APPLICATION TO THE PUBLIC UTILITIES COMMISSION OF THE STATE OF SOUTH DAKOTA FOR A FACILITY PERMIT TO CONSTRUCT A 300.6-MEGAWATT WIND FACILITY

CROWNED RIDGE II WIND FARM

Crowned Ridge Wind II, LLC

April 1, 2019

Table of Contents

List of Appendices

List of Figures

List of Tables

LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
ADLS	Aircraft Detection Lighting System
Applicant	Crowned Ridge Wind II, LLC
ARSD	Administrative Rules of South Dakota
BMP	best management practice
CFR	Code of Federal Regulations
CMWS	composite mean wind speed
COD	commercial operations date
Commission	South Dakota Public Utilities Commission
CUP	Conditional Use Permit
dBA	A-weighted decibel
ECPG	Eagle Conservation Plan Guidance
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
FHA	Farmers Home Administration
fmsl	feet above mean sea level
GE	General Electric
GIS	geographic information system
GLO	General Land Office
IEC	International Electrotechnical Commission
km	kilometer(s)
kV	kilovolt(s)
m	meter(s)
MET	meteorological
MISO	Midcontinent Independent System Operator, Inc.
MW	megawatt(s)
N	North
NEER	NextEra Energy Resources, LLC
NHD	National Hydrography Data
NLCD	National Land Cover Database
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NSP	Northern States Power Company
NWI	National Wetlands Inventory
NWP	Nationwide Permit
O&M	operations and maintenance
PPA	Power Purchase Agreement
R	Range
ROCC	Renewable Operations Control Center
ROW	right-of-way
SCADA	supervisory control and data acquisition
SDCL	South Dakota Codified Law
SDDENR	South Dakota Department of Environment and Natural Resources

SDDOA	South Dakota Department of Agriculture
SDDOT	South Dakota Department of Transportation
SDGFP	South Dakota Game, Fish, and Parks
SDPUC	South Dakota Public Utilities Commission
SEP	Special Exception Permit
SHPO	State Historic Preservation Office
SPCC Plan	Spill Prevention, Control, and Countermeasures Plan
SRHP	State Register of Historic Places
SSURGO	Soil Survey Geographic
SWPPP	stormwater pollution prevention plan
T	Township
TCP	traditional cultural property
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
W	West
WEG	Wind Energy Guidelines
WIA	walk-in area

1.0 Introduction

1.1 Executive Summary Introduction

Crowned Ridge Wind II, LLC (the Applicant), a wholly owned, indirect subsidiary of NextEra Energy Resources, LLC (NEER), is requesting an Energy Facility Permit from the South Dakota Public Utilities Commission (Commission or SDPUC) for a 300.6-megawatt (MW) wind energy conversion facility to be located in Codington, Deuel, and Grant Counties, South Dakota (the Project).

The Project will be situated within approximately 60,996 acres (the Project Area) (Figure 1 in Appendix A), and the total installed capacity of the Project will not exceed 301 MW. Project components will include the following.

- Up to 132 wind turbine generators.
- Access roads to turbines and associated facilities.
- Underground 34.5-kilovolt (kV) electrical collection lines connecting the turbines to the collector substation.
- Underground fiber-optic cable for turbine communications co-located with the collection lines.
- The low-side of a 34.5- to 230.0-kV collector substation.
- Two permanent meteorological (MET) towers.
- An operations and maintenance (O&M) facility.
- Additional temporary construction areas, including a concrete batch plant area.

The Project will use the Crowned Ridge II 5-mile 230-kV generation tie line[1] and the Crowned Ridge Wind II collector substation to transmit the generation to the dead-end transmission structure adjacent to the Crowned Ridge Wind Project collector substation. Using a breaker position at the Crowned Ridge Wind Project collector substation, the 300.6 MW from Crowned Ridge Wind II Project will be aggregated with the 300 MW from the Crowned Ridge Wind Project collector substation and conjoined to the Crowned Ridge 230-kV transmission line.[2] The transmission line will connect to the reactive compensation substation, then terminate at the Big Stone South 230-kV Substation approximately 100 feet away that is owned by Otter Tail Power Company.

[1] The Crowned Ridge II generation tie line was approved in Docket EL18-018.
[2] The Crowned Ridge 230-kV transmission line was approved in Docket EL 17-050.

The Applicant has entered into a purchase and sale agreement under which it will permit and construct this Project, and, thereafter, transfer the Project, along with its Facility Permits, to Northern States Power Company (NSP) at the commercial operations date (COD). The commercial operations date for the Project is projected to be in or before the second quarter of 2020.

On July 6, 2017, the Minnesota Public Utilities Commission approved NSP's Petition for Approval of the Acquisition of Wind Generation from the NPS's 2016–2030 Integrated Resource Plan, including the Power Purchase Agreement (PPA) with the Applicant and the acquisition and transfer of the Project. On December 6, 2018, North Dakota Public Service Commission issued an order granting an advance determination of prudence for the PPA between NSP and the Applicant.

The Applicant has actively developed the Project over the past 10 years, working closely with federal and state agencies, landowners, and tribal and local governments to properly design the Project. The Applicant will continue this collaborative process throughout the development, construction, and operation phases of the Project.

Throughout this Application, the term Project Construction Easement refers to the area within which all temporary and permanent impacts will occur within the Project Area.

1.2 Completeness Checklist

Consistent with South Dakota Codified Law (SDCL) 49-1-8 and Administrative Rules of South Dakota (ARSD) 20:10:13:01(1), Table 1.1 sets forth the Commission filing requirements with an identification of where the requirement is addressed in this Application.

Table 1.1. Completeness Checklist

SDCL	ARSD	Required Information	Section in Application
49-41D-11(1) through (11) 49-41B-35(2)	20:10:22:05	**Application contents.** The application for a permit for a facility shall contain a list of each permit that is known to be required from any other governmental entity at the time of the filing. The list of permits shall be updated, if needed, to include any permit the applicant becomes aware of after filing the application. The list shall state when each permit application will be filed. The application shall also list each notification that is required to be made to any other governmental entity.	24.0
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.	3.0

SDCL	ARSD	Required Information	Section in Application
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.	3.0
49-41B-11(8)	20:10:22:08	**Purpose of facility.** The applicant shall describe the purpose of the proposed facility.	4.0
49-41B-11(12)	20:10:22:09	**Estimated cost of facility.** The applicant shall describe the estimated construction cost of the proposed facility.	5.0
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.	4.0
49-41B-11	20:10:22:11	**General site descriptions.** 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.	6.0
49-41B-11(6);34A-9-7(4)	20:10:22:12	**Alternative sites.** The applicant shall present information related to the 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 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.	7.0

SDCL	ARSD	Required Information	Section in Application
49-41B-11(11); 49-41B-22(2)	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 of the environment as a result of their construction or operation in the transmission site or siting area.	9.0–18.0
49-41B-11(11); 49-41B-22(2)	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 transmission site or through which the transmission facility will pass; (2) A topographic map of the transmission site or siting area; (3) A written summary of the geological features of the or transmission site using the topographic map as a base showing the bedrock geology and surficial geology with sufficient cross-sections to depict the major subsurface variations in the siting area; (4) A description and location of economic deposits such as lignite, sand and gravel, scoria, and industrial and ceramic quality clay existent within the transmission site; (5) A description of the soil type at the 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 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.	9.0

SDCL	ARSD	Required Information	Section in Application
49-41B-11(11); 49-41B-22(2)	20:10:22:15	**Hydrology.** The applicant shall provide information concerning the hydrology in the area of the proposed plant 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 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 definitions of their characteristics, including the capacity of the aquifer to yield water, the estimated recharge rate, and the quality of ground water; (5) A description of designs for storage, reprocessing, and cooling prior to discharge of heated water entering natural drainage systems; (6) If deep well injection is to be used for effluent disposal, a description of the reservoir storage capacity, rate of injection, and confinement characteristics and potential negative effects on any aquifers and groundwater users which may be affected.	10.0
49-41B-11(11);49-41B-22(2)	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, 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.	11.0

SDCL	ARSD	Required Information	Section in Application
49-41B-11(11);49-41B-22(2)	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, 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.	15.0
49-41B-11(11) 49-41b-22(2)	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 transmission site identifying existing land use according to the following classification system: (a) Land used primarily for row and non row crops in rotation; (b) Irrigated lands; (c) Pasturelands and rangelands; (d) Haylands; (e) Undisturbed native grasslands; (f) Existing and potential extractive nonrenewable resources; (g) Other major industries; (h) Rural residences and farmsteads, family farms, and ranches (i) Residential; (j) Public, commercial, and institutional use; (k) Municipal water supply and water sources for organized rural water systems; and (l) Noise sensitive land uses; (2) Identification of the number of persons and homes which will be displaced by the location of the proposed facility; (3) An analysis of the compatibility of the proposed facility with present land use of the surrounding area, with special attention paid to the effects on rural life and the business of farming; and (4) A general analysis of the effects of the proposed facility and associated facilities on land uses and the planned measures to ameliorate adverse impacts.	13.0

SDCL	ARSD	Required Information	Section in Application
49-41B-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 pre-exempt 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.	14.0
49:41B-11	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.	15.0
49-41B-11;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.	16.0
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.	17.0

SDCL	ARSD	Required Information	Section in Application
49-41B-11(#); 49-41B-22	20:10:22:23	**Community impact**. The applicant shall include an identification and analysis of the effects the construction, operation, and maintenance of the proposed facility will have on the anticipated affected area including the following: (1) A forecast of the impact on commercial and industrial sectors, housing, land values, labor market, health facilities, energy, sewage and water, solid waste management facilities, fire protection, law enforcement, recreational facilities, schools, transportation facilities, and other community and government facilities or services; (2) A forecast of the immediate and long-range impact of property and other taxes of the affected taxing jurisdictions; (3) A forecast of the impact on agricultural production and uses; (4) A forecast of the impact on population, income, occupational distribution, and integration and cohesion of communities; (5) A forecast of the impact on transportation facilities; (6) A forecast of the impact on landmarks and cultural resources of historic, religious, archaeological, scenic, natural, or other cultural significance. The information shall include the applicant's plans to coordinate with the local and state office of disaster services in the event of accidental release of contaminants from the proposed facility; and (7) An indication of means of ameliorating negative social impact of the facility development.	18.0
49-41B-11	20:10:22:24	**Employment estimates.** The application shall contain the estimated number of jobs and a description of job classifications, together with 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 country and the township in which the facility is located after construction is completed.	19.0
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.	20.0

SDCL	ARSD	Required Information	Section in Application
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 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.	21.0
49-41B-11(2,11)	20:10:22:33:02	**Information concerning wind energy facilities.** If a wind energy facility is proposed, the applicant shall provide the following information: (1) Configuration of the wind turbines, including the distance measured from ground level to the blade extended at its highest point, distance between the wind turbines, type of material, and color; (2) The number of wind turbines, including the number of anticipated additions of wind turbines in each of the next five years; (3) Any warning lighting requirements for the wind turbines; (4) Setback distances from off-site buildings, rights-of-way of public roads, and 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	22.0 and 23.0
49-41B-11	20:10:22:34	**Transmission facility layout and construction**. If a transmission facility is proposed, the applicant shall submit a policy statement concerning the route clearing, construction and landscaping operations, and a description of plans for continued right-of-way maintenance, including stabilization and weed control.	Not applicable

SDCL	ARSD	Required Information	Section in Application
49-41B-11(2)(11)	20:10:22:35	**Information concerning transmission facilities**. If a transmission facility is proposed, the applicant shall provide the following information as it becomes available to the applicant: (1) Configuration of the towers and poles, including material, overall height and width, (2) Conductor configuration and size, length of span between structures, and number of circuits per pole or tower, (3) The proposed transmission site and major alternatives as depicted on overall photographs and land use culture maps, (4) Reliability and safety; (5) Right-of-way or condemnation requirements; (6) Necessary clearing activities; and (7) If the transmission facility is placed underground, the depth of burial, distance between access points, conductor configuration and size, and number of circuits.	Not applicable
49-41B-7; 49-41B-22	20:10:22:36	**Additional information in application**. The applicant shall also submit as part of the application any additional information necessary for the local review committees to assess the effects of the proposed facility pursuant to SDCL 49-41B-7. The applicant shall also submit as part of its application any additional information necessary to meet the burden of proof specified in SDCL 49-41B-22.	24.0
	20:10:22:37	**Statement required describing gas or liquid transmission line standards of construction.** The applicant shall submit a statement describing existing pipeline standards and regulations that will be followed during construction and operation of the proposed transmission facility.	Not applicable
	20:10:22:38	**Gas or liquid transmission line description.** The applicant shall provide the following information describing the proposed gas or liquid transmission line: (1) A flow diagram showing daily design capacity of the proposed transmission facility. (2) Changes in flow in the transmission facilities connected to the proposed facility; (3) Technical specifications of the pipe proposed to be installed, including the certified maximum operating pressure, expressed in terms of pounds per square inch gauge (psig); (4) A description of each new compressor station and the specific operating characteristics of each station; and (5) A description of all storage facilities associated with the proposed facility.	Not applicable

SDCL	ARSD	Required Information	Section in Application
	20:10:22:05	**List of Permits.** The application for a permit for a facility shall contain a list of each permit that is known to be required from any other governmental entity at the time of the filing. The list of permits shall be updated, if needed, to include any permit the applicant becomes aware of after filing the application. The list shall state when each permit application will be filed. The application shall also list each notification that is required to be made to any other governmental entity.	24.0
49-41B-22		**Applicant's burden of proof.** The applicant has the burden of proof to establish that: (1) The proposed facility will comply with all applicable laws and rules; (2) The facility will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants or expected inhabitants in the siting area; (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	24.0
	20:10:22:39	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	25.0

2.0 Description of the Nature and Location of the Project

The Project is situated within an approximately 60,996-acre Project Area spanning across parts of Codington, Deuel, and Grant Counties, South Dakota. The Project will consist of up to 132 proposed turbine locations and will include a collector substation and O&M facility located approximately 11 miles northeast of Watertown, South Dakota.

The Project Area in Codington County contains 66 proposed turbine locations (including two that are alternate turbine locations only) and extends as far south as 177th street and as far west as 461st Avenue. The Project Area in Deuel County contains 66 proposed turbine locations and extends as far east as the half section line between 174th Street and 177th Street and as far south as 181st Street. The Project Area in Grant County contains two proposed turbine locations and extends as far north as the section line 1 mile south of 162nd Street and as far east as the half-section line between 467th Avenue and 469th Avenue in Grant County, South Dakota.

2.1 The Project

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

- Physical resources (geology, economic deposits, soils; see Section 9)
- Hydrology (surface water and groundwater; see Section 10)
- Terrestrial ecosystems (vegetation, wetlands, wildlife, threatened and endangered species; see Section 11)
- Aquatic ecosystems (see Section 12)
- Land use (agriculture, residential, displacement, sound, aesthetics, electromagnetic interference, safety and health, real estate values; see Section 13)
- Water quality (see Section 15)
- Air quality (see Section 16)
- Communities (socioeconomics, transportation and emergency response, cultural resources; see Section 18)

The Project is not expected to have significant impacts on the environment. Approximately 76 acres of permanent disturbance is expected as a result of the Project. This represents approximately 0.12% of the total acreage within the Project Area. Permanent impacts will be dispersed throughout the Project Area.

The Applicant sited facilities to avoid direct impacts to field-verified wetlands to the extent practical. Generally, wind turbines are located in higher elevation areas and avoid low-lying areas where wetlands are present. Additionally, the Applicant has sited access roads to avoid or minimize potential impacts to identified natural resources to the extent practical, while also minimizing impacts to existing field operations to the extent practical. Although not anticipated at this time, if shifts to Project infrastructure are necessary, the Applicant will ensure that such changes minimize direct impacts to field-verified wetlands.

Most of the land that will be impacted by the Project is agricultural (see Section 11.1.2). Project construction is not expected to adversely affect terrestrial ecosystems. The Applicant will use best management practices (BMPs) during construction to avoid or minimize impacts to vegetation and water resources in the Project Area. The Project avoids U.S. Fish and Wildlife Service (USFWS) grassland and USFWS grassland/wetland combination easements (see Section 10.2). As such, there is no federal nexus for the Project that will require National Environmental Policy Act review.

Seven species listed as threatened or endangered under the federal Endangered Species Act have potential to occur in the Project Area counties (see Sections 11.3.1 and 12.1.1): Dakota skipper (*Hesperia dacotae*, threatened); Poweshiek skipperling (*Oarisma poweshiek*, endangered);

northern long-eared bat (*Myotis septentrionalis*, threatened); piping plover (*Charadrius melodus*, threatened); rufa red knot (*Calidris canutus rufa*, threatened); whooping crane (*Grus americana*, endangered); and Topeka shiner (*Notropis topeka*, endangered). Wildlife studies and coordination with USFWS and South Dakota Game, Fish, and Parks (SDGFP) determined the Project to have a low risk of impacts to federally listed species (see Sections 11 and 12).

The Project will not result in significant changes to existing land uses (see Section 13.1.1). Sound from the Project construction activities will be temporary. Once the Project is operational, sound from the turbines and other facilities will be limited per applicable county requirements.

1) Codington County – 50 A-weighted decibels (dBA), average A-weighted sound pressure level effects at the property line of existing sound receptors (i.e., non-participating residences, businesses, and buildings owned and/or maintained by a governmental entity).
2) Deuel County – 45 dBA, average A-weighted sound pressure at the perimeter of existing residences, for non□participating residences.
3) Grant County – 45 dBA, average A-weighted sound pressure, including constructive interference effects, measured at 25 feet from the perimeter of existing sound receptors (i.e., non-participating residences, businesses, and buildings owned and/or maintained by a governmental entity).

A sound level modeling study was completed for the Project to confirm compliance with these standards (see Section 13.3).

Construction activities for this Project will be short-term, with no expected adverse impacts to the area socioeconomics (see Section 18.1). Project construction is anticipated to provide economic benefits to businesses in the region.

Construction activities may result in increased short-term airborne dust/particulate matter from construction equipment and vehicle emissions (see Section 16.2). These activities will be addressed in a Project Storm Water Pollution Prevention Plan (SWPPP). Impacts to air quality will be temporary, and no long-term impacts are anticipated from construction activities. No air quality impacts from Project operation are anticipated and the Project will not produce air emissions that will impact the surrounding area (see Section 16).

In accordance with the *Guidelines for Cultural Resource Surveys and Survey Reports in South Dakota (For Review and Compliance)* (South Dakota State Historical Society 2005), cultural resources reviews were conducted for an area that includes a 1-mile buffer of the Project Construction Easement. Additionally, from June to December 2017 and April to November 2018, a Level III survey was conducted for archaeological, historical, and tribal resources at the majority of proposed turbine locations, access routes to turbines, and collection lines. The Applicant estimates these surveys are approximately 87% complete. Remaining surveys will be completed in 2019. The archaeologists supervising these investigations meet the U.S. Secretary

of the Interior's Professional Qualifications Standards for archaeology. Tribal members from the Sisseton Wahpeton Oyate, Yankton Sioux, and Spirit Lake Nation selected to represent those tribes in identifying significant tribal resources were an integral part of the investigation team. The Applicant has sited Project facilities to avoid or minimize impacts to identified cultural resources to the extent practical, and the Applicant will continue to coordinate with relevant agencies and tribal members regarding implementation of construction BMPs (e.g., site fencing) (see Section 18.6).

Additional Project avoidance and minimization measures include the following.

- 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; new access roads constructed for the Project will be located so as to limit cuts and fills.
- Temporarily disturbed, uncultivated areas will be reseeded with certified weed-free seed mixtures and restored to pre-construction conditions.
- 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 in accordance with the SWPPP.
- Impacts to land held for conservation purposes via USFWS Grassland and USFWS Grassland/Wetland (combination) Easements will be avoided.
- Timing of construction activities will consider minimization of impacts to grouse leks.
- The Applicant will 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.
- The Project will meet or exceed the Codington, Deuel, and Grant County sound requirements set forth above.
- The Project will meet Codington, Deuel, and Grant County shadow flicker requirements of limiting shadow flicker to 30 hours per year or less at all schools, churches, businesses, and occupied dwellings.

In this Application, the Applicant has addressed each matter set forth in SDCL Chapter 49-41B and in ARSD Chapter 20:10:22 (Energy Facility Siting Rules) related to wind energy facilities. Included with this Application is a Completeness Checklist (see Table 1.1) 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 Project complies with applicable laws and rules;
- the Project 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 Project will not substantially impair the health, safety, or welfare of the inhabitants; and
- the Project will not unduly interfere with the orderly development of the region, having given consideration to the views of the governing bodies of the local affected units of government.

3.0 Name of Owner, Manager, and Participants (ARSD 20:10:22:06; 20:10:22:07)

ARSD 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.*

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

The owner and manager of the proposed Project is Crowned Ridge Wind II, LLC, a wholly owned indirect subsidiary of NEER.

The contact persons for the owner and manager are:

Tyler Wilhelm
Project Manager
Crowned Ridge Wind II, LLC
700 Universe Boulevard
Juno Beach, Florida 33408
Tyler.Wilhelm@nexteraenergy.com
Office: (561) 694-3193

Brian J. Murphy
Senior Attorney
NextEra Energy Resources, LLC
700 Universe Boulevard
Juno Beach, Florida 33408
Brian.J.Murphy@nee.com
Office: (561) 694-3814

4.0 Purpose of, and Demand for, the Wind Energy Facility (ARSD 20:10:22:08, 20:10:22:10)

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

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

The Project will generate electricity to be delivered to the high-voltage transmission grid at the Big Stone South Substation. The Applicant has entered into a purchase and sale agreement under which it will permit and construct the Project and, thereafter, transfer the Project along with its Facility Permits to NSP at the commercial operations date. The Applicant is responsible for the development and construction of the Project.

The Project provides zero-emission cost electricity to the grid and long-term, economic energy pricing in the region. Electricity generated from the Project will be used within the Midcontinent Independent System Operator, Inc. (MISO) regional grid to help satisfy demand within MISO's operating territory. Demand for and benefits of the power are discussed in Section 4.2.

The Project will provide benefits not only to the state, but also to the local communities in the form of construction jobs, an increase in local economy, and investments in local businesses. The Project represents an approximate $400 million investment in Codington, Deuel, and Grant Counties, of which the owner will pay taxes on the Project, increasing the tax revenues available in the local communities and state. The Project will employ up to 12 personnel (see Section 19).

4.1 Wind Resources Areas

The Project location was selected due to its high wind resources and open area that easily could support a large-scale wind energy facility. The Applicant conducted wind resource studies over a 10-year period within or adjacent to the Project Area. These studies indicated that the Project Area is one area in South Dakota with premier wind sources that also is suitable for wind energy development. Based on data collected, composite mean wind speeds (CMWS) are 8.75 meters per second and generally are highest in the winter (mainly December and January) months. The Project is classified as an International Electrotechnical Commission (IEC) Class II wind site. IEC classifications are a set of design requirements that ensure wind turbines are engineered against damage from hazards within their planned lifetime. An IEC Class II wind site has an annual average wind speed at hub height between 8.5 and 10.0 meters per second.

4.2 Renewable Power Demand

Demand for renewable energy is evident in the United States, including the upper Midwest region and the state of South Dakota. The National Conference of State Legislatures specifies that 29 states, Washington, D.C., and three territories have adopted a Renewable Portfolio Standard and eight states and one territory have set renewable energy goals (National Conference of State Legislatures 2018). Additionally, Xcel's Minnesota Resource Plan shows a demand for 1,800 MW of new wind energy generation by 2026 (Xcel Energy 2015).

The Project contributes to the solution to the demand for clean energy within the Midwest. The market exists for independently produced electricity from wind projects and other renewables to meet the growing demand for renewable energy. The Project's location conveniently is located within South Dakota's high wind resource and is in close proximity to the available capacity along the CapX2020 transmission project which allows for windier parts of South Dakota to satisfy the growing demand for electricity in more densely populated regions farther east. In fact, a recently completed 70-mile stretch of the CapX2020 project in South Dakota has resulted in proposals for over nine wind projects and one natural gas plant totaling more than 2,000 MW. One of those contributing wind projects is the Crowned Ridge Wind Project, the largest proposed wind energy investment in South Dakota's history.

According to a March 2018 Gallup poll, 73% of the public believe that alternative energy is key in solving the nation's energy problems and 70% of the public think more emphasis should be put on wind energy (Gallup 2018).

4.3 Consequences of Delay

Should the Project be delayed, the Project benefits to the local communities, region, and state will be at risk (see Section 18 for description of benefits). The Project will face commercial challenges that could place it at risk of completion if COD is not achieved in or before the second quarter 2020. Delay of the Project's COD could also impact savings for regional customers as a higher cost of energy may be needed to fulfill renewable standards and requirements for the region from an alternative source of energy with potentially less, long-term economic benefits for the state and the Project's local communities. To receive the Production Tax Credit, the Project must be constructed by December 31, 2020.

5.0 Estimated Cost of the Wind Energy Facility (ARSD 20:10:22:09)

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

The Project has an estimated capital cost of approximately $425 million. Estimated costs include construction costs and wind turbine pricing estimates for the proposed 300.6-MW layout consisting of 117 General Electric (GE) 2.3 turbines and 15 GE 2.1 turbines. This cost estimate also includes lease acquisition, permitting, engineering, procurement, and construction of turbines, access roads, the underground electrical collector system, the collector substation, interconnection facilities, O&M facility, supervisory control and data acquisition (SCADA) system, MET towers, and Project financing. Fluctuations in capital costs could be as much as 20% for the Project, dependent on final micrositing and MISO interconnection costs.

6.0 General Site and Project Component Description (ARSD 20:10:22:11)

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

The Project will be located on approximately 60,996 acres of land in Codington, Deuel, and Grant Counties, east of Watertown, South Dakota (see Figure 1). Figures in Appendix A provide the Project location relative to state, county, and town boundaries; lakes and rivers; railroads; and major highways and roads. There are no active transportation facilities (e.g., airports) other than roads and railroads within or directly adjacent to the Project Area. One school, Holy Rosary Elementary, is in the Project Area (Figure 2). Table 6.1 provides the counties, townships, sections, and ranges that intersect the Project Area.

Table 6.1. Sections that Intersect the Project Area

County	Township Name	Township	Range	Sections
Codington	Waverly	118	51	23–28, 33–36
Codington	Waverly	117	51	1–4, 8
Codington	Kranzburg North	117	51	12–15, 17, 20–29, 32–36
Codington	Kranzburg South	116	51	1–5, 9–15, 17, 20–24, 27–28, 36
Grant	Troy	118	50	19, 30–32
Deuel	Rome	117	50	6–9, 17–21, 27–35
Deuel	Goodwin	116	50	3–9, 13, 15–36
Deuel	Havana	115	50	3–8, 17

The Project will have a nameplate capacity of approximately 300.6 MW and will include the following permanent features: wind turbines and associated pad-mounted transformers; access roads; underground electrical collection lines; the low-side of the collector substation; interconnection facilities and switching stations; two MET towers; an O&M facility; and SCADA system. Table 6.2 lists the sections within the Project Area which contain features of the Project.

Table 6.2. Sections Containing Project Features

County	Township Name	Township	Range	Sections
Codington	Waverly	118	51	23–28, 33–36
Codington	Waverly	117	51	1–4
Codington	Kranzburg North	117	51	12–15, 20–25, 28, 29, 36
Codington	Kranzburg South	116	51	12–16, 20–24, 27, 28
Grant	Troy	118	50	30, 31
Deuel	Rome	117	50	6, 7, 17–21, 27–33
Deuel	Goodwin	116	50	4, 5, 7, 8, 13, 15–30, 32–36
Deuel	Havana	115	50	3–5

In addition, the following temporary features will be associated with the Project: crane paths and one concrete batch plant. These features are described below in more detail. The dimensions and estimated temporary and permanent impacts of these features are presented in tabular format in Section 8.0.

6.1 Turbines

The Project will consist of 132 three-bladed, upwind, horizontal-axis wind turbines (Figure 3) which originate from the GE 2 MW-116 model series. The proposed Project will use 117 GE 2.3-MW turbines with 116-meter (381-foot) rotor diameter and 90-meter (295-foot) hub height (Figure 4a) as the Project's primary turbine technology, and 15 GE 2.1-MW turbines with 116-meter (381-foot) rotor diameter and an 80-meter (262-foot) hub height (Figure 4b) as the Project's secondary technology, which will be used in select locations (Table 6.3).

Alternate turbines generally are included in wind projects to provide flexibility during the permitting and construction processes in the event unforeseen conditions arise during construction that indicate a primary turbine should be dropped and an alternate turbine activated. The Project includes two alternate turbines and turbine locations. The two alternate turbines have the same specifications as the primary turbine technology described above. A maximum total of 132 turbines will be constructed. For 24 turbines, Low Noise Trailing Edge (LNTE) blades were used to reduce the sound pressure levels in order to achieve compliance with county regulations by increasing the flexibility in turbine locations to meet setback requirements.

Table 6.3. Wind Turbine Characteristics

Manufacturer	Model	Rotor Diameter	Hub Height	Generator Nameplate Capacity
GE	GE 2MW-116	116 meters	90 meters	2.3 MW
GE	GE 2MW-116	116 meters	80 meters	2.1 MW

The turbines are comprised of three major features being the tower, the nacelle, and the rotor.

Tower: The wind turbine is mounted on top of a tubular tower. The tubular towers proposed for the Project will be conical steel structures. The tubular tower is manufactured in sections from steel plate and the three tubular steel sections use bolted connections. A lockable steel door at the base of the tower provides secure access. An internal ladder with fall protection, connected to the steel wall of the tower, provides access to the top of the tower. There are service platforms within the tower. The turbines will be grounded in accordance with National Electrical Safety Code standards and comply with all FAA requirements; in accordance with FAA regulations, the towers will be painted off-white to minimize visual impact.

Nacelle: The nacelle houses the main components of the wind turbine generator. Access from the tower into the nacelle is through the bottom of the nacelle. The nacelle is ventilated. It is illuminated with electric light. A hatch at the front end of the nacelle provides access to the blades and hub. The rotor can be secured in place with a rotor lock. The nacelle components include the drive train, gearbox, and generator. The nacelle is housed in a steel-reinforced fiberglass shell that protects internal machinery from the environment. The housing is designed to allow for adequate ventilation to cool internal machinery. The nacelle also contains an

anemometer and a wind vane to measure wind speed and direction. The generated electricity is conducted through cables within the tower to the Down Tower Assembly mounted at the base of the turbine tower. Attached to the top of select nacelles, per FAA specifications, will be a single, medium-intensity aviation warning light. The preferred manner of lighting is by means of an Aircraft Detection Lighting System (ADLS). Subject to FAA approval, applicants will install an ADLS within 1 year of approval by the FAA for the specified project. In the event the FAA does not approve the use of an ADLS system, the Applicant will comply with all lighting and markings otherwise required by the FAA (see Section 13.6.2).

Rotor: A rotor assembly is mounted on the drive shaft and operates upwind of the tower. Rotor speed is regulated by a combination of blade pitch angle adjustment and generator/converter torque control. The rotor spins in a clock-wise direction under normal operating conditions when viewed from an upwind location.

6.2 Access Roads and Crane Paths

Existing county roads and newly constructed private, gravel roads will be used during the construction and operation of the Project within the Project Area. Most of the county roads within the Project Area have a gravel surface, some of which may need to be improved to accommodate equipment deliveries and construction traffic. For the same reasons, some culverts also may need to be upgraded. The Applicant will obtain permits and authorizations from the appropriate agencies to comply with county, state, and federal rules for oversized loads. Additionally, the Applicant will identify routes and complete any improvements necessary in accordance with the Road Use Agreements to be developed in coordination with Grant, Codington, and Deuel Counties. To date, Road Use Agreements have been executed with Grant and Deuel Counties. A Road Use Agreement is currently under review by Codington County.

The Applicant will construct low-profile, private, gravel roads for construction and maintenance access to each turbine, the O&M facility, and the collector substation. During the construction phase, access roads to Project infrastructure will use a temporary width of approximately 32 feet to accommodate larger equipment. After construction, the access roads to turbines will be reduced to a permanent width of approximately 16 feet. It is anticipated that the access road network for the Project will include approximately 36.03 miles of new permanent access roads. Subject to final turbine placement, the Applicant has conservatively calculated approximately 640.2 acres of temporary disturbance and 69.8 acres of disturbance during the life of the Project for access roads.

Separate access (i.e., crane paths) is required in some cases for the cranes used to erect wind turbines. Temporary crane paths will be constructed between turbine locations and situated to minimize total ground impacts to the extent practical. Following completion of construction, the Applicant will remove temporary crane paths and restore these areas to the extent practicable.

The table in Section 8.0 summarizes the estimated ground disturbance impacts (both temporary impacts during construction and operational impacts during the life of the Project) calculated for the Project's access roads, crane paths, and other notable Project features.

6.3 Underground Electrical Collection Lines and Junction Boxes

Each wind turbine will be connected to the collector substation by underground power cables, called collection lines, and fiber optic communication lines. A pad-mounted transformer at each turbine location provides the power at 34.5 kV. The collection lines are buried at least 48 inches below ground surface to allow for existing land uses and safe operation of the Project. Fiber optic lines are collocated with collection lines and are used for communication and for operating wind turbines. Junction boxes are above-ground locations where collections lines are spliced and connected. Typical installation methods include trenching, boring, and horizontal/directional drilling. It is anticipated that 542.7 acres of temporary disturbance will result from the construction of the underground collection lines, and a total of 0.03 acre of permanent disturbance will be associated with the junction boxes.

6.4 Collector Substation

All underground electrical collection cables and communication lines will terminate at the collector substation. The purpose of the Project's collector substation will be to step up the electricity generated by the Project at 34.5 kV to 230.0 kV so that it may be transmitted along the transmission system. The collector substation will include two power transformers, transmission breakers, feeder breakers, disconnect switches, a control house, metering unit, and a substation pull-off superstructure. The collector substation will be monitored at a remote operations center, to ensure it is operating safely. The general location of the collector substation is planned to be constructed northwest of 165st Street and 464th Avenue, approximately 11 miles northeast of Watertown, South Dakota. Approximately 10 acres of land will be purchased to facilitate the construction and operation of the collector substation and 10 acres of land for the O&M facility (see Sections 6.7 and 8.0). The collector substation will be located within a fenced area, designed in accordance to industry standards. It is anticipated that 2 acres of permanent disturbance will result from the construction of the collector substation.

6.5 Interconnection Facilities and Reactive Power Compensation Station

The single-circuit, 5-mile-long 230-kV transmission line will use tubular steel structures. The transmission line will transmit the energy produced from the Project to a dead-end transmission structure adjacent to the collector substation at Crowned Ridge Wind. Using a new breaker position at the Crowned Ridge Wind substation, the Project's 300.6 MW will be aggregated with the 300 MW from Crowned Ridge Wind and conjoined to the Crowned Ridge 34-mile-long 230-kV generation tie line which will terminate at the reactive compensation substation adjacent to the

Big Stone South Substation. The reactive power compensation substation will contain breakers, switches, a series capacitor bank, and a shunt capacitor bank. The generated power will be transferred from the reactive power substation to the adjacent Big Stone South Substation via an approximately 100-foot-long overhead string bus. These features are described for the purpose of providing a complete description of the Project; however, they are addressed under separate permit applications (Dockets EL17-050 and EL-019).

6.6 Meteorological Tower

Two permanent MET towers will be installed with anemometers (for wind speed measurement) in the Project Area. The towers will be approximately 275 feet (83 meters) in height. The anemometers will be mounted at varying heights above the ground. The permanent MET towers will be marked and lighted as specified by the FAA. The MET towers will result in 1.25 acres of temporary impacts, and in only 0.001 acre of permanent impact.

6.7 O&M Facility

The O&M facility will include a main building with offices, spare parts storage, restrooms, a septic system, a shop area, outdoor parking facilities, a turn-around area for larger vehicles, outdoor lighting, and gated access with partial- or full-perimeter fencing. Located directly adjacent to the Project's collector substation, the O&M facility will be a single–story building of approximately 8,000 square feet, which will house operating personnel, offices, operations and communication equipment, parts storage, and maintenance. The facility will be planned, maintained, and operated in compliance with applicable North American Electric Reliability Corporation Reliability Standards. Xcel has a program of maintenance standards providing the capability to manage compliance to transmission maintenance standards. The Applicant will use these O&M subject matter experts to develop and implement procedures for the maintenance of the transmission line and substation. Up to 10 acres of land will be purchased to facilitate the construction and operations for the O&M facility (see Section 6.4). It is anticipated that 1.7 acres of permanent disturbance will result from the O&M facility.

6.8 SCADA System

The Project's SCADA system enables the monitoring and controlling of the entire Project, inclusive of the Project's wind turbines. A fiber-optic cable system will be connected to each individual turbine within the Project Area. Two separate teams will provide real-time oversite of the Project: the O&M team located on site within the O&M facility and a team working remotely from the Renewable Operations Control Center (ROCC). The SCADA system, which is monitored 24 hours a day, 7 days a week by both the O&M team and ROCC, further ensures safety, reliability, and optimal performance of the Project. Data recorded by the SCADA system allows for real-time adjustments to be made to the turbines for instances such as higher wind

speeds or ice build-up on the turbine blades. Additionally, the full-time observation of the SCADA system allows for the O&M team to take necessary steps on site before larger issues could occur which prevents remobilization of larger equipment to the Project Area and unnecessary disturbances to existing land uses.

6.9 Concrete Batch Plant

A large amount of concrete is needed for turbine foundations. As such, it is most efficient to mix concrete on-site. One batch plant will serve as a staging area for dry constituents (sand, aggregate cement, etc.) hauled to the Project Area from off-site sources, and water supplied from municipal or other off-site sources and trucked to the Project Area, and mixing. The appropriate water appropriation permits will be obtained for the source water, as necessary. Electrical power for the batch plants will be supplied by portable generators or the local electrical distribution system. If the location of the batch plant should change, the Applicant will site the necessary batch plant on leased land and will avoid sensitive cultural and natural resources. It is anticipated that 9.2 acres of temporary disturbance and 0 acres of permanent disturbance will result from the proposed batch plant.

6.10 Construction

Construction of the Project is expected to last from 5 to 9 months and commence in fall 2019. Once the Applicant obtains the Facility Permit and other county, state, and federal approvals, the Applicant will complete engineering-scale design of the access roads, construction areas, turbine foundations, and electrical components. Construction of the onsite roads, tower foundations, collection lines, and substation will take approximately 3 to 6 months. Turbine installation will take approximately 2 to 3 months. Figure 5 in Appendix A shows a typical site layout during construction. Collection lines will be installed using trenching methods or, if necessary due to site conditions or the presence of sensitive resources, by other methods such as horizontal directional drilling. The Applicant will remove topsoil prior to trenching and restore topsoil after trenching is complete. The construction contractor typically will decompact up to 10 inches below grade for crane paths post-construction. For road construction, topsoil will be removed and stockpiled in the temporary construction area. If necessary for access roads, culverts will be installed or improved. For turbine foundation installation, topsoil and subsoil will be removed, separated, and stockpiled at each site. Following construction, subsoil and topsoil will be restored over the area surrounding the foundation. Temporary construction areas will be restored after construction, including removing gravel, decompacting subsoil, and replacing topsoil. Temporary and permanent stabilization measures such as mulching, seeding with appropriate seed mixtures, and installing slope breakers, will be implemented as detailed in the Project's SWPPP.

The Applicant will coordinate with the South Dakota Department of Transportation (SDDOT), Codington, Deuel, and Grant Counties, and Project Area townships to manage construction traffic, and to ensure that equipment and components are delivered safely to the Project. The Applicant will obtain SDDOT Highway Access and Utility Permits prior to construction, and contractors will be required to obtain applicable over-height or overweight haul permits. County road permits required for right-of-way (ROW) occupancy, utility crossings, road approaches, and overweight loads will be obtained from Codington, Deuel, and Grant Counties prior to beginning construction activities for which the permit is required. The Project is expected to employ approximately 250 people at the height of construction.

Additionally, the Applicant will work closely with affected landowners to ensure fences are maintained and livestock protected during the construction phase and throughout Project operation.

6.11 Operations

Approximately 7 to 12 permanent employees, consisting of an operations manager and wind technicians, will operate the windfarm and substation after construction is completed. The operations team will be at the Project Area or O&M facility during normal business hours. This team will conduct routine inspections and maintenance will occur during the life of the Project. The operations team will also address any issues and optimize the performance of the plant. The team will have personnel on-call 24 hours per day, 7 days per week to address issues arising outside of normal business hours. The onsite operations team will work in conjunction with the ROCC. The ROCC will assist in identifying any turbines not operating efficiently, identify operating issues, and recommend responsive action to optimize performance of the Project. The ROCC is constantly monitoring all issues such as overheating, turbulence, and vibrations. The onsite operations team will also perform visual assessments of wind turbines and associated components for long-term viability. The Applicant's plan for addressing emergency incidents will be in place as discussed in Section 18.3.3 and Section 22.2.

During operations, the site team will perform scheduled, preventive maintenance on wind turbines. Typically, this is done with representatives of the turbine manufacturer for the first 1 to 3 years. Two separate routine maintenance checks are completed each year: one is semi-annual, and one is annual. The semi-annual turbine maintenance is performed twice a year and consists of lubrication, fluid checks, minor electrical inspections, and turbine functionality checks. The annual maintenance, completed once per year, is a 36-hour inspection with a three-technician crew.

7.0 Alternative Sites and Siting Criteria (ARSD 20:10:22:12)

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

(1) The general criteria used to select alternative sites, how these criteria were measured and weighed, and reasons for selecting these criteria;

(2) An evaluation of alternative sites considered by the applicant for the facility;

(3) An evaluation of the proposed plant, wind energy, or transmission site and its advantages over the other alternative sites considered by the applicant, including a discussion of the extent to which reliance upon eminent domain powers could be reduced by use of an alternative site, alternative generation method, or alternative waste handling method.

The following is a description of the general Project Area selection process, a discussion of the site configuration alternatives considered for the Project, and a summary of the Project's siting criteria applied through the development process.

7.1 General Project Location Selection

Development of the Project was an iterative process involving general Project Area identification, Project Area (i.e., boundary) refinement; and micro-siting of proposed Project infrastructure within the Project Area. Each of these steps is described in more detail below.

Elimination of alternatives, and the identification of the Project Area was primarily driven by:

- available wind energy resource;
- access to viable transmission interconnection;
- landowner support for wind energy development; and
- land use and environmental resource compatibility with wind development.

In 2006, Crowned Ridge began evaluating the available wind resource in the Project Area. Over 10 years of wind resource data were collected by the Applicant which showed that a significant wind resource was present and suitable for the development of a competitive, large-scale wind energy facility. The Project Area's wind resource aided the Applicant's efforts in identifying the overall size of the Project, the Project's turbine type and technology, and the most efficient areas for the placement of turbines.

The Project is located within adequate proximity to the Big Stone South Substation where access to sufficient transmission infrastructure and interconnection capacity is available. Newly proposed transmission improvement projects, some of which are now completed in eastern South Dakota, further assured available capacity in the region and solidified the viability of the Project. With such proximity to the Big Stone South Substation, the Applicant was able to design the Crowned Ridge Wind II Project with a tie in to the 5-mile-long 230-kV generation line which will be aggregated with the 300 MW from Crowned Ridge Wind and conjoined to the Crowned Ridge

34-mile-long 230-kV generation tie line to effectively and efficiently deliver power to the MISO transmission grid while using rural, agricultural lands, minimizing impacts to human settlements, and providing benefits to the local economy in the form of easement payments.

Landowner support of the Project has been present for over 10 years and is showcased by the Applicant's ability to obtain the necessary wind leases to adequately host the Project. Many of the Project's landowners have been wind lease holders since development commenced in 2006 and elected to renew their leases multiple times over the course of development. Within the approximately 60,996-acre Project Area leases have been obtained for 270 parcels totaling approximately 40,903 acres of land or approximately 67% of the total Project Area.

A discussion of land use and environmental resource compatibility is included in Section 7.2 below.

7.2 Site Configuration Alternatives

Previous, earlier alternative Project configurations were based on considerations such as participating landowners, available desktop wetland and floodplain data, applicable roads, and former iterations of the Codington County, Deuel County, and Grant County Wind Energy System Requirements. The purpose of previous layouts was to establish a general site configuration that will allow the Applicant's engineering and environmental teams to complete due diligence through detailed desktop analyses, field surveys, manual walkdowns, and micro-siting.

The Applicant completed desktop analyses and site-specific field studies of various site configurations in accordance with the USFWS Land-based Wind Energy Guidelines (WEG) to determine the potential for presence of sensitive natural resources. Data collected during these analyses and surveys informed an iterative process of refined infrastructure micro-siting, whereby the Applicant refined the Project configuration over a period of several months.

Multiple project configurations were also considered as a result of adopted changes to the local wind energy siting requirements in Codington, Deuel, and Grant Counties. This process occurred during the later stages of development while the Applicant was finalizing the Project's turbine locations. New siting requirements such as 1-mile setbacks from municipal boundaries (i.e., Kranzburg and Goodwin) and increased setbacks from named lake park districts and participating residences removed large quantities of leased acreage from consideration.

The current Project site layout (see Figure 3) is compatible with existing land use (see Section 13), uses the wind resource in an efficient manner, and avoids or minimizes impacts to natural (e.g., wetlands, streams) and cultural (e.g., cairns, stone circles) resources. As described in Section 18.6, impacts to cultural resources will be avoided or mitigated in consultation with the State Historic Preservation Office (SHPO). The Applicant also will avoid or minimize impacts to

terrestrial and aquatic resources and ecosystems, including wildlife, as described in Sections 11 and 12, respectively.

Additionally, the layout is compliant with state and county setback requirements and ordnances. Setback requirements are laid out in Section 13, Table 13.1.

The buildable area for turbines, after considering the setbacks shown in Table 13.1, and other environmental factors (see Figure 6), is depicted on Figure 7.

7.3 Lack of Reliance on Eminent Domain Powers

The Applicant will not exercise eminent domain powers; rather, all easements will be voluntarily acquired.

8.0 Environmental Information (ARSD 20:10:22:13)

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

Sections 9 through 18 describe the existing environment at the time of the submission of the Application, anticipated impacts to the existing environment from construction and operation of the proposed Project, identification of irreversible changes that are anticipated to remain beyond the operating lifetime of the proposed facility, and mitigation measures the Applicant will undertake. These chapters also identify avoidance, minimization, and mitigation measures that will be implemented for the Project.

ARSD 20:10:22:13 states, "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 is unaware of any other operating energy conversion facilities, existing or under construction, or other major industrial facilities under regulation within or adjacent to the Project Area. As such, no cumulative or synergistic consequences related to environmental effects contemplated by the regulation are known to exist for the proposed Project. The Applicant is aware that the Dakota Range Wind 1 area located to the northwest of the Project has been permitted through the SDPUC, but not yet constructed.

Table 8.1 summarizes the ground disturbance impacts (both temporary impacts during construction and permanent impacts during the life of the Project) calculated for the Project.

Table 8.1. Summary of Crowned Ridge Wind Disturbance Impacts

Project Component	Temporary Construction Disturbance	Construction Disturbance to be Reclaimed	Permanent Disturbance during Operations
Wind Turbines[*]	4.50 acres per turbine (this area includes one temporary crane pad per turbine)	4.48 acres per turbine	0.02 acre per turbine (this area includes one permanent transformer mount per turbine)
Access Roads[†]	200 feet wide per linear foot of road	184 feet wide per linear foot of road	16 feet wide per linear foot of road
Collection Lines[‡]	Approximately 50 feet wide per linear foot	Approximately 50 feet wide per linear foot minus 12 × 8 feet per junction box	0 feet wide per linear foot (0.0 acre) for collection lines 12 × 8 feet (0.002 acre) for each junction box (34 junction boxes anticipated)
Crane Path[§]	Approximately 50 feet wide per linear foot, with possibility of some locations up to 80 feet wide per linear foot	Approximately 50 feet wide per linear foot	0 feet wide per linear foot
Supervisory Control and Data Acquisitions (SCADA) Meteorological (MET) Tower[¶]	1.25 acres	1.25 acres minus 5 square feet (0.001 acre)	0.001 acre
O&M Facility	9.87 acres	8.14 acres	1.86 acres
Collector Substation	10.37 acres	8.37 acres	2 acres[#]
Batch Plant	9.04 acres	9.04 acres	0 acres

[*] *Construction impacts assumed a 250-foot construction radius around each turbine (approximately 4.50 acres per turbine). Impacts during operation account for a 30-foot-diameter gravel pad, containing the turbine base, or 0.02 acre per turbine.*

[†] *Access road construction easement width is 200 feet to account for potential maximum impact and is a conservative estimate of disturbance. Access roads are anticipated to temporarily be 32 feet or less in width during construction and later will be reduced to a permanent 16-foot width for operation. Access road impacts also assume all proposed roads are new access roads and do not consider improvements to existing roads separately.*

[‡] *Collection line impacts are based on proposed collection corridors that vary in width from 50 to 90 feet. Where collection line corridors overlap access road construction easements, the respective impact buffers generally overlap. Once collection lines are further defined, final impacts will be less than those currently calculated.*

[§] *Crane path width is based on turbine types. Crane paths required to support crane access to turbines typically are up to 50 feet wide. In select and highly constrained portions of the Project, up to 80 feet in width may be needed for crane paths. Overall, temporary impacts are a conservative estimate of disturbance. Where crane paths overlap access road construction easements, the respective impact buffers generally overlap.*

[¶] *Area of impact is 1.25 acres for one guyed tower during installation. Once installed, the tower has a 1 square-foot base plate and four 1 square-foot anchor points, for a total of 5 square feet. Two towers are associated with the Project.*

[#] *Permanent substation footprint likely will be closer to 0.75 acre, as such, 2.00 acres likely is an overestimate.*

9.0 Effect on Physical Environment (ARSD 20:10:22:14)

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

(1) A written description of the regional land forms surrounding the proposed plant or wind energy site or through which the transmission facility will pass;

(2) A topographic map of the plant, wind energy, or transmission site;

(3) A written summary of the geological features of the plant, wind energy, or transmission site using the topographic map as a base showing the bedrock geology and surficial geology with sufficient cross sections to depict the major subsurface variations in the siting area;

(4) A description and location of economic deposits such as lignite, sand and gravel, scoria, and industrial and ceramic quality clay existent within the plant, wind energy, or transmission site;

(5) A description of the soil type at the plant, wind energy, or transmission site;

(6) An analysis of potential erosion or sedimentation which may result from site clearing, construction, or operating activities and measures which will be taken for their control;

(7) Information on areas of seismic risks, subsidence potential and slope instability for the plant, wind energy, or transmission site; and

(8) An analysis of any constraints that may be imposed by geological characteristics on the design, construction, or operation of the proposed facility and a description of plans to offset such constraints.

9.1 Geological Resources

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

9.1.1 Existing Geological Resources

The following sections describe the existing geological resources, landforms, surficial geology, bedrock geology, economic deposits, seismic risks, and subsidence potential within the Project Area.

9.1.1.1 Regional Landforms and Surficial Geology

The Project Area lies almost equally within two ecoregions, namely the Prairie Coteau to the northeast and the Big Sioux Basin to the southwest. As described by Bryce et al. (1996), the Prairie Coteau formed from stagnant glacial ice melting beneath sediment layers, which resulted in tightly undulating, hummocky topography with no discernable drainage pattern. This region contains closely spaced semi-permanent and seasonal wetlands, with a chain of large lakes that formed where there was little ice shear and higher precipitation amounts, which support widespread burr oak woodlands near wetland margins. The Big Sioux Basin ecoregion is a trough that penetrates the core of the Prairie Coteau and is characterized by a well-developed drainage network with more tilled agriculture due to the general lack of wetlands and gentler topography than within the Prairie Coteau.

Project elevations range from approximately 1,920 to 2,031 feet above mean sea level (fmsl) in the Prairie Coteau region and from approximately 1,833 fmsl to 2,023 fmsl in the Big Sioux Basin. Project topography is shown in Figure 8.

As illustrated in Figure 9a, the Project is underlain from northeast to southwest by Late Wisconsin-age glacial till and outwash deposits. The till is characterized as compact, silty clay-rich matrix with silt to boulder-size clasts of glacial origin, while the outwash deposits are described as heterogeneous sand and gravel of glaciofluvial origin (Martin et al. 2004). The Prairie Coteau portion consists of stagnation moraine, end moraine, collapsed outwash, and ground moraine deposits, while till consisting of end moraine and undifferentiated moraine deposits underlies the western portion of the Project in the Big Sioux Basin. The till deposits generally consist of a compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin, with an estimated composite thickness of up to 300 feet of Late Wisconsin-age deposits (Martin et al. 2004); however, pre-Late Wisconsin drift deposits underlie these Late Wisconsin drift deposits, which results in a total thickness for all these glacial deposits of 400 to 700 feet (Gilbertson 1989). Within the till are shallow glacial outwash deposits of sand and gravel that occur at the land surface to depths of generally 50 feet or less, and deeper water-bearing sand and gravel units at depths generally greater than 100 feet below ground surface (Jensen 2001, 2003, 2004) (see Section 10). Figure 9b shows the geological cross section of the Project Area.

As described by Martin et al. (2004), the geomorphic character of the till deposits ranges from smooth rolling terrain (ground moraine) to elevated linear ridges with hummocky terrain locally at former ice sheet margins (end moraine), while the undifferentiated till exhibits a distinctive weathered, dissected surface that is typically overlain by up to 10 feet of loess. In addition to the glacial deposits, Quaternary alluvium is present along the streams within the Project Area.

9.1.1.2 Bedrock Geology

As shown in Figure 10, upper Cretaceous bedrock, consisting of the Pierre Shale, the Niobrara Formation, and the Carlile Shale underlie the Project Area. The Pierre Shale underlies the majority of the western portion of the Project Area and is described as blue-gray to dark-gray, fissile to blocky shale with persistent beds of bentonite, black organic shale, and light brown chalky shale, with minor sandstone, conglomerate, and abundant carbonate and ferruginous concretions. The Niobrara Formation occupies a narrow band in the center of Project Area and is described as white to dark gray argillaceous chalk, marl, and shale that weathers yellow to orange and contains thin, laterally continuous bentonite beds, chalky carbonaceous shale, minor sand, and small concretions. The Carlile Shale underlies the eastern portion of the Project Area and is described as dark gray to black, silty to sandy shale with several zones of septarian, fossiliferous, carbonate concretions, and contains up to three sandstone units in the upper portion of the formation and a sandy calcareous marl at the base. These bedrock formations (see Figure 10) are overlain by up to 700 feet of glacial deposits and are not exposed at the surface (Gilbertson 1989).

9.1.1.3 Economic Deposits

Based on data provided by the South Dakota Department of Environment and Natural Resources (SDDENR), review of aerial photographs, and field observations, economic deposits are present in two locales within the Project Area: along the eastern boundary of the Project Area; and in the western to west-central portion of the Project Area. The eastern locale is continuous in all three counties and consists of a northwest- to southeast-trending belt that is an outwash plain situated in the Antelope Valley and parallels a ridge known as the Altamont moraine (Jarrett 1986; Schroeder 1976; Schulz 1991). However, due to the irregular shape of the eastern Project Area boundary, the eastern outwash deposit is not present in the Project Area in Codington County, occurs in four locations in the Project Area in Grant County, and occurs in four locations in the Project Area in Deuel County. This outwash deposit has an average overburden thickness of 2 to 3 feet and an average thickness of 25 to 30 feet, with aggregate thicknesses up to 60 feet. Overburden refers to soil and other geologic materials lying between the surface and the top of the economic deposit. Here, the soil and clay layers overlying the sand and gravel deposit constitute the overburden.

The western to west-central locale is a lenticular, somewhat discontinuous northwest- to southeast-trending glacial outwash channel deposit that is present at 10 locations in in the Project Area in Codington County and two locations in the Project Area in Deuel County, but is absent in Grant County. As described by Jarrett (1986), Schroeder (1976), and Schulz (1991), multiple test borings have been conducted historically in these deposits to assess their economic potential. These borings demonstrated that in both the eastern and western to west-central locales, sand and gravel deposits were encountered within 25 feet of the land surface and generally had less than 5 feet of overburden. The sizes of these deposits, in conjunction with the relatively thin overburden, makes them well-suited for development as construction aggregate sources.

Nine sites in the Project Area have been tested or bonded for development of sand and gravel deposits, but only two active sand and gravel pits are present in the Project Area (see Figure 13) (SDDENR 2018a). The Applicant is not aware of any plans to develop other extractive mineral resources in the Project Area, but the potential to develop those resources does exist.

9.1.1.4 Seismic Risks

Risk of seismic activity in the Project Area is considered low. Between 1872 and 2013, 87 earthquakes were recorded in South Dakota (SDDENR 2013). None of these earthquakes occurred in Codington, Grant, or Deuel Counties, and the closest recorded earthquake, with a Modified Mercalli Intensity of 3.7, occurred in northeastern Roberts County on October 20, 1995 (SDDENR 2013).

9.1.1.5 Subsidence Potential

The majority of the western Project Area is underlain by the Pierre Shale, with the Niobrara Formation and the Carlisle Shale underlying the eastern portion of the Project Area. These

formations are overlain by 400 to 700 feet of glacial till deposits. Limestone units and karst terrain are not present in the Project Area and thus, the potential for subsidence is negligible. The Applicant is not aware of any subsidence potential or slope instability problems within the Project Area.

9.1.2 Geological Resources Impacts/Mitigation

The risks posed by the Project are generally limited by the characteristics of the geologic materials in the area. The unconsolidated geologic materials within the Project Area are composed of glacial till consisting of ground moraine, end moraine, stagnation moraine, and undifferentiated moraine that are generally of low permeability, although sand and gravel glacial outwash deposits and aeolian dusts and sands are present in these materials. The first occurrence of water-bearing sand and gravel deposits in the glacial till is generally greater than 100 feet, while the first occurrence of water-bearing units in the sand and gravel outwash deposits and alluvium is generally less than 50 feet (Jensen 2001, 2003, 2004). Some of the sand and gravel outwash deposits are tilted and are overlain by relatively impermeable clays that act as confining layers. Thus, at locations where the elevation is lower than the source or recharge area for these deposits, wells developed in these deposits will be artesian and, if the elevation difference is great enough, the well may be a flowing artesian well. The sand and gravel outwash and alluvial deposits have high permeability but can be limited in size and aerial extent. Alluvial and outwash deposits may be encountered within the Project Area. However, the relatively inert turbine foundation materials (concrete) and depths (generally less than 20 feet), and shallow excavation depths (4 to 6 feet) for collection lines and access roads indicate that these resources will not be significantly impacted by the Project.

Information compiled by Jarrett (1986), Schroeder (1976), and Schulz (1991) indicates that economically valuable mineral deposits, such as sand and gravel, occur in two locales in the Project Area. These locales are comprised of undifferentiated and collapsed glacial outwash deposits that generally occur in a northwest- to southeast-trending belt along the eastern Project Area boundary in southwestern Grant County and northwestern Deuel County, and northwest- to southeast-trending, relatively narrow, and somewhat discontinuous glacial outwash channel deposits in west-central Codington County and western Deuel County (Jarrett 1986; Schroeder 1976; Schulz 1991). Numerous test borings within the Project Area encountered average sand and gravel deposit thicknesses of 25 to 30 feet with generally less than 3 feet of overburden. The undifferentiated and collapsed outwash deposits along the eastern Project Area boundary generally were characterized as having good potential for development as construction aggregate sources, while the western to west-central glacial outwash channel deposits were characterized as having fair potential for development (Jarrett 1986; Schroder 1976; Schulz 1991), as shown on Figure 9a (Flint 1955). These deposits generally are described as tan to brown, fine- to medium-grained sand and clayey and silty, oxidized, fine- to medium-grained gravel. Permanent impacts

to economic deposits may occur due to turbine towers, interconnection circuits, and access roads being located on top of these deposits that could potentially be mined at some future date, but the Applicant is not aware of any plans to develop these resources within the construction area. Even with economic mineral development at some future date, the Applicant anticipates that any permanent impacts to these deposits will be minimal.

9.2 Soil Resources

The following sections describe the existing soil resources within the Project Area and the potential effects of the proposed Project on the soil resources. Figure 11 illustrates the Project Area soil resources.

9.2.1 Existing Soil Resources

The following sections describe the existing soil types, erosion potential and slopes, and prime farmland soils within the Project Area.

9.2.1.1 Soil Types

The U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) office for each county defines the soil associations found within their respective county. Soil associations are defined as a group of individual soil series that occur in a repeatable pattern across the landscape and share a distinctive pattern of soils, relief, and drainage. A soil association generally includes two or three major soil series and a few minor soil series.

Soil Survey Geographic (SSURGO) Geographic Information System (GIS) data are available from the NRCS and were analyzed using ESRI's ArcMap 10.5 software to determine the soil associations located within the Project Area and construction easement. The data indicate 124 soil associations are identified in the Project Area, while 82 soil associations are identified in the Project Construction Easement.

9.2.1.2 Erosion Potential and Slopes

Attributes to identify erodible or highly erodible soils are not provided in the SSURGO data. However, if disturbed, the increased potential for erosion associated with surface runoff for soils increases as slope gradient rises over 2% (Soil Science Division Staff 2017). Within the Project Construction Easement, 37 soil associations (area totaling approximately 468.2 acres) have a slope of 0% to 2%, while the remaining 45 soil associations (area totaling approximately 1,471.5 acres) have a slope that ranges from 2% to 40%.

9.2.1.3 Prime Farmland Soils

The NRCS defines prime farmland as areas that have acceptable acidity or alkalinity, a dependable supply of moisture from irrigation or precipitation, favorable temperature, and an adequate growing season. Typically, soils in prime farmland are sufficiently well-drained and not

excessively erodible during the growing season. Table 9.1 presents the percent of area by farmland classifications for the Project Area and Project Construction Easement.

Table 9.1. Farmland Classification within the Project Area and Project Construction Easement

Farmland	Project Area		Project Construction Easement	
	Total Acreage	Percent	Total Acreage	Percent
All areas are prime farmland	40,544.3	66.5	1,401.3	72.2
Farmland of statewide importance	7,179.2	11.8	176.4	9.1
Prime farmland if drained	3,428.5	5.6	87.2	4.5
Prime farmland if irrigated	941.3	1.5	88.5	4.6
Not prime farmland	8,902.5	14.6	186.8	9.6
Total	**60,995.8**	**100.0**	**1,940.2**	**100.0**

9.2.2 Soil Resources Impacts/Mitigation

9.2.2.1 Potential for Impacts to Soil Resources

Soil erosion is the greatest risk to the geologic environment. Where the land slope is relatively flat, the soil erosion potential is low. However, where steeper slopes (i.e., greater than 6%) are present, the potential for soil erosion increases significantly.

As stated above, 37 soil associations (area totaling approximately 468.2 acres) along the Construction Easement have a slope of 0% to 2%, while the remaining 87 soil associations (area totaling approximately 1,471.5 acres) have a slope that ranges from 2% to 40%. In addition to slope, soil properties that also influence erosion from water runoff include soil texture, percent organic matter, structure infiltration capacity, and soil permeability. Soils containing high proportions of silt and fine sand are most erodible, while well-drained and well-graded gravels and gravel sand mixtures with little or no silt are the least erodible materials. The erosion caused by stormwater runoff is influenced by slope length and gradient; rainfall frequency, intensity, and duration; and the amount of time bare soils are exposed. In addition to natural processes, erosion can be caused by site-clearing and earth-moving activities.

9.2.2.2 Erosion, Slope Stability, and Sedimentation

Project construction activities described in Section 6 and Table 8.1 will result in an estimated 1,940.2 acres of temporary impacts to soils, and in approximately 76.2 acres of permanent impacts to soils. Impacts to soils could include compaction, potential loss of soil due to erosion, and the potential contamination of soils from construction equipment spills.

9.2.3 Prime Farmland Impacts

Table 9.2 provides the estimated temporary and permanent impacts to farmland classifications associated with construction and operation of the Project.

Table 9.2. Estimated Temporary and Permanent Impacts to Farmland

Farmland Classification	Temporary Impacts (acres)*	Permanent Impacts (acres)†
All prime farmland	1,386.6	56.9
Farmland of statewide importance	176.4	5.0
Prime farmland if drained	86.2	3.2
Prime farmland if irrigated	88.5	4.3
Not prime farmland	186.6	6.8
Total	**1,924.3**	**76.2**

* *Temporary impacts are calculated assuming 4.50 acres of temporary impact around each wind turbine tower location, a 50-foot-wide collection line ROW, and up to a 200-foot-wide temporary construction disturbance for access roads.*

† *Permanent impacts are calculated as a 0.02-acre area around each wind turbine tower location, plus 16-foot-wide permanent access roads. Because collection lines will be buried, there will be no permanent impacts from installation of those lines, except for approximately 35 junction boxes (12 × 8 feet) (total of 0.07 acre).*

9.2.4 Mitigation

The locations of turbine towers, collection lines, and access roads have been selected to minimize impacts to land forms, geology, and economic deposits. Available geologic data indicate that the Project will not significantly affect soil conditions or bedrock geology. Seismic activity is not anticipated to affect the performance of the wind turbines. The placement of tower foundations in the ground will have a minor impact on underlying geologic conditions. Except as described in this Application, the Applicant is not aware of any additional constraints that may be imposed by geological characteristics on the design, construction, or operation of the facility. Most geotechnical testing for the Project is complete. Limited, additional geotechnical testing will be completed prior to construction to further evaluate site-specific geologic conditions at select locations.

Soil erosion is possible in areas of steep slopes (i.e., greater than 3:1 [horizontal:vertical] or 33%); however, only 3.6% (70.4 acres) of the Project Construction Easement has slopes that may range above 30%. To reduce adverse effects to and from soils, the Applicant will develop and implement a SWPPP and use BMPs during construction to protect topsoil and minimize soil erosion. Soil areas disturbed during construction will be decompacted and returned to pre-construction contours to the extent practicable and in accordance with landowner agreements. The goal is to have all surfaces drain naturally, blend in with the undisturbed natural terrain, and be left in a condition to facilitate re-vegetation, provide for proper drainage, and prevent erosion. Temporary areas, such as the concrete batch plant area, will be restored in accordance with the landowner agreements and the SWPPP.

10.0 Effect on Hydrology (ARSD 20:10:22:15)

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

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

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

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

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

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

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

10.1 Groundwater Resources

10.1.1 Existing Groundwater Resources

The majority of groundwater resources in the Project Area in Codington, Grant, and Deuel Counties occur in sand and gravel deposits or the Dakota Formation at depths that are generally greater than 100 feet below the land surface. However, the first occurrence of groundwater in alluvial, glacial outwash, and shallow sand and gravel deposits is generally less than 50 feet below ground surface (Jensen 2001, 2003, 2004). Notably, the Antelope Valley Aquifer, which is a glacial outwash channel deposit, occurs in a northwest- to southeast-trending belt that is present along the eastern Project Area boundary in southwestern Grant County and northwestern Deuel County. The northwest- to southeast-trending glacial outwash channel deposits that are present in the western and west-central portions of the Project Area are associated with the Prairie Coteau Aquifer (Hansen 1994). Additionally, deposits of recent alluvium are present along drainages and may overlie some of the outwash deposits. As mapped by the NRCS (2018), shallow groundwater occurs in the soils within the Project Area at depths ranging from 0 inches at the soil surface to greater than 80 inches. The approximate depth to shallow groundwater in the soils within the Project Area exhibit the following distribution: 0 to 18 inches, 5.7%; 18 to 30 inches, 5.0%; 30 to 41 inches, 17.7%; 49 to 61 inches, 11.6%; and greater than 80 inches, 42.5%. The minimum average depth of shallow groundwater is 39.8 inches and the maximum average depth is 50.0 inches (NRCS 2018). While these shallow groundwater resources may not provide

adequate yields to wells for use as a domestic or livestock water supply, they are important sources of recharge for the deeper underlying aquifers and to support agricultural plant growth.

10.1.2 Groundwater Resources Impacts/Mitigation

Permanent impacts to groundwater are not expected but temporary impacts to groundwater may occur. Depending on the exact turbine locations, tower foundations (which are typically up to 8 feet deep for spread foot style foundation and up to 32 feet deep for Patrick & Henderson style foundation) have the potential to intersect the perched groundwater in the soil profile and the shallow groundwater in the outwash deposits and alluvium, but the foundations are not likely to impact the deeper groundwater resources. Review of the Project array and aquifer materials deposits in the Project Area reveals that two turbines (CRII-5 and CRII-79) are located on alluvium, nine turbines (CRII-2, CRII-3, CRII-4, CRII-6, CRII-11, CRII-62, CRII-70, CRII-73, and CRII-78) are located where sand and gravel deposits are at a depth of 0 to 50 feet, five turbines (CRII-36, CRII-48, CRII-54, CRII-108, and CRII-122) are located on outwash deposits with first occurrence depths of 0 to 50 feet, and the remainder of the turbines are located on areas where the first occurrence of sand and gravel deposits is greater than 100 feet below ground surface. Construction and placement of collection lines and access roads typically are shallow (4 feet) and may encounter the perched groundwater in the soil profile at some locations. At those locations, shallow groundwater dewatering may be required to facilitate construction of this infrastructure, which will represent a temporary impact to groundwater. If construction dewatering is anticipated, the Applicant will follow the SWPPP and implement appropriate BMPs, as needed. The potential drawdown effects of any dewatering activity will be local and temporary. Permanent impacts to groundwater from construction dewatering activities and/or structure placement in the shallow groundwater flow regime is not expected.

Additional sources of groundwater may be used during construction for dust control if required by County Road Use Agreements. The Applicant expects to obtain the water from existing waste water treatment plants after treatment or reclamation and provide a beneficial re-use of water if available. If treated water for dust control is not available, the Applicant will evaluate other options to minimize water use including trucking in water from local municipalities and working with landowners to use existing pond water resources. The Applicant will obtain any necessary permits if any surface water or groundwater supplies have the potential to be affected.

Risk for groundwater contamination caused by release of contaminants during construction is low. The overall low permeability of the unconsolidated geologic and soil materials will inhibit contaminant flow, although isolated high-permeability granular lenses of limited size may be present that could result in a more rapid contaminant distribution. As part of the SWPPP, a spill prevention and response plan to address potential releases to groundwater or surface water will be developed and implemented.

Water used during operations for the O&M building is expected to come from existing rural water sources. In the event existing rural water sources are not available or sufficient to supply the O&M building for drinking and sanitary use, the Applicant will explore drilling a well for potable water and will seek all appropriate permits if needed.

The Project will not require water storage, reprocessing, cooling, or deep well injection. Permanent effects to aquifers and potable water supplies are not expected.

10.2 Surface Water Resources

10.2.1 Existing Surface Water Resources

The Project is in one hydrologic region (the Missouri), intersects four major watersheds within Hydrologic Unit Code (HUC) 10 (e.g., Willow Creek, Hidewood Creek, Stray Horse Creek, and City of Watertown – Big Sioux River), and includes seven sub-watersheds (HUC 12), as defined by the U.S. Geological Survey (USGS) (Seaber et al. 1987). Figure 12 illustrates the hydrologic resources discussed in this section. The Project Area encompasses the two physiographic regions discussed in Section 9.1.1.1, with the eastern approximately 39.7 square miles in the Prairie Coteau and the western approximately 55.2 square miles in the Big Sioux Basin.

10.2.1.1 Hydrology

The USGS-named streams within the Project Construction Easement are listed in Table 10.1. Two named streams and multiple unnamed tributaries to these streams are located within the Project Area; the number of times the named streams intersect the Project Construction Easement are summarized in Table 10.1.

Table 10.1. USGS-Named Streams/Rivers and Floodplains within the Project Construction Easement

Surface Water Name	Number of Crossings	Floodplain Present at River Crossing*
Willow Creek	1	Yes
Stray Horse Creek	3	Yes
Total	4	-

* *Includes review of available digital floodplain data for Codington County and Grant County.*

Sources: National Hydrography Data (NHD) (USGS 2014a) and Federal Emergency Management Agency (FEMA) data (FEMA 2016).

According to National Wetlands Inventory (NWI) data, most wetlands within the Project Area and the Project Construction Easement are freshwater emergent wetlands, as shown below in Table 10.2 (USFWS 2017a).

Table 10.2. NWI-Mapped Wetlands Identified within Project Area and Project Construction Easement

NWI Wetland Type	Project Area		Project Construction Easement	
	NWI-mapped Wetland Area (acres)	Percent of Area Containing Wetlands	NWI-mapped Wetland Area (acres)	Percent of Area Containing Wetlands
Lake	0.0	0.00	0.0	0.00
Freshwater Emergent Wetland	1,522.6	2.50	165.0	0.60
Freshwater Forested/Shrub Wetland	19.9	0.03	2.0	0.02
Freshwater Pond	150.2	0.25	3.0	0.01
Riverine	152.3	0.25	38.0	0.11
Total	**1,845.0**	**3.03**	**208.0**	**0.74**

The USFWS manages wetland and grassland easements within the Project Area, which includes approximately 1,692.7 acres of USFWS wetland, grassland, or combined wetland/grassland easements. Only the designated protected basins within grassland/wetland easements are protected by the easement (discussed in Section 13.2.1). Uplands surrounding protected basins within USFWS wetland easements are not protected, and commonly are in agricultural use. Seven turbines are sited on parcels containing USFWS wetland easements. No turbines or other infrastructure are sited within protected basins on USFWS wetland easements. No turbines or other infrastructure are sited on USFWS grassland or grassland/wetland combination easements. Additionally, the SDGFP manages approximately 882.6 acres of public and private lands within the Project Area as waterfowl production areas, game production areas, and Walk-in Areas (WIA) (see Section 13.2.1). Three turbines are placed on these conservations or public-leased areas.

10.2.1.2 National Park Service Nationwide Rivers Inventory

No stream or river segments within the Project Area are listed in the National Park Service Nationwide Rivers Inventory.

10.2.1.3 Impaired Waters

No total maximum daily load (TMDL) waters are identified within the Project Area; however, one waterbody is listed as impaired without an approved TMDL, as included in the Section 303(d) list of impaired waters (SDDENR 2018b).

10.2.1.4 Floodplains

Electronic FEMA floodplain data are available for Codington and Grant Counties, but not Deuel County. Review of these data indicates that two waterbodies within the Project Construction Easement contain 100-year floodplains (shown as FEMA Flood Zone A on Figure 12). To the extent practicable, Project construction activities have been planned to not cross mapped streams

or floodplains. If design changes require placement of structures within the 100-year floodplain of any waterbody within the Project Construction Easement, the Applicant will first attempt to avoid impacts through boring. If boring is not feasible, the Applicant will obtain a floodplain development permit from the appropriate regulatory agency, as required by Section 3.11.04 of the Codington County Zoning Ordinance and Section 1106 of the Grant County Compiled Zoning Ordinance as needed. As shown on Figure 12, Willow Creek and Stray Horse Creek cross the Project Area and both have an associated FEMA Flood Zone A. One wind turbine (CRII-79) is located in the Willow Creek floodplain and two wind turbines (CRII-5 and CRII-79) are located in the Stray Horse Creek floodplain. The Project Construction Easement crosses the Willow Creek floodplain once and the Stray Horse Creek three times.

10.2.2 Surface Water Resources Impacts/Mitigation

The Applicant has minimized or avoided direct permanent impacts to rivers, streams, and floodplains to the extent feasible, although temporary impacts may occur from construction activities. Potential impacts to rivers, streams, and floodplains are expected to be avoided or minimized by locating wind turbines outside of these areas and routing access roads and collection lines around, or boring under these resources. To the extent practicable, impacts to waterbodies, wetlands, and aquatic resources will be avoided or minimized through the siting process and using stormwater BMPs during construction.

Impacts to wetlands and waterbodies that may result because of access road construction are minor and will be authorized under U.S. Army Corps of Engineers (USACE) Nationwide Permit (NWP) 12 for utility lines and associated facilities in waters of the U.S. (see Section 11). NWP 12 authorizes permanent impacts to non-tidal waters of the U.S. from a single and complete project up to 0.5 acre and any such permanent impacts may remain beyond the Project's operational lifetime. Disturbed surfaces will be restored as nearly as possible to their pre-construction conditions during Project decommissioning.

As described above, collection lines will be sited to avoid intersecting wetland or other waterbodies to the extent practical. Where collection lines must intersect these resources, the Applicant will attempt to bore under these features to minimize impacts where feasible (see Section 11).

Where activity must occur in a wetland area, the Applicant will use standard construction BMPs to minimize impacts to those allowable under USACE NWP 12 thresholds. Standard construction BMPs include the following.

- On construction plans, clearly mark the limits of construction.
- In the field, fence-off water resources in close proximity to construction activities with high visibility fencing to prevent unintended impacts.
- Keep construction staging and stockpiling of materials out of wetlands and their buffers.

- Restrict site access of machinery to as few areas as possible to reduce soil compaction.
- Use removable crane mats to cross streams and wetlands instead of building construction pads.
- If movable equipment must be in the wetland or buffer, do not leave it there over night or on weekends.
- Do not store fuel or refuel mobile equipment in a wetland or its buffer. When refueling equipment that is not readily movable (i.e., cranes), follow BMPs for temporary spill prevention, control, and containment.
- Do not mix, test, store, or dispose of concrete within a wetland or its buffer.

The Project Area contains USFWS wetland and wetland/grassland combination easements. The Project has been designed to avoid protected basins such that no surface impacts to protected basins are expected.

Locations of the larger areas of potential temporary or permanent impacts such as the laydown area, the concrete batch plant, the substation, and the O&M facility have been selected to avoid and minimize impacts to wetlands. The Applicant has completed approximately 89% of aquatic resources surveys. Remaining surveys will be completed in 2019 and results will be used to refine and select precise locations of Project facilities. Further, the stormwater BMPs that will be implemented as part of the SWPPP will provide additional protections to wetlands located in the Project Area. Based on the foregoing approaches, the Applicant anticipates that temporary and/or permanent impacts to wetlands during construction will be avoided or minimized.

To limit impacts to hydrologic resources caused by soil erosion, groundwater contamination, or stormwater runoff, the Applicant will obtain a South Dakota General Permit for Storm Water Discharges Associated with Construction Activity (SDR100000), develop and implement a SWPPP, and use BMPs to reduce impacts during construction. As required by SDR100000 and the SWPPP, any vehicle fueling within the Project Area will be done in accordance with appropriate BMPs and will occur at an appropriate distance from waterways determined by site-specific conditions, such as ground cover, slope, and soil type.

10.2.2.1 Impacts to Impaired Waters and Mitigation

Review of the 2018 Integrated Report (SDDENR 2018b) indicates that Willow Creek, from the Big Sioux River to Section 7, Township (T) 117 North (N), Range (R) 50 West (W) is impaired for e. coli and dissolved oxygen, but no other impaired or TMDL waters are within the Project Area. The SWPPP will identify any impaired waters crossed by the Project Construction Easement and additional precautions will be implemented to ensure that stormwater with e. coli and other constituents that could impact dissolved oxygen concentrations are not discharged to Willow Creek.

10.2.2.2 Impacts to Flood Storage Areas and Mitigation

Flood storage areas are not present within the Project Area and thus, no impacts to those types of facilities are anticipated.

10.3 Current and Planned Water Uses

10.3.1 Current and Planned Water Uses within Project Area

Existing water sources for residential and agricultural uses are provided by rural water systems and wells. Two named streams and multiple unnamed tributaries provide surface water opportunities for recreational purposes in the Project Area (see above and Figure 12). For groundwater resources, current and planned uses are for commercial, irrigation, and domestic water supplies.

10.3.2 Effect on Current or Planned Water Use

The Applicant expects to re-use treated water from waste water treatment plants for dust control during construction. Re-use of previously treated water will minimize the use of new potable surface water or groundwater supplies. If water re-use is not available, the Applicant will pursue locally available sources of pond water with participating landowners and will pursue any permits necessary to do so. Water use during operations is expected to come from existing rural water supplies for the O&M building. In the event rural water supplies are not available, the Applicant will install a groundwater well. Impacts to current or planned water uses are expected to be minimal given the avoidance and minimization measures described above. All water resources, including any that potentially could be used for the Project (although none currently have been identified), are illustrated in the Figure 12.

11.0 Effect on Terrestrial Ecosystems (ARSD 20:10:22:16)

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

The following sections describe the existing terrestrial ecosystems in the Project Area, potential effects to these resources from the Project, and mitigation measures intended to offset potential effects. Terrestrial ecosystem data were collected from available data sources, state and federal agency coordination, and field surveys.

11.1 Vegetation (Flora)

The following sections describe the vegetation within the Project Area and the potential effects of the proposed Project on this resource. Planned avoidance, minimization, and mitigation measures for those effects are also described.

11.1.1 Existing Vegetation

To develop a characterization of the existing environment, a desktop analysis was performed for the Project Area. The desktop analysis consisted of a review of publicly available resources with pertinent environmental data, including the USGS National Land Cover Database (NLCD), USDA National Agriculture Statistics Service data, high-resolution aerial imagery, and data available from South Dakota State University's Public Research Access Institutional Repository and Information Exchange. These data were combined in GIS and manually reviewed by biologists experienced with aerial photography interpretation and the ecological communities of eastern South Dakota.

The Project lies within two ecoregions: the Prairie Coteau and the Big Sioux Basin (Bryce et al. 1996) (see Section 9). The predominant cover type within the Project Area is agricultural (67.21%) followed by grass/pasture (25.93% (Table 11.1; Figure 13). The predominant land cover type in the Project Construction Easement is agricultural (73.79%) followed by grass/pasture (21.82%) (see Table 11.1; see Figure 13). Cropland provides minimal habitat for most terrestrial species, though it may provide a food source and cover for some.

Table 11.1. Land Cover within the Project Area and Project Construction Easement

	Project Area		**Project Construction Easement**	
Land Cover Type*	**Area (acres)**	**% of Total**	**Area (acres)**	**% of Total**
Agricultural	40,996.25	67.21	1,486.34	73.79
Grass/Pasture	15,817.46	25.93	439.52	21.82
Developed	2,756.75	4.52	62.67	3.11
Other Hay/Non-alfalfa	535.79	0.88	22.32	1.11
Herbaceous Wetlands	431.68	0.71	1.85	0.09
Deciduous Forest	308.24	0.51	0.07	<0.01
Open Water	78.97	0.13	0.55	0.03
Winter Wheat	37.58	0.06	-	-
Fallow/Idle Cropland	18.01	0.03	0.84	0.04
Barren	11.79	0.02	0.05	<0.01
Shrubland	3.02	0.01	0.19	0.01
Woody Wetlands	0.22	<0.01	-	-
Total	**60,995.76**	**100.00**	**2,014.40**	**100.00**

* *Source: USDA, National Agriculture Statistics Service 2018*

The USFWS South Dakota Ecological Services Field Office publishes a list of threatened and endangered species with potential to occur within counties in South Dakota (USFWS 2017b). The SDGFP also maintains a list of threatened, endangered, and candidate species (SDCL Chapters 34A-8 and 34A-8A) and provides information on recorded observations within a given county (SDGFP 2016). Previous coordination with the USFWS and SDGFP also was reviewed for information on federally or state-listed species (Appendix B). According to these sources, there are no records of federally or state-listed plant species in Codington, Deuel, or Grant Counties.

11.1.1.1 Native Grassland

The USDA class "grass/pasture" may include land currently used for hay/pasture; land currently not used for hay/pasture or cropland, but that may or may not have been disturbed in the past; and/or undisturbed native grasslands. These areas likely provide suitable habitat for grassland and some prairie species. However, Bauman et al. (2016) conducted a GIS exercise to quantify undisturbed lands in eastern South Dakota that are most likely to support native, undisturbed prairie that, in turn, are more likely to support prairie obligate and sensitive species. This exercise is described below.

Bauman et al. (2016) used South Dakota Farm Service Agency's 2013 Common Land Unit data layers, and the 2012 USDA National Agriculture Imagery Program county mosaic aerial imagery, to evaluate approximately 22.6 million acres of land in the 44 counties that comprise eastern South Dakota. Land currently under crop production, or that has in the past been used for crop production, was removed from consideration for the exercise. This was followed by manual removal of other disturbed areas. The remaining land tracts were then categorized as potentially "undisturbed grassland" or "undisturbed woodland." Waterbodies larger than 40 acres as defined by the SDGFP's Statewide Water Bodies layer were then removed to allow a more accurate interpretation of the remaining undisturbed grassland/wetland complex. The resulting dataset provides an indication of the location of likely undisturbed grasslands that may support native prairies and provide habitat for prairie species (Bauman et al. 2016). These areas may overlap with the cover types "herbaceous" and/or "hay/pasture" in Table 11.1.

According to Bauman et al. (2016), 647 discrete tracts of land may support native prairie within the Project Area. These tracts range in size from less than 0.1 to 454.4 acres, with an average size of 17.9 acres. The total acreage of land that may contain native prairie habitat within the Project Area according to Bauman et al. (2016) is approximately 11,599.9 acres.

11.1.1.2 Noxious Weeds

Noxious weeds are regulated by State and Federal rules and regulations (SDCL 38-22 and Code of Federal Regulations [CFR] 2006) that are designed to stop the spread of plants which may be detrimental to the environment, agricultural practices, and/or the public. The South Dakota Department of Agriculture (SDDOA) lists 16 species of noxious weed that have potential to

occur in Codington, Deuel, and/or Grant Counties (SDDOA 2018a, 2018b) (Table 11.2). Noxious weed surveys have not been completed for the Project Area. However, some species (e.g., bull thistle [*Cirsium vulgare*], Canada thistle [*Cirsium arvense*]) have been observed in the Project Area during other surveys.

Table 11.2. Noxious Weeds with Potential to Occur in the Project Area

Common Name	Scientific Name	Status
Absinth wormwood	*Artemisia absinthium*	Local noxious weed – Codington, Deuel, and Grant Counties
Bull thistle	*Cirsium vulgare*	Local noxious weed – Codington and Deuel Counties
Canada thistle	*Cirsium arvense*	State noxious weed
Common tansy	*Tanacetum vulgare*	Local noxious weed – Grant County
Field bindweed	*Convulvulus arvensis*	Local noxious weed – Grant County
Hoary cress	*Cardaria draba*	State noxious weed
Leafy spurge	*Euphorbia esula*	State noxious weed
Musk thistle	*Carduus nutans*	Local noxious weed – Codington, Deuel, and Grant Counties
Perennial sow thistle	*Sonchus arvensis*	State noxious weed
Plumeless thistle	*Carduus acanthoides*	Local noxious weed – Codington, Deuel, and Grant Counties
Poison hemlock	*Conium maculatum*	Local noxious weed – Codington, Deuel, and Grant Counties
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
Spotted knapweed	*Centaurea maculosa*	Local noxious weed – Grant County
Yellow toadflax	*Linaria vulgaris*	Local noxious weed – Codington and Deuel Counties

11.1.2 Vegetation Impacts/Mitigation

No impacts to federally or state-listed plants are expected to occur as a result of the Project. No federally or state-listed plant species are known to occur in the Project Area.

The Applicant will compensate landowners for crop damage that occurs on cultivated lands. Impacts to agricultural land are discussed in detail in Section 13. Impacts to cultivated lands are not considered biologically significant, as these lands currently are frequently disturbed by tilling, planting, and harvesting activities.

Unmitigated loss of vegetation, or introduction of noxious weeds could result in an impact to vegetation resources. Construction of the Project will result in permanent impacts to

approximately 76.21 acres and in temporary impacts to approximately 1,940.19 acres (Table 11.3).

Table 11.3. Temporary and Permanent Impacts as a Result of the Project

Land Cover Type*	Temporary Impacts (acres)	Permanent Impacts (acres)
Agricultural	1,432.64	55.71
Grass/Pasture	423.49	16.03
Developed	59.34	3.33
Other Hay/Non-Alfalfa	21.40	0.93
Herbaceous Wetlands	1.79	0.06
Fallow/Idle Cropland	0.73	0.11
Open Water	0.51	0.04†
Shrubland	0.19	-
Deciduous Forest	0.07	-
Barren	0.05	-
Total	**1,940.21**	**76.21**

* *Source: USDA, National Agriculture Statistics Service 2018*

† *Review of aerial photography shows this 0.04 acre as within an active agricultural field and not to be open water.*

Permanent impacts will occur from construction of specific Project features including the wind turbine foundations and access roads (see Section 6 and Table 8.1). These impacts will 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 ground-clearing in construction areas.

Temporary impacts will be mitigated through use of BMPs as described in the Project SWPPP. Such BMPs include re-vegetation practices and installation of erosion-control devices. For example, in temporarily impacted areas that were previously natural (i.e., non-cropland), the Applicant will use native vegetation (weed-free) seed mixtures to revegetate disturbed areas to pre-construction conditions where feasible and pending landowner preferences. Where temporary impacts occur, the land will be returned to pre-construction conditions.

The Project will not involve any major tree-clearing. Where feasible, access roads have been sited to avoid crossing tree rows. The collector substation and O&M facility also were sited to avoid impacts to tree rows. Some minor clearing of brush or trees may be required during construction. In discrete and limited areas where minor tree-clearing will occur, the Applicant will first conduct nest clearance surveys and will implement seasonal clearing restrictions as described in Section 11.3.2.5.

11.2 Wetlands and Waterbodies

The following sections describe the wetlands and waterbodies within the Project Area and the potential effects of the proposed Project on them. Planned avoidance, minimization, and mitigation measures for those effects also are described.

11.2.1 Existing Wetlands and Waterbodies

The USACE (1987) *Corps of Engineers Wetland Delineation Manual* defines wetlands 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." The manual further stipulates three criteria that a feature will exhibit if it qualifies as a wetland: dominance of hydrophytic vegetation, hydric soil, and wetland hydrology. Waterbodies are defined as those features that hold or convey water, but do not qualify as wetlands.

Publicly available data sources, such as the following, were used to complete a desktop analysis to assess the likelihood of wetlands and other waters of the U.S. occurring within the Project Area.

- Aerial imagery (various years, including publicly available colored-infrared imagery)
- USFWS NWI (USFWS 2017a) mapping
- USGS National Hydrography Dataset (NHD) (USGS 2014a)
- NLCD (USGS 2014b)

The NWI indicates that there are 2,772 potential features within the Project Area (Table 11.4). The NHD indicates that there are 565 line segments representing potential reaches of waterbodies within the Project Area. Finally, the USFWS indicates 74 protected basins are present within the Project Area.

Table 11.4. NWI Wetlands and Waterbodies Mapped Within the Project Area

Wetland Type	Number of Features within Project Area	Acres in Project Area
Freshwater Emergent Wetland	2,128	1,522.55
Riverine	359	152.28
Freshwater Pond	252	150.15
Freshwater Forested/Shrub Wetland	33	19.89
Total	**2,772**	**1,844.87**

Aquatic resources surveys and wetland delineations were completed during 2017 and 2018 to more accurately characterize wetlands and waters of the U.S. within the footprint comprising Project facilities (turbines, access roads, collection lines, potential substation locations, etc.). To-

date, aquatic resources surveys have been conducted within approximately 6,100 acres of the Project Area, which represents approximately 90% of the approximate total area requiring survey. During these surveys, wetlands and other waterbodies (e.g., streams) were recorded. Results of these surveys have informed, and will continue to inform, Project siting. Survey methods and results are described in Appendix C, the Aquatic Resources Summary Report. Aquatic resources surveys and wetland delineation surveys are ongoing. The Applicant estimates that surveys will begin again in early April 2019, weather pending, and will be complete in late spring to early summer 2019. Appendix C will be amended following completion of surveys to incorporate all survey results, and the amended report will be submitted to the Commission once complete.

11.2.2 Wetland and Waterbody Impacts/Mitigation

Project facilities have been sited to avoid both temporary and permanent impacts to wetlands and waterbodies to the extent practical. Through avoidance measures, the Applicant has limited impacts to wetlands and waterbodies to minimal areas associated with access roads. Impacts to wetlands and waterbodies that may result because of access road construction are minor and will be authorized under USACE NWP 12 for utility lines and associated facilities in waters of the U.S. The Applicant anticipates the majority of impacts will be temporary. However, it is anticipated that some access roads will remain in place after the Project's operational lifetime, where preferred by landowners. Therefore, limited authorized, permanent impacts to wetland areas may remain beyond the Project's operational lifetime. All other disturbances will be restored as nearly as possible to their pre-construction conditions during Project decommissioning.

Collection lines will be sited to avoid intersecting wetland or other waterbodies to the extent practical. Where collection lines must intersect wetlands or other waterbodies, the Applicant will bore under these features to the extent practical to minimize impacts to these resources.

11.3 Wildlife (Fauna)

The following sections describe potentially present and/or observed wildlife species within the Project Area and the potential effects of the proposed Project on these species. Planned avoidance, minimization, and mitigation measures for those effects are also described.

11.3.1 Existing Wildlife

Several wildlife surveys have been completed in the Project Area. Those surveys, and their results, are summarized in Section 11.3.1.4. Most of the observed wildlife species occurring in the Project Area are considered common and widespread species in the region, and many are adapted to developed areas and human disturbance.

Mammal inventories have not been completed for the Project. Species observed in the Project Area include Richardson's ground squirrel (*Urocitellus richardsonii*), mink (*Mustela vison*), common raccoon (*Procyon lotor*), white-tailed deer (*Odocoileus virginianus*), least weasel (*M. nivalis*), and coyote (*Canis latrans*). These species are common in suitable habitats throughout the region. Six bat species have potential to occur in the Project Area: eastern red bats (*Lasiurus borealis*), silver-haired bats (*Lasionycteris noctivagans*), hoary bats (*Lasiurus cinereus*), northern long-eared bats, little brown bats (*Myotis lucifugus*), and big-brown bats (*Eptesicus fuscus*). These bat species, and their potential to occur in the Project Area, are discussed in detail in Appendices D and E. No federally or state-listed mammal species have been observed during biological surveys in the Project Area.

The Project Area is located in the Central Flyway migration corridor. Section 11.3.1.4 provides a more detailed summary of birds, including waterfowl and raptors, observed in the Project Area.

Reptile and amphibian inventories have not been completed for the Project as no federally or state-listed reptile or amphibian species are reported as known or expected to occur within Codington, Deuel, and Grant Counties. Common species occurring in Codington, Deuel, and Grant Counties are expected to inhabit suitable habitats in the Project Area.

11.3.1.1 Initial Site Assessment

The USFWS developed the Land-Based WEG (USFWS 2012) and the Eagle Conservation Plan Guidance (ECPG; USFWS 2013) to provide wind developers with voluntary guidelines intended to reduce potential impacts of wind energy projects on wildlife. The WEG and ECPG provide a structured approach for assessing potential risk to wildlife and promote coordination between project proponents and federal and state wildlife and natural resources agencies. The SDGFP and South Dakota Bat Working Group also have developed siting guidelines for wind energy projects (SD Siting Guidelines; SDGFP and South Dakota Bat Working Group, Undated). These guidelines generally are consistent with the WEG and provide guidance for non-wildlife resources (e.g., land use and sound).

In accordance with Tiers 1 and 2 of the WEG, and Stage 1 of the ECPG, a desktop review of readily available information was conducted to determine the Project's potential to effect species of concern and/or their habitats. Data sources included and were not limited to the USFWS's Information for Planning and Conservation tool, the South Dakota Natural Heritage Database, USGS's Breeding Bird Survey, and aerial imagery. The Applicant also queried the USFWS and SDGFP for information on sensitive resources within the Project vicinity. Results of this initial site assessment informed Tier 3 studies, which are discussed below in Section 11.3.1.4.

Coordination with the USFWS and SDGFP regarding earlier configurations of the Project Area began in 2005 (see Appendix B). The Applicant has been coordinating with the USFWS and SDGFP since 2017 on the specific Project Area described herein and continues to coordinate with these agencies to-date (see Appendix B).

11.3.1.2 Federally Listed Terrestrial Species

The sources described above were reviewed for records pertaining to federally listed wildlife species known or expected to occur in Codington, Deuel, and/or Grant Counties. The results of this review for terrestrial species are provided in Table 11.5.

Table 11.5. Federally Listed Terrestrial Species with Potential to Occur in Codington, Deuel, and Grant Counties

Common Name	Scientific Name	Known or Potential County Occurrence	Status*	Global Rank†	State Rank†
Insects					
Dakota skipper	*Hesperia dacotae*	Codington, Deuel, Grant	FT	G2G3	S2
Poweshiek skipperling	*Oarisma poweshiek*	Codington, Deuel, Grant	FE	G2	S2
Mammals					
Northern long-eared bat	*Myotis septentrionalis*	Codington, Deuel, Grant	FT	G4	S3
Birds					
Bald eagle	*Haliaeetus leucocephalus*	Codington, Deuel, Grant	BGEPA	G4	S1B, S2N
Golden eagle	*Aquila chrysaetos*	Codington, Deuel, Grant	BGEPA	G5	S3S4B, S3N
Piping plover	*Charadrius melodus*	Codington, Grant	FT	G3	S2B, SZN
Rufa red knot	*Calidris canutus rufa*	Codington, Deuel, Grant	FT	G4T2	SNRN
Whooping crane	*Gus americana*	Codington, Grant	FE	G1	SZN

**[1]FT – federally threatened; FE – federally endangered; BGEPA – protected by Bald and Golden Eagle Protection Act.*

† Global/State Rank Definition (applied range-wide for global rank and state-wide for state rank)

G1 S1 – Critically imperiled because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 S2 – Imperiled because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3 S3 – Either very rare and local throughout its range, or found locally (even abundantly at some of its locations) in a restricted range, or vulnerable to extinction throughout its range because of other factors; in the range of 21 of 100 occurrences.

G4 S4 – Apparently secure, though it may be quite rare in parts of its range, especially at the periphery. Cause for long-term concern.

G5 S5 – Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.

SZ – No definable occurrences for conservation purposes, usually assigned to migrants.

SR – Element reported for the state but no persuasive documentation.

Bird species may have two state ranks, one for breeding (S#B) and one for nonbreeding seasons (S#N). Example: bald eagle (S1B, S2N) indicates an S1 rank in breeding season and S2 in nonbreeding season.

11.3.1.2.1 Prairie Butterflies – Dakota Skipper (Federally Threatened) and Poweshiek Skipperling (Federally Endangered)

The Dakota skipper (*Hesperia dacotae*) is an obligate of undisturbed, native prairies, and generally inhabits wet lowlands dominated by bluestem grasses, or dry uplands that are a mixture of bluestem and needle stem grasses (Vaughn and Shepherd 2005). Larvae have been observed

feeding on several grasses, although little bluestem (*Schizachyrium scoparium*) is the preferred food source; the preferred nectar source for adults is purple coneflower (*Echinacea angustifolia*) (Vaughn and Shepherd 2005), in addition to other prairie flowering species. As of 2002, Dakota skippers had been recorded at 53 sites in 10 counties in South Dakota, including two sites in Codington County and five sites in Deuel County (USFWS 2002). Of the Dakota Skipper sites recorded in Codington and Deuel Counties, none are within the Project Area. The closest occurrence is from Round Lake just east of the eastern boundary of the northeastern portion of the Project Area in Deuel County. No designated critical habitat for the Dakota skipper is within the Project Area. The nearest critical habitat is in Deuel County, approximately 5 miles east of the Project Area. Dakota skippers have not been recorded in the Project Area (USFWS 2017b).

The Poweshiek skipperling (*Oarisma poweshiek*) lives in high-quality tallgrass prairie in both upland, dry areas and low moist areas (USFWS 2014). Nectar species for the Poweshiek skipperling include purple coneflower, black-eyed Susan (*Rudbeckia hirta*), palespike lobelia (*Lobelia spicata*), and other flowering prairie species. There is no definitive research available regarding which plant species are necessary for larvae to develop, but they appear to select fine-stemmed grasses and sedges, such as slender spike rush (*Eleocharis elliptica*), prairie dropseed (*Sporobolis heterlepis*), and little bluestem (Shepherd 2005: USFWS 2014). Skadsen (2015) suggests the Poweshiek skipperling may be extirpated from South Dakota.

Dakota skipper habitat assessments were completed for earlier iterations of the Project Area in June 2008, June and July 2009, 2015, and in 2016. Habitat assessments for the current Project Area were completed in 2017 and 2018 (Appendix F). Adult presence/absence surveys were completed within the Project Area during the 2018 adult flight season (see Section 11.3.1.4.1; see Appendix F). The presence/absence surveys were completed in accordance with the 2018 Dakota Skipper Survey Protocol (USFWS 2018). No Dakota skippers or Poweshiek skipperlings were observed.

11.3.1.2.2 Northern Long-eared Bat (Federally Threatened)

Summer habitat for the northern long-eared bat consists of forested areas with trees greater than 3 inches in diameter at breast height (USFWS 2017c). Northern long-eared bats roost in live trees and/or snags that have exfoliating bark, cracks, crevices, and/or cavities (USFWS 2017c). The species typically forages in forest interiors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure (USFWS 2017c). Northern long-eared bats also may roost in human-made structures such as buildings, barns, bridges, and bat houses (USFWS 2017c). The species hibernates in caves, mines, or other cave-like structures during the winter. The USFWS lists the northern long-eared bat as possibly present in Codington, Deuel, and Grant Counties, indicating that the counties are within the range of the species and may contain suitable habitat. However, there are no records of the species being present in these counties (USFWS 2017a). The nearest county records published by the USFWS

indicating known presence of the northern long-eared bat are in Brookings County to the south of the Project and in Roberts County to the north (USFWS 2017b).

The USFWS cites White Nose Syndrome, a fungal pathogen specific to bats, as the primary cause for the decline of the species, rather than habitat removal (USFWS 2016). The northern long-eared bat was listed as a threatened species with a final 4(d) rule on April 2, 2016 (USFWS 2016). The 4(d) rule prohibits purposeful take of the species range-wide. Within the "WNS Zone" (counties within 150 miles of known occurrences of the pathogen that causes white-nose syndrome) incidental take resulting from specified activities is prohibited during certain times of year. Incidental take that results from tree-clearing activities is prohibited only where it occurs within 0.25 mile of a known northern long-eared bat hibernacula or within 150 feet of a known maternity roost tree between June 1 and July 31. Incidental take as a result of the operation of wind facilities is not prohibited.

Several passive bat acoustic surveys have been completed on previous iterations of the Project Area (see Section 11.3.1.4). These surveys indicated a low likelihood of northern long-eared bat presence in the study areas. A passive bat acoustic survey was completed on the current Project Area in April through November 2017. This survey is summarized in Section 11.3.1.4.3.2 and provided in Appendix D.

A desktop bat habitat assessment was conducted with the purpose of assessing the availability and suitability of bat habitat, including that of northern long-eared bats, within an earlier iteration of the Project Area in summer 2015 (see Section 11.3.1.4). This assessment identified only marginal potential northern long-eared bat habitat. A desktop bat habitat assessment was completed for the current Project Area in September 2018 (see Section 11.3.1.4.2.1) (see Appendix E). The assessment concluded that there is limited suitable northern long-eared bat habitat within the Project Area and that USFWS considers the species unlikely to occur except as an occasional migrant (USFWS personal communication, 2018) (see Appendix B).

11.3.1.2.3 Bald Eagle and Golden Eagle (Protected under the Bald and Golden Eagle Protection Act)

Bald eagles (*Haliaeetus leucocephalus)* typically occupy habitat near large rivers, lakes, and marshes with available food sources (USFWS 2007). They build stick nests as large as 10 feet in diameter in trees and occasionally on human-made structures (USFWS 2007). Skadsen (2017) identifies the bald eagle as an "uncommon migrant" in northeast South Dakota. The golden eagle (*Aquila chrysaetos*) nests primarily west of the Missouri River in South Dakota, usually on cliffs, rocky outcrops, and in large trees (Kochert et al. 2002; Pulkrabek and O'Brien 1974). Skadsen (2017) lists the golden eagle as a "rare migrant" in northeast South Dakota.

Several avian use and raptor nest surveys have been completed for nearby study areas, or for earlier iterations of the Project Area (see Section 11.3.1.4). These surveys observed bald eagles near the Project; however, no golden eagles were observed during these recent surveys. In 2015,

studies in a nearby study area observed bald eagles; however, no golden eagles were observed (Tetra-Tech 2015). In total, 453 hours of survey were conducted over all four seasons during the 2015 survey, during which four bald eagles and zero golden eagles were observed (Tetra-Tech 2015). The timing of the sightings suggests that observed individuals likely were migrants and not resident breeding adults (Tetra-Tech 2015). In the spring and fall of 2008, avian surveys were conducted for an earlier iteration of the Project in Grant, Codington, Deuel, and Brookings Counties (Tetra-Tech 2008a, 2008b). Three golden eagles and zero bald eagles were observed (Tetra-Tech 2008a, 2008b).

Most recently, large bird use surveys were completed for the current Project Area from April through November 2017 (see Section 11.3.1.4.2.3). A total of 232 surveys across 29 points were completed. Six observations of bald eagles were made within the Project Area during the 232 surveys; no golden eagles were observed within the Project Area. Raptor nest aerial surveys conducted in 2017 and 2018 identified no bald or golden eagle nests within the Project Area, and 10 bald eagle nests within 10 miles of the Project Area (see Section 11.3.1.4.2.1; Appendix G). The closest occupied bald eagle nest observed was in 2017 approximately 5,174 feet from the Project Area boundary. In 2018, the closest occupied bald eagle nest observed was approximately 3,274 feet from the Project Area boundary. No golden eagles were observed during 2017 through 2018 Project Area surveys.

11.3.1.2.4 Piping Plover (Federally Threatened)

Within South Dakota, piping plovers breed and nest on open beaches, alkaline wetlands, and sandflats (Aron 2005). In the Northern Great Plains, the nesting season extends from late April through August, with peak activity in May and June (Aron 2005). Nests consist of shallow scrapes in the sand lined with rocks or small shells (Aron 2005). The SDGFP (2016) lists the piping plover as known to have occurred in Codington County but not in Deuel County or Grant County; however, the USFWS (2017b) does not list the species as a known or potential occurrence in Codington County. The Platte River Recovery Implementation Program (2017) indicates that the species nests primarily on the Missouri River, downstream of the Gavins Point (approximately 135 miles south of Project Area) and Fort Randall Dams (approximately 145 miles southwest of Project Area), with some nesting on tributaries of the Missouri. The Platte River Recovery Implementation Plan (2017) also states that piping plovers have been observed at Horseshoe Lake in western Codington County, approximately 16 miles west of the Project Area.

Several avian use surveys have been completed for nearby study areas, or for earlier iterations of the Project Area (see Section 11.3.1.4). No piping plovers were observed during these surveys. Avian use surveys were completed for the current Project Area from April through November 2017. These surveys are described below in Section 11.3.1.4.2. Point-count surveys were conducted at 29 locations throughout the Project Area; in total, 232 surveys were completed. No piping plovers were observed.

11.3.1.2.5 Rufa Red Knot (Federally Threatened)

The rufa red knot is a shoreline species that breeds in drier Arctic tundra areas that generally are sparsely vegetated. Nests are cup-shaped depressions lined with vegetation and located on the ground. Outside of the breeding season, the species primarily is found in marine habitats, especially near coastal inlets, estuaries, and bays (Harrington 2001). The species may be present in South Dakota as a migrant or accidental occurrence, but breeding or wintering populations have not been observed (Harrington 2001).

Several avian use surveys have been completed for nearby study areas, or for earlier iterations of the Project Area (see Section 11.3.1.4). No rufa red knots were observed during these surveys. Avian use surveys were completed for the current Project Area from April through November 2017. These surveys are described below in Section 11.3.1.4.2.3. Point-count surveys were conducted at 29 locations throughout the Project Area; in total, 232 surveys were completed. No rufa red knots were observed.

11.3.1.2.6 Whooping Crane (Federally Endangered)

The USFWS indicates that South Dakota is within the whooping crane migration corridor and that the species may stopover in suitable habitat including cropland and pastures, wet meadows, shallow marshes, shallow portions of large waterbodies, and both freshwater and alkaline basins (see Appendix B). The Project Area is approximately 50 miles east of the 95% core migration corridor (as delineated by Pearse et al. 2018a and 2018b) at its closest, indicating that it is relatively less likely for the species to be present within the Project Area than in areas closer to the migration corridor. According to the USFWS Whooping Crane Tracking Project Database, the closest whooping crane observation is from 1973, approximately 23.5 miles northwest of the Project Area.

Several avian use surveys have been completed for nearby study areas, or for earlier iterations of the Project Area (see Section 11.3.1.4). No whooping cranes were observed during these surveys. Avian use surveys were completed for the current Project Area from April through November 2017. These surveys are described below in Section 11.3.1.4.2. Point-count surveys were conducted at 29 locations throughout the Project Area; in total, 232 surveys were completed. No whooping cranes were observed. Additionally, a whooping crane habitat desktop assessment was conducted to identify potentially suitable in the Project Area plus a 1-mile buffer (see Section 11.3.1.4.1.2). The assessment found that wetlands considered suitable comprised only 0.2% of the total Project Area (Section 11.3.1.4.2.2).

11.3.1.3 State-Listed Terrestrial Species

The sources described in Section 11.3.1.1 were reviewed for records pertaining to state-listed wildlife species known or expected to occur in Codington, Deuel, and/or Grant County. The results of this review are provided in Table 11.6.

Table 11.6. State-Listed Species with Potential to Occur in Codington, Deuel, and Grant Counties

Common Name	Scientific Name	Known or Potential County Occurrence	Status*	Global Rank†	State Rank†
Mammals					
Northern river otter	*Lontra canadensis*	Codington, Deuel, Grant	ST	G5	S2
Birds					
Osprey	*Pandion haliaetus*	Grant	ST	G5	S1B, SZN
Piping plover	*Charadrius melodus*	Codington, Grant	ST	G3	S2B, SZN
Whooping crane	*Gus americana*	Codington, Grant	SE	G1	SZN

[1]*ST – state threatened; SE – state endangered; BGEPA – protected by Bald and Golden Eagle Protection Act.*
Global/State Rank Definition (applied range wide for global rank and statewide for state rank)
†*G1 S1 – Critically imperiled because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.*
G2 S2 – Imperiled because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.
G3 S3 – Either very rare and local throughout its range, or found locally (even abundantly at some of its locations) in a restricted range, or vulnerable to extinction throughout its range because of other factors; in the range of 21 of 100 occurrences.
G4 S4 – Apparently secure, though it may be quite rare in parts of its range, especially at the periphery. Cause for long-term concern.
G5 S5 – Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.
SZ – No definable occurrences for conservation purposes, usually assigned to migrants.
SR – Element reported for the state but no persuasive documentation.
Bird species may have two state ranks, one for breeding (S#B) and one for nonbreeding seasons (S#N). Example: osprey (S1B, SZN) indicates an S1 rank in breeding season and SZ in nonbreeding season.

The piping plover and whooping crane are discussed in detail in Sections 11.3.1.2.4 and 11.3.2.1.6 above, respectively.

11.3.1.3.1 Northern River Otter (State Threatened)

Northern river otters (*Lontra canadensis*) can occupy many types of habitat; however, riparian vegetation along a wetland margin is a key habitat feature (SDGFP 2012). This species is more prevalent in areas with abundant food and limited disturbance (SDGFP 2012). Northern river otters and beavers are closely associated; the northern river otter exploits dens, downed trees, ponds, and prey that thrive in beaver ponds (SDGFP 2012). The northern river otter was reintroduced into the Minnesota River valley in 1980 and 1981 (Skadsen 2016a). Since then, Skadsen (2016a) reports that the population has expanded its range and the species now is frequently observed in Grant County along the Yellowbank River drainages, which extend to approximately 2 miles east of the Project Area, and along other tributaries and lakes within the Minnesota River valley, which lies approximately 25 miles northeast of the Project Area. However, it is unknown whether northern river otters frequently use these tributaries in Codington and Deuel Counties (SDGFP 2012). The Project Area contains streams and other open water habitat which have the potential to support northern river otters (see Section 11.2).

The closest documented observation of the northern river otter was along an unnamed tributary to Hidewood Creek approximately 3.1 miles southeast of the Project Area (South Dakota Natural Heritage Database spatial data accompanying correspondence shown in Appendix B).

11.3.1.3.2 Osprey (State Threatened)

Ospreys (*Pandion haliaetus*) inhabit areas near large waterbodies that support their prey, which consists almost exclusively of fish (SDGFP 2017a). Their nest sites include large trees on or near waterbodies, with preference to locations that offer separation from surrounding vegetation to avoid predators (SDGFP 2017a). The Project Area contains streams and other open water habitat which have the potential to support osprey prey resources (see Section 11.2), though forested areas with available nesting sites are limited throughout the Project Area (see Section 11.1).

Several avian use surveys have been completed for nearby study areas, or for earlier iterations of the Project Area (see Section 11.3.1.4). No ospreys were observed during those surveys. Avian use surveys were completed in the Project Area from April through November 2017; in total, 232 surveys across 29 points were completed. No ospreys were observed within the Project Area. Raptor nest aerial surveys were conducted in 2017 and 2018; no osprey nests were identified within the Project Area or within 2 miles of the Project Area.

11.3.1.3.3 Prairie Grouse

The greater prairie-chicken (*Tympanuchus cupido*) and sharp-tailed grouse (*T. phasianellus*) may be present in the Project Area. These species are not federally or state-listed as threatened or endangered. During spring 2007 through 2008 avian surveys, several active greater prairie-chicken leks were observed within a nearby study area. Throughout agency coordination on the current Project Area, the Applicant has requested and received lek occurrence data from the SDGFP (see Appendix B). These locations have been documented spatially in the Applicant's Project planning databases to ensure consideration during Project siting. Data from SDGFP include one lek recorded in 2017 within the Project Area. During most recent avian use studies in the Project Area (see Section 11.3.1.4.2.3), two greater-prairie chickens, no sharp-tailed grouse, and no leks were observed.

11.3.1.4 Studies Conducted to Date

The Applicant has completed numerous wildlife studies for both the Project Area, and for earlier iterations of the Project Area (Table 11.7). Most recent (2017–2018) studies, which were completed on the current Project Area iteration, are described in more detail below.

Table 11.7. Wildlife Studies Completed for the Crowned Ridge II Wind Energy Facility Project Area and Vicinity

Date	Survey	Survey Area
Mar. 2007–June 2008	Avian use surveys (spring)	Earlier iteration of Project Area
June 2008	Dakota skipper habitat delineation	Earlier iteration of Project Area
Aug.–Nov. 2008	Avian use survey (fall)	Earlier iteration of Project Area
June–July 2009	Dakota skipper habitat delineation	Earlier iteration of Project Area
Aug.–Nov. 2014	Avian use surveys (fall)	Earlier iteration of Project Area
Mar.–Nov. 2014; Nov.–Mar. 2015	Eagle survey	Earlier iteration of Project Area
2015	Dakota Skipper habitat evaluation	Earlier iteration of Project Area
Summer 2015	Bat habitat assessment	Nearby study area
Aug.–Oct. 2015; Apr.–Oct. 2016	Bat acoustic survey	Earlier iteration of Project Area
Mar.–Apr. 2016	Raptor nest survey	Earlier iteration of Project Area
Apr.–May 2016	Lek surveys	Earlier iteration of Project Area
Apr.–Oct. 2016	Bat acoustic survey	Earlier iteration of Project Area
July 2016	Bat acoustic survey	Earlier iteration of Project Area
Sept. 2016	Dakota skipper and Poweshiek skipperling habitat assessment	Earlier iteration of Project Area
Apr. 2016–Feb. 2017	Avian use survey	Earlier iteration of Project Area
Apr. and May 2017	Raptor nest aerial survey	Project Area
Apr.–Nov. 2017	Avian point count surveys	Project Area
Apr.–Nov. 2017	Bat acoustic monitoring	Project Area
Spring 2018	Raptor nest aerial survey	Project Area
June–July 2018	Dakota skipper and Poweshiek skipperling adult survey	Project Area
Summer 2018	Desktop whooping crane habitat assessment	Project Area
Sep. 2018	Desktop bat habitat assessment	Project Area

11.3.1.4.1 Prairie Butterflies – Dakota Skipper and Poweshiek Skipperling

The Applicant completed a thorough desktop and field-verified habitat assessment for potentially suitable Dakota skipper and Poweshiek skipperling habitat in the Project Area (see Appendix F). Based on habitat assessment results, "adult presence/absence survey areas" were identified. In these areas, the Applicant completed three rounds of Dakota skipper and Poweshiek skipperling adult presence/absence surveys between June 28 and July 12, 2018, with 48 hours' spacing between each survey round and in accordance with the USFWS's 2018 Dakota Skipper Protocol. The surveys fell within the adult flight period of both species.

Prior to the survey, the Applicant obtained USFWS concurrence with the proposed survey methods. All observed butterfly species were documented, and a general count of flowering plants was conducted. No Dakota skippers or Poweshiek skipperlings were observed.

11.3.1.4.2 Birds

Raptor and Eagle Nest Surveys

Two raptor nest aerial surveys were completed in 2017 and one was completed in 2018 to identify nesting raptors and to provide spatial and species information (Appendix G). Biologists surveyed for all raptor nests within the Project Area and a 2-mile (3.2-kilometer [km]) buffer. Biologists surveyed specifically for eagle nests with the Project Area and a 10-mile (16-km) buffer.

The 2017 surveys identified 20 non-eagle raptor nest structures within the 2-mile buffer survey area. Six of these nests were considered occupied and 14 nests were considered unoccupied. Three occupied non-eagle raptor nests (two red-tailed hawk [*Buteo jamaicensis*] nests, one Swainson's hawk [*Buteo swainsoni*] nest) were observed within the Project Area. Three occupied non-eagle raptor nests (one red-tailed hawk nest, two Swainson's hawk nests) were observed outside the Project Area within the 2-mile buffer. One occupied bald eagle nest and one unoccupied bald eagle nest were observed within the 2-mile buffer and outside the Project Area (3,256 feet and 5,166 feet, respectively). Two occupied bald eagle nests and two unoccupied bald eagle nests were identified within the 10-mile buffer and beyond the 2-mile buffer. No bald eagle nests were observed within the Project Area.

The 2018 survey identified 37 non-eagle raptor nest structures within the 2-mile buffer survey area. Eleven nests were considered occupied and 26 nests were considered unoccupied. Six occupied non-eagle raptor nests (four red-tailed hawk nests, two great-horned owl [*Bubo virginianus*] nests) were observed within the Project Area. Likewise, five occupied non-eagle raptor nests (four red-tailed hawk nests, one unknown nest) were observed outside the Project Area within the 2-mile buffer. Three occupied bald eagle nests and one unoccupied eagle nest were observed within the 2-mile buffer and outside the Project Area (4,691 feet, 5,166 feet, 9,314 feet, and 3,256 feet, respectively). Three occupied bald eagle nests and one unoccupied bald eagle nest were identified within the 10-mile buffer and beyond the 2-mile buffer. No bald eagle nests were observed within the Project Area (see Appendix G).

Whooping Crane Habitat Assessment

A desktop assessment was conducted to identify potentially suitable whooping crane habitat in the Project Area plus a 1-mile buffer. The assessment followed methods outlined in The Watershed Institute's Potentially Suitable Habitat Assessment for the Whooping Crane (The Watershed Institute 2013). In total, 85 wetlands, totaling 2,419.6 acres, scored 12 or higher. The Watershed Institute considers a habitat score of 12 or higher as potential suitable habitat. Twenty-five of these 85 wetlands, totaling 95.0 acres, overlapped the Project Area. These wetlands comprise only 0.2% of the total Project Area.

Avian Use Surveys

Avian use surveys for the Project Area were completed April 1 through November 30, 2017, with the objective of characterizing activity, spatial distribution, and relative abundance of avian species. Study methods included large bird use surveys and small bird use surveys in accordance with recommendations set forth in the WEGs. Point-count surveys were conducted at 29 locations throughout the Project Area with 800-meter and 100-meter buffers for large and small bird surveys, respectively. A total of 232 surveys across the 29 points were completed during the survey.

The Applicant recorded 471 large bird observations. Flight altitudes for 275 of the 471 observations occurred at 0 to 200 meters (m) above ground level; however, 209 of the 275 observations (44.4%) occurred at a height below 30 m, which is outside of the typical turbine rotor-swept area. Surveyors recorded one large bird species recognized by the USFWS as a bird of conservation concern within the Project Area: bald eagle (USFWS 2008). Ten raptor species were observed: American kestrel (*Falco sparverius*), bald eagle, Cooper's hawk (*Accipiter cooperii*), merlin (*Falco columbarius*), northern goshawk (*Accipiter gentilis*), northern harrier (*Circus cyaneus*), red-tailed hawk, rough-legged hawk (*Buteo lagopus*), sharp-shinned hawk (*Accipiter striatus*), and Swainson's hawk. No golden eagles were observed within the Project Area. Twenty-three non-raptor large bird species were recorded: American crow (*Corvus brachyrhynchos*), American white pelican (*Pelecanus erythrorhynchos*), American wigeon (*Anus americana*), blue-winged teal (*Spatula discors*), Canada goose (*Branta canadensis*), double-crested cormorant (*Phalacrocorax auritus*), Franklin's gull (*Leucophaeus pipixcan*), gadwall (*Mareca strepera*), great blue heron (*Ardea herodias*), great egret (*Ardea alba*), greater prairie-chicken (*Tympanuchus cupido*), greater yellowlegs (*Tringa melanoleuca*), lesser yellowlegs (*Tringa flavipes*), mallard (*Anas platyrhynchos*), northern shoveler (*Anas clypeata*), ring-billed gull (*Larus delawarensis*), ring-necked pheasant (*Phasianus colchicus*), sandhill crane (*Grus canadensis*), snowy egret (*Egretta thula*), snow goose (*Chen caerulescens*), turkey vulture (*Cathartes aura*), Wilson's snipe (*Gallinago delicata*), and wild turkey (*Meleagris gallopavo*). All species observed during the 8-month survey period are considered typical for the region and seasons of observation.

In total, 637 small bird observations of 54 species were made during the surveys. Flight altitudes for all of the 637 observations occurred at 0 to 200 m above ground level; however, 604 of the 637 observations (94.8%) occurred at a height below 30 m, which is outside the turbine rotor-swept area. Biologists recorded three small bird species recognized by the USFWS as birds of conservation concern within the Project Area: the chestnut-collard longspur (*Calcarius ornatus*), grasshopper sparrow (*Ammodramus savannarum*), and upland sandpiper (*Bartramia longicauda*) (USFWS 2008). Western meadowlark (*Sturnella neglecta*), red-winged blackbird *(Agelaius phoeniceus*), and American robin (*Turdus migratorius*) accounted for 219 (34.4%) of all observations. A complete list of observed species is provided in the Avian Use Survey Report

(Appendix H). All species observed during the 8-month survey period are considered typical for the region and seasons of observation.

11.3.1.4.3 Bats

Bat Habitat Assessment

A bat habitat desktop assessment was conducted with the purpose of assessing the availability and suitability of bat habitat within the Project Area, and to determine the potential for presence of state-listed and federally listed bat species (see Appendix E).

Six bat species have potential to occur within the Project Area: eastern red bats, silver-haired bats, hoary bats, northern long-eared bats, little brown bats, and big-brown bats. The Applicant cross-referenced these species' requirements with availability of suitable habitat in the Project Area, reviewed occurrence records, and coordinated with the USFWS to determine seasonal likelihood of occurrence for each species.

The only federally listed species with potential to occur within the Project Area is the northern long-eared bat. There is limited suitable habitat for the northern long-eared bat within the Project Area, typically in the form of wooded riparian corridors, small woodlots, and isolated forest patches. As a forest interior species, the northern long-eared bat requires contiguous forest blocks of 15 or greater acres and prefers forested blocks of greater than 114 acres (see Appendix E). The Project Area contains 123 total acres of forested blocks that individually are between 15 and 114 acres, and no forested blocks that individually are 114 acres or greater (see Appendix E). These acreages represent a combined 0.2% of the Project Area qualifying as suitable roosting and/or foraging habitat. The habitat available within the Project Area is similar in availability and density to the surrounding landscape, indicating that there is no regionally unique habitat that would serve as an attractant for northern long-eared bats to the Project Area. Furthermore, the USFWS has stated that there is low likelihood of northern long-eared bats occurring within the Project Area as a summer resident (USFWS personal communication, 2018) (see Appendix E). There is potential for the northern long-eared bat to occur within the Project Area as a migrant during the spring and fall, though migration behavior of the species is poorly understood.

Based on habitat suitability and availability, the remaining species with potential to occur have varying likelihoods of occurrence throughout the year (see Appendix E).

Bat Acoustic Survey

A long-term, passive, acoustic bat monitoring survey was conducted within the Project Area between April 6 and December 1, 2017, in accordance with the recommendations set forth in the WEGs (see Appendix D). An acoustic detector was deployed on a 3-m-high pole within the Project Area. Data were analyzed to determine bat passes per detector night of recording, where a "detector night" is equal to one detector deployed for one calendar night.

Nearly 70% of the calls recorded occurred in the fall. Although the dynamics of bat migration are not fully understood, one factor that could contribute to this difference is recruitment of juveniles into the fall migration population. Seasonal differences in the recorded data suggest that the Project Area experiences limited bat migration in the spring. However, if 2017 data are indicative of an overall pattern, spring bat populations are sparse when compared with other regions of the United States. The highest levels of activity observed correlated with fall migration, though even these spikes of activity were low when compared with other fall migration events.

Overall, the level of bat activity may suggest that bat use of the Project Area is relatively low. The annual mean passes the per detector night recorded during the study was 3.6. For comparison, Jain (2005) documented a mean activity level in 2003 and 2004 of 34.9 and 36.6 passes per detector-night, respectively, in Iowa. Because of the lack of suitable roosting and foraging habitat in the Project Area, the number of bats is likely much lower than what might be observed in other, more ecologically diverse parts of the country.

11.3.2 Wildlife Impacts/Mitigation

As described above, the Project will result in temporary and permanent impacts to approximately 1,940.21 and 76.21 acres, respectively. The majority (1,486.34 acres; 73.79%) of these impacts will occur in agricultural areas (see Table 11.3). Agricultural areas may provide some, although relatively limited, foraging and cover habitat for some wildlife species. As described above, the Applicant will restore temporarily impacted acres to pre-construction conditions. In temporarily impacted areas, wildlife is expected to be displaced in the short-term, re-inhabiting these areas following disturbance.

Construction of the Project may result in the direct mortality of some individuals of some wildlife species (e.g., reptiles and amphibians). Mortality associated with construction (e.g., crushing by vehicles) is expected to be limited, and not result in population-level effects. Wildlife, when mobile (e.g., adult birds, volant bats) are capable of escaping disturbance. The Applicant will implement BMPs, including pre-construction nest clearance surveys, to limit impacts to bird eggs and nestlings. Project construction also will result in sound or disturbance with potential to temporarily displace individuals of some species. However, the displacement is expected to be short-lived. In most cases, wildlife may only be temporarily displaced from habitat and will be expected to use adjacent habitats elsewhere in the Project Area during disturbances.

During O&M activities, wildlife may be disturbed by activity including vehicle and foot traffic. Such disturbances will be short-term and limited to the duration of the activities. Many wildlife species occurring in the Project Area are adapted to human disturbance and are expected to habituate to long-term, intermittent, routine activity (e.g., O&M activities) in the Project Area.

Construction crews will be instructed to avoid disturbing or harassing wildlife when observed. Further, crews will remove trash from the Project Area to avoid inadvertently attracting scavenger species, which could in turn increase potential impacts to prey species (e.g., nesting birds).

Potential mortality to bird and bat species during the operation phase of the Project is described below.

11.3.2.1 Federally Listed Species

The following sections describe potential effects to federally listed species, if those species were to occur in the Project Area.

11.3.2.1.1 Northern Long-Eared Bat

No impacts to summering or wintering northern long-eared bats are expected to result from the Project.

The USFWS has indicated that the northern long-eared bat is unlikely to occur in the Project Area except as an occasional migrant (USFWS personal communication, 2018). Results of the Applicant's studies indicate an overall lack of suitable habitat for the species. It is possible that the species could occur in the Project Area as a migrant.

Although not the case here, where northern long-eared bats occur as summer residents, the removal and fragmentation of forested patches 15 acres or larger could affect the species. Removing potential roost trees (trees that provide roosting opportunity but are not known to be roosts) degrades the quality of habitat, and removal of trees may eliminate potential foraging habitat. Felling occupied roost trees during the summer could affect individual northern long-eared bats, where the species is present. Because the species is unlikely to occur in the Project Area as a summer resident, these impacts will not occur because of the Project. However, the Applicant has opted to minimize tree-clearing and to observe seasonal clearing restrictions to further reduce the chances for impacts to the species. Impacts to the northern long-eared bat, if present, will be minimized to the extent practicable through project design and BMPs described here and summarized in Section 11.3.2.5.

11.3.2.1.2 Dakota Skipper and Poweshiek Skipperling

No Dakota skippers or Poweshiek skipperlings were observed during protocol surveys in the Project Area in 2018. If occupied in future years, the Project could impact potentially suitable habitat for Dakota skippers and Poweshiek skipperlings through habitat removal or modification. Impacts could occur through placement of structures within suitable habitat or through routing of features such as access roads. The species, where present, are vulnerable to impacts within larval habitat year-round and adult habitat during the flight season (approximately June 15–July 20, weather dependent). Where suitable habitat cannot be avoided, the Applicant will avoid construction activities in those specific locations during the adult flight period (approximately

June 15–July 20, weather dependent) to avoid direct mortality of breeding adults. Impacts to the prairie butterflies, if present, will be minimized to the extent practicable through project design and BMPs described here and summarized in Section 11.3.2.5.

11.3.2.1.3 Bald Eagles

Bald eagles have been observed in and near the Project Area. Potential impacts to bald eagles, if present in the Project Area, include the possibility for collisions with structures. Siltation and erosion that results from the Project could lead to degradation of water quality, potentially affecting bald eagle prey sources. The Applicant has avoided siting turbines within 1.5 miles of occupied bald eagle nests. Impacts to bald eagles, if present, will be further minimized to the extent practicable through Project design and BMPs described here and summarized in Section 11.3.2.5.

11.3.2.1.4 Whooping Cranes

There is very limited likelihood that whooping cranes occur within the Project Area. No whooping cranes have been observed in the Project Area during targeted wildlife surveys. Furthermore, habitat assessments indicate a paucity of suitable stopover habitat for the species within the Project Area. The Project is not expected to impact whooping cranes.

11.3.2.2 State-Listed Species

Habitat removal and degradation are the primary potential impacts to the northern river otter. Erosion and siltation can affect water quality, limiting prey availability for northern river otters. Impacts to streams and waterbodies will be avoided to the extent practicable through Project design and BMPs described in Section 11.2 and summarized below in Section 11.3.2.5.

If present, osprey have the potential to collide with vertical structures. Siltation and erosion that results from the Project could lead to degradation of water quality, potentially affecting osprey prey sources. Impacts to osprey, if present, will be avoided to the extent practicable through Project design and BMPs described here and summarized in Section 11.3.2.5.

11.3.2.3 Avian Species

Impacts to avian species can be direct (e.g., turbine strike mortality) or indirect (e.g., loss or degradation of habitat).

The Applicant has selected a tubular turbine design, reducing perching and nesting sites thereby reducing risk of avian mortality. In addition, the Applicant will implement BMPs, including nest clearance surveys prior to construction to limit impacts to bird eggs and nestlings (see Section 11.3.2.5). As described above in Section 11.1.1, the Applicant has minimized tree-clearing, which results in avoidance and minimization of impacts to potentially suitable nesting bird habitat. Likewise, aquatic resources have been avoided to the extent practical, and the Applicant will implement erosion- and sediment-control devices as appropriate during construction. Such

measures avoid and minimize the potential for adverse effects to potential bird habitat in the Project Area.

The Applicant has completed both small and large bird use surveys of the Project Area to assess baseline conditions (see Section 11.3.1.4.1.3). The Applicant plans to conduct 1 year of systematic post-construction mortality monitoring to confirm low-risk expectations and to confirm operational trends are consistent with those observed for other projects in the region. The primary objective for post-construction monitoring will be to estimate the mortality rate during operation of the Project. If the monitoring confirms the Project is low risk and in line with expectations, only 1 year of monitoring will be conducted. If results indicate mortality exceeds that predicted based on ranges detected at similar projects and similar habitat types in the region, a second year of post-construction monitoring may be implemented.

11.3.2.4 Bats

Impacts to bats can be direct (e.g., turbine strike mortality) or indirect (e.g., loss or degradation of habitat). As described above in Section 11.1.1, the Applicant has minimized tree-clearing, which results in avoidance and minimization of impacts to potentially suitable roosting bat habitat. Likewise, aquatic resources have been avoided to the extent practical, and the Applicant will implement erosion- and sediment-control devices as appropriate during construction. Such measures avoid and minimize the potential for adverse effects to potential foraging bat habitat in the Project Area.

The Applicant has completed a habitat suitability assessment, and an acoustic survey, for bats in the Project Area (see Sections 11.3.1.4.2.1 and 11.3.1.4.2.2). The Applicant plans to conduct 1 year of systematic post-construction mortality monitoring to confirm operational trends are consistent with previously observed trends for other projects in the region, as described above.

11.3.2.5 Avoidance, Minimization, and Mitigation Measures

The following avoidance, minimization, and mitigation measures summarize those described above, which have been developed by the Applicant to avoid, minimize, or offset potential adverse impacts to terrestrial ecosystems that may result from the Project.

- Avoid siting turbines in wetlands or other waterbodies.
- Avoid placing structures, or conducting any activity, on USFWS grassland or USFWS wetland/grassland combination easements.
- Site turbines more than 1.5 miles from known occupied bald eagle nests.
- Site turbines with consideration of SDGFP-documented leks.
- Minimize tree clearing.
- Re-vegetate disturbed areas to as close to pre-construction conditions as possible in coordination with the landowner and per applicable permit conditions and requirements.

- Conduct pre-construction bird nest clearance surveys or observe seasonal clearing restrictions to minimize impacts to breeding birds, including raptors, and summering bats.
- Avoid activity in potentially suitable habitat for the Dakota skipper and Poweshiek skipperling where possible.
- Minimize impacts to Dakota skippers and Poweshiek skipperlings by avoiding construction during the adult flight period (approximately June 15–July 20) to avoid mortality of breeding adults.
- Implement standard erosion-control measures, including temporary sediment barriers, slope breakers, and mulching to avoid sedimentation and runoff to avoid impacts to wetlands and streams.
- During revegetation efforts in potentially suitable Dakota skipper and Poweshiek skipperling habitat, use seed mixtures that incorporate vegetation that supports these prairie butterfly species.
- Complete 1 year of post-construction mortality monitoring and adhere to the Wildlife Response and Reporting System Manual for the life of the Project. The Wildlife Response and Reporting System Manual standardizes and prescribes actions taken in response to any wildlife fatalities and/or injuries found within the Project Area boundaries.

12.0 Effect on Aquatic Ecosystems (ARSD 20:10:22:17)

ARSD 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.*

12.1 Existing Aquatic Ecosystems

Aquatic resources present in the Project Area are described in detail in Section 10 and are illustrated in Figure 12. Aquatic resources in the Project Area have been altered to various levels, ranging from annually cultivated wetlands to channelized watercourses to naturally occurring pothole wetlands with little physical alteration.

12.1.1 Federally Listed Aquatic Species

The USFWS South Dakota Ecological Services Field Office publishes a list of threatened and endangered species known or presumed to occur within counties in South Dakota (USFWS 2017b). Coordination with the USFWS was reviewed for information on federally or state-listed species with potential to occur in the Project Area (see Appendix B). The USFWS lists one federally listed aquatic species in Codington County and Deuel County, the Topeka shiner

(*Notropis topeka*; endangered) and none in Grant County. The Topeka shiner has a G5 global rank, and an S3 state rank (see footnote to Table 12.1).

12.1.1.1 Topeka Shiner (Federal Endangered)

The Topeka shiner is a small minnow native to eastern South Dakota, and is found within tributaries to the James, Vermillion, and Big Sioux drainages. The species prefers a variety of habitats including runs, pools, and backwater areas in cool, perennial streams. Occupied streams typically are groundwater-fed; and have high water quality, clean gravel substrates, and vegetated banks (Shearer 2003). Shearer (2003) synthesized available occurrence data and identified 16 streams where the Topeka shiner was observed before 1997, and 38 streams where the species was observed between 1997 and 2002. While one of those streams is in Codington County, two of the streams occur within Deuel County, though they are not located within the Project Area. However, recent observations of the species from 2005 and 2009 do exist from Willow Creek and a tributary to Willow Creek, in Codington County (SDNHD spatial data accompanying correspondence shown in Appendix B). Portions of these streams are located within the northwest portion of the Project Area. Additional tributaries to the Big Sioux River do occur in the Project Area, and the USFWS (2017b) lists the species as known from Codington and Deuel Counties. There is no information available to determine whether the Topeka shiner currently inhabits streams in the actual Project Area or Project Construction Easement.

12.1.2 State-Listed Aquatic Species

The SDGFP maintains a list of threatened, endangered, and candidate species (SDCL Chapters 34A-8 and 34A-8A) and provides information on recorded observations within a given county (SDGFP 2016). Available resources through the SDGFP were reviewed for information on federally or state-listed species with potential to occur in the Project Area (see Table 12.1; see Appendix B). The SDGFP lists two state-listed aquatic species with documented occurrences in Grant County: the blacknose shiner (*Notropis heterolepis*) and northern redbelly dace (*Chrosomus eos*) (SDGFP 2016). The SDGFP lists two state-listed aquatic species with documented occurrences in Deuel County: the banded killifish (*Fundulus diaphanous*) and the northern redbelly dace. The SDGFP also lists the Topeka shiner as documented in Codington and Deuel Counties; however, the species is not state-listed in South Dakota.

Table 12.1. State-Listed Aquatic Wildlife with Potential to be Present in the Project Area

Common Name	Scientific Name	Status*	County Records	Global Rank†	State Rank†
Banded killifish	*Fundulus diaphanous*	SE	Documented in Deuel County	G5	S1
Blacknose shiner	*Notropis heterolepis*	SE	Documented in Grant County	G5	S1
Northern redbelly dace	*Chrosomus eos*	ST	Documented in Grant and Deuel Counties	G5	S2

** SE – state endangered; ST – state endangered*

† Global/State Rank Definition (applied rangewide for global rank and statewide for state rank; these may change with new information):

S1 = Critically imperiled because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

S2 = Imperiled because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G5 = Demonstrably secure, though it may be quite rare in parts of its range, especially at the periphery.

12.1.2.1 Northern Redbelly Dace (State Threatened)

The northern redbelly dace is a small olive to dark brown-colored fish native to eastern South Dakota that prefers quiet spring-fed areas of streams, bogs, and beaver ponds with aquatic vegetation (SDGFP 2017b). It is found within tributaries to the Missouri, Minnesota, Big Sioux, White, Niobrara, and Keya Paha River drainages. McCoy and Hales (1974) observed the northern redbelly dace in both the North and South Forks of the Yellowbank River in Grant County in 1973 (SDNHD spatial data accompanying correspondence shown in Appendix B), but the species was not observed during subsequent surveys (Burgess and Shearer 2008; Dieterman and Berry 1996). It is hypothesized that the species may be extirpated from northeast South Dakota (Skadsen 2016b). Tributaries to the North Fork of the Yellow Bank River are not present within the Project Area or the Project Construction Easement (see Section 10).

12.1.2.2 Blacknose Shiner (State Endangered)

The blacknose shiner is a small minnow native to eastern South Dakota, and is found in tributaries to the Minnesota, Big Sioux, James, and Keya Paha River drainages. The species prefers cool, clear streams with deep pools, abundant vegetation, and sandy to gravel substrates (SDGFP 2017c). Historical records exist for the Little Minnesota River and Lake Traverse, neither of which are in Grant County (Bailey and Allum 1962). Skadsen (2016b) lists the blacknose shiner as likely extirpated from northeast South Dakota. Additional tributaries to the Big Sioux River do occur in the Project Area, and the SDGFP (2016b) indicates that the species is known from Grant County. However, there is no information available to determine whether the blacknose shiner currently inhabits streams in the Project Area or Project Construction Easement.

12.1.2.3 Banded Killifish (State Endangered)

The banded killifish is a small olive-colored fish with yellow sides and green-brown vertical bands, native to eastern South Dakota. The species prefers quiet, shallow lakes, ponds, and streams with abundant vegetation and sandy-gravel substrates, though it has also been detected in streams with muddy bottoms and no aquatic vegetation (SDGFP 2018). The banded killifish is found in tributaries to the James, Vermillion, and Big Sioux River basins (SDGFP 2014). Since 2000, the species only has been reported from the inlet of Bitter Lake in Day County and Little Eureka Lake in McPherson County. The SDGFP (2016b) indicates that the species is known from Deuel County and tributaries to the Big Sioux River do occur in the Project Area; however, there is no information available to determine whether the banded killifish currently inhabits streams in the Project Area or Project Construction Easement.

12.2 Aquatic Ecosystems Impacts/Mitigation

As described in Section 11, the Applicant will avoid siting turbines, access roads, collection lines, and other Project facilities in wetlands to the extent practicable. Where wetlands must be intersected, the Applicant will either bore under these features, or minimize impacts to NWP thresholds to the extent practical (see Section 11.2.2).

The primary potential for impact to any aquatic ecosystem will be as a result of increased sediment or total suspended solids in aquatic resources due to construction-related soil erosion. Surficial soils in flat areas generally 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. Most of the soils in the Project Area are not highly susceptible to erosion; however, care will be taken to avoid or minimize excavation in steep slope areas. Excavation in such areas is expected to be limited to discrete areas, such as portions of access roads. Where possible, access roads will be sited to avoid steep slopes. There may also be limited trenching of underground cabling in steep slopes, although that will be minimized as much as possible. During construction, BMPs will be implemented to help ensure that drainage ways and streams are not impacted by sediment runoff from exposed soils during precipitation events (see Section 11).

Project construction will require coverage under the General Permit for Storm Water Discharges Associated with Construction Activities issued by the SDDENR. A condition of this permit is to develop and implement a SWPPP. The Applicant will develop the SWPPP prior to construction. The SWPPP will describe BMPs for erosion and sedimentation control. Such BMPs may include silt fences, straw wattles, water bars, vegetative buffers, and other measures to control stormwater run-on and runoff to mitigate erosion and sedimentation. As a result of erosion- and sediment-control BMPs, no impacts to aquatic ecosystems are anticipated. Further, because no impacts to aquatic ecosystems are anticipated, no impacts to the state- or federally listed species discussed above, if present in the Project Area, are anticipated.

13.0 Land Use (ARSD 20:10:22:18)

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

(1) A map or maps drawn to scale of the plant, wind energy, or transmission site identifying existing land use according to the following classification system:
(a) Land used primarily for row and nonrow crops in rotation;
(b) Irrigated lands;
(c) Pasturelands and rangelands;
(d) Haylands;
(e) Undisturbed native grasslands;
(f) Existing and potential extractive nonrenewable resources;
(g) Other major industries;
(h) Rural residences and farmsteads, family farms, and ranches;
(i) Residential;
(j) Public, commercial, and institutional use;
(k) Municipal water supply and water sources for organized rural water systems; and
(l) Noise sensitive land uses;
(2) Identification of the number of persons and homes which will be displaced by the location of the proposed facility;
(3) An analysis of the compatibility of the proposed facility with present land use of the surrounding area, with special attention paid to the effects on rural life and the business of farming; and
(4) A general analysis of the effects of the proposed facility and associated facilities on land uses and the planned measures to ameliorate adverse impacts.

13.1 Land Use

This section discusses the existing land use, displacement of residences or businesses, public lands and conservation easements, sound, shadow flicker, electromagnetic interference, and visual resources of the Project Area. Also described are the Project's potential impacts on these resources and measures to mitigate the potential impacts. Local land use controls, including zoning ordinances, are discussed in Section 14.

13.1.1 Existing Land Use

The Project is located entirely on private land, which includes undeveloped rural areas, agricultural land, and residential farmsteads. The primary land use within the Project Area is agricultural (see Section 11, Table 11.1 for land cover acreage and percentages). Within the Project Construction Easement, land is agricultural (1,473.5 acres or 73.73%), grass/pasture (438.43 acres or 21.94%), developed (60.86 acres or 3.05%), other hay/non-alfalfa (22.32 acres or 1.12%), deciduous forest (0.07 acre or 0.0%), herbaceous wetlands (1.72 acres or 0.09%), fallow/idle cropland (0.84 acre or 0.04%), open water (0.55 acre and 0.03%), barren land (0.05 acre and 0.0%), and shrubland (0.19 acre and 0.01%) (see Figure 2). Land within the Project Construction Easement is characterized by tilled agriculture and a well-developed drainage network across the Big Sioux Basin and hummocky topography with no distinct drainage pattern

in the Prairie Coteau. Vegetation is primarily cropland and grassland with small patches of planted trees in shelterbelts around farmsteads/homesteads, and near natural streams. Two active sand and gravel pits are located in the Project Area (see Figure 13). Potential extractive nonrenewable resources are present within the Project Construction Easement. The following land classifications are not present within the Project Construction Easement: irrigated land, major industries, areas zoned as residential, commercial or institutional uses, or municipal water supply and water sources for organized water systems. Rural residence and farmsteads are located within the Project Construction Easement.

13.1.2 Land Use Impacts/Mitigation

The Project is compatible with existing land use and is not anticipated to result in sizable permanent impacts to the surrounding land, including agricultural operations. Typically, wind farm projects do not result in sizable permanent impacts due to their limited construction easement of ground-disturbing activities, and wind farm projects typically remove less than 1 acre per turbine. Land use will be permanently modified in areas where turbines, substations, collection lines, and access roads are located. Temporary impacts will occur for initial construction and installation of other ancillary features, such as collection and communication lines, or for crane walks and temporary access. Where temporary impacts occur, the land will be returned to pre-construction conditions. Land within the Project Construction Easement is primarily used for agricultural production (73.7%; see Section 13.1.1 and Figure 2), which is expected to continue following construction and during operation of the Project. Construction of the Project will result in short-term disturbances to soils and vegetation and increased traffic and sound on local roads. Sound and temporary air quality impacts, in the form of diesel exhaust and dust resulting from the operation of heavy equipment, are anticipated. However, once construction is complete, traffic and sound levels will return to pre-construction levels. Long-term operation of the Project is not expected to adversely impact rural lifestyles or create hardships for rural residents. The Project will contribute to rural lifestyles by improving road conditions and access through the Project Area. Because operation of the Project is a compatible land use, the additional easement income for the agricultural landowners is expected to facilitate continued farming and ranching of the lands in agricultural production. Landowners will also be compensated for crop damage during Project construction and operations that impact agricultural lands.

Based on farmstead data collected by the Applicant, 253 occupied structures, including residences, barns, businesses, and buildings owned and/or maintained by a governmental entity are located within the Project Area.

The Applicant will execute lease options or purchase land rights to acquire private property required by the Project, in accordance with state and federal land acquisition requirements. Land

rights will be recorded as part of the public record. Land for the substation and O&M facilities will be purchased.

Approximately 160 residences (excluding accessory farmstead buildings and barns and silos), including residences in the towns of Kranzburg, Goodwin, and Bemis are located within the Project Area. According to the South Dakota GIS and farmstead data collected by the Applicant, two existing MET towers and two proposed MET towers are in the Project Area. The closest an existing MET tower is to a proposed turbine (CRII-69) is 726 feet. The closest proposed MET tower is 920 feet from the nearest proposed turbine (CRII-75). The minimum distances between an occupied residence, business, or governmental building and a proposed turbine location are summarized in Table 13.1. Based on the proposed layout of the turbines, access roads, and collection lines, there will be no displacement of residences or businesses due to construction of Project facilities.

Table 13.1. Setback Requirements for Codington, Deuel, and Grant Counties

Category	**Requirements/Commitments**
State Requirements	
Setbacks	Turbines shall be set back at least 500 feet or 1.1 times the height of the tower, whichever is greater, from any surrounding property line (SDCL 43-13-24).
Codington County Requirements: **Section 5.22.03 General Provisions (Vertical height of Tower 75 to 500 feet)**	
Setbacks [1]	- 550 feet from participating occupied residence, business, church, or school - 1,500 feet from non-participating occupied residence, business, church, or school (within all Districts other than Town Districts) - 5,280 feet from non-participating occupied residence, business, church, or school (within Town Districts) - 5,280 feet from Municipal Boundaries at the time of Conditional Use Application - 110% of the height of the wind turbine from right-of-way of public roads [2] - 110% the height of the wind turbines from any property line [3] *Exception: The Board of Adjustment may allow setback/separation distances to be less than the established distances identified above if the road authority, participating or non-participating landowners, or municipality (by resolution of the governing body) agree to a lesser setback/separation distance. If approved, such agreement is to be recorded and filed with the Codington County Zoning Officer. Said agreement shall be binding upon the heirs, successors, and assigns of the title holder and shall pass with the land.*
Noise	Noise level generated by wind energy system shall not exceed 50 dBA, average A-weighted sound pressure level effects at the property line of existing nonparticipating residences, businesses, and buildings owned and/or maintained by a governmental entity [4]

Category	Requirements/Commitments
Flicker Analysis	Flicker at any receptor shall not exceed 30 hours per year within the analysis area for all schools, churches, businesses, and occupied dwellings within a 1-mile radius of each turbine within a project. *Exception: The Board of Adjustment may allow for a greater amount of flicker than identified above if the participating or non-participating landowners agree to said amount of flicker. If approved, such agreement is to be recorded and filed with the Codington County Zoning Officer. Said agreement shall be binding upon the heirs, successors, and assigns of the title holder and shall pass with the land.*
Turbine Spacing	The turbines shall be spaced no closer than three (3) rotor diameters (RD) (measurement of blades tip to tip) within a straight line. If required during final micro siting of the turbines to account for topographic conditions, up to ten (10) percent of the towers may be sited closer than the above spacing but the permittees shall minimize the need to site the turbines closer.
1) Setback distance to be measured from the wall line of the neighboring principal building to the base of the WES tower. The vertical height of the wind turbine is measured from the ground surface to the tip of the blade when in a fully vertical position. *2) The horizontal setback shall be measured from the base of the tower to the public right-of-way.* *3) The horizontal setback shall be measured from the base of the tower to the adjoining property line unless wind easement has been obtained from adjoining property owner.* *4) Noise level measurements shall be made with a sound level meter using the A-weighting scale, in accordance with standards promulgated by the American National Standards Institute. An L90 measurement shall be used and have a measurement period no less than ten minutes unless otherwise specified by the Board of Adjustment*	
Grant County Requirements: **Section 1211.0 General Provisions**	
Setbacks (1)	- 1,500' from participating residence, business, church, or school, building owner and/or operated by a governmental entity (2) - 1,500' from non-participating residence, business, church, or school, building owned and/or operated by a governmental entity - 5,280' from Municipal Boundaries existing at the time of Conditional Use Permit Application - 500' or 110% of the vertical height of the wind turbine, whichever is greater, from Public Right-of-Way (3) - 500' or 110% of the vertical height of the wind turbine, whichever is greater, from any property line (4) *Exception: The Board of Adjustment may allow setback/separation distances to be less than the established distances identified above if the road authority, participating or non-participating landowners, or municipality (by resolution of the governing body) agree to a lesser setback/separation distance. If approved, such agreement is to be recorded and filed with the Register of Deeds. Signed agreement shall be binding upon the heirs, successors, and assigns of the title holder and shall pass with the land.*
Noise	- Noise level shall not exceed 45 dBA, average A-weighted Sound pressure including constructive interference effects measured twenty-five (25) feet from the perimeter of the existing non-participating residences, businesses, and buildings owned and/or maintained by a governmental entity. (5) - Noise level shall not exceed 50 dBA, average A-weighted Sound pressure including constructive interference effects measured twenty-five (25) feet from the perimeter of participating residences, businesses, and buildings owned and/or maintained by a governmental entity. (5)

Category	Requirements/Commitments
Flicker Analysis	Flicker at any receptor shall not exceed thirty (30) hours per year within the analysis area for all schools, churches, businesses and occupied dwellings within a one (1) mile radius of each turbine within a project. *Exception: Exception: The Board of Adjustment may allow for a greater amount of flicker than identified above if the participating or non-participating landowners agree to said amount of flicker. If approved, such agreement is to be recorded and filed with the Grant County Register of Deeds. Said agreement shall be binding upon the heirs, successors, and assigns of the title holder and shall pass with the land.*
Turbine Spacing	The turbines shall be spaced no closer together than three (3) rotor diameters (RD) (measurement of blades tip to tip) within a string. If required during final micro siting of the turbines to account for topographic conditions, up to ten (10) percent of the towers may be sited closer than the above spacing but the permittees shall minimize the need to site the turbines closer.

Category	Requirements/Commitments
1) Setback distance to be measured from the wall line of the neighboring principal building to the base of the WES tower. The vertical height of the wind turbine is measured from the ground surface to the tip of the blade when in a fully vertical position. *2) No less than 110% of the vertical height of the wind turbine if agreed upon by participating entity.* *3) The horizontal setback shall be measured from the base of the tower to the public right-of-way.* *4) The horizontal setback shall be measured from the base of the tower to the adjoining property line unless wind easement has been obtained from adjoining property owner.* *5) Noise level measurements shall be made with a sound level meter using the A-weighting scale, in accordance with standards promulgated by the American National Standards Institute. A L90 measurement shall be used and have a measurement period no less than ten (10) minutes unless otherwise specified by the Board of Adjustment*	
Deuel County Requirements: **Section 1215.03 General Provisions**	
Setbacks [1]	- 1,500' from existing participating residence, business, and public buildings - 4 times the turbine blade height from existing non-participating residences and businesses [2][3][4] - 3 miles from Lake Park District at Lake Cochrane - 2 miles from Lake Alice - 1 mile from Lake Park District at Bullhead Lake - 1 mile from the nearest residence of municipalities of Altamont, Astoria, Brandt, and Goodwin - 1.5 miles from City limits of Gary, Toronto, and Clear Lake (except Sections 11, 12, & 14) - 110% of the turbine blade height from Public Right-of-Way [3] - 110% of the turbine blade height from Property Line [5] *Exception: The Board of Adjustment may allow setback/separation distances to be less than the established distances identified above if the road authority, participating or non-participating landowners, or municipality (by resolution of the governing body) agree to a lesser setback/separation distance. If approved, such agreement is to be recorded and filed with the Register of Deeds. Signed agreement shall be binding upon the heirs, successors, and assigns of the title holder and shall pass with the land.*
Noise	- Noise level shall not exceed 45 dBA average A□weighted sound pressure at the perimeter of existing residences, for non□participating residences
Flicker Analysis	Limit for allowable shadow flicker at existing residences to no more than 30 hours.
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.

1) Setback distance to be measured from the wall line of the neighboring principal building to the base of the WES tower. *2) Non-Participating property owners have the right to wave the setback requirements.* *3) The turbine blade height is measured from the ground surface to the tip of the blade when in a fully vertical position.* *4) The term "business" does not include agricultural uses.* *5) The turbine blade height is measured from the ground surface to the tip of the blade when in a fully vertical position unless wind easement has been obtained from adjoining property owner.*	
Voluntary	
Setbacks, Noise, Flicker Analysis	Applicant voluntarily agreed to meet the setbacks, noise and shadow flicker requirements before the new ordinances were formerly adopted
Punished Woman's Lake	The turbines will be set back at least 1-mile from the shoreline of Punished Woman's Lake.

13.2 Public Lands and Conservation Easements

13.2.1 Existing Public Lands and Conservation Easements

Public lands within the Project Area consist of privately owned lands that are leased by the SDGFP as Waterfowl Production Areas, Game Production Areas, and WIAs. Waterfowl Production Areas are managed to protect habitat for waterfowl and migratory birds. Game Production Areas are managed to provide wildlife habitat, improve production of wildlife, and provide opportunities for wildlife viewing and hunting. WIAs allow public hunting on private land with agreements lasting 1 to 3 years. Table 13.2 indicates the acreage of public lands within the Project Area (see Figure 2).

Table 13.2. Public Lands in the Project Area

Land Type	Area (acres)	Easement Parcels (number)
Waterfowl Production Areas	0	0
Game Production Areas	0	0
WIAs	882.6	5
Total	**882.6**	**5**

Conservation easements within the Project Area include USFWS wetland easements, grassland easements, wetland/grassland combination easements, and Farmers Home Administration (FHA) easements. There are approximately 1,692.8 acres of wetland, grassland, wetland/grassland combination, or FHA easements in the Project Area (Table 13.3). Within wetland easements, the USFWS and private landowners agree to avoid impacts to specific wetlands. These wetlands are referred to as protected basins.

Table 13.3. Conservation Easements in the Project Area

Easement Type	Area (acres)	Easement Parcels (number)
Grassland Easement	582.0	3
Wetland Easement	480.8	6
Wetland/Grassland Easement	316.5	1
FHA Easement	313.5	1
Total	**1,692.8**	**11**

13.2.2 Impacts/Mitigation to Public Lands and Conservation Easements

No turbines or other infrastructure have been sited on Waterfowl Production Areas, Game Production Areas, WIAs, grassland, wetland/grassland combination easements, or on FHA easements. No turbines or other infrastructure have been sited in, or directly adjacent to, protected basins. Construction of any access road or turbine in proximity to a protected basin will include additional protective measures including, but not limited to, erosion-control measures and SWPPP BMPs (see Section 10.2.2).

13.3 Sound

The primary land use surrounding the Project is agricultural and consists of farms with dispersed recreation areas, fishing areas, and lakes. Farming activities and vehicle traffic on county and local roads account for the largest amount of sound within the Project Construction Easement. The cities of South Shore, Strandburg, Twin Brooks, Waverly, Stockholm, Troy, Watertown, and Altamont lie outside of the Project Area boundary while the communities of Kranzburg, Goodwin, and Bemis are located within the Project Area boundary.

13.3.1 Existing Sound Levels and Regulatory Framework

13.3.1.1 Sound Terminology

Sound, also referred to as noise, is measured on a logarithmic scale in units of decibels (dB). Human hearing is not equally sensitive to all frequencies of sound, and the dBA scale most closely corresponds to the frequency sensitivity range for human hearing. Sound levels capable of being heard by humans are measured in dBA (Table 13.4). Cumulative sound increases along the scale of human perception in a logarithmic scale with sound levels at less than 3 dBA being barely perceptible and changes in sound levels over 20 dBA being dramatically perceived.

Table 13.4. Typical Human Response to dBA Sound

Sound Pressure Level (dBA)	Human Perception
Less than 3 dBA	Barely perceptible
5 dBA	Clearly noticeable
10 dBA	Doubling or halving of loudness
20 dBA	Dramatic change in loudness

Existing sound in rural areas varies between 40 and 50 dBA, with sound in suburban areas generally between 50 and 60 dBA, and sound in urban areas ranges from 60 to 70 dBA (Smith et al. 1999). General background sounds such as a quiet rural area, a whisper, a library, and a quiet suburb are under 50 dBA. Sounds in urban areas include conversations in restaurants, offices, and running of household items, such as a dishwasher, vacuum, or radio. Everyday common sound levels are noted in Table 13.5. Higher sound levels, generally those between 80 to 180 dBA, include jet takeoffs, motorcycles, concerts, stadium sound, shotguns, and a rocket launch (Noise Help 2017; IAC Acoustics 2017). Figure 14 illustrates select common sound levels in the environment.

Table 13.5. Sound Source Examples of dBA Sound

Sound Pressure Level (dBA)	Sound Source Example(s)
10	A pin dropping
20	Rustling leaves
30	Whisper; quiet rural area
40	Computer; library
50	Refrigerator; quiet suburb
60	Air conditioner at 100 feet; conversation in restaurant, office, background music
70	Dishwasher; vacuum cleaner; radio; passenger car at 65 miles per hour; excavation equipment (loader, dump truck, concrete mixer truck, air compressor)
80	Garbage disposal; car wash; propeller plane flyover at 1,000 feet; diesel truck at 40 miles per hour; excavation equipment (grader, bulldozer, excavator, concrete truck)
90	Boeing 737 at 1 nautical mile; lawn mower
100	Motorcycle (riding); garbage truck; jet flyover at 1,000 feet
110	Concert with live rock music; jackhammer; steel mill; automobile horn at 1 meter
120	Thunderclap; chainsaw; oxygen torch
130	Peak stadium crowd sound
140	Jet engine at takeoff; air craft carrier deck
150	Fighter jet launch
160	Shotgun
170	Safety airbag
180	Rocket launch

Sources: Noise Help 2017; IAC Acoustics 2017.

13.3.1.2 Sound Regulations

The state of South Dakota does not have regulatory sound limits for wind turbines. Codington County, Deuel County, and Grant County ordinances do have regulatory sound limits for wind turbines.

The Codington County Zoning Ordinance #68, Section 5.22.03.12 prescribes sound limits for wind turbine projects as follows.

> a) Noise level generated by wind energy system shall not exceed 50 dBA, average A-weighted sound pressure including constructive interference level effects at the property line of existing off-site non-participating residences, businesses, and buildings owned and/or maintained by a governmental entity.
>
> b) Noise level measurements shall be made with a sound level meter using the A-weighting scale, in accordance with standards promulgated by the American National Standards Institute. An L90 measurement shall be used and have a measurement period no less than ten minutes unless otherwise specified by the Board of Adjustment.

Deuel County's current ordinance B2004-01-23B, Section 1215.03.13 prescribes sound limits for wind turbine projects as follows.

> a) Noise level shall not exceed 45 dBA average A-weighted sound pressure at the perimeter of existing residences, for non-participating residences.

Grant County's current Ordinance, 2016-01C, Section 1211.04, paragraph 14 prescribes sound limits for wind turbine projects as follows.

> a.) Noise. Noise level shall not exceed 45 dBA, average A-weighted Sound pressure including constructive interference effects measured twenty-five (25) feet from the perimeter of existing off-site non-participating residences, businesses, and buildings owned and/or maintained by a governmental entity.
>
> b) Noise level shall not exceed 50 dBA, average A-weighted Sound pressure including constructive interference effects measured twenty-five (25) feet from the perimeter of participating residences, businesses, and buildings owned and/or maintained by a governmental entity.
>
> c) Noise level measurements shall be made with a sound level meter using the A-weighting scale, in accordance with standards promulgated by the American National Standards Institute. A L90 measurement shall be used and have a measurement period no less than ten (10) minutes unless otherwise specified by the Board of Adjustment.

Codington County's sound limit is 50 dBA and is only applicable at the property line of existing non-participating residences, businesses, and buildings owned and/or maintained by a government entity. Although not required by the county, the sound pressure levels at participating property boundaries and participating and non□participating occupied structures (i.e., residences, businesses, and buildings) within 2 km of a wind turbine also were evaluated. Deuel County's only applicable sound limit is 45 dBA at the perimeter of existing non-participating residences. Grant County's current applicable sound limit is 45 dBA at a distance of 25 feet from the perimeter of non□participating occupied structures, and 50 dBA for all participating occupied structures, meaning existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity.

13.3.2 Sound Level Impacts/Mitigation

13.3.2.1 Construction Sound Levels

Construction activities will generate short-term and intermittent sound that may affect nearby residences on a short-term basis. Short-duration construction sounds may range depending on equipment used and the operation being performed but may typically range from 70 to 100 dBA for construction equipment such as air compressors, backhoes, concrete mixers, cranes, dozers, generators, jackhammers, scrapers, shovels, and trucks (see Table 13.5) (Federal Transit

Administration 2006). Sounds levels are expected to be quieter for areas farther away from facilities.

During construction, sound levels will be minimized by ensuring that construction equipment is equipped with working mufflers to minimize sound levels. Construction activities generally will be limited to the hours of 7 a.m. to 9 p.m. Major construction activities for the windfarm ideally will begin in October 2019 and be complete in March 2020. No additional mitigation measures are necessary as there will be minimal sound impacts from the Project.

13.3.2.2 Operational Sound Levels

Sound from operational activities includes the sound of the wind turbine rotor blades interacting with air flow as they turn. The level of sound is based on the speed of the turbine and the distance of the listener to the turbine. The wind turbine nacelle, where the mechanical and electrical equipment is housed, will also create sound, but is designed to reduce sound from the turbine through vibration of the mounts, gears, and acoustic insulation.

The Applicant conducted a preliminary sound assessment of the wind turbine specifications to be used on the project (EAPC Wind Energy [EAPC] 2019) (Table 13.6; Appendix I). According to the GE sound documentation, the loudest normal operating sound pressure level emitted from the GE 2.3-116 is 107.5 at 10 minutes per second and higher at hub height. Because this value is reported at hub height, it is the same for both the 80-m and 90-m hub-height turbines. The GE 2.3-116 sound emission specifications were used for the GE 2.1-116, which is a conservative assumption as the sound emission levels for the GE 2.1-116 likely will be lower than for the larger 2.3-116.

Table 13.6. Crowned Ridge Wind Turbine Specifications

Manufacturer	Model	Hub Height (m)	Rotor Diameter (m)	Cut-In Wind Speed (m/s)	Cut-Out Wind Speed (m/s)	Max. Sound Press. Level (dBA)	Max. Sound Press. Level LNTE (dBA)
General Electric	GE 2.3	80	116	3	22	107.5	106
General Electric	GE 2.3	90	116	3	22	107.5	106
General Electric	GE 2.1	80	116	3	22	107.5	106

Source: EAPC 2019

A sound analysis was conducted for the Project Area by EAPC using windPRO and the ISO 9613-2 “Attenuation of sound during propagation outdoors, Part 2” sound calculation model with “General” ground attenuation and an attenuation factor of 0.5, which represents a typical mixed vegetation (i.e., prairie grass, weeds, brush) and crop cover (EAPC 2019). Realistic sound pressure levels were calculated at 1.5 m above ground level at the participating and non□ participating existing occupied structures and occupied parcel boundaries (Codington County

only). The term “realistic” in this case means that some amount of ground attenuation is accounted for (EAPC 2019).

The inputs for the windPRO sound calculation include the following.

- Turbine coordinates
- Turbine specifications
- Turbine sound emission data
- Sound receptor coordinates
- Participation status
- USGS Digital Elevation Model (DEM) (height contour data)
- Uncertainty factor
- Meteorological conditions
- Ground attenuation

The sound analysis indicates that no non participating existing residences will be above 45.0 dBA (Table 13.7). Therefore, the Project will be compliant with Codington, Deuel, and Grant County’s allowable sound pressure levels as described in their respective ordinances (EAPC 2019).

Table 13.7. Summary of Sound Assessment

County	Feature	Sound Limit (dBA)	Maximum Predicted (dBA)
Codington	Participating Occupied Structures	N/A	47.9
	Non-Participating Occupied Structures	N/A	44.8
	Participating Occupied Parcel Boundary Lines	N/A	53.3
	Non-participating Occupied Parcel Boundary Lines	50	49.7
Deuel	Participating Occupied Structures	N/A	47.3
	Non-Participating Occupied Structures	45	44.2
Grant	Participating Occupied Structures	50	41.4
	Non-Participating Occupied Structures	45	40.3

Impacts to nearby residents and other potentially affected parties in terms of sound have been taken into consideration as part of the turbine siting. The Applicant proposes siting turbines no closer than 1,500 feet from non-participating residences in both Codington and Grant Counties and no more than 4 times the turbine blade height from non-participating residences and businesses in Deuel County; 550 feet in Codington County and 1,500 feet from participating residences in Deuel and Grant Counties to meet or exceed the siting requirements with the County Ordinances of 50 dBA to the property line of non-participating residences in Codington; 45 dBA at the perimeter of non-participating residences in Deuel County; and 45 dBA measured 25 feet from the perimeter of existing non-participating residences in Grant County. To the

extent that the sound characteristics of the selected turbine vary, the Applicant will ensure compliance with county sound standards. The array layout has been modeled to help ensure cumulative impacts from all wind turbines, and maximum calculated sound levels for all turbine models, are below the county sound limits at residential, business, and government building receptors.

13.4 Shadow Flicker

Shadow flicker from wind turbines occurs when rotating wind turbine blades move between the sun and the observer. Shadow flicker is generally experienced in areas near wind turbines where the distance between the observer and wind turbine blade is short enough that sunlight has not been significantly diffused by the atmosphere. When the blades rotate, this shadow creates a pulsating effect, known as shadow flicker. If the blade's shadow is passing over the window of a building, it will have the effect of increasing and decreasing the light intensity in the room at a low frequency in the range of 0.4 to 0.78 hertz (Hz), hence the term "flicker." In this case, with a maximum rotational speed of 15.6 rpm for the GE 2.3 116, the frequency will be 0.78 Hz. This flickering effect can also be experienced outdoors, but the effect is typically less noticeable, and becomes less noticeable when farther from the wind turbine causing the flicker (EAPC 2019).

Shadow flicker can be influenced by various factors such as distance to turbine, angle of sun, time of year, time of day, environment around the turbine, and climate, and is more noticeable the closer the turbine is to the object, house, or person. This flickering effect is most noticeable within approximately 1,000 m of the turbine and becomes more and more diffused as the distance increases. Beyond 1,700 m, the shadow flicker effects are indistinguishable (EAPC 2019). The farther away from the turbine, the less effect of shadow flicker. The time of year also influences shadow flicker, which is greatest in the winter months when the angle of sun is lower and casts longer shadows. It is also more pronounced around sunrise and sunset when the sun is near the horizon. Trees and buildings and other obstacles can reduce shadow flicker effects and they provide their own shadows. Climate and weather can increase or decrease the amount of shadow flicker depending on when the sun is present or blocked by clouds, or if bad weather or lack of wind means that the turbines are not in operation.

While there are no explicit state regulations on the number of shadow flicker hours allowed, the shadow flicker ordinances of Codington, Deuel, and Grant Counties limit the maximum number of shadow flicker to 30 hours per year at occupied dwellings or residences. Deuel, Grant, and Codington Counties allow shadow flicker to exceed 30 hours per year at either a participating or non-participating landowner if waived in writing with an agreement that is recorded and filed with the County Register of Deeds.

For the turbine array provided, no occupied dwelling or residence experienced more than 29 hours and 56 minutes of shadow flicker per year for all three counties based on realistic assumptions regarding operational time and sunshine probability (Table 13.8; Appendix J).

Table 13.8. Summary of Shadow Flicker Assessment

County	Feature	Shadow Limit (hr/yr)	Maximum Predicted (hr/yr)
Codington	Participating Occupied Structures	30	29:56
	Non-Participating Occupied Structures	30	23:22
Deuel	Participating Occupied Structures	30	29:33
	Non-Participating Occupied Structures	30	24:02
Grant	Participating Occupied Structures	30	8:56
	Non-Participating Occupied Structures	30	6:28

13.5 Electromagnetic Interference

Power frequency electric and magnetic fields (EMF) are created wherever electricity flows, which includes the wiring in homes and schools, power lines, and the electrical equipment and devices we use at work and home. Leading U.S. and international scientific organizations, such as the National Cancer Institute and the World Health Organization, have evaluated EMF research. These organizations generally conclude that overall the body of scientific research does not show that exposure to EMF causes or contributes to any type of cancer or any other disease or illness (National Institute of Environmental Health Sciences 1999).

13.6 Visual Resources

Landscapes that include a balance of diversity and harmony have the highest potential for scenic value and may be considered important to persons living in or traveling through a region. Viewer perception is founded on two items: the sensitivity and magnitude of the viewer's concern for the view shed, and exposure (i.e., function of the type, distance, perspective, and duration of the view). Sensitive visual and aesthetic resources within the Project Area include historical structures, open space, and water resources.

13.6.1 Existing Visual Resources

Dominant visual characteristic in the Project Area is agricultural land (both cultivated and grazed) followed by a mixture of rural residential, wetlands, and water features. Constructed infrastructure, including homes, county roads, barns, silos, and other structures, exists throughout the Project Area but not within the Project Construction Easement, except for roads. Other visual characteristics common in the Project Area include communication and transmission lines, MET towers, and cell towers. Wind turbines have also been constructed adjacent to the Project Area in

Brookings and Deuel Counties. Area topography includes a well-developed drainage network and tilled agriculture along the Big Sioux Basin. However, along the Prairie Coteau, undulating, hummocky topography is present with no discernable drainage pattern. Visual topographic characteristics include seasonal and semi-permanent wetlands, hummocks, hills, perennial streams, and flat land areas with more tilled agriculture. Topography and Project Area elevation are discussed in detail in Section 9; Project topography is illustrated in Figure 8.

13.6.2 Visual Impacts

The degree to which the Project will be visible will vary by location. The Project will frequently be visible to landowners who live along or near the Project, or residents who travel the roads near the Project. However, constructed features (e.g., existing utility lines), topography, and natural landscape features such as tree cover, in relation to a viewer's physical location, may impede view of the Project. Generally, the Project also will be visible outside of local communities, such as Watertown and Milbank. The Project also will be visible to local and regional travelers along State Highway 29 and County Roads 22, 123 and 212 and recreational users on WIAs and public lands.

The primary visual impact from the Project will include the introduction of additional vertical and horizontal lines on the horizon from wind turbines and transmission lines. Structures will be visible during the day due to visual contrast and potential surface glare, and at night with potential lighting.

The Applicant uses measures to minimize the impact the Project will have on existing scenic integrity including incorporating county setback requirements and commitments in the Project design (see Table 13.1). Many areas near the Project Area currently are visually impacted by existing roadways and local transmission lines. Placement of infrastructure will be designed to minimize visual impacts to scenic locations and maximize the feasible distance from road and trail crossings. The Applicant will use care to preserve the natural landscape and prevent impacts to the natural surroundings where feasible.

The Project's wind towers will be marked as required by the FAA. To further reduce visual impacts, the Applicant voluntarily agreed to apply for the use of an Aircraft Detection Lighting System (ADLS). The use of an ADLS is subject to FAA approval and the Applicant will install an ADLS within 1-year of approval by FAA for the Project. The ADLS turns on its lights when it detects an aircraft within a designated range and minimizes negative view shed impacts for residents. In the event FAA does not approve the use of an ADLS system, the Applicant will comply with all lighting and markings otherwise required by FAA. The Applicant has received the necessary DNHs from the FAA for the Project and intends to apply for the use of an ADLS in the second quarter of 2019.

14.0 Local Land Use Controls (ARSD 20:10:22:19)

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

The Project will be constructed in accordance with Section 5.22 of the Codington County Comprehensive Zoning Regulations, Section 1215 of the Deuel County Zoning Ordinance, and Section 12.11.1.0 of the Grant County Compiled Zoning Ordinances, and land use control policies. Comprehensive land use plans are available for Codington, Deuel, and Grant Counties. Construction of the Project will comply with applicable local ordinances as discussed in Section 24.0 and are consistent with the Codington County Comprehensive Land Use Plan, the Deuel County Comprehensive Land Use Plan, and the Grant County Comprehensive Land Use Plan.

The setback distances adopted by Codington, Deuel, and Grant Counties are summarized in Table 13.1 and compliance with these requirements will minimize land use impacts from the Project.

In preparing this Application, the Applicant submitted the following local land use permit applications:

- A combined application for a Conditional Use Permit (CUP) to Codington County dated June 8, 2018, for the Crowned Ridge Wind and Crowned Ridge Wind II wind energy systems. The Applicant obtained the CUP from Codington County on July 16, 2018, containing conditions as displayed in Appendix K.
- A combined application for a Special Exception Permit (SEP) to Deuel County dated August 14, 2018, for the Crowned Ridge Wind II wind energy system. The Applicant obtained the SEP from Deuel County on October 22, 2018, containing conditions as displayed in Appendix K.
- A combined application for a CUP to Grant County dated September 17, 2018, for the Crowned Ridge Wind and Crowned Ridge Wind II wind energy systems. The Applicant obtained the CUP from Grant County on December 17, 2018, containing conditions as displayed in Appendix K.

15.0 Water Quality (ARSD 20:10:22:20)

ARSD 20:10:22:20. Water quality. *The applicant shall provide evidence that the proposed facility will*

comply with all water quality standards and regulations of any federal or state agency having jurisdiction and any variances permitted.

15.1 Existing Water Quality

Section 303(d) of the federal Clean Water Act requires that the States develop a list of waterbodies that do not meet their designated uses due to excess pollutants (impaired waters) and to determine total maximum daily loads of all pollutants from all sources that a waterbody can receive and still meet applicable water quality standards. The 303(d) list of impaired waters is issued every 2 years and is based on violations of water quality standards. Review of the 2018 list (SDDENR 2018b) indicates that Project Construction Easements cross one waterbody, Willow Creek, that is listed as impaired by the U.S. Environmental Protection Agency (USEPA).

15.2 Water Quality Potential Impacts/Mitigation

During the construction of the Project, there is a potential for sediment from disturbed lands or other contaminants to reach surface waterbodies because of excavation, grading, equipment operation, construction traffic, or other unforeseen circumstances. If land surface erosion or other potential contaminant sources are not controlled during construction, the quality of any receiving surface waterbodies has the potential to be affected.

Construction of the Project will avoid surface waterbodies to the extent feasible to minimize the potential for direct impacts to these resources. Because wind turbine towers are generally located at higher elevations within the Project Area to maximize wind exposure, impacts to surface waterbodies and drainageways from the turbine sites are not anticipated. Collection line routes and access road locations have been selected to avoid wetlands and other waterbodies to the extent practicable, but some infrastructure may cross streams, intermittent drainageways, and wetlands at various locations. If trenching through drainageways is needed, temporary impacts to surface drainage patterns may occur during construction. However, these impacts will be short-lived, and existing contours and drainage patterns will be restored. To avoid impacts to perennial streams, horizontal directional drilling will be used to bore underneath streams for installation of the underground collection lines, including any crossings of Willow Creek, which the USEPA lists as impaired. Where access road crossings of streams or drainageway cannot be avoided, appropriately designed culverts will be installed to maintain the free flow of water and therefore, the Project will not result in changes to the existing drainage patterns within the Project Area.

If direct and permanent impacts are expected as a result of infrastructure placement, the Applicant will keep all crossings of potentially jurisdictional wetlands and waters under the 0.10-acre threshold of permanent impacts to remain eligible for using NWP 12. There are approximately 208 acres of NWI wetlands and freshwater ponds that are crossed by the Project Construction Easement (see Table 10.2). For wetland areas, authorized construction methods (e.g., trenching,

temporary filling, etc.) under NWP 12 will be used and appropriate stormwater BMPs will be implemented to minimize surface water impacts.

Due to the nature and extent of the construction activity, the Applicant will obtain a National Pollutant Discharge Elimination System (NPDES) General Permit Authorizing Stormwater Discharges Associated with Construction Activities (SDR100000) issued by the SDDENR. As required by that permit, the Applicant will prepare and implement an SWPPP that prescribes stormwater BMPs to control erosion and subsequent sedimentation from construction activities. BMPs may include the use of silt fences, straw wattles, erosion control blankets, water bars, vegetative buffers, or other methods to control stormwater runoff and mitigate erosion and sedimentation. Additionally, the SWPPP will include a Spill Prevention and Response Procedures section that will describe procedures to prevent spills of petroleum products and other hazardous materials, actions to take for an effective response to stop and control any spill, when and how to notify appropriate regulatory agencies, and how wastes generated during cleanup activities will be managed and properly disposed.

Once Project construction has been completed, no significant impact to surface water quality is expected because wetland and waterbody impacts will have been avoided or minimized, and disturbed land will be restored to as close to pre-construction conditions as possible, as required by Section 3.20 of the general permit and the SWPPP. The Applicant will follow its Spill Prevention, Control, and Countermeasures Plan (SPCC Plan) in the event of any petroleum products or other hazardous or toxic material spills, and will restore the land to pre-construction conditions as much as possible.

The Applicant will implement BMPs during construction of the Project to protect topsoil and adjacent waterbodies and minimize soil erosion. Structural and non-structural erosion and sediment control practices will be employed to minimize the potential for contaminants to be discharged to surface waterbodies. Structural BMPs include, but are not limited to:

- Place stockpiled materials away from surface waterbodies and shorelines;
- Control stormwater run-on and runoff;
- Segregate and stockpile topsoil separately in areas where topsoil is removed. Topsoil will be respread after construction has been completed. In temporary crane paths, the laydown area, or other areas where the topsoil has become compacted, the topsoil will be decompacted prior to reseeding;
- Install temporary control measures, such as silt fences, straw wattles, erosion control blankets, check dams, surface roughening, and seeding to protect disturbed soils; and
- Reseed and revegetate disturbed areas.

Non-structural BMPs include, but are not limited to:

- Develop and implement an SWPPP;

- Schedule earth-disturbing activities to times when precipitation events are less likely to occur;
- Regularly water disturbed areas to control dust;
- Develop and maintain inspection schedules and correct deficiencies noted during these inspections;
- Perform routine trash collection and grounds maintenance; store collected trash in containers (with lids) for disposal at a suitable off-site facility; and
- Familiarize employees with good housekeeping procedures, tips, reminders, and pollution prevention concepts.

16.0 Air Quality (ARSD 20:10:22:21)

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

16.1 Existing Air Quality

The State of South Dakota follows ambient air quality goals and standards as defined under the federal government regulations (ARSD 74:36:02). The nearest Ambient Air Quality Monitoring Site is located in Watertown in Codington County, South Dakota, southeast of the Project. The primary emission sources within the Project Area include agriculture-related equipment and vehicles traveling along state highways or county roads.

The existing air quality of the Watertown region is good, based on the air quality index established by the USEPA under federal regulations. The Project Area has limited air pollutant emissions. The Brookings and Watertown area has only exceeded the 24-hour particulate matter 10 microns in diameter or less (PM_{10}) standard three times in the 27 years the measurement system has been in operation. These exceeding events were due to high wind events causing fugitive dust levels to exceed the 24-hour standard (SDDENR 2014). Fugitive dust emissions are generated from wind erosion of disturbed areas and may affect both rural and urban environments. Air quality pollutant emissions include particulate matter such as fine dust from vehicle travel on unpaved roads; agricultural activities; other wind-blown dust and air pollutants; ozone or ground-level smog such as carbon monoxide; and sulfur dioxide and nitrogen oxides from vehicles, stationary sources burning coal and oil, electric utilities, and industrial boilers. Sulfur dioxide and nitrogen oxide are monitored in Sioux Falls, which is the closest monitoring station to the Project Study Area that monitors these elements (SDDENR 2018c).

16.2 Air Quality Impacts/Mitigation

Temporary impacts to air quality are expected as a result of Project construction. Construction activities may result in increased short-term airborne dust/particulate matter and construction equipment and vehicle emissions. Construction activities may include ROW clearing, hauling, and excavation that could generate dust; airborne mobilization of dust particles constitutes wind erosion that will be addressed in the SWPPP. These impacts are temporary, and no long-term impacts are anticipated from construction activities. No impacts from Project operation are anticipated nor will the Project produce air emissions that will impact the surrounding area.

The entire state of South Dakota is in attainment for all criteria pollutants (USEPA 2018). Therefore, general conformity is not applicable. The Applicant will use standard BMPs to minimize air quality pollution emissions. Such BMPs may include dust suppression/control, and reclamation during and after construction, as required by the SWPPP and/or Codington County, Deuel County, and Grant County Haul Road permits that may be required.

17.0 Time Schedule (ARSD 20:10:22:22)

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

Table 17.1. Permitting and Construction Schedule

Milestone	Date
Land Leasing	2006 to Spring 2019
Environmental Studies	2008 to 2019
County Conditional Use Permits / Special Exception Permits	June 2018 to October 2018
SDPUC Facility Permit	April 2019 to October 2019
Pre-construction Engineering	2017 to 2019
Finalize Layout	January 2019
Construction	October 2019 to March 2020
Commercial Operations Date	No later than Q2 2020

18.0 Community Impact (ARSD 20:10:22:23)

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

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

government facilities or services;
(2) A forecast of the immediate and long-range impact of property and other taxes of the affected taxing jurisdictions;
(3) A forecast of the impact on agricultural production and uses;
(4) A forecast of the impact on population, income, occupational distribution, and integration and cohesion of communities;
(5) A forecast of the impact on transportation facilities;
(6) A forecast of the impact on landmarks and cultural resources of historic, religious, archaeological, scenic, natural, or other cultural significance. The information shall include the applicant's plans to coordinate with the local and state office of disaster services in the event of accidental release of contaminants from the proposed facility; and
(7) An indication of means of ameliorating negative social impact of the facility development.

This section describes the main community characteristics in and around the Project Study Area, including the Project's impacts on socioeconomics, community resources, agriculture, transportation, and cultural resources. Socioeconomic variables evaluated include population, minority populations, poverty, employment and income, and housing. These variables were obtained or derived from the U.S. Census Bureau 2010 census and the 2013–2017 American Community Survey data and projections.

18.1 Socioeconomic and Community Resources

The socioeconomics analysis area is Codington, Deuel, and Grant Counties. Data for the City of Watertown and the State of South Dakota are used occasionally for comparison purposes.

18.1.1 Existing Socioeconomic and Community Resources

Table 18.1 summarizes select demographic factors for Watertown, Codington County, Grant County, Deuel County, and South Dakota. Deuel County's percentage of minorities is lower than Codington County, Grant County, Watertown, and the state. The percent of population living below the poverty level is highest for the state, followed by Watertown, Codington County, Deuel County, and Grant County.

Table 18.1. Socioeconomic Factors in Select Regions

Location	Population	Minority Populations (Percent)	Population Below Poverty Level (Percent)	Per Capita Income
Watertown	22,083	5.5	13.0	$28,783
Codington County	27,963	5.3	11.7	$29,249
Grant County	7,133	4.5	7.6	$29,363
Deuel County	4,282	0.4	10.0	$29,204
State of South Dakota	855,444	15.3	13.9	$28,761

Source: U.S. Census Bureau 2013-2017

The median annual household income in 2017 (using 2017 inflation-adjusted dollars) was $48,485 in Watertown, $52,025 in Codington County, $56,276 in Grant County, $57,969 in Deuel County, and $54,126 in the state of South Dakota (U.S. Census Bureau 2013-2017). The median annual household income accounts for multiple household earners, whereas the per-capita income (see Table 18.1) is the average income earned by each person in a given area so that multiple income earners in the same family or household are counted separately. Using 2017 inflation-adjusted dollars, the per-capita income in Watertown was $28,783, in Codington County was $29,249, in Deuel County was $29,204, and in Grant County was $29,363, while the per-capita income for the state was $28,761. The percentage of persons living below the poverty level ranked highest at the state level at 13.9.%, followed by Watertown at 13.0%, Codington County at 11.7%, Deuel County at 10.0%, and Grant County at 7.6% (U.S. Census Bureau 2013-2017).

As shown in Table 18.2, the largest employment and labor markets by occupation in Watertown and Codington County are similar and consist of sales and administration (29.7% and 27.9%, respectively), production and transportation (18.7% for each region), science and arts, including health facilities (11.5% and 11.6%, respectively), management (8.6% and 10.6%, respectively), and construction and extraction (5.5% and 5.6%, respectively). The largest employment and labor markets by occupation in Grant County are sales and administration (24.8%), management (14.6%), production and transportation (12.9%), science and arts, including health facilities (8.9%), and installation, maintenance, and repair (6.3%). The three largest employment industries in Watertown and Codington County are similar and include manufacturing (17.6% and 17.5%, respectively), educational and healthcare services (17.8% and 17.7%, respectively), and retail trade (18.3% and 15.8%, respectively). The three largest employment industries in Deuel County include manufacturing (18.3%), agriculture, forestry, fishing and hunting, and mining (18.1%), and healthcare and social assistance (17.0%). The three largest employment industries in Grant County are educational and healthcare services (20.6%), agriculture, forestry, fishing and hunting, and mining (15.5%), and manufacturing (10.7%) (U.S. Census Bureau 2013-2017). Smaller industries and labor markets with fewer employees in Watertown, Codington County, Deuel County, and Grant County include infrastructure, fire protection, law enforcement, recreational facilities, schools, and other community or government services.

Table 18.2. Employment by Occupation in Select Regions, Shown as Percentage of Employed Persons

Industry/Labor Market	Watertown	Codington County	Grant County	Deuel County
Sales and Administration	29.7	27.9	24.8	17.3
Production and Transportation	18.7	18.7	12.9	16.4
Science and Arts, including Health Facilities	11.5	11.6	8.9	12.5
Management	8.6	10.6	14.6	19.6
Farming	0.9	1.2	5.5	4.8
Construction and Extraction	5.5	5.6	6.1	8.8
Installation, Maintenance, and Repair	3.5	3.4	6.3	4.5
Business	3.6	3.3	2.9	1.5

Source: U.S. Census Bureau 2013-2017

Current housing and land values in the region are similar across all areas. In 2017, the U.S. Census Bureau reported 10,181 housing units in Watertown, 12,898 housing units in Codington County, 2,225 housing units in Deuel County, and 3,561 housing units in Grant County. The Codington County 2017 data reflect a 4.96% increase in housing units when compared with 2010 Census data, while the Deuel County 2017 data show a 0.14% increase, and the Grant County 2017 data show a 1.05% increase. Watertown shows a 3.14% increase since 2010. In 2010, the median values of owner-occupied housing units in Watertown and Codington County were similar at $127,800 and $131,000, respectively, while Deuel County was lower at $87,200, and Grant County was at $99,800. The Codington County 2017 figures reflect a 27.10% increase in value since the 2010 Census, Deuel County shows a 29.24% increase, Grant County shows a 16.03% increase, and Watertown shows a 25.98% increase.

The U.S. Census Bureau provides periodic socioeconomic estimates for selected geographies to help provide information on the changing demographics of the population between decennial censuses. Through the American Community Survey, the Census provided 3-year socioeconomic estimates for Codington, Deuel, and Grant Counties and the State of South Dakota, as summarized in Table 18.3 (U.S. Census Bureau 2013-2017).

Table 18.3. Socioeconomic Projections from 2013 to 2017

Location	Population	Race Percentage (White)	Percentage of Population Below Poverty Level	Per Capita Income
Watertown	22,083	94.5	13.0	$28,783
Codington County	27,963	94.7	11.7	$29,249
Grant County	7,133	95.5	7.6	$29,363
Deuel County	4,282	99.6	10.0	$29,204
South Dakota	855,444	84.7	13.9	$28,761

Source: U.S. Census Bureau 2013-2017

18.1.2 Socioeconomic and Community Resources Impacts/Mitigation

There will be short- and long-term benefits from the Project that include, but are not limited to, an increase in the Counties' tax base as a result of the incremental increase in revenues from utility property taxes (based on the Project value of $425 million; see Section 5). The chief economic effect of the Project will result from property taxes paid for the proposed improvements in Codington, Deuel, and Grant Counties infrastructure of approximately $39 million. Land lease payments to Project landowners will result in approximately $40 million over the contracted term of the Project. Additional benefits will result from the Project's capability to transmit energy generated from renewable energy resources that could spur energy development in the area, thereby generating additional economic gains. Further information on benefits of the Project is presented in Section 4.0.

Construction and operation of the Project is not expected to affect the local distribution of jobs or occupations in the community and is not anticipated to have significant short- or long-term effects on commercial and industrial sectors, housing, land values, labor markets, health facilities, sewer or water treatment facilities, solid waste management facilities, fire or police facilities, schools, recreational facilities, and other government facilities or services. The Applicant does not expect a permanent impact on the population, income, occupation distribution, or integration or cohesion of communities.

The Project will be offset from roads and section lines, and the turbines and Project Construction Easement are not located within state or county highway ROWs. Also, collection lines will bore under roads. The final engineering design will consider planned or programmed future improvements to area roadways to ensure that sufficient roadway ROWs are maintained for future roadway widening. The Applicant will develop a Road Use Agreement with each County that will govern procedures for road use, repair, and restoration after construction, and any operational maintenance required.

The Project will have a positive impact on the local area as a result of lodging and food sales and other indirect economic benefits associated with transient workers. The Applicant expects the

Project will employ workers associated with the construction and support services areas. Employee estimates are described in Section 19.

A common concern of communities surrounding wind energy facilities is the potential impact on residential property values. Wind energy projects drive economic development, job growth, and tax revenue which benefits landowners and land values in areas (Appendix L; NextEra Fact Sheet). Landowners who host wind turbines on their property earn regular lease payments, which add to its value, and lease payments continue with a sale of the property. Hoen et al. (2009) collected data from 7,500 sales of single-family homes situated within 10 miles of 24 existing wind facilities in nine different states. Rural areas in Iowa, Illinois, and Wisconsin that were analyzed in the study are similar in nature to the communities in South Dakota found in the current Project Area.

Analysis of eight hedonic pricing models on repeat sales and sales volume models shows no conclusive evidence of impacts of wind facilities to widespread property value in communities surrounding these facilities. Hoen et al. (2009) conclude the following:

> Neither the view of the wind facilities nor the distance of the home to those facilities is found to have any consistent, measurable, and statistically significant effect on home sales prices. Although the analysis cannot dismiss the possibility that individual homes or small numbers of homes have been or could be negatively impacted, it finds that if these impacts do exist, they are either too small and/or too infrequent to result in any widespread, statistically observable impact. (Hoen et al. 2009:iii).

The base model for the study also concluded the following: 1) there is no statistically significant difference in sales price between homes found within 1 mile and 5 miles of wind energy facilities; and 2) while home buyers and sellers consider the scenic vista of a home when establishing sales prices, there is no statistically significant home sale price difference apparent in the model for homes having minor, moderate, substantial, or extreme views of wind turbines (Hoen et al. 2009).

Additionally, Hoen et al. (2013) examined data from 50,000 home sales in 27 counties in nine states analyzed, including Minnesota, Iowa, and Illinois, which are similar in rural nature to South Dakota. The study found no statistically significant difference in home sales prices between 1 to 5 miles of wind turbines within a wind energy facility during the post-construction or post announcement/pre-construction periods of wind energy facilities. Research suggested that the "property-value effect of wind turbines is likely to be small, on average, if it is present at all" (Hoen et al. 2013:iii).

RM Hoefs & Associates, Inc., completed a 2015 survey of marker reactions to wind turbines and/or wind energy facilities with the objective of studying the effects of wind turbines on property values (see Appendix L, RM Hoefs & Associates, Inc. 2015). The analysis was based

on 12 wind farms in North Dakota, although paired sales were only found at five wind farms. Out of a review of 26 participants, 25 did not consider any negative impacts or detrimental conditions on property values by adjacent wind energy facilities (see Appendix L, RM Hoefs & Associates, Inc. 2015). Based on the studies outlined above, the Project is expected to have a negligible effect, if any, on the assessed values of private property and, therefore, on property taxes.

The transportation, treatment, and disposal of hazardous waste will be required in accordance with state and federal regulations. The use and storage of petroleum products will be in accordance with applicable local, state, and federal regulations, the spill prevention and response procedures established in the SWPPP, and the SPCC Plan developed for the Project. Additionally, there is the possibility that the improper use, storage, and/or disposal of hazardous materials such as fuels, oils, and maintenance fluids could result in a release that could cause contamination and exposure during construction, operation, and maintenance activities associated with the Project. Direct effects of a release will include contaminating soil and water resources; while indirect effects could include exposing humans, wildlife, and vegetation to the contamination. The SPCC Plan implemented by the Applicant will minimize this risk and the contamination potential. Specifically, this plan will ensure that necessary resources are available to respond to a release and will minimize the risk of contaminating soil and water resources and the associated exposure to humans, wildlife, vegetation, and air quality. The risk of contamination and exposure will be further minimized by the Project's overall design and SPCC Plan requirements, such as adequately sized containment structures, regular facility inspections, and properly trained personnel. As required by the SPCC rule (40 CFR 112.7(j)), the Project SPCC Plan will incorporate county and state oil storage requirements as well.

Consistent with the Applicant’s corporate environmental health and safety policy, the Applicant will also implement an Environmental Training and Monitoring Program that will communicate environmental concerns and appropriate work practices, including spill prevention, control, and countermeasure protocols to all field personnel.

18.2 Commercial, Industrial, and Agricultural Sectors

18.2.1 Existing Agricultural Sector

The Project Area is in the agricultural sector and, except for two active sand and gravel pits, no commercial, industrial, mining, or institutional land uses are located within the Project Area (see Figure 13).

Codington County has a total land area of 717 square miles, with approximately 577 square miles of land (80% of the county land area) being in farms (rounded to the nearest whole number) (U.S. Census Bureau 2013; Census of Agriculture 2012). In 2012, the county contained 713 farms, with an average size of 518 acres. Crop sales were primarily grains, oil seeds, dry

beans, and dry peas, while cattle, hogs, and sheep comprised the majority of livestock sales (Census of Agriculture 2012). From 2007 to 2012, the number of full-time farms increased by 7.5% and land acres used for farming increased by 0.94%, while the average farm size decreased by 0.65%. Sales of farm goods increased 60% from 2007 to 2012, and totaled $172,411,000 in 2012.

Grant County has a total land area of 688 square miles, with approximately 670 square miles of land (97% of the county land area) being in farms (rounded to the nearest whole number) (Census of Agriculture 2012). In 2012, the county contained 618 farms, with an average farm size of 694 acres. Crop sales were primarily grains, oil seeds, dry beans, and dry peas, while cattle, hogs, and sheep comprised the majority of livestock sales (Census of Agriculture 2012). From 2007 to 2012, the number of full-time farms increased by 11.4%, land acres used for farming increased by 17.9%, and the average farm size increased by 0.60%. Sales of farm goods increased 80% from 2007 to 2012 and totaled $240,819,000 in 2012.

Deuel County has a total land area of 637 square miles, with approximately 534 square miles of land (84% of the county land area) being in farms (rounded to the nearest whole number) (Census of Agriculture 2012). In 2012, the county contained 664 farms, with an average farm size of 515 acres. Crop sales primarily were grains, oil seeds, dry beans, and dry peas; cattle, hogs, and sheep comprised most livestock sales (Census of Agriculture 2012).

18.2.2 Agricultural Impacts/Mitigation

The Project is expected to have relatively minor impacts on agriculture in the region. Field observations and review of aerial photography indicate that the majority of active farming operations involve non-tilled agriculture and livestock production.

The Project will result in temporary and limited permanent impacts to farmland within the Project footprint. During construction, livestock operations may be temporarily affected by restricted access to active construction areas to protect the safety of livestock and construction workers. Coordination of property access with landowners with gates will occur to minimize impacts on agricultural operations and repair any gates or agricultural access routes that may be impacted during construction. After construction is completed, grazing in the Project construction areas will be permitted. Permanent impacts to agricultural lands primarily will result from installation of access roads, substations, and wind turbines. Construction of the Project is anticipated to result in permanent loss of approximately 76.2 acres of farmland within the Project Area (see Table 9.2). The permanent impacts associated with each structure were calculated based on the facility footprint information provided in Table 8.1. Construction of the Project will result in an estimated 1,924.3 acres of temporary impacts to farmland due to the preparation of structures including turbine foundations and crane paths (see Table 9.2). This impact is estimated

based on the current wind turbine array, associated collection line routes, access roads, and the Project Construction Easement.

Areas temporarily disturbed during construction will be repaired and restored to pre-construction contours to the extent practicable so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate natural revegetation, provide for proper drainage, and prevent erosion. Temporary construction areas will be restored per landowner agreements and the SWPPP.

Drain tile lines may be present along the Project route. The Applicant will work with landowners to identify and mark drain tile lines to avoid damage during construction. Where locations are known, temporary travel paths will avoid drain tiles where possible. Where avoidance is not possible, matting may be used. If drain tile lines are inadvertently damaged by construction of the Project, the Applicants will repair tile lines. Landowners will be compensated for any crop damage that occurs during construction.

18.3 Community Facilities and Services

18.3.1 Existing Community Facilities and Services

The Project Area is located in, near, or adjacent to Waverly, Kranzburg, Goodwin, and Bemis. Other existing communities are located outside of the Project Area including Watertown, Altamont, and Clear Lake. Facilities and services provided in these communities include but are not limited to the following: restaurants, grocery stores, hotels, postal services, equipment suppliers, packaging services, vehicle and equipment repair and maintenance shops, and gas stations.

18.3.2 Community Facilities and Services Impacts/Mitigation

The Project will provide short- and long-term impacts on community facilities and services. During the Project construction activities, local communities and businesses—such as restaurants, grocery stores, hotels, postal services, equipment suppliers, packaging services, vehicle and equipment repair and maintenance shops, and gas stations—will see an increase in business from construction workers. Other services such as equipment, fuel, operating supplies, and products may also be utilized from the county and state. Short-term construction personnel may be hired locally or from outside of the local communities for both skilled and unskilled labor positions. Additionally, housing may be needed for non-local construction laborers.

18.3.3 Emergency Response

The Applicant will coordinate with first responders, including but not limited to local police and sheriff, fire services, and ambulance and emergency medical technician services. The Applicant will develop a safety plan for construction and operation personnel that will be shared with local

emergency response personnel, as needed. The Applicant will complete any high angle rescues in the event needed during turbine operations and bring any injured personnel to the ground for transportation to local medical facilities by first responders. The Project will not result in an increased need for emergency services, fire protection, or public services, local utilities, or other government or community services.

18.4 Transportation

Transportation within the Project Area includes that occurring on U.S. highways (including an Interstate), state highways, Codington, Deuel, and Grant County highways, township roads, unauthorized roads, and roads on private lands.

18.4.1 Existing Environment

Most of the Project is within 0.25 mile of existing transportation routes, including township and county roads. The network that will comprise the transportation system used during Project construction and O&M includes rural and section line roads. No active railroads are present within the Project Area. Major roads within the Project Area are depicted in Figures 1 and 2. Airports in the Project's vicinity in South Dakota include Watertown Regional Airport (west of Interstate 29 and approximately 8.4 miles west of the Project Area) and the Clear Lake Municipal Airport (approximately 4.9 miles southeast of the Project Area). No private air strips were identified within or near the Project Area.

18.4.2 Transportation Impacts and Mitigation

The Project is not anticipated to result in permanent impacts to transportation resources in the Project Area. Indirect effects may include increased traffic volume along local, state, and federal roadways. Impacts are anticipated to be minor, as a relatively low number of workers and equipment will be accessing any one location within the Project Area at any time during operations. Impacts from potential construction associated with 200 to 300 temporary workers are expected to be limited in duration and temporary. Direct effects to transportation also will be minimal during O&M activities. The Applicant will work with state and local highway departments regarding applicable permitting requirements. Collection lines will bore under active highways. There will be no anticipated impacts to registered commercial transportation facilities.

18.5 Telecommunications

This section describes the potential for interference of licensed communication links in close proximity to the proposed Project Area for the purposes of determining exclusion zones to aid the design of a proposed wind energy generation project. Wind Logics, Inc., completed a report for the Project that summarizes the microwave links and towers along with local cellular towers,

media towers (AM and FM), television, and aviation towers, identified within and near the assessment area (Appendix M).

18.5.1 Existing Telecommunications

A review of the Federal Communications Commission (FCC) national database and the Universal Licensing System was conducted to identify possible constraints. Wind turbine offset distances were taken into consideration for the design of the wind turbine array. Five microwave towers were identified within the Project Area. In addition, 12 microwave links have been identified near the project area and 10 have been found to intersect the Project Area. The Worst Case Fresnel Zone for all of these links has been calculated, and the appropriate turbine offset has been used to minimize any harmful impact from the proposed turbine layout. One cellular tower was identified within the Project boundary. Four additional cellular towers were discovered within 25 km of the Project boundary. No active AM radio towers were identified within the Project boundary or within 25 km of the Project Area. No digital or analog television stations were identified within the Project boundary. No active aviation towers were identified within the Project boundary or within 25 km of the area of interest.

18.5.2 Telecommunications Impacts/Mitigation

Electromagnetic analysis results show that interference is not expected to impact nearby microwave, AM, FM, cellular, television, and aviation towers based on the array design. Harmful interference associated with cellular towers is not likely as cellular transitions or packet switching occurs when a cellular link becomes unavailable. While the impact of wind turbines on digital television reception is not well known due to limited cases and testing, any interference is expected to be limited to areas near the edge of station reception, areas near a turbine that is within the line-of-sight between the transmit tower and receptor, and areas of complex topography (see Appendix M). While no harmful interference is expected for the aviation towers, the Applicant is subject to FAA regulations to determine any exclusion zones. Proposed turbine locations will maintain the standard appropriate offset distances in addition to any setbacks set by the agency to minimize harmful impact. The Applicant filed for Determinations of No Hazard with the FAA in December 2018 and received Determinations of No Hazard from the FAA for all proposed turbine locations in March 2019.

18.6 Cultural Resources

This section presents the results of a record search, a review of previously recorded cultural resources, as well as the results of the current Level III survey conducted for the Project.

In accordance with the *Guidelines for Cultural Resource Surveys and Survey Reports in South Dakota (For Review and Compliance)* (South Dakota State Historical Society 2005), cultural resources reviews were conducted for an area that includes a 1-mile buffer of the Project

Construction Easement. The cultural resources survey of the Project Construction Easement was performed for an area within at least a 300-foot radius around each proposed turbine location center point; this area was expanded to a radius of up to 500 feet around some turbines to allow for an expanded construction area. Access routes to turbines were encompassed in cultural resources survey for a width of 200 feet along their full length to provide adequate flexibility for construction and establishment of the permanent ROW that typically is only 16 feet wide. Collection lines from turbines encompassed in cultural resources survey for a width of 100 feet along their full length to provide adequate flexibility for construction, and work space for boring equipment where needed.

Historic architectural survey reviewed buildings and structures within a 1-mile radius of the turbine locations. The record search for the Project Area considered all cultural resources documented within and up to 1 mile beyond the Project boundary.

The records search for the Project Area was conducted on May 15, 2018, through the Archaeological Research Center at the South Dakota State Historical Society. Pursuant to South Dakota Codified Law 1-20-21, information contained within the records search data is considered confidential and not for public distribution. Additional background research conducted for the Project Area included review of the historical General Land Office (GLO) plat maps available online from the Bureau of Land Management. Information presented below is a summary of the data obtained from the Archaeological Research Center and from the GLO database; site-specific locational information is considered confidential and is not included in this review.

The results of the records search indicate that 27 previous cultural resource inventories have been conducted within 1 mile of the Project Area for other projects. Two of these inventories overlap the Project Construction Easement. Four of the previous inventories were completed in the past 10 years.

18.6.1 Existing Cultural Resources

The records search was conducted within 1 mile of the Project Area, per South Dakota SHPO guidance. This search determined that 22 previously documented archaeological sites, 12 previously documented historic bridges, 54 previously documented standing historic structures including one historic district, and three previously documented cemeteries have been recorded within, and within 1 mile of the Project Area. Previously documented sites eligible for the National Register of Historic Places (NRHP) and State Register of Historic Places (SRHP) intersected by the Project Construction Easement and within 1 mile of the Project Area are discussed below by resource type.

18.6.1.1 Previously Documented Archaeological Sites

The 22 previously documented archaeological sites include Native American artifact scatters and stone circles, and include Euro-American alignments, artifact scatters, rock art, earthen depressions, farmsteads, foundations, railroads, and roads. Of the 22 previously recorded sites, two are eligible for the NRHP and SRHP, two are not eligible for the NRHP or SRHP, and 18 sites have not been evaluated for the NRHP or SRHP.

The Project Construction Easement overlaps one previously documented archaeological site, a destroyed segment of the abandoned Chicago Rock Island & Pacific railroad. The railroad grade through the Project Construction Easement is fully plowed under and without structures in an agricultural field. No part of it remains at this location to support any further NRHP or SRHP eligibility.

18.6.1.2 Previously Documented Standing Structures

Within 1 mile of the Project Area, 53 previously documented standing structures and one historic district have been identified**.** These standing structures include residences, agricultural buildings, farmsteads, churches, schools, and commercial buildings. No previously documented standing structures are located within the Project Construction Easement.

Of the 53 previously documented standing structures within 1 mile of the Project Area, 10 are eligible for the NRHP and SRHP, 12 have been determined not eligible for the NRHP and SRHP, and 31 have not been evaluated for the NRHP or SRHP. The structures eligible for the NRHP and SRHP are the Holy Rosary Catholic Church and Parsonage, the Kranzburg School District No. 5/Town Hall, the Nicholas T. Ries Farmstead, Kliegle Garage, the Old Goodwin Schoolhouse, School House – District #67, and four unnamed buildings and structures (state historic site numbers DE00000035, DE00000050, DE00000102, and DE00000096). Four of these are listed in the NRHP: the Holy Rosary Catholic Church and Parsonage, Kranzburg School District No. 5/Town Hall, Nicholas T. Ries Farmstead, and Kliegle Garage. The historic district is NRHP listed and encompasses the standing structures associated with the Nicholas T. Ries Farmstead.

18.6.1.3 Previously Documented Historic Bridges

Twelve previously documented historic bridges have been identified within 1 mile of the Project Area. One historic bridge is eligible for the NRHP, nine bridges have been determined not eligible for the NRHP, and two bridges have not been evaluated for the NRHP. However, the Project Construction Easement does not intersect any of these resources and the bridges will not be altered by Project vehicle use of public roadways.

18.6.1.4 Previously Documented Cemeteries

Three previously documented cemeteries have been identified within 1 mile of the Project Area. The three cemeteries remain unevaluated for NRHP and SRHP eligibility. The Project Construction Easement does not intersect any of these resources.

18.6.1.5 General Land Office Review

The GLO survey plat maps were reviewed for historical features that coincide with the Project Construction Easement. This review revealed that from 1872 and 1874, three townships (Township [T] 116 North [N], Range [R] 50 West [W]; T116N, R51W; and T117N, R51W) exhibited evidence of Euro-American expansion and possible settlement within the Project Boundary due to the appearance of the Winona and St. Peters Railroad by 1872. The historic Winona and St. Peters Railroad, a subsidiary of the Chicago and North Western Railroad, is not crossed by the Project Construction Easement.

18.6.2 Level III Survey for Cultural Resources and Architectural History Survey

From June to December 2017, and April to November 2018, a Level III Survey was conducted for archaeological, historical, and tribal resources at each proposed turbine location, access route to turbines, and collection lines from turbines. The archaeologists supervising these investigations meet the U.S. Secretary of the Interior's Professional Qualifications Standards for archaeology. The area of Level III survey covers the Project Construction Easement.

Tribal members from the Sisseton Wahpeton Oyate, Yankton Sioux, and Spirit Lake Nation selected to represent those tribes in identifying significant tribal resources were an integral part of the survey field team. Tribal members were responsible for identifying sites of religious and cultural significance to the tribes, or traditional cultural properties (TCPs). An architectural history survey was also conducted of standing buildings and structures within 1 mile of the Project Construction Easement for all proposed turbine locations. The architectural history survey was led by architectural historians meeting the U.S. Secretary of the Interior's Professional Qualification Standards in that field.

The Level III Survey identified 509 Native American sites during Project Construction Easement surveys and identified 24 historical Euro-American archaeological sites or isolated artifact occurrences, including one previously recorded historic archaeological site—the railroad grade discussed in Section 18.6.1.1 Previously Documented Archaeological Sites. The historic architectural survey further field-checked approximately 982 standing building and structure locations within 1 mile but outside of the Project Area (the project is set back from standing buildings and structures by design). The historic architectural survey focused on those sites where historic setting and feeling may be important and considered the potential visibility of Project turbines.

All TCP sites identified by tribal members, such as sites represented by rock cairns, alignments, and other traditionally recognized features on the landscape, are considered important to the identifying tribes and will be considered eligible for listing on the NRHP. The newly identified historical Euro-American archaeological remains, primarily represented by sparse artifact debris or the occasional building foundation ruins, are proposed as not eligible for the NRHP due to their lack of historical importance and lack of significant scientific research value.

Standing buildings and structures that are eligible for NRHP listing may potentially be exposed to Project impacts beyond the Project Construction Easement. In the greater Project Area, where setting and feeling are important for conveying the historic significance of NRHP-eligible buildings and structures, and where these are not screened from the Project (such as by windbreaks, shelterbelts, or other trees or rolling landscape), visual or auditory impacts could result from the Project. Twenty historic buildings and structures that are eligible for or listed on the NRHP or SRHP were identified within 1 mile of the Project Area, ranging between 0.31 mile and 1.75 miles from the nearest turbine. These include barns, bridges, a cemetery, a church, dwellings, a garage, a grain elevator, a granary, an outbuilding, a parsonage, a post office, schools, and a stable.

18.6.3 Cultural Resource Impacts/Mitigation

Planned construction activities for the Project may occur within the vicinity of sites important to tribal cultural traditions, archaeological sites, or historic standing structures. Sites evaluated as not eligible for NRHP listing are not significant and impacts to these sites would therefore not be considered. Those sites that are evaluated as eligible for NRHP listing by the participating tribes or by SHPO, or that are of undetermined NRHP eligibility, will be protected by establishing avoidance measures at those portions of the resources that make them eligible for NRHP listing to exclude them from physical impacts from the Project. In addition to avoiding potential direct physical impacts to significant site areas during Project construction, indirect secondary effects from the introduction of new visual elements into the setting of NRHP-eligible tribal resources and historic buildings and structures could impact the integrity of these sites. However, regarding potentially affected historic and archaeological sites, state preservation law SDCL 1-19A-11.1 applies to those that are currently listed on the NRHP or SRHP, not simply those that are eligible for listing.

18.6.3.1 Tribal and Archaeological Resource Impacts/Mitigation

NRHP-eligible tribal and archaeological resources are identified as TCPs by the coordinating tribes on the Project, including the Sisseton Wahpeton Oyate, Yankton Sioux, Rosebud Sioux, and Spirit Lake Tribes. Since setting and feeling are important and contributing aspects of these sites' traditional character and experience, Sisseton Wahpeton Oyate, Yankton Sioux, Rosebud Sioux, and Spirit Lake Tribal Historic Preservation Officers believe that the Project will impose setting-related impacts at sites of traditional, cultural, and religious importance to Native

peoples. Archaeological consultants on the Project support this finding. Project developers worked together with the consulting tribes and archaeologists to create the avoidance, minimization, and mitigation measures identified for TCPs below:

- Implement standard avoidance or resource protection practices (e.g., barrier fencing, contractor training) where feasible in collaboration with the tribes listed above and the Applicant.
- Make best effort to identify participating landowners who may be willing to work with the tribes on site preservation, accessibility and protection of TCPs on their property.
- Conduct site revisits prior to construction.
- Help facilitate post-construction site revisits for tribes with the landowners.
- Identify and implement education/interpretation opportunities regarding tribal resource preservation and/or Native American perspectives which may include sensitivity training when needed.

The treatments and recommendations to address the impacts to TCPs were developed by Tribal Cultural Specialists who are traditional practitioners having specific training and specialized knowledge about these features and sites.

All of the TCPs identified in this investigation are considered and recommended eligible for NRHP listing. Although this Project is private and federal permitting requirements do not apply, the criteria used for impact assessment is similar to that employed for federally regulated projects. The Sisseton Wahpeton Oyate, Yankton Sioux, Rosebud Sioux, and Spirit Lake Tribal Historic Preservation Officers and the Project developer have worked together to create a set of avoidance, minimization, and mitigation measures to address these impacts.

18.6.3.2 Historic Building and Structure Impacts/Mitigation

No construction-related activities that would permanently alter important historic aspects of historic buildings or structures will occur directly within the boundaries of NRHP-eligible historic building or structure sites. Minimum turbine setbacks from occupied standing buildings, including those which may be historic sites, are in place for the Project. Current distances from turbines for building sites listed on or eligible for the NRHP or SRHP meet or extend beyond standard setbacks and mitigate potential visual impacts. These setbacks include at least 550 feet from occupied buildings within Project leases, 1,500 feet from buildings outside of Project leases in Codington and Grant County, and a 4-times turbine height setback from residences outside of Project leases in Deuel County, and 1.0 mile from municipal boundaries for townsites and the buildings they contain within their municipal boundaries (per Table 13.1 Minimum Setback Distances).

Sixteen of the 20 building sites (80%) that are listed on or eligible for the NRHP or SRHP are more than 1 mile from the nearest turbine. Only four building sites are closer than 1 mile. Only one NRHP-listed site is within 1 mile of proposed turbines, the Nicholas T. Ries Farmstead; this historic farmstead is surrounded by windbreak and shelter-belt trees that create a visual barrier

around it; and the nearest turbine is set back 0.78 mile (over 4,410 feet) south from the back of the property. One previously recorded site identified to be eligible for the NRHP or SRHP, the School House – District #67, is located closer than 1 mile to a Project turbine; this dilapidated wood-frame building is abandoned and is set back 0.3 mile (over 1,630 feet) from the nearest turbine. Another set of buildings on a farmstead, identified during field review for the Project to have two that are NRHP-eligible (a barn and a stable), is approximately 0.45 mile (over 2,370 feet) from the nearest turbine; this historic farmstead is surrounded by windbreak and shelter-belt trees that create a visual barrier around it. All minimum setback requirements are exceeded for buildings/structures listed on or eligible for the NRHP or SRHP.

19.0 Employment Estimates (ARSD 20:10:22:24)

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

The Project is expected to employ approximately 250 temporary workers during the 5- to 9-month construction period of the Project. It is likely that general skilled labor is available in Codington, Deuel, and Grant Counties or the state to serve the basic infrastructure and site development needs of the Project. Specialized labor will be required for certain components of Project construction. It is likely that this labor will be imported from other areas of the state or from other states, as the relatively short duration of construction does not warrant special training of local or regional labor. Balancing the use of local contractors and imported specialized contractors will likely alleviate any labor relations issues.

After construction of the Project is completed, approximately 10 to 12 employees will be hired for full-time positions on the Project's O&M team. Employment positions will consist of a full-time Operations Manager and Wind Technicians who will operate the windfarm and substation for the life of the Project. The team will have personnel on-call 24 hours per day, 7 days per week to address issues arising outside of normal business hours.

20.0 Future Additions and Modifications (ARSD 20:10:22:25)

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

applicant may wish to be approved in the permit.

The Applicant does not have planned, and does not anticipate, any future modifications needed to the Project. However, a separate Facility Permit application for the construction of the 300-MW Crowned Ridge Wind project has been filed by Crowned Ridge Wind, LLC. That project will be located adjacent to the Project and will be owned and operated by Crowned Ridge Wind, LLC, a wholly owned indirect subsidiary of NEER.

21.0 Decommissioning of Wind Energy Facility (ARSD 20:10:22:33:01)

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

The Applicant has entered into lease and easement agreements with private landowners within the Project Area for the placement of Project infrastructure. The Applicant anticipates that the life of the Project will be approximately 25 years, which is consistent with the Project's contracted term. At the end of the Project's contracted life there may be opportunities to extend the life of the Project by repowering the Project by retrofitting the turbines and power system with upgrades based on new technology, which may allow the wind farm to produce efficiently and successfully for many more years.

In the event the Project's contracted life is not extended, the Project will be decommissioned in accordance with applicable state and county regulations. Current decommissioning requirements in Codington, Deuel, and Grant Counties require that all towers, turbine generators, transformers, overhead collection and feeder lines, foundations, buildings, and ancillary equipment be dismantled and removed to a depth of 4 feet. To the extent possible, the site shall be restored and reclaimed to its pre-Project topography and topsoil quality. All access roads shall be removed, unless written approval is given by the landowner requesting roads be retained. The owner will comply with all decommissioning and restoration requirements in Codington, Deuel, and Grant Counties as listed within section 9 of the Codington and Deuel County ordinances and section 10 of the Grant County ordinance, which also include requirements on financial assurances specific to each county. The Decommissioning Plan for the Project is included in Appendix N. The estimated net decommissioning costs for the Project are summarized in the Decommissioning Plan in Appendix N.

22.0 Reliability and Safety (ARSD 20:10:22:33.02(8))

22.1 Reliability

GE, one of the world's largest wind turbine suppliers, has over 35,000 wind turbines installed globally. GE has been producing wind turbines since 2002. Preventative maintenance based on analyzing real time data will be used to help mitigate potential failures.

To improve reliability, the Project has the ability to create short-term forecasts of wind speed and energy that will be produced. Determining weather conditions with accuracy enables a project owner and operator to efficiently maximize facility output. 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 daily, hourly, and incremental forecast, updated every 15 minutes to the off-taker, balancing authority, and/or regional transmission operators. Predicting energy generation through vast, location-specific weather forecasting is used to integrate wind energy into the region's power grid and to schedule turbine and transmission maintenance windows, improving overall reliability. As wind forecasting has improved, the reliability of wind energy generation forecasts provided to transmission operators also has improved.

22.2 Safety

The Project is located in a rural setting with low population density. Construction and operation of the Project will have minimal impacts on the security and safety of the local population. The construction team will coordinate with first responders, including, but not limited to, air ambulance, local sheriff's office(s), and local fire services to develop a safety plan during the Project's 5- to 9-month construction period. During Project operation, the on-site operation and maintenance team members also will be in contact with local first responders to offer information about the Project and to answer any questions response teams may have regarding Project plans and details. The following security measures will be taken to reduce the chance of physical and property damage, as well as personal injury, at the Project:

- Towers will be set back from occupied residences and roadways as described in this Application in Table 13.1 and the applicable regulations identified herein. These distances are considered safe based on developer experience and are consistent with prior Facility Permits.
- Security measures will be taken during construction and operation of the Project including temporary (safety) and permanent fencing, gates, warning signs, and locks on equipment and facilities.
- Regular maintenance and inspections will address potential blade failures, minimizing the potential for blade throw.

- Turbines will sit on steel enclosed tubular towers within which all electrical equipment will be located, except for the pad-mounted transformer where applicable.
- Access to the interior of the tower will be only though a solid steel door that will be locked when not in use. The exterior cannot be climbed.
- Safety training and standardized practices will be conducted for construction crews and on-site personnel.

23.0 Information Concerning Wind Energy Facilities (ARSD 20:10:22:33:02)

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

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

The following information requirements concerning wind energy facilities has been referenced in previous sections of the Application, as indicated below.

- Configuration of wind turbine – Section 6.1
- Number of wind turbines – Section 6.1
- Warning lighting requirements for wind turbines – Sections 13.0 and 18.0
- Setback distances – Section 7.2
- Sound levels during construction and operation – Section 13.3.2
- Electromagnetic interference – Section 13.5
- Site and major alternatives – Section 7.0

- Reliability and safety – Section 22.0
- Right-of-way or condemnation requirements – Sections 6.0 and 7.3
- Clearing activities – Sections 6.11 and 11.1.2
- Configuration of interconnection towers and poles – Section 6.5
- Conductor and structure configurations – Section 6.5
- Underground electric interconnection facilities – Section 6.3

24.0 Additional Information in Application (ARSD 20:10:22:36)

24.1 Permits and Approvals

Table 24.1 includes the potential required permits and approvals for the Project.

24.2 Agency Coordination

The Applicant conducted meetings with Grant County officials (the Grant County Commissioners, the Grant County Planning and Zoning Officer, and the Grant County Auditor) on November 8, 2016, and December 20, 2016, as well as on January 17, April 4, June 6, and June 20 in 2017. As a result of these meetings, the Applicant was able to better understand proposed changes to the Grant County zoning ordinance and how the Applicant could proactively develop the Project to ensure compliance.

The Applicant met with the Codington County Planner and First District Association of Local Governments on February 9, April 5, May 23, and August 31 of 2017 to discuss the requirements of the Codington County siting ordinances and the County's expectations through the development and construction of the Project.

The Applicant met with the Deuel County Planner and First District Association of Local Governments on July 31, 2018, to discuss the requirements of the Deuel County siting ordinances and the County's expectations through the development and construction of the Project.

The Applicant will continue the collaborative process with agencies throughout the development, construction, and operation phases of the Project.

24.3 Applicant's Burden of Proof

As described throughout the application, 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 facilities comply with applicable laws and rules.
- The facilities 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 facilities will not substantially impair the health, safety, or welfare of the inhabitants.
- The facilities 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.

Table 24.1. Potential Required Permits and Approvals

Agency	Type of Permit, Approval, or Coordination	Status*	Need or Description
Federal			
U.S. Fish and Wildlife Service	Section 10 (no federal nexus, private project) of the Endangered Species Act; Migratory Bird Treaty Act; Bald and Golden Eagle Protection Act	2	Coordination regarding adherence to the voluntary Land-Based Wind Energy Guidelines; coordination with Refuges Division regarding protected easements.
U.S. Army Corps of Engineers	Section 404 of the Clean Water Act	A	NWP 12 is required for dredging or fill in jurisdictional waters of the U.S. for utility line projects.
Federal Avian Administration	Determination of No Hazard	C	Required for any potential obstacles to navigation airspace over 200 feet in height.
State of South Dakota			
Public Utilities Commission	Facility Permit	1	Required for wind facility over 100 MW.
Department of Environment & Natural Resources	Section 401 Water Quality Certification	2	Required for fill in jurisdictional waters of the U.S.; water quality certification is granted to NWP 12.
	NPDES Permit: General Permit for Storm Water Discharges Associated with Construction Activities	A	Required for disturbance of over 1 acre of land. Must prepare a Stormwater Pollution Prevention Plan.
	Temporary water use permit for construction activities	2	Required for compliance with the Water Pollution Control Act. Temporary permits for the use of public water for construction, testing, or drilling purposes. Construction contractors will obtain as necessary.
	General Permit for Temporary Dewatering	2	Compliance with the Water Pollution Control Act. Temporary permit for the discharge of water for construction dewatering. Construction contractors will obtain as necessary.

Agency	Type of Permit, Approval, or Coordination	Status*	Need or Description
	Air Quality Permit	A	Required for a process or fuel burning unit that emits a pollutant into the ambient air.
South Dakota Game, Fish, and Parks Commission	Environmental review for state listed species	2	Coordination regarding State-listed species and species of conservation concern
South Dakota State Historical Society	SDCL 1-19A-11.1	A	Compliance required for state permits.
Department of Transportation	Highway Access Permit; Road Crossing Agreements	2	Permit required for construction of access roads from state highways.
	Utility Permit	2	Required for utility crossings on state highway ROW, as necessary.
	Oversize/overweight Permit	2	Required for heavy hauling construction equipment and materials on state highways. Construction contractor will obtain, as necessary.
South Dakota Aeronautics Commission	Aeronautical Hazard Permit	A	Turbine lighting on conjunction with FAA Review
Local			
Codington County	Building Permits or Conditional Use Permits; Road Crossing Agreements; Oversize/overweight Permit; Open Burning Permits.	C	Conditional Use Permits required for the Project and the substation. Building Permits, Road Crossing Agreements, and Oversize/overweight Permits may be required, as determined on a case-by-case basis.
Deuel County	Building Permits or Conditional Use Permits; Road Crossing Agreements; Oversize/overweight Permit; Open Burning Permits.	C	Conditional Use Permits required for the Project and the substation. Building Permits, Road Crossing Agreements, and Oversize/overweight Permits may be required, as determined on a case-by-case basis.
Grant County	Conditional Use Permit	C	Conditional Use Permit required for turbines.
Townships	Road Crossing Agreements; Oversize/overweight Permit	2	The Project will require crossing agreements.

**1: Applied – decision pending*

2: Final design will determine whether the permit/approval is required, or final layout is needed for permit application.

A: Permit requirement will apply, but Applicant has not yet applied. Typical for construction preparation activities.

C: Complete.

C: Permit issued, in compliance period prior to authorization for construction.*

25.0 Testimony and Exhibits (ARSD 20:10:22:39)

The Applicant is submitting testimony and exhibits in support of the Application. The exhibits are identified in the Application, and the following will provide testimony in support of the Application:

Name and Title	**Entity**	**Subject Matter**
Daryl Hart, Director, Renewable Business Development Tyler Wilhelm, Project Manager, Renewable Business Development	NextEra Energy Resources, LLC	Project management and development activities
Kimberly Wells, Senior Manager, Environmental Services	NextEra Energy Resources, LLC	Environmental
Mark Thompson, Manager of Engineering	NextEra Energy Resources, LLC	Construction, O&M, and decommissioning
Jay Haley, Partner	EAPC Wind Energy	Sound and shadow flicker modeling and results

26.0 References

Aron, C. 2005. *South Dakota Interior Least Tern (Sterna antillarum athalassos) and Piping Plover (Charadrius melodus) Management Plan*. Wildlife Division Report No. 2005-02. Pierre: South Dakota Department of Game, Fish and Parks.

Bailey, R.M., and M.O. Allum. 1962. *Fishes of South Dakota*. Miscellaneous Publication No. 119. Ann Arbor: Museum of Zoology, University of Michigan.

Bauman, P., B. Carlson, and T. Butler. 2016. *Quantifying Undisturbed (Native) Lands in Eastern South Dakota: 2013*. Brookings: South Dakota State University Extension.

Bryce, S. A., J. M. Omernik, D. E. Pater, M. Ulmer, J. Schaar, J. Freeouf, R. Johnson, P. Kuck, and S. H. Azevedo. 1996. Ecoregions of North and South Dakota, (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,500,000).

Burgess, A., and J. Shearer. 2008. *A Comprehensive Aquatics Survey of Minnesota River Tributaries*. Unpublished report, South Dakota Department of Game, Fish and Parks, Pierre.

Dieterman, D.J., and C.R. Berry, Jr. 1996. *The Distribution and Relative Abundance of Fishes in Seven Streams of the Minnesota River Basin of Northeastern South Dakota*. Special Report Federal Aid F-21-R-27. Prepared for South Dakota Department of Game, Fish and Parks, Pierre.

EAPC Wind Energy. 2019. *Final Report Crowned Ridge Wind Farms Sound and Shadow Flicker Study, Codington, Deuel, and Grant Counties, South Dakota*. Author Jay Haley, P.E. Partner.

Federal Emergency Management Agency. 2016. FEMA's National Flood Hazard Layer. Available at: https://msc.fema.gov/portal/advanceSearch. Accessed on July 7, 2017.

Federal Transit Administration. 2006. Construction Equipment Typical Noise Level. Available at: https://www.researchgate.net/figure/Construction-Equipment-Noise-Emission-Levels-greatest-to-least_tbl2_228381219. Accessed December 5, 2018.

Flint, R.F. 1955. *Pleistocene Geology of Eastern South Dakota*. Geological Survey Professional Paper 262. Washington, D.C.: United States Government Printing Office.

Gallup. 2018. Gallup Poll on Energy from March 2018. Available at: https://news.gallup.com/poll/2167/energy.aspx. Accessed December 3, 2018.

Gilbertson, J. P. 1989. *Quaternary Geology of Northeastern South Dakota*. South Dakota Geological Survey. Vermilion, South Dakota.

Hansen, D. S. 1994. *Major Aquifers in Codington and Grant Counties*. South Dakota Geological Survey Information Pamphlet No. 47.

Harrington, B.A. 2001. Red Knot (*Calidris canutus*). In *The Birds of North America*, No. 563, edited by A. Poole and F. Gill. Philadelphia, Pennsylvania: The Birds of North America, Inc.

Hoen, B., J.P. Brown, T. Jackson, R. Wiser, M. Thayer, and P. Cappers. 2013. *A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States. Environmental Energy Technologies Division*. Available at: http://emp.lbl.gov/sites/all/files/lbnl-6362e.pdf. Accessed January 8, 2019.

Hoen, B., R. Wiser, P. Cappers, M.A. Thayer, and G. Sethi. 2009. *The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis*. Available at: https://emp.lbl.gov/publications/impact-wind-power-projects. Accessed January 8, 2019.

IAC Acoustics. 2017. IAC Acoustics Industrial Noise Control Website. Available at: http://www.industrialnoisecontrol.com/comparative-noise-examples.htm. Accessed December 12, 2018.

Jain, A.A. 2005. Bird and bat behavior and mortality at a northern Iowa windfarm. M.S. thesis, Iowa State University, Ames, Iowa.

Jarrett, M.J. 1986. *Sand and Gravel Resources in Grant County, South Dakota, Information Pamphlet IP – 36*. Vermillion: State of South Dakota, Department of Environment and Natural Resources, Division of Geological Survey.

Jensen, A.R. 2001. First Occurrence of Aquifer Materials in Deuel County, South Dakota. Aquifer Materials Map 7, South Dakota Geological Survey.

_____. 2003. First Occurrence of Aquifer Materials in Codington County, South Dakota. Aquifer Materials Map 13, South Dakota Geological Survey.

_____. 2004. First Occurrence of Aquifer Materials in Grant County, South Dakota. Aquifer Materials Map 17, South Dakota Geological Survey.

Kochert, M.N., K. Steenhof, C.L. McIntyre, and E.H. Craig. 2002. Golden Eagle (*Aquila chrysaetos*). The Birds of North America Online (A. Poole, editor). Ithaca, New York: Cornell Lab of Ornithology.

Martin, J. E., J. F. Sawyer, M. D. Fahrenbach, D. W. Tomhave, and L. D. Schulz. 2004. Geologic Map of South Dakota. The Geological Survey, Department of Environment and Natural Resources. South Dakota.

McCoy, R.W., and D.C. Hales. 1974. A survey of eight streams in eastern South Dakota: physical and chemical characteristics, vascular plants, insects and fishes. *Proceedings of the South Dakota Academy of Science* 53:202–219.

National Conference of State Legislatures. 2018. State Renewable Portfolio Standards and Goals. Available at: http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx. Accessed December 2, 2018.

National Institute of Environmental Health Sciences (NIEHS). 1999. *NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields Prepared in Response to the 1992 Energy Policy Act (PL 102-486, Section 2118).* NIH Publication No. 99-4493.

Natural Resources Conservation Service (NRCS). 2018. Soil Survey Geographic (SSURGO) geographic information system (GIS) data, Codington, Deuel, and Grant Counties. South Dakota.

Noise Help. 2017. Noise Help website. Available at: https://www.noisehelp.com. Accessed December 12, 2018.

Pearse, A.T., M. Rabbe, L.M. Juliusson, M.T. Bidwell, L. Craig-Moore, D.A. Brandt, and W. Harrell. 2018a. Delineating and identifying long-term changes in whooping crane (*Grus americana*) migration corridor. *PLoS ONE* 13:e0192737. Available at: https://doi.org/10.1371/journal.pone.0192737. Accessed November 5, 2018.

———. 2018b. Map of whooping crane migration corridors. U.S. Geological Survey data release. Available at: https://doi.org/10.5066/F7FT8K74. Accessed November 5, 2018.

Platte River Recovery Implementation Program (PRRIP). 2017. Piping Plover (*Charadrius melodus*). Available at: https://www.platteriverprogram.org/AboutPRRIP/Pages/PipingPlover.aspx. Accessed December 12, 2018.

Pulkrabek, M., and D. O'Brien. 1974. *An Inventory of Raptor Nesting in Harding County, South Dakota-1974.* Pittman-Robertson Project W-95-R-8. Pierre: South Dakota Department of Game, Fish and Parks.

Schroeder, Wayne. 1976. *Sand and Gravel Resources in Deuel County, South Dakota*. Information Pamphlet No. 9. Vermillion: State of South Dakota, Department of Environment and Natural Resources, Division of Geological Survey.

Schulz, L. D. 1991. *Sand and Gravel Resources in Codington County, South Dakota, Information Pamphlet IP – 44.* Vermillion: State of South Dakota, Department of Environment and Natural Resources, Division of Geological Survey.

Seaber, P.R., F.P. Kapinos, and G.L. Knapp. 1987. Hydrologic Unit Maps. U.S. Geological Survey Water Supply Paper 2294. Washington, D.C.: U.S. Geological Survey, United States Government Printing Office.

Shearer, J.S. 2003. *Topeka Shiner (*Notropis topeka*) Management Plan for the State of South Dakota*. Wildlife Division Report No. 2003-10. Pierre: South Dakota Department of Game, Fish and Parks.

Shepherd, M.D. 2005. Species Profile: *Oarisma poweshiek.* In *Red List of Pollinator Insects of North America,* edited by M.S. Shepherd, D.M. Vaughan, and S.H. Black. CD-ROM Version 1 (May 2005). Portland, Oregon: The Xerces Society for Invertebrate Conservation.

Skadsen, D.R. 2015. *Butterflies*. Northeast Glacial Lakes Watershed. Available at: http://www.neglwatersheds.org/images/Butterflies.pdf. Accessed December 12, 2018.

———. 2016a. *Mammals*. Northeast Glacial Lakes Watershed. Available at: http://www.neglwatersheds.org/images/Mammals.pdf. Accessed December 12, 2018.

———. 2016b. *Fish*. Northeast Glacial Lakes Watershed. Available at: http://www.neglwatersheds.org/images/Fish.pdf. Accessed December 12, 2018.

———. 2017. *Birds*. Northeast Glacial Lakes Watershed. Available at: http://www.neglwatersheds.org/images/Birds.pdf. Accessed December 12, 2018.

Smith BS et al. 1999. Thrill or Threat? The sound of movies. *The Hearing Review*, Nov 1999, 50-54.

Soil Science Division Staff. 2017. Chapter 3. Examination and Description of Soil Profiles. In *Soil Survey Manual*, edited by C. Ditzler, K. Scheffe, and H.C. Monger. USDA Handbook 18. Washington, D.C.: Government Printing Office.

South Dakota Department of Game, Fish and Parks (SDGFP). 2012. *South Dakota River Otter Management Plan*. Wildlife Division Report Number 2012-07. Pierre: South Dakota Department of Game, Fish and Parks.

———. 2014. *South Dakota Wildlife Action Plan*. Wildlife Division Report 2014-03. Pierre: South Dakota Department of Game, Fish and Parks.

———. 2016. State and Federally Listed Threatened, Endangered and Candidate Species Documented in South Dakota by County. Updated on July 19, 2016. Available at: https://gfp.sd.gov/userdocs/docs/ThreatenedCountyList.pdf. Accessed February 8, 2019.

———. 2017a. Osprey Recovery in Southeastern SD. Available at: https://gfp.sd.gov/wildlife/management/diversity/osprey-recovery.aspx. Accessed July 11, 2017.

———. 2017b. Northern Redbelly Dace Characteristics. Available at: https://gfp.sd.gov/wildlife/critters/fish/rare-fish/northern-redbelly-dace.aspx. Accessed July 7, 2017.

———. 2017c. Blacknose Shiner Characteristics. Available at: https://gfp.sd.gov/wildlife/critters/fish/rare-fish/blacknose-shiner.aspx. Accessed July 7, 2017.

———. 2018. State T&E Species Status Reviews Approved by SDGFP Commission 5 April 2018. Available at: https://gfp.sd.gov/UserDocs/nav/status-reviews.pdf. Accessed February 4, 2019.

SDGFP and South Dakota Bat Working Group. Undated. Siting Guidelines for Wind Power Projects in South Dakota. Available at: https://gfpga.sd.gov/wildlife/docs/wind-power-siting-guidelines.pdf. Accessed December 12, 2018.

South Dakota Department of Agriculture (SDDOA). 2018a. State Noxious Weed and Plant List. Available at: https://sdda.sd.gov/ag-services/weed-and-pest-control/weed-pest-control/sd-state-noxious-weed-declared-pest-list-and-distribution-maps/. Accessed February 8, 2019.

———. 2018b. County Noxious Weed and Plant List. Available at: https://sdda.sd.gov/ag-services/weed-and-pest-control/weed-pest-control/county-noxious-weed-pest-list-and-distribution-maps/default.aspx. Accessed February 8, 2019.

South Dakota Department of Environment and Natural Resources (SDDENR). 2013. Earthquakes in South Dakota (1872-2013). Update May 1, 2013. Available at: http://www.sdgs.usd.edu/publications/maps/earthquakes/earthquakes.htm. Accessed December 12, 2018.

———. 2014. Exceptional Event Demonstration for PM10 Exceedances in Brookings and Watertown on October 6, 2011. Available at: https://denr.sd.gov/des/aq/aqnews/20111006EEDemonstration_final.pdf. Accessed December 12, 2018.

_____. 2018a. South Dakota ConAGG sites GIS shapefile. Available at: http://opendata2017-09-18t192802468z-sdbit.opendata.arcgis.com/datasets/377c81246c89421bbd26bd5be569055f_0. Accessed February 6, 2019.

———. 2018b. The 2018 Integrated Report for Surface Water Quality Assessment, South Dakota Department of Environment and Natural Resources, Pierre, South Dakota, 206 pages. Available at: http://denr.sd.gov/documents/18irfinal.pdf. Accessed March 11, 2019.

———. 2018c. Online website for Air Quality Monitoring Sites. Available at: https://denr.sd.gov/des/aq/monitoring/state-mo.aspx. Accessed December 12, 2018.

South Dakota State Historical Society. 2005. *Guidelines for Cultural Resource Surveys and Survey Reports in South Dakota (For Compliance and Review).* Pierre: South Dakota Historical Society Cultural Heritage Center.

South Dakota Legislature Legislative Research Council. 2019a. South Dakota Codified Law 49-34A-94. Available at: https://sdlegislature.gov/Statutes/Codified_Laws/DisplayStatute.aspx?Type=Statute&Statute=49-34A-94. Accessed March 12, 2019.

——— 2019b. South Dakota Codified Law 49-34A-94. Available at: https://sdlegislature.gov/Statutes/Codified_Laws/DisplayStatute.aspx?Type=Statute&Statute=49-34A-101. Accessed March 12, 2019.

Tetra-Tech. 2008a. *Spring Avian Survey, Bemis Wind Resource Area Grant, Codington, Deuel, and Brookings Counties, South Dakota*. Prepared for FPL Energy, LLC. July.

———. 2008b. *Fall Avian Survey, Bemis Wind Resource Area Grant, Codington, Deuel, and Brookings Counties, South Dakota*. Prepared for FPL Energy, LLC. December.

———. 2015. *Fall Avian Survey, Bemis Wind Resource Area Grant, Codington, Deuel, and Brookings Counties, South Dakota*. Prepared for FPL Energy, LLC. December.

The Watershed Institute. 2013. *Potentially Suitable Habitat Assessment for the Whooping Crane (*Grus americana*)*. Topeka, Kansas: The Watershed Institute, Inc.

U.S. Army Corps of Engineers (USACE). 1987. *Corps of Engineers Wetland Delineation Manual*. Technical Report Y-87-1. Vicksburg, Mississippi: U.S. Army Engineers Waterways Experiment Station.

U.S. Census Bureau. 2010. 2010 U.S. Census Data. Available at: https://www.census.gov/2010census/data/. Accessed on October 11, 2018.

U.S. Census Bureau. 2013-2017. American Community Survey 5-Year Estimates. Available at: https://factfinder.census.gov/faces/nav/jsf/pages/index.xhtml. Accessed on February 20, 2019.

U.S. Department of Agriculture, National Agriculture Statistics Service, Census of Agriculture. 2012. Census Volume 1, Chapter 2: County Level Data. Available at: https://www.nass.usda.gov/Publications/AgCensus/2012/Full_Report/Volume_1,_Chapter_2_County_Level/South_Dakota/st46_2_001_001.pdf. Accessed October 11, 2018.

———. 2018. South Dakota Cropland Layer. Available at: http://nassgeodata.gmu.edu/CropScape/SD. Accessed March 8, 2019.

U.S. Environmental Protection Agency (USEPA). 2018. Green Book Map Download; Individual State Maps with Nonattainment Areas. Available at: https://www.epa.gov/green-book/green-book-map-download. Accessed November 3, 2018.

U.S. Fish and Wildlife Service (USFWS). 2002. *Status Assessment and Conservation Guidelines – Dakota Skipper, Iowa, Minnesota, North Dakota, South Dakota, Manitoba, and Saskatchewan*. April 2002. Available at: https://www.fws.gov/midwest/endangered/insects/pdf/dask-status.pdf. Accessed December 12, 2018.

———. 2007. Bald Eagle (*Haliaeetus leucocephalus*). Fact Sheet. Available at: https://www.fws.gov/migratorybirds/pdf/management/bald-eagle-fact-sheet.pdf. Accessed December 12, 2018.

———. 2008. *Birds of Conservation Concern 2008*. Arlington, Virginia: U.S. Department of the Interior, Fish and Wildlife Service, Division of Migratory Bird Management.

———. 2012. *Land-Based Wind Energy Guidelines*. Wind Turbine Guidelines Advisory Committee. Washington, D.C.: U.S. Department of the Interior, U.S. Fish and Wildlife Service.

———. 2013. *Eagle Conservation Plan Guidance Module 1 – Land-based Wind Energy*, Version 2. Washington, D.C.: U.S. Department of the Interior, U.S. Fish and Wildlife Service, Division of Migratory Bird Management.

———. 2014. Poweshiek Skipperling *(Oarisma poweshiek)* Fact Sheet. Available at: https://www.fws.gov/midwest/endangered/insects/posk/pdf/poskFactSheetOct2014.pdf. Accessed December 12, 2018.

———. 2016. 50 CFR Part 17 Endangered and Threatened Wildlife and Plants; Threatened Species Status for the Northern Long-eared Bat with 4(d) rule; Final Rule and Interim Rule. 80 Federal Register 63: 17973-18033.

———. 2017b. *South Dakota Listed Species by County List* (updated January 11, 2017). Available at: https://www.fws.gov/southdakotafieldoffice/SpeciesByCounty_Jan2017.pdf. Accessed February 8, 2019.

———. 2017a. National Wetlands Inventory. Updated October 1, 2017. Available at: http://www.fws.gov/wetlands/. Accessed March 7, 2018.

———. 2017c. *2017 Range-Wide Indiana Bat Summer Survey Guidelines*. May 9, 2017. Available at: https://www.fws.gov/midwest/endangered/mammals/inba/surveys/pdf/2017INBASummerSurveyGuidelines9May2017.pdf. Accessed July 17, 2017.

———. 2018. 2018 Dakota Skipper (*Hesperia dacotae*) North Dakota Survey Protocol. U.S. Fish and Wildlife Service, Mountain-Prairie Region. Available at: https://www.fws.gov/midwest/endangered/insects/dask/pdf/2018DASKSurveyProtocol4202018.pdf. Accessed June 2018.

U.S. Geological Survey (USGS). 2014a. National Hydrography Dataset. Updated June 25, 2014. Available at: https://gdg.sc.egov.usda.gov/GDGOrder.aspx. Accessed March 7, 2018.

———. 2014b. NLCD 2011 Land Cover (2011 Edition, amended 2014) - National Geospatial Data Asset (NGDA) Land Use Land Cover. Available at: http://nationalmap.gov/viewer.html. Accessed May 12, 2017.

Vaughn, D.M., and M.D. Shepherd. 2005. Species Profile: *Hesperia dacotae*. In *Red List of Pollinator Insects of North America*, edited by M.D. Shepherd, D.M. Vaughan, and S.H. Black. CD-ROM Version 1 (May 2005). Portland, Oregon: The Xerces Society for Invertebrate Conservation.

Xcel Energy. 2015. Supplement to Xcel Energy's 2016-2030 Upper Midwest Resource Plan, Attachment C, Northern States Power Company, Case No. E002/RP-15-21, at 2. Available at: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId=%7BBE6AC9ED-5D10-4A18-A775-13A4C90B8001%7D&documentTitle=20153-108302-01. Accessed December 2, 2018.

27. 0 Applicant's Verification

VERIFIED APPLICANT'S SIGNATURE

State of Florida)
County of Palm Beach) :SS

Jason Utton, being duly sworn, deposes and says that he is the authorized agent of Crown Ridge Wind, II LLC.

He states that he does not have personal knowledge of all the facts recited in the forgoing application, but the information in the application has been gathered by and from employees, contractors of the owners of Crown Ridge Wind, II LLC; and that the information in the application is verified by him as true and correct on behalf of Crowned Ridge Wind, II LLC.

Dated this 1st day of April, 2019.

Jason Utton
Vice President – Development
NextEra Energy Resources, LLC

Subscribed and sworn to before me this
1st day of April, 2019.

Notary Public
My Commission Expires:

JULIE N. KRAUSS
Commission # GG 092884
Expires June 3, 2021
Bonded Thru Troy Fain Insurance 800-385-7019