Chapter 6.0
49-41B-11(12)	20:10:22:09	**Estimated cost of facility.** The applicant shall describe the estimated construction cost of the proposed facility	Chapter 7.0
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.	Chapter 6.0
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.	Chapter 8.0 Figures 1, 8, 9, and 10 Appendix E

SDCL	ARSD	Required Information	Location
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.	Chapter 9.0
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.	Chapters 10.0, 11.0, 12.0, 13.0, 14.0, 15.0, 17.0, 18.0, and 20.0
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;	Chapter 11.0 Figures 2, 6a, 6b, and 7

SDCL	ARSD	Required Information	Location
		(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.	
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	Chapter 12.0 Figure 8

SDCL	ARSD	Required Information	Location
		negative effects on any aquifers and groundwater users which may be affected.	
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.	Chapter 13.0
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.	Chapter 14.0
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 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	Chapters 15.0 and 20.0 Figure 9

SDCL	ARSD	Required Information	Location
		(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.	
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.	Chapter 16.0
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.	Chapter 17.0
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.	Chapter 18.0
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.	Chapter 19.0
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	Chapter 20.0

SDCL	ARSD	Required Information	Location
		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.	
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.	Chapters 20.0 and 21.0
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.	Chapter 22.0
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 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	Chapter 23.0

SDCL	ARSD	Required Information	Location
		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.	
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, 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.	Chapter 25.0
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;	Chapter 1.0 and Section 26.4

SDCL	ARSD	Required Information	Location
		(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; (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	
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.	Chapter 27.0 and Appendices

4.0 NAMES OF PARTICIPANTS (ARSD 20:10:22:06)

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

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- Ronnie G. Hornstra – President, Prevailing Winds, LLC
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5.0 NAME OF OWNER AND MANAGER (ARSD 20:10:22:07)

Prevailing Winds, LLC, a South Dakota limited liability company, is wholly owned by 160 South Dakota investors for the specific purpose of developing a wind energy project in Bon Homme and Charles Mix Counties near Avon, South Dakota. Many of these investors are landowners and residents from local communities adjacent to the Project. Prevailing Winds' corporate mission statement is:

> "Prevailing Winds, LLC is a community based wind development corporation, committed to the development of wind turbine based renewable energy. Our commitment is to develop wind energy projects that are sustainable, long-term and environmentally sound. We are committed to the social and economic improvement of rural South Dakota by maximizing a projects economic benefit within the local communities."

Prevailing Winds began development activities on the current Project in early 2015 when 30 local investors formed the company and funded a feasibility study to determine if the proposed Project location could support a 200-MW wind energy project. The local investors became members of the limited liability company and funded the feasibility studies through a Private Placement Memorandum. All 30 investors are also members in B&H Wind Holdings, LLC. B&H Wind Holdings, LLC is the company that fully developed and sold the now operating 80-MW Beethoven Wind Project, adjacent to and north of the Prevailing Winds Project Area, which is now owned by NorthWestern Energy.

Prevailing Winds' Board of Managers governs all business and affairs of the company. Prevailing Winds' Board of Managers is comprised of the following people, seven of whom are local residents (Table 5-1).

Table 5-1: Prevailing Winds' Board of Managers

Name	Title
Ronnie Hornstra	President, Manager
Keith L. Thorstad	Executive Vice President, Manager
Ron Wagner	Secretary, Treasurer, Manager
Paul Dummer	Manager
David Mogck	Manager
Mark Rames	Manager
Bruce Voigt	Manager
Erik Johnson	Manager

To assist with the development of the Project, Mnioka Construction, LLC (Mnioka), with offices in Chokio, Minnesota, was retained by Prevailing Winds as the Project developer. Mnioka also assisted

B&H Wind Holdings, LLC with development of the Beethoven Wind Project. Mnioka Construction, LLC is owned by Keith L. Thorstad, Executive Vice President and a Manager of Prevailing Winds, LLC.

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

The Prevailing Winds Wind Energy Facility would annually generate up to 860,000 megawatt-hours (MWh) of utility scale electric power (output dependent on turbine model) for residential, commercial, and industrial consumers within South Dakota and the Southwest Power Pool (SPP). Electric power generated from the Project would help meet the region's and rate payers' growing needs for low cost, renewable energy for many decades and would provide a significant economic benefit to the local communities, schools, local government bodies, and the State of South Dakota.

Currently, the demand for renewable energy from wind is extremely high, with the cost of energy from wind declining by over 66 percent in the past 6 years. The lower cost of wind energy and wind energy fixed costs are driving need and demand. In many situations, wind energy and natural gas generation are being combined to produce the lowest cost baseload power. 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 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 Power Purchase Agreements (PPA) with wind energy projects or purchasing wind projects outright. New demand for wind energy is also coming from non-utility buyers. Corporations are buying wind energy, and in 2015 more than half of the PPAs (2,074 MW) went to non-utility off-takers, up from 23 percent in 2014 and 5 percent in 2013. It is expected that non-utility off-takers may execute PPAs for over 4,000 MW of wind power in 2016.

The need to comply with the U.S. Environmental Protection Agency's (EPA) Mercury and Air Toxics Standards (MATS) regulations, together with weak electricity demand growth and continued competition from generators fueled by natural gas, have recently led several power producers to announce plans to retire coal-fired facilities. Between 2012 and 2020, about 60 gigawatts (GW) of coal-fired capacity is projected to retire in the *Annual Energy Outlook 2014* reference case, which assumed implementation of the MATS standards, as well as other existing laws and regulations (U.S. Energy Information Administration [EIA], 2014). Nearly 18 GW of electric generating capacity was retired in 2015, with more than 80 percent of the retired capacity from conventional steam coal (EIA, 2016). Power producers across the region are expanding their use of wind energy paired with natural gas as a cost effective source of new generation. Wind and natural gas are replacing aging coal and nuclear facilities that are being retired for regulatory and financial reasons, as recently explained in the recommendation from Omaha Public Power District (OPPD) to close its 500-MW Fort Calhoun Nuclear Station at the end of the year and from Talen Energy, operator of the 2,094-MW Colstrip coal-fired power plant in Montana, informing its owners that it plans to stop operating the plant by 2018.

Wind energy is an inexhaustible source of clean, renewable electric power that can help fill this capacity shortfall. Operation of the 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. Achieving 20 percent wind energy in the nation would reduce carbon dioxide (CO_2) emissions by 825 million metric tons and water consumption by 4 trillion gallons annually (Department of Energy [DOE]-Office of Energy Efficiency & Renewable Energy [EERE], 2008).

In its *Annual Energy Outlook 2007*, the EIA estimated that U.S. electricity demand would grow by 39 percent from 2005 to 2030, reaching 5.8 billion MWh by 2030. The DOE-EERE *20% Wind Energy by 2030* report examined the technical feasibility of using wind energy to generate 20 percent of the nation's electricity demand by 2030 (DOE-EERE, 2008). To meet 20 percent of that demand, U.S. wind power capacity would have to reach more than 300 GW. At the end of 2015, the total amount of wind energy capacity in the U.S. had grown to 73.99 GW. Reaching 300 GW requires an increase of more than 226 GW in 15 years, or 15 GW per year.

In March 2015, the DOE released its *Wind Vision* report, which builds on and updates the 2008 *20% Wind Energy by 2030* report (DOE, 2015). The *Wind Vision* report analyzes the benefits of a study 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 business-as-usual scenario does not prescribe a wind future trajectory, but instead models wind deployment under policy conditions current on January 1, 2014, utilizing demand and cost inputs from the EIA *Annual Energy Outlook 2014*. The study concludes that the study scenario of 35 percent wind power by 2050 will provide $149 billion (3 percent) lower cumulative electric sector expenditures; 14 percent reduction in cumulative greenhouse gas emissions ($400 billion in avoided global damages); $108 billion savings in avoided mortality, morbidity, and economic damages from cumulative reductions in sulfur dioxide, nitrogen oxides, and particulate matter; 23 percent reduction in water used by the energy sector; and over $1 billion in annual land lease payments to landowners.

Load growth for the Dakotas was last projected to be at least 2,100 MW over the next 10 years. South Dakota's current electric generation is primarily from hydroelectric and coal-fired power plants, with approximately half derived from each. South Dakota relies on shipments of coal from Wyoming to meet its coal demand, and supplies of fossil fuels such as coal, oil, and natural gas are finite. Implementation of tighter EPA regulations on existing coal-fired plants is accelerating retirements of outdated facilities, and construction of new coal, nuclear, or hydroelectric stations in the area is extremely unlikely.

The Project would provide significant needed local and regional economic benefits. The area where the Project is proposed is almost entirely dependent on an agricultural economy. Local agricultural economies are very sensitive to world commodity prices and weather. The primary driver to increase local agricultural economies are to add value to existing farming operations through increasing farming efficiency with larger farms and adding large livestock feeding operations. Both may benefit the individual farmer but generally do not increase jobs or population in the local communities. Wind energy adds significant revenue to existing farming operations and creates jobs in the local communities. It can also increase populations with operations and management jobs.

The Project would add significant revenue to the local agricultural economy by using approximately 51 acres of private agricultural lands in Bon Homme and Charles Mix Counties. The Project's use of 51 acres would generate nearly $1 million annually in new income for landowners; approximately $680,000 in new annual tax revenues for local counties, schools and townships[1]; and approximately $12 million in new tax revenues for State government[1] from Project operations. Construction, operations, and maintenance of the facility are expected to create approximately 200 jobs[2] during the peak construction phase and approximately 8 to 10 long-term operations and management positions, which would benefit local businesses. Statewide and nationally, the wind industry generates well-paying jobs in the entire supply chain, including engineering, manufacturing, and construction.

Because no large Transmission and Generator Operators (T&GO) are headquartered or based in South Dakota, the energy, capacity, and renewable energy credits generated by the Project would likely be sold to a T&GO that is out of State. This arrangement is beneficial in that it brings a source of new revenue into the State, much like tourism brings revenue from out of State to South Dakota.

All power produced by the Project that is sold to an SPP member must be bid into and sold to the SPP market. If the owner of the Project is an Independent Power Producer, they could choose to operate the Project as a "Merchant Facility" and bid the Project output into the SPP market before there is a long-term buyer for the energy produced from the Project. All power produced would serve the customers of the member utilities in SPP (i.e., Western, Basin Electric Power Cooperative, Heartland Consumers Power

[1] Based on current State statutes.
[2] Based on estimates from wind energy project contractor construction practices.

District, and OPPD). Electricity injected into the transmission system does not know boundaries or service territories; the electrons flow out to where they are needed and flow out as far as they are needed.

It is essential the Project move forward this year to deliver the lowest cost energy possible and remain competitive with wind projects in neighboring states. The Fiscal Year 2016 Omnibus Appropriations Bill, passed on December 18, 2015, includes a 5-year extension and phase-down of the Federal Production Tax Credit (PTC) for wind energy. Near-term prospects look strong for wind energy projects that qualify for PTCs this year – especially as utilities, major end-use customers, and municipalities seek more low cost emissions-free renewable energy. Wind projects that commence construction in 2015 and 2016 receive a full value PTC. For projects that commence construction in 2017, the credit is at 80 percent of full value PTC; in 2018, 60 percent of full value PTC; and in 2019, 40 percent of full value PTC.

The Internal Revenue Service (IRS) has recently provide updated guidance (Notice 2016-31) (the "2016 Guidance") regarding how the Project may satisfy the "commencement of construction" requirement for eligibility for the PTC. The 2016 Guidance continues the "commencement of construction" criteria as set forth in earlier guidance (Notice 2013-29), where there are two methods the Project may use to establish that construction of an otherwise qualified facility has begun: the "Five Percent Safe Harbor" or the "Physical Work Test," each of which is described in more detail below.

The 2016 Guidance also confirms that the "continuous construction" required for the Physical Work Test and "continuous efforts" required for the Five Percent Safe Harbor will be satisfied if the Project places the facility in service during a contract year that is no more than four calendar years after the calendar year during which construction of the facility began. That is, for a facility that commences construction in 2016, if the facility is placed in service by December 31, 2020, the facility will satisfy the continuity safe harbor.

If the Project does not qualify for the full value PTC this year, it will be at a significant competitive disadvantage on energy prices for several years. The Project could be delayed for several years as price markets adjust upward or project costs fall to reach the low energy prices utilities, major end-use customers, and municipalities expect to pay. The Applicant expects that most wind projects that achieve full value PTC would be successful, and inversely that wind projects that do not achieve full value PTC would be less successful due to some oversupply in the market and price considerations.

6.1 Wind Resources Areas

The Applicant has retained the services of Simon Wind, LLC (Simon Wind; formerly V-Bar, LLC) to perform a Wind Resource Analysis for the Project. To obtain an accurate representation of the wind resource within the Project Area, Simon Wind performed a comprehensive analysis of the Project Area using the following data:

- Onsite data collected at the Project’s 60-meter Roth meteorological tower
- Onsite data collected at the Project’s 60-meter Link meteorological tower
- Onsite data collected at the Project’s 60-meter Brandt meteorological tower
- Onsite data collected at the Project’s 60-meter Burfeindt meteorological tower
- Onsite data collected at the Project’s 60-meter Sohler meteorological tower
- Long-term correlation from: Mitchell, Sioux Falls, Winner, SD, MERRA upper-air data points
- Project Area topographic and land cover data
- Up to 100 potential turbine locations within the Project Area
- Power curves from multiple turbine models and manufacturers
- State and County standards and setbacks

Simon Wind used this data to develop a Wind Resource Analysis for the Project Area. Simon Wind analyzed multiple hypothetical layouts and multiple turbine models from different manufacturers to determine the potential energy output for the Project. Data from each unique hypothetical turbine layout and its energy output was used in a Project pro forma, along with Project indicative construction costs, operational costs, and costs of capital, to estimate Project energy costs for multiple scenarios. Prevailing Winds will not commit to a specific turbine model and layout for the Project until after the PPA is signed and Project financials are set. This is due to the rapid changes in new turbine technology and price reductions in turbines. For any wind project to remain competitive, it must have the flexibility to use the latest technology at the lowest costs.

Currently, the GE 2.3-116 turbine model, with its technology, cost profiles, and energy output, offers the lowest cost of energy for the Project. If a PPA was signed, it could be used to construct the Project, but recently at the American Wind Energy Association (AWEA) Conference, both GE and Senvion introduced new turbine models that will likely eclipse the GE 2.3-116 in technology and costs. During the next Wind Resource Analysis for the Project Area, Prevailing Winds will develop hypothetical layouts for these new turbine models to determine Project energy output. Prevailing Winds will then use the Project pro forma to analyze indicative project costs and energy output to estimate Project energy costs for each new turbine model. If the analysis equals or lowers Project energy costs, then Prevailing Winds will include these turbines in its development plan for the Project.

The following is an example of the data generated from the Wind Resource Analysis for the Project Area. The example uses a hypothetical layout for the GE 2.3-116 turbine model to create potential energy output for the Project Area. The turbine's power curve is used together with the Project's correlated onsite data to determine the Project's annual gross energy production and capacity factor for the Project Area. Table 6-1 presents the capacity factor and energy production for the Project Area for the GE 2.3-116 at an 80-meter hub height. Table 6-2 depicts the estimated mean annual wind speed for the Project Area in meters per second (m/s) at 80 meters (262 feet). As shown in the table, the Project Area has an average wind speed of 8.17 m/s at a turbine hub height of 80 meters (262 feet), which classifies the Project as an IEC Classification Class II / III wind site.

Table 6-1: Gross Energy Production Analysis

Normalized Energy Production and Capacity Factor		
Turbine	**Energy Production (MWh)**	**Net Capacity Factor**
GE 2.3-116	799,572	45.61

Table 6-2: Wind Resource Analysis

Normalized Monthly and Annual Wind Speed Averages (m/s)	
Turbine	**80-m Wind Speed (m/s)**
GE 2.3-116	8.17

6.1.1 Interannual Variation

The expected annual average wind speed at the Project Area, as determined by Simon Wind, is 8.37 m/s at an 80-meter hub height. Simon Wind compared the onsite data to long-term wind data near the Project Area. The analysis showed that daily correlation coefficients of the towers average about 0.90 to all reference stations except one (Winner), whose correlation coefficients averaged 0.79. The high correlation lends confidence to the assessment in that the site-specific data can accurately be placed in a long-term climatological context.

6.1.2 Seasonal Variation

The Wind Resource Analysis shows the anticipated monthly average wind speeds for the Project at a hub height of 80 meters. Wind speeds at 80 meters are highest in November and April and lowest in July and August. Composite mean wind speeds (CMWS) are generally above 8 m/s during winter, spring, and fall. The CMWS generally falls below 8 m/s during the months of June, July, August, and September.

6.1.3 Diurnal Conditions

At the Project Area, the winds at turbine hub height (80 meters) generally fall off in the morning as solar warming causes increased mixing of the winds at different levels above ground. After sunset, less mixing occurs, and the winds at the hub height will again tend to increase. This pattern changes through the year, as there is a higher diurnal variation in the summer months.

6.1.4 Atmospheric Stability

As is typical of analyzing projects in rural areas, atmospheric stability data has not been compiled for this Project. However, it is expected to be “moderately stable” in the general area, because stability conditions for the open and rolling terrain in the southeastern South Dakota region do not vary significantly. Storm events can occur in the area, although their intensity, frequency, and duration are not unusual in comparison to what is typical for South Dakota. Other wind farms have been placed in similar environments.

6.1.5 Turbulence

In general, the turbulence intensity for this part of southeastern South Dakota is anticipated to be low. The mean turbulence intensities (standard deviation of wind speed divided by average wind speed) are less than 0.10 in winds greater than 5 m/s. Characteristic turbulence (mean turbulence intensities plus one standard deviation in a 15-m/s wind) is a very low 0.12 to 0.13 when scaled to the nominal 80-meter hub height.

6.1.6 Extreme Wind Conditions

Extreme wind speeds may occur with winds from any of the prevailing directions and may happen during any season. The possibility of a tornado exists in the Project Area, with the potential for winds of 200 miles per hour (mph) (89 m/s). Through March 2016, the observed maximum hourly mean wind speed has been 27.2 m/s, and the peak gust has been 46 m/s. The peak gust occurred at the 60-meter Sohler Tower during a thunderstorm in August 2010.

6.1.7 Variation with Height

The Wind Resource Analysis indicates an annual mean wind shear exponent of 0.177 at the 10- to 60-meter interval, and 0.168 between the 10- and 80-meter levels. The relative wind speeds across the five-tower network are consistent with their exposure; higher elevations have higher wind speeds.

6.1.8 Spatial Wind Variation

Little wind variation exists in the Project Area due to the land cover of the area, which is mostly farmland and devoid of significant tree cover. The relative wind speeds across the three-tower network are consistent with their exposure; higher elevations have higher wind speeds.

6.1.9 Other Meteorological Conditions at Proposed Project Area

Extreme weather conditions in this area are occasional and include hail, ice storms, lightening, tornados and severe thunderstorms. Due to the low frequency and short duration of these conditions, minimal effects are expected on turbine performance.

6.1.10 Location of Other Wind Turbines in General Area

The nearest operating wind turbines are the turbines owned by NorthWestern Energy in the Beethoven Wind Project. The nearest turbines are 1 to 2 miles northwest of the Applicant's potential turbine locations for this Project in the direction of the prevailing winds and 1.25 miles northeast of the Applicant's nearest potential turbine location in the direction of the non-prevailing winds.

6.1.11 Wind Rose

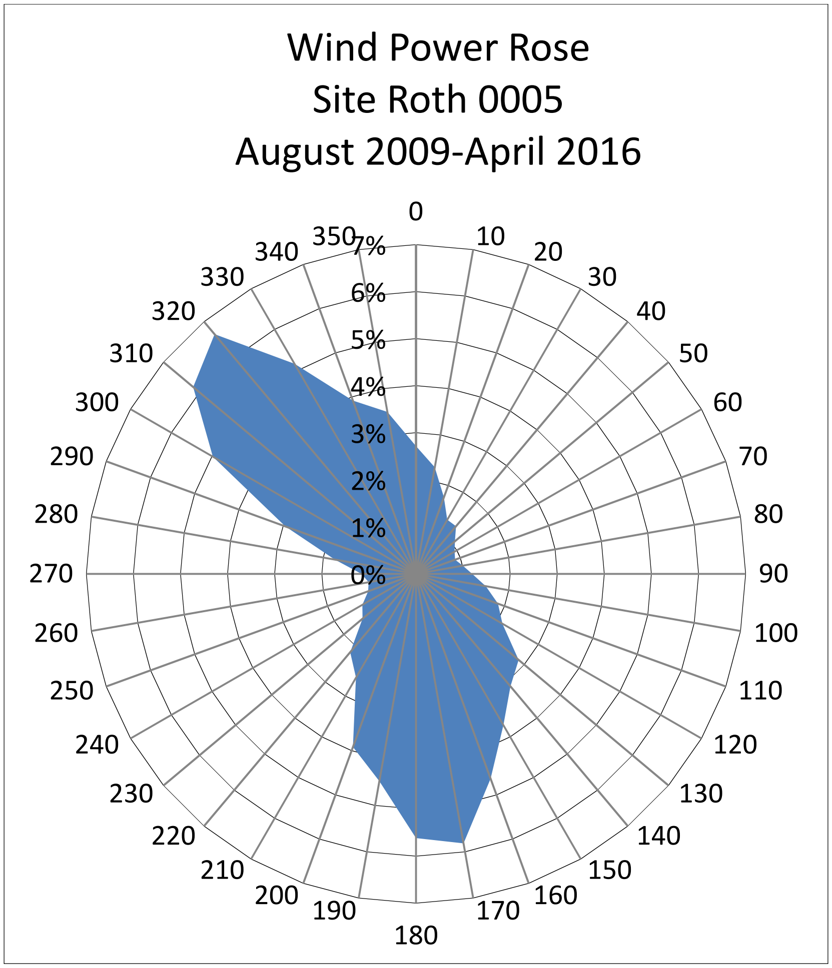
Prevailing winds are generally from the northwest and south at all five meteorological towers. Wind power roses are created specifically for the GE 2.3-116 turbine (Figure 6-1), and they will be essentially the same for any other turbine models under consideration.

6.2 Renewable Power Demand

Demand for renewable energy from wind is extremely high, and at this time, the U.S. may be seeing the greatest demand for wind energy that the wind industry has ever experienced. The cost of energy from wind has declined by over 66 percent in the past 6 years. New wind energy in wind-rich states is now one of the lowest cost sources of energy that can be added to the Nation's energy system. This low cost energy is in high demand by many utilities, who are signing long-term PPAs with wind energy projects or purchasing the wind project outright. In a new development for the wind industry, non-utilities, such as corporations, are also buying wind energy. Last year, more than half of the PPAs signed (2,074 MW) went to non-utility off-takers, up from 23 percent in 2014 and 5 percent in 2013. It is expected that non-utility off-takers will execute PPAs for over 4,000 MW of wind power in 2016.

Public opinion also strongly supports the use of renewable (alternative) energy according to a Gallup National poll in March 2016. In the poll, Gallup asked "Which of the following approaches to solving the nation's energy problems do you think the U.S. should follow right now – (emphasize production of more oil, gas, and coal supplies (or) emphasize the development of alternative energy such as wind and solar power?)". Seventy-three percent of Americans answered in favor of putting more emphasis on producing future energy from wind and solar power. Only 21 percent answered in favor of putting more emphasis on producing future energy from oil, gas, and coal. Four percent answered both are equal.

Figure 6-1: Wind Power Rose



State legislatures and governors have adopted renewable portfolio standards (RPSs) in 29 states. These standards require utilities to sell a specified percentage or amount of renewable electricity. The requirement can apply only to investor-owned utilities, but many states also include municipalities and electric cooperatives, though their requirements are equivalent or lower. Twenty-nine states, Washington, DC, and two territories have adopted an RPS, while eight states and two territories have set renewable energy goals.

In South Dakota, an RPS goal was established in 2008, with the objective that 10 percent of all electricity sold at retail within the State will be obtained from renewable energy and recycled energy sources by

2015 (SDCL 49-34A-101). The proposed Project would provide a new source of low cost energy for South Dakota and the U.S., helping the Nation move towards the goal of energy independence, while reducing pollution and carbon emissions.

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

The current estimated capital cost of the Project is approximately $307 million based on indicative construction and wind turbine pricing cost estimates for the hypothetical GE 2.3-MW turbine layout. This estimate includes lease acquisition; permitting, engineering, procurement, and construction of turbines, access roads, underground electrical collector system, Project collector substation, interconnection facilities, O&M facility, supervisory control and data acquisition (SCADA) system, and meteorological towers; project financing; and returns for South Dakota investors. Capital cost estimates could fluctuate as much as 15 percent for the Project, dependent on which turbine model is ultimately used and SPP interconnection costs.

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

The Project would be located on approximately 36,000 acres of land in Bon Homme and Charles Mix Counties near Avon, South Dakota. Table 8-1 shows the sections that intersect the Project Area.

Table 8-1: Sections that Intersect the Project Area Boundary

County	Township	Range	Sections
Bon Homme	95N	60W	6-7
	95N	61W	1-23
	96N	61W	9, 16-21, 28-33
Charles Mix	95N	62W	1-2, 11-14
	96N	62W	2-3, 10-11, 13-15, 22-27, 34-36

Figure 1 shows the locations of the State, county, and city boundaries with respect to the Project Area, as well as the major highways and roads that extend through the area. Figure 8 shows the locations of water bodies and streams within the Project Area. Figure 10 shows the locations of cemeteries, places of historical significance, and other community facilities (i.e., schools, religious facilities) within or near the Project Area. There are no active transportation facilities (i.e., railroads, airports) other than roads within or adjacent to the Project Area.

8.1 Wind Farm Facility

The Project would consist of up to 100 wind turbines with an aggregate nameplate capacity of up to 201 MW. This Application is based on a hypothetical layout for the GE 2.3-116 turbine (87 turbines), although the GE 2.0-116 turbine (100 turbines) and other 2-MW or 3-MW class turbines from other manufacturers are under consideration. The Project would also include underground electric collector lines, a central collector substation, a 230-kV transmission line interconnecting to a Western-owned switchyard, an O&M facility, access roads connecting to each turbine, up to three permanent meteorological towers, and a SCADA system (installed with the collector lines and transmission line). Figure 2 shows a U.S. Geological Survey (USGS) topographic map overlain with the Project Area.

Currently, advancements in turbine technology and performance are progressing at a rapid pace. Manufacturers are generally releasing new turbine models every 6 to 12 months. To remain competitive, the Project must incorporate these improvements into the Project. The Applicant respectively requests the option to use a different turbine manufacturer and/or model than listed in this document. Having the flexibility in the future to select the best turbine available, based on technology, performance, and price, gives the Applicant the potential to improve energy generation, lower energy costs, and reduce impacts of the Project.

Each wind turbine model requires a unique layout and supporting facilities, and, therefore, the Project layout changes with each new wind turbine model under consideration. Depending on which turbine model is ultimately selected for the Project and on landowner participation, some of the hypothetical turbine locations currently used in the Wind Resource Analysis may not be utilized, and new turbine locations may be required within the Project Area. It would be imprudent at this time to commit to turbine locations knowing that the Project layout would change many times before the Project would be constructed.

The Applicant would locate all turbines within the Project Area and would fully comply with applicable permit conditions from applicable permitting authorities prior to finalizing any turbine layout. The Applicant would continue to advance the Project layout by working with all Project participants. At the appropriate time, the Applicant is committed to submitting the final turbine locations and all support facilities to the SDPUC, local permitting authorities, and the public for review and comment. The Applicant would provide the final layout well in advance of Project construction.

Many other factors besides turbine model may also necessitate changing the layout from the hypothetical turbine locations currently used in the Wind Resource Analysis. For example, site surveys may determine the presence of sensitive cultural artifacts or biological elements that must be avoided. The onsite surveys will include a buffer sufficient to allow some adjustment of actual turbine or road locations, as necessary to avoid such sensitive areas without requiring additional surveying. However, additional site surveys will be conducted, if necessary. Also, ongoing discussions with the landowners, Bon Homme and Charles Mix Counties, and the South Dakota Department of Transportation (SDDOT) may lead to changes in turbine locations or road alignments. As discussed further in Chapters 11.0, 13.0, 14.0, and 20.0, other factors, such as unsuitable soil conditions, could affect ultimate turbine and road locations.

The Applicant will coordinate with SDPUC as the final layout is developed for this Project and will submit a final layout to the SDPUC when it is developed. The final layout will adhere to State and County setbacks and standards described in the Application (such as setbacks from houses, roads, unleased lands, and sound setbacks) as well as the avoidance and mitigation measures. New facility locations that were not surveyed will be surveyed, and the results of these surveys will be shared with the SDPUC.

8.2 Major Wind Turbine Components

Modern wind turbines, including the GE models being considered by Prevailing Winds, generally consist of a nacelle, hub, blades, tower, and foundation (Figure 3). The nacelle may house the generator, gear box, controls, braking systems, cooling systems, hoist, cabling, transformer, lightning protection system, and other miscellaneous equipment. The hub consists of the blades, spinner, blade pitch motors, blade angle detection systems, and lightning protection system. All proposed turbine models have three blades composed of carbon fibers, fiberglass, and internal supports to provide a lightweight but strong component. The tip of each blade is equipped with a lightning receptor. The tower supports the nacelle, hub, and blades. The tower houses the nacelle access systems, power rail, controls, communication cables, control systems, and invertor, which are located at the base of the tower. Contemporary towers often include a lift or lift assist systems for personnel accessing the nacelle. Towers are tubular steel (not latticed) and are painted a non-glare white per FAA requirements. Specialized electrical equipment may also be located at the base of each tower to condition the generated electricity to match the collection system requirements.

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

The excavated area for the turbine foundations would typically be approximately 65 feet in diameter (approximately 0.07 acre). During construction, a larger area (approximately 400 feet by 400 feet) may be used to lay down the rotors and maneuver cranes during turbine assembly (Figure 4). For purposes of calculating temporary impacts in this Application, the Applicant has assumed approximately 320 acres of total temporary disturbance from work/staging areas for 87 turbines. After construction, total permanent disturbance from the 87 turbines would be reduced to approximately 16 acres (100-foot diameter area for each turbine), which would remain for the life of the Project.

All turbine models also contain 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 if grid power is lost. Wind 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 into electrical energy by the generator. Heated mechanical and/or ultrasonic anemometers and weather vanes, 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 other times when the turbine is 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 pad-mount transformer located at the base of the tower.

Table 8-2 contains specific turbine characteristics for three turbines under consideration; all other turbines under consideration are similar.

Table 8-2: Wind Turbine Characteristics

Characteristic	GE 2.0-116	GE 2.3-116	Senvion 3.4-140
Name capacity	2,000 kW (2.0 MW[a])	2,300 kW (2.3 MW)	3,400 kW (3.4 MW)
Hub height	80 meters (262.5 feet)	80 meters (262.5 feet)	90 meters (295.3 feet)
Rotor diameter	116 meters (380.6 feet)	116 meters (380.6 feet)	140 meters (459.3 feet)
Total height	138 meters (452.8 feet)	138 meters (452.8 feet)	160 meters (524.9 feet)
Cut-in speed[b]	3.0 m/s (6.7 mph)	3.0 m/s (6.7 mph)	3.0 m/s (6.7 mph)
Rated speed[c]	12.5 m/s (28.0 mph)	12.5 m/s (28.0 mph)	11 m/s (24.6 mph)
Cut-out speed[d]	25 m/s (55.9 mph)	25 m/s (55.9 mph)	22 m/s (49.2 mph)
Number of blades	3	3	3
Rotor area	10,568 m^2 (113,753 ft^2)	10,568 m^2 (113,753 ft^2)	15,394 m^2 (165,689 ft^2)
Rotor speed	8 to 15.7 rpm	8 to 15.7 rpm	5.2 to 9.6 rpm
Rotational direction	Clockwise looking downwind	Clockwise looking downwind	Clockwise looking downwind
Tip speed	81.7 m/s to 85.4 m/s (183 mph to 191 mph)	81.7 m/s to 85.4 m/s (183 mph to 191 mph)	38.1 m/s to 70.4 m/s (86 mph to 158 mph)
Orientation	Upwind	Upwind	Upwind
Speed regulation	Pitch control	Pitch control	Pitch control
No. of turbines for an approximately 200-MW facility	100 (200.0 MW)	87 (200.1 MW)	59 (200.6 MW)

(a) kW = kilowatt; MW = megawatt; m/s = meters per second; mph = miles per hour; m^2 = square meters; ft^2 = square feet; rpm = revolutions per minute

(b) Cut-in wind speed = wind speed at which turbine begins operation
(c) Rated speed = wind speed at which turbine reaches its rated capacity
(d) Cut-out wind speed = wind speed above which turbine shuts down operation

8.3 Access Roads

The wind turbines would be accessible from public roads via all-weather Class 5 gravel access roads. Access roads would follow fence lines, field lines, farming patterns, and existing field access roads to the extent possible. Access roads would include appropriate drainage controls, including culverts, and would be constructed in a manner that would allow farm and/or landowner equipment to cross. Access roads would be surfaced with a road base designed to allow passage under inclement weather conditions. The access road cross sections would consist of graded soil, overlain by geotextile fabric (if needed), and surfaced with compacted aggregate base course. Siting access roads in areas with unstable soil would be avoided wherever possible. Access roads are constructed adjacent to the wind turbines to facilitate both construction and maintenance of the wind turbines year-round. The permanent access roads would be approximately 16 feet wide. During construction only, these roads may be temporarily widened by an additional 16 feet of compacted soil to support the size and weight of heavy-duty cranes and turbine delivery vehicles.

The final access road design would be dependent on geotechnical information obtained during the engineering phase. It is anticipated that the access road network for the Project would include approximately 12 to 14 miles of new roads. For purposes of calculating access road impacts in this Application, the Applicant has assumed approximately 48 acres of temporary disturbance and 29 acres of long-term disturbance for access roads. Final turbine placement would determine the amount of roadway and disturbance for this Project.

All access roads would be sited in consultation with local landowners, and local requirements would be followed wherever access roads join State or local roadways. Upon completion of construction, all temporary disturbance areas would be de-compacted, reclaimed, and reseeded (in grasslands or pasture). An access road layout will be provided to the SDPUC, local permitting authorities, and the public for review and comment with the final turbine locations and all other support facilities.

Select existing State, county, and section line roads may also be improved to aid in servicing the turbine sites.

8.4 O&M Facility

The O&M facility may be constructed onsite or in a community near the Project. The location of the O&M facility has yet to be determined. The facility would most likely be onsite, in a location with proper transportation, communications facilities, and easy access to Project facilities. An unoccupied farm site or existing facility, meeting the owner's and turbine manufacturer's criteria, could be utilized.

The proposed O&M facility would house the equipment to operate and maintain the wind farm. A gravel parking pad would provide the building with a parking area and secured outside storage. For purposes of calculating temporary impacts in this Application, the Applicant has assumed approximately 4 acres of total temporary disturbance from O&M facility construction. After construction, total permanent disturbance from the O&M facility, including parking, would be approximately 3 acres.

Station power for Prevailing Winds facilities would be provided through the Project interconnection. Back-up power for the Prevailing Winds substation will be provided by the local electrical cooperative(s), providing power to operate communications, relaying, and control systems, indefinitely.

8.5 Meteorological Towers

The Applicant has deployed four temporary 60-meter meteorological towers within the Project Area. These temporary meteorological towers are expected to be removed during Project construction. The Applicant anticipates that the Project would include permanent wind measurement equipment, which could consist of up to three permanent 80-meter (262 feet) meteorological towers. The permanent meteorological towers would be self-supporting and would not have guy wires. The towers would be lighted and painted as necessary to comply with FAA guidelines and would be connected to the Project collection system for communications and power needs. Each meteorological tower would result in a permanent impact of approximately 30 feet by 30 feet (0.2 acre). Permanent meteorological tower locations will be provided to the SDPUC, local permitting authorities, and the public for review and comment with the final turbine locations and all other support facilities. Permanent meteorological towers and associated improvements combined would result in temporary and permanent impacts of approximately 1 acre.

8.6 Temporary Laydown Areas/Batch Plant/Crane Walks

During construction, a temporary office trailer and laydown area would be selected within the Project Area. Construction materials, including turbine components, would be temporarily stored in an area covering approximately 15 to 20 acres before being installed or moved to the final turbine sites. In addition, one or more concrete batch plants may be necessary during construction in order to prepare concrete for foundations onsite. It has not been determined at this time if onsite batch plants will be necessary for the Project. If they are utilized, each would temporarily impact approximately 3 to 5 acres of land, and it is anticipated that they would be located adjacent to the temporary laydown area. For purposes of calculating temporary impacts in this Application, the Applicant has assumed a temporary disturbance of approximately 30 acres for laydown/office trailer/batch plant area would be used during construction.

In addition to the approximately 30-acre laydown/office trailer /batch plant area, temporary crane walk disturbances would also be necessary for the Project. Crane walks are estimated to be 40 feet wide and would be located along the same route as the collector system and access roads, except where topography or soils conditions prevent safe crane travel. Temporary office trailer/laydown area, onsite batch plant, and crane walk route locations will be provided to the SDPUC, local permitting authorities, and the public for review and comment with the final turbine locations and all other support facilities. For purposes of calculating temporary impacts in this Application, the Applicant has assumed that the temporary disturbance from the crane walks and collector system would be 265 acres combined.

8.7 Project Electrical System

Each of the wind turbines would have a transformer either pad-mounted outside the tower at the base of the turbine, mounted in the nacelle, or mounted within the tower. The proposed turbines would be connected to the Project collector substation by an underground 34.5-kV electrical collection system, including an occasional aboveground junction box. At the collector substation, the power would be converted from 34.5 kV to 230 kV and then transmitted via an aboveground 230-kV transmission line to a Western-owned switchyard, either within the Project Area or at Western’s existing Utica Junction 230-kV switching station, located approximately 22 miles east of the Project Area.

If the Project were to interconnect in the Project Area, a Western-owned switchyard would be constructed adjacent to Western’s Fort Randal to Utica Junction double-circuit 230-kV line. The Western-owned switchyard and Project collector substation would be located adjacent to each other, requiring a short 230-kV line to connect the two facilities. Project interconnection facility locations will be provided to the SDPUC, local permitting authorities, and the public for review and comment with the final turbine locations and all other support facilities.

If the Project were to interconnect at Western’s existing Utica Junction 230-kV switching station, the Applicant would construct an approximately 25-mile 230-kV transmission line from the Project Area centroid, east to the Utica Junction switching station. At the Utica Junction switching station, the Applicant would utilize open space within the existing station to locate equipment specified and constructed by Western to connect the Project to Western’s 230-kV transmission system. This Application does not include construction of this approximately 25-mile transmission line. If the Project were to interconnect to the Utica Junction 230-kV switching station, Prevailing Winds would file a separate application for construction of the transmission line from the Project Area to the switching station.

All proposed electrical collector system components and transmission lines would be located on properties leased by Prevailing Winds or in public road rights-of-way. Following is a more detailed discussion of the various components of the Project electrical system.

8.7.1 Collector System

Each wind turbine within the Project Area would be interconnected by communication and electrical power collection circuit facilities. These facilities would include underground feeder lines (collector lines) that would collect wind-generated power from each wind turbine and deliver it to the Prevailing Winds-owned substation (collector substation).

8.7.1.1 Underground 34.5-kV Collector System

An underground 34.5-kV collector system would be used to route the power from each turbine to the collector substation, where the electrical voltage would be stepped up from 34.5 kV to 230 kV. The underground collector system bundle (containing three conductors, ground wire, and fiber optic conduit) would be placed in one trench and connect each of the turbines to the collector substation. The estimated trench length is 287,000 feet (approximately 54.3 miles). The temporary disturbance associated with the underground collector system is estimated to be 15 feet wide. For purposes of calculating temporary impacts in this Application, the Applicant identified in Section 8.6 that crane walks and the collector system are located along the same route except where topography or soil conditions prevent safe crane travel. The Applicant has identified the combined temporary disturbance from the crane walks and collector system as 265 acres.

The underground collector circuits would consist of three power cables contained in an insulated jacket and bare copper ground wire, all buried at a minimum depth of 4 feet that would not interfere with farming operations. Access to the underground collector lines would be located at each turbine site, at junction boxes located at points where the underground collector system cables are spliced, and where the cables enter into the collector substation. Due to the power carrying limits and minimization of power losses, there would be eight underground collector line circuits connecting 10 to 13 turbines each to the collector substation. Underground 34.5-kV collector system locations will be provided to the SDPUC, local permitting authorities, and the public for review and comment with the final turbine locations and all other support facilities.

The underground electrical collector and communication system cable bundle would be generally installed by open trenching. Topsoil would be segregated and temporarily stockpiled prior to trenching. Using this method, the disturbed soils and topsoil are typically replaced over the buried cable within 1 day, and the drainage patterns and surface topography are restored to pre-existing conditions. In grassland/rangeland areas, the Applicant would re-vegetate the disturbed soils with a weed-free native plant seed mix.

8.7.1.2 Underground Communication System

The fiber optic communication conduits and cables for the Project would be installed in the same trench as the underground electrical collector cables and would connect the communication channels from each turbine to control facilities in the collector substation, O&M facility, and offsite locations.

8.7.2 Collector Substation

A new collector substation would be constructed in generally the centroid of the Project Area, on private land, where the 34.5-kV electric collection grid and fiber optic communication network would terminate. The collector substation would include up to two main transformers to step up the voltage of the collection grid from 34.5 kV to 230 kV, aboveground bus structures to interconnect the substation components, breakers, a control building, relays, switchgear, cable storage, communications and controls and other related facilities required for delivery of electric power to the 230-kV transmission line and Western switching station. A list of the anticipated collector substation components is shown in Table 8-3.

Table 8-3: Anticipated Collector Substation Components

Substation Equipment	Quantity
Control building	1
34.5-kV switchgear	8
34.5-kV circuit breakers	2
230/34.5-kV transformer	2
230-kV circuit breaker	2

The design of the collector substation is not finalized, but the Applicant expects it would be enclosed by a chain link fence with dimensions of roughly 300 feet by 250 feet (1.75 acres). The substation components would be placed on concrete and steel foundations. A collector substation layout will be provided to the SDPUC, local permitting authorities, and the public for review and comment with the final turbine locations and all other support facilities. For purposes of calculating temporary impacts in this

Application, the Applicant has assumed approximately 5 acres of total temporary disturbance and approximately 2 acres of permanent impacts from collector substation construction.

The collector substation would be designed in compliance with Federal, State and local regulations, National Electrical Safety Code (NESC) standards, and other applicable industry standards and would interconnect to a Western-owned interconnection switchyard. It is anticipated that the Western-owned switchyard would be located adjacent to the collector substation, and the proposed transmission interconnection would consist of three jumpers, approximately 100 feet in length, between the two facilities. One steel dead-end structure, approximately 65 feet in height, would be installed at each facility to connect the jumpers. Alternatively, the Project may be required to interconnect at Western’s existing Utica Junction 230-kV switching station, located approximately 22 miles east of the Project Area. This would require the Applicant to construct approximately 25 miles of 230-kV transmission line from the Project Area centroid, east to the Utica Junction 230-kV switching station.

8.7.3 New Western-Owned Switchyard or Utica Junction Switching Station

This Project proposes an interconnection to a new Western-owned switchyard, constructed adjacent to the Project substation. This new switchyard would be located adjacent to the existing Western-owned Fort Randal to Utica Junction double-circuit 230-kV transmission line and would include 230-kV gas-insulated circuit breakers, associated switches, bus work, and metering equipment specified and constructed by Western. It would not include a transformer.

Alternatively, the Project may be required to interconnect at Western’s existing Utica 230-kV switching station, located approximately 22 miles east of the Project Area. The Applicant would construct approximately 25 miles of 230-kV transmission line from the Project Area centroid, east to the Utica Junction 230-kV switching station. The interconnection inside the Utica Junction switching station would include 230-kV gas-insulated circuit breakers, associated switches, bus work, and metering equipment specified and constructed by Western. It would not include a transformer.

8.7.4 Station Power

During operation, wind turbine power consumption is in the range of 15 to 25 kilowatts (kW) per turbine. Turbines peak when they yaw, but they would not do so simultaneously. On the other hand, turbines might consume power simultaneously for heating if they are idling during cold and windless days. Turbine demand/consumption is supplied by back-feed power from the point of interconnection (POI). It is assumed that 1,740 kW (20 kW for each of 87 turbines) would be the typical power requirement. Prevailing Winds would work with the local electric cooperatives to determine the number of turbines within each cooperative's territory and enter into a service agreements with the transmission operator (TO) and the local electric cooperatives for station power energy and demand charges. The collector substation back-up power and power for the O&M building would be supplied through local distribution systems.

9.0 ALTERNATE SITES AND SITING CRITERIA (ARSD 20:10:22:12)

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 such that the power generated by the project can be relatively easily delivered into the grid. The following sections further describe the criteria used in the selection of the Project Area and the criteria used to develop turbine configuration layout.

9.1 General Project Location Selection

The initial Project feasibility studies first looked for potential wind energy locations along Western's Fort Randal to Utica Junction to Sioux City double-circuit 230-kV transmission line. The Western 230-kV line was chosen based on available transmission capacity identified in transmission studies completed previously and acquired from B&H Wind Holdings, LLC. The first objective was to find large contiguous areas of land with higher elevations near the Western 230-kV line that could support 200 MW of wind energy. Three locations identified were:

- Location #1 - Dry Choteau Creek Coteau near Avon, South Dakota
- Location #2 - Turkey Ridge Coteau south and southeast of Freeman, South Dakota
- Location #3 - Hills around Beresford, South Dakota

Figure 5 shows the locations of the alternative sites. Table 9-1 contains a summary of each alternative site considered for the Prevailing Winds Project. Prevailing Winds' assessment of each alternative site determined that Location #1 on the Dry Choteau Creek Coteau near Avon, South Dakota, was best suited for a 200-MW wind energy project interconnecting with the Western 230-kV line. Proximity to the Western 230-kV line lowers Project costs, and the superior wind resource (because of elevation) increases Project energy output and revenues. Location #1 also has lower population density and lower environmental risks, which further reduce Project impacts. Combining these factors makes a wind project located at Location #1 more cost effective than the Location #2 and Location #3 alternative sites. Prevailing Winds completed further feasibility studies to determine the suitability of Location #1. Upon successful completion of the feasibility studies in February 2015, Prevailing Winds submitted an Interconnection Request to Western for 200 MW on the 230-kV line inside Location #1 and began full development of the Project.

Table 9-1: Summary of Alternative Sites

Factor	Location #1	Location #2	Location #3
Interconnection distance to Western 230-kV	0 miles	15 miles	26 miles
Area above 1,600 feet elevation	<60 square miles	36 square miles	0 square miles
Area above 1,700 feet elevation	<17 square miles	3 square miles	0 square miles
Highest elevation	1,880 feet	1,740 feet	1,550 feet
Population density	Low	Moderate	High
Primary ground cover	Tilled	Tilled	Tilled
Bat habitat	Low	Low/moderate	Moderate
Eagle habitat	Low	Low/moderate	Low/moderate
Avian habitat	Low	Low/moderate	Low
Wetlands	Low/moderate	Moderate	Low
Cultural resources sites	Low/none	Low/none	Low
Beam paths	Low	High	Moderate
Historical wind data	Yes	No	No

9.2 Site Configuration Alternatives

The hypothetical layout of 87 turbines reflects an optimal configuration to best capture wind energy within the Project Area. All layouts will be reviewed for the purpose of eliminating and/or minimizing impacts to the environment, cultural resources, and residences. Prevailing Winds will create a final site layout that maximizes the energy generation of the Project, while minimizing impacts to the land and surrounding residence. The topography and environmental characteristics of the site, the selected turbine model, impacts to area residents, and the Standards for Large Wind Energy Systems (LWES) developed by the SDPUC and found in the Draft Model Ordinance for Siting of Wind Energy Systems (see Table 9-2) and the Bon Homme County Zoning Ordinance (see Table 9-3) will dictate final turbine locations.

Table 9-2: State-Recommended Standards for Siting Large Wind Energy Systems

Category	State-Recommended Standards
Mitigation measures	(a) Site Clearance. The permittees shall disturb or clear the site only to the extent necessary to assure suitable access for construction, safe operation and maintenance of the LWES. (b) Topsoil Protection. The permittees shall implement measures to protect and segregate topsoil from subsoil in cultivated lands unless otherwise negotiated with the affected landowner. (c) Compaction. The permittees shall implement measures to minimize compaction of all lands during all phases of the project's life and shall confine compaction to as small an area as practicable.

Category	State-Recommended Standards
	(d) Livestock Protection. The permittees shall take precautions to protect livestock on the LWES site from project operations during all phases of the project's life. (e) Fences. The permittees shall promptly replace or repair all fences and gates removed or damaged by project operations during all phases of the project's life unless otherwise negotiated with the fence owner. (f) Roads (1) Public Roads. Prior to commencement of construction, the permittees shall identify all state, county or township "haul roads" that will be used for the WES project and shall notify the state, county or township governing body having jurisdiction over the roads to determine if the haul roads identified are acceptable. The governmental body shall be given adequate time to inspect the haul roads prior to use of these haul roads. Where practicable, existing roadways shall be used for all activities associated with the WES. Where practicable, all-weather roads shall be used to deliver concrete, turbines, towers, assemble nacelles and all other heavy components to and from the turbine sites. The permittees shall, prior to the use of approved haul roads, make satisfactory arrangements with the appropriate state, county or township governmental body having jurisdiction over approved haul roads for construction of the WES for the maintenance and repair of the haul roads that will be subject to extra wear and tear due to transportation of equipment and WES components. The permittees shall notify the County Zoning Office of such arrangements. (2) Turbine Access Roads. Construction of turbine access roads shall be minimized. Access roads shall be low profile roads so that farming equipment can cross them and shall be covered with Class 5 gravel or similar material. Access roads shall avoid crossing streams and drainage ways wherever possible. If access roads must be constructed across streams and drainage ways, the access roads shall be designed in a manner so runoff from the upper portions of the watershed can readily flow to the lower portion of the watershed. (3) Private Roads. The permittees shall promptly repair private roads or lanes damaged when moving equipment or when obtaining access to the site, unless otherwise negotiated with the affected landowner. (4) Control of Dust. The permittees shall utilize all reasonable measures and practices of construction to control dust during construction. (g) Soil Erosion and Sediment Control Plan. The permittees shall develop a Soil Erosion and Sediment Control Plan prior to construction and submit the plan to the County Zoning Office. The Soil Erosion and Sediment Control Plan shall address the erosion control measures for each project phase, and shall at a minimum identify plans for grading, construction and drainage of roads and

Category	State-Recommended Standards
	turbine pads; necessary soil information; detailed design features to maintain downstream water quality; a comprehensive re-vegetation plan that uses native plant species to maintain and ensure adequate erosion control and slope stability and to restore the site after temporary project activities; and measures to minimize the area of surface disturbance. Other practices shall include containing excavated material, protecting exposed soil, stabilizing restored material and removal of silt fences or barriers when the area is stabilized. The plan shall identify methods for disposal or storage of excavated material.
LWES shall meet the following minimum spacing requirements.	(a) Distance from currently occupied off-site residences, business and public buildings shall be not less than one thousand (1,000) feet. Distance from the residence of the landowner on whose property the tower(s) are erected shall be not less than five hundred (500) feet or one point one (1.1) times the system height, whichever is greater. For the purposes of this section only, the term "business" does not include agricultural uses. (b) Distance from right-of-way of public roads shall be not less than five hundred (500) feet or one point one (1.1) times the system height, whichever is greater. (c) Distance from any property line shall be not less than five hundred (500) feet or one point one (1.1) times the system height, whichever is greater, unless appropriate easement has been obtained from adjoining property owner.
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.
Footprint minimization	The permittees shall design and construct the WES so as to minimize the amount of land that is impacted by the WES. Associated facilities in the vicinity of turbines such as electrical/electronic boxes, transformers and monitoring systems shall to the extent practicable be mounted on the foundations used for turbine towers or inside the towers unless otherwise allowed by the landowner on whose property the LWES is constructed.
Electromagnetic interference	The permittees shall not operate the LWES so as to cause microwave, television, radio, or navigation interference contrary to Federal Communications Commission (FCC) regulations or other law. In the event such interference is caused by the LWES or its operation, the permittees shall take the measures necessary to correct the problem.
Noise standard	Noise level produced by the LWES shall not exceed 55 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.
Lighting	Towers shall be marked as required by the Federal Aviation Administration (FAA). There shall be no lights on the towers other than what is required by the FAA. This restriction shall not apply to infrared heating devices used to protect the monitoring equipment.

Category	State-Recommended Standards
Electrical cables	The permittees shall place electrical lines, known as collectors, and communication cables underground when located on private property except when total distance of collectors from the substation require an overhead installation due to line loss of current from an underground installation. This paragraph does not apply to feeder lines.
Feeder lines	The permittees shall place overhead electric lines, known as feeders, on public rights-of-way if a public right-of-way exists or immediately adjacent to the public right-of-way on private property. Changes in routes may be made as long as feeders remain on public rights-of-way or immediately adjacent to the public right-of-way on private property and approval has been obtained from the governmental unit responsible for the affected right-of-way. If no public right-of-way exists, the permittees may place feeders on private property. When placing feeders on private property, the permittees shall place the feeder in accordance with the easement(s) negotiated. The permittees shall submit the site plan and engineering drawings for the feeder lines to the Board before commencing construction.
Height from ground surface	The minimum height of blade tips at their lowest possible point shall be twenty-five (25) feet above grade.
Towers	(a) Color and Finish. The finish of the exterior surface shall be non-reflective or matte. (b) All towers shall be singular tubular design, unless approved by the Board.
Permit expiration	The permit shall become void if no substantial construction has been completed within three (3) years of issuance.
Required information for permit application	(a) Boundaries of the site proposed for LWES and associated facilities on United States Geological Survey Map or other map as appropriate. (b) Map of easements for LWES. (c) Map of occupied residential structures, business and public buildings within one half mile of the proposed LWES site boundaries. (d) Preliminary map of sites for LWES, access roads and utility lines. Location of other LWES within five (5) miles of the proposed LWES site. (e) Project-specific environmental and cultural concerns (e.g. native habitat, rare species, and migratory routes). This information shall be obtained by consulting with the following agencies: (1) South Dakota Department of Game, Fish and Parks; (2) U.S. Fish and Wildlife Service; and (3) South Dakota State Historical Society Evidence of such consultation shall be included in the application. (f) Project schedule. (g) Mitigation measures. (h) Status of interconnection studies/agreements.

Category	State-Recommended Standards
Decommissioning	(a) Cost Responsibility. The owner or operator of a LWES is responsible for decommissioning that facility and for all costs associated with decommissioning that facility and associated facilities. The decommissioning plan shall clearly identify the responsible party. (b) Useful Life. A LWES is presumed to be at the end of its useful life if the facility generates no electricity for a continuous period of twelve (12) months. The presumption may be rebutted by submitting to the Board for approval of a plan outlining the steps and schedule for returning the LWES to service within twelve (12) months of the submission. (c) Decommissioning Period. The facility owner or operator shall begin decommissioning a LWES facility within eight (8) months after the time the facility or turbine reaches the end of its useful life, as determined in 14(b). Decommissioning must be completed with eighteen (18) months after the facility or turbine reaches the end of its useful life. (d) Decommissioning Requirements. Decommissioning and site restoration includes dismantling and removal of all towers, turbine generators, transformers, overhead and underground cables, foundations, buildings and ancillary equipment to a depth of forty-two (42) inches; and removal of surface road material and restoration of the roads and turbine sites to substantially the same physical condition that existed immediately before construction of the LWES. To the extent possible, the site must be restored and reclaimed to the topography and topsoil quality that existed just prior to the beginning of the construction of the commercial wind energy conversion facility or wind turbine. Disturbed earth must be graded and reseeded, unless the landowner requests in writing that the access roads or other land surface areas be retained. (e) Decommissioning Plan. Prior to commencement of operation of a LWES facility, the facility owner or operator shall file with the Board the estimated decommissioning cost per turbine, in current dollars at the time of the application, for the proposed facility and a decommissioning plan that describes how the facility owner will ensure that resources are available to pay for decommissioning the facility at the appropriate time. The Board shall review a plan filed under this section and shall approve or disapprove the plan within six (6) months after the decommissioning plan was filed. The Board may at any time require the owner or operator of a LWES to file a report describing how the LWES owner or operator is fulfilling this obligation. (f) Financial Assurance. After the tenth (10th) year of operation of a LWES facility, the Board may require a performance bond, surety bond, letter of credit, corporate guarantee or other form of financial assurance that is acceptable to the Board to cover the anticipated costs of decommissioning the LWES facility.

Category	State-Recommended Standards
	(g) Failure to Decommission. If the LWES facility owner or operator does not complete decommissioning, the Board may take such action as may be necessary to complete decommissioning, including requiring forfeiture of the bond. The entry into a participating landowner agreement shall constitute agreement and consent of the parties to the agreement, their respective heirs, successors, and assigns, that the Board may take such action as may be necessary to decommission a LWES facility and seek additional expenditures necessary to do so from the facility owner.
Pre-construction filing	At least forty-five (45) days prior to commencement of construction, the applicant/permittee shall submit final maps depicting the approximate location of the proposed wind turbines, access roads and collector and feeder lines. Upon completion, the applicant shall also supply an "as-built" ALTA survey indicating that the proposed facilities are in compliance with the setbacks in the permit.

Source: SDPUC Draft Model Ordinance for Siting of Wind Energy Systems

Table 9-3: Bon Homme County Standards for Siting Large Wind Energy Systems

Category	Bon Homme County Standards
Mitigation measures	(a) Site Clearance. The permittees shall disturb or clear the site only to the extent necessary to assure suitable access for construction, safe operation and maintenance of the LWES. (b) Topsoil Protection. The permittees shall implement measures to protect and segregate topsoil from subsoil in cultivated lands unless otherwise negotiated with the affected landowner. (c) Compaction. The permittees shall implement measures to minimize compaction of all lands during all phases of the project's life and shall confine compaction to as small an area as practicable. (d) Livestock Protection. The permittees shall take precautions to protect livestock on the LWES site from project operations during all phases of the project's life. (e) Fences. The permittees shall promptly replace or repair all fences and gates removed or damaged by project operations during all phases of the project's life unless otherwise negotiated with the fence owner. (f) Roads (1) Public Roads. Prior to commencement of construction, the permittees shall identify all state, county or township "haul roads" that will be used for the LWES project and shall notify the state, county or township governing body having jurisdiction over the roads to determine if the haul roads identified are acceptable. The governmental body shall be given adequate time to inspect the haul roads prior to use of these haul roads. Where practicable, existing roadways shall be used for all activities associated with the LWES. Where practicable, all-weather roads shall be used to

Category	Bon Homme County Standards
	deliver concrete, turbines, towers, assemble nacelles and all other heavy components to and from the turbine sites. (2) The permittees shall, prior to the use of approved haul roads, make satisfactory arrangements with the appropriate state, county or township governmental body having jurisdiction over approved haul roads for construction of the LWES for the maintenance and repair of the haul roads that will be subject to extra wear and tear due to transportation of equipment and LWES components. The permittees shall notify the County Zoning Office of such arrangements. (3) Turbine Access Roads. Construction of turbine access roads shall be minimized. Access roads shall be low profile roads so that farming equipment can cross them and shall be covered with Class 5 gravel or similar material. Access roads shall avoid crossing streams and drainage ways wherever possible. If access roads must be constructed across streams and drainage ways, the access roads shall be designed in a manner so runoff from the upper portions of the watershed can readily flow to the lower portion of the watershed. (3) Private Roads. The permittees shall promptly repair private roads or lanes damaged when moving equipment or when obtaining access to the site, unless otherwise negotiated with the affected landowner. (4) Control of Dust. The permittees shall utilize all reasonable measures and practices of construction to control dust during construction. (g) Soil Erosion and Sediment Control Plan. The permittees shall develop a Soil Erosion and Sediment Control Plan prior to construction and at least forty-five (45) days prior to commencement of construction submit the plan to the County Zoning Office. The Soil Erosion and Sediment Control Plan shall address the erosion control measures for each project phase, and shall at a minimum identify plans for grading, construction and drainage of roads and turbine pads; necessary soil information; detailed design features to maintain downstream water quality; a comprehensive re-vegetation plan that uses native plant species to maintain and ensure adequate erosion control and slope stability and to restore the site after temporary project activities; and measures to minimize the area of surface disturbance. Other practices shall include containing excavated material, protecting exposed soil, stabilizing restored material and removal of silt fences or barriers when the area is stabilized. The plan shall identify methods for disposal or storage of excavated material.
Setbacks	(a) Distance from currently occupied off-site residences, business and public buildings shall be not less than one thousand (1,000) feet. Distance from the residence of the landowner on whose property the tower(s) are erected shall be not less than five hundred (500) feet or one point one (1.1) times the system height, whichever is greater. For

Category	Bon Homme County Standards
	the purposes of this section only, the term “business” does not include agricultural uses. (b) Distance from right-of-way of public roads shall be not less than five hundred (500) feet or one point one (1.1) times the system height, whichever is greater. (c) Distance from any property line shall be not less than five hundred (500) feet or one point one (1.1) times the system height, whichever is greater, unless appropriate easement has been obtained from adjoining property owner.
Electromagnetic interference	The permittees shall not operate the LWES so as to cause microwave, television, radio, or navigation interference contrary to Federal Communications Commission (FCC) regulations or other law. In the event such interference is caused by the LWES or its operation, the permittees shall take the measures necessary to correct the problem.
Lighting	Towers shall be marked as required by the Federal Aviation Administration (FAA). There shall be no lights on the towers other than what is required by the FAA. This restriction shall not apply to infrared heating devices used to protect the monitoring equipment.
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.
Footprint minimization	The permittees shall design and construct the LWES so as to minimize the amount of land that is impacted by the LWES. Associated facilities in the vicinity of turbines such as electrical/electronic boxes, transformers and monitoring systems shall to the extent practicable be mounted on the foundations used for turbine towers or inside the towers unless otherwise allowed by the landowner on whose property the LWES is constructed.
Electrical cables	The permittees shall place electrical lines, known as collectors, and communication cables underground when located on private property except when total distance of collectors from the substation require an overhead installation due to line loss of current from an underground installation. This paragraph does not apply to feeder lines.
Feeder lines	The permittees shall place overhead electric lines, known as feeders, on public rights-of-way if a public right-of-way exists or immediately adjacent to the public right-of-way on private property. Changes in routes may be made as long as feeders remain on public rights-of-way or immediately adjacent to the public right-of-way on private property and approval has been obtained from the governmental unit responsible for the affected right-of-way. If no public right-of-way exists, the permittees may place feeders on private property. When placing feeders on private property, the permittees shall place the feeder in accordance with the easement(s) negotiated. The permittees shall submit at least forty-five (45) days prior to commencement of construction the site plan and engineering drawings for the feeder lines to the Board before commencing construction.

Category	Bon Homme County Standards
Height from ground surface	The minimum height of blade tips at their lowest possible point shall be twenty-five (25) feet above grade.
Towers	(a) Color and Finish. Color shall be as required by the Federal Aviation Administration. The finish of the exterior surface shall be non-reflective or matte. (b) All towers shall be singular tubular design, unless approved by the Board.
Noise and shadow flicker	Noise level produced by the LWES shall not exceed forty five (45) dBA, average A-weighted sound pressure at inhabited dwelling existing at the time the permit application is filed, unless a signed waiver or easement is obtained from the owner of the dwelling. The permittees shall submit at least forty-five (45) days prior to commencement of construction a report of predicted noise levels at inhabited dwellings within one mile of Turbines to the Board before commencing construction. When determined appropriate by the Board a Shadow Flicker Control System shall be installed upon all turbines which will cause a perceived shadow effect upon an occupied residential dwelling. Such system shall limit blade rotation at those times when shadow flicker exceeds 30 minutes per day or 30 hours per year at perceivable shadow flicker intensity. The permittees shall submit at least forty-five (45) days prior to commencement of construction a report of predicted Shadow Flicker levels at inhabited dwelling within one and one-half (1 1/2) miles of Turbines to the Board before commencing construction.
Permit expiration	The permit shall become void if no substantial construction has been completed within three (3) years of issuance.
Required information for permit application	(a) Boundaries of the site proposed for LWES and associated facilities on United States Geological Survey Map or other map as appropriate. (b) Map of easements for LWES. (c) Map of occupied residential structures, business and public buildings within one mile of the proposed LWES site boundaries. (d) Preliminary map of sites for LWES, access roads and utility lines. Location of other LWES within five (5) miles of the proposed LWES site. (e) Project-specific environmental and cultural concerns (e.g. native habitat, rare species, and migratory routes). This information shall be obtained by consulting with the following agencies: (1) South Dakota Department of Game, Fish and Parks; (2) U.S. Fish and Wildlife Service; and (3) South Dakota State Historical Society

Category	Bon Homme County Standards
	Evidence of such consultation shall be included in the application. (f) Project schedule. (g) Mitigation measures. (h) Status of interconnection studies/agreements.
Decommissioning	(a) Cost Responsibility. The owner or operator of a LWES is responsible for decommissioning that facility and for all costs associated with decommissioning that facility and associated facilities. The decommissioning plan shall clearly identify the responsible party. (b) Useful Life. A LWES is presumed to be at the end of its useful life if the facility generates no electricity for a continuous period of twelve (12) months. The presumption may be rebutted by submitting to the Board for approval of a plan outlining the steps and schedule for returning the LWES to service within twelve (12) months of the submission. (c) Decommissioning Period. The facility owner or operator shall begin decommissioning a LWES facility within eight (8) months after the time the facility or turbine reaches the end of its useful life, as determined in 14(b). Decommissioning must be completed with eighteen (18) months after the facility or turbine reaches the end of its useful life. (d) Decommissioning Requirements. Decommissioning and site restoration includes dismantling and removal of all towers, turbine generators, transformers, overhead and underground cables, foundations, buildings and ancillary equipment to a depth of forty-two (42) inches; and removal of surface road material and restoration of the roads and turbine sites to substantially the same physical condition that existed immediately before construction of the LWES. To the extent possible, the site must be restored and reclaimed to the topography and topsoil quality that existed just prior to the beginning of the construction of the commercial wind energy conversion facility or wind turbine. Disturbed earth must be graded and reseeded, unless the landowner requests in writing that the access roads or other land surface areas be retained. (e) Decommissioning Plan. Prior to commencement of operation of a LWES facility, the facility owner or operator shall file with the Board the estimated decommissioning cost per turbine, in current dollars at the time of the application, for the proposed facility and a decommissioning plan that describes how the facility owner will ensure that resources are available to pay for decommissioning the facility at the appropriate time. The Board shall review a plan filed under this section and shall approve or disapprove the plan within six (6) months after the decommissioning plan was filed. The Board may at any time require the owner or operator of a LWES to file a report describing how the LWES owner or operator is fulfilling this obligation. (f) Financial Assurance. After the tenth (10th) year of operation of a LWES facility, the Board may require a performance bond, surety

Category	Bon Homme County Standards
	bond, letter of credit, corporate guarantee or other form of financial assurance that is acceptable to the Board to cover the anticipated costs of decommissioning the LWES facility. (g) Failure to Decommission. If the LWES facility owner or operator does not complete decommissioning, the Board may take such action as may be necessary to complete decommissioning, including requiring forfeiture of the bond. The entry into a participating landowner agreement shall constitute agreement and consent of the parties to the agreement, their respective heirs, successors, and assigns, that the Board may take such action as may be necessary to decommission a LWES facility and seek additional expenditures necessary to do so from the facility owner.
Pre-construction filing	At least forty-five (45) days prior to commencement of construction, the applicant/permittee shall submit report of predicted noise levels, report of predicted shadow flicker levels, Soil Erosion and Sediment Control Plan, final maps depicting the approximate location of the proposed Turbines, substations, laydown areas, access roads, collector lines and feeder lines. Upon completion, the applicant shall also supply an “as-built” ALTA survey indicating that the proposed facilities are in compliance with the setbacks in the permit.

Source: Bon Homme County, South Dakota, Zoning Ordinance

Turbines may be placed at a minimum internal spacing of five rotor diameters (RD) in the prevailing wind direction and three RDs in the non-prevailing wind direction, per the turbine manufacturer in its approval of the turbine array for warranty purposes. Prevailing Winds has established that the prevailing wind directions are azimuths of 305 degrees and 160 degrees, based on analysis of the onsite data, which was correlated to long-term meteorological data. Turbines will be placed to meet all State-recommended and Bon Homme County standards.

9.3 Lack of Reliance on Eminent Domain Powers

Because Prevailing Winds is not a public utility, it would not rely on eminent domain powers to acquire easements for the wind energy facility. Use of all required properties for the wind energy facility would be obtained through voluntary leases with property owners. Private land and public road rights-of-way would be used for all facilities. The Applicant would also coordinate with Federal, State, and local agencies to obtain appropriate permits for the Project.

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

Chapters 11.0 through 14.0 and Chapters 17.0, 18.0, and 20.0 provide a description of the existing environment at the time of the 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.

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

The following sections describe the existing physical environment within the Project Area and the potential effects of the proposed Project on the physical environment.

11.1 Existing Physical Environment

The following sections describe the existing geology, soil types, seismic risks, and subsidence potential within the Project Area.

11.1.1 Geology

This section describes the regional landforms, surficial geology, bedrock geology, and economic deposits within the Project Area.

11.1.1.1 Regional Landforms/Surficial Geology

The topography within the Project Area is generally characterized by smooth hills and ridges with rounded tops. Relief within the Project Area is low to moderate with site elevations ranging from approximately 1,500 to 1,900 feet above mean sea level (AMSL). Within the Project Area, shallow local drainages bisect the terrain. The Project Area is located atop a local topographic high point, from which drainage occurs to the northeast, east, southeast, south, and southwest. A number of the shallow drainages within the Project Area have been dammed to create small stock water ponds.

The majority of the Project Area is located within the Central Lowland province of the Interior Plains physiographic region. The Central Lowland province is characterized by flat lands and geomorphic remnants of glaciation. The western edge of the Project Area is located within the Great Plains province of the Interior Plains physiographic region. The Great Plains province is characterized by plateau-like flat plains with little relief throughout the area (National Park Service [NPS], 2015a).

The physiographic features of the Project Area, including smooth hills and ridges and shallow meandering drainages, were formed as the underlying bedrock was eroded by the action of wind and water. The surficial geology of the Project Area can be described as a thin veneer of residual soils underlain by the Pierre Shale bedrock. Residual soils generally exhibit similar mineralogy to their underlying parent materials, although the high degree of weathering usually causes the overall soil structure to differ. The following surficial geologic units are mapped within the Project Area (South Dakota Geological Survey [SDGS], 2004):

- Qal – Alluvium (Quaternary) – Clay- to boulder-sized clasts with locally abundant organic material. Thickness up to 75 feet (23 meters).
- Qlts – Till, stagnation, moraine (Upper Wisconsin) – Compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature characterized by hummocky terrain with abundant sloughs resulting from stagnation of ice sheets. Composite thickness of all Upper Wisconsin till may be up to 300 feet (91 meters).

Figure 6a illustrates the surficial geology within the Project Area (SDGS, 2004), and Figure 6b is a geologic cross section of the Project Area.

11.1.1.2 Bedrock Geology

The uppermost bedrock unit underlying most of the Project Area is the Pierre Shale. The Pierre Shale, as described by the USGS (USGS, 2014a), is an Upper Cretaceous-aged blue-gray to dark-gray, fissile to blocky shale with persistent beds of bentonite, black organic shale, and light-brown chalky shale. The Pierre Shale contains minor sandstone and conglomerate beds and abundant carbonate and ferruginous (iron-rich) concretions and ranges in thickness from 1,000 to 2,700 feet (205 to 823 meters).

The southeast and west sides of the Project Area are underlain by the Niobrara Formation. The Niobrara Formation, as described by the USGS (USGS, 2014b), is an Upper Cretaceous-aged white to dark gray argillaceous chalk, marl, and shale. It contains thin, laterally continuous bentonite beds, chalky carbonaceous shale, minor sand, and small concretions. The thickness of this formation ranges from 160 to 225 feet (49 to 69 meters).

The center-west side of the Project Area is underlain by the Carlile Shale. The Carlile Shale, as described by the SDGS Geologic Map of South Dakota (SDGS, 2004), is an Upper Cretaceous-aged dark gray to black, silty to sandy shale with several zones of septarial, fossiliferous, carbonate concretions. The Carlile Shale contains up to three sandstone beds near the middle of the formation and sandy calcareous marl at the base. The thickness of the Carlile Shale ranges from 345 to 620 feet (105 to 189 meters). Siting of wind turbines is most likely to be within the higher elevations of the Project Area, thus within the Pierre Shale bedrock. Figure 6b depicts the geologic cross section information available for the Project Area.

11.1.1.3 Economic Deposits

Commercially viable mineral deposits within Charles Mix and Bon Homme Counties are limited to sand, gravel, and construction aggregates. Information from the South Dakota Department of Environment and Natural Resources (SDDENR) Minerals and Mining Program and a review of the USGS 7.5 minute quadrangle mapping indicates that a sand and gravel quarry was developed in the southern part of the

Project Area, but it has been inactive since 1995. The nearest active gravel quarry is approximately 0.6 mile southwest of the Project Area (SDDENR, 2015a).

A review of information from the SDDENR Oil and Gas Initiative Program reveals that the majority of current and historic oil and gas development South Dakota occurs in the western half of the State. The Project Area does not lie within an identified oil and gas field, and there are no active or historical oil and gas developments within or near the vicinity of the Project Area (SDDENR, 2015b).

11.1.2 Soil Type

The soils within the Project Area primarily consist of loams, silty loams, and silty clay loams derived mostly from glacial till, alluvium, and the underlying Pierre Shale bedrock. The soils in the Project Area are not highly susceptible to erosion and are generally conducive to crop production (Natural Resources Conservation Service [NRCS], 2015).

Nearly half of the soils within the Project Area have the potential to be highly corrosive to buried steel, while nearly all the soils within the Project Area have the potential to be moderately corrosive to concrete. Soils are not interpreted to be expansive based upon indicated soil classifications. The majority of soils in the Project Area are well drained, and only approximately 7 percent of the soils have a significant hydric component (30 to 100 percent of the soil is hydric). Approximately 12 percent of the soils are considered to have a high potential for frost action (NRCS, 2015). Table 11-1 lists the soil types comprising more than 1 percent of the Project Area and the characteristics of these soils, and Figure 7 illustrates the soil types and distributions within the Project Area.

11.1.3 Seismic Risks

The risk of seismic activity in the vicinity of the Project Area is low. The USGS Earthquake Hazards Program estimates a 1.1 to 1.4 percent probability that a magnitude 5 or greater earthquake will occur within 50 kilometers of the Project Area within the next 20 years. Further, the USGS 2014 Seismic Hazard Map for South Dakota indicates the peak ground acceleration (PGA) with a 2 percent chance of exceedance in 50 years is 0.06 to 0.1 g (USGS, 2014c).

According to the SDGS, no earthquakes have been recorded in Charles Mix County from 1872 to 2013 (SDGS, 2013). However, a magnitude 4.3 earthquake was recorded approximately 7 miles east of the Project Area in 1982. Available geologic mapping and information from the USGS Earthquake Hazards Program do not indicate any active or inactive faults within the Project Area (USGS, 2002).

Table 11-1: Soil Types Within the Project Area

Soil Type	Soil Taxonomy	Soil Texture	Parent Material	Natural Drainage Class	Depth to Restrictive Feature (inches)	Acres in Project Area	Percent of Project Area
BeE (Betts-Ethan loams, 9 to 25 percent slopes)	Fine-loamy, mixed, superactive, messic Typic Cacliustepts, and Typic Calciustolls	Loam	Glacial till	Well drained	Greater than 80	430	1.19%
Bo (Bon silt loam, channeled)	Fine-loamy, mixed, superactive, mesic Cumulic Haplustolls	Silt loam	Alluvium derived from glacial till	Well drained	Greater than 80	616	1.71%
CmB (Clarno-Bonilla loams, 2 to 6 percent slopes)	Fine-loamy, mixed, superactive, mesic Typic and Pachic Haplustolls	Loam	Glacial till	Moderately to well drained	Greater than 80	591	1.63%
CsB (Clarno-Ethan-Bonilla loams, 2 to 6 percent slopes)	Fine-loamy, mixed, superactive, mesic Typic Haplustolls, Typic Calciustolls, Pachic Haplustolls	Loam	Glacial till	Well drained	Greater than 80	1,229	3.40%
EnC (Ethan-Bonilla loams, 1 to 9 percent slopes)	Fine-loamy, mixed, superactive, mesic Typic Calciustolls and Pachic Haplustolls	Loam	Glacial till	Well drained	Greater than 80	1,792	4.96%
EoD (Ethan-Davis loams, 9 to 15 percent slopes)	Fine-loamy, mixed, superactive, mesic Typic Calciustolls and Pachic Haplustolls	Loam	Glacial till	Well drained	Greater than 80	636	1.76%
EpC (Ethan-Homme complex, 6 to 9 percent slopes)	Fine-loamy, mixed, superactive, mesic Typic Calciustolls and fine-silty, mixed, superactive, mesic Typic Haplustolls	Silty clay loam	Glacial till	Well drained	Greater than 80	4,074	11.28%
HmA (Homme-Davison-Tetonka complex, 0 to 3 percent slopes)	Fine-silty, mixed, superactive, mesic Typic Haplustolls; fine-loamy, mixed, superactive, mesic Aeric Calciaquolls; and fine, smectitic, mesic Argiaquic Argialbolls	Silt loam	Glacial meltwater sediment, glacial till, or alluvium	Well drained	Greater than 80	547	1.51%

Soil Type	Soil Taxonomy	Soil Texture	Parent Material	Natural Drainage Class	Depth to Restrictive Feature (inches)	Acres in Project Area	Percent of Project Area
HmB (Homme-Ethan-Onita complex, 1 to 6 percent slopes)	Fine-silty, mixed, superactive, mesic Typic Haplustolls; fine-loamy, mixed, superactive, mesic Typic Calciustolls; and fine, smectitic, mesic Pachic Argiustolls	Silty clay loam	Glacial drift, glacial till, or alluvium	Well drained	Greater than 80	13,044	36.1%
HpB (Homme-Ethan-Tetonka complex, 0 to 6 percent slopes)	Fine-silty, mixed, superactive, mesic Typic Haplustolls; Fine-loamy, mixed, superactive, mesic Typic Calciustolls; Fine, smectitic, mesic Argiaquic Argialbolls	Silty clay loam	Glacial drift, glacial till, or alluvium	Poorly to well drained	Greater than 80	2,723	7.54%
HrA (Homme-Onita silty clay loams, 0 to 2 percent slopes)	Fine-silty, mixed, superactive, mesic Typic Haplustolls and fine, smectitic, mesic Pachic Argiustolls	Silty clay loam	Glacial drift, alluvium	Well drained	Greater than 80	1,117	3.09%
HrB (Homme-Onita silty clay loams, 1 to 6 percent slopes)	Fine-silty, mixed, superactive, mesic, Typic Haplustolls and fine, smectitic, mesic Pachic Argiustolls	Silty clay loam	Glacial drift, alluvium	Well drained	Greater than 80	3,182	8.81%
HtA (Homme-Onita-Tetonka complex, 0 to 3 percent slopes)	Fine-silty, mixed, superactive, mesic Typic Haplustolls and fine, smectitic, mesic Pachic Argiustolls and Argiaquic Argialbolls	Silty clay loam	Glacial drift, alluvium	Poor to well drained	Greater than 80	380	1.05%
On (Mobridge silt loam, 0 to 2 percent slopes)	Fine-silty, mixed, superactive, mesic Pachic Argiustolls	Silt loam	Colluvial-alluvial sediments	Well drained	Greater than 80	840	2.33%
Te (Tetonka silt loam, 0 to 1 percent slopes)	Fine, smectitic, mesic Argiaquic Argialbolls	Silt loam	Alluvium	Poorly drained	Greater than 80	509	1.41%
Tn (Tetonka-Chancellor silty clay loams)	Fine, smectitic, mesic Argiaquic Argialbolls and Vertic Argiaquolls	Silty clay loam	Alluvium	Poorly drained	Greater than 80	608	1.68%

Source: NRCS, 2015

11.1.4 Subsidence Potential

The risk for subsidence within the Project Area is considered negligible. The Pierre Shale bedrock is present at the surface, or beneath a thin veneer of residual soil, throughout a vast majority of the Project Area and is not known to exhibit karst topography or contain layers or members susceptible to dissolution by water. No historic underground mining operations, which could lead to subsidence potential, exist within the Project Area.

11.2 Facility Impacts

The following sections describe the potential effects of the proposed Project on geologic and soil resources and the potential geological constraints on design, construction, and operation of the Project.

11.2.1 Potential for Impacts to Geologic and Soil Resources

Due to the lack of developed or potential economic mineral resources within the Project Area, development of the proposed facility poses no impact to economic mineral resources.

Construction of the 87 wind turbine foundations, access roads, collector lines, substation, and O&M facilities would result in approximately 673 acres of temporary disturbance and approximately 51 acres of permanent impacts to soils within the Project Area. During construction, existing vegetation would be removed in the areas associated with the proposed Project components, potentially increasing the risk of erosion, which is discussed in more detail below. Impacts to agricultural soils from the Project are discussed in Sections 13.2 and 20.2.4.

11.2.1.1 Erosion, Slope Stability, and Sedimentation

The Applicant will design the Project layout to limit construction cut and fill work and limit construction in steep slope areas. Wind turbines are generally located at higher elevations to maximize exposure to wind and to avoid steep slope areas for foundation installation. The current layout has sited access roads to avoid steep slopes as much as possible, and the underground collector lines similarly avoid crossing steep ravines whenever feasible.

Construction of the Project would 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 Storm Water Pollution Prevention Plan (SWPPP). The SWPPP would be developed during civil engineering design of the Project and would prescribe BMPs to control erosion and sedimentation. The BMPs may include silt fences, straw wattles, erosion control blankets, temporary storm water sedimentation ponds, re-vegetation, or other features and methods designed to control storm water runoff and mitigate erosion and sedimentation. The BMPs would be implemented to reduce the potential for impacts to drainage ways and streams by sediment-laden runoff. During the facility design life, storm water volume and flow erosion rates are not anticipated to increase from those of pre-development conditions.

11.2.2 Geological Constraints on Design, Construction, and Operation

In general, the geological and geotechnical conditions within the Project Area are favorable and are not anticipated to control or impact development of the Project. Excavation, bearing, and groundwater conditions associated with the shallow Pierre Shale bedrock throughout the Project Area are anticipated to be conducive to construction and operation of the wind turbine tower foundations and access roadways.

Prior to construction, soil borings would be performed at all wind turbine locations to develop the specific design and construction parameters. Laboratory testing of soil samples obtained from the site and geophysical surveys would be performed to determine the engineering characteristics of the site subgrade soils. If necessary, corrections to roadway and foundation subgrade would be prescribed for unsuitable soils.

12.0 EFFECT ON HYDROLOGY (ARSD 20:10:22:14, 20:10:22:15)

The following sections describe the exiting hydrology within the Project Area and the potential effects of the proposed Project on hydrology.

12.1 Existing Hydrology

This section describes the hydrogeology, surface water resources, floodplains, NPS, Nationwide Rivers Inventory (NRI) resources, and impaired waters within the Project Area.

12.1.1 Hydrogeology

The groundwater system underlying the parts of South Dakota that are east of the Missouri River, including the Project Area, is nearly exclusively based on glacial outwash aquifers. According to the SDGS, there are approximately 444 public water supply systems east of the Missouri River, and 392 of them utilize glacial outwash aquifers (Iles, 2008). This is consistent with the types of the soils in the area, many of which were formed from glacial till or glacial drift. Glacial drift and alluvium aquifers in South Dakota vary in depth from 0 to 400 feet, with a range of yield from 3 to 50 gallons per minute (Chadima, 1994). Unlike bedrock-type aquifers, glacial outwash aquifers are extremely difficult to predict at the subsurface; however, the quality of water from glacial outwash aquifers tends to exceed that of water derived from bedrock-type aquifers.

12.1.2 Surface Water Resources

The Project Area is located within the Missouri River Basin surface water drainage system. Based on information obtained from the U.S. Army Corps of Engineers' (USACE) *Final Environmental Impact Statement, Master Water Control Manual, Review and Update Study for the Missouri River*, this drainage system has a total drainage area of approximately 529,350 square miles, including approximately 9,700 square miles in Canada (USACE, 2004). The Missouri River flows from the confluence of the Jefferson, Madison, and Gallatin Rivers in southwestern Montana, a distance of approximately 2,320 miles prior to converging with the Mississippi River directly upstream of St. Louis, Missouri (USACE, 2004). There are six mainstem reservoir system dams (including the major streams and tributaries) associated with the Missouri River Basin: (1) Fort Peck; (2) Garrison; (3) Oahe; (4) Big Bend; (5) Fort Randall; and (6) Gavins Point.

The Missouri River Basin surface water drainage system consists of region, sub-region, basin, and sub-basin drainages. The Project Area is associated with the Cheyenne Sub-Region of the Missouri Region. The Project Area is located in the Lewis and Clark Lake Sub-Basin. Choteau Creek, located southwest of the Project Area, is part of the Lewis and Clark Lake Sub-Basin drainage system. Drainage generally flows from the northwest to the southeast within this Sub-Basin. Named streams of the Lewis and Clark Lake Sub-Basin that extend through the Project Area include Dry Choteau Creek and Little Emanuel Creek (Figure 8). No planned water uses by communities, agriculture, recreation, fish, or wildlife that may be affected by the location of the Project were identified.

12.1.3 Floodplains

There are no Federal Emergency Management Agency (FEMA)-mapped floodplains within the Project Area. However, floodplains in Bon Homme County have not been mapped by FEMA. The nearest mapped floodplains to the Project area are along Choteau Creek, over 1 mile west of the Project Area.

12.1.4 National Park Service Nationwide Rivers Inventory (NRI)

The NRI is a "listing of more than 3,400 free-flowing river segments in the U.S. that are believed to possess one or more 'outstandingly remarkable' natural or cultural values judged to be of more than local or regional significance. Under a 1979 Presidential Directive, and related Council on Environmental Quality procedures, all Federal agencies must seek to avoid or mitigate actions that would adversely affect one or more NRI segments" (NPS, 2015b). There are no NRI-listed rivers within the Project Area. The nearest NRI-listed river is the James River, located approximately 18 miles south of the Project Area.

12.1.5 Impaired Waters

The Clean Water Act (CWA) requires states to publish biannually a list of streams and lakes that are not meeting their designated uses because of excess pollutants. These streams and lakes are considered impaired waters (EPA, 2015a). 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 (TMDL) of a pollutant that the water can receive and still safely meet water quality standards. There are no 303(d)-listed water bodies within the Project Area, but the nearest downstream 303(d)-listed water body to the Project Area, Emmanuel Creek, is located approximately 4 miles southeast and is within the Lewis and Clark Lake Sub-Basin (SDDENR, 2014).

12.2 Facility Impacts

This section describes the potential effects of the Project on current or planned water uses and surface or groundwater resources.

12.2.1 Effect on Current or Planned Water Use

The proposed Project facilities would not have impacts on either municipal or private water uses in the Project Area. B-Y Water District in Tabor supplies rural water to the Project Area and maintains a network of distribution lines within the Project Area. Water storage, reprocessing, or cooling is not required for either the planned construction or operation of the facilities. The Project facilities would not require deep well injection. The Project operation would not require the appropriation of surface water or permanent dewatering. If the O&M facility is located in the Project Area, the Applicant would connect the O&M facility to the rural water system. Water usage at the O&M facility would be similar to household volume, less than 5 gallons per minute. The Applicant would coordinate with the B-Y Water District to locate and map its network of distribution lines within the Project Area and determine if a rural water supply connection is necessary for the Project.

Alternatively, a water supply well would be required if rural water service is not available. The Applicant would work with the SDDENR to obtain the necessary water rights permit. The Applicant would provide the SDPUC with specifications of the aquifer to be used and definition of its characteristics that include the capacity of the aquifer to yield water, the estimated recharge rate, and the quality of groundwater used to supply potable water to the O&M facility (per ARSD 20:10:22:15(4)).

The construction of wind farm facilities can interrupt the availability of groundwater through construction dewatering. Construction dewatering may temporarily lower the water table such that nearby wells may lose some of their capacity. However, the Project is not anticipated to require major dewatering; therefore, interruption of groundwater availability caused by dewatering is unlikely. In the event potential temporary dewatering wells are necessary during construction activities, the temporary wells would be installed and decommissioned as required by South Dakota law.

The Project would have no impact on surface water availability or use for communities, schools, agriculture, recreation, fish, or wildlife.

12.2.2 Potential for Surface and Groundwater Impacts

Potential impacts to water resources from the construction and operation of wind projects include deterioration of surface water quality through sedimentation, impacts to drainage patterns, impacts to flood storage areas, and increased runoff due to the creation of impervious surfaces. The approximately 51 acres of permanent impacts planned within the Project Area are broadly dispersed throughout the Project and represent less than 0.2 percent of the total acreage in the Project Area. Therefore, the Project is not expected to cause significant changes in runoff patterns or volume of runoff, nor is it expected to have adverse impacts on existing hydrology. During construction, BMPs will be implemented to control erosion and reduce potential for sediment runoff from exposed soils during precipitation events.

12.2.2.1 Groundwater Dewatering

The construction of wind farm facilities can require dewatering of excavated areas as a result of shallow groundwater, particularly for wind turbine foundations or collector line trenches. Construction dewatering may temporarily lower the water table in the immediate area and may temporarily lower nearby surface water elevations depending on the proximity and connectivity of groundwater and surface water and extent of the excavated area.

Groundwater dewatering is not anticipated to be a major concern within the Project Area, because wind turbines are most likely to be placed at higher elevation where the water table tends to be deeper. Should groundwater be encountered that must be dewatered, the necessary permits would be obtained and the duration of dewatering would be limited to the extent possible. Dewatered groundwater would be properly handled to allow sediments to settle out and be removed before the water is discharged, to reduce soil erosion and sedimentation of surface waters.

12.2.2.2 Deterioration of Water Quality

The excavation and exposure of soils during the construction of wind turbines, access roads, underground collector lines, substations, and transmission lines could cause sediment runoff during rain events. This sediment may increase the total suspended solids (TSS) loading in receiving waters. It is estimated that approximately 673 acres would be temporarily disturbed as a result of construction of turbines, substation, access roads, underground collector lines, O&M facility, meteorological equipment, and temporary laydown areas.

Construction of the Project would 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 would be developed during civil engineering design of the Project and would prescribe BMPs to control erosion and sedimentation. The BMPs may include silt fence, wattles, erosion control blankets, temporary storm water sedimentation ponds, re-vegetation, or other features and methods designed to control storm water runoff and mitigate erosion and sedimentation. The BMPs would be implemented to reduce the potential for impacts to drainage ways and streams by sediment runoff. Because erosion and sediment controls would be in place for construction and operation of the Project, no impacts to water quality are expected as a result of the Project.

12.2.2.3 Impacts to Drainage Patterns

In general, because wind turbines would be located at higher elevations within the Project Area to maximize wind exposure, impacts to ephemeral streams and drainage ways are not anticipated from turbine sites. The underground collection system may temporarily impact surface drainage patterns during construction if the collection system is trenched through drainage ways; however, these impacts would be short-term, and existing contours and drainage patterns are expected to be restored within 24 hours of trenching. Where stream/drainage crossings cannot be avoided for construction of access roads, appropriately designed culverts or low water crossings would be placed to maintain the free flow of water. The permanent disturbances introduced by the wind farm facilities (approximately 51 acres) would be spread throughout the approximately 36,000-acre Project Area and are not expected to change existing drainage patterns.

12.2.2.4 Impacts to Flood Storage Areas

In natural systems, floodplains serve several functions that include storing excess water during high-flow/high-runoff periods, moderating the release of water during high-flow/high-runoff periods, reducing flow velocity, and filtering out sediments and other pollutants. The placement of fill into floodplains reduces the effectiveness of these functions. As noted previously, wind turbines would be located at higher elevations, and the current layout avoids placing the turbines, collector systems, and access roads in low-lying areas. No FEMA-mapped floodplains are located within the Project Area.

12.2.2.5 Increased Runoff

The creation of impervious surfaces reduces the capacity of an area to absorb precipitation into the soil and tends to increase the volume and rate of storm water runoff. The Project would create up to 51 acres of impermeable surface through the construction of turbine pads, access roads, meteorological equipment, overhead collection structures, the O&M facility, and the collector substation. The wind turbine pads, access roads, and O&M facility and substation yards would be constructed of compacted gravel and would not be paved. However, this level of compaction may inhibit infiltration and may increase runoff in these areas.

The 51 acres of permanent disturbance represents less than 0.2 percent of the total area within the Project Area. Therefore, the Project is not expected to cause significant changes in runoff patterns or volume. As noted above, appropriate storm water management BMPs would be implemented during the construction and operation of the Project. These BMPs are anticipated to adequately mitigate for runoff due to the increase in impervious surface.

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

The following sections describe the existing terrestrial ecosystem within the Project Area and the potential effects of the proposed Project on these terrestrial systems.

13.1 Existing Terrestrial Ecosystem

Terrestrial ecosystem data were collected from literature searches, Federal and State agency reports, and natural resource databases. Biologists from Western EcoSystems Technology, Inc. (WEST) and HDR, Inc. (HDR) provided regional and site-specific information for terrestrial resources.

13.1.1 Vegetation

The Project Area is located within two Level IV Ecoregions: the Southern Missouri Coteau and the Southern Missouri Coteau Slope (EPA, no date). The Southern Missouri Coteau is located in the southern fringe of continental glaciation, and exhibits muted coteau topography with gentle undulations rather than steep hummocks. It also contains a small amount of high wetland density and more stream erosion backcutting into areas of internal drainage. For this reason, there is more tilled land on the Southern Missouri Coteau because of the gentler topography. Specifically, soybeans and corn are major crops planted due to the gentler topography and milder climate with increased precipitation. Natural vegetation in the region includes western wheatgrass (*Pascopyrum smithii*), green needlegrass (*Nassella virifula*), needle and thread (*Hesperostipa comata*), and porcupine grass (*Miscanthus sinensis*). Prairie cordgrass (*Spartina pectinata*) and northern reedgrass (*Calamagrostis stricta*) are present in poorly drained areas.

The Southern Missouri Coteau Slope contains mesic soils rather than frigid soils and a substantial cap of rock-free loess. Sunflowers, wheat, millet, and barley are planted in the level to rolling uplands of the Southern Missouri Coteau Slope. Corn is a marginal crop that does well in wet years. Willows (*Salix spp.*), green ash (*Fraxinus pennsylvanica*), and elm (*Ulmus spp.*) grow in the riparian areas, and western wheatgrass, green needlegrass, big bluestem (*Andropogon gerardi*), and needlethread are scattered throughout the region. Stream drainages tend to be grazed.

The majority of the Project Area has been converted to agricultural use, with crop production and livestock grazing as the main agricultural practices. There are trees and woodlands found mainly in planted shelter belts and within draws and on hillslopes. Wetlands are scattered throughout the Project Area.

13.1.1.1 Cropland and Pastureland

Approximately 44 percent of the Project Area is cultivated cropland (row crop or non-row crop), 18 percent is pastureland and rangeland, and 25 percent is hayland.

In Charles Mix County in 2012 (the latest available year for the U.S. Department of Agriculture [USDA] Census of Agriculture), approximately 64 percent of the land area was cropland, with soybeans for beans being the most common crop (USDA, 2012a). Corn was the second most common cultivated crop in the county. Cultivated cropland in Charles Mix County increased by 11 percent from 403,374 acres in 2007 to 448,940 acres in 2012 (USDA, 2012a). Specific acreages of different crops within the Project Area, which change from year to year, are not available. In Charles Mix County in 2012, approximately 33 percent of the land area was pastureland (USDA, 2012a, 2012b). Pastureland decreased 12 percent from 263,605 acres in 2007 to 231,622 acres in 2012.

In Bon Homme County in 2012, approximately 77 percent of the land area was cropland, with soybeans for beans being the most common crop (USDA, 2012c). Corn is the second most common cultivated crop in Bon Homme County. Cultivated cropland in Bon Homme County increased by 21 percent from 219,754 acres in 2007 to 277,172 acres in 2012 (USDA, 2012c). Specific acreages of different crops within the Project Area, which change from year to year, are not available. In Bon Homme County in 2012, approximately 16 percent of the land area was pastureland (USDA, 2012b, 2012c). Pastureland decreased 31 percent from 86,714 acres in 2007 to 59,285 acres in 2012.

NRCS farmland classifications include “prime farmland” (land that has the best combination of physical and chemical characteristics for the production of crops), “farmland of statewide importance” (land other than prime farmland that has a good combination of physical and chemical characteristics for the production of crops), and “not prime farmland” (land that does not meet qualifications for prime farmland), among other classifications. The majority of the farmland in the Project Area is classified as either “prime farmland” (30 percent) or “farmland of statewide importance” (38 percent). Thirteen percent is categorized as “not prime farmland.” The remaining 19 percent is divided among “prime farmland” categories with stipulations. Farmland types within the Project Area are shown in Table 13-1.

Table 13-1: Farmland Types Within the Project Area

Farmland Type	Area (acres)	Percentage of Project Area
Prime farmland	10,962.44	30%
Farmland of statewide importance	13,636.29	38%
Not prime farmland	4,653.27	13%

Farmland Type	Area (acres)	Percentage of Project Area
Prime farmland if drained	3,844.58	11%
Prime farmland if drained and either protected from flooding or not frequently flooded during the growing season	426.85	1%
Prime farmland if irrigated	2,512.04	7%
Total	36,035.48	100%

13.1.1.2 Easements

Based on correspondence with the USFWS Lake Andes National Wildlife Refuge (Newton, 2015), three wetland and two grassland conservation easements are managed by the USFWS within the Project Area.

13.1.1.3 Noxious Weeds

Noxious weeds are regulated by State (SDCL 38-22) and Federal (U.S. CFR 2006) 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), 11 listed species of noxious weeds have the potential to occur and are regulated within Charles Mix and/or Bon Homme Counties (SDDOA, 2012) (Table 13-2).

Table 13-2: State and Local Noxious Weeds of South Dakota

Common Name	Scientific Name	Weed Status
Canada thistle	*Cirsium arvense*	State noxious weed
Hoary cress	*Cardaria draba*	State noxious weed
Leafy spurge	*Euphorbia esula*	State noxious weed
Perennial sow thistle	*Sonchus arvensis*	State noxious weed
Purple loosestrife	*Lythrum salicaria*	State noxious weed
Russian knapweed	*Centaurea repens*	State noxious weed
Salt cedar	*Tamarix aphylla, T. chinensis, T. gallica, T. parviflora, and T. ramosissima*	State noxious weed
Absinth wormwood	*Artemisia absinthium*	Local noxious weed – Bon Homme
Field bindweed	*Convolvulus arvensis*	Local noxious weed – Bon Homme
Musk thistle	*Carduus nutans*	Local noxious weed – Charles Mix/Bon Homme
Plumeless thistle	*Carduus acnthoides*	Local noxious weed – Charles Mix/Bon Homme

13.1.1.4 Wetlands

Wetlands perform several important functions within a landscape, including flood attenuation, groundwater recharge, water quality protection, and wildlife habitat. Wetlands are defined in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987), 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:

1. Hydrophytic vegetation – The prevalent vegetation consists of macrophytes that are typically adapted to areas having hydrologic and soil conditions that are typically inundated or saturated by surface or groundwater. Hydrophytic species, due to morphological, physiological, and/or reproductive adaptation(s), have the ability to grow, effectively compete, reproduce, and/or persist in anaerobic soil conditions.
2. Hydric soil – Soils are present and have been classified as hydric, or they possess characteristics that are associated with reducing soil conditions.
3. Wetland hydrology – Wetland hydrology indicators provide evidence that the site has a continuing wetland hydrologic regime and that hydric soils and hydrophytic vegetation are not relicts of a past hydrologic regime. Wetland hydrology encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface at some point during the growing season.

Wetlands are defined by the USACE as a subset of waters of the U.S. Other waters of the U.S. include unvegetated waterways and other water bodies with a defined bed and bank, such as tide channels, drainages, ponds, creeks, rivers, and lakes. The USACE has the authority to regulate the discharge of dredged and fill material into jurisdictional waters of the U.S. Table 13-3 includes waters of the U.S. that may be protected by the CWA.

Table 13-3: Waters of the U.S.

Based on the agencies' interpretation of the statute, implementing regulations and relevant case law, the following waters are protected by the CWA[a b]: • Traditional navigable waters • Interstate waters, including interstate wetlands • The territorial seas • Impoundments of waters otherwise identified as waters of the U.S. • Tributaries of traditional navigable waters, interstate waters, or the territorial seas • All waters adjacent to the above In addition, the following waters are protected by the CWA if a fact-specific analysis determines they have a "significant nexus" to a traditional navigable water, interstate water, or the territorial seas • Prairie potholes • Carolina bays and Delmarva bays • Pocosins • Western vernal pools • Texas coastal prairie wetlands • Waters located within the 100-year floodplain of traditional navigable waters, interstate waters, and the territorial seas The following aquatic areas are generally not protected by the CWA: • Waste treatment systems • Prior converted cropland • Ditches with ephemeral or intermittent flow that are not a relocated tributary • Ditches that do not flow into a traditional navigable water, interstate water, or territorial sea • Artificially irrigated areas that would revert to dry land should the irrigation cease • Artificial, constructed lakes and ponds created in dry land • Artificial reflecting pools or swimming pools • Small ornamental waters created in dry land • Water-filled depressions created in dry land incidental to mining or construction activity • Erosional features • Puddles • Groundwater • Storm water control features • Wastewater recycling structures in dry land

Source: USACE, no date

(a) Generally, "significant nexus" is based on the flow characteristics and functions of the tributary and the functions of wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical and biological integrity of downstream traditional navigable waters.

(b) This regulatory definition is currently being reviewed by the courts and is subject to change.

Impacts to waters of the U.S. are reviewed, permitted, and mitigated through the CWA Section 404 permitting process.

Wetlands and other waters of the U.S. within the Project Area were identified by reviewing National Wetland Inventory (NWI) maps. NWI maps are produced by the USFWS and provide reconnaissance level information including location, type, and size of these resources. NWI maps are produced by review of high altitude imagery, and interpretation is variable based on quality of aerial photographs, experience of the interpreter, and whether ground-truthing was conducted. According to the NWI, approximately 1,266 acres out of the approximately 36,000-acre Project Area are comprised of freshwater emergent wetlands, ponds, forested wetlands, and a small lake (Figure 8). This means that only approximately 3.5 percent of the Project Area is mapped as wetlands or ponds. Descriptions of the mapped wetlands and ponds are shown on Table 13-4.

Table 13-4: NWI Wetland and Pond Types Mapped Within the Project Area

Wetland Type	Cowardin Classification[a]	Acres within Project Area
Freshwater emergent wetland	PEM/ABF (Palustrine, Emergent, Palustrine, Aquatic Bed, Semipermanently Flooded)	183.95
	PEM/ABFd (Palustrine, Emergent, Palustrine, Aquatic Bed, Semipermanently Flooded, Partially Drained/Ditched)	1.83
	PEM/ABFH (Palustrine, Emergent, Palustrine, Aquatic Bed, Semipermanently Flooded, Diked/Impounded)	3.89
	PEM/FOA (Palustrine, Emergent, Palustrine, Forested, Temporary Flooded)	3.57
	PEM/FOAD (Palustrine, Emergent, Palustrine, Forested, Temporary Flooded, Partially Drained/Ditched)	0
	PEM/FOC (Palustrine, Emergent, Palustrine, Forested, Seasonally Flooded)	5.64
	PEMA (Palustrine, Emergent, Temporary Flooded)	136.32
	PEMAd (Palustrine, Emergent, Temporary Flooded, Partially Drained/Ditched)	173.07
	PEMAx (Palustrine, Emergent, Temporary Flooded, Excavated)	0
	PEMC (Palustrine, Emergent, Seasonally Flooded)	412.87
	PEMCd (Palustrine, Emergent, Seasonally Flooded, Partially Drained/Ditched)	30.28
	PEMCh (Palustrine, Emergent, Seasonally Flooded, Diked/Impounded)	0.26
	PEMF (Palustrine, Emergent, Semipermanently Flooded)	6.00
	PEMFd (Palustrine, Emergent, Semipermanently Flooded, Partially Drained/Ditched)	18.72
Freshwater ponds	PAB/EMF (Palustrine, Aquatic Bed, Emergent, Semipermanently Flooded)	31.22
	PAB/EMFH (Palustrine, Aquatic Bed, Emergent, Semipermanently Flooded, Diked/Impounded)	3.20

Wetland Type	Cowardin Classification[a]	Acres within Project Area
	PABF (Palustrine, Aquatic Bed, Semipermanently Flooded)	81.71
	PABFd (Palustrine, Aquatic Bed, Semipermanently Flooded, Partially Drained/Ditched)	7.33
	PABFh (Palustrine, Aquatic Bed, Semipermanently Flooded, Diked/Impounded)	35.53
	PABFHx (Palustrine, Aquatic Bed, Semipermanently Flooded, Diked/Impounded, Excavated)	1.79
	PABFx (Palustrine, Aquatic Bed, Semipermanently Flooded, Excavated)	29.84
	PABGx (Palustrine, Aquatic Bed, Intermittently Exposed, Excavated)	0
	PUBFx (Palustrine, Unconsolidated Bottom, Semipermanently Flooded, Excavated)	0.54
Forested wetland	PFO/EMAD (Palustrine, Forested, Palustrine, Emergent, Temporary Flooded, partially Drained/Ditched)	0
	PFO/EMC (Palustrine, Forested, Palustrine, Emergent, Seasonally Flooded)	1.63
	PFO/EMCH (Palustrine, Forested, Palustrine, Emergent, Seasonally Flooded, Diked/Impounded)	4.29
	PFOA (Palustrine, Forested, Temporary Flooded)	18.62
	PFOAd (Palustrine, Forested, Temporary Flooded, Partially Drained/Ditched)	0.65
	PFOC (Palustrine, Forested, Seasonally Flooded)	13.62
	PFOCd (Palustrine, Forested, Seasonally Flooded, Partially Drained/Ditched)	0.70
	PFOCH (Palustrine, Forested, Seasonally Flooded, Diked/Impounded)	1.80
Freshwater lake	L2ABG (Lacustrine, Littoral, Aquatic Bed, Intermittently Exposed)	57.44
	Total:	**1,266.31**

Source: USFWS NWI data
(a) Cowardin Classification System: Elements of the Cowardin, et al. (1979) classification system used in eastern South Dakota and NWI codes for systems, subsystems, classes, and modifiers. There are no subsystems in the palustrine system.

HDR conducted a wetland determination review for the Project in 2015 and 2016. The results are included in Appendix H.

13.1.2 Wildlife

Wildlife species associated with croplands, grasslands, and shrublands are the most common types of species observed and expected to occur within the Project Area. A list of the species observed during site visits conducted by WEST biologists on February 25 and 26, 2015, is provided in Table 13-5. The information presented in this section and additional information on wildlife in the Project Area is provided in the *Tiers 1 and 2 Report for the Prevailing Winds Wind Project* included in Appendix B of this Application.

Table 13-5: Wildlife Species Observed at the Project Area During a Site Visit on February 25 and 26, 2015

Common Name	Scientific Name
American robin	*Turdus migratorius*
European starling	*Sturnus vulgaris*
Horned lark	*Eremophila alpestris*
Mallard	*Anas platyrhynchos*
Northern flicker	*Colaptes auratus*
Red-tailed hawk	*Buteo jamaicensis*
Ring-necked pheasant	*Phasianus colchicus*
Rock pigeon	*Columba livia*
Unidentified raptor	N/A

Source: WEST, 2016

13.1.2.1 Migratory Birds

Although not protected under the ESA, numerous bird species have been identified by the USFWS as Birds of Conservation Concern (BCC; USFWS, 2008). These are “species, subspecies, and populations of migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the Endangered Species Act of 1973” (USFWS, 2008). The Project Area lies within Bird Conservation Region (BCR) 11 (Prairie Potholes), a landscape dotted with many small depressional wetlands called potholes.

Twenty-seven bird species are listed as BCC within BCR 11 (USFWS, 2008; Appendix B of the Tiers 1 and 2 Report, Appendix B), many of which would have potential for occurrence within the Project Area (Jennings et al., 2005). Four diurnal raptors are among the BCC within BCR 11 with potential to occur in the Project Area (bald eagle [also a State-threatened species], Swainson’s hawk [*Buteo swainsoni*], and peregrine falcon [*Falco peregrinus*]). In addition to bald eagles, golden eagles (*Aquila chrysaetos*) have the potential to occur in the Project Area during some time of the year. Bald and golden eagles are protected by the Migratory Bird Treaty Act (MBTA) and the Bald and Golden Eagle Protection Act (BGEPA). Swainson’s hawks may breed in the Project Area, and peregrine falcons potentially migrate through the Project Area (Jennings et al., 2005). The remaining BCC species are a mix of shorebirds, waterbirds, owls, woodpeckers, and passerines, all of which likely have some potential for impacts from wind energy development (Appendix B of the Tiers 1 and 2 Report, Appendix B).

13.1.2.2 Raptors

The following sections identify raptor presence within the Project Area.

13.1.2.2.1 Raptor Species Likely to Occur in the Project Area

The following diurnal raptor and vulture species could potentially breed in or near the Project Area: American kestrel (*Falco sparverius*), bald eagle, golden eagle, Cooper's hawk (*Accipiter cooperii*), northern harrier (*Circus cyaneus*), red-tailed hawk (*Buteo jamaicensis*), ferruginous hawk (*B. regalis*), Swainson's hawk, broad-winged hawk (*B. platypterus*), peregrine falcon, osprey, and turkey vulture (*Cathartes aura*) (Jennings et al., 2005). Owls with the potential to breed in or near the Project Area include barn owl (*Tyto alba*), burrowing owl (*Athene cunicularia*), eastern screech owl (*Otus asio*), long-eared owl (*Asio otus*), short-eared owl (*Asio flammeus*), and great horned owl (*Bubo virginianus*) (Jennings et al., 2005).

Diurnal raptor species that may also occur within the Project Area outside of the breeding season (migration, winter, or post-breeding dispersal) include northern goshawk (*Accipiter gentilis*), Cooper's hawk, golden eagle, bald eagle, merlin (*Falco columbarius*), peregrine falcon, prairie falcon (*F. mexicanus*), gyrfalcon (*F. rusticolus*), red-tailed hawk, rough-legged hawk (*Buteo lagopus*), and sharp-shinned hawk (*Accipiter striatus*) (Jennings et al., 2005). Owls that may occur outside of the breeding season include the eastern screech owl, great horned owl, northern saw-whet owl (*Aegolius acadicus*), long-eared owl, and short-eared owl (Jennings et al., 2005). During the site visit, four red-tailed hawk observations and two unidentified diurnal raptor observations were recorded at the Project Area.

13.1.2.2.2 Potential for Raptor Migration in the Area

Several factors influence the migratory pathways of raptors, the most significant of which is geography. Two geographical features often used by raptors during migration are ridgelines and the shorelines of large bodies of water (Liguori, 2005). Updrafts formed as the wind hits the ridges, and thermals, created over land and not water, make for energy-efficient travel over long distances (Liguori, 2005). For this reason, raptors sometimes follow corridors or pathways, for example, along prominent ridges with defined edges, during migration.

Raptors likely migrate through the Project Area in a broad front pattern with some potential for more localized use of the ridge on the southwestern portion of the Project Area (Figure 3 of the Tiers 1 and 2 Report, Appendix B). Trees, shrubs, and water impoundments, which are scattered throughout the Project

Area and region, may provide some stopover habitat for migrating raptors (Figure 4 of the Tiers 1 and 2 Report, Appendix B).

13.1.2.2.3 Potential Raptor Nesting Habitat

During the site visit, small scattered woodlots, wooded farmsteads, shelter belts, and wooded draws and hillsides were observed that could provide raptor nesting habitat for species such as red-tailed hawk and Swainson's hawk. Grassland areas could provide nesting habitats for ground-nesting raptors and owls, such as the northern harrier and burrowing owl. One known bald eagle nest is located approximately 1.8 miles north of the Project Area.

13.1.2.3 Bats

Seven bat species are potential residents and/or migrants in the Project Area and include big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), northern long-eared bat (*Myotis septentrionalis*), little brown bat (*Myotis lucifugus*), and western small-footed bat (*Myotis ciliolabrum*). Potential roosting habitat within the Project Area is found in the form of scattered trees, wooded hillslopes, and abandoned buildings; no caves were observed during the site visit, and no known caves were documented in a literature search. However, karst formations may be found within the Project Area. Species occurring in South Dakota and potentially in the Project Area are listed in Table 13-6.

Table 13-6: Bat Species Occurring in South Dakota and Potentially in Project Area

Common Name	Scientific Name	Habitat	Presence in Project Area
Big brown bat	*Eptesicus fuscus*	Common in most habitats, abundant in deciduous forests and suburban areas with agriculture; maternity colonies beneath bark, tree cavities, buildings, barns, and bridges.	Likely
Eastern red bat	*Lasiurus borealis*	Abundant tree bat; roosts in trees; solitary.	Likely
Hoary bat	*Lasiurus cinereus*	Usually not found in man-made structures; roosts in trees; very wide-spread.	Likely
Silver-haired bat	*Lasionycteris noctivagans*	Common bat in forested areas, particularly old growth; maternity colonies in tree cavities or hollows; hibernates in forests or cliff faces.	Likely
Northern long-eared bat	*Myotis septentrionalis*	Associated with forests; chooses maternity roosts in buildings, under loose bark, and in the cavities of trees; caves and underground mines are their choice sites for hibernating. On western edge of range.	Unlikely

Common Name	Scientific Name	Habitat	Presence in Project Area
Little brown bat	*Myotis lucifugus*	Commonly forages over water; roosts in attics, barns, bridges, snags, and loose bark; hibernacula in caves and mines.	Probable
Western small-footed bat	*Myotis ciliolabrum*	Found in mesic conifer forest, also riparian woodland; roosts in rock outcrops, clay banks, loose bark, buildings, bridges, caves, and mines.	Probable

13.1.3 Sensitive Terrestrial Species

Federally listed threatened and/or endangered species could potentially occur in the Project Area. Based on habitats found within the proposed Project Area during desktop evaluation and the site visit, five animal species have the potential to occur in the Project Area during some portion of the year, including: federally listed as endangered interior least tern (*Sterna antillarum athalassos*; USFWS, 2013a) and whooping crane (*Grus americana*; USFWS, 2015a) and federally listed as threatened piping plover (*Charadrius melodus*; USFWS, 2013b), red knot (*Calidris canutus rufa*; USFWS, 2014), and northern long-eared bat (*Myotis septentrionalis*; USFWS 2016a, 2015b). These species are discussed in further detail below.

13.1.3.1 Interior Least Tern

The interior least tern nests along sand and gravel bars within wide, unobstructed river channels and open flats along shorelines of lakes and reservoirs (Texas Parks and Wildlife Department [TPWD], 2015). Unnatural water fluctuations, permanent flooding, or vegetation coverage of nesting habitat caused by water management may contribute to nest failure.

13.1.3.2 Whooping Crane

The whooping crane migrates from its breeding grounds in Wood Buffalo National Park, Canada, to its wintering areas in Aransas National Wildlife Refuge, Texas (USFWS, 2009). Threats to wild cranes include habitat destruction, chemical spills in its wintering habitat, lead poisoning, collisions with manmade objects such as fences and power lines, disease (e.g., avian cholera and parasites), and shooting (USFWS, 2015a). Cranes typically utilize shallow wetlands and marshes, the edges and sandbars of shallow rivers, and agricultural fields near a water source during migration (USFWS, 2015a).

13.1.3.3 Piping Plover

The piping plover is typically found on sandy beaches, mudflats, and exposed areas around wetlands and lakes. Suitable nesting habitat includes barren sandbars in large river systems and on alkaline lake shores (USFWS, 2002). Piping plover populations are threatened by habitat loss due to vegetation encroachment, shoreline development, anthropogenic and animal disturbances, and water management activities, such as dam construction and channelization.

13.1.3.4 Red Knot

The red knot is a medium-sized shorebird that migrates from its breeding grounds in Canada’s Arctic region to multiple wintering grounds, including the Northeast Gulf of Mexico, the Southeastern U.S., northern Brazil, and Tierra del Fuego at the southern point of South America. During the breeding season, red knots are typically found in sparsely vegetated, dry tundra areas (Harrington, 2001; All About Birds, 2015). Outside of the breeding season, red knots are usually found along intertidal, marine beaches (Harrington, 2001). During migration, some red knots can be found flying over inland areas, but these cases are rare (Sibley, 2003). The red knot population is threatened by habitat loss in migration and wintering areas, reduction of quality and quantity of food resources, asynchronies in timing throughout its breeding and migration range, and high predation on the breeding grounds every 3 to 4 years (USFWS, 2014).

13.1.3.5 Northern Long-Eared Bat

The northern long-eared bat was listed as a threatened species on April 2, 2015. It is found in the U.S. from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through part of South Dakota (Bat Conservation International, Inc. [BCI], 2015). The Project Area is on the western fringe of the estimated range for the species (BCI, 2015). This species hibernates in caves and abandoned mines during winter (BCI, 2015); however, no known hibernacula exist in the Project Area, with the closest being located in the Black Hills on the South Dakota/Wyoming border. 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 (BCI, 2015).

13.2 Impacts to Terrestrial Systems

This section describes the potential impacts of the proposed Project on vegetation, wetlands, wildlife, sensitive terrestrial species, and bird and bat mortality.

13.2.1 Vegetation

Based on initial Project scoping conducted for the Project on the USFWS Information for Planning and Conservation (IPaC) online review tool, no federally listed plant species are present within the Project Area (USFWS, 2016b). Unmitigated loss of native or protected vegetation or introduction of noxious weeds could result in an impact to vegetation resources. Damage to field crops that occur on cultivated lands during construction would be compensated for by the Applicant. Impacts to agricultural cropland are discussed further in Section 20.2.4.

Construction of the Project would result in temporary and permanent impacts to existing vegetation within the Project Area (Section 13.1.1). Direct permanent impacts would occur due to construction of the wind turbine foundations, access roads, collector substation, meteorological equipment, O&M facility, and collector lines. These impacts would result in a loss of production of crops and pasture grasses. Other indirect impacts could include the spread of noxious weed species resulting from construction equipment introducing seeds into new areas, or erosion or sedimentation due to clearing ground in the construction areas. Vegetation communities most sensitive to disturbance are native prairies, grasslands with native plant communities, wetlands, and natural woodlands. The Project has been sited to avoid, to the extent possible, these sensitive habitats.

The proposed Project would result in approximately 673 acres of temporary disturbance and 51 acres of permanent disturbance to vegetation (predominantly cropland and grassland/pasture). Impacts that would occur to cultivated lands are not considered biologically significant, because these lands are frequently disturbed by tilling, planting, and harvesting activities associated with crop production.

Turbines, access roads, collector lines, and the collector substation would be sited to avoid sensitive habitats to the extent possible. Where avoidance is not possible, siting would attempt to reduce impacts to these sensitive habitats. Temporary impacts would be mitigated through BMPs, such as re-vegetation and erosion control devices. These measures would reduce temporary impacts to vegetative communities adjacent to the Project facilities. Noxious weeds would be controlled using weed-free seed mixes and controlled spraying, as necessary.

Specific BMPs would be used for any construction within grassland/pasture and would include the following measures:

- Crews will limit ground disturbance wherever possible during construction in grasslands and limit the areas where construction vehicles drive through the Project Area
- Exposed subgrade in areas where the native soil has been removed will be regraded to the original ground contour, and the soil will be replaced to follow the original soil profiles to the extent practicable
- The Applicant will reseed disturbed areas with a weed-free native plant seed mixture at an appropriate application rate

The Project would not involve any major tree clearing activities. Turbines are sited in open upland areas. When feasible, access roads and crane paths are sited to avoid crossing tree rows. The collector substation, overhead transmission lines, and underground 34.5-kV collector line routes would be sited to avoid impacts to tree rows and woodlots whenever feasible. Some minor clearing of brush may be required for collector lines and access roads. In areas where access roads may need to cross windrows due to engineering restrictions or the layout of leased lands, the Applicant would work with the landowner in order to develop an appropriate alignment that would be the least intrusive.

13.2.2 Wetlands

Impacts to wetland resources could occur by directly filling wetlands due to Project construction, or by otherwise negatively altering their quality. The Applicant anticipates that the Project would avoid most wetland areas. Wind turbines would be constructed in the upland areas, avoiding the low-lying wetlands. Wetland areas would also be avoided to the extent possible when routing access roads and collector lines. Construction of collector lines that cross delineated wetlands would be conducted by directional boring beneath the wetland. To further protect wetlands, BMPs for sediment and erosion control would be implemented. In order to limit the risk of contamination of wetlands due to accidental spilling of fuels or other hazardous substances, construction equipment would be refueled in areas away from wetlands or drainage areas, and a spill kit would be available at the construction site. Formal wetland delineations within the Project Area would be completed during design and prior to construction, after a turbine model is selected for the Project. If the final layout were to result in unavoidable impacts to wetlands or waters of the U.S., the Applicant would coordinate with the USACE.

13.2.3 Wildlife

Terrestrial wildlife species could be impacted at various spatial and temporal scales during the construction phase of the Project. Direct disruption of habitat and potentially direct mortality could occur during the construction phase of the Project. Permanent habitat loss due to construction of wind turbines would be minimal across the Project Area and localized.

Construction crews would be instructed to avoid disturbing or harassing wildlife, and direct mortalities would not likely impact wildlife populations. Following construction, wildlife species are expected to habituate to routine facility operation and maintenance activities in a manner similar to relationships with existing ranching operations. BMPs would be practiced by construction personnel to reduce attractants to scavengers and would-be nest predators.

13.2.4 Sensitive Terrestrial Species

This section describes the potential impacts of the proposed Project on the federally listed species that could potentially occur in the Project Area.

13.2.4.1 Interior Least Tern

No suitable nesting habitat was identified within the Project Area, but the interior least tern could potentially nest along the Missouri River or pass through the Project Area during spring and fall migration.

13.2.4.2 Whooping Crane

Suitable whooping crane stopover habitat is present in the Project Area and includes shallow livestock ponds surrounded by agricultural and grassland parcels and freshwater emergent wetlands. Additionally, the Project Area is located 2.2 miles east of the eastern edge of the 220-mile-wide whooping crane migration corridor, based on national flyway information (Figure 6 of the Tiers 1 and 2 Report, Appendix B), but it is within the 95 percent migration corridor when considered specific to South Dakota. Therefore, it is possible, but unlikely, that whooping cranes could occur in the Project Area.

13.2.4.3 Piping Plover

Designated critical habitat for the piping plover is located approximately 6 miles south of the Project Area along the Missouri River (Figure 6 of the Tiers 1 and 2 Report, Appendix B; USFWS, 2015c). No suitable piping plover habitat was observed in the Project Area during the site visit. Piping plovers are unlikely to breed within the Project Area, but the species could potentially migrate through the Project Area.

13.2.4.4 Red Knot

No suitable red knot habitat was observed in the Project Area during the site visit. Red knots are unlikely to breed within the Project Area, but the species could potentially migrate through the Project Area.

13.2.4.5 Northern Long-Eared Bat

Some habitat features for the northern long-eared bat are located in the Project Area. Although white-nose syndrome (WNS; caused by the fungus *Pseudogymnoascus destructans*) is the primary threat to northern long-eared bat populations (USFWS, 2015b), there is also concern about the impacts of wind facilities on bat species. However, under the final 4(d) rule published on January 14, 2016 (USFWS, 2016a), it was determined that wind-energy development has not led to significant declines in this species, nor is there evidence that regulating the incidental take that is occurring would meaningfully change the conservation or recovery potential of the species in the face of WNS. In other words, take of the species by a wind facility is not currently considered a violation of Section 9 of the ESA. This will change if the species becomes listed as endangered or if the 4(d) rule is rescinded. Bat acoustic surveys would be conducted to determine presence/absence of the northern long-eared bat within the Project Area.

13.2.5 Bird and Bat Mortality

Bat casualties have been reported from most wind energy faculties where post-construction fatality data are publicly available. Reported estimates of bat mortality at wind energy facilities have ranged from 0.01 to 47.5 fatalities per turbine per year (0.9 to 43.2 bats per MW per year) in the U.S., with an average of 3.4 per turbine or 4.6 per MW (National Wind Coordinating Collaborative [NWCC], 2004). The majority of the bat casualties at wind energy facilities to date are migratory species that undertake long migrations between summer roosts and wintering areas. The species most commonly found as fatalities at wind energy facilities include hoary bats, silver-haired bats, and eastern red bats (Johnson, 2005). The highest numbers of bat fatalities found at wind energy facilities to date have occurred in eastern North America on ridge tops dominated by deciduous forest (NWCC, 2004). However, Gruver et al. (2009), BHE Environmental (2010, 2011), Barclay et al. (2007), and Jain (2005) reported relatively high fatality rates from facilities in Wisconsin, Iowa, and Canada that were located in grassland and agricultural habitats. Unlike the eastern U.S., wind energy facilities that reported higher bat fatality rates, the Wisconsin, Alberta, and Iowa facilities are in open grasslands and crop fields.

Construction of the Project would likely result in the mortality of some bats. The magnitude of these fatalities and the degree to which bat species would be affected is difficult to determine, but they should be within the average range of bat mortalities found throughout the U.S. based on general vegetation and landscape characteristics.

13.2.6 Mitigation

Project facilities would be sited to avoid, to the extent possible, impacts to federally listed and other sensitive wildlife species. Project siting, as well as wildlife, cultural, and other environmental studies for the Project, are ongoing. Once these studies and Project siting are complete, the Applicant would develop site-specific mitigation measures, as needed, to further reduce impacts to wildlife. Site-specific mitigation measures would be developed in coordination with the USFWS, SDGFP, and other applicable agencies. The Applicant would construct and operate the Project in accordance with Federal and State requirements.

As discussed in Chapter 2.0, it is anticipated that Western will prepare an EA for the Project interconnection. As part of the EA process, the Applicant would coordinate with Western and the USFWS to identify additional mitigation measures that would be implemented for the Project as a condition of EA approval.

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

The following sections describe the existing aquatic ecosystems within the Project Area and the potential impacts to aquatic ecosystems as a result of the Project.

14.1 Existing Aquatic Ecosystem

Surface waters are described in Section 12.1 and shown on Figure 8. The Project facilities are located in the Lewis and Clark Lake Sub-Basin drainage system. As described in Section 13.1.1.4, there are approximately 1,270 acres of NWI wetlands within the Project Area (approximately 3.5 percent of the total Project Area). The wetlands in the Project Area consist of freshwater emergent and forested wetlands, freshwater ponds, and a small freshwater lake.

The pallid sturgeon (*Scaphirhynchus albus*) is a federally listed as endangered fish species (USFWS, 2013c) and listed in all counties that are contiguous with the Missouri River. It can be found in the Missouri River, which is located approximately 6 miles south of the Project. The federally listed as endangered Topeka shiner (*Notropis topeka*; USFWS, 2013d) is a small minnow native to the streams of the prairie and prefers small, quiet streams with clean gravel or sand substrates and vegetated banks (Shearer, 2003). The shiner can be found in the James River and tributaries, which are about 17 miles northeast of the Project (South Dakota Game, Fish, and Parks [SDGFP], 2015).

14.2 Impacts to Aquatic Ecosystems and Mitigation

As described in Section 13.2.2, impacts to wetlands would be minimal, because wetlands would be avoided to the extent possible when locating access roads, collector lines, and other Project facilities. The primary potential for impact to aquatic ecosystems would be from increased sedimentation or increased total suspended solids due to soil erosion from the Project construction sites. In general, surficial soils on flat areas are less prone to erosion than soils in sloped areas. Construction on or adjacent to steep slope areas can render soils unstable, accelerate natural erosion processes, and cause slope failure.

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 (USLE) and the Revised Universal Soil Loss Equation (RUSLE) 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 0.05 to 0.37, with the majority between 0.24 and 0.32.

The Project Area slope ranges from 0 to 40 percent, with the majority of slope at 1 to 6 percent. Care would be taken to avoid or limit excavation in steep slope areas. Because wind turbines are generally located at higher elevations to maximize exposure to wind, excavation in steep slope areas should be limited to crane paths and small sections of access roads. Where possible, crane paths and access roads would be sited to avoid steep slopes. There may also be limited trenching of underground cabling in steep slopes, although that would be limited as much as possible by directional boring these areas. During construction, BMPs would be implemented to help avoid impacts to drainage ways and streams from sediment runoff from exposed soils during precipitation events.

Construction of the Project would 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 would be developed during civil engineering design of the Project and would prescribe BMPs to control erosion and sedimentation. The BMPs may include silt fence, wattles, erosion control blankets, temporary storm water swales and sedimentation ponds, re-vegetation, or other features and methods designed to control storm water runoff and mitigate erosion and sedimentation. The BMPs would be implemented to reduce impacts to drainage ways and streams by sediment runoff. Because erosion and sediment control would be in place for construction and operation of the Project, no impacts to aquatic ecosystems are expected as a result of the Project.

It is unlikely that the pallid sturgeon or Topeka shiner would be affected by the development of and operations associated with a wind facility. Although not in the Project Area, the Missouri River does have tributaries reaching into the Project Area. BMPs would be designed to control sedimentation and erosion during construction of the Project to prevent downstream water quality impacts to the Missouri River. The Project Area is not located within the James River watershed, and, therefore, no direct or indirect impacts to the Topeka shiner would occur.

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

The following sections describe the existing land use, sound, and aesthetics within the Project Area and potential land use impacts of the Project.

15.1 Existing Land Use

Land use within the Project Area is predominantly agricultural, consisting of a mix of cropland, hayland, pastureland, and rangeland. Occupied farm sites and rural residences are within the Project Area, and other scattered rural residences are adjacent to, but outside of, the Project Area. Figure 9 is a land use map of the Project Area based on the classification system specified in ARSD 20:10:22:18(1). The following land use classifications occur within the Project Area:

- Land used primarily for row and non-row crops in rotation
- Pasturelands and rangelands
- Haylands
- Undisturbed native grasslands
- Rural residences and farmsteads, family farms, and ranches
- Public, commercial, and institutional use
- Noise sensitive land uses

The following land use classifications were not identified within the Project Area:

- Irrigated lands
- Existing and potential extractive nonrenewable resources
- Other major industries
- Residential
- Municipal water supply and water sources for organized rural water systems

Figure 10 is a map showing public lands and facilities within the Project Area. The 114-acre USFWS Charles Mix County Waterfowl Production Area is located within the Project Area. Several public lands are located adjacent to, but not within, the Project Area. These include the following: the Dante Lake Wildlife Management Area, several tracts of land associated with the Lake Andes Wetlands Management District, the Long Spur Game Production Area, tracts of land associated with the Sorenson Game Production Area, a Wetlands Reserve Program area, and the Williamson Game Production Area. There are approximately 410 acres of privately owned lands within the Project Area that are leased for public hunting access by SDGFP (referred to as Walk-In Areas). An additional 80 acres of Game Production

Areas are present in the Project Area as well. One church and an associated cemetery are located within the Project Area (Figure 10). As identified in Section 13.1.1.2, USFWS grassland (396 acres) and wetland (627 acres) easements are present with the Project Area.

15.2 Existing Sound

The Project Area is located in rural Bon Homme and Charles Mix Counties. The Project Area contains cropland, grassland, and rural residences scattered throughout. Farming activities and occasional vehicular traffic are assumed to be the largest contributor to sound, although ambient sound measurements have not been recorded for the Project Area at this time.

The term "sound level" is often used to describe two different sound characteristics called sound power and sound pressure. Every source that produces sound has a sound power level (L_w). The sound power level is the acoustical energy emitted by a sound source and is an absolute number that is not affected by the surrounding environment. The acoustical energy produced by a source propagates through the air as air pressure fluctuations. These pressure fluctuations, also called sound pressure (L_p), are what human ears hear and microphones measure.

Sound energy is physically characterized by amplitude and frequency. Sound amplitude is measured in decibels (dB) as the logarithmic ratio of a sound pressure to a reference sound pressure (20 microPascals).

The reference sound pressure corresponds to the typical threshold of human hearing. A 3-dB change in a continuous broadband sound is generally considered "just barely perceptible" to the average listener. A 6-dB change is generally considered "clearly noticeable," and a 10-dB change is generally considered a doubling (or halving) of the apparent loudness.

Frequency is measured in hertz (Hz), which is the number of cycles per second. The typical human ear can hear frequencies ranging from approximately 20 to 20,000 Hz. Normally, the human ear is most sensitive to sounds in the middle frequencies (1,000 to 8,000 Hz) and is less sensitive to sounds in the low and high frequencies. As such, the A-weighting scale was developed to simulate the frequency response of the human ear to sounds at typical environmental levels. The A-weighting scale emphasizes sounds in the middle frequencies and de-emphasizes sounds in the low and high frequencies. Any sound level to which the A-weighting scale has been applied is expressed in A-weighted decibels or dBA. For reference, the A-weighted sound pressure level and subjective loudness associated with some common sound sources are listed in Table 15-1.

Table 15-1: Typical Sound Pressure Levels Associated with Common Sound Sources

Sound Pressure Level (dBA)[a]	Subjective Evaluation	Environment	
		Outdoor	Indoor
80	Moderately loud	Diesel truck (40 miles per hour) at 50 feet	Inside auto at high speed, garbage disposal, dishwasher
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner, electric typewriter
60	Moderate	Air-conditioner condenser at 15 feet, near highway traffic	General office
50	Quiet	--	Private office
40	--	Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV and stereo)
20	--	Rustling leaves	Quiet theater, whisper
10	Just audible	--	Human breathing
0	Threshold of hearing	--	--

Source: Adapted from *Architectural Acoustics*, M. David Egan, 1988, and *Architectural Graphic Standards*, Ramsey and Sleeper, 1994

(a) dBA = A-weighted decibels

As indicated in Table 15-1, agricultural areas such as the Project Area commonly have sound levels in the 30 to 40 dBA range. Ambient sound would increase closer to roadways, depending on the frequency and types of vehicles passing by.

15.3 Existing Visual Resources

Cropland, grassland, large open vistas, and gently rolling topography visually dominate the Project Area landscape. Vegetation in and near the Project Area is predominantly cropland and grassland/pasture. Existing structures in the Project Area consist of occupied residences dispersed throughout as well as scattered farm buildings. Two large Western transmission lines bisect the Project Area from east to west, and one East River Electric transmission line traverses the Project Area from east to west. East River Electric's Avon Substation is located in the northeastern portion of the Project Area. State Highways 50, 46, and 37 extend through the Project Area. The existing Beethoven Wind Farm, comprised of 43 wind turbines, is located adjacent to the northeast corner of the Project Area (SDPUC, 2016). The small municipality of Avon is located immediately south and adjacent to the Project Area boundary.

Visual impacts to the landscape attributable to the Project would depend on the extent to which the existing landscape is already altered from its natural condition, the number of viewers (residents, travelers, visiting recreational users, etc.) within visual range of the area, and the degree of public or agency concern for the quality of the landscape. There are 80 occupied residences (1.4 residences per square mile) within the Project Area and other scattered rural residences and small communities that are near, but outside of, the Project Area (Figure 9). Travelers through the Project Area would include local or regional traffic along State Highways 50, 46, and 37. USFWS Waterfowl Production Areas, SDGFP Game Production Areas, and SDGFP Walk-In Areas for public hunting are present within, and near/adjacent to, the Project Area (SDGFP, 2016).

15.4 Land Use Impacts Analysis

The following sections describe the potential Project land use impacts, including displacement, recreational impacts, sound, aesthetics, and electromagnetic interference. Although discussed in Section 20.2.4, impacts to the agricultural land uses within the Project Area will be limited to the extent possible. Minimal existing agricultural land would be taken out of crop and forage production by the proposed Project, primarily the area around wind turbine foundations, access roads, and electrical collection and interconnection facilities. Landowners would be compensated by the Applicant 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 would not alter agricultural activities.

Approximately 673 acres of agricultural land (including cropland and grassland) would be temporarily impacted by Project construction. It is estimated that approximately 51 acres of agricultural land would be permanently impacted, which constitutes less than 0.2 percent of the total land within the Project Area. Areas disturbed due to construction that would not host permanent Project facilities would be re-vegetated with vegetation types matching the surrounding agricultural landscape.

15.4.1 Displacement

As stated above, there are 80 occupied residences within the Project Area. Based on the proposed Project layout of turbines, access roads, collector lines, and associated facilities, there would be no displacement of residences or businesses due to construction of the Project facilities.

15.4.2 Recreational Impacts

During Project construction, there could be temporary access disruptions to Walk-In Areas for hunting during construction, although it is unlikely. During operation of the Project, permanent impacts to this land would result due to placement of turbines and access roads. South Dakota’s Walk-In Hunting Areas allow public hunting on private lands. Lands enrolled in the program do not require permission for private individuals to hunt on the land, and landowners receive lease payments from SDGFP as compensation. The Applicant would coordinate with SDGFP regarding impacts and access to Walk-In Hunting Areas.

15.4.3 Sound Assessment

Sound concerns may arise during construction, operation, and decommissioning of the Project. Construction and decommissioning would have similar sound level impacts. Operational sound would occur due to the turbine blades moving and due to the collector substation. The different impacts are described below.

15.4.3.1 Construction and Decommission

There would be sound associated with construction and decommissioning of the Project. Construction and decommissioning of the Project would involve site preparation, excavation, placement of concrete, and the use of typical industrial construction practices. Sound impacts would be reduced by scheduling heavy construction work during daylight hours, to the extent possible. Certain operations, due to their nature or scope, must be accomplished in part outside of normal working hours. Such work generally consists of activities that must occur continuously, once begun (such as pouring concrete, filling a transformer with oil, turbine erection, etc.). Construction and decommissioning sound would comply with applicable county and State requirements, regulations, and ordinances.

The impacts that various construction and decommissioning-related activities might have would vary considerably based on the proximity to the facility. Generic sound data ranges are available for various types of equipment at certain distances. Table 15-2 lists generic activities and the associated sound levels at a distance of 50 feet.

Table 15-2: Range of Typical Construction Equipment Sound Levels (dBA)[a]

Generic Construction Equipment	Minimum Sound at 50 Feet	Maximum Sound at 50 Feet
Backhoes	74	92
Compressors	73	86
Concrete mixers	76	88
Cranes (movable)	70	94
Dozers	65	95
Front loaders	77	96
Generators	71	83
Graders	72	91

Generic Construction Equipment	Minimum Sound at 50 Feet	Maximum Sound at 50 Feet
Jack hammers and rock drills	80	98
Pumps	69	71
Scrapers	76	95
Trucks	83	96

Source: FHWA Highway Construction Noise and the HEARS database
(a) BA = A-weighted decibels

The types of equipment listed in Table 15-2 may be used at various times and for various amounts of time. Most activities would not occur at the same time. The Applicant expects that the maximum sound level during any of these activities would be between 85 and 95 dBA at 50 feet for a short duration. However, that sound level would quickly drop, similar to what happens when a car passes by. Sound levels are expected to be quieter for areas where activities are occurring at distances greater than 50 feet from the facility.

15.4.3.2 Operation

The sound commonly associated with a wind turbine is described as a rhythmic "whoosh" caused by aerodynamic processes. This sound is created as air flow interacts with the surface of rotor blades. As air flows over the rotor blade, turbulent eddies form in the surface boundary layer and wake of the blade. These eddies are where most of the sound is formed. Additional sound is generated from vortex shedding produced by the tip of the rotor blade. Air flowing past the rotor tip creates alternating low-pressure vortices on the downstream side of the tip causing sound generation to occur. Older wind turbines, built with rotors that operate downwind of the tower (downwind turbines), often have higher aerodynamic impulse sound levels. This is caused by the interaction between the aerodynamic lift created on the rotor blades and the turbulent wake vortices produced by the tower. The wind turbine rotors that would be used on this Project are built to operate upwind of the tower (upwind turbines). Upwind turbines are not impacted by wake vortices generated by the tower, and, therefore, overall sound levels can be as much as 10 dBA less. The rhythmic fluctuations of the overall sound level are less perceptible farther from the turbine. Additionally, multiple turbines operating at the same time would create sound fluctuations at different times. These non-synchronized sounds would blend together to create a more constant sound to an observer at most distances from the turbines. Another phenomenon that reduces perceivable sound from turbines is the wind itself. Higher wind speed produces sound that tends to mask (or drown out) the sounds created by wind turbines.

Advancement in wind turbine technology has reduced pure tonal emissions of modern wind turbines. Manufacturers have reduced distinct tonal sounds by reshaping turbine blades and adjusting the angle at which air contacts the blade. Pitching technology allows the angle of the blade to adjust when the maximum rotational speed is achieved, which allows the turbine to maintain a constant rotational velocity. Therefore, sound emission levels remain constant as the velocity remains the same.

Wind turbines can create sound in other ways as well. Wind turbines have a nacelle where the mechanical portions of the turbine are housed. The current generation of wind turbines uses multiple techniques to reduce the sound from this portion of the turbine: vibration isolating mounts, special gears, and acoustic insulation. In general, all moving parts and the housing of contemporary wind turbines have been designed to limit the sound they generate.

In addition to the wind turbines, the substation proposed for the Project would create sound when it is energized. A substation consists of transformer(s) that create sound through a process called magnetostriction. The sound associated with a substation is generally referred to as a hum. The transformer(s) would have cooling fans that also create sound at various times, depending on system loading and ambient air temperatures.

15.4.3.2.1 Model Inputs and Settings

Predicted Project sound levels were modeled using industry-accepted sound modeling software (see Sound Assessment Study in Appendix C). The program used to model the turbines was the Computer Aided Design for Noise Abatement (CadnaA), Version 4.3.143, published by DataKustik, Ltd., Munich, Germany. The CadnaA program is a scaled, three-dimensional program that takes into account air absorption, terrain, ground absorption, and ground reflection for each piece of sound-emitting equipment and predicts downwind sound pressure levels. The model calculates sound propagation based on International Organization for Standardization (ISO) 9613-2:1996, General Method of Calculation. ISO 9613, and therefore CadnaA, assesses the sound pressure levels based on the Octave Band Center Frequency range from 31.5 to 8,000 Hz.

Predictive modeling was conducted using the hypothetical Project layout of 87 turbines. Sixteen alternate turbine locations were also included in the model. The collector substation was not included in the sound model at this time. Attenuation from ground absorption was incorporated into the model. At this time, terrain data around the Project was not incorporated into the model. The terrain around the Project is mostly rural with few minor changes in elevation. The land is primarily used for agricultural purposes. As such, vegetation is mostly low-lying with some small areas of trees. The terrain around the proposed Project would not be expected to have a large impact on the model results.

CadnaA calculates downwind sound propagation using ISO 9613 standards, thus omni-directional downwind sound propagation and worst-case directivity factors. In other words, the model assumes that each turbine propagates its maximum sound level in all directions at all times. While this likely over-predicts upwind sound levels, this approach has been validated by field measurements.

Atmospheric conditions were based on program defaults. Layers in the atmosphere often form where temperature increases with height (temperature inversions). Sound waves can reflect off of the temperature inversion layer and return to the surface of the earth. This process can increase sound levels at the surface, especially if the height of the inversion begins near the surface of the earth. Temperature inversions tend to occur mainly at night when winds are light or calm, usually when wind turbines are not operating. CadnaA calculates the downwind sound in a manner that is favorable for propagation (worst-case scenario) by assuming a well-developed moderate ground-based temperature inversion such as can occur at night. Therefore, predicted sound level results tend to be higher than would actually occur.

The atmosphere does not flow smoothly and tends to have swirls and eddies, also known as turbulence. There are two basic forms of turbulence: thermal turbulence and mechanical turbulence. Thermal turbulence is caused by the interaction of heated air rapidly rising from the heated earth’s surface, with cooler air descending from the atmosphere. Mechanical turbulence is caused as moving air interacts with objects such as trees, buildings, and wind turbines. Turbulent eddies generated by wind turbines and other objects can cause sound waves to scatter, which in turn provides sound attenuation between the wind turbine and the receiver. The acoustical model assumes laminar air flow, which minimizes sound attenuation that would occur in a realistic inhomogeneous atmosphere. This assumption also causes the predicted sound levels to be higher than would actually occur.

Wind turbine heights and acoustical emissions were input into the model. The nacelles of each wind turbine would be mounted on a tower 80 meters (262.5 feet) high. The expected worst-case sound power levels for the GE 2.3-116 wind turbines were obtained in a confidential document provided by GE and were based on various wind speeds at heights of 10 meters (32.8 feet) above grade. The sound emissions data supplied was determined using IEC 61400-11 acoustic measurement standards. The expected sound power level for each turbine is displayed in Table 15-3.

Table 15-3: GE 2.3-116 Maximum Sound Power Levels

Equipment	dBA at Octave Band Frequency (Hz)[a]									Total Sound Power Level (dBA)[b]
	31.5	63	125	250	500	1000	2000	4000	8000	
GE 2.3-116	79.0	89.0	95.2	99.9	102.9	102.5	97.8	89.2	69.1	105.7

(a) Hz = hertz
(b) dBA = A-weighted decibels

15.4.3.2.2 Modeling Results

A point source at the hub was used to model sound emissions from each wind turbine. This approach is appropriate for simulating wind turbine sound emissions due to the large distances between the turbines and the receivers as compared to the dimensions of the wind turbines. The corresponding sound levels from the table above were applied to every point source. Sound levels were predicted at occupied residences (receivers in the model). Each receiver was assumed to have a height of 1.52 meters (5.0 feet) above ground level.

The following assumptions were made to maintain conservativeness in the model and to estimate the worst case modeled sound levels:

- Attenuation was not included for sound propagation through wooded areas, existing barriers, and shielding
- All turbines were assumed to be operating at maximum power output (and therefore, maximum sound levels) at all times to represent worst-case sound impacts from the Project as a whole

Sound pressure levels were predicted for the identified receivers in the CadnaA sound model using the manufacturer-specified sound power levels and the assumptions listed above. The maximum model-predicted L_{eq} sound pressure levels at each receiver (the logarithmic addition of sound level impacts of each turbine) are included in Appendix B of the Sound Assessment Study. These values represent only the sound emitted by the wind turbines and do not include any extraneous noises (traffic, etc.) that could be present during physical noise measurements.

As previously mentioned, decibels are a logarithmic ratio of a sound pressure to a reference sound pressure. Therefore, they must be logarithmically added to determine a cumulative impact (i.e., logarithmically adding 50 dBA and 50 dBA results in 53 dBA). Logarithmically adding each of the individual turbine's impacts at each receiver provides an overall Project impact at each receiver. The highest model-predicted value at any receptor was 44.8 dBA. Extraneous sounds (grain dryers, traffic, etc.) may make the overall sound level higher than 45.0 dBA in some circumstances, but the turbines alone should not cause that to occur.

15.4.4 Visual Impacts

Visual impacts can be defined as the human response to the creation of visual contrasts that result from the introduction of a new element into the viewed landscape. These visual contrasts interact with the viewer's perception, preferences, attitudes, sensitivity to visual change, and other factors that vary by individual viewer to cause the viewer to react negatively or positively to the changes in the viewed landscape.

Construction, operation, and decommissioning of the proposed Project would potentially introduce visual contrasts in the Project Area that would cause a variety of visual impacts. The types of visual contrasts of concern include the potential visibility of wind turbines, electric transmission structures and conductors, and associated facilities such as roads; marker lighting on wind turbines and transmission structures as well as security and other lighting; modifications to landforms and vegetation; vehicles associated with transport of workers and equipment for construction, operations and maintenance, and facility decommissioning; and the construction, operation, maintenance, and decommissioning activities themselves. A subset of potential visual impacts associated with wind turbine generator structures are blade movement, blade glinting[3], and shadow flicker[4].

The primary visual impacts associated with the Project would result from the introduction of the numerous vertical lines of the wind turbines into the generally strongly horizontal landscape found in the Project Area. The visible structures would potentially produce visual contrasts by virtue of their design attributes (form, color, and line) and the reflectivity of their surfaces and potential glare. In addition, marker lighting could cause visual impacts at night.

For nearby viewers including the rural residences dispersed throughout the Project Area, the large sizes and strong geometric lines of both the individual turbines themselves and the array of turbines could dominate views, and the large sweep of the moving rotors would tend to command visual attention. Structural details, such as surface textures, could become apparent, and the O&M facility and other

[3] Reflection of sunlight from moving wind turbine blades when viewed from certain angles under certain lighting conditions.
[4] As wind turbine blades spin under sunny conditions, they may cast moving shadows on the ground or nearby objects, resulting in alternating light intensity (flickering) as each blade shadow crosses a given point.

structures could be visible as well, as could reflections from the towers and moving rotor blades (blade glint).

As discussed in Section 15.3, viewers within the Project Area include the occupied residences, travelers along State Highways 50, 46, and 37, and hunters utilizing the public hunting areas. For these viewers, the magnitude of the visual impacts associated with the Project would depend on certain factors, including:

- Distance of the proposed wind energy facility 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
- Viewer attitudes toward renewable energy and wind power

Scenic resources with sensitive viewsheds can include national parks, monuments, and recreation areas; national historic sites, parks, and landmarks; national memorials and battlefields; national wild and scenic rivers, national historic trails, national scenic highways, and national wildlife refuges; State- or locally designated scenic resources, such as State-designated scenic highways, State parks, and county parks; and other scenic resources that exist on Federal, State, and other non-Federal lands, including traditional cultural properties important to tribes. The nearest scenic resources to the Project Area are the Lake Andes National Wildlife Refuge (NWR), located approximately 10 miles west of the Project Area, and the Missouri River, designated as a National Recreation River by the NPS, located approximately 10 miles south of the Project Area. At these distances, adverse visual impacts are not anticipated. Depending on topography and atmospheric conditions, the Project turbines could be visible from the NWR or the River. However, the Project would not cause large visual contrasts in the landscape at this distance and would not be noticeably visible, if visible at all.

15.4.5 Shadow Flicker

Shadow flicker occurs when wind turbine blades pass in front of the sun to create recurring shadows on an object. Such shadows occur only under very specific conditions, including sun position, wind direction, time of day, and other similar factors.

The intensity of shadow flicker varies significantly with distance, and as separation between a turbine and receptor increases, shadow flicker intensity correspondingly diminishes. Shadow flicker intensity for distances greater than 10 rotor diameters, which is 1,160 meters for the Project, is generally low and considered imperceptible. At such distances, shadow flicker is typically only caused at sunrise or sunset, when cast shadows are sufficiently long.

Shadow flicker impacts are not currently regulated in applicable State or Federal law, nor are there requirements in the current Charles Mix County ordinances. However, Bon Homme County ordinances limit shadow flicker on a specific residence to a maximum of 30 minutes per day or 30 hours per year at perceivable shadow flicker intensity. Thus, although the Project falls within both Charles Mix and Bon Homme Counties, the existing Bon Homme County requirements were used as a baseline for the entire Project.

Shadow flicker was modeled at the Project Area using WindPRO, an industry-leading software package for the design and planning of wind energy projects (see Shadow Flicker Analysis in Appendix D). This package models the sun's path with respect to every turbine location during every minute over a complete year. Any shadow flicker caused by each turbine is then aggregated for each receptor for the entire year. Predictive modeling was conducted using the hypothetical Project layout of 87 turbines.

Appendix F of the Shadow Flicker Analysis (Appendix D) presents the estimated shadow flicker results by occupied residence, including annual and daily results. Table F-1 and Table F-2 of the study present estimated hours per year of shadow flicker by occupied residence, sorted by receptor name and total flicker time, respectively. Table F-3 and Table F-4 of the study present maximum estimated minutes per day of shadow flicker by occupied residence, sorted by receptor name and total flicker time, respectively.

The following is a set of key observations from the results of the Study:

- 36 of the 135 known receptors were observed to experience shadow flicker over the course of a year.
- 2 of the 135 known receptors exceed the Bon Homme County limitation of up to 30 hours per year of shadow flicker on a specific residence, and 21 of the 135 known receptors exceed the county's limitation of up to 30 minutes per day of shadow flicker on a specific residence.
- Receptor REC-32 is observed to have the most flicker with approximately 34 hours per year and up to 53 minutes in a given day.
- The majority of observed shadow flicker on each residence occurs during early morning and/or late afternoon and evening hours (see Appendix G of the Shadow Flicker Analysis in Appendix D). As a result, the intensity of flicker at these times is expected to be reduced.
- The study was performed using a conservative modeling approach with Project site-specific conditions. For example, the study modeled each receptor as a "green house," meaning each

receptor was modeled as having windows on all sides and effectively causing the home to be susceptible to flicker effects in all directions. Further, the Project Area was modeled as if no obstacles were present, including trees or buildings, which may significantly reduce or eliminate the duration and/or intensity of shadow flicker at a receptor. Due to the conservative approach of the study, the actual duration and intensity of shadow flicker experienced at each receptor is expected to be less than those reported in the study.

- Occurrences of shadow flicker that exceed the Bon Homme County limitation of up to 30 hours per year and 30 minutes per day of shadow flicker on a specific residence would be removed with an operational control system installed at the Project.

Shadow flicker impacts correlate directly with turbine model, number of turbines, and turbine locations. After the final turbine model is selected, the Applicant will conduct additional shadow flicker analyses to identify shadow flicker impacts for that turbine model. To mitigate shadow flicker, the Applicant would first site the turbines in locations that reduce or remove shadow flicker at all receptors. Second, to comply with Bon Homme County's Ordinance, the Applicant would install an operational control system that can automatically limit the shadow flicker at all receptors. The operational control system consists of light sensors at each turbine, accurate locations of all turbines and receptors, and software that calculates the spatial relationship between the turbine and receptors to determine if a shadow is being cast on a receptor whenever a turbine is operating. If it is determined that a shadow is being cast on a receptor, then the software tracks the time the receptor is impacted on a daily and annual basis. If the limits defined in Bon Homme County's Ordinance or other requirements are exceeded, then the turbine is shut down until the spatial relationship between the turbine and receptors is such that a shadow would no longer be cast on a receptor, and the turbine then restarts. The operational control system would be utilized to meet the applicable limits and standards.

15.4.6 Electromagnetic Interference

There is the potential for communication systems to experience disturbances from electric feeder and communication lines associated with wind farms. Based on a desktop review, eight Federal Communications Commission (FCC)-regulated systems were identified within the Project Area. If, after construction, the Applicant receives information relative to communication systems interference potentially caused by operation of the wind turbines in areas where good reception is presently obtained, the Applicant would resolved such problems on a case-by-case basis.

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

The Project would be constructed on agricultural land in Bon Homme and Charles Mix Counties, South Dakota. Land use in Charles Mix County is not regulated by zoning regulations. Land use in Bon Homme County is regulated by the Bon Homme County Zoning Ordinance, adopted on November 3, 2015, and effective December 9, 2015. Bon Homme's ordinance includes a wind energy system regulation, which specifies standards for siting large wind energy systems in the County. The specific standards are identified in Table 9-3 of this Application. Prevailing Winds will comply with the Bon Homme County wind energy siting standards and other applicable provisions of the zoning ordinance.

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

Potential impacts to water quality are addressed in Chapter 12.0. The excavation and exposure of soils during the construction of wind turbines and access roads may cause sediment runoff during rain events. Erosion control BMPs would keep sediments onsite that might otherwise increase sediment loading in receiving waters.

Construction of the Project would 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 would be developed during civil engineering design of the Project and would prescribe BMPs to control erosion and sedimentation. The BMPs may include silt fence, wattles, erosion control blankets, temporary storm water sedimentation ponds, re-vegetation, or other features and methods designed to control storm water runoff and mitigate erosion and sedimentation. The BMPs would be implemented to reduce the potential for impacts to drainage ways and streams by sediment runoff. Because erosion and sediment control would be in place for construction and operation of the Project, impacts to water quality as a result of the Project are expected to be less than significant.

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

The following sections discuss the existing air quality conditions within the Project Area and the potential air quality impacts from the Project.

18.1 Existing Air Quality

The entire State of South Dakota is in attainment for all NAAQS criteria pollutants (EPA, 2015b). The nearest ambient air quality monitoring site to the Project Area is located near Santee, Knox County, Nebraska, which is south and east of the Project Area (EPA, 2016). The primary emission sources that exist within the Project Area include agricultural-related equipment and vehicles traveling along State Highways 50, 46, and 37.

18.2 Air Quality Impacts

During construction of the Project, fugitive dust emissions would temporarily increase due to truck and equipment traffic in the Project Area. Additionally, there would be short-term emissions from diesel trucks and construction equipment. Air quality effects caused by dust would be short-term, limited to the time of construction or decommissioning, and would not result in NAAQS exceedances for particulate matter. Implementation of the Project components would not result in a violation to Federal, State, or local air quality standards and, therefore, would result in less than significant impacts to air quality. Temporary minor sources of air pollution emissions from Project construction equipment, such as a concrete batch plant, would be permitted by the balance-of-plant contractor or concrete batch plant operator through the SDDENR. The operation of the Project would not produce air emissions that would impact the surrounding ambient air quality. Potential complaints regarding fugitive dust emissions would be addressed in an efficient manner.

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

The Applicant expects to have the Project operational as early as December 2017. A preliminary permitting and construction schedule is included in Table 19-1. Although conditions beyond the Applicant's control, such as, but not limited to, delays in interconnection studies, transmission upgrades, or Project financing may delay Project construction and operational date.

Table 19-1: Preliminary Permitting and Construction Schedule

Milestone	Date
Submit SDPUC application	June 2016
Western NEPA approval	April 2017
SDPUC permit award	December 2016
Other Federal, State, and local permits	October 2016
PTC qualify Project	December 2016
Sign wind turbine supply agreement	February 2017
Access road construction	March to December 2017
Wind turbine foundation construction	May to December 2017
Trenching of underground collector system	May to December 2017
Collector substation construction	June to December 2017
230-kV transmission line construction	June to December 2017
Wind turbine erection and pre-commissioning	July 2017 to November 2017
Back-feed station power	October 2017
Testing and final assembly	October to December 2017
Commercial operation date (COD)	December 2017

20.0 COMMUNITY IMPACT (ARSD (20:10:22:23)

The following sections describe the existing socioeconomic and community resources within the Project Area and potential community impacts of the proposed Project.

20.1 Existing Socioeconomic and Community Resources

This section describes the existing Project Area socioeconomic resources, including communities, commercial and industrial sectors, transportation, and cultural resources.

20.1.1 Communities

The Project Area is located in southeastern South Dakota in Charles Mix and Bon Homme Counties. Charles Mix and Bon Homme Counties had estimated populations of 9,287 and 7,023, respectively, in 2014 (U.S. Census Bureau, 2014). Wagner, with an estimated 2014 population of 1,576, is the largest city in Charles Mix County (U.S. Census Bureau, 2014). Wagner is located approximately 3.6 miles west of the Project Area. Avon, in Bon Homme County, is the nearest municipality to the Project Area and is adjacent to the southern boundary of the Project Area. Springfield is the largest municipality in Bon Homme County with a 2014 population estimate of 1,963. The populations of these communities, as well as other communities in Charles Mix and Bon Homme Counties and their distances from the Project Area, are shown in Table 20-1.

Table 20-1: Population Estimates of Communities in Charles Mix and Bon Homme Counties and Distance from Project Area

Community	2014 Population Estimate	County	Distance and Direction from Project Area
Dante	85	Charles Mix	0.5 mile west
Wagner	1,576	Charles Mix	3.6 miles west
Ravinia	62	Charles Mix	10.3 miles west
Lake Andes	833	Charles Mix	15.6 miles west
Pickstown	217	Charles Mix	16.5 miles west
Geddes	212	Charles Mix	25 miles northwest
Platte	1,248	Charles Mix	35 miles northwest
Avon	577	Bon Homme	Adjacent to south border
Tyndall	1,059	Bon Homme	5 miles east
Springfield	1,963	Bon Homme	10 miles southeast
Scotland	830	Bon Homme	16 miles east
Tabor	413	Bon Homme	16 miles southeast

Source: U.S. Census Bureau, 2014

The population in Charles Mix County is predominantly white (64.3 percent), while 32.4 percent of the population is American Indian and 3.3 percent is some other race. In Bon Homme County, 90.4 percent of the population is white, while 5.6 percent is American Indian. The remaining 4 percent is some other race. In the State of South Dakota as a whole, 86 percent of the population is white, 9 percent is American Indian, and 5 percent is some other race (U.S. Census Bureau, 2014).

The median household income in 2014 in Charles Mix and Bon Homme Counties was $41,220 and $42,795, respectively. In 2014, 24.6 and 12.8 percent of the population, respectively, were below the poverty level in Charles Mix and Bon Homme Counties. By comparison, the median household income for the State as a whole was higher ($50, 338) than both counties, and the poverty level (14.2 percent) was between the reported percentages for the counties.

In Charles Mix County, the top industries in terms of employment in 2013 were: (1) educational services, health care, and social services (comprising 28.3 percent of employment); (2) agriculture, forestry, fishing and hunting, and mining (13.7 percent); and (3) retail trade (12.1 percent). In Bon Homme County, the top industries in terms of employment in 2013 were: (1) educational services, health care, and social services (comprising 24.6 percent of employment); (2) agriculture, forestry, fishing and hunting, and mining (18.6 percent); and (3) manufacturing (10.0 percent). The unemployment rates in Charles Mix and Bon Homme Counties in February 2016 were 3.2 and 2.6 percent, respectively, and the South Dakota unemployment for that same month was 3.2 percent (South Dakota Department of Labor and Regulation [SDDLR], 2016).

20.1.2 Commercial, Industrial, and Agricultural Sectors

The Project Area is predominantly agricultural, consisting of a mix of cropland, rangeland, and pastureland. No commercial or industrial land uses are located within the Project Area. In 2012, Charles Mix County’s 759 farms (totaling 692,319 acres of land) produced $227.9 million in agricultural products (USDA, 2012a). Fifty-five percent was from livestock sales, and 45 percent was crop sales. Turkeys were the top livestock inventory item in the county, and soybeans (for beans) was the top crop in terms of acreage. Charles Mix County ranked 14 out of the 66 South Dakota counties in total value of agricultural products sold (USDA, 2012a).

In 2012, Bon Homme County’s 671 farms (totaling 351,596 acres of land) produced nearly $107.9 million in agricultural products (USDA, 2012c). Sixty-two percent was from livestock sales, and 38 percent was crop sales. Cattle and calves were the top livestock inventory item in the county, and soybeans (for beans) was the top crop in terms of acreage. Bon Homme County ranked 43 out of the 66 South Dakota counties in total value of agricultural products sold (USDA, 2012c).

20.1.3 Transportation

This section describes the existing surface transportation and aviation within the Project Area.

20.1.3.1 Surface Transportation

Table 20-2 lists the major roads that intersect the Project Area. The primary access to the Project Area is via South Dakota State Highways 50, 46, and 37, which extend predominantly through the central, southern, and western portions of the Project Area (Figure 1). All three State highways are paved. Secondary access to turbine locations would be via existing County and Township gravel roads. Paved County roads would be avoided wherever possible due to their light construction. Roads would be assessed for strength and condition prior to construction, and the condition of the roads would be documented through high-resolution video prior to construction. County and Township gravel roads determined to be insufficient for construction use would be upgraded and strengthened prior to construction at the Project's expense. County and Township gravel roads would be maintained by the Project's contractor during construction at the Project's expense. Paved roads would be returned to preconstruction or better condition if damage occurs. The Project would enter into Road Use Agreements with each road authority to define use and restoration of roads utilized during construction of the Project.

Table 20-2: Project Area Roads

Road	Surface Type	Surface Width	Total Lanes
State Highway 50	Paved asphalt	24 feet	2
State Highway 46	Paved asphalt	24 feet	2
State Highway 37	Paved asphalt	24 feet	2
Secondary County roads	Gravel or crushed rock / Bituminous	20 to 22	2
Secondary Township roads	Gravel or crushed rock	16 to 20	2

Source: SDDOT, 2015

In 2015, Average Daily Traffic (ADT) volume was 2,697 trips along State Highway 50 through the Project Area, 3,001 trips along State Highway 46, and 2,094 trips along State Highway 37. ADT along 292nd Street through the Project Area was 113 (collected in 2015), and ADT along 401st Avenue was not available (SDDOT, 2015).

20.1.3.2 Aviation

There are no airports located within the Project Area. The closest airport is Wagner Municipal Airport, which is a public airport located in Wagner, South Dakota, approximately 6.5 miles west of the Project Area. The closest private airport to the Project Area is the Plihal Farms airstrip, located immediately north of Tyndall, South Dakota, approximately 6 miles east of the Project Area. The nearest U.S. air military installation is Offutt Air Force Base, located approximately 155 miles southeast of the Project Area (U.S. Air Force, 2016). The nearest South Dakota National Guard Air National Guard installation is the 114th Fighter Wing, located approximately 77 miles northeast of the Project Area at Joe Foss Field Base, in Sioux Falls, South Dakota. The Project would be located inside and adjacent to the boundaries of the Lake Andes Military Operations Area but below the operating floor of 6,000 feet AMSL.

20.1.4 Cultural Resources

HDR conducted a Level I Cultural Resources Records Search for the Project in May 2016 (Appendix E). HDR contacted the South Dakota Archaeological Research Center (SDARC) to acquire data for previously recorded archaeological sites and surveys, bridges, cemeteries, structures, and miscellaneous cultural features within the Project's cultural resources study area. In addition to examining the SDARC files, HDR also reviewed General Land Office (GLO) maps.

Eight previously identified archaeological sites, 14 previously identified architectural properties, 11 previously inventoried bridges, one previously inventoried cemetery, and 17 previous cultural resources surveys are within the cultural resources study area. Of the previously identified resources, two of the seven architectural properties are listed on the NRHP (BO00000032 and CH00000024) and 2 of the 12 bridges are eligible for the NRHP (BO00000293 and CH00000261). All remaining previously identified resources are either not eligible for the NRHP or have not been evaluated.

In addition to reviewing background information, HDR staff conducted a reconnaissance level windshield survey of the Project Area. This windshield survey was completed by HDR staff in June 2016 to assess the current conditions of prevalent land use in the Project Area and determine the potential for encountering significant cultural resources during subsequent phases of the Project. The Project setting along with the information provided by the SDARC suggest additional, as yet undiscovered, sites may be present within the Project Area.

20.2 Socioeconomic and Community Impacts

This section describes the potential impacts of the proposed Project on communities, property values, agriculture, and transportation.

20.2.1 Community Impacts

The Project is expected to create both short-term and long-term positive impacts to the local economy. Impacts to social and economic resources from construction activities would be short-term. Local businesses, such as restaurants, grocery stores, hotels, and gas stations, would see increased business during this phase from construction-related workers. Local industrial businesses, including aggregate and cement suppliers, welding and industrial suppliers, hardware stores, automotive and heavy equipment repair, electrical contractors, and maintenance providers, would also likely benefit from construction of the Project.

The Project, if constructed, would generate over $100 million in direct economic benefits and would use approximately 51 acres of land to produce economic benefits for local landowners, local communities, and the State of South Dakota. Over the life of the Project (25 years), it would create direct payments of more than:

- Approximately $25.7 million to landowners, or $1,128,000 annually from lease payments
- Approximately $8.5 million to Counties and Townships, or $340,000 annually from taxes paid
- Approximately $8.5 million to school district(s), or $340,000 annually from taxes paid
- Approximately $22.1 million to the State of South Dakota, or $885,000 annually from taxes paid

In addition to the direct payments, construction of the Project would create a $14.9 million boost to the local economy. Prevailing Winds estimates that operations and maintenance of the Project would bring 8 to 11 new families to the area and that $220,000 of food, supplies, and fuel would be purchased locally by the Project and Project staff annually (or $20.4 million over the life of the Project).

In South Dakota, wind farms constructed after July 1, 2007, are subject to an alternative taxation calculation in lieu of all taxes on real and personal property levied by the State, counties, municipalities, school districts, and other political subdivisions. The definition of "wind farm" includes only facilities producing electricity for commercial sale that have a minimum capacity of 5 MW. All property used for the wind farm's collector system is eligible for the exemption and alternative taxation.

The alternative taxation method has two components. The first component is an annual tax equal to $3 per kW of capacity of the wind farm, prorated according to when the wind farm begins operation during the first calendar year. The second component is an annual tax on the power produced by a wind farm. Any wind farm producing power for the first time on or after April 1, 2015, shall pay an annual tax of $.00045 per kW-hour of electricity produced by the wind farm. Sections of SDCL that govern the taxation of wind farms are as follows:

10-35-16. Definition of terms. Terms as used in this section and §§ 10-35-17 to 10-35-22, inclusive, mean:

(1) "Collector system," all property used or constructed to interconnect individual wind turbines within a wind farm into a common project, including step-up transformers, electrical collection equipment, collector substation transformers, and communication systems;
(2) "Company," any person, corporation, limited liability company, association, company, partnership, political subdivision, rural electric cooperative, or any group or combination acting as a unit;
(3) "Nameplate capacity," the number of kilowatts a wind farm can produce, as assigned to the power units in the wind farm by the manufacturer and determined by the secretary;
(4) "Wind farm," all real or personal property used or constructed for the purpose of producing electricity for commercial purposes utilizing the wind as an energy source and with a nameplate capacity of at least five thousand kilowatts. The term includes the collector system;
(5) "Transmission line," an electric transmission line and associated facilities including the collector system, with a design of one hundred fifteen kilovolts or more.

10-35-17. Alternative annual tax on wind farm property. Any company owning or holding under lease, or otherwise, real or personal property used, or intended for use, as a wind farm producing power for the first time on or after July 1, 2007, and prior to April 1, 2015, shall pay the alternative annual taxes provided in §§ 10-35-18 and 10-35-19. A wind farm that produces power for the first time on or after April 1, 2015, shall pay the alternative annual taxes provided in §§ 10-35-18 and 10-35-19.1. The alternative taxes imposed by §§ 10-35-18, 10-35-19, and 10-35-19.1, are in lieu of all taxes levied by the state, counties, municipalities, school districts, or other political subdivisions of the state on the personal and real property of the company which is used or intended for use as a wind farm, but are not in lieu of the retail sales and service tax imposed by chapter 10-45, the use tax imposed by chapter 10-46, or any other tax.

10-35-18. Annual tax based on nameplate capacity of wind farm. Any company owning or holding under lease, or otherwise, real or personal property used, or intended for use, as a wind farm producing power for the first time on or after July 1, 2007, shall pay an annual tax equal to three dollars multiplied by the nameplate capacity of the wind farm. The tax shall be imposed beginning the first calendar year the wind farm generates gross receipts. The tax shall be paid annually to the secretary the first day of February of the following year. The tax for the first calendar year shall be prorated based upon the percentage of the calendar year remaining after the company generates gross receipts. Except as otherwise provided in §§ 10-35-16 to 10-35-21, inclusive, the provisions of chapter 10-59 apply to the administration of the tax.

10-35-19. Annual tax on electricity produced by wind farm producing power for first time between July 1, 2007 and April 1, 2015. Any company owning or holding under lease, or otherwise, real or personal property used, or intended for use, as a wind farm producing power for the first time on or after July 1, 2007, and prior to April 1, 2015, shall pay an annual tax of $.00065 per kilowatt hour of electricity produced by the wind farm. The owner of a wind farm subject to tax shall file a report with the secretary detailing the amount of electricity in kilowatt-hours that was produced by the wind farm for the previous calendar year. The secretary shall prescribe the form of the report. The tax for the electricity produced in a calendar year shall become due and be payable to the secretary on the first day of February of the following year. Except as otherwise provided in §§ 10-35-16 to 10-35-21, inclusive, the provisions of chapter 10-59 apply to the administration of the tax.

> 10-35-19.1. Annual tax on electricity produced by wind farm producing power for first time on or after April 1, 2015. Any company owning or holding under lease, or otherwise, real or personal property used, or intended for use, as a wind farm producing power for the first time on or after April 1, 2015, shall pay an annual tax of $.00045 per kilowatt hour of electricity produced by the wind farm. The owner of a wind farm subject to the tax shall file a report with the secretary detailing the amount of electricity in kilowatt-hours that was produced by the wind farm for the previous calendar year. The secretary shall prescribe the form of the report. The tax for the electricity produced in a calendar year shall become due and be payable to the secretary on the first day of February of the following year. Except as otherwise provided in §§ 10-35-16 to 10-35-21, inclusive, the provisions of chapter 10-59 apply to the administration of the tax.
>
> 10-35-20. Wind energy tax fund created. The secretary shall deposit the tax imposed by §§ 10-35-18, 10-35-19, and 10-35-19.1 into the wind energy tax fund. There is created in the state treasury the wind energy tax fund.
>
> 10-35-21. Distributions from wind energy tax fund. The secretary shall distribute all of the tax deposited in the wind energy tax fund pursuant to § 10-35-18 and twenty percent of the tax deposited in the wind energy tax fund pursuant to §§ 10-35-19 and 10-35-19.1 to the county treasurer where the wind farm is located. If a wind farm is located in more than one county, each county shall receive the same percentage of the tax as the percentage of wind towers in the wind farm located in the county. Upon receipt of the taxes, the county auditor shall apportion the tax among the school districts, the county, and the organized townships where a wind tower is located. The tax shall be apportioned by the county auditor by allocating fifty percent of the tax to the school district where each wind tower is located, fifteen percent to the organized township where each wind tower is located, and thirty-five percent to the county. If a wind tower is located in a township that is not organized, the unorganized township's share of the tax for that wind tower is allocated to the county. The secretary shall distribute the money to the counties on or before the first day of May. Any remaining revenue in the wind energy tax fund shall be deposited in the state general fund.
>
> 10-35-22. Repealed by SL 2015, ch 66, § 4, eff. Apr. 1, 2015.

There would be indirect jobs created in the Avon, Tripp, Tyndall, and Wagner areas as a result of increased personal incomes. The Project would purchase station power for the turbines, substation, and O&M building from two local rural electric cooperatives in a portion of their service territories where customers are decreasing and cost to maintain the systems continues to increase.

The local owners of the Project would also have a potential to benefit from the success of the Project, but the returns to the local owners are minor in comparison to economic benefits that the Project would create for landowners, counties, townships, school district(s), the State of South Dakota, local communities, and the local electric cooperatives. The following list provides a summary of the potential economic benefits of the Project:

- Over $100 million in economic benefit from approximately 51 acres of land

- New income for landowners; each turbine pays approximately $8,000 per year in lease payments
- Operations and maintenance jobs; 8 to 11 new permanent high-paying jobs
- Indirect jobs; permanent jobs created as a result of increased personal incomes
- Local constructions jobs and supplies during construction
- Potential new annual tax income for Bon Homme County: Approximately $192,000[5] [6] [7]
- Potential new annual tax income for Charles Mix County: Approximately $148,000[5] [6] [7]
- Potential new annual tax income for Avon School District: Approximately $254,000[6] [7] [8]
- Potential new annual tax income for Wagner School District: Approximately $86,000[6] [7] [9]

For the purpose of providing clarity, the following explains the recent changes (2016 legislative session) made in the South Dakota School Funding Formula. The legislature did not change how wind farm tax dollars are collected or distributed to schools, counties, townships, and the State. What the legislature did change was how new income from wind energy taxes and other local revenue sources are accounted for in determining the amount of State-aid funds a school district with wind turbines located within its boundaries will receive. The new school funding formula is blind to new income from wind energy taxes for the first 5 years after a new wind project begins paying taxes, meaning the school district will receive increased funding from both State-aid and wind energy. In years 6 through 10, the increased funding from wind energy will be reduced by 20 percent each year until it reaches 0 percent, at which point wind energy will no longer increase a school district's revenue above the then current level of State-aid funding. The net effect of the new South Dakota School Funding Formula passed into law in 2016 is an overall increase in school funding for local school districts for the first 9 years of Project operations.

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

The construction crews would include skilled labor, such as foremen, carpenters, iron workers, electricians, millwrights, and heavy equipment operators, as well as unskilled laborers. This diverse

[5] Includes Township tax income
[6] All assumptions are dependent on final turbine locations and are subject to change
[7] All assumptions are based on current SDCLs that govern the taxation of wind farms listed earlier in this section
[8] Assumes 65 turbines in the Avon School District
[9] Assumes 22 turbines in the Wagner School District

workforce would be needed to install all of the Project components, including wind turbines, access roads, underground collector system, O&M building, collector substation, etc. Table 20-3 list the anticipated construction jobs for the Project. Job estimates are based on the recent construction of the Beethoven wind project and an estimate from a wind energy contractor's construction estimate.

Table 20-3: Anticipated Construction Jobs

Total construction days	195
Total man-hours	510,000
Peak construction jobs	245

Only minor changes to population or employment are anticipated as a result of construction and operation of the proposed Project. The Applicant anticipates that there would not be sufficient trained local labor to fill the number of jobs available. The majority of the non-local construction workforce would probably travel within a 55-mile radius, and within that radius, the largest city that would provide workers would be Sioux Falls, South Dakota. Workers within the 55-mile radius would likely not need additional temporary or permanent housing at the Project Area but would commute to the jobs. The Project would have a less than significant impact on overall population and occupation distribution in the Project Area.

Construction activities for the Project would be short-term, and any short-term effects to local businesses would most likely be beneficial. No negative long-term impact to the socioeconomics of the Project Area are expected, and no adverse effects on the industrial sector, housing, labor market, health facilities, water and sewer systems, existing energy facilities, solid waste facilities, schools, fire protection, law enforcement, or other community, government, or recreational facilities are anticipated.

20.2.2 Emergency Response

The proposed wind farm is located within a rural portion of Bon Homme and Charles Mix Counties. During the Project construction period and during subsequent operation, it is expected that the Project would have no significant impact on the security and safety of the local communities and the surrounding area. Some additional risk for worker or public injury may exist during the construction phase, as it would for any large construction project. However, work plans and specifications would be prepared to address worker and community safety during Project construction. During Project construction, the Project's general contractor would identify and secure all active construction areas to prevent public access to potentially hazardous areas.

During Project construction, the Project contractor would work with local and county emergency management to develop procedures for response to emergencies, natural hazards, hazardous materials incidents, manmade problems, and potential incidents concerning Project construction. The contractor would provide site maps, haul routes, project schedules, contact numbers, training, and other requested project information to local and county emergency management.

During Project operations, the Project operator would coordinate with local and county emergency management for the purpose of protecting the public and the property related to the Project during natural, manmade or other incidents. The Project would register each turbine location and the O&M building with the rural identification/addressing (fire number) system and 911 systems.

20.2.3 Property Value Impacts

A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States, prepared by the Ernest Orlando Lawrence Berkeley National Laboratory (Hoen, et al., 2013) for the Office of Energy Efficiency and Renewable Energy, Wind and Water Power Technologies Office, U.S. Department of Energy, studied data collected from more than 50,000 home sales among 27 counties in 9 states, for homes within 10 miles of 67 different wind facilities. Of the 50,000 home sales, 1,198 sales were within 1 mile of a turbine. The authors found no statistical evidence that home values near turbines were affected in the post-construction or post-announcement/pre-construction periods. Previous research on potentially analogous disamenities (e.g., high-voltage transmission lines, roads) suggests that the property-value effect of wind turbines is likely to be small, on average, if it is present at all.

A 2003 Renewable Energy Policy Project (REPP) study (Sterzinger, et al., 2003) of the effect of wind development on property values found no statistical effects of changes in property values over time due to wind-energy projects. This study examined changes in property values within 5 miles of 10 wind energy projects that came online between 1998 and 2001, looking at the 3-year period before and after each project came on-line and using a simple linear-regression analysis. The study found no major pre-post differences, and it also found no major differences when property-value changes in the 5-mile radius area around the wind energy projects were compared with selected "comparable communities."

In October 2015, Prevailing Winds completed a three-step Brookings County 2015 property value survey (PVS) to gather data on property values near wind turbines in South Dakota. Property values were surveyed to assess and look for trends in post-wind farm construction property values at a South Dakota wind farm. The intent of the survey was to compile property value data and opinions for informational purposes and was not intended to be a full study of impacts. The full survey is attached as Appendix E. Below are the abstracts and survey results of the PVS.

20.2.3.1 Abstract of Step 1

Prevailing Winds performed a survey of publicly available 2015 property values in Brookings County, South Dakota. Prevailing Winds began the survey by obtaining publicly available property values for the 233 parcels (Exhibit C of the PVS, Appendix E) of land within and adjacent to the Buffalo Ridge II wind project. The Buffalo Ridge II wind project has wind turbines located in 7 sections of Argo Township and 16 sections of Oaklake Township; there are 15 sections directly adjacent to the sections with turbines. A total of 38 sections within Brookings County were included in the survey. Property records included in the survey were for years 2011, 2012, 2013, 2014, and 2015. Survey results were based on the total difference in property value from the first year of wind turbine operations (2011) to 2015.

The Buffalo Ridge II wind project was constructed in 2010 and began operations in December 2010. The Buffalo Ridge II project is 210 MW and has 105 Gamesa G87 2.0-MW wind turbines. The project is located in northeastern Brookings County and southeastern Deuel County near the towns of Astoria (1.5 miles), Toronto (0.8 mile), and White (3.5 miles). Eighty-one wind turbines are located in Brookings County and 24 wind turbines are located in Deuel County (project fact sheet is included as Exhibit B of the PVS, Appendix E).

The PVS only included parcels located in Brooking County but may be expanded to include the Deuel County parcels in the future. Parcel data was gathered from the Brookings County public tax and GIS system (Beacon, 2015).

20.2.3.2 Survey Results of Step 1

The survey found the following for all property values since 2011 (attached in Exhibit A of the PVS, Appendix E):

- Properties that increased in value: 232
- Average increase in value since 2011: 58 percent
- Properties that decreased in value: 1
- Average decrease in value: 3 percent

The survey found the following for property values of residences since 2011 (attached in Exhibit A of the PVS):

- Total number of residences within area surveyed: 54
- Number of residences not located on farm land (rural acreages): 30
- Number of rural acreages that increased in value: 29
- Number of rural acreages that decreased in value: 1
- Number of residences associated with farming activities (farm places): 24
- Number of farm places that increased in value: 24
- Number of farm places that decreased in value: 0

20.2.3.3 Abstract of Step 2

Prevailing Winds performed a survey of publicly available agricultural land sales in Brookings County, South Dakota, from November 2009 to July 2015 to compare sale prices to assessed values. Prevailing Winds limited its data set to Argo and Oak Lake Townships, where the Buffalo Ridge II project is located.

20.2.3.4 Survey Results of Step 2

The survey found the following sales data for specific parcels:

- Parcel#: 030001124905110 - E1/2NE1/4 EXC. E 800' OF N 470' & W1/2NE1/4 of 5-112-49
  In 2009, 170.46 acres of 100 percent cropland sold for: $741,501
  Assessed value: $226,273
- Parcel#: 030001124916200 - NW1/4EXC.S 1/2SW1/4NW1/4 & NE1/4SW1/4 of 16-112-49
  In 2010, 180 acres of 98 percent cropland sold for: $448,000
  Assessed value: $206,325
- Parcel#: 130001124834400 - SE1/4 of 34-112-48
  In 2011, 160 acres of 83 percent cropland sold for: $888,000
  Assessed value: $226,500
- Parcel#: 030001124935100 - NE1/4 of 35-112-49
  In 2012, 160 acres of 93 percent crop land sold for: $944,000
  Assessed value: $274,700
- Parcel#: 130001124825100 - S1/2NE1/4 of 25-112-48
  In 2013, 80 acres of 31 percent cropland sold for: $288,791
  Assessed value: $82,200

- Parcel#: 130001124825400 - S1/2SE1/4 of 25-112-48
  In 2013, 80 acres of 4.2 percent cropland sold for: $213,181
  Assessed value: $56,700
- Parcel#: 130001124825410 - N1/2SE1/4 of 25-112-48
  In 2013, 80 acres of 3.5 percent cropland sold for: $187,266
  Assessed value: $49,800
- Parcel#: 130001124822100 - E1/2NE1/4 of 22-112-48
  In 2014, 80 acres of 26 percent cropland sold for: $130,000
  Assessed value: $81,300
- Parcel#: 030001124916400 - SE1/4 of 16-112-49
  In 2015, 160 acres of 92 percent cropland sold for: $960,000
  Assessed value: $355,900

20.2.3.5 Abstract of Step 3

Prevailing Winds, through one of its consultants, obtained the results of a phone survey conducted in September 2015 of auctioneers near or around wind project areas in South Dakota to get their opinion on the effect wind turbines have on land values.

20.2.3.6 Survey Results of Step 3

The responses from auctioneers are as follows:

- Hyde, McPherson, and Hand Counties
  Advantage Land Auctions - Brookings: 605-692-2525
  Spoke to: Jackson Hegerfeld, "Buyers don't seem to even consider they're around; no difference."
- Day County
  Thorpe Auction - Aberdeen: 605-225-7776
  Spoke to: Jim Thorpe, "I haven't done any, but I doubt it would be measurable."
- Jerauld County
  Bob Hansen Auctions - Salem: 605-425-2608
  Spoke to: Marshall Hansen, "No effect at all."
- Deuel and Clark Counties
  Burlage-Peterson Auction - Brookings: 605-692-7102
  Spoke to: Lenny Burlage, "Land prices up where turbines are located; absolutely no effect on neighboring property."

- Bon Homme County

  Peterson Auction - Springfield/Tyndall: 605-369-2638

  Spoke to: Glen Peterson, "Haven't done any land auctions on or near wind turbines, so couldn't say."
- Hutchinson and Charles Mix Counties

  Wieman Auction: 800-251-3111

  Spoke to Carol Wieman, "No idea, haven't done any auctions near wind turbines."
- Lincoln County

  Westra Atkins Land: 605-310-6941

  Spoke to Joel Westra, "Haven't done any recent land auctions in Lincoln County, but I don't hear or see anything either way."

The full survey document is attached in Appendix F of this Application.

20.2.4 Agricultural Impacts

Minimal existing agricultural land would be taken out of crop and forage production by the proposed Project, primarily the area around wind turbine foundations, access roads, and electric collection and interconnection facilities. Landowners would be compensated by the Applicant 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 would not alter agricultural activities.

Approximately 673 acres of agricultural land (including cropland and grassland) would be temporarily impacted by Project construction. It is estimated that approximately 51 acres of agricultural land would be permanently impacted, which constitutes less than 0.2 percent of the total land within the Project Area. Areas disturbed due to construction and that would not host permanent Project facilities would be re-vegetated with vegetation types matching the surrounding agricultural landscape.

20.2.5 Transportation Impacts

This section addresses the potential impacts of the proposed Project on ground transportation and air traffic.

20.2.5.1 Ground Transportation

The Project Area contains three two-lane paved State Highways, three two-lane paved County Roads, and several County and Township gravel roads. During construction, it is anticipated that several types of light, medium, and heavy-duty construction vehicles would travel to and from the site, as well as private vehicles used by the construction personnel. Construction hours are expected to be from 6:00 a.m. to 9:00 p.m. on weekdays, and possibly on weekends. Some activities may require extended construction hours, and nighttime construction may be necessary to meet the overall proposed Project schedule. The movement of equipment and materials to the site would cause a relatively short-term increase in traffic on local roadways during the construction period. Most equipment (e.g., heavy earthmoving equipment and cranes) would remain at the site for the duration of construction activities. Shipments of materials, such as gravel, concrete, and water would not be expected to substantially affect local primary and secondary road networks. That volume would occur during the peak construction time when the majority of the foundation and tower assembly is taking place. At the completion of each construction phase, this equipment would be removed from the site or reduced in number.

The Project would not result in any permanent impacts to the area's ground transportation resources. There would be improvements to most gravel roads and temporary impacts to local roads during the construction phase of the Project. The Applicant would work with each County and Township on Road Use Agreements during the permitting process so that all parties understand how the Project would proceed prior to construction starting. Within the Project Area, oversized and overweight loads would be strictly confined to roads designated in the Road Use Agreement. The Applicant would work with SDDOT, Charles Mix and Bon Homme Counties, and Choteau Creek and Lone Tree Townships to obtain the appropriate access and use permits, and to reduce and mitigate the impacts to area transportation.

20.2.5.2 Air Traffic

The air traffic generated by the airports listed above would not be impacted by the proposed Project. The Applicant would follow FAA guidelines for marking towers and would implement the necessary safety lighting. Notification of construction and operation of the wind energy facility would be sent to the FAA, and steps would be taken to comply with FAA requirements. The Applicant would file Notices of Proposed Construction (Form 7460-1) with the FAA for all wind turbines and permanent meteorological tower(s) locations and updated filings as needed during micro-siting. The Applicant would also file Tall Structures Aeronautical Hazard Applications with the South Dakota Aeronautics Commission for a permit approving the proposed wind turbines and permanent meteorological tower(s) locations.

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 turbine towers in active croplands and installation of aboveground collector and transmission lines would create potential hazards for crop-dusting aircraft. However, aboveground collection and transmission lines are expected to be similar to existing distribution lines (located along the edges of fields and roadways), and the turbines and meteorological tower(s) themselves would be visible from a distance and lighted and marked according to FAA guidelines.

20.3 Cultural Resource Impacts

The Applicant would physically avoid previously recorded resources (identified in Section 20.1.4) during Project construction and operation activities. In addition, in recognition that Project activities may encounter as yet unidentified archaeological resources, the Applicant will conduct a Level III archaeological survey for areas that would be physically impacted by the Project. These areas may include, but are not limited to, the proposed footprint of the turbines, substation, temporary work areas, staging areas, and access roads and cable routes. In addition, the Applicant would conduct a Historic Architectural Resources Reconnaissance Survey focusing on locating standing historic-era structures in the foreground of proposed turbines to assess the visual impacts of the Project on their integrity of setting. All work would be conducted in accordance with the *South Dakota Guidelines for Cultural Resource Surveys and Survey Report*s (South Dakota State Historical Society, 2005), *South Dakota Historic Resource Survey Manual* (Vogt, 2006), and the *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation* (NPS, 1983). The Applicant will make every reasonable effort to physically avoid identified potentially eligible resources.

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

See Section 20.2.1.

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

No future additions and modifications are anticipated at this time due to constraints on the SPP transmission system. As noted in Section 8.1, the Applicant requests that the SDPUC approve the Project based on the Project Area and Project size of 201 MW, with the understanding that turbine locations may ultimately be relocated or not be constructed as part of the Project or, alternately, that additional turbine locations may be required within the Project Area.

23.0 DECOMMISSIONING OF WIND ENERGY FACILITIES (ARSD 20:10:22:33.01)

Decommissioning would be triggered at the end of the Project's serviceable life or upon discontinuation of its use, as described below. The Project shall be considered a discontinued use after 1 year without energy production, unless a plan is developed outlining the steps and schedule for returning the Project to service. The Project and accessory facilities shall be decommissioned following discontinuation of use.

The purpose of the Decommissioning Plan (Appendix G) is to commit that the Project facility and its related structures are properly removed at the end of their useful life and that the surrounding soil and vegetation is restored to a usable and nonhazardous condition. Moreover, the Decommissioning Plan also requires that sufficient financial resources are available to undertake proper decommissioning. The Decommissioning Plan contains three components: (1) the manner of equipment removal and site restoration; (2) the estimated costs of decommissioning and salvage; and (3) a description of alternative financial assurance instruments to provide for the availability of funds to cover the estimated decommissioning costs.

In addition to any requirements under the Permits, each individual land lease requires proper decommissioning of turbines. Decommissioning of the site would include removal of turbines and related facilities. Removal of related facilities would include access roads, equipment, towers, buildings, transformers, and cables or wires. Foundations would be removed to a depth of 4 feet below grade and backfilled. Additionally, disturbed surfaces would be graded, reseeded, and restored as nearly to preconstruction conditions as is possible.

The Applicant reserves the right to extend options instead of decommissioning at the end of the site permit term. These options may include applying for an extension of the Permits, if necessary, and continuing operation of the Project. 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.

23.1 Facility Dismantling, Removal, and Site Restoration

Based on experience in the wind industry, the decommissioning process for the Project would be as follows:

1. Mobilize cranes to the site for each wind turbine.
2. Dismantle and remove the rotor, nacelle, and towers and transport entire wind turbine generator off-site.

3. Bring an excavator to expose applicable portions of each foundation. Then, with an air hammer or comparable equipment, the concrete foundations and transformer pads would be removed to a depth of at least 4 feet in compliance with the landowner's agreement, and applicable State and Federal environmental regulations. Any agreement for removal to a lesser depth or for no removal shall be recorded with the county and shall show the locations of all such foundations. All such agreements between the permittee and the affected landowner shall be submitted to the SDPUC prior to the completion of restoration activities. At this time, there are no agreements with any landowner that would specify restoration to a lesser depth than the 4 feet. For the purposes of the decommissioning cost estimates, it is assumed that the facility equipment would be removed to a depth of 4 feet below ground surface.
4. Within the foundation excavation limits, remove the metal and cable to a depth of 4 feet below ground surface. For the purposes of the decommissioning cost estimates it is assumed that the facility equipment would be removed to a depth of 4 feet below ground surface. Where possible, the metal and cable items would be separated and recycled.
5. Backfill the holes with the soil that was excavated and grade the foundation areas to as close as reasonably possible to the original ground contours. Topsoil would be added as required to support revegetation to original condition.
6. Other than those roads that the landowners wishes to retain, access roads owned by the Project operator that lead to the wind turbines would be removed and restored to preconstruction conditions. Areas would be graded as close as reasonably possible to the original ground contours. For the purposes of the decommissioning cost estimate, it is assumed that all the site access roads would be removed.
7. Remove transformers and all other substation equipment from the site associated with the Project. Remove all concrete foundations, gravel and fencing, and grade area as close as reasonably possible to the original substation conditions.
8. Underground cable circuits are anticipated to be buried at a depth of 4 feet below grade. All cable would be cut off and abandoned in place. For the purposes of the decommissioning cost estimates, it is assumed that the facility equipment would be removed to a depth of 4 feet below ground surface.
9. Materials and components that can be salvaged would be recycled or resold.
10. All decommissioning and restoration activities would be performed in accordance with South Dakota PUC Wind Energy Ordinance and County permit conditions. The permittee would submit a copy of such permits and authorizations to the Counties upon request.

11. The permittee would comply with all laws applicable to the generation, storage, transportation, clean-up, and disposal of hazardous wastes generated during any phase of the Project's life.
12. All decommissioned gearboxes, transformers, and hydraulic systems would be drained of fluids and put into appropriate containers before dismantling, and would be transported and disposed of in accordance with all State and Federal environmental regulations.
13. To the extent that it is determined that it is more cost-effective to remove the turbine foundations using blasting techniques, a Blasting Plan would be developed, and prior approval would be obtained from County officials. All blasting operations would be conducted in accordance with State Fire Marshall and Occupational Safety and Health Administration (OSHA) rules and regulations.

23.2 Estimated Costs for Decommissioning and Site Restoration

Please see Attachment A of Appendix G for the current estimate of costs for decommissioning and restoration of the Project facility and returning the site, as close as reasonably possible, to preconstruction condition suitable for agricultural use. The estimate is based on the decommissioning approach outlined above and is conservatively based on the removal of 87 2.3-MW wind turbine generators, turbine transformers, the collector substation, the site access roads, and meteorological towers.

The cost estimate takes into account two major financial considerations: the cost to conduct the Project decommissioning and restoration activities (i.e., outgoing expenditures), and, when applicable, the salvage value of components being decommissioned (i.e., incoming revenue). To be conservative, the salvage value used in this cost estimate is 70 percent of the currently estimated market value for those salvageable components.

23.3 Financial Assurance to Accomplish Decommissioning

The Decommissioning Plan identifies the financial resources that would be available to pay for decommissioning and removal of the Project and accessory facilities. The Applicant would demonstrate financial resources to complete the requirements of the approved Decommissioning Plan after the tenth year of operation of the Project by one of the following methods of Financial Assurance:

- Letter of credit
- Net worth test
- Escrow account
- Performance or forfeiture bond

If any portion of the Project has been decommissioned in accordance with this Decommissioning Plan and to the satisfaction of the County, the Applicant shall be entitled to refund of any or all the amount of financial assurance in the amount of decommissioning cost set forth in this Decommissioning Plan allocable to the portion of the Project so decommissioned by the Applicant.

The Applicant shall provide for the right of entry by authorized agents of the State and County onto the project site, subject to the delivery of reasonable prior notice, for the purposes of effecting or completing any required decommissioning under this Decommissioning Plan, in the event that the Applicant fails to perform its obligations under this Plan.

24.0 RELIABILITY AND SAFETY (ARSD 20:10:22:33.02)

The following sections discuss the reliability and safety of the wind farm facility.

24.1 Reliability

Reliability (Availability) is defined as the ability of the turbine to generate electricity when sufficient wind is available. GE has over 29,000 wind turbines (47.5 GW) currently installed globally. GE's turbine availability record is 98 percent for all turbines installed since 2010. To further provide for reliability and to protect the Project financially, wind project owners require availability guarantees in turbine supply agreements with turbine manufacturers and long-term turbines service contracts with O&M service providers. Availability guarantees require the turbine manufacturers and O&M service providers maintain the turbine at 96 percent Availability or higher. If the turbine manufacturers and O&M service providers fail to maintain the required level of Availability, then the turbine manufacturers and O&M service providers are required to pay a project liquidated damages for the lost revenue from lost energy production. Typically, the turbine manufacturer maintains the turbine for the first 2 years, then the turbines are maintained under O&M service contracts with terms of 5 or 10 years.

SPP has studied wind integration to provide continued reliable operation of the region's power grid now and in the future when significant additions of wind energy capacity would be added. The most recent study is the 2016 Wind Integration Study, released on January 5, 2016 (SPP, 2016). The 2016 Wind Integration Study identified that wind energy in SPP has grown over the last several years and represented approximately 14 percent of system capacity at the end of 2015. Wind energy is expected to expand to higher levels in the future. Recommendations in the 2016 Wind Integration Study outline specific tasks that, if implemented, would enable the SPP transmission system to reliably handle up to 60 percent wind penetration levels. The listed recommendations would increase transmission reliability and provide additional reliability capabilities as additional wind energy is installed throughout the SPP region. Below are the 2016 Wind Integration Study recommendations:

- Install voltage reactive support capabilities for existing wind farms.
- Install enhanced operations tools for dynamic reactive reserves and develop criteria requirements for real-time operations.
- Install real-time operations tools to calculate and monitor real-time voltage stability limits using an applicable real-time software suite.
- Provide additional flexibility to the reliability coordinator for non-dispatchable variable energy resource (NDVER) redispatch.

- Develop additional planning criteria to enhance analysis requirements for incorporating a more robust scenario development.
- Expedite approved integrated transmission plan (ITP) projects.
- Evaluate the bulk electric system impacts with the addition of solar photovoltaics in combination with wind.
- Perform an additional evaluation of phasor measurement units (PMU) applications to provide real-time situational awareness.

To further improve reliable operation of the region’s power grid, wind energy projects are required to provide short-term forecasts of wind speed and energy that would be produced. Accurately anticipating weather conditions lets wind energy project owners and operators get the most out of the facilities. Transmission system operators need to know how much energy wind facilities can deliver and when to dispatch generators on the system to match load to generation. Typically, wind projects provide a next-day, next-hour, and next-15 minutes forecast, updated every 15 minutes to the off-taker, balancing authority, and/or regional TO. These predictions of energy generation through in-depth, site-specific weather forecasting are used to integrate wind energy into the region’s power grid and to schedule turbine and transmission maintenance windows, improving overall reliability.

24.2 Safety

The Project Area is located in an area of low population density; therefore, construction and operation of the Project would have minimal impacts on the security and safety of the local population. The following safety measures would be taken to reduce the chance of physical and property damage, as well as personal injury, at the site:

- The towers would be placed at distances away from existing roadways and residences per the applicable planned setback requirements described in Section 9.2
- Security measures would be implemented during the construction and operation of the Project, including temporary (safety) and permanent fencing, warning signs, and locks on equipment and wind power facilities
- Turbines would sit on solid steel enclosed tubular towers; access to each tower would be only through a solid steel door that would be locked and accessed only by authorized personnel
- Tower exteriors would be designed to be unclimbable
- Turbines would conform to applicable industry standards
- A professional engineer would certify that the foundation and tower design of the turbines is within accepted professional standards, given local soil and climate conditions

25.0 INFORMATION CONCERNING WIND ENERGY FACILITIES (ARSD 20:10:22:33.02)

The following information requirements concerning wind energy facilities have been discussed in previous sections of this Application, as indicated below.

- Configuration of wind turbine – Section 8.2 and Figure 3
- Number of wind turbines – Sections 8.1 and 22.0
- Warning lighting requirements for wind turbines – Section 20.2.5.2
- Setback distances – Section 9.2
- Sound levels during construction and operation – Section 15.4.3
- Electromagnetic interference – Section 15.4.6
- Site and major alternatives – Section 9.0 and Figures 5 and 9
- Reliability and safety – Section 24.0
- Right-of-way or condemnation requirements – Section 8.0 and 9.3
- Clearing activities – Sections 8.2 and 13.2
- Configuration of interconnection towers and poles – Section 8.7
- Conductor and structure configurations – Section 8.7
- Underground electric interconnection facilities – Section 8.7

Please refer to Chapter 3.0 Completeness Checklist (ARSD 20:10:22:33.02, Information concerning wind energy facilities) for additional requirement details.

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

The following sections discuss permits and approvals, agency coordination, public and agency comments, and burden of proof.

26.1 Permits and Approvals

The Project must comply with Federal, State, and local laws requiring permits or approvals. Table 26-1 lists the permits and approvals that are anticipated as part of the Project.

Table 26-1: List of Potential Permits or Approvals

Agency	Permit/Approval	Description	Status
Western	NEPA compliance	EA required for interconnection to Western transmission line	To be completed prior to approval of interconnection agreement
USFWS	Threatened and endangered species – Section 7 compliance	Determination of effect on federally listed species	To be completed in conjunction with EA
FAA	Form 7460-1, Notice of Proposed Construction or Alteration	Required if construction or alteration is within 6 miles of public aviation facility and for structures higher than 200 feet	Will be completed after final design is complete
USACE	Section 404 permit	Complete an application under the Clean Water Act for impacts to wetlands and waters of the U.S.	Unlikely, but to be determined once layout is finalized
Native American tribes	Section 106 consultation	Determination of effect on Native American cultural resources	To be completed in conjunction with EA
South Dakota SHPO	Section 106 consultation	Determination of effect on archaeological and historical resources	To be completed in conjunction with EA
SDPUC	Energy Facility Site Permit	Application required for wind facilities with nameplate capacity greater than 100 megawatts	Submitted June 2016
SDGFP	Coordination	Coordination as part of the EA process	Ongoing
SDDENR	401 Water Quality Certification	Complete an application under the Clean Water Act, only if Individual Permit is required for Section 404	Not anticipated unless individual Section 404 permit is needed from USACE

Agency	Permit/Approval	Description	Status
	General Permit for Storm Water Discharges Associated with Construction Activities (NPDES)	Storm water permit required for construction activities	SWPPP will be prepared and Notice of Intent will be submitted after final design is complete
	Temporary Water Use Permit	Temporary permits for the use of public water for construction, testing, or drilling purposes; issuance of a temporary permit is not a grant of water right	If necessary, will be obtained prior to construction
	General Permit for Temporary Discharges	Temporary permit for the use of public water for construction dewatering	If necessary, will be obtained prior to construction
	Water Rights Permit for Nonirrigation Use	Needed if water will be appropriated for O&M facility	If necessary, will be obtained prior to construction
	Mine License Permit	Required to mine sand, gravel, or rock to be crushed and used in construction	If necessary, will be obtained prior to construction
SDDOT, Aeronautics Commission	Aeronautical Hazard Permit	Permit lighting plan determined with FAA coordination	Will be completed after final design is complete
SDCL 49-32-3.1	Notice to telecommunications companies	Telecommunication companies review the preliminary electrical layout and may suggest revisions to reduce impact to their systems	Will be completed after final design is complete
SDDOT	Highway Access Permit	Permit required for any access roads abutting State roads	If necessary, will be obtained after final design is complete
	Utility Permit	Permit required for any utility crossing or use within State road right-of-way	If necessary, will be obtained after final design is complete
	Oversize & Overweight Permit	Permit required for heavy equipment transport over State roads during construction	Will be obtained prior to construction
Bon Homme County	Conditional Use Permit	Permit required for construction of the Project	Will be obtained prior to construction
	Individual Building Permits	Permit required for construction of each turbine and building	Will be obtained prior to construction

Agency	Permit/Approval	Description	Status
Charles Mix County	Individual Building Permits	Permit required for construction of each turbine and building	Will be obtained prior to construction

26.2 Agency Coordination

The Applicant will continue to coordinate with various Federal, State, and local agencies to identify agency concerns regarding the proposed Project, as it has in various manners of communication at different stages of the Project as far back as 2014. Following is a list of the agencies that the Applicant has contacted regarding the Project:

- SDGFP
- South Dakota State Historic Preservation Office (SHPO)
- USFWS
- Western
- Bon Homme County
- Charles Mix County

Additional agency and public coordination will be conducted in conjunction with the scoping process required for the EA. Western will be the lead Federal agency for the EA. The Applicant will continue working with the public and interested Federal, State, and local agencies to address any comments they have regarding the Project. Additional opportunities for public and agency comments will be held as part of the review process for this Application.

26.3 Public and Agency Comments

As discussed in Chapter 9.0, the Applicant considered several potential Project sites in South Dakota before choosing the existing site. The Applicant considered input from agencies and the public in siting the Project. Factors that were considered included:

- Project distance from the Missouri River, where higher populations of many plant and animal species are present
- Project distance from the Whooping Crane Migration Corridor
- State and Federal Lands within or near Project Area
- Grasslands and habitats within or near Project Area
- Existing eagle nests located northeasterly of Project Area

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

As described in Chapters 2.0 and 3.0, the Applicant has addressed the matters set forth in SDCL Chapter 49-41B and in ARSD Chapter 20:10:22 (Energy Facility Siting Rules), related to wind energy facilities.

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

- The proposed wind energy and transmission facilities would comply with applicable laws and rules
- The facilities would not pose a threat of serious injury to the environment or to the social and economic condition of inhabitants in or near the Project Area
- The facilities would not substantially impair the health, safety, or welfare of the inhabitants
- The facilities would not unduly interfere with the orderly development of the region, having given consideration to the views of the governing bodies of the local affected units of government

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

The following sections consist of the list the preparers and the Applicant verification.

27.1 List of Preparers

Table 27-1 lists the individuals that contributed to this Application.

Table 27-1: List of Preparers

Company	Individual	Title
Prevailing Winds	Roland Jurgens	Project Manager
Burns & McDonnell	Jennifer Bell	Senior Environmental Scientist
Burns & McDonnell	Molly Hughes	Senior Environmental Scientist
Burns & McDonnell	Jerrad Dringman	GIS Analyst
WEST	Clayton Derby	Wildlife Biologist
HDR	Alan Stanfill	Cultural Resource Specialist
HDR	Jill Rust	Biologist/Environmental Scientist

27.2 Applicant Verification

Mr. Roland Jurgens, being duly sworn, deposes and states that he is the Project Manager of the Project, and as the authorized representative of the Applicant is authorized to sign this Application on behalf of the Project Owner/Applicant, Prevailing Winds, LLC.

He further states that he does not have personal knowledge of all the facts recited in the Application and Exhibits and Attachments attached hereto, but the information has been gathered from employees and agents of the Owner/Applicant, and the information is verified by him as being true and correct on behalf of the Owner/Applicant.

Dated this 28th day of June 2016.

Mr. Roland Jurgens

28.0 REFERENCES

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APPENDIX A – FIGURES

APPENDIX B – WILDLIFE REPORT

APPENDIX C – SOUND ASSESSMENT STUDY

APPENDIX D – SHADOW FLICKER ANALYSIS

APPENDIX E – CULTURAL RESOURCES REPORT (NOT FOR PUBLIC DISCLOSURE)

APPENDIX F – PROPERTY VALUE SURVEY

APPENDIX G – DECOMMISIONING COST ESTIMATE

APPENDIX H – WETLAND DETERMINATION REVIEW

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