BURNS McDONNELL

Application to the South Dakota Public Utilities Commission for Energy Facility Permits

Deuel Harvest Wind Energy LLC

Deuel Harvest North Wind Farm
November 30, 2018

Application to the South Dakota Public Utilities Commission for Energy Facility Permits

prepared for

Deuel Harvest Wind Energy LLC
Deuel Harvest North Wind Farm
Deuel County, South Dakota

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prepared by

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LIST OF ABBREVIATIONS

Abbreviation	Term / Phrase / Name
4(d) Rule	Endangered Species Act Final 4(d) Rule for the Northern Long-eared Bat
ADLS	Aircraft Detection Lighting System
ADT	Average Daily Traffic
AGL	above ground level
AM	amplitude modulation
AMSL	above mean sea level
APE	Area of Potential Effect
APLIC	Avian Power Line Interaction Committee
Applicant	Deuel Harvest Wind Energy LLC
ARMS	Archaeological Resource Management System
ARSD	Administrative Rules of South Dakota
ARSR	Air Route Surveillance Radar
ASI	Aviation Systems Inc.
ASR	Antenna Structure Registration
BBCS	Bird and Bat Conservation Strategy
BCC	Birds of Conservation Concern
BCI	Bat Conservation International, Inc.
BCR	Bird Conservation Region
BGEPA	Bald and Golden Eagle Protection Act
BMPs	Best Management Practices
Board	Deuel County Commissioners and Board of Adjustment

Abbreviation	Term / Phrase / Name
Burns & McDonnell	Burns & McDonnell Engineering Company, Inc.
Component Footprint	Project components plus a buffered corridor defined by Deuel Harvest Wind
CRP	Conservation Reserve Program
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibels
Deuel Harvest	Deuel Harvest Wind Energy LLC
DoD	Department of Defense
DOE	U.S. Department of Energy
DSIRE	Database of State Incentives for Renewables & Efficiency
ECPG	Eagle Conservation Plan Guidance
EIA	U.S. Energy Information Administration
ELF	extremely low frequency
EMF	electric and magnetic fields
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FM	frequency modulation
GE	General Electric

Abbreviation	Term / Phrase / Name
GIA	Generator Interconnection Agreement
GIS	Geographic Information System
GPA	Game Production Area
GW	gigawatt
Hz	hertz
IBA	Important Bird Area
IEC	International Electrotechnical Commission
Invenergy	Invenergy LLC
IPaC	Information for Planning and Conservation
IRAC	Interdepartmental Radio Advisory Committee
IRP	Integrated Resource Plan
ISO	International Organization for Standardization
ITC	Interstate Telecommunications Cooperative, Inc.
JPO	Joint Program Office
kHz	kiloHertz
km	kilometer
Ksat	saturated hydraulic conductivity
kV	kilovolt
kV/m	Kilovolts per meter
kW	kilowatt
kWh	kilowatt hour
L_{90}	the sound level exceeded 90 percent of the time period

Abbreviation	Term / Phrase / Name
L_{eq}	equivalent-continuous sound level
LoS	Line of Sight
L_x	exceedance sound level
m/s	meters per second
MAI	Member of the Appraisal Institute
MBTA	Migratory Bird Treaty Act
MET	Meteorological
mG	milligauss
MISO	Midcontinent Independent Transmission System Operator, Inc.
MOA	Memorandum of Agreement
mph	miles per hour
m/s	meters per second
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NAIP	National Agriculture Imagery Program
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NEXRAD	Next-Generation Radar
NFIP	National Flood Insurance Program
NLCD	National Land Cover Database
NLEB	northern long-eared bat
NOAA	National Oceanic and Atmospheric Administration

Abbreviation	Term / Phrase / Name
NPDES	National Pollutant Discharge Elimination System
NPH	Notice of Presumed Hazard
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NTIA	National Telecommunication Information Administration
NWCC	National Wind Coordinating Collaborative
NWI	National Wetland Inventory
NWP	Nationwide Permit
NWR	National Wildlife Refuge
O&M	operations and maintenance
PGA	peak ground acceleration
Project	Deuel Harvest North Wind Farm Project
PTC	Production Tax Credit
RES	renewable energy standards
RF	radio frequency
ROW	right-of-way
RUSLE	Revised Universal Soil Loss Equation
SCADA	supervisory control and data acquisition
SDCL	South Dakota Codified Laws
SDDENR	South Dakota Department of Environment and Natural Resources

Abbreviation	Term / Phrase / Name
SDDLR	South Dakota Department of Labor and Regulation
SDDOA	South Dakota Department of Agriculture
SDDOT	South Dakota Department of Transportation
SDGFP	South Dakota Game, Fish, and Parks
SDGS	South Dakota Geological Survey
SDPUC	South Dakota Public Utilities Commission
SEP	Special Exception Permit
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SOI	Secretary of the Interior
SPSA	State Public Shooting Area
SWPPP	Storm Water Pollution Prevention Plan
TMDL	Total Maximum Daily Load
TNC	The Nature Conservancy
TPA	Traffic Pattern Airspace
ULS	Universal Licensing System
U.S.	United States
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
USLE	Universal Soil Loss Equation

Abbreviation	Term / Phrase / Name
v/m	volts per meter
WEG	Wind Energy Guidelines
WEG	Wind Erodibility Group
WES	wind energy systems
WEST	Western EcoSystems Technology, Inc.
WHO	World Health Organization
WIA	Walk-In Area
WMA	Wildlife Management Area
WMD	Wetlands Management District
WNS	white-nose syndrome
WPA	Waterfowl Production Area

COMPLETENESS CHECKLIST

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

Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11(1) thru (12)	20:10:22:05	**Application contents**. The application for a permit for a facility shall contain the applicable information specified in §§ 20:10:22:06 to 20:10:22:25, inclusive, 20:10:22:36, and 20:10:22:39. If the application is for a permit for an energy conversion facility, it shall also contain the information specified in §§ 20:10:22:26 to 20:10:22:33, inclusive. If the application is for a permit for a transmission facility as defined in SDCL subdivision 49-41B-2.1(1), it shall also contain the information in §§ 20:10:22:34 and 20:10:22:35. If the application is for a permit for a transmission facility as defined in SDCL subdivision 49-41B-2.1(2), it shall also contain the information in §§ 20:10:22:37 and 20:10:22:38. If the application is for a permit for a wind energy facility, it shall also contain the information	Sections 4.0 through 28.0

		in §§ 20:10:22:33.01 and 20:10:22:33.02. 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.	
49-41B-11(1)	20:10:22:06	**Names of participants required**. The application shall contain the name, address, and telephone number of all persons participating in the proposed facility at the time of filing, as well as the names of any individuals authorized to receive communications relating to the application on behalf of those persons.	Section 4.0
49-41B-11(7)	20:10:22:07	**Name of owner and manager.** The application shall contain a complete description of the current and proposed rights of ownership of the proposed facility. It shall also contain the name of the project manager of the proposed facility.	Section 5.0
49-41B-11(8)	20:10:22:08	**Purpose of facility.** The	Section 6.0

		applicant shall describe the purpose of the proposed facility.	
49-41B-11(12)	20:10:22:09	**Estimated cost of facility**. The applicant shall describe the estimated construction cost of the proposed facility	Section 7.0
49-41B-11(9)	20:10:22:10	**Demand for facility.** The applicant shall provide a description of present and estimated consumer demand and estimated future energy needs of those customers to be directly served by the proposed facility. The applicant shall also provide data, data sources, assumptions, forecast methods or models, or other reasoning upon which the description is based. This statement shall also include information on the relative contribution to any power or energy distribution network or pool that the proposed facility is projected to supply and a statement on the consequences of delay or termination of the construction of the facility.	Section 6.0
49-41B-11(2)	20:10:22:11	**General site description.** The application shall contain a general site description of the proposed facility including a description of the specific site and its location with respect to state, county, and other political subdivisions; a map showing prominent features such as cities,	Section 8.0 and Figures A-1, A-5, A-6, A-7

		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.	
49-41B-11(6); 49-41B-21; 34A-9-7(4)	20:10:22:12	**Alternative sites.** The applicant shall present information related to its selection of the proposed site for the facility, including the following: (1) The general criteria used to select alternative sites, how these criteria were measured and weighed, and reasons for selecting these criteria; (2) An evaluation of alternative sites considered by the applicant for the facility; (3) An evaluation of the proposed plant, wind energy, or transmission site and its advantages over the other alternative sites considered by the applicant, including a discussion of the extent to which reliance upon eminent domain powers could be reduced by use of an alternative site, alternative generation method, or alternative waste handling method.	Section 9.0
49-41B-1(2,11); 49-41B-21; 49-41B-22	20:10:22:13	**Environmental information.** The applicant shall provide a description of the existing environment at the time of the submission of the application, estimates of changes in the existing	Sections 10.0, 11.0, 12.0, 13.0, 14.0, 15.0, 17.0, 18.0, 20.0

		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.	
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:14	**Effect on physical environment**. The applicant shall provide information describing the effect of the proposed facility on the physical environment. The information shall include: (1) A written description of the regional land forms	Sections 11.0 Figures A-4, A-8, A-9, A-10, A-11

		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.	
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:15	**Hydrology.** The applicant shall provide information concerning the hydrology in the area of the proposed plant, wind energy, or transmission site and the effect of the proposed site on surface and groundwater. The information shall include: (1) A map drawn to scale of the plant, wind energy, or transmission site showing surface water drainage patterns before and anticipated patterns after construction of the facility; (2) Using plans filed with any local, state, or federal agencies, indication on a map drawn to scale of the current planned water uses by communities, agriculture, recreation, fish, and wildlife which may be affected by the location of the proposed facility and a summary of those effects; (3) A map drawn to scale locating any known surface or groundwater supplies within the siting area to	Section 12.0 and Figure A-5

		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.	
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:16	**Effect on terrestrial ecosystems.** The applicant shall provide information on the effect of the proposed facility on the terrestrial ecosystems, including existing information resulting from biological surveys conducted to	Section 13.0; Figures A-3, A-12, A-13, A-14; Appendices H through O

		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.	
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:17	**Effect on aquatic ecosystems.** The applicant shall provide information of the effect of the proposed facility on aquatic ecosystems, and including existing information resulting from biological surveys conducted to identify and quantify the aquatic fauna and flora, potentially affected within the transmission site, wind energy site, or siting area, an analysis of the impact of the construction and operation of the proposed facility on the total aquatic biotic environment and planned measures to ameliorate negative biological impacts as a result of construction and operation of the proposed facility.	Section 14.0; Appendices G and H

49-41B-11(2,11); 49-41B-22	20:10:22:18	**Land use.** The applicant shall provide the following information concerning present and anticipated use or condition of the land: (1) A map or maps drawn to scale of the plant, wind energy, or transmission site identifying existing land use according to the following classification system: (a) Land used primarily for row and nonrow crops in rotation; (b) Irrigated lands; (c) Pasturelands and rangelands; (d) Haylands; (e) Undisturbed native grasslands; (f) Existing and potential extractive nonrenewable resources; (g) Other major industries; (h) Rural residences and farmsteads, family farms, and ranches; (i) Residential; (j) Public, commercial, and institutional use; (k) Municipal water supply and water sources for organized rural water systems; and (l) Noise sensitive land uses; (2) Identification of the number of persons and homes which will be	Sections 15.0 and 20.0; Figure A-13

		displaced by the location of the proposed facility; (3) An analysis of the compatibility of the proposed facility with present land use of the surrounding area, with special attention paid to the effects on rural life and the business of farming; and (4) A general analysis of the effects of the proposed facility and associated facilities on land uses and the planned measures to ameliorate adverse impacts.	
49-41B-11(2,11); 49-41B-28	20:10:22:19	**Local land use controls.** The applicant shall provide a general description of local land use controls and the manner in which the proposed facility will comply with the local land use zoning or building rules, regulations or ordinances. If the proposed facility violates local land use controls, the applicant shall provide the commission with a detailed explanation of the reasons why the proposed facility should preempt the local controls. The explanation shall include a detailed description of the restrictiveness of the local controls in view of existing technology, factors of cost, economics, needs of parties, or any additional information to aid the	Section 16.0; Section 9.2

		commission in determining whether a permit may supersede or preempt a local control pursuant to SDCL 49-41B-28.	
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:20	**Water quality.** The applicant shall provide evidence that the proposed facility will comply with all water quality standards and regulations of any federal or state agency having jurisdiction and any variances permitted.	Section 17.0
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:21	**Air quality.** The applicant shall provide evidence that theproposed facility will comply with all air quality standards and regulations of any federal or state agency having jurisdiction and any variances permitted.	Section 18.0
49-41B-11(3)	20:10:22:22	**Time schedule.** The applicant shall provide estimated time schedules for accomplishment of major events in the commencement and duration of construction of the proposed facility.	Section 19.0
49-41B-11(4, 10, 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,	Section 20.0

		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.	

49-41B-11(4)	20:10:22:24	**Employment estimates.** The application shall contain the estimated number of jobs and a description of job classifications, together with the estimated annual employment expenditures of the applicants, the contractors, and the subcontractors during the construction phase of the proposed facility. In a separate tabulation, the application shall contain the same data with respect to the operating life of the proposed facility, to be made for the first ten years of commercial operation in one-year intervals. The application shall include plans of the applicant for utilization and training of the available labor force in South Dakota by categories of special skills required. There shall also be an assessment of the adequacy of local manpower to meet temporary and permanent labor requirements during construction and operation of the proposed facility and the estimated percentage that will remain within the county and the township in which the facility is located after construction is completed.	Sections 20.0 and 21.0
49-41B-11(5)	20:10:22:25	**Future additions and modifications.** The applicant shall describe	Section 22.0

		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.	
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.	Section 23.0 and Appendix U
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	Section 8.0, Section 24.1, and Section 25.0

		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.	
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.	Section 8.7, Section 8.15, and Section 26.0
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: (1) Configuration of the towers and poles, including material, overall height, and width; (2) Conductor configuration and size,	Section 8.7, Section 9.0, Section 8.15, and Section 24.2

		length of span between structures, and number of circuits per pole or tower; (3) The proposed transmission site and major alternatives as depicted on overhead photographs and land use culture maps; (4) Reliability and safety; (5) ROW 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.	
49-41B-7; 49-41B-22	20:10:22:36	**Additional information in application.** The applicant shall also submit as part of the application any additional information necessary for the local review committees to assess the effects of the proposed facility pursuant to SDCL 49-41B-7. The applicant shall also submit as part of its application any additional information necessary to meet the burden of proof specified in SDCL 49-41B-22.	Section 27.0
49-41B-22	20:10:22:36	**Applicant's burden of proof.** The applicant has the burden of proof to establish that: (1) The proposed	Section 27.4

		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.	
49-41B-11	20:10:22:39	**Testimony and exhibits.** Upon the filing of an application pursuant to SDCL 49-41B-11, an applicant shall also file all data, exhibits, and related testimony which the applicant intends to submit in support of its application. The application shall specifically show the witnesses supporting the information contained in the application.	Section 28.0

1.0 INTRODUCTION

Deuel Harvest Wind Energy LLC (Applicant or Deuel Harvest), submits this application (Application) to the South Dakota Public Utilities Commission (Commission or SDPUC) for Energy Facility Permits (Permit) for the Deuel Harvest North Wind Farm wind energy conversion facility (Wind Farm) and a 345-kilovolt (kV) transmission line with associated 345-kV interconnection substation (Transmission Facility) to be located entirely within Deuel County, South Dakota. The Project will have a nameplate capacity of up to 310.1 megawatts (MW) and will include construction of up to 112 turbines. The Wind Farm and the Transmission Facility are collectively referred to as the Deuel Harvest North Wind Farm (Project).

The Project is located entirely within Deuel County in the townships of Portland, Lowe, Altamont, Glenwood, and Herrick (Project Area; see Figure A-1 in Appendix A). The Project Area encompasses approximately 48,730 acres, 41,980 of which are under lease for the Project. Project facilities will include the following:

- Up to 112 wind turbines;
- Access roads to turbines and associated facilities;
- Underground 34.5-kV electrical collector lines connecting the turbines to the collection substation;
- Underground fiberoptic cable for turbine communications co-located with the collector lines;
- An operations and maintenance (O&M) building;
- Up to four permanent meteorological (MET) towers;
- A 34.5 to 345-kV collection substation (Project Substation);
- A 345-kV interconnection substation (Interconnection Substation);
- An approximately 150-foot long 345-kV transmission line (Transmission Line) connecting the Project Substation and the Interconnection Substation; and
- Additional temporary construction areas, including crane paths, public road improvements, a laydown yard, and a concrete batch plant(s) (as needed).

Deuel Harvest is negotiating a Generator Interconnection Agreement (GIA) with Otter Tail Power Company and the Midcontinent Independent System Operator, Inc. (MISO). The Project will interconnect to the regional electric grid along the Big Stone to Brookings 345-kV transmission line via a new 345-kV Interconnection Substation to be located in Glenwood Township and be able to deliver 300 MW of electricity. The Interconnection Substation will be constructed by the Applicant or Otter Tail Power Company and will be owned and operated by Otter Tail Power Company.

The Transmission Facility is wholly within the Project Area, less than 2,640 feet long, and does not require the use of eminent domain; however, it does cross a section line and therefore may be considered a "transmission facility" pursuant to SDCL 49-41B-2.1(1). Accordingly, the Transmission Line may fall within the Commission's jurisdiction, and the Transmission Line and associated Interconnection Substation are included in this Application.

Deuel Harvest is an affiliate of Invenergy LLC (Invenergy). Invenergy develops, builds, owns, and operates large-scale power plants across four core technologies: wind (90 projects, 12,864 MW); natural gas (11 projects, 5,642 MW); solar (25 projects, 2,150 MW); and battery storage (5 projects, 72 MW). Invenergy has a proven development track record of 131 large-scale projects, and currently provides wind turbine operations and maintenance services on more than 3,400 wind turbines currently in operation. As part of Invenergy's various generation projects, Invenergy has permitted and built 414 miles of transmission lines greater than 69-kV and continues to operate 182 miles of those lines.

2.0 PROJECT DEVELOPMENT SUMMARY

Deuel Harvest began developing the Project in mid-2015 with initial landowner outreach, establishment of a local office on Main Street in Clear Lake, South Dakota, and the construction of three MET towers to verify and quantify the strong wind resource in the area. Leasing, stakeholder outreach, engineering, and additional Project development activities have continued through 2018.

2.1 Community Outreach and Land Acquisition

Deuel Harvest's outreach efforts have included: meeting with individual landowners and landowner groups, regulatory agencies, local government units, and the general public to discuss the Project; and gathering comments to address in the Project's planning, design, permitting, construction, and operation phases. A turbine siting constraints map is shown on Figure A-2 in Appendix A, while environmental constraints are shown on Figure A-3 in Appendix A. The Project layout is shown on Figure A-4 in Appendix A. Below is a brief summary of stakeholder outreach efforts since 2015:

- Participating Landowners – Group and individual meetings from mid-2015 to present, including a Project facility layout review in September and October 2017;
- Agencies – Multiple consultations with staff from the Commission, U.S. Fish and Wildlife Service (USFWS), South Dakota State Historical Society, State Historic Preservation Office (SHPO), and South Dakota Game, Fish, and Parks (SDGFP);
- Local Governmental Units – Presentations to Deuel County Commissioners and Board of Adjustment (Board), and communications with County Administration, Township representatives, and the County Highway Superintendent;
- Local Stakeholders – Meetings and communications with the Watertown Rotary Club, Lake Cochrane Improvement Association, Lake Alice representatives, Deuel Area Development, Inc., Deuel County Agricultural Development, Deuel County Community Foundation, and Interstate Telecommunications Cooperative, Inc.;
- State Stakeholders – Meetings and communications with Senator John Wiik (District 04), State Representative John Mills (District 04), State Representative Jason Kettwig (District 04), Hunter Roberts of the Office of the Governor, Eric Fosheim and Jeff Haverly of the South Dakota Governor's Office of Economic Development, and the South Dakota Wind Energy Association;
- Sponsorships and Memberships – Sponsor of Crystal Springs Rodeo in 2015, 2016, 2017, and 2018; member of Deuel Area Development, Inc. in 2016; supporter of the Deuel County Community Foundation in 2016, 2017, and 2018 through various donations and functions; and member of South Dakota Farm Bureau in 2017 and 2018.

Deuel Harvest also maintains a Project website (see www.deuelwind.com) as well as a Facebook account (see www.facebook.com/DeuelHarvestWindFarm). These resources provide additional information about the Project to the public.

2.2 Agency Coordination

As noted above, Deuel Harvest has engaged in ongoing coordination with staff from USFWS, SHPO, and SDGFP starting in 2016. Details concerning Deuel Harvest's agency coordination are provided in Section 27.2, and agency correspondence regarding the Project is included in Appendix B.

2.3 County Permitting

Deuel Harvest submitted an application for a Special Exception Permit (SEP) for the Project to the Deuel County Board of Adjustment (Board) in December 2017. On March 2, 2018, the Board issued the SEP for the Project. Copies of the SEP, the associated findings, and the Deuel County Wind Energy System Zoning Ordinance are included in Appendix C. The Board's decision to issue the SEP has been appealed, and that appeal is currently pending in South Dakota Circuit Court, Case No. 19DIV18-19. Deuel Harvest anticipates that the Circuit Court will issue an opinion in early 2019.

2.4 Purchase or Off-Take Agreements

Deuel Harvest does not currently have a purchase agreement or off-take agreement for the Project but is currently in discussions with interested parties.

2.5 Environmental Analysis

In the siting of its Project facilities, Deuel Harvest is following the Land Based Wind Energy Guidelines (USFWS, 2012), Eagle Conservation Plan Guidance (USFWS, 2013), and U.S. Army Corps of Engineers (USACE) Guidelines in addition to consultations with USFWS and SDGFP staff. A site visit was conducted in June 2017 with a USFWS biologist as well. In addition to thorough consultation with the aforementioned agencies, the following studies were undertaken and used to design the Project to avoid or minimize impacts to potentially sensitive environmental areas:

Table 2-1: Environmental Studies and Surveys for the Deuel Harvest North Wind Farm

Study	Dates	Status
Site Characterization Study	Fall 2017 and Spring 2018	Complete
Wetland Delineations	Fall 2018	Complete
Wetlands and Waterbodies Survey	Fall 2016; and Fall 2017	Complete
Raptor Nest Survey	Spring 2016 and Spring 2017	Complete
Breeding Bird Survey	June 2016	Complete
Small Bird Use Surveys	April-November 2016; and	Complete

Study	Dates	Status
	March 2017	
Large Bird Use Surveys	April 2016-March 2017; and May 2017-April 2018	Complete
Bat Mist Netting Survey	Summer 2016	Complete
Bat Acoustic Survey	Summer-Fall 2016; and Summer-Fall 2017	Complete
Protected Butterfly Species Survey	Fall 2018	Complete
Cultural Resources Surveys (Level I and Level III)	Summer 2018	Complete
Historic / Architectural Survey	Summer 2018	Complete
AM and FM Radio Report	November 2018	Complete
Communication Tower Study	November 2018	Complete
Microwave Study	November 2018	Complete

2.6 Project Design

The results of the various studies and coordination activities listed above, along with applicable setback requirements, have been used to inform the Project layout and design. Final construction engineering of Project facilities will continue to occur between the filing of this Application and construction.

3.0 FACILITY PERMIT APPLICATION

In accordance with South Dakota Codified Laws (SDCL) Chapter 49-41B and Administrative Rules of South Dakota (ARSD) Chapter 20:10:22, the Application provides information on the existing environment, potential Project impacts, and proposed avoidance, minimization, and mitigation measures for the following resources:

- Physical (geology, economic deposits, and soils) (Section 11.0);
- Hydrology (surface water and groundwater) (Section 12.0);
- Terrestrial ecosystems (vegetation, wetlands, wildlife, and threatened and endangered species) (Section 13.0);
- Aquatic ecosystems (Section 14.0);
- Land use (agriculture, residential, displacement, sound, aesthetics, electromagnetic interference, safety and health, and real estate values) (Section 15.0);
- Water quality (Section 17.0);
- Air quality (Section 18.0); and
- Communities (socioeconomics, transportation and emergency response, and cultural resources) (Section 20.0).

3.1 Summary of Potential Impacts

Approximately 722 acres of temporary disturbance is expected during the construction of the Project, 68 acres of which will be permanent[1]. The permanent impacts represent less than 0.2 percent of the total acreage within the Project Area, and disturbances would be dispersed throughout the Project Area.

The Project has been sited and planned to minimize impacts to wetland areas. Wind turbines and access roads are generally located in cropland and upland areas, avoiding low-lying wetlands and drainageways. As the final design details for Project infrastructure are complete, any wetland impacts would be minimized to provide compliance with Section 404 of the Clean Water Act (CWA).

Most land proposed to be affected by construction of the Project is cropland or grassland. Construction of Project facilities in cropland or grassland is not expected to negatively affect terrestrial ecosystems. Best Management Practices (BMPs) would be implemented to avoid or reduce impacts to the vegetation and water resources of the Project Area during construction. Because the Project avoids impacts to federal

[1]65.6 acres of permanent disturbance for the Wind Farm (based on all 124 turbine locations), and 2.5 acres of permanent disturbance for the Transmission Facility.

lands, including USFWS Grassland, Conservation, or Wetland Easements, no federal nexus exists for the Project that would require National Environmental Policy Act (NEPA) review.

Six species listed as threatened or endangered under the Federal Endangered Species Act (ESA) have the potential to occur in the Project Area: Dakota skipper (*Hesperia dacotae*), Poweshiek skipperling (*Oarisma poweshiek*), northern long-eared bat (*Myotis septentrionalis*), red knot (*Calidris canutus rufa*), whooping crane (*Grus americana*), and Topeka shiner (*Notropis topeka*). Wildlife studies and coordination with USFWS and SDGFP determined the Project to have a low risk of impacts to threatened or endangered species (see Section 14.2).

Existing land uses are not anticipated to be significantly changed or impacted by the Project. Sound from the Project construction activities would be temporary. Once the Project is operational, sound from the turbines and other facilities would be limited per applicable County and SDPUC requirements. Deuel County adopted a Zoning Ordinance on May 23, 2017 (Ordinance) that pertains to wind energy systems (WES). The Ordinance limits sound levels of WES to "45 dBA average A-weighted Sound pressure at the perimeter of existing residences, for non-participating residences." A Pre-Construction Wind Turbine Noise Analysis was completed for the Project (Appendix D) to assess Project impacts and confirm compliance with these standards (see Section 15.3).

Construction activities for this Project would be short-term, and no negative impact to the socioeconomics of the area is expected. Project construction is anticipated to provide economic benefits to businesses in the region (as discussed in Section 20.1.2).

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

A cultural resource Level I records review for the Project Area identified previously recorded archaeological and historic resources located within or near the Project Area. Level III intensive cultural resources surveys of High Probability Areas within the Project disturbance footprint were completed in September 2018. Sites identified as potentially eligible for NRHP listing have been avoided.

Additional avoidance and minimization measures proposed for the Project include:

- Wind turbines will be illuminated as required by Federal Aviation Administration (FAA) regulations and will also employ an Aircraft Detection Lighting System (ADLS), subject to availability and FAA approval;

- Existing roads will be used for construction and maintenance where possible;
- Access roads created for the Project will be located to limit cuts and fills;
- Temporarily disturbed uncultivated areas will be reseeded to blend in with existing vegetation;
- BMPs will be used during construction to control erosion and prevent or reduce impacts to drainageways and streams by sediment runoff from exposed soils in accordance with the Storm Water Pollution Prevention Plan (SWPPP);
- The Applicant will avoid direct impacts to land held for conservation purposes via USFWS Wetland, Grassland, and Conservation Easements;
- The Applicant will avoid or minimize impacts to potentially undisturbed grasslands;
- The Applicant will meet or exceed setbacks, conditions, and siting standards required by State and local governing bodies;
- The Project shall not exceed 45 dBA average A-weighted sound pressure at the perimeter of existing non-participating residences, in conformance with Deuel County's requirements;
- The Project shall not exceed 50 dBA average A-weighted sound pressure at the perimeter of existing participating residences;
- The Project shall not exceed 30 hours of shadow flicker per year at residences, in conformance with Deuel County's requirements;
- The Transmission Facility (Interconnection Substation, and Transmission Line) will result in 2.5 acres of permanent impacts; and
- 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 and transmission facilities. Included with this Application is a Completeness Checklist (page vii) that sets forth where in the Application each rule requirement is addressed.

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

- The proposed facility complies with applicable laws and rules;
- The facility will not pose a threat of serious injury to the environment or to the social and economic condition of inhabitants in, or near, the Project Area;
- The facility will not substantially impair the health, safety, or welfare of the inhabitants; and
- 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.

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

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.*

The Applicant, Deuel Harvest Wind Energy LLC, is a Delaware limited liability company and wholly owned by Invenergy LLC. Invenergy LLC is a privately held Delaware limited liability company headquartered in Chicago, Illinois. Individuals who are authorized to receive communications relating to the application on behalf of the Applicant include:

- Michael Svedeman
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5.0 NAME OF OWNER AND MANAGER (ARSD 20:10:22:07)

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

The Applicant will be the sole owner of the proposed Project.

Deuel Harvest Wind Energy LLC is an affiliate of Invenergy LLC. Invenergy LLC is a privately held Delaware limited liability company headquartered in Chicago, Illinois. Deuel Harvest Wind Energy LLC will own, and operate the Project, and it or its affiliates hold the land rights and interconnection requests necessary to facilitate development of the Project as proposed. Deuel Harvest Wind Energy LLC is registered to conduct business in South Dakota as a foreign limited liability company. Michael Svedeman (Manager, Project Development) of Invenergy LLC, is managing development of the Project.

6.0 PURPOSE OF, AND DEMAND FOR, THE 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 have a nameplate capacity of 310.1 MW and generate up to 300 MW of electricity. The electricity generated by the Project would interconnect to the high-voltage transmission grid via a new Interconnection Substation, to be located in Glenwood Township. Deuel Harvest is negotiating a Generator Interconnection Agreement with Otter Tail Power Company and MISO. The electricity generated by the Project would be used as needed on the MISO regional grid and will help MISO operators meet electricity demand. The Project would also provide electricity with zero emissions costs to the grid. Deuel Harvest is actively marketing the sale of electricity from the Project to third parties, including utilities and commercial/industrial customers. The Project may sell power in the form of a power purchase agreement, or the Project could be directly owned by a utility.

The Project would provide numerous local benefits. For example, construction of a 300 MW project like the Project typically requires approximately 400 temporary construction workers over approximately 12 months. Construction and operation of a typical 300 MW wind project also provides millions of dollars to the local economy throughout its life. This includes spending throughout the community, such as at hotels, restaurants, grocery stores, and other local businesses. During operations, the Project is anticipated to employ approximately 15 full-time, local personnel at the Project's O&M facility. Over the estimated 30-year life of the Project, the Project is expected to directly generate more than $4.5 million in annual local revenue, including taxes, lease payments, and local staff salaries.

6.1 Wind Resource Areas

To obtain an accurate representation of the wind resource within the Project Area, the Applicant preformed a comprehensive analysis using the following data:

- Onsite data collected at the Project's three MET towers;
- Long-term correlation from National Aeronautics and Space Administration's (NASA's) Modern-Era Retrospective Analysis for Research and Applications, Version 2 (MEERA-2);

- Project Area topographic and land cover data;
- Up to 124 potential turbine locations within the Project Area;
- Power curves from the General Electric 2.82-127 turbine at an 88.6-meter hub height and 2.3-116 turbine at an 80-meter hub height and;
- State and County standards and setbacks.

Based on data collected, wind speeds are highest in October and November and lowest in July and August. Long term mean wind speeds are generally around 9 meters per second (m/s) during winter, spring and fall, but fall closer to 8 m/s during the months of June, July and August. Wind speeds at hub height generally fall off in the morning as solar warming causes increased mixing of the winds at different levels aboveground. After sunset, less mixing occurs and the winds at hub height will tend to increase.

The Applicant compared onsite data to long-term wind data near Deuel Harvest. The analysis showed that daily correlation coefficients of the towers average about 0.83 to the long-term MEERA-2 dataset. This high correlation lends confidence to the assessment that the site-specific data can accurately be placed in a long-term climatological context. The Project is classified as an International Electrotechnical Commission (IEC) Classification 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 the hub height greater than 8.5 m/s and less than 10 m/s.

6.2 National and State Energy Demand

The electric power sector is the largest consumer of primary energy in the United States (U.S.) (U.S. Energy Information Administration [EIA], 2017a). In 2016, U.S. electricity customers consumed 3.8 billion MW-hours of energy (EIA, 2017b), and the EIA estimates that U.S. electricity consumption will grow by 5 percent from 2016 to 2040 (EIA, 2017b). Wind energy currently accounts for approximately 6.32 percent (90 gigawatts [GW]) of U.S. electricity generation (U.S. Department of Energy [DOE], 2017a). According to the Pew Research Center, 83 percent of Americans support expanding wind development in the U.S. (Pew Research Center, 2016).

Although South Dakota has one of the smallest populations of any state, due to its energy intensive industries (i.e., agriculture, manufacturing, and mining), hot summers, cold winters, and periodic droughts, South Dakota is one of the top 10 states in total energy consumption per capita. South Dakota is also one of the top seven states in wind potential. Although it is already ranked second in the nation after Iowa in the amount of net electricity generation provided by wind (approximately 26 percent in

2016), South Dakota's potential is just beginning to be developed (EIA, 2017c). The DOE's WIND Exchange platform indicates that South Dakota has approximately 417,879 MW of total potential wind capacity; however, only 977 MW of wind energy generation has been installed as of the second quarter of 2017 (DOE, 2017b), which is less than one percent of its total potential capacity.

Demand for wind energy in the region continues to be strong, both from utilities as well as commercial and industrial customers. This is evident in regulatory filings from utilities and corporate sustainability commitments. The Project is needed to meet this industrial/commercial, electric utility, and consumer demand for renewable power.

The demand for renewable wind energy has increased because of its cost-competitiveness with traditional fuel sources, such as coal and natural gas. The Project would provide a new source of low-cost energy for South Dakota and the U.S., helping the nation move towards the goal of energy independence while reducing pollution and carbon emissions. The cost of energy from wind has declined by nearly two-thirds over the past decade, while the average output has increased by more than one-third during that same period.[2] According to Lazard, an international economics firm, wind energy in the interior/Great Plains region is the least costly source of new power generation, even without accounting for available federal tax incentives, which further reduce the cost to customers (Lazard, 2016).

As costs have fallen and technology has improved, wind energy has proven to be both a cost-effective, reliable source of energy generation for utilities and a valuable hedge against volatile fossil fuel prices. For example, Xcel Energy's most recent Integrated Resource Plan (IRP) in Minnesota demonstrates that adding 1,800 MW of new wind energy generation over the next several years is both necessary and cost effective.[3] Xcel Energy has also stated its intent to meet 85 percent of their customers' needs with carbon-free resources, including wind energy, by 2030. Otter Tail Power Company's most recent IRP shows it will be adding 400 MW of wind in the near term.[4] Great River Energy, a large generation and transmission cooperative, recently committed to 50 percent renewable energy by 2030.[5]

[2] https://emp.lbl.gov/wind-technologies-market-report.
[3] MN PUC Docket No. 15-21, MPUC Order; MN PUC Docket No. 16-777, MPUC Order; 2020-2034 Upper Midwest Resource Plan Informational Letter, MN PUC Docket No. E002/RP-15-21, June 8, 2018; https://www.xcelenergy.com/company/corporate_responsibility_report/library_of_briefs/climate_change_and_greenhouse_gas_emissions.
[4] MN PUC Docket No. 16-386, MPUC Order.
[5] Great River Energy Fact Sheet: "50% Renewable Energy by 2030"; June 5, 2018 - https://greatriverenergy.com/wp-content/uploads/2018/06/50x30_Fact_Sheet.pdf.

Beyond the growing demand from utilities, non-traditional power buyers, such as Google, IKEA, Apple, eBay, Facebook, General Motors, Johnson & Johnson, Kellogg's, Microsoft, Nike, and Wal-Mart, have announced plans to purchase renewable energy, like wind power. In fact, over two-thirds of the Fortune 100 companies have sustainability or renewable energy procurement goals, and over 3,800 MW of renewable energy have been purchased by non-utilities as of August 2018.[6] That compares to 2,890 MW procured by non-utilities in 2017 and approximately 1,700 MW in 2016. These businesses have a rapidly growing appetite for affordable clean energy, and South Dakota wind is poised to help meet that demand. Beyond the market for wind energy, the public has also shown support for the use of renewable energy. According to a Gallup National poll in March 2018, 73 percent of Americans are in favor of "emphasizing the development of alternative energy such as wind and solar power" compared to 21 percent in favor of emphasizing production of oil, gas, and coal (Gallup, Inc., 2018).

This support can also be seen in legislation throughout the nation. Twenty-nine states have adopted renewable energy standards (RES). These standards require utilities to sell a specified percentage or amount of electricity generated from renewable resources annually. An additional eight states, including South Dakota, and two territories have adopted renewable energy goals. According to the 2016 SDPUC's Annual Report, only seven out of 12 utilities in South Dakota have met the State's renewable energy goal (SDPUC, 2017). South Dakota has additional regulatory policies, financial incentives, and technical resources aimed at encouraging energy efficiency and the expanded use of renewable sources for electricity generation in the State such as property tax incentives and alternative taxation calculation. A list of these programs and policies can be viewed on the Database of State Incentives for Renewables & Efficiency (DSIRE) USA website[7].

South Dakota utilities are also seeking additional renewable resources to meet their load demands:

> …the Company (Northern States Power Company aka Xcel Energy) continues to seek to incorporate renewables and energy efficiency measures when and where those measures are cost effective.[8]
>
> *and*
>
> [Missouri River Energy Services] (MRES) continues to evaluate opportunities for additional renewable resources to ensure continuing

[6] http://businessrenewables.org/corporate-transactions/; https://info.aee.net/growth-in-corporate-advanced-energy-demand-market-benefits-report.
[7] http://programs.dsireusa.org/system/program?fromSir=0&state=SD&
[8] 2016 Report of Northern States Power Company on Meeting the Renewable, Recycled and Conserved Energy Objective, Cover Letter at p.2 (June 29, 2017) (available at https://puc.sd.gov/commission/Energy/REO/xcel2017.PDF).

> compliance with the various state [Renewable Energy Objectives] and the Minnesota [Renewable Energy Standard]...MRES seeks out projects that meet its needs as well as the needs of its members as part of our continuing commitment to expand the role of renewable energy used to serve our member communities.[9]

The Project also could help meet the RES of neighboring states. For example, Minnesota has a RES of 25 percent by 2025 for all utilities except Xcel Energy, which has a RES of 30 percent renewable energy by 2020. In addition, many national and local corporations have been purchasing renewable energy, either directly or through virtual Power Purchase Agreements, to meet their corporate sustainability goals.

Invenergy is actively marketing this Project to potential offtakers, including public utilities serving South Dakota customers, and commercial and industrial companies. Invenergy has contracted, developed, and built projects for public utilities such as Xcel Energy, MidAmerican Energy, ComEd, and American Electric Power. Since 2015, Invenergy has also contracted more MW with commercial and industrial companies than any other developer. These companies include Owens Corning, 3M, Equinix, and Google.

6.3 Consequences of Delay

If the Project is delayed, the Project's benefits would be reduced. Specifically, the Project must be constructed by the end of 2020 to receive a 2.5-cents per kilowatt hour (kWh) Production Tax Credit (PTC). If the Project does not reach operation until 2021 or later, the Project will not qualify for 100 percent of the PTC; the PTC per kWh amount will decrease by 20 percent each year until the Project is placed in service.

In addition, the Project is negotiating a GIA with Otter Tail Power Company that requests a Project in-service date in the fourth quarter of 2020. As further outlined in Section 19.0 of this Application, Project construction will need to begin by the fourth quarter of 2019 to meet an in-service date in the fourth quarter of 2020. If the Project is delayed, the Applicant will not have adequate time to conduct pre-construction engineering and finalize turbine supply agreements to meet this in-service date.

[9] Renewable, Recycled, and Conserved Energy Objective Annual Report for 2016, Missouri River Energy Services at p. 1 (June 29, 2017) (available at https://puc.sd.gov/commission/Energy/REO/mres2017.PDF).

7.0 ESTIMATED COST OF THE PROPOSED 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 current estimated capital cost of the Project (including both the Wind Farm and the Transmission Facility) is approximately $400 million dollars based on indicative construction and wind turbine pricing cost estimates for the proposed turbine layout. This estimate includes lease acquisition; permitting, engineering, procurement, and construction of turbines, access roads, underground electrical collector system, a Project Substation, Transmission Facility, an O&M building, a supervisory control and data acquisition (SCADA) system, and up to four permanent MET towers; tax payments, landowner payments, and Project financing. The Wind Farm has a current estimated capital cost of $387 million, and the Transmission Facility has a current estimated capital cost of $13 million. An in-depth summary of estimated Project costs can be seen in Table 7-1 below.

Ongoing O&M costs and administrative costs are estimated to be approximately $8.5 million per year, including payments to landowners for wind lease and easement rights, and taxes related to the capacity and generation of the Project.

The overall cost of developing the Project depends primarily onsite selection and construction timing. Site-dependent costs will include access to the individual wind turbine locations, site-specific subsurface conditions that determine foundation design, access road design and layout, ease of underground work, and the layout of the turbine arrays, which affects road and electrical cable cost.

Table 7-1: Breakdown of Estimated Project Costs

Real Property	
Site Improvements	$11,700,000
Construction – New Building	$1,700,000
Total Real Property	*$13,400,000*
Personal Property	
Manufacturing Equipment	$233,425,000
Equipment & Materials installed and purchased by Contractor	$60,815,000
Transmission Facility	$13,000,000
Equipment & Materials installed and purchased by the Utility	$27,000,000
Soft Costs	$53,045,000
Total Personal Property (including soft costs)	*$387,285,000*
Total Real and Personal Property	**$400,685,000**

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

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 would be located entirely in Deuel County, South Dakota, in the townships of Portland, Lowe, Altamont, Glenwood, and Herrick (see Figure A-1 in Appendix A). Table 8-1 summarizes the townships and sections within the Project Area.

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

Township Name	Township	Range	Sections
Portland	117N	49W	4-5, 8-9, 13-17, 21-28, 34-36
Lowe	117N	48W	19, 21-22, 25-29, 31-36
Altamont	116N	49W	4-9, 15-16, 18, 21, 28-31
Glenwood	116N	48W	1-3, 10-15, 19-26, 28-29, 32, 35-36
Herrick	115N	48W	1
Herrick	115N	47W	6

The Transmission Facility is located entirely within Glenwood Township (Sections 23 and 24). Figure A-1 in Appendix A shows the locations of the State, County, and city boundaries with respect to the Project Area, as well as the major highways and roads that extend through the area. Figure A-6 in Appendix A shows the locations of waterbodies and streams within the Project Area. Figure A-7 in Appendix A shows the locations of cemeteries, churches, and schools within or adjacent to the Project Area, while Figure A-8 in Appendix A shows public lands. Figures in Appendix E, H, and T show the locations of places of historical significance within or near the Project Area. No active transportation facilities (i.e., railroads, public airports) occur within or adjacent to the Project Area.

8.1 Project Facilities

The Project will have a nameplate capacity of 310.1 MW and generate up to 300 MW of electricity. The Project will include construction of up to 112 turbines. The Project Area consists of approximately 41,980 acres of leased land, of which up to approximately 68 acres will be developed for permanent facilities.

The Project facilities to be constructed include the following:

- Up to 112 wind turbines;
- Access roads to turbines and associated facilities;
- Underground 34.5-kV electrical collector lines connecting the turbines to the collection substation;
- Underground fiberoptic cable for turbine communications co-located with the collector lines;
- An O&M building;
- Up to four permanent MET towers;
- A 34.5 to 345-kV Project Substation;
- A 345-kV Interconnection Substation;
- An approximately 150-foot long 345-kV Transmission Line connecting the Project Substation and the Interconnection Substation; and
- Additional temporary construction areas, including crane paths, public road improvements, a laydown yard, and a concrete batch plant(s) (as needed).

As a result of final micro-siting, minor shifts in the turbine locations may be necessary to avoid unanticipated cultural resources during construction or due to geotechnical evaluations of the wind turbine locations, landowner input, or other factors. Therefore, the Applicant requests that the permit allow turbines to be shifted within 250 feet or less from the turbine location identified in the Application without prior Commission approval, so long as the turbine shifts comply with County and State setback requirements and specified noise and shadow flicker requirements; cultural resource impacts are avoided or mitigated in consultation with the SHPO; environmental constraints are adhered to as agreed upon with the USFWS and the SDGFP; and wetland impacts are avoided. Prior to implementing the turbine adjustment, the Applicant would file in the docket an affidavit demonstrating compliance with the limitations set forth above. Any turbine adjustment that does not comply with the aforementioned limitations would be considered a "material change," and the Applicant shall file a request for approval of the "material change" prior to making the adjustment pursuant to the following approval process:

- Applicant will file with the Commission and serve on the official Service List a request for approval of the adjustment that includes:
    - An affidavit describing the proposed turbine adjustment, the reason for the adjustment, the reason the adjustment does not comply with one or more turbine flexibility limitations set forth above, and information regarding compliance with all other applicable requirements; and

    - A map showing both the approved location and the proposed adjustment (in different colors).
- Once received, the information would be reviewed by Commission staff, and Commission staff will have 10 calendar days within which to request further Commission review.
- If no further review is requested, Applicant may proceed with the adjustment.
- If further review is requested, the Commission will issue a decision regarding Applicant's request at its next available regularly scheduled Commission meeting, subject to notice requirements, after the request for further review is made by Commission staff.

As a result of final micro-siting and the utility coordination needed to facilitate Project interconnection, shifts in the access roads and collector system, as well as changes in the locations of the O&M facility, MET towers, Project Substation, Transmission Facility, concrete batch plant, and laydown / staging areas, may be necessary. Therefore, the Applicant requests that the permit allow those facilities to be modified, as needed, so long as the new locations are on land leased for the Project; cultural resources are avoided or mitigated; environmental constraints are adhered to; wetland impacts are avoided; and all other applicable regulations and requirements are met.

8.2 Major Wind Turbine Components

Each wind turbine consists of three major components: the tower, the nacelle, and the rotor. These components are mounted on a concrete foundation, also known as a turbine pad, to provide structural support to the assembled turbine. The nacelle sits atop the tower, and the rotor hub is mounted on a drive shaft that is connected to the gearbox and generator contained within the nacelle. The generator, gear boxes, controller, shafts, brake, generator cabling, hoist, generator cooling, and associated equipment are located within the nacelle. Turbine blades convert kinetic energy from wind into rotational energy. The hub supports the blades and connect the rotor, yaw motors, mechanical braking system, and power supply for emergency braking. The foundation and tower support the rotor and nacelle.

All turbines have active yaw and pitch regulation and asynchronous generators and use a bedplate drive-train design where all nacelle components are joined on common structures to improve durability. All turbines can operate with adjusted cut-in speeds and full blade feathering.

Table 8-2 below provides a list of the turbines currently being considered for the Project. Final selected turbine locations will comply with all turbine-specific parameters such as setback and noise requirements.

Table 8-2: Wind Turbine Specifications

Manufacturer	Turbine Name	Hub Height	Rotor Diameter	Tip Height	MW Rating
General Electric (GE)	GE 2.3-116	80 m (263 ft)	116 m (381 ft)	138 m (452 ft)	2.3
General Electric	GE 2.82-127	88.6 m (291 ft)	127 m (417 ft)	152.1 m (499 ft)	2.82

The Applicant proposes to erect up to 112 wind turbines for the Project which will be comprised of two turbine models. One of the turbine models will be the GE 2.3-116 turbine. These turbines qualify the Project for the PTC. The other turbine model is anticipated to be the GE 2.82-127. The total number of turbines will be dependent on the final combination of turbine models.

Deuel Harvest requests the Commission provide flexibility for the Project to use a turbine of comparable capacity and specifications, provided it meets all applicable County and State setback requirements and specified noise and shadow flicker requirements; cultural resource impacts are avoided or mitigated in consultation with SHPO; environmental constraints are adhered to as agreed upon with the USFWS and the SDGFP; and wetland impacts are avoided. Prior to implementing the turbine adjustment, the Applicant would file in the docket an affidavit demonstrating compliance with the limitations set forth above.

Deuel Harvest has fully evaluated the two proposed turbine models in the proposed layout. The GE 2.3-116 turbine can be placed in every location and be compliant with all setback constraints and Ordinance requirements. The GE 2.82-127 can be used in 111 locations.[10] The anticipated combination of turbine models is shown on Figure A-4 in Appendix A. There are 12 alternative locations, each denoted with an "A." The final number of turbines constructed will be dependent on final engineering analysis to provide the up to 310.1 MW of nameplate capacity and final Project design.

The setback, noise, and shadow flicker analyses confirmed that the layout meets applicable setback, noise, and shadow flicker requirements. These reports are included in Appendix D (Pre-Construction Wind Turbine Noise Analysis) and Appendix F (Shadow Flicker Assessment Report). Figure A-2 in Appendix

[10] Turbines 7, 16, A22, 78, 81, 82, 83, 98, A99, 111, 112, 122, and 124 can support a GE 2.3 -116 model only due to sound and shadow flicker requirements. All other turbine locations within the layout can accommodate either turbine model listed in Table 8-2.

A (turbine siting constraints map) demonstrates compliance for setback requirements with all turbine locations.

The Applicant requests that the Permit allow a turbine of comparable capacity and specifications to be used, so long as the new model complies with all other applicable regulations and Permit requirements.

8.2.1 Turbine Towers

The tubular towers proposed for the Project would be conical steel structures. Each tower has a lockable access door, internal lighting, and an internal ladder and lift to access the nacelle. In accordance with FAA regulations, the towers would be painted a non-glare off-white to minimize visual impact.

The towers are tubular steel with a hub height of 80 m (262 ft) to 88.6 m (291 ft). The turbine tower, where the nacelle is mounted, consists of three sections manufactured from certified steel plates. Welds are made with automatically-controlled power-welding machines and are ultrasonically inspected during manufacturing per American National Standards Institute specifications. All surfaces are sand blasted and multi-layer coated for protection against corrosion. Access to the turbine is through a lockable steel door at the base of the tower. Within the tower, access to the nacelle is provided by a ladder equipped with a fall arresting safety system.

8.2.2 Nacelle

The main mechanical and electrical components of the wind turbine are housed in the nacelle. The nacelle is mounted on a sliding ring that allows it to rotate, or "yaw," into the wind to maximize energy capture. 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. It is externally equipped with an anemometer and a wind vane to measure wind speed and direction. The generated electricity is conducted through cables within the tower to a switch enclosure mounted at the base of the turbine tower. The FAA determines the Project lighting specifications and plan, and the Applicant will use an ADLS, subject to availability and FAA approval.

8.2.3 Rotor

A rotor assembly is mounted on the drive shaft and operates upwind of the tower. Electric motors within the rotor hub vary the pitch of each blade according to wind conditions to maximize turbine efficiency at varying wind speeds. The GE 2.82-127 turbine has a 127 m (417 ft) rotor diameter, and the GE 2.3-116 turbine model has a 116 m (381 ft) rotor diameter.

8.2.4 Turbine Foundations

Foundations for the towers are anticipated to be a spread foundation design. The foundation extends above ground by less than 1 foot and is approximately 13 feet in diameter when above ground.

8.2.5 Generator Step-up Transformers

Electrical, communication cables, and a control system are located at the base of the tower. The electricity produced by the wind turbine generator is transmitted through insulated cables to a transformer located either within or adjacent to the base of the turbine that increases wind turbine generator voltage to the collection system voltage of 34.5-kV.

8.3 Access Roads

Where available, existing public roads, private roads, and field paths are being utilized to access Project components. The existing roads may require improvements before, during, or following construction. Where necessary, new access roads will be constructed between existing roadways and Project components. The new and improved access roads would be all-weather, gravel surfaced, and generally 16 feet in width. During construction, some of the access roads would be widened to accommodate movement of the turbine erection crane and other heavy construction equipment, with temporary widths generally not exceeding 50 feet.

Once the Project completes construction of the wind turbines, the roads will be reduced to a permanent width of approximately 16 feet. Total access road length across the entire Project will be approximately 26.8 miles. For purposes of calculating access road impacts in this Application, the Applicant anticipates approximately 133 acres of temporary disturbance and 52 acres of permanent disturbance during the life of the Project for new private access roads.

8.4 Underground Electrical Collector Lines

The electrical collector lines would consist of an underground cable system between the collection substation and the individual turbine locations. The collector system would be designed for operation at 34.5-kV and the collector lines would be installed in a trench at least 48 inches below the ground to avoid potential impact from the existing land uses. Approximately 67.5 miles of underground collector lines will be installed, depending on final electrical design. The collector lines are to be located primarily on privately-owned parcels but may also include some installations in public right-of-way (ROW) subject to the permitting requirements of the ROW authority. A fiber optic cable and an additional separate ground wire would also be installed with the collector system. The fiber optic cable would be used for telemetry, control, and communication purposes. Aboveground junction boxes would be installed as required for

connections or splices. For purposes of calculating temporary impacts in this Application, the Applicant anticipates approximately 114 acres of total temporary disturbance from underground collector system construction. The Applicant assumes that some of the construction disturbance for the underground collector system would be shared with construction disturbance for access roads where these facilities overlap. Ground disturbance impacts during the operational life of the Project are anticipated to be approximately 0.09 acres for the aboveground junction boxes.

8.5 Project Substation

The Project Substation will be approximately 2 acres in size, located generally in the center of the Project Area, and will consist of two substation transformers, circuit breakers, disconnect breakers, disconnect switches, bus conductors, switching devices, auxiliary equipment, a control enclosure containing equipment for proper control, protection, monitoring, and communications, and associated equipment and facilities. The principal function of the substation is to increase the voltage from the collector system (34.5-kV) to the voltage of the transmission line (345-kV), which will transport the electricity of the entire Project to the MISO grid via the Interconnection Substation. The Project Substation will be located within a fenced area that is designed in accordance with industry standards to provide safety and security.

The expected Project Substation is shown on Figures A-2, A-3, and A-4 in Appendix A. As discussed in Section 8.1, the Applicant requests that the Permit allow the Project Substation to be modified as needed, so long as the new location is on land leased for the Project; cultural resource impacts are avoided or mitigated in coordination with the SHPO; environmental constraints are adhered to as agreed upon with USFWS and SDGFP; wetland impacts are avoided or minimized; and all other applicable regulations and requirements are met.

8.6 Interconnection Substation

The Interconnection Substation will be approximately 2 acres in size and will serve as the electrical interconnection between the Project and the regional transmission system. The Interconnection Substation will include, but is not limited to, the following: 345-kV circuit breakers, disconnect breakers, disconnect switches, bus conductors, auxiliary equipment, and a control enclosure containing equipment for proper control, protection, monitoring, and communications. The Interconnection Substation will be located within a fenced area that will be designed in accordance with industry standards to provide safety and security.

Deuel Harvest is negotiating a GIA with Otter Tail Power Company and MISO, which will establish the requirements for the construction and ownership structure of the Interconnection Substation and Project

Substation. The Interconnection Substation will be constructed by the Applicant or Otter Tail Power Company and will be owned and operated by Otter Tail Power Company.

The expected Interconnection Substation is shown on Figures A-2, A-3, and A-4 in Appendix A and in Appendix H. As discussed in Section 8.1, the Applicant requests that the Permit allow the Interconnection Substation to be modified as needed, so long as the new location is on land leased for the Project; cultural resource impacts are avoided or mitigated in coordination with the SHPO; environmental constraints are adhered to as agreed upon with USFWS and SDGFP; wetland impacts are avoided or minimized; and all other applicable regulations and requirements are met.

8.7 Transmission Line

The Project will include an overhead 345-kV Transmission Line connecting the Project Substation and Interconnection Substation. The 345-kV Transmission Line will be approximately 150 feet in length and span between the Project Substation and Interconnection Substation. Due to the short span, the Transmission Line will only require dead-end structures within the Project Substation and Interconnection Substation. The Transmission Line will be located on land under lease for the Project and wholly within the Project Area. The Applicant anticipates that construction of the Transmission Line will not impact land outside of the Project Substation and Interconnection Substation. The 660-foot long Transmission Line Corridor is identified on Figures A-2, A-3, and A-4 in Appendix A.

The Applicant requests the ability to adjust the location of the Transmission Line so long as it remains within the 660-foot long Transmission Line Corridor identified in this Application, impacts to cultural resources and sensitive habitat are avoided, and wetland impacts are avoided. Any adjustments that fall outside of the Transmission Line Corridor, or do not meet the above-stated limitations, would be considered a "material change." If there were a "material change", the Applicant would follow the same process for review of the proposed "material change" as outlined in Section 8.1 for turbine adjustments.

The Transmission Line would be a three-phase, single circuit transmission line supported by steel H-frame dead-end structures within the Project Substation and Interconnection Substation. No inground infrastructure will be located between the Project and Interconnection Substations. Figure A-5 in Appendix A is dead-end structure diagram for the Transmission Line. The steel H-frame dead-end structures would be buried in the ground to a depth of 14 to 15.5 feet and would be 80 to 105 feet tall. The structures are anticipated to be approximately 150 feet apart, and the conductors would be located approximately 20-30 feet above the ground, meeting all applicable requirements in the National Electric

Safety Code. Deuel Harvest would use 795 KCMIL reinforced conductors or conductors of comparable capacity.

8.8 O&M Building

An O&M building will be constructed adjacent to the Project Substation and Interconnection Substation, or another suitable location within the Project Area, and will provide access and storage for Project O&M equipment. The O&M building will be an approximately 7,000 to 10,000 square-foot building, which would house operating personnel, offices, operations and communication equipment, parts storage and maintenance activities, and a vehicle parking area. An area for outdoor storage of larger equipment and materials would also be included within a fenced area for safety and security. Deuel Harvest has identified a location (see Figures A-2, A-3, and A-4 in Appendix A) for the O&M building that is centrally located among the Project facilities.

As discussed in Section 8.1, the Applicant requests that the permit allow the O&M building location to be modified, as needed, so long as the final location is on land leased for the Project; cultural resource impacts are avoided or mitigated in coordination with the SHPO; environmental constraints are adhered to as agreed upon with USFWS and SDGFP; wetland impacts are avoided or minimized; and all other applicable regulations and requirements are met.

For purposes of calculating temporary impacts in this Application, the Applicant has assumed approximately 3 acres of total temporary disturbance from O&M building construction. After construction, total permanent disturbance from the O&M building, including parking, would be approximately 2.5 acres. Deuel Harvest would purchase up to 5 acres to facilitate construction and use of the O&M building.

8.9 SCADA System

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

A third mechanism for safety and control is within the turbines themselves. Each turbine monitors the wind speed and direction to ensure its current position is most efficient to produce electricity. These data

are also used for feathering the blades; applying the brakes in high wind speeds or if there is ice build-up on the blades; and to tell the turbine when the wind is strong enough to begin turning the generator and producing electricity at the "cut-in" wind speed.

8.10 Meteorological Towers

Up to four permanent MET towers may be installed as part of the Project. These MET towers are used to acquire wind data to confirm turbine performance once the Project is operational. The MET towers will be self-supporting with heights not to exceed the hub height of the wind turbines. The permanent MET towers will be marked and lighted as specified by the FAA. Each MET tower would result in a permanent impact of approximately 42 feet by 42 feet (0.1 acre). The location of these MET towers will depend on the final location of the turbines and specifications of the turbine manufacturer and financing parties. Locations will be within the Project Area, on land that is under lease with Deuel Harvest, and will meet all County setbacks and requirements.

The Applicant requests that the permit allow the MET tower locations to be modified, as needed, as long as the final locations are on land leased for the Project, cultural resources and habitats for federally and State listed species are avoided, wetland impacts are avoided, and all other applicable regulations and requirements are met.

8.11 Crane Paths

Separate access may be required for the cranes used to erect the wind turbines. In such cases, temporary crane paths would be constructed between turbine locations. Following completion of construction, the temporary crane paths would be removed, and the area restored, in accordance with industry standards.

8.12 Temporary Laydown / Staging Area

The Temporary Laydown / Staging Area will be located in the same general area where the O&M building will be constructed. The Applicant requests that the Permit allow the laydown / staging area location to be modified, as needed, so long as the final location is on land leased for the Project, known cultural resources and habitats for federally and State listed species are avoided, wetland impacts are avoided, and all other applicable regulations and requirements are met.

8.13 Wind Farm Construction

Once applicable local, State, and federal approvals are obtained, the Applicant will complete engineering-scale design of access roads, construction areas, turbine foundations, and electrical components. The Applicant anticipates that the construction of access roads, tower foundations, and the Project Substation

will take approximately 8 to 10 months. with installation of the turbines taking approximately 2 to 3 months. Collector lines will be installed by trench, or based on site conditions, by other non-trenching means (e.g., directional boring). For collection system trenching during construction, the Applicant will remove topsoil prior to trenching and restore topsoil after trenching is complete. The Project contractor will typically decompact up to 10 inches below grade for crane paths after construction. For road construction, topsoil will be removed and stockpiled in the temporary construction area. If necessary for drainage and access. temporary culverts and field approaches will be installed. For turbine foundation installation, topsoil and subsoil will be removed, separated, and stockpiled at each turbine site. After construction, the subsoil and topsoil will be restored over the spread footer concrete wind turbine foundation.

8.13.1 Post-Construction Cleanup and Site Restoration

All temporary construction areas will be restored after construction, including removing gravel, decompacting subsoil. and replacing removed topsoil. Where necessary, temporary and permanent stabilization measures will be implemented, including mulching, seeding with appropriate seed mix, and installing slope breakers. All temporarily disturbed areas will be graded back to natural contours, de-compacted, and seeded as needed. Erosion control practices will be maintained until seeded areas are stabilized. Deuel Harvest will clean up construction debris and restore temporarily impacted areas.

8.14 Operations and Maintenance

The Applicant will manage operations, maintenance, and service of the Project and its related facilities. The Project will have a full-time staff of technicians, a supervisor, and others as necessary to conduct scheduled and non-scheduled maintenance activities. Onsite service and maintenance activities include routine inspections, regular preventive maintenance on all turbines and related facilities, and unscheduled maintenance and repair on the wind turbines, electrical power systems, and communications systems.

Project access roads will also be maintained to facilitate site access including snow removal and regrading as necessary. An emergency response plan will be in place and is discussed in Section 20.3.3.

8.15 Transmission Facility Construction and Operations (20:10:22:34)

ARSD 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.*

8.15.1 Transmission Facility Mobilization, Site Preparation, and Clearing

Upon completion of applicable federal, State and local approvals, establishment of soil conditions, and

completion of final design, construction of the Transmission Facility will begin. Precise timing of construction will consider various requirements that may be in place due to permit conditions, system loading issues, weather, and available workforce and materials.

The Transmission Facility has been sited to minimize environmental impacts. and tree clearing is not anticipated to be required. Applicant will work closely with affected landowners to verify their fences are maintained and livestock is protected not only during construction activities, but throughout operations. Silt fence and other erosion control measures would be installed in accordance with the Project's SWPPP and applicable permit conditions. and sensitive areas would be marked for avoidance. Appropriate safety measures would be implemented before pole foundation excavation begins, including notification through the One-Call system to verify third-party utilities and adjacent pipelines are properly marked. Equipment and vehicles would be transported to the Project Area and staged at the temporary laydown or staging area.

8.15.2 Transmission Facility Construction Procedures

As discussed in Section 8.7, the Project will include a 345-kV Transmission Line connecting the Project Substation and Interconnection Substation. The 345-kV Transmission Line will be approximately 150 feet in length and span the Project Substation and Interconnection Substation. Due to the short span, the Transmission Line will only require dead-end structures within the Project Substation and Interconnection Substation. The Transmission Line will be located on land under lease for the Project and wholly within the Project Area. Applicant anticipates that construction of the Transmission Line will not impact land outside of the Project Substation and Interconnection Substation, and the land within the Transmission Line Corridor contains no trees. As such, no additional route clearing or construction and landscaping operations are anticipated.

The staging area required for construction of the Transmission Facility will be shared with the associated Wind Project. Staging involves delivering the equipment and materials to construct the Transmission Facility and storing them until they are needed for construction of the Transmission Facility. The Interconnection Substation will be constructed by the Applicant or Otter Tail Power Company.

8.15.3 Transmission Facility Restoration Procedures

The construction workspace would be disturbed during the normal course of work, which will take approximately 6 months. The Applicant will take the steps necessary to lessen the impact of the Transmission Facility on the surrounding environment by restoring areas disturbed by construction in accordance with BMPs and any Project's permit conditions.

The Applicant or its contractor will contact each property owner after construction is completed to identify and address any damage that may have occurred as a result of the construction of the Transmission Facility. If damage has occurred to crops, fences, or the property, the Applicant will fairly compensate the landowner for the damages sustained in accordance with the terms and conditions agreed upon. Commonly used BMPs to control soil erosion and assist in reestablishing vegetation that may be used on the Transmission Facility include, but are not limited to, erosion control blankets with embedded seeds, silt fences, hay bales, hydro seeding, and planting individual seeds or seedlings of non-invasive plant species.

8.15.4 Transmission Facility Operations and Maintenance

Transmission lines are designed to operate for decades. Typically, they require only minimal maintenance, particularly in the first few years of operation. The estimated service life of the proposed Transmission Facility is approximately 30 years. The principal operating and maintenance cost for transmission facilities is the cost of inspections. Inspections would be conducted to verify that the transmission line is fully functional and that no vegetation has encroached so as to violate good utility best practice prescribed clearances. The Applicant will prune or remove vegetation as required to avoid physical contact from vegetation that could cause the Transmission Line to fail. However, vegetation removal is expected to be minimal, given the short length of the line and lack of trees in the Transmission Line Corridor. Annual operating and maintenance for the 345-kV Transmission Line will be conducted by the Project's operations and maintenance workers.

9.0 ALTERNATE SITES AND SITING CRITERIA (ARSD 20:10:22:12 AND ARSD 20:10:22:35)

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.

Following is a description of the general Project location site selection process, a discussion of the turbine and site configuration alternatives considered for the Project, and a summary of the siting criteria applied to the Project.

9.1 General Project Location Selection

Deuel Harvest conducted feasibility studies in 2015 to identify a wind farm location in South Dakota within the MISO service territory. Initial studies included a desktop review of environmental resources and any potentially sensitive areas, looking for potential wind turbine locations in South Dakota that could connect to the then-under-construction Big Stone to Brookings 345-kV transmission line, and were within windy areas per proprietary wind resource screening tools. With that initial information and given Deuel Harvest's knowledge of other wind developments in the region, the Project Area was identified after working closely and gauging interest with local landowners and stakeholders. Additional important characteristics that drew Deuel Harvest to the Project Area include:

- A higher prevalence of USFWS Grassland, Wetland, and Conservation Easements and potentially undisturbed grassland to the north and west of the Project Area;
- Diminishing wind speeds to the east of the Project Area;
- Access to the Big Stone to Brookings 345-kV transmission line to minimize interconnection infrastructure and need for long distance transmission lines;
- Project Area is all within one county;
- Compatibility with existing agricultural use; and
- Strong support from landowners in the Project Area, as well as the surrounding community. Deuel Harvest continued to gain its support by establishing long-term relationships within the community.

9.2 Site Configuration Alternatives

The proposed layout of 112 turbines reflects an optimal configuration for a competitive Project within the Project Area, while avoiding impacts to residences, known cultural resources, wetlands, grasslands, and sensitive species and their habitats. A previous site configuration, which included 161 turbine locations, was one of three layouts submitted and permitted at the County level in December 2017 (see Section 2.0 for a discussion of County permitting). For market and wind resource suitability reasons, it was determined that Deuel Harvest would utilize a combination of 2.3 and 2.82 MW turbines. This reduced the number of turbine locations in the layout from 161 to 112 and reduced the total footprint of turbines. The turbines are now primarily located in the central portion of the Project Area to maximize the available wind resource.

Deuel Harvest has identified 124 potential turbine locations for up to 310.1 MW of nameplate capacity based on the applicable local, State, and federal requirements, including the State and local requirements and / or commitments set forth in Table 9-1 below. The final micro-siting could result in minor turbine adjustments, in compliance with these requirements. The buildable area for turbines, after taking into account the setbacks in Table 9-1 as well as further environmental constraints is visually depicted on the turbine siting constraints map provided as Figure A-2 in Appendix A.

The Interconnection Substation was sited to minimize the length required to connect with the Project Substation, which minimizes impacts from the Transmission Line. As described in Section 8.7, the Transmission Line is approximately 150-feet long and the proposed Transmission Line Corridor is the most direct route between the substations.

Table 9-1: Project Siting Requirements / Commitments

Category	Requirements / Commitments
State Requirements	
Setbacks[11]	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, unless the owner of the wind turbine tower has a written agreement with an adjacent land owner allowing the placement of the tower closer to the property line.
Deuel County Requirements	

[11] Per SDCL 43-13-24

Category	Requirements / Commitments
Setbacks[12]	Distances from existing non-participating residences and businesses shall be not less than four times the height of the wind turbine[13]. Distance from existing participating residences, business and public buildings shall be not less than 1,500 feet. Non-participating property owners shall have the right to waive the respective setback requirements. Distance from public right-of-way shall be one hundred and ten percent (110%) the height of the wind turbines, measured from the ground surface to the tip of the blade when in a fully vertical position. Distance from any property line shall be one hundred and ten percent (110%) the height of the wind turbine, 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. Distance from the Lake Park District located at Lake Cochrane is at least 3 miles, from Lake Alice at least 2 miles and 1 mile from the Lake Park District at Bullhead Lake. Distance from the municipalities of Altamont, Astoria, Brandt and Goodwin of 1 mile from the nearest residence and 1.5 miles from the city limits of the towns of Gary, Toronto and Clear Lake, except the area of Clear Lake located in sections 11, 12 and 14.
Noise [14]	Noise level shall not exceed 45 dBA average A-weighted sound pressure at the perimeter of existing residences, for non-participating residences.
Shadow Flicker[15]	Limit for allowable shadow flicker at existing residences to no more than 30 hours annually.

9.3 Lack of Reliance on Eminent Domain Powers

The Project will not use eminent domain powers to acquire easements for the Wind Farm or Transmission Facility. All land rights required for the Project were obtained through voluntary leases with property owners. Private land and public road ROW would be used for all facilities. Further, the Applicant will coordinate with federal, State, and local agencies to obtain appropriate permits for the Project. Thus, selection of an alternative site would not reduce reliance on eminent domain powers.

[12] Per Deuel County Zoning Ordinance § 1215.03(2)
[13] A setback of four times the turbine height of the GE 2.82-127 turbine (1,996 feet; rounded to 2,000 feet) was used for all Non-Participating Residences.
[14] Per Deuel County Zoning Ordinance § 1215.03(13)(a)
[15] Per Deuel County Zoning Ordinance § 1215.03(13)(b)

10.0 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 11.0 through 15.0 and Sections 17.0, 18.0, and 20.0 provide a description of the existing environment at the time of the Application submittal, the potential changes to the existing environment that are anticipated as a result of Project construction and operation, and the irreversible changes that are anticipated to remain beyond the operational lifetime of the facility. These sections also identify the avoidance, minimization, and mitigation measures that will be implemented for the Project.

For purposes of analyzing environmental impacts in this Application, all 124 proposed turbine locations are included. Figure A-4 in Appendix A shows the current layout for the Project. Temporary and permanent impacts for upgrades to existing roads are highly dependent on final engineering design, and what each County and township authority requires in the Road Use Agreements. Alternative sites are denoted with an "A" preceding the turbine number. Table 10-1 identifies the ground disturbance impacts (both temporary impacts during construction and operational impacts during the life of the Project) assumed for the Project.

Table 10-1: Summary of Deuel Harvest North Wind Farm Ground Disturbance Impacts

	Construction Impacts (Temporary)		Operational Impacts (Long-Term)	
Project Component	**Dimensions**	**Total Acreage**	**Dimensions**	**Total Acreage**
Turbines[a]	60-meter radius	346 acres	32-foot radius	9 acres
Access roads[a]	40-foot wide	133 acres	16-foot wide	52 acres
Crane paths[a]	14-foot wide	107 acres	N/A	N/A
Collector lines[a,c]	14-foot wide	114 acres	36 inches by 56 inches	0.09 acre
Project Substation	3 acres	3 acres	2 acres	2 acres
Interconnection Substation	3 acres	3 acres	2 acres	2 acres
Transmission Line[b]	150 feet by 660 feet	2.3 acres	150 feet by 150 feet	0.5 acre

Project Component	Construction Impacts (Temporary)		Operational Impacts (Long-Term)	
MET towers	0.3 acre	1.2 acre	0.1 acre	0.4 acre
O&M building	3 acres	3 acres	2.5 acres	2.5 acres
Laydown / staging / batch plant areas	10 acres	10 acres	N/A	N/A
	Approximate Total	**722 acres**	**Approximate Total**	**68 acres**

(a) Impact calculations are based on all 124 proposed turbine locations and associated facilities.
(b) Transmission Line temporary Construction Impacts assume impact to the entire Transmission Line Corridor. Operational Impacts include the 150 foot length of Transmission Line to be installed and associated 150 ROW.
(c) Collector line Operational Impacts will be from the junction boxes used to join strings of collector line.
(d) Total impact acreages are based on GIS (Geographic Information System) calculations. Because some overlap exists in the disturbance areas for the individual Project components, the total impact acreages do not equal the sum of the impact acreages for the individual components presented in this table.

No other operating energy conversion facilities, existing or under construction, or other major industrial facilities under regulation occur within or adjacent to the Project Area. The closest operating wind project to the proposed Project is the Buffalo Ridge II Wind Farm, which is a 210-MW, 42,800-acre wind farm approximately 16.5 miles south of the Project Area, in northeastern Brookings and southeastern Deuel counties. In addition, the SDPUC granted an Energy Conversion Facility Permit to Otter Tail Power Company for the approximately 250-MW Astoria Station Project which is approximately 14.4 miles south of the Project Area. Because of the distance of these projects from the Project Area, construction and operation of the Project would not result in cumulative effects on resources in the area from siting the Project in combination with other energy conversion or major industrial facilities.

11.0 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.

The following sections describe the existing physical environment within the Project Area, the potential effects of the proposed Project on the physical environment, and measures that will be utilized to avoid, minimize, and / or mitigate potential impacts.

11.1 Geological Resources

The existing geological resources within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

11.1.1 Existing Geological Resources

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

11.1.1.1 Regional Landforms / Surficial Geology

The topography of the Project Area is generally characterized by a hummocky appearance formed by the advance and melting of glacial ice. Topographic relief within the Project Area is moderate with site elevations ranging from 1,201 to 1,922 feet above mean sea level (AMSL). The Project Area is located on the eastern side of the Coteau des Prairies, a broad, flat-iron shaped highland of glacial origin with a gently sloping to undulating surface. Drainage generally flows to the northeast in the Project Area.

The Project Area is also located within the Coteau des Prairies division of the Central Lowland province of the Interior Plains physiographic region. The Central Lowland province is typically characterized by flat lands and glacial landforms (Fenneman and Johnson, 1946; Flint, 1955).

In Deuel County, based on a review of boring logs (records of the type of rock found during drilling, sampling, and coring), the unconsolidated sediment that formed the Coteau des Prairies is up to 800 feet thick in the Project Area. The stratigraphy of the unconsolidated sediments consists of interbedded till, outwash, and lake sediment deposits that represent a series of glacial advances and retreats of the Quaternary Period. The uppermost unconsolidated layer underlying most of the Project Area is late Wisconsin age Altamont end stagnation, and ground moraine from the Des Moines Lobe. The late Wisconsin age till is calcareous, silty, sandy to pebbly clay loam and is yellowish-brown when weathered and dark gray when un-weathered. Outwash silts, sands, and gravels are also present near the surface in the Project Area and are terrace, valley train, and collapsed deposits associated with late Wisconsin age glaciation. Recent alluvium and outwash deposits are associated with drainage features and stream valleys (Beissel and Gilbertson, 1987). Surficial geology in the Project Area is illustrated in Figures A-9 and A-10 in Appendix A.

The South Dakota Geological Survey (SDGS) mapped the following surficial geologic units within the Project Area (SDGS, 2004):

- Qal – Alluvium (Quaternary) – Clay, boulder-sized clasts with locally abundant organic material. Thickness up to 75 feet (23 meters).
- Qlo – Outwash, undifferentiated (Upper Wisconsin) – Heterogeneous sand and gravel with minor clay and silt, of glaciofluvial origin, including outwash plains, kames, kame terraces, and other undifferentiated deposits. Thickness up to 30 feet (9 meters).
- Qloc – Outwash, collapsed (Upper Wisconsin) – Heterogeneous sand and gravel of glaciofluvial origin. Deposited as outwash sediments that collapsed due to melting of buried ice. Thickness up to 90 feet (27 meters).
- Qlte – Till, end moraine (Upper Wisconsin) – Compact, silty clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature characterized by elevated linear ridges with hummocky terrain locally at former ice sheet margins. Composite thickness of all Upper Wisconsin till may be up to 300 feet (91 meters).
- Qltg – Till, ground moraine (Upper Wisconsin) – Compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature characterized by smooth, rolling terrain. Composite thickness of all Upper Wisconsin till may be up to 300 feet (91 meters).

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

11.1.1.2 Bedrock Geology

The majority of the Project Area, particularly the western and central portions, is underlain by Carlile Shale. This Upper Cretaceous, dark gray to black, silty to sandy shale has several zones of septarian, fossiliferous, carbonate concretions. It contains up to three sandstone units in the upper portion of the formation and sandy calcareous marl at the base and has a thickness of up to 330 feet. Pierre Shale makes up much of the eastern portion of the Project Area. This blue-gray to dark gray Upper Cretaceous shale is composed of beds of bentonite, black organic shale, and light brown chalky shale. It contains minor sandstone, conglomerate, and abundant carbonate and ferruginous concretions, with a thickness of up to 1,000 feet. The Niobrara Formation makes up a narrow strip between the Carlile Shale and the Pierre Shale; this formation, also Upper Cretaceous, is composed of white to dark gray argillaceous chalk, marl, and shale. It weathers yellow to orange, and contains thin, laterally-continuous bentonite beds, chalky carbonaceous shale, minor amounts of sand, and small concretions, with a thickness of up to 150 feet (Tomhave and Schultz, 2004). Figure A-11 in Appendix A depicts the bedrock geology for the Project Area.

11.1.1.3 Economic Deposits

Commercial mineral deposits within the Project Area are limited to sand, gravel, and construction aggregate enterprises. Information from the South Dakota Department of Environment and Natural Resources (SDDENR) Minerals and Mining Program and a review of U.S. Geological Survey (USGS) 7.5-minute quadrangle mapping indicates that one sand and gravel operation occurs in the northwestern portion of the Project Area in Section 26 of Portland Township (Section 26, T117N, R49W (SDDENR, 2018a). Sand and gravel operations are shown on Figure A-7 in Appendix A. Of the nine locations shown, only one is active. Historic sand and gravel operations were also conducted within the Project Area based upon a review of the SDDENR Minerals and Mapping Program and "Sand and Gravel Resources in Deuel County, South Dakota" (Schroeder, 1976). These locations have been verified as abandoned or restored by the SDDENR Minerals and Mapping Program and recent aerial imagery. Due to their glacial origin, the clay deposits found within the Project Area contain silt and significant carbonate, which limits its commercial applications (Beissel and Gilbertson, 1987).

A review of the online information from the SDDENR Oil and Gas Initiative Program verifies that the Project Area is not within a known oil or gas field as most of the current and historic oil and gas development occurs in the western half of the State. The nearest identified oil and gas field is the Lantry field, which is located approximately 230 miles west of the Project Area (SDDENR, 2018b). No other active or historical economic mineral deposits exist within the vicinity of the Project.

11.1.1.4 Seismic Risks

The risk of seismic activity near the Project Area is extremely low to negligible. According to the USGS 2014 Seismic Hazard Map for the United States, a 2 percent chance exists for an earthquake to occur within the Project Area in the next 50 years (i.e., a recurrence interval of 2,500 years) that would result in a peak ground acceleration (PGA) of between 2 percent of gravity (0.02 grams) to 0.04 grams. The USGS also estimates a 10 percent chance exists for an earthquake to occur within the Project Area in the next 50 years (i.e., a recurrence interval of 475 years) that would result in a PGA of between 0.01 g and 0.02 g (Petersen et al., 2015). For reference, a PGA of 0.1 g is generally considered the minimum threshold for damage to older structures or structures not made to resist earthquakes. According to the short-term induced seismicity models (USGS 2018 1-year model), the chance of potentially minor damage ground shaking in 2018 in the Project Area is less than 1 percent (USGS, 2018).

According to the SDGS, no earthquakes have been recorded in Deuel County or surrounding counties from 1872 to 2013 (SDGS, 2013). A review of the available geologic mapping and information provided by the USGS Earthquake Hazards Program indicates that no identified active or inactive faults occur in the Project Area or vicinity (USGS, 2006).

11.1.1.5 Subsidence Potential

The potential for subsidence within the Project Area is negligible. The Pierre Shale, Niobrara Formation, and Carlisle Shale bedrock are buried by between 200 and 800 feet of glacial till and outwash across the entire Project Area. The bedrock units do not exhibit karst topography or contain layers susceptible to dissolution by water. Historic underground mining operations, which could lead to an increase in subsidence potential, do not exist within the Project Area.

11.1.2 Geological Resources Impacts / Mitigation

The geologic conditions within the Project Area are appropriate for the construction of the Project. Excavation, bearing, and groundwater conditions associated with the underlying unconsolidated materials and Pierre Shale and other sedimentary bedrock in the Project Area are anticipated to be conducive to construction and operation of the Project Facilities. Excavation and / or grading would be required

Project Facilities, and trenching would be required to install collector lines. Geotechnical borings would be completed at all wind turbine locations, and soil samples would be tested to determine the engineering characteristics of the site subgrade soils and develop turbine-specific design and construction parameters. Geotechnical soil samples would be collected and analyzed. Geophysical surveys would also be performed to further evaluate site subgrade soils. Modifications to roadway and foundation subgrade design would be made as necessary to account for specific site conditions. As discussed in Section 23.0, the Project would be decommissioned after the end of the Project's operating life and facilities would be removed in accordance with applicable State and County regulations, unless otherwise agreed to by the landowner. After Project decommissioning is complete, the portions of underground facilities that have been abandoned in place would remain beyond the operational lifetime of the facility; however, these remaining facilities would not result in irreversible changes to the underlying geological conditions of the Project Area.

Due to the limited developed or potential economic mineral resources within the Project Area, the construction and operation of the proposed Project poses no impact to economic mineral resources. The active sand / gravel pit is located approximately 3,135 feet (0.6 miles) from the nearest turbine location and 43,100 feet (8.2 miles) from the Transmission Line Corridor, while the closest inactive pit is located approximately 500 feet from the nearest turbine location and 11,700 feet (2.2 miles) from the Transmission Line Corridor. Therefore, no mitigation is required for impacts to mineral resources.

11.2 Soil Resources

The existing soil resources within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

11.2.1 Existing Soil Resources

This section describes the existing soil types, erosion potential and slopes, and prime farmland soils within the Project Area.

11.2.1.1 Soil Types

The soils within the Project Area generally consist of loams, silty clay loams, and clay loams derived mostly from glacial till, outwash, and alluvium. The soils in the Project Area are not highly susceptible to erosion and are generally conducive to crop production (Natural Resources Conservation Service [NRCS], 2018a).

Within the Project Area, approximately 10.5 percent of the soils have the potential to be highly corrosive to buried steel, and approximately 77.9 percent of the soils have potential to be moderately corrosive to

buried steel. Also, within the Project Area, approximately 2.3 percent of the soils have the potential to be highly corrosive to buried concrete and approximately 49 percent of the soils have the potential to be moderately corrosive to buried concrete. The majority (77.7 percent) of soils in the Project Area are well drained, and only 20.2 percent have a significant hydric component (30 to 100 percent of the soil is hydric). Approximately 14.6 percent of the soils are considered to have a high potential for frost action (NRCS, 2018a). Table 11-1 lists the soil types comprising more than 1 percent of the Project Area and the characteristics of these soils. Figure A-12 in Appendix A illustrates the soil types and distributions within the Project Area.

11.2.1.2 Erosion Potential and Slopes

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Factor K values range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water. The soils in the Project Area have a moderately low to moderate susceptibility to erosion and have K Factors ranging from 0.10 to 0.37, with the majority between 0.17 and 0.24. Wind Erodibility Group (WEG) consists of soils that have similar properties affecting their susceptibility to wind erosion in cultivated or disturbed areas. The soils assigned to group 1 are the most susceptible to wind erosion and those assigned to group 8 are the least susceptible. The soils in the Project Area have low to moderate susceptibility to wind erosion and have WEG designations between 2 and 8, with the majority between 4 and 6. Slopes in the Project Area range from 0 to 40 percent, with most slopes between 1 and 6 percent.

Table 11-1: Soil Types Within the Project Area

Soil Type[a]	Soil Taxonomy	Soil Texture	Parent Material	Natural Drainage Class	Depth to Restrictive Feature (inches)	Acres in Project Area[a]	Percent of Project Area
FmB (Forman-Aastad loams, 1 to 6 percent slopes)	Fine-loamy, mixed, frigid Udic Argiborolls	Loam	Loamy till	Well drained	>201	10,756.3	22.1
BkB (Barnes-Svea loams, 1 to 6 percent slopes)	Fine-loamy, mixed, frigid Udic Haploborolls	Clay loam	Loamy till	Well drained	>201	6,749.0	13.8
FtC (Forman-Buse-Aastad loams, 2 to 9 percent slopes)	Fine-loamy, mixed, frigid Udic Argiborolls	Loam	Loamy till	Well drained	>201	4,495.1	9.2
BmC (Barnes-Svea-Buse loams, 2 to 9 percent slopes)	Fine-loamy, mixed, frigid Udic Haploborolls	Loam	Loamy till	Well drained	>201	3,200.1	6.6
BxE (Buse-Lamoure, channeled, complex, 0 to 40 percent slopes)	Fine-loamy, mixed, frigid Typic Calciborolls	Loam	Loamy till	Well drained	>201	2,734.7	5.6
FtD (Forman-Buse-Aastad loams, 2 to 15 percent slopes)	Fine-loamy, mixed, frigid Udic Argiborolls	Loam	Loamy till	Well drained	>201	2,670.7	5.5
Pc (Parnell-Vallers complex)	Fine, montmorillonitic, frigid Vertic Argiaquolls	Silty clay loam	Clayey alluvium	Very poorly drained	>201	2,130.6	4.4
BgD (Barnes-Buse-Svea loams, 2 to 15 percent slopes)	Fine-loamy, mixed, frigid Udic Haploborolls	Loam	Loamy till	Well drained	>201	1,586.4	3.3
So (Southam silty clay loam, 0 to 1 percent slopes)	Fine, smectitic, calcareous, frigid Cumulic Vertic Endoaquolls	Silty clay loam	Local alluvium	Very poorly drained	>201	1,558.8	3.2

Soil Type[a]	Soil Taxonomy	Soil Texture	Parent Material	Natural Drainage Class	Depth to Restrictive Feature (inches)	Acres in Project Area[a]	Percent of Project Area
ArB (Arvilla sandy loam, 2 to 6 percent slopes)	Sandy, mixed, frigid Udic Haploborolls	Sandy loam	Loamy alluvium over outwash	Somewhat excessively drained	>201	1,406.2	2.9
Pa (Parnell silty clay loam)	Fine, montmorillonitic, frigid Vertic Argiaquolls	Silty clay loam	Clayey alluvium	Very poorly drained	>201	1,371.0	2.8
Z171B (Renshaw-Fordville loams, coteau, 2 to 6 percent slopes)	Fine-loamy over sandy or sandy-skeletal, mixed, superactive, frigid Calcic Hapludolls	Loam	Alluvium over outwash	Somewhat excessively drained	>201	1,051.8	2.2
PeB (Peever clay loam, coteau, 2 to 6 percent slopes)	Fine, montmorillonitic, frigid Udic Argiborolls	Clay loam	Clayey till	Well drained	>201	1,015.0	2.1
BnD (Barnes-Svea-Buse loams, 2 to 12 percent slopes, stony)	Fine-loamy, mixed, frigid Udic Haploborolls	Clay loam	Loamy till	Well drained	>201	761.8	1.6
FmA (Forman-Aastad loams, 0 to 2 percent slopes)	Fine-loamy, mixed, frigid Udic Argiborolls	Loam	Loamy till	Well drained	>201	669.8	1.4
BeE (Barnes-Buse-Southam complex, 0 to 25 percent slopes)	Fine-loamy, mixed, frigid Udic Haploborolls	Clay loam	Loamy till	Well drained	>201	651.1	1.3
BcE (Barnes-Buse loams, 15 to 25 percent slopes)	Fine-loamy, mixed, frigid Udic Haploborolls	Clay loam	Loamy till	Well drained	>201	648.0	1.3
Total						43,456.4	89.3

Source: NRCS (2018a)

(a) Soil types comprising more than 1 percent of the Project Area

11.2.1.3 Prime Farmland Soils

NRCS farmland classifications include "prime farmland" (land that has the best combination of physical and chemical characteristics for the production of crops), "farmland of Statewide importance" (land other than prime farmland that has a good combination of physical and chemical characteristics for the production of crops), and "not prime farmland" (land that does not meet qualifications for prime farmland), among other classifications. Approximately 43 percent of the soils within the Project Area are prime farmland, 16 percent of the soils are farmland of Statewide importance, 2.5 percent of the soils are prime farmland if irrigated, and 1.8 percent of the soils are prime farmland if drained. Farmland types within the Project Area are shown in Table 11-2.

Table 11-2: Farmland Types Within the Project Area

Farmland Type	Area (acres)	Percentage of Project Area
Prime farmland	20,950	43.0
Farmland of Statewide importance	7,699	15.8
Not prime farmland	17,995	36.9
Prime farmland if drained	878	1.8
Prime farmland if irrigated	1,208	2.5
Total	48,730	100

11.2.2 Soil Resources Impacts / Mitigation

The following sections describe the potential effects of the proposed Project on soil resources. Where applicable, planned measures to avoid, minimize, or mitigate impacts are noted.

11.2.2.1 Potential for Impacts to Soil Resources

Construction of the 124 wind turbine foundations, 141,640 feet (26.83 miles) of access roads, 356,260 feet (67.47 miles) of collector lines, Project Substation, Interconnection Substation, Transmission Line, O&M building, and associated facilities would result in approximately 722 acres of temporary disturbance and approximately 68 acres of permanent impacts to soils within the Project Area. No temporary or permanent impacts to soil resources will occur as a result of the construction of the Transmission Line other than soil compaction during construction.

During construction, existing ground cover vegetation would be removed in construction work areas, which could potentially increase the risk of erosion. Potential impacts to agricultural soils from the Project are discussed in Sections 13.1.3 and 20.2.2. As discussed in Section 23.0, the facility would be

decommissioned after the end of the Project's operating life and would be removed in accordance with applicable State and County regulations, unless other agreements have been made with the landowner. Disturbed surfaces would be graded, reseeded, and restored as nearly as possible to their preconstruction conditions. After decommissioning of the Project is complete, no irreversible changes to soil resources would remain beyond the operating life of the Project.

11.2.2.2 Erosion, Slope Stability, and Sedimentation

The Applicant has designed the Project layout to minimize construction cut and fill requirements, and limit construction in areas with steep slopes, while maintaining optimal turbine locations. Wind turbines are typically located at higher elevations to maximize wind exposure, minimize wind obstructions, and avoid steep slopes for foundation installation. The current layout of proposed access roads generally avoids steep slopes as well. Similar efforts apply to the layout of the underground collector lines to generally avoid crossing steep ravines.

Construction of the Project will require coverage under the SDDENR General Permit for Storm Water Discharges Associated with Construction Activities. To maintain compliance with provisions of this General Permit, Deuel Harvest will prepare a SWPPP to identify potential sources of stormwater pollution from the Project site and specify BMPs to control erosion and sedimentation and minimize negative impacts caused by stormwater discharges from the Project. The SWPPP will be prepared prior to construction of the Project. The SWPPP will be implemented from the initiation of construction and used through site restoration efforts. During Project operation, storm water volume, storm water flow, and erosion and sediment impacts to surface water and groundwater resources are not anticipated to change from pre-construction conditions.

The soil suitability to support turbine foundations will be verified through the completion of geotechnical borings that will be completed prior to construction. The engineering characteristics of turbine site subgrade soils will be determined through review of the geotechnical data obtained through the drilling and laboratory testing of soil samples. Adjustments to Project Facilities would be made for unsuitable soils as needed.

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

The following sections describe the existing hydrology within the Project Area, the potential effects of the proposed Project on hydrology, and measures that will be utilized to avoid, minimize, and mitigate potential impacts.

12.1 Groundwater Resources

The existing groundwater resources within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project and avoidance, minimization, and mitigation measures.

12.1.1 Existing Groundwater Resources

Approximately 52 percent of South Dakota's public drinking water systems rely solely on groundwater and approximately 74 percent of South Dakota's citizens use groundwater as their source of drinking water. Of the 33 rural water systems that are either in the planning or construction phase or are presently providing water to South Dakotans, 16 of them are using, or will use, only groundwater, and 3 utilize a combination of groundwater and surface water (Iles, 2008).

In South Dakota, water-producing bedrock units are deep and therefore expensive to drill and install wells in, may have undesirable water quality, or may not yield an adequate quantity of water where it is needed. The Dakota Formation is the only bedrock unit in the Project Area that contains aquifers. In eastern South Dakota, glacial outwash aquifers provide most of the water supply. Of the 444 public water supply systems east of the Missouri River, 392 (88 percent) use glacial outwash aquifers. The glacial outwash

aquifers commonly possess water quality which is better than more deeply buried bedrock-type aquifers, but not always (Iles, 2008).

Three major glacial outwash aquifers are present in Deuel County: the Big Sioux, the Prairie Coteau, and the Altamont (Kume, 1985). Within the Project Area, the Altamont aquifer is present at a depth of 755 feet below the surface near the city of Altamont and 177 feet below the surface in the northeast corner of the Project Area (Kume, 1976). Water quality in the Altamont aquifer generally is not suitable to use for irrigation, although it may be acceptable in some places. Elsewhere, the water ranges from marginally acceptable to unsatisfactory for use as a domestic or public supply. Although little used for livestock supplies, the water is acceptable for such use and is a potential source of stock water (Kume, 1985).

Within the Project Area, the first occurrence of aquifer materials is primarily sand and gravel that is generally greater than 100 feet below the land surface. Shallower occurrences within the Project Area are present along the shores of Lake Alice, an area south of Rush Lake, and along the stream beds of Crow Creek and Monighan Creek where aquifers are present in sand and gravel generally less than or equal to 50 feet below the land surface. Lost Creek, Crow Timber Creek, and unnamed tributaries to these creeks in the northeast part of the Project Area, and Caine Creek with its associated unnamed tributaries in the northcentral portion of the Project Area, support aquifers in the alluvium consisting of clay and silt gravel and are generally less than or equal to 50 feet below the land surface (Jensen, 2001).

12.1.2 Groundwater Resources Impacts / Mitigation

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

Groundwater dewatering is not anticipated to be a major concern within the Project Area, because the wind turbines, MET towers, Project Substation, O&M building, Interconnection Substation, and Transmission Line are typically located at higher elevations, where water tables are usually at greater depths below ground surface. Should groundwater be encountered that must be dewatered, the necessary permits would be obtained, and associated requirements implemented. Furthermore, any groundwater dewatering will be temporary and minimized. Dewatered groundwater would be properly handled to allow sediments to settle out and be removed before the water is discharged, to reduce soil erosion and sedimentation of surface waters.

If applicable, Authorization to Discharge Under the Surface Water Discharge System (Permit No.: SDG0700000) will be obtained from the SDDENR prior to commencing construction; BMPs will be used to which the terms will be adhered. Thus, groundwater dewatering is not anticipated to be a major concern within the Project Area.

12.2 Surface Water Resources

The existing surface water resources within the Project Area are described below (and shown on Figure A-6 in Appendix A), followed by a discussion of the potential effects of the Project, and avoidance, minimization, and mitigation measures.

12.2.1 Existing Surface Water Resources

This section describes the existing hydrology, floodplains, National Park Service (NPS) Nationwide Rivers Inventory (NRI) resources, and impaired waters within the Project Area.

12.2.1.1 Hydrology

The USGS, in cooperation with various federal and State agencies, has mapped the hydrologic boundaries of water resources, in order of descending scale, into regions, subregions, basins, sub-basins, watersheds, and sub-watersheds. The Project Area lies within three sub-basins: the Lac qui Parle Sub-basin, the Upper Minnesota Sub-basin, and the Middle Big Sioux Sub-basin (Figure A-6 in Appendix A).

Surface drainage in Deuel County is influenced by the Wisconsinan glaciation. Stagnation moraine ranges in local relief from 10 to 90 feet. Drainage is mostly internal, but several meltwater channels transect the area, which contain linear streams that drain west to east off the Coteau des Prairies. Stagnation moraine roughly parallels the Bemis and Altamont moraines. All major lake basins and most potholes or sloughs occupy basins formed by melting glacial ice blocks, and all major streams flow in channels that were formed as drainage outlets for glacial meltwater.

Named streams present in the Project Area include Monighan Creek, South Fork Yellow Bank River, Crow Timber Creek, Crow Creek, and Caine Creek. Named lakes within the Project Area include Lake Alice, Lone Tree Lake, and Lake Francis.

Most (34,945 acres or 71.7 percent) of the Project Area is within the Lac qui Parle Sub-basin. This sub-basin is characterized by dendritic parallel meltwater channels with few lakes. Outflow from the Project Area within this basin is via Lost Creek, Timber Creek, Crow Timber Creek, and Monighan Creek, as well as their unnamed tributaries, which flow west to east to the West Branch Lac qui Parle River. The West Branch Lac qui Parle River flows north and east just outside of the eastern Project Area boundary.

Lake Francis and Lone Tree Lake are the largest waterbodies within the sub-basin. Lake Francis has an outlet on the southeast corner and drains into Monighan Creek. Lone Tree Lake has an outlet on the southeast corner and drains into an unnamed tributary to Lost Creek.

Approximately 13,690 acres (28.1 percent) of the Project Area is within the Upper Minnesota Sub-basin. Drainage in this area generally flows west to east via several unnamed tributaries to Caine Creek, which then flows north to the South Fork Yellow Bank River. Lake Alice, which is the largest waterbody within the sub-basin, is owned by the State of South Dakota and supports a fishery managed by the SDGFP. A single public access site maintained by SDGFP is located on the north shore. Lake Alice is a relatively shallow, meandered natural lake with a maximum depth of 12 feet and a mean depth of 8 feet. The only tributary to the lake is on the western end of the lake and a single outlet is in the northwest corner and drains into Connor Slough, eventually emptying into the Minnesota River. Curlyleaf pondweed and European rudd, an exotic fish species, are invasive species present in Lake Alice. Care should be taken to prevent the spread of these species to other waterbodies. Several sloughs and pothole wetlands are present on the western boundary of the Project Area.

The remaining 95 acres (0.2 percent) of the Project Area lies within the Middle Big Sioux Sub-basin. The entire Big Sioux River Watershed drains about 8,282 square miles in eastern South Dakota, southwestern Minnesota, and northwestern Iowa. The Big Sioux River and its large associated glacial aquifer provide most of the domestic water supply for towns and rural areas throughout its course, which includes the growing area in and around Sioux Falls.

12.2.1.2 National Park Service Nationwide Rivers Inventory

The NRI is a listing of more than 3,200 free-flowing river segments in the U.S. that are believed to possess one or more “outstandingly remarkable” natural or cultural values judged to be of more than local or regional significance. Under a 1979 Presidential Directive, and related Council on Environmental Quality procedures, all federal agencies must seek to avoid or mitigate actions that would adversely affect one or more NRI segments (NPS, 2018). No NRI-listed rivers occur within the Project Area. The nearest NRI-listed river to the Project Area is the South Fork Yellow Bank River located on the north boundary of the Project Area paralleling the Deuel / Grant County line in Grant County. This segment is described as a cool water stream with pools and riffles that sustains introduced brook trout populations.

12.2.1.3 Impaired Waters

The goal of the Clean Water Act (CWA) is "to restore and maintain the chemical, physical, and biological integrity of the Nation's waters" (33 U.S.C §1251(a)). Under section 303(d) of the CWA, states,

territories and authorized tribes, collectively referred to in the Act as "states," are required to develop lists of impaired waters. These are waters for which technology-based regulations and other required controls are not stringent enough to meet the water quality standards set by states. The law requires that states establish priority rankings for waters on the lists and develop Total Maximum Daily Loads (TMDLs) for these waters. A TMDL includes a calculation of the maximum amount of a pollutant that can be present in a waterbody and still meet water quality standards (EPA, 2018a).

No 303(d)-listed waterbodies occur within the Project Area. The nearest listed waterbody is the South Fork Yellow Bank River, located on the north boundary of the Project Area paralleling the Deuel / Grant County line in Grant County. This waterbody is listed as impaired for pathogens (*Escherichia coli*). No TMDL data have been established by the Environmental Protection Agency (EPA) for this river. Bullhead Lake, located 1.75 miles west of the Project Area, is listed as impaired for algal growth (Chlorophyll-A), although no TMDL data have been established by the EPA for this waterbody. Florida Creek, located 3.8 miles south of the Project Area at its closest point, has been listed as impaired for pathogens (fecal coliform), impaired biota, and turbidity in 2008, but since 2013 has been listed as attaining all uses, meaning that it is no longer impaired. The West Branch Lac qui Parle River was also listed as impaired for pathogens (fecal coliform) in 2008, but since 2013 has been listed as attaining all uses.

12.2.1.4 Floodplains

The Federal Emergency Management Agency (FEMA) maintains materials developed to support flood hazard mapping for the National Flood Insurance Program (NFIP). Flood hazard mapping provides states, local communities, and Tribes with flood risk information and tools that they can use to increase their resilience to flooding and better protect people and property through collaboration with State and local entities.

FEMA has not completed a study to determine flood hazard for the Project Area; therefore, a flood map has not been published at this time. The nearest mapped floodplains to the Project Area are Zone A designations associated with the South Fork Yellow Bank River on the northern boundary of the Project Area and the West Fork of the Lac qui Parle River on the eastern Project Area boundary.

12.2.2 Surface Water Resources Impacts / Mitigation

Pollution of surface waters in the region is primarily due to suspended sediments, excess nutrients (primarily nitrogen and phosphorus), pesticides, pathogens, and biochemical oxygen demand. High concentrations and loads of suspended sediments and nutrients can often be linked to artificial drainage

patterns (ditches, tile, etc.) and wetland reductions. Alone or in combination, these landscape alterations have effectively increased the hydraulic efficiency and magnitude of storm and snowmelt runoff events.

High nutrient levels in lakes and streams often result from overland runoff across erodible soils. Eroded soils and the runoff that transport these particles often carry pesticides and excess nutrients to receiving waters. Increased discharges and elevated flood peaks also erode streambanks, impact shoreline vegetation, and deposit sediment on floodplains, in streams, and in downstream receiving waters. Sediment in water often leads to impaired habitat for aquatic life, decreased photosynthetic activity, and reduced recreational quality. Excessive levels of nutrients often promote eutrophication, defined as nutrient-rich oxygen-poor water. Elevated nutrient levels often promote abundant algal populations.

Potential impacts to surface waters due to the Project include transport of sediment into waters during construction due to excavation and the exposure of soils. Increase in impervious surfaces from development of the O&M building, access roads, turbine foundations, Project Substation, Interconnection Substation, Transmission Line, and MET towers will constitute acres, representing less than 0.2 percent of the Project Area and will be dispersed throughout the Project Area. Because the Transmission Line will span the Project Substation and the Interconnection Substation, no impacts to surface waters are anticipated from the Transmission Line. Increased sedimentation, reduction of available flood storage, and impacts to drainage patterns due to stormwater runoff from the Project during construction and operation will be minimized by the use of BMPs. The use of BMPs, further described in Section 13.2.2.2, will minimize the delivery of sediment due to erosional processes. The Project is not expected to cause significant changes to existing hydrology or stormwater runoff. The use of BMPs during construction will also control erosion and minimize sedimentation during precipitation events.

12.2.2.1 Impacts to NRI-Listed Rivers and Mitigation

Due to the lack of NRI-listed rivers within the Project Area, construction and operation of the proposed facility poses no impact to these resources. Therefore, no mitigation is required for impacts to NRI-listed rivers.

12.2.2.2 Impacts to Impaired Waters and Mitigation

Due to the lack of 303(d)-listed waterbodies within the Project Area, construction and operation of the proposed facility will not impact these resources. Therefore, no mitigation is required for impacts to 303(d)-listed water bodies. As discussed in Section 11.2.2.2, construction of the Project would require development and implementation of a SWPPP and BMPs in accordance with the General Permit for Storm Water Discharges Associated with Construction Activities issued by the SDDENR.

12.2.2.3 Deterioration of Water Quality

Excavation and exposure of soils during construction can cause an increase in stormwater runoff and sedimentation in receiving waters during storm events. Coverage under the General Permit for Storm Water Discharges Associated with Construction Activities, administered by the SDDENR, will be required for the Project. A SWPPP will be developed and implemented for the Project that identifies potential sources of stormwater pollution at the construction site and specifies the structural and non-structural controls, or BMPs, that are to be used to minimize the negative impacts to receiving waters caused by stormwater discharges associated with the construction activities. The BMPs may include silt fences, straw wattles, erosion control blankets, Project staging, and other methods to control erosion and sedimentation. The erosion and sediment controls that will be implemented during Project construction and operation are expected to avoid negative impacts to water quality.

12.2.2.4 Impacts to Drainage Patterns

The dispersed nature of the Project Facilities will not provide enough of a concentration of increased impervious surfaces in any specific location to change drainage patterns. With wind turbine and MET tower foundations, the O&M building, access roads, Project Substation, Interconnection Substation, and Transmission Line generally being located at higher elevations, impacts to streams and drainageways are not anticipated.

The construction of the underground collection system may impact drainageways, but these impacts would be temporary in nature, with existing contours and drainage patterns restored after trenching, typically within 24 hours of trenching. Where crossings of streams and drainageways cannot be avoided by access roads, appropriately designed crossings (i.e., culverts, low-water crossings) would be constructed to maintain existing drainage.

12.2.2.5 Increased Runoff

The creation of impervious surfaces reduces the ability of soils to infiltrate precipitation to groundwater, potentially increasing the volume and rates of stormwater runoff. The wind turbine and MET tower foundations, O&M building, access roads, Project Substation, Interconnection Substation, and Transmission Line will create up to 68 acres of impervious surfaces. Infiltration will be inhibited within the newly created impervious surfaces, and incremental increases in stormwater runoff may be exhibited immediately adjacent to these surfaces. The increase in impervious surfaces represents less than 0.2 percent of the Project Area, and the implementation of stormwater BMPs is anticipated to adequately mitigate any increases in runoff resulting from construction. As such, the Project is not anticipated to cause significant changes in runoff patterns or volume.

12.2.2.6 Impacts to Flood Storage Areas

Floodplains mapping has not been completed by FEMA for the Project Area. Although the Federal Government has not officially mapped floodplains in the County, it is unlikely the Project would impact floodplains. Wind turbine and MET tower foundations, access roads, the Project Substation, the Interconnection Substation, the Transmission Line, and the O&M building will be located at higher elevations. Any potential impacts to floodplains would be temporary in nature, and existing contours and elevations would be restored upon Project completion.

12.3 Current and Planned Water Uses

The current and planned water uses within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project, and avoidance, minimization, and mitigation measures.

12.3.1 Current and Planned Water Use

Brookings-Deuel Water District (Water District) supplies rural water to the Project Area and maintains a network of distribution lines within the Project Area. Private wells that supply water for domestic and irrigation purposes are also located throughout the Project Area.

12.3.2 Current or Planned Water Use Impacts / Avoidance

The Applicant analyzed the current planned water uses by communities, agriculture, recreation, fish, and wildlife to determine their potential to be affected by the location of the proposed facility. Surface water appropriation, permanent dewatering, deep well injection, and water storage, reprocessing, or cooling will not be required for construction or operation of the Project.

Water use at the O&M building would be similar to household volume and is anticipated to be less than five gallons per minute. The Applicant would coordinate with the Water District to locate and map its network of distribution lines within the Project Area and determine if a rural water supply connection is possible for the Project.

If connection to the rural water supply is not feasible, a water supply well will be required for the O&M building. The Applicant would provide the SDPUC with specifications of the aquifer to be used, the capacity of the aquifer to yield water, the estimated recharge rate, and the quality of groundwater used to supply potable water to the O&M building[16]. Additionally, if rural water supply is not available, a private wastewater treatment system would be needed for the O&M building. If needed, this system would be developed to meet the requirements of the SDDENR. Use of water for operations will be negligible and

[16] Per ARSD 20:10:22:15(4).

will not create undue burden; therefore, no mitigation is proposed. The Project will not impact municipal or private water uses in the Project vicinity.

If required, construction dewatering will be conducted in compliance with South Dakota law. Residential domestic wells will not be impacted by construction dewatering due to a minimum setback of 4 times the wind turbine tip height from non-participating residences and 1,500 feet from participating residences. If water supply wells are located near potential construction dewatering locations, provisions would be made to ensure that an adequate supply of water is provided until construction dewatering activities have ceased. These impacts are expected to be minor and temporary. Surface water availability for communities, schools, agriculture, recreation, fish, or wildlife will not be impacted.

The Project would have no impact on surface water availability or use for communities, agriculture, recreation, fish, or wildlife. As discussed in Section 13.2.2, minimal permanent impacts to wetlands and streams are anticipated. Following construction, temporary impacts to wetlands and streams would be restored to pre-construction conditions.

13.0 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 within the Project Area, potential effects of the proposed Project on these terrestrial systems, and mitigation and minimization measures planned to lessen or avoid potential impacts to terrestrial systems. Terrestrial ecosystem data were collected from literature searches, federal and State agency reports, natural resource databases, and field surveys completed for the Project. Specific resources discussed in the following sections include vegetation, wetlands, and wildlife, including federally and State listed species.

13.1 Vegetation

The existing vegetation within the Project Area is described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

13.1.1 Existing Terrestrial Ecosystem

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

The Project Area is located within the Prairie Coteau level IV ecoregion of the level III Northern Glaciated Plains ecoregion, which encompasses the eastern edge of South Dakota (EPA, 2013). The Prairie Coteau ecoregion roughly coincides with the southern limits of continental glaciation, and has a tightly undulating, hummocky landscape with no drainage patterns. As a result, it is perforated with closely spaced semi-permanent and seasonal wetlands, locally referred to as Prairie Potholes. It has higher precipitation levels than other coteaus such as the Missouri, which allows widespread burr oak woodlands to grow near wetland margins (Bryce et al., 1996). Historically, this ecoregion supported both tallgrass and shortgrass prairies; however, the native grasslands have been predominantly converted to agriculture croplands (Bryce et al., 1996), with corn (*Zea mays*) and soybeans (*Glycine max*) as the dominant crops (Miller, 1997). Natural vegetation in the region includes big and little bluestem (*Andropogon gerardii* and *Schizachyrium scoparium*), switchgrass (*Panicum virgatum*), Indiangrass

(*Sorghastrum nutans*), and blue grama (*Bouteloua gracilis*). Woodlands surround wetlands in the northeast section of this region. The Prairie Coteau contains frigid udic soils composed of glacial till above cretaceous shales. Pasturelands in the region are composed of rolling areas, while flatter areas are utilized for agriculture, consisting of small grains, corn, and soybeans.

The majority of the Project Area has been converted to agricultural use, with cultivated crops as the main agricultural practice. The second dominant land use cover type is herbaceous, although no differentiation was made between planted (introduced) and native grasses. Wetland areas occur throughout the Project Area (Appendices G and H). Figure A-13 in Appendix A shows the vegetation coverage in the Project Area.

Approximately 39 percent of the Project Area is cultivated cropland, 31 percent is herbaceous (including grassland), which includes native and planted (introduced) grasses, and 16 percent is hay / pastureland.

13.1.1.1 Potentially Undisturbed Grasslands

A desktop review of potential native / potentially undisturbed grasslands in the Project Area was conducted by reviewing the grassland layers from South Dakota State University (South Dakota State University, 2016), National Land Cover Data (NLCD) (U.S. Department of Agriculture [USDA] Natural Resource Conservation Service, 2018b), National Agriculture Imagery Program (NAIP) aerial photography (USDA, 2015), USFWS National Wetland Inventory (NWI) maps (USFWS, 1981), multiple years of Google Earth imagery (Google Earth, 2018), and USFWS conservation, grassland, and wetland easement locations obtained from Deuel Harvest. A total of approximately 16,285 acres of potentially undisturbed grasslands within the Project Area were identified based on the desktop analysis. The potentially undisturbed grassland areas are shown on Figure A-13 in Appendix A. Areas of potentially undisturbed grasslands were field-verified in 2017 and 2018 by qualified biologists. The desktop review and field verification of potentially undisturbed grasslands determined that much of the Project Area has previously been highly impacted due to land conversion to row-crop agriculture and due to the introduction of non-native, cool-season grass species.

13.1.1.2 Cropland and Pastureland

In Deuel County in 2012 (the latest available year for the USDA Census of Agriculture data), approximately 61 percent of the land in farms was cropland, with corn for grain being the most common crop (USDA, 2012a). Soybeans were the second most common cultivated crop in the County. Specific acreages of different crops within the Project Area, which change from year to year, are not available. In Deuel County in 2012, approximately 33 percent of the land area was pastureland (USDA, 2012a).

As described in Section 11.2.1.3, NRCS farmland classifications include "prime farmland" (land that has the best combination of physical and chemical characteristics for the production of crops), "farmland of statewide importance" (land other than prime farmland that has a good combination of physical and chemical characteristics for the production of crops), and "not prime farmland" (land that does not meet qualifications for prime farmland), among other classifications. Most of the land in the Project Area is classified as "not prime farmland" (37 percent) or "prime farmland" (43 percent). Sixteen percent is categorized as "farmland of statewide importance." The remaining five percent is divided among "prime farmland if irrigated or drained" categories with stipulations. Farmland types within the Project Area are shown in Table 11-2.

13.1.1.3 Conservation Easements

Based on correspondence with USFWS and conservation easement database searches, several federally administered, State-managed, and private conservation lands occur in the Project Area (Conservation Biology Institute [CBI], 2012 and 2016). The USFWS administers several Waterfowl Production Areas (WPAs) within the Project Area, including Deuel County 101, 124, 135, and 156. The nearest Project facility to the above listed WPAs is approximately 0.2 miles from Project facilities. Additional WPAs occur within a 5-mile radius of the Project Area. A parcel of the Dakota Tallgrass Prairie Wildlife Management Area (WMA), Deuel County 51, is located within the Project Area and the Rome State WMA is a few miles east of the Project Area. NRCS easements are also located within the Project Area vicinity; three NRCS easement parcels are located just outside the Project Area boundaries between Clear Lake and Altamont (NRCS, 2018b). The easements contain prairie and wetland communities which provide habitat for grassland and wetland-dependent waterfowl, water birds, game birds, raptors which prey upon waterfowl, and shorebirds, depending on water conditions and nesting cover available. Public lands are shown on Figure A-8 in Appendix A.

The SDGFP owns and manages the Lake Francis Game Production Area (GPA) located within the Project Area. GPAs are managed for production and maintenance of wildlife species for hunting opportunities, including small and big game, and waterfowl (SDGFP, 2018a).

SDGFP contracts with private landowners to provide general hunting access through the Walk-In Area (WIA) program. Landowners who have Conservation Reserve Program (CRP) or other valuable wildlife habitat can open their lands to foot-traffic-only hunting in exchange for a small payment and immunity from non-negligent liability (SDGFP, 2018a). The Project Area contains three WIA parcels (SDGFP, 2018b).

The Nature Conservancy (TNC) owns a private conservation area, Altamont Prairie, protected by a USFWS easement that occurs in the central-eastern region of the Project Area. Two additional TNC areas occur nearby: Jacobsen Fen, located approximately 0.5 mile south of the Project Area, and 7-Mile Fen, located approximately 2.5 miles south of the Project Area. Both include a protected ecoregion containing a mix of tallgrass prairie and pothole habitat. Deuel Harvest has coordinated closely with TNC staff to discuss the Project and show the extent to which we are minimizing impacts to potentially undisturbed grasslands in the Project Area.

13.1.1.4 Noxious Weeds

Noxious weeds are regulated by State (SDCL 38-22) and Federal (U.S. CFR 2006) rules and regulations designed to stop the spread of plants that are detrimental to the environment, crops, livestock, and public health. According to the South Dakota Department of Agriculture (SDDOA), seven species of noxious weeds occur and are regulated within Deuel County (SDDOA, 2018) (Table 13-2).

Table 13-1: Noxious Weeds Occurring in Deuel County

Common Name	Scientific Name	Year Designated	Year Expires (End of December)
Absinth wormwood	*Artemisia absinthium*	2018	2022
Bull thistle	*Cirsium vulgare*	2018	2022
Musk thistle	*Carduus nutans*	2018	2022
Plumeless thistle	*Carduus acanthoides*	2018	2022
Poison hemlock	*Conium maculatum*	2018	2022
Scotch thistle	*Onopordum acanthium*	2013	2017
Yellow toadflax	*Linaria vulgaris*	2015	2019

13.1.2 Vegetation Impacts / Mitigation

Based on scoping conducted for the Project on the USFWS Information for Planning and Conservation (IPaC) online review tool, no federally listed plant species are present within the Project Area (USFWS, 2018a). Unmitigated loss of native or protected vegetation or introduction of noxious weeds could result in an impact to vegetation resources. Damage to field crops that occur on cultivated lands during construction would be compensated by the Applicant.

Construction of the Project would result in temporary and permanent impacts to existing vegetation within the Project Area. Direct permanent impacts would occur due to construction of the wind turbine foundations, access roads, Project Substation Interconnection Substation, Transmission Line, MET

equipment, O&M building, and collector lines. These impacts would result in a loss of production of crops and pasture grasses. Indirect impacts could include the spread of noxious weed species resulting from construction equipment introducing seeds into new areas, or erosion or sedimentation due to clearing ground in the construction areas. Vegetation communities most sensitive to disturbance are native prairies, grasslands with native plant communities, wetlands, and natural woodlands. The Project has been sited to reduce impacts to these sensitive habitats.

The proposed Project would result in approximately 327 acres of temporary disturbance and 57 acres of permanent disturbance to vegetation (predominantly cropland and grassland / pasture). Impacts that would occur to cultivated lands are not considered biologically significant, because these lands are frequently disturbed by tilling, planting, and harvesting activities associated with crop production.

Turbines, access roads, collector lines, and the Project Substation have been sited to generally avoid sensitive habitats. Where sensitive habitats cannot be avoided, additional micro-siting efforts would attempt to reduce impacts to these sensitive habitats. Temporary impacts would be mitigated through BMPs, such as re-vegetation and erosion control devices. These measures would reduce temporary impacts to vegetative communities adjacent to the Project facilities. Noxious weeds would be controlled using weed-free seed mixes and controlled spraying, as necessary.

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

- Ground disturbance will be limited wherever possible during construction in potentially undisturbed grasslands and limit the areas where construction vehicles drive through the Project Area;
- Exposed subgrade in areas where the native soil has been removed will be regraded to the original ground contour, and the soil will generally be replaced to follow the original soil profiles; and
- Disturbed areas will be reseeded with a weed-free native plant seed mixture at an appropriate application rate.

Tree-clearing activities for the Project will be minimized. Turbines have been primarily sited in open upland areas. When feasible, access roads and crane paths are sited to avoid crossing tree rows. The Project Substation, Transmission Facility, and underground 34.5-kV collector line routes were sited to avoid impacts to tree rows and woodlots whenever feasible. Some minor clearing of brush may be required for collector lines and access roads. In areas where access roads may need to cross shelter belts

due to engineering restrictions or the layout of leased lands, the Applicant would work with the landowner to develop an appropriate alignment that would be the least intrusive.

13.2 Wetlands and Waterbodies

The wetlands and waterbodies identified within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project, and avoidance, minimization, and mitigation measures. While aquatic in nature, wetlands and waterbodies are important functional components of the terrestrial ecosystem and are thus discussed in this section.

13.2.1 Existing Wetlands and Waterbodies

Wetlands perform several important functions within a landscape, including flood attenuation, groundwater recharge, water quality protection, and providing wildlife habitat. Wetlands are defined in the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory, 1987), as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." The Manual identifies three wetland criteria that must be met for a wetland to be present: dominance of hydrophytic vegetation, hydric soils, and sufficient hydrology. Some wetlands, as well as other waterbodies, are considered waters of the U.S. under Section 404 of the CWA and are, therefore, regulated by the USACE with respect to discharge of fill material into the water features. Wetlands have the following general diagnostic characteristics:

- Hydrophytic vegetation – The prevalent vegetation consists of macrophytes that are typically adapted to areas having hydrologic and soil conditions that are typically inundated or saturated by surface or groundwater. Hydrophytic species, due to morphological, physiological, and reproductive adaptation(s), can grow, effectively compete, reproduce, and persist in anaerobic soil conditions.

- Hydric soil – Soils are present and have been classified as hydric, or they possess characteristics that are associated with reducing soil conditions.

- Wetland hydrology – Wetland hydrology indicators provide evidence that the site has a continuing wetland hydrologic regime and that hydric soils and hydrophytic vegetation are not relicts of a past hydrologic regime. Wetland hydrology encompasses all hydrologic characteristics of areas that are periodically inundated or have soils saturated to the surface at some point during the growing season.

Wetlands are defined by the USACE as a subset of waters of the U.S. Other waters of the U.S. include unvegetated waterways and other water bodies with a defined bed and bank, such as tide channels, streams, drainages, ponds, creeks, rivers, and lakes. The USACE has the authority to regulate the discharge of dredged and fill material into jurisdictional waters of the U.S. Table 13-3 and Table 13-4 include waters of the U.S. within the Project Area that may be protected by the CWA. Impacts to waters of the U.S. are reviewed, permitted, and mitigated through the CWA Section 404 permitting process.

Prior to conducting a field delineation, a desktop review of wetlands and other waters of the U.S. was conducted for the Project. The review was conducted for the Project facility, including buffers. The buffers on Project facilities included turbine locations (250-foot radius), access roads (100-foot on either side of the centerline), collector lines (50-foot on either side of the centerline), and crane paths (50-foot buffer on either side of the centerline). Other potential Project Facilities, such as the Project Substation, Transmission Facility, O&M building, and laydown areas, were included in this analysis but did not have buffers applied. The Project facilities and associated buffers collectively are referred to as the Survey Corridor, which totaled approximately 1,779 acres.

The desktop review of wetlands and other waters of the U.S. included reviewing NWI maps (USFWS, 2016a; Appendices G and H). NWI maps are produced by the USFWS and provide reconnaissance-level information including location, type, and size of these resources. NWI maps are produced by review of high-altitude imagery, and interpretation is variable based on quality of aerial photographs, experience of the interpreter, and whether ground-truthing was conducted. According to the NWI maps, approximately 31 acres out of the approximately 1,779-acre Survey Corridor consist of freshwater emergent wetlands, freshwater ponds, riverine, lake, and freshwater forested / shrub wetland (USFWS, 2016a; Appendices G and H). This means that approximately 1.7 percent of the Project Area is mapped as wetlands or ponds.

Formal wetland and stream delineations for the Survey Corridor were completed in August and September 2018 (Appendix G). A follow-up wetland delineation was conducted on November 14, 2018 to survey an additional 30.2 acres, referred to as the Interconnection Area, resulting from design changes (Appendix H). The design changes were due to the relocation of the proposed Interconnection Substation, a portion of the Transmission Line corridor, Project Substation, and O&M building. All wetland delineation efforts were conducted in accordance with the 1987 Corps of Engineers Wetlands Delineation Manual (Environmental Laboratory, 1987) and the 2010 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Midwest Region – Version 2.0 (USACE, 2010).

A total of 25.25 acres of wetlands and 2,879 linear feet of stream channel were identified within the Survey Corridor and Interconnection Area. Table 13-3 summarizes the types and acreages of delineated wetlands within the Survey Corridor and Interconnection Area, and Table 13-4 summarizes the types and lengths of delineated streams within the Survey Corridor and Interconnection Area.

Table 13-2: Wetland Types Delineated Within the Survey Corridor and Interconnection Area

Wetland Classification	Area of Wetland Within Project Area (acres)
Palustrine Emergent (PEM)	24.04
Palustrine Aquatic Bed (PAB)	0.75
Palustrine Scrub-Shrub (PSS)	0.25
Palustrine Forested (PFO)	0.21
Total	**25.25**

Source: Wetland Delineation Report (Appendices G and H)

Table 13-3: Stream Types Delineated Within the Survey Corridor and Interconnection Area

Stream Classification	Length of Stream Within Corridor (feet)
Ephemeral	903
Intermittent	1,191
Perennial	785
Total	**2,879**

Source: Wetland Delineation Report (Appendices G and H)

13.2.2 Wetland and Waterbody Impacts / Mitigation

Impacts to wetlands, streams, and other water resources could occur by directly filling water resources due to Project construction, or by otherwise negatively altering their quality. The Applicant anticipates that the Project would avoid significant impact to wetland areas and streams. Wind turbines would be constructed in upland areas, avoiding the low-lying wetlands and streams. Wetland areas and streams would also generally be avoided when routing access roads and collector lines. Collector lines that cross delineated wetlands and streams would be constructed by directionally boring beneath the wetland. To further protect wetlands and streams, BMPs for sediment and erosion control would be implemented. To limit the risk of contamination of wetlands and streams due to accidental spilling of fuels or other hazardous substances, construction equipment would be refueled in areas away from wetlands or drainage areas, and a spill kit would be available at the construction site. Formal wetland and stream delineations within the Project Area were completed in August, September, and November 2018. If the final Project

Facility locations were to result in unavoidable impacts to wetlands or waters of the U.S., the Applicant would coordinate with the USACE.

13.3 Wildlife

To reduce the potential impacts of wind energy facilities on wildlife species and habitat, the USFWS has developed the *Land-Based Wind Energy Guidelines* (WEG) (USFWS, 2012) and the *Eagle Conservation Plan Guidance* (ECPG) (USFWS, 2013a). These voluntary guidelines provide a structured, scientific approach for assessing wildlife risks at wind energy facilities, promote communication between project proponents and federal / State agencies, and provide a practical approach to address wildlife conservation concerns at all stages of land-based wind energy development. SDGFP, in cooperation with the South Dakota Bat Working Group, has also developed siting guidelines for wind energy projects to address potential impacts to natural resources (South Dakota Bat Working Group and SDGFP, undated). These guidelines are generally consistent with the WEG, but also provide guidance for other non-wildlife resources (e.g., land use, noise, visual resources, soil erosion, and water quality).

The Applicant followed the processes outlined by the WEG and ECPG for developing, constructing, and operating wind energy projects. The Applicant has engaged in ongoing coordination with the USFWS and SDGFP to seek input on wildlife resources potentially occurring within the Project Area and to seek guidance on the appropriate studies to evaluate risk and inform development of impact avoidance and minimization measures for the Project. Summaries of coordination meetings are included in Section 27.2, and Appendix B contains all agency correspondence to date.

13.3.1 Existing Wildlife

The wildlife identified within the Project Area is described below, followed by a discussion of the potential effects of the proposed Project's construction and operation, and mitigation and minimization measures.

Wildlife species associated with croplands, grasslands, and shrublands are generally common types of species observed and expected to occur within the Project Area. Multiple site visits were conducted by WEST (Appendices J and L) and Burns & McDonnell (Appendices H, I, K, M, and N) to characterize the Project Area. A list of common wildlife species that are likely to be found in the Project Area is provided in Table 13-5.

Table 13-4: Representative Common Wildlife Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Common Name	Scientific Name
Birds		**Mammals**	
American bittern	*Botaurus lentiginosus*	Big brown bat	*Eptesicus fuscus*
American kestrel	*Falco sparverius*	Eastern red bat	*Lasiurus borealis*
American white pelican	*Pelecanus erythrorhynchos*	Hoary bat	*Lasiurus cinereus*
Bald eagle	*Haliaeetus leucocephalus*	Little brown bat	*Myotis lucifugus*
Broad-winged hawk	*Buteo platypterus*	Northern long□eared bat	*Myotis septentrionalis*
Canada goose	*Branta canadensis*	Silver-haired bat	*Lasionycteris noctivagans*
Double-crested cormorant	*Phalacrocorax auritus*	White-tailed deer	*Odocoileus virginianus*
Franklin's gull	*Leucophaeus pipixcan*	Coyote	*Canis latrans*
Golden eagle	*Aquila chrysaetos*	Masked shrew	*Sorex cinereus*
Great blue heron	*Ardea herodias*	Eastern cottontail	*Sylvilagus floridanus*
Great egret	*Ardea alba*	White-tailed jackrabbit	*Lepus townsendii*
Mallard	*Anas platyrhynchos*	Thirteen-line ground squirrel	*Spermophilus tridecemlineatus*
Merlin	*Falco columbarius*	Beaver	*Castor canadensis*
Northern harrier	*Circus cyaneus*	**Reptiles and Amphibians**	
Osprey	*Pandion haliaetus*	American toad	*Anaxyrus americanus*
Red-tailed hawk	*Buteo jamaicensis*	Canadian toad	*Anaxyrus hemiophrys*
Ring-necked duck	*Aythya collaris*	Woodhouse's toad	*Anaxyrus woodhousii*
Rough-legged hawk	*Buteo lagopus*	Boreal chorus frog	*Pseudacris maculata*
Snow goose	*Chen caerulescens*	Northern leopard frog	*Rana pipiens*
Swainson's hawk	*Buteo swainsoni*	Snapping turtle	*Chelydra serpentina*
Turkey	*Meleagris gallopavo*	Painted turtle	*Chrysemys picta*
Turkey vulture	*Cathartes aura*	Prairie skink	*Plestiodon septentrionalis*
Western grebe	*Aechmophorus occidentalis*	Red-bellied snake	*Storeria occipitomaculata*
White-fronted goose	*Anser albifrons*	Plains garter snake	*Thamnophis radix*
Wood duck	*Aix sponsa*	Common garter snake	*Thamnophis sirtalis*

13.3.1.1 Migratory Birds

Numerous avian species use the Project Area. The Migratory Bird Treaty Act (MBTA) provides protection for most avian species in the U.S. The Bald and Golden Eagle Protection Act (BGEPA) provides protection for bald and golden eagles. Additional habitats or areas may have designations at a State level or by third party entities.

The Project Area is located within the Central Flyway, which is used by migrating waterfowl, songbirds,

shorebirds and raptors. The Project Area encompasses diverse wetlands, open water, woodlands, and cultivated croplands that may provide suitable foraging and stopover habitat for migrating avian species. Important Bird Areas (IBAs), as defined by the National Audubon Society, are identified as being important for the conservation of bird populations at the global, regional, or local levels. This includes sites for breeding, wintering, and / or migrating birds, as well as providing essential habitat for one or more species (National Audubon Society, 2017). The registered IBAs that are closest to the Project Area include the Prairie Coteau Complex IBA, a portion of the complex is located approximately 2 miles southeast of the Project Area, and the Salt Lake IBA, is located approximately 5 miles northeast of the Project Area, both in Minnesota (National Audubon Society, 2017).

The Prairie Coteau Complex IBA consists of six separate areas containing a variety of private lands, TNC lands, State of Minnesota WMAs and WPAs (National Audubon Society, 2017). This IBA contains numerous wetlands that contain native tallgrass prairies, including sedge wetlands, which attract a diverse variety of prairie, grassland, and marsh birds. The Salt Lake IBA includes a 312-acre alkaline lake (i.e., salty inland lake) surrounded by grasslands and cultivated crops with large mudflats. This IBA also supports a large diversity of grassland species, waterfowl, waterbirds, and shorebird species (National Audubon Society, 2017).

The USFWS lists 27 species as Birds of Conservation Concern (BCC) within the Prairie Potholes Bird Conservation Region (BCR) 11, in which the Project is located (USFWS, 2008). These avian species are protected under the MBTA and have been identified as vulnerable to population declines in the BCR (USFWS, 2008).

Of these 27 species, 19 could potentially use or occur in appropriate habitats (e.g., wetlands, grasslands, forested areas) within the Project Area during migration, nesting, or wintering (Jennings et al., 2005). The combination of wetlands and grasslands in the Project Area may attract many nesting, foraging, and roosting birds, and grain fields may provide additional feeding opportunities.

13.3.1.2 Raptors

The following sections describe the likelihood of the presence of raptor species within the Project Area.

13.3.1.2.1 Raptor Species Likely to Occur in the Project Area

Based on raptor distribution maps, 1 vulture species, 8 owl species and 15 diurnal raptor species could occur in or near the Project Area during migration, nesting, or wintering. Of these 24 species, 15 have the potential to breed in the Project Area (Table 13-6). This is based on potentially suitable nesting habitat and the individual breeding ranges of the species (SDGFP, 2016; NatureServe, 2018).

Table 13-5: Raptor Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Year-round	Summer	Winter	Migration
Diurnal Raptors					
American kestrel	*Falco sparverius*		X		X
Bald eagle	*Haliaeetus leucocephalus*	X			
Broad-winged hawk	*Buteo platypterus*		X		X
Cooper's hawk	*Accipiter cooperii*	X			
Golden eagle	*Aquila chrysaetos*			X	X
Gyrfalcon	*Falco rusticolus*				X
Ferruginous hawk	*Buteo regalis*				X
Merlin	*Falco columbarius*				X
Northern goshawk	*Accipiter gentilis*				X
Northern harrier	*Circus cyaneus*	X			
Osprey	*Pandion haliaetus*				X
Red-tailed hawk	*Buteo jamaicensis*	X			
Rough-legged hawk	*Buteo lagopus*			X	X
Sharp-shinned hawk	*Accipiter striatus*			X	X
Swainson's hawk	*Buteo swainsoni*		X		X
Owls					
Barn owl	*Tyto alba*		X		X
Burrowing owl	*Athene cunicularia*		X		
Eastern screech owl	*Megascops asio*	X			
Great horned owl	*Bubo virginianus*	X			
Long-eared owl	*Asio otus*	X			
Northern saw-whet owl	*Aegolius acadicus*	X			
Short-eared owl	*Asio flammeus*	X			
Snowy owl	*Bubo scandiacus*			X	X
Vultures					
Turkey vulture	*Cathartes aura*		X		X

Source: South Dakota Birds (2018); SDGFP (2018c); NatureServe (2018)

Breeding Bird Survey and Avian Usage studies of the Project Area in 2016, 2017, and 2018 identified the red-tailed hawk, rough-legged hawk, Swainson's hawk, northern harrier, Cooper's hawk, American kestrel, merlin, golden eagle, and bald eagle, among other species within the Project Area (Appendices J and K).

13.3.1.2.2 Potential for Raptor Migration in the Area

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

During migration, raptors could rest and forage in the Project Area. Field edges, roads, railroads, buildings, open fields, wetlands, and riparian areas within the Project Area provide potential foraging habitat for raptors where prey species may be concentrated. No unique land features, habitat types, or seasonal differences are known to occur in the Project Area relative to the overall landscape of the region that could concentrate prey and potential use by raptors.

The Project is located on flat to gently rolling agricultural fields, lacking the defined topographical ridges or other features typically used by migrating raptors. Potential for raptors to use open fields, wetland areas, Lake Alice, Lake Francis, Lone Tree Lake, and riparian corridors along the streams and unnamed drainages in the Project Area is likely.

13.3.1.2.3 Potential Raptor Nesting Habitat

The current land usages and field studies have shown that small scattered woodlots, wooded farmsteads, shelter belts, and wooded draws and hillsides could provide raptor nesting habitat for species such as the red-tailed hawk and Swainson's hawk (Appendices I, J, and L). Breeding ground-nesting raptors could nest in small woodlots, shelterbelts, and isolated trees. Ground-nesting species, such as the burrowing owl, short-eared owl, and northern harrier, may nest in the grasslands or wet meadows present in the Project Area. Nesting within developed or agricultural areas could occur in manmade structures, such as abandoned buildings, power poles, ornamental trees, and other infrastructure.

13.3.1.3 Bats

Six bat species have ranges overlapping the Project Area, including the federally and State-threatened northern long-eared bat (NLEB). The other five bat species with ranges overlapping the Project Area include the eastern red bat (*Lasiurus borealis*), little brown bat (*Myotis lucifugus*), big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*) (Appendices L and M). The silver-haired bat is considered a Species of Greatest Conservation Need (SGCN).

The Project Area contains approximately 177 acres of deciduous forest (NLCD, 2011) suitable for summer tree-roosting bats, primarily located along the forested patches of Lost Creek, Crow Timber Creek, Crow Creek, and Monighan Creek and scattered wooded patches throughout the Project Area (Appendices G, I, and J). No known caves were documented in a literature search for Deuel County; however, a USGS map of potential karst formations showed a narrow band of carbonite rocks extending through eastern South Dakota and Deuel County. It is not anticipated that bats utilize the Project Area during winter due to the lack of known hibernaculum or cave habitats. Species occurring in South Dakota and potentially occurring in the Project Area are listed in Table 13-7.

Bat acoustic and mist-netting studies conducted in 2016 and 2017 within the Project Area detected three of the identified bat species with a potential to occur in the Project Area. These three bats were the big brown, eastern red, and hoary (Appendix L), confirming that these species utilize the Project Area from spring through fall.

Table 13-6: Bat Species with Known or Potential Occurrence in the Project Area

Common Name	Scientific Name	Habitat	Presence in Project Area
Big brown bat	*Eptesicus fuscus*	Common in most habitats, abundant in deciduous forests and suburban areas with agriculture; maternity colonies beneath bark, tree cavities, buildings, barns, and bridges.	Yes, encountered
Eastern red bat	*Lasiurus borealis*	Abundant tree bat; roosts in trees; solitary.	Yes, encountered
Hoary bat	*Lasiurus cinereus*	Usually not found in man-made structures; roosts in trees; very wide-spread.	Yes, encountered
Silver-haired bat	*Lasionycteris noctivagans*	Common bat in forested areas, particularly old growth; maternity colonies in tree cavities or hollows; hibernates in forests or cliff faces.	Likely

Common Name	Scientific Name	Habitat	Presence in Project Area
Northern long-eared bat	*Myotis septentrionalis*	Associated with forests; chooses maternity roosts in buildings, under loose bark, and in the cavities of trees; caves and underground mines are their choice sites for hibernating; on western edge of range.	Unlikely
Little brown bat	*Myotis lucifugus*	Commonly forages over water; roosts in attics, barns, bridges, snags, and loose bark; hibernacula in caves and mines.	Likely

Source: Appendices L and M

13.3.2 Sensitive Terrestrial Species

The following sections discuss federally and State listed species that may occur in the Project Area based on federal and State species lists and maps of known distribution and range.

13.3.2.1 Federally Listed Species

Federally listed threatened or endangered species could potentially occur in the Project Area. Based on information provided from the IPaC system (USFWS, 2018a), four federally listed wildlife species may occur in Deuel County, South Dakota, and may occupy habitats present within the proposed Project Area. These species are the NLEB, rufa red knot, Dakota skipper, and the Poweshiek skipperling. The federally endangered whooping crane has a low likelihood of occurring in Deuel County based on distribution ranges and regional sightings (eBird, 2018; NatureServe, 2018), and is discussed in this section. Federally listed threatened and endangered species are discussed in further detail below.

Northern Long-Eared Bat

The NLEB is included under the *ESA Final 4(d) Rule for the Northern Long-eared Bat* (4(d) Rule). The NLEB hibernates in caves or abandoned mines during the winter. During the summer, the NLEB may roost beneath loose bark of live, dead, or dying trees. Additionally, the NLEB may roost in barns, in sheds, under bridges, or in other buildings that have little human disturbance. Female NLEBs typically roost as a maternity colony, while male NLEBs tend to roost singly or in small groups. Roosting and foraging habitat include forests, wooded fence rows, and riparian areas. The primary causes of decline in NLEB populations are the rapid spread of white-nose syndrome (WNS) across the eastern U.S. and the

Midwest, habitat degradation, and human disturbance of hibernacula (caves or abandoned mines) during the bats' hibernation. WNS is caused by the fungus *Pseudogymnoascus destructans*.

The USFWS has issued a 4(d) Rule to allow for more flexible implementation of the ESA and "to tailor prohibitions to those that make the most sense for protecting and managing at-risk species." The implementation of the final 4(d) Rule for the NLEB exempts certain activities within the WNS buffer zone (those areas within 150 miles of WNS-positive counties) provided certain conservation measures are implemented. Specifically, the final 4(d) Rule allows for incidental take associated with tree removal, provided the clearing occurs more than 0.25 mile from known hibernacula and more than 150 feet from known, occupied maternity roost trees during the pup-rearing season (June 1 to July 31). Furthermore, incidental take resulting from activities unassociated with tree removal (e.g., turbine strikes) is not prohibited.

Based on the map updated by USFWS on October 1, 2018 (USFWS, 2018b), the Project would occur within the WNS buffer zone; thus clearing should not occur within 0.25 mile of known hibernacula or within 150 feet of known maternity roost trees during the pup rearing season, per guidance in the 4(d) Rule. The distribution of NLEBs in South Dakota is poorly understood, but Project mist-netting surveys conducted in the Project Area did not identify any NLEBs in the initial Project Area (Appendix L).

The range of NLEBs is typically associated with mature interior forests and not the habitats associated with croplands and limited grasslands and forested areas in the Project Area. In addition, forested habitat typically occupied by NLEBs does not occur within the Project Area; therefore, NLEBs are unlikely to occur in the Project Area. Based on the foregoing, the proposed Project is not likely to adversely affect NLEBs, and population-level impacts are not expected. In addition, Project turbines will be feathered below a cut-in speed of 3.0 m per second (m/s; 6.7 mph) from sunset to sunrise April 1 – October 31 to reduce impacts to all bat species, including the northern long-eared bat. This feathering will reduce the speed that blades will rotate when the turbines are not generating electricity in order to minimize the risk of bat-blade collisions. Also, as recommended in the USFWS' Northern Long-Eared Bat Interim Guidance (Appendix O; USFWS 2014), all turbines will be sited more than 1,000 ft from the edge of connected patches of forested habitat (Appendix O; Section 2.3.2) to avoid potential impacts to bats, including northern long-eared bats. As such, no impacts to NLEB are anticipated from the Project.

Rufa red knot

The rufa red knot is a medium-sized, stocky, short-necked sandpiper with a rather short, straight bill. The rufa subspecies, one of three subspecies occurring in North America, has one of the longest migration distances known, travelling between its breeding grounds in the central Canadian Arctic to wintering

areas that are primarily in South America (USFWS, 2011a). During the breeding season, red knots are typically found in sparsely vegetated, dry tundra areas (Harrington, 2001; All About Birds, 2018). Outside of the breeding season, red knots are usually found along intertidal, marine beaches (Harrington, 2001). During migration, some red knots can be found flying over inland areas, but these cases are rare (Sibley, 2003). The red knot population is threatened by habitat loss in migration and wintering areas, reduction of quality and quantity of food resources, asynchronies in timing throughout its breeding and migration range, and high predation on the breeding grounds every 3 to 4 years (USFWS, 2014).

The rufa red knot has documented observations outside the Project Area. Based on lack of observations in the Project Area and lack of suitable breeding habitat, a low probability exists for the occurrence of this species in the Project Area.

Dakota skipper and Poweshiek Skipperling

The federally threatened Dakota skipper requires upland prairie that is relatively dry and often found on hillsides and ridges for all portions of its life cycle (i.e., it is not a migratory species). Needle grasses (*Stipa* spp.), little bluestem, and other similar clump-forming native warm season grasses, as well as purple coneflower (*Echinacea angustifolia*), are typical of high-quality sites for the Dakota skipper. The Dakota skipper also uses other flowers for nectar, such as fleabanes (*Erigeron* spp.) and black-eye susans (*Rudbeckia* spp.), among others (USFWS, 2018c).

Habitat capable of supporting Poweshiek skipperlings are generally considered to be similar to habitat that can support Dakota skippers. However, the Poweshiek skipperling lives in high quality tallgrass prairie in both low, moist areas and dry, upland areas (USFWS, 2018b). This habitat is required for all portions of its life cycle (i.e., it is not a migratory species). The adult Poweshiek skipperlings feed on nectar from prairie flowers such as black-eyed susan, palespike lobelia (*Lobelia spicata*), and purple coneflower (Selby, 2005; USFWS, 2018d).

Sharp population declines for both the Dakota skipper and Poweshiek skipperling have been observed the last 20 years; however, reasons for this decline are still poorly understood (USFWS, 2011b). Herbicide use, invasive species, pathogens, conversion to croplands, and habitat fragmentation have resulted in loss and degradation of preferred tallgrass prairie habitat and have been suggested as possible causes of decline for both species (Selby, 2010; Appendix N).

Critical habitat has been designated for both species in Deuel County, South Dakota, on lands located both inside and outside of their current estimated geographical range (USFWS, 2015a, 2015b, 2015c).

The designation was based on the presence of physical or biological features that support life-history processes essential for the conservation of these species and occupancy at the time of listing.

One parcel of land designated as critical habitat for the Dakota skipper occurs adjacent to the Project Area (Figure A-3 in Appendix A). This parcel is designated as "DS SD Unit 03, Subunit A" and includes approximately 40 acres that adjoins to the west approximately 450 acres adjacent to the Project Area (USFWS, 2015a, 2015b, 2015c; Appendix N). This same parcel is also included in the critical habitat for Poweshiek skipperling and designated as "PS SD Unit 03, Subunit A" (USFWS, 2015a, 2015b, 2015c; Appendix N).

A historical record from the SDGFP for both the Poweshiek skipperling and Dakota skipper exists within Project Area (Figure A-3 in Appendix A; Appendix N). Both uplands and wetlands in the Project Area have been heavily invaded by non-native cool season grasses, while parcels with native prairie grasses are largely associated with relatively low diversity Conservation Reserve Program (CRP) plantings and/or grazing or haying activities limiting vegetation stand diversity for native plants. Additionally, native prairie flowers that may support these butterfly species, such as *Echinacea* spp., are not abundant in the remnant native prairie grasses.

The potential for these protected species to occur in the Project Area is moderate. This assessment is based on the location of designated critical habitat relative to the Project Area, and grassland conversions reducing the amount of suitable habitat for both butterfly species, and grazing/haying activities. The Project has been sited to avoid impacts to potential suitable habitat for the Dakota skipper or Poweshiek skipperling. Based on these efforts, the Project is not likely to adversely affect Dakota skippers or Poweshiek skipperlings, and population-level impacts are not expected.

Whooping Crane

The whooping crane is a large migratory bird that temporarily occurs in South Dakota during the spring and fall migrations. The Aransas / Wood Buffalo population nests in prairie wetlands in Saskatchewan, Canada and migrates south to winter on the gulf coast of Texas. The Project Area is not located within the USFWS whooping crane migration corridor, which is located approximately 85 miles west of the Project Area (Appendices J and K); thus, whooping cranes are unlikely to occur in the Project Area.

13.3.2.2 State-listed Species

Five species that are State-listed may occur in Deuel County, South Dakota. Four of those species are based on USFWS and SDGFP county distribution lists and the fifth, the osprey (*Pandion haliaetus*), is based on the species' known distribution and range mapping. Based on suitable habitat descriptions for

each species (NatureServe 2018, South Dakota Birds 2018), four of the five species may potentially occur in the Project Area, ranging from a low to moderate likelihood of occurrence. These four species are the whooping crane (also federally endangered), osprey, banded killifish (*Fundulus diaphanous),* and northern redbelly dace (*Chrosomus eos*). The State-threatened northern river otter (*Lontra canadensis*) is not likely to occur within the Project Area due to limited suitable habitat and lack of historical records. The three aquatic species (banded killifish, northern redbelly dace, and northern river otter) are addressed in Section 14.2.

Whooping Crane
Please refer to Section 13.3.2.1 for discussion on Whooping Crane.

Osprey
The State-threatened osprey is a piscivorous raptor typically found near freshwater and salt-water habitats, including coastlines, inland lakes, and rivers. Ospreys build large nests that contain sticks, lined with bark, sod, grasses, and vines atop of dead trees or artificial structures. Ospreys occurred historically in the region but declined between the 1950s and the 1970s from the effects of pesticides. Ospreys have been recorded in the general vicinity of the Project Area, mostly during migration. The closest prior observation to the Project Area is approximately 29 km (18 miles) to the south, at Oak Lake, South Dakota (eBird, 2018). It is possible that migrating ospreys may forage in the Project Area, utilizing forested areas along riparian corridors, open waterbodies, and open wetlands. Although this species was sited during Year 2 of the large-bird surveys, as discussed in Section 13.3.32 below, the likelihood of this species to occur in the Project Area would be low due to the limited amount of suitable breeding and foraging habitat and the lack of recorded sightings for the County and Project Area.

13.3.3 Studies Conducted to Date

Various wildlife studies were completed for the Project between 2016 and 2018, as outlined in Table 2.1 above. The Project Area has evolved since the wildlife studies began. The wildlife studies cover the current Project Area. As see on in Appendix B, the Applicant met with USFWS and SDGFP on throughout 2016 to 2018 to discuss the Project and provide updated survey results.

Federal protection is provided for bald and golden eagles, as well as species of migratory birds, through the BGEPA and the MBTA. Both laws are intended to prohibit “take” and regulate impacts to eagles and other migratory birds from direct mortality, habitat degradation, and / or displacement of individual birds. To determine the presence of bird species that occur within the Project Area, the Applicant completed various surveys in accordance with Tier 3 of the WEG, Stage 2 of the ECPG, and USFWS and SDGFP guidance. Surveys included raptor nest surveys and avian use surveys. In addition to avian surveys, bat

acoustic surveys were completed in 2017. The reports detailing the methods and results of the bird and bat surveys are included in Appendices I through M and summarized below.

13.3.3.1 Raptor and Eagle Nest Surveys

Aerial raptor nest surveys were completed in 2016 and ground-based raptor nest surveys were completed in 2017 (Appendix I) to characterize the raptor nesting community and locate nests for raptors within the Project Area and 1-mile buffer, and for eagles within 10 miles of the Project Area. The 2017 survey focused on the identified nest locations from the 2016 raptor nest surveys within the Project Area and incidental observation of any new nests for the 2017 breeding season. The Project Area has changed during the survey periods with the current Project Area included in all the survey efforts.

The 2016 survey efforts that were completed March 28 through April 1 documented 15 stick nests in the Project Area, as defined at that time and which incorporated the entire current Project Area. Nineteen stick nests were documented in the Project Area during the May 2017 survey. The 2017 survey efforts document 13 nests at the same relative location as those found in 2016. Within the 19 observed nests, 7 nests were determined to be active and 12 nests were either inactive or unable to be determined. No bald eagle nests were observed within the Project Area. Five active bald eagle nests and 3 potential bald eagle nests (i.e., unoccupied or inactive) were located within 10 miles of the Project Area. The closest active bald eagle nest is approximately 4 miles from the Project Area, while the farthest active nest is approximately 9 miles from the Project Area. The inactive bale eagle nests are approximately 2 to 8 miles from the Project (Appendix I).

13.3.3.2 Avian Use Surveys

Two years of avian / eagle use point-count surveys were completed for the Project from April 2016 to April 2018 to evaluate species composition, relative abundance, and spatial characteristics of avian use in accordance with agency recommendations (Appendices J and K). At the initiation of the avian surveys in April 2016, 24 points were selected for monthly surveys. Due to changes in the Project Area, 10 survey points were added in January 2017, one point was removed in May 2017, and 15 points were added and 2 points removed in August 2017. Changes to the Project Area included the addition of some lands in the western part of the Project.

Fixed-point bird use surveys were conducted using methods described by Reynolds et al. (1980) to estimate the seasonal and spatial use of the Project Area by birds, particularly diurnal raptors (defined here as kites, accipiters, buteos, harriers, eagles, falcons, and osprey). The Year One surveys, conducted April 2016 to March 2017, included large-bird surveys and small-bird surveys. The Year Two surveys,

conducted May 2017 to April 2018, included surveys for large birds. The large-bird surveys recorded data for large-bird species, eagles, and species of concern (i.e., federally or state-threatened and endangered species, USFWS BCC (USFWS, 2008), and South Dakota SGCN (SDGFP, 2014).

Fixed-point bird use surveys were conducted approximately once per month, with seasons defined as spring (March 1 – May 31), summer (June 1 – August 31), fall (September 1 – November 30), and winter (December 1 – February 28). Points were selected to survey representative habitats and topography of the Project Area, while achieving relatively even coverage of the Project Area. In Year One (2016), 327 surveys were conducted. In Year Two (2017), 512 surveys were conducted. Each survey plot for large-bird surveys was an 800-meter (2,625-foot) radius circle centered on the point. Each survey plot was surveyed for 60 minutes during the large-bird surveys. Small-bird surveys were conducted only in Year One and used a 100-meter radius and 8-minute survey length. Analysis of the survey results included calculating bird diversity, species richness, mean use, percent of use, frequency of occurrence, flight height, and spatial use.

The small-bird surveys conducted in Year One recorded 2,715 birds in 1,073 groups (defined as one or more individuals), representing 49 species. Passerines (songbirds) accounted for 96.2 percent of small bird observations. The most abundant passerine species was horned lark (*Eremophila alpestris*), followed by brown-headed cowbird (*Molothrus ater*) and unidentified blackbirds.

During Year One of the large-bird use surveys, 42 unique bird species, including 30,640 observations in 1,039 separate groups, were recorded. More birds were observed in spring (80.4 percent of observations) than any other season. Waterfowl accounted for most (95.7 percent) observations recorded mostly during spring (83.4 percent of waterfowl observations). Raptors (8 different species) accounted for 0.7 percent of large bird observations. The most common raptor species were red-tailed hawk (*Buteo jamaicensis*) and northern harrier (*Circus cyaneus*). Bald eagle and unidentified eagles accounted for 19.6 percent of raptor observations (39 and 2 observations, respectively) and 0.1 percent of large bird observations. Eagles were observed more often during spring (20 observations) and winter (12 observations) than during summer (5 observations) or fall (4 observations). Sensitive species observed during the Year One large bird surveys included American white pelican (*Pelecanus erythrorhynchos*), bald eagle, marbled godwit (*Limosa fedoa*), and willet (*Tringa semipalmata*). American white pelican, marbled godwit, and willet are considered South Dakota SGCN, while the bald eagle is protected under the BGEPA. No State- or federally threatened or endangered species were observed, and no golden eagles were observed.

During Year Two of the large-bird surveys, 3,528 large bird observations of 29 species in 539 separate groups were observed. More birds were generally observed in spring (61.1 percent of observations) than in summer (7.5 percent), fall (26.2 percent), or winter (5.2 percent). Waterfowl accounted for 86.5 percent of observations (3,051 observations), with most (2,064 observations) recorded during spring. The most frequently observed waterfowl species was Canada goose (*Branta canadensis*), with 2,347 observations, which accounted for 67 percent of all large bird observations. Other frequently observed waterfowl species were snow goose (*Chen caerulescens*; 600 observations) and mallard (*Anas platyrhynchos*; 39 observations). Raptors accounted for 6.3 percent of large bird observations (223 observations). The most common raptor species identified was the red-tailed hawk, with 130 observations. Eagles accounted for 6.7 percent of raptor observations (15 observations). Eagles were observed more often in winter (6 observations; 40 percent of all eagle observations) than other seasons. Eagles were observed least often in summer (2 observations; 13.3 percent of all eagle observations). Eagle observations included 11 bald eagles and 4 golden eagles. Sensitive species observed during the Year Two surveys included American white pelican, bald eagle, golden eagle, and osprey. The osprey is listed by the SDGFP as a threatened species.

13.3.3.3 Bat Surveys

Of the six bat species with the potential to occur in the Project Area, the NLEB is the only state or federally listed bat with the potential to occur within the area. The NLEB was listed as a threatened species under the ESA in 2015. The Project Area is on the western fringe of the estimated range for the species (Bat Conservation International, Inc. [BCI], 2015). Two types of bat surveys were conducted for the Project: a presence / absence survey that targeted any bat species, including NLEB, was conducted using mist-netting equipment July to August 2016 and bat acoustic studies were conducted April 14 to November 3, 2016 and July 20 to October 17, 2017.

The mist-netting survey conducted between July 22, 2016, and August 15, 2016, was completed at 10 sites in the Project Area, for the purpose of determining presence or probable absence of the NLEB in the Project area. Species captured included the big brown bat, eastern red bat, and hoary bat. No NLEBs were captured, so this species was determined to be likely absent from the Project Area.

Acoustic surveys were conducted from a single ground-based site near the middle of the Project Area for the purpose of characterizing overall bat activity for the Project. The acoustic survey site was located near the border of a lake, wetland area, forest, and cropland. The acoustic survey in Year One was conducted April 14 to November 3, 2016, and the acoustic survey in Year Two was conducted July 20 to October 17, 2017. Bat calls were filtered from noise files, and the calls were categorized as low-

frequency (minimum frequency 30 kiloHertz [kHz] or less) or high-frequency (minimum frequency greater than 30 kHz). Low-frequency species include big brown bat, hoary bat, and silver-haired bat, while high-frequency species include eastern red-bat, little brown bat, and NLEB.

In the Year One acoustic bat study (April 14 to November 3, 2016), a total of 5,498 bat passes were recorded across 204 detector-nights, for an average bat activity level of 26.8 passes per detector-night. High-frequency bat passes represented 51 percent of the recorded bat passes, while low-frequency bat passes represented 49 percent of the recorded passes. Bat activity was highest in summer (38.1 passes per detector-night), followed by fall (21.5 passes per detector-night) and spring (7.6 passes per detector-night).

In the Year Two acoustic bat study (July 20 to October 17, 2017), a total of 4,196 bat passes were recorded across 89 detector-nights, for an average bat activity level of 47.1 passes per detector-night. Most of the bat passes (54 percent) were from high-frequency species, while low-frequency species made up 46 percent of the passes. Activity was higher during the summer (91.6 passes per detector-night) than during the fall (27.8 passes per detector-night). Compared to a corresponding timeframe from Year One, high-frequency bat activity was 10 percent higher and low-frequency bat activity was 96 percent higher in Year Two. Summer activity was approximately 100 percent higher and fall activity was approximately 4 percent less in Year Two than in Year One.

13.3.3.4 Dakota skipper and Poweshiek Skipperling

Protected butterfly habitat assessments were conducted in 2016 and 2017 (Appendix N).

13.3.4 Wildlife Impacts / Mitigation

Terrestrial wildlife species could be impacted at various spatial and temporal scales during the construction phase of the Project. Direct disruption of habitat and potentially direct mortality could occur during the construction phase of the Project. Permanent habitat loss due to construction of wind turbines and other facilities, including the 150-foot long Transmission Line, would be minimal across the Project Area and localized.

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

13.3.4.1 Federally Listed Terrestrial Species

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

Whooping Crane

The Project Area is composed of cropland and herbaceous cover with interspersed streams and areas of open water, which provides potentially suitable stopover habitat during spring and fall migration. However, the likelihood of occurrence of the whooping crane is small given the lack of historical observations in the area and considering that the Project Area is approximately 85 miles east of the whooping crane migration corridor and South Dakota's primary occurrence area. No impacts to the whooping crane are anticipated from the Project.

Rufa Red Knot

No suitable rufa red knot habitat was observed in the Project Area during the numerous site visits. Red knots are unlikely to breed within the Project Area, but the species could potentially migrate through the Project Area, although stopover during migration is not likely due to lack of habitat. No impacts to the rufa red knot are anticipated from the Project.

Dakota Skipper and Poweshiek Skipperling

Based on the location of designated critical habitat relative to the Project Area, historical records within the Project Area, and limited suitable grassland habitat, a low potential exists for these species to occur in the Project Area. Considering these factors, it is not anticipated that these species will experience impacts associated with the construction and long-term maintenance of the Project.

Furthermore, no evidence exists to suggest that butterfly mortality is a concern at commissioned wind farm sites due to collisions with turbines (Grealey and Stephenson, 2007). Studies on this topic have suggested the wind speeds and patterns associated with operating turbines likely will not create a collision issue with butterflies resulting in a low probability of direct impacts. Since a majority of habitat has already been impacted by grassland conversions and invasion by cool season species, minor indirect impacts will occur due to loss of habitat for these species. Impacts to these species can be mitigated through siting to minimize work in suitable habitat, restricting work to within designated areas, salvaging topsoil for reuse at the derived locations, and reclaiming native habitat where possible upon completion of the Project. Protected butterfly habitat assessments were conducted in 2017 and 2018 (Appendix N).

Northern Long-Eared Bat

Habitat features, including hibernacula such as caves and abandoned mines, are lacking in the Project Area, and distance to such features makes the likelihood of NLEBs being present very low. Although WNS is the primary threat to NLEB populations, impacts of wind facilities on bat species can also be a concern. However, under the ESA *Final 4(d) Rule for the Northern Long-eared Bat* (4(d) rule) published on January 14, 2016 (USFWS, 2016b), it was determined that wind-energy development has not led to significant declines in this species, nor is there evidence that regulating the incidental take that is occurring would meaningfully change the conservation or recovery potential of the species considering the impact of WNS. In addition, Project turbines will be feathered below a cut-in speed of 3.0 m per second (m/s; 6.7 mph) from sunset to sunrise April 1 – October 31 to reduce impacts to all bat species, including the northern long-eared bat. This feathering will reduce the speed that blades will rotate when the turbines are not generating electricity in order to minimize the risk of bat-blade collisions. Also, as recommended in the USFWS' Northern Long-Eared Bat Interim Guidance (BBCS; USFWS 2014), all turbines will be sited more than 1,000 ft from the edge of connected patches of forested habitat (BBCS; Section 2.3.2) to avoid potential impacts to bats, including northern long-eared bats. As such, no impacts to NLEB are anticipated from the Project.

13.3.4.2 State-listed Species

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

Whooping Crane

See Section 13.3.4.1.1 for the discussion of the State-endangered whooping crane.

Osprey

Ospreys have been recorded in the general vicinity of the Project Area, mostly during migration. Two osprey observations were recorded in the Project Area in the Year Two large-bird use survey. However, osprey are rare in the Project Area and, other than this specific observation, no sightings have been reported in Deuel County in the last ten years. It is possible that migrating osprey may forage in the Project Area, utilizing forested areas along riparian corridors, open waterbodies, and open wetlands. The likelihood of this species to occur in the Project Area is low due to the limited amount of suitable breeding and foraging habitat and the lack of recorded sightings for Deuel County and the Project Area.

It is anticipated that riparian areas and wetlands will be avoided by constructing facilities in upland areas. Direct impacts to this species include potential collision with wind turbines, although, as discussed in

Section 13.3.4.3 below, bird fatalities due to collisions with wind facilities is low and should be similar to the average mortality rates in the U.S. at wind facilities within similar landscapes.

13.3.4.3 Birds

Wind energy facilities, including transmission lines, may result in direct mortality of birds from collisions and indirect impacts from avoidance, habitat disruption, and displacement of birds. Bird species such as raptors (hawks, eagles, falcons, and owls) appear to be at higher risk of collisions with wind turbines, although the reason is not fully understood (National Wind Coordinating Collaborative [NWCC], 2004). Fatality rates of birds at wind energy facilities likely depend on amount of bird use, vegetation, and other physical and biological characteristics of the facility and surrounding area.

Studies within grassland and shrub-steppe habitat have documented decreased densities of and decreased avoidance by grassland songbirds and others as a function of distance to wind turbines and roads. These studies suggest birds adapt (habituate) to the presence of wind energy facilities. Although it is anticipated that some avian mortality could result due to the presence of wind facilities, the impacts should be within the average range of mortality based on documented events at other facilities within similar environments.

With respect to the Transmission Facility, to minimize any potential avian impacts, the Transmission Line will be designed in accordance with Avian Power Line Interaction Committee (APLIC) standards and was sited with the minimum length necessary to connect the Project Substation and Interconnection Substation.

13.3.4.4 Avoidance, Minimization, and Mitigation

Project Facilities have been sited to avoid or minimize impacts to federally listed and other special-status wildlife species. The Applicant will continue to implement applicable avoidance, minimization, and mitigation measures. The Applicant will construct and operate the Project in accordance with federal and State requirements.

The Applicant is preparing a Bird and Bat Conservation Strategy (BBCS) (Appendix O) in accordance with the USFWS WEG that will be implemented to minimize impacts to avian and bat species during construction and operation of the Project. As stated in the BBCS, the following impact minimization and avoidance measures will be implemented for the Project:

Design minimization and avoidance measures include:

- All wetlands, conservation easements, protected lands, and USFWS critical habitat will be avoided;

- Wind turbines and associated facilities for the Project will be sited with consideration for the topographic and environmental characteristics of the site, efficiency of selected turbine models, and minimal impacts to area residents;
- As recommended in the USFWS' Northern Long-Eared Bat Interim Guidance (USFWS 2014), all turbines will be sited more than 305 m (1,000 ft) from the edge of connected patches of forested habitat (Section 2.3.2) to avoid potential impacts to bats, including northern long-eared bats, during the summer;
- The Project's location in a predominantly previously disturbed landscape avoids the following habitat features: (1) habitats associated with any federally listed wildlife or plant species, (2) bird movement corridors, (3) landscape features that attract raptors, (4) bat hibernacula or maternity/nursery colonies, and (5) concentrated bird and/or bat use areas;
- Native habitat (including native prairie, forested habitat, and wetlands) will be avoided and previously disturbed lands (including existing roadways) will be used, where practical, to avoid wildlife habitat fragmentation. Potential undisturbed grassland impacts are estimated to be 0.09%;
- Turbines will be sited away from grassland habitat with records of Dakota skipper and Poweshiek skipperling, and any habitat potentially suitable for these species recorded during the Butterfly Habitat Assessments;
- All turbines will be sited away from the South Fork Yellow Branch River; the nearest turbine will be 0.80 km (0.50 mi) from the river;
- All turbines will be sited away from Lake Alice; the nearest turbine will be 2.41.6 km (1.0 mi) from the lake;
- All turbines will be sited away from Long Tree Lake, Lake Francis, and Rush Lake; the nearest turbine will be 0.80 km (0.50 mi) from each lake;
- All turbines will be sited away from the "Avoidance Areas" identified by the SDGFP;
- All turbines will be sited away from all USFWS WPAs and SDGFP GPAs; the nearest turbine will be 402 m (1,320 ft) from these areas;
- Turbine towers will be designed and constructed to discourage bird nesting and wildlife attraction;
- The Project will employ unguyed, tubular towers with slow-rotating, upwind rotors;
- Aviation hazard lighting will be minimized to Federal Aviation Administration requirements and strobed, minimum-intensity red lights will be installed on Project turbines, as recommended by the FAA and in the WEG (USFWS 2012) to avoid attracting birds or bats. Deuel Harvest will also employ an ADLS at the Project, subject to availability and FAA approval

- Hoods/shields will be installed on exterior lights at the O&M building, Project Substation, and Interconnection Substation to minimize skyward light;
- Turbine doors will not have exterior lights installed at the entrance;
- Deuel Harvest will install the electrical collection system underground; therefore, no bird collision or electrocution risks would apply to the buried lines; and
- If an avian collision risk is identified along the Project's transmission line during line operation, applicable measures to minimize the potential for bird collisions will be implemented in accordance with APLIC's suggested measures to increase the visibility of the smaller-diameter shield wire (e.g., flight diverters; APLIC 2012).

Construction minimization and avoidance measures include:

- Prior to construction, all supervisory construction personnel will be instructed on the BBCS and wildlife resource protection measures, including: (1) applicable federal and state laws (e.g., those that prohibit animal collection or removal) and (2) the importance of these resources and the purpose and necessity of protecting them, and ensure this information is disseminated to applicable contractor personnel, including the correct reporting procedures;
- Construction personnel will be trained in the following areas when appropriate: awareness of sensitive bird species, potential bird nesting areas, potential bat roosting/breeding habitat, butterfly habitat, and general wildlife issues;
- A SWPPP will be prepared and implemented, as required by the EPA; the plan will include standard sediment control devices (e.g., silt fences, straw bales, netting, soil stabilizers, check dams) to minimize soil erosion during and after construction;
- Storm water management practices will be implemented to minimize open water resources that may attract birds and bats;
- During construction, reasonable measures will be taken to protect and preserve existing trees, vegetation, water resources, and wildlife habitat; Traffic will be restricted to Project-specific roads; use of unimproved roads will be restricted to emergency situations;
- Speed limits will be set to ensure safe and efficient traffic flow; signs will be placed along roads, as necessary, to identify speed limits, travel restrictions, and other standard traffic control information;
- Following construction, temporary work areas will be graded to the approximate original contour, and the areas will be revegetated with approved seed mixtures; Deuel Harvest will consult with the NRCS and landowners on appropriate reclamation methods and seed mixtures;
- Noxious weeds will be controlled in all surface-disturbed areas using mowing and herbicides; and

- All herbicide and pesticide mixing and applications will be conducted in accordance with all federal, State, and local laws and regulations and the specific product's label; herbicides and pesticides will only be directly applied to localized spots and will not be applied by broadcasting techniques.

Operation minimization and avoidance measures include:

- Traffic will be restricted to Project-specific roads; use of unimproved roads will be restricted to emergency situations;
- Speed limits will be set to ensure safe and efficient traffic flow; signs will be placed along roads, as necessary, to identify speed limits, travel restrictions, and other standard traffic control information;
- All carrion (with the exception of birds and bats) discovered on site during regular maintenance activities will be removed and disposed of in an appropriate manner to avoid attracting eagles and other raptors; birds and bats discovered on site will be addressed in conformance with the Project's incidental reporting process and the post-construction monitoring protocol in as described in greater detail in Section 5 of the BBCS (Appendix O);
- In addition to carrion removal, Deuel Harvest will encourage landowners with livestock operations in and adjacent to the Project area to clear livestock carcasses regularly and expediently to avoid attracting eagles and other raptors to the Project Area;
- Project turbines will be feathered below cut-in, 3.0 m per second (m/s; 6.7 mph) from sunset to sunrise April 1 – October 31 to reduce impacts to all bat species, including the northern long-eared bat. This feathering will reduce the speed that blades will rotate when the turbines are not generating electricity in order to minimize the risk of bat-blade collisions; and
- Monitoring and adaptive management will be implemented as described in greater detail in Section 5 of the BBCS to ensure the effectiveness of the avoidance, minimization, and mitigation strategies incorporated into the Project, including the turbine operational protocol.

14.0 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.*

14.1 Existing Aquatic Ecosystem

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

14.1.1 Surface Waters and Wetland Resources

Surface waters are described in Section 12.2. The Project Area is located in the Lac qui Parle and Upper Minnesota Sub-basins of the Minnesota Basin drainage system, and the Middle Big Sioux Sub-basin of the Big Sioux Basin drainage system. Approximately 3,698 acres of NWI wetlands occur within the Project Area (approximately 7.6 percent of the total Project Area). The wetlands in the Project Area consist of freshwater emergent wetlands, freshwater ponds, riverine, lake, and freshwater forested / shrub wetland. Aquatic biota present within the waterways of the Project Area are diverse and representative of the area.

14.1.2 Federal and State Special-Status Aquatic Species

Federally listed threatened or endangered aquatic species could potentially occur in the Project Area (Table 14-1). Based on habitats found within the proposed Project Area, four aquatic species have the potential to occur in the Project Area during some portion of the year: the federally endangered Topeka shiner and the State-threatened banded killifish, northern redbelly dace, and northern river otter (SDGFP, 2016; USFWS 2018a).

Table 14-1: Federal and State-Listed Aquatic Species Potentially Occurring in the Project Area

Species	Federal Status	State Status	Potential to Occur
Banded killifish	--	Endangered	Low. Limited to James, Vermillion, and Big Sioux River Basins, and to the northeastern lakes of South Dakota, which is outside the Project Area
Northern redbelly dace	--	Threatened	Low. The preferred habitat is a series of beaver ponds that are filled with a constant supply of cool, spring water with an enough oxygen for the fish

Northern river otter	--	Threatened	Low. The preferred habitat is riparian vegetation along wetland margins; low likelihood based on limited suitable habitat in Project Area
Topeka shiner	Endangered	--	Low. Limited to the James River and tributaries. Topeka shiners live in small to mid-size prairie streams in the central U.S. where they are usually found in pool and run areas. Suitable streams tend to have good water quality and cool to moderate temperatures

14.1.2.1 Banded Killifish

The banded killifish is a State-endangered fish species that prefers quiet, shallow lakes and ponds with abundant aquatic vegetation and sandy-gravel substrates (NatureServe, 2018). The current known distribution of the banded killifish in South Dakota is limited to the James, Vermillion, and Big Sioux River Basins, and to the northeastern lakes of South Dakota (SDGFP, 2016, 2018c; Fuller and Neilson, 2018). These areas are outside the Project Area, making the potential occurrence for this species in the Project Area low. Furthermore, no work will occur within rivers or streams, and BMPs would be designed to control sedimentation and erosion during construction of the Project to prevent downstream water quality impacts. The likelihood this fish species would be impacted by the Project is low.

14.1.2.2 Northern Redbelly Dace

The northern redbelly dace is a State-threatened fish species, with a strong preference for spring-fed streams that are sluggish and have dense vegetation; however, it also can be found in small, spring-fed lakes and bogs (NatureServe, 2018). The preferred habitat can be described as a series of beaver ponds that are filled with a constant supply of cool, spring water with enough oxygen for the fish. The cover and vegetation provided by logs and brush supply areas of shade, as well as cover to avoid predators and ambush prey (Cunningham and Hickey, 1995). Based on the northern redbelly dace's associated habitats, historical documentation, and type and size of the perennial water sources within the Project Area, these waterbodies may provide suitable habitat for this species.

The northern redbelly dace once existed south of the Project Area between Clear Lake and Monighan Creek; however, no historical documentation of this species occurs within the Project Area, and associated habitat with the appropriate size and type of perennial water sources is lacking. A low likelihood exists of this species occurring in the Project Area and no impacts are anticipated.

14.1.2.3 Northern River Otter

The northern river otter is a semiaquatic mammal of the Mustelid family. River otters inhabit permanent water with abundant fish or crustacean prey and relatively high water quality (Boyle, 2006). Because of

their high mobility and low densities, river otters require relatively long reaches of streams and rivers. Complexity of river and lake shorelines provides greater potential for shallow water and wetlands, which provide habitat for otter prey, including slower-swimming fish, amphibians, reptiles, and invertebrates (Boyle, 2006). The physical habitat attribute most important to river otters besides water is riparian vegetation, which provides security cover when they are feeding, denning, or moving on land (Boyle, 2006). Another essential habitat component is structural diversity and complexity provided by objects such as fallen trees, logjams, stumps, undercut banks, and rocks (Melquist and Dronkert, 1987). Principal threats are habitat destruction and degradation, and human-caused mortality. Habitat destruction and degradation include water development resulting in stream flow and channel morphology alteration, water pollution, loss of riparian vegetation, and human settlement and recreational use along rivers and lakes (Boyle, 2006). The northern river otter is not likely to occur within the Project Area due to limited suitable habitat and lack of historical records.

14.1.2.4 Topeka Shiner

The federally endangered Topeka shiner is a small minnow native to the streams of the prairie and prefers small, quiet streams with clean gravel or sand substrates and vegetated banks (Shearer, 2003). Suitable streams tend to have good water quality and cool to moderate temperatures. In Iowa, Minnesota, and portions of South Dakota, Topeka shiners also live in oxbows and off-channel pools. Some documented Topeka shiner locations in South Dakota have been reported in degraded streams with sloughs connected to occupied streams, backwater areas, and silt substrates (Schmidt, 2003; Wall et al., 2004; USFWS, 2009). The Topeka shiner can be found in the James River and tributaries, which are about 17 miles northeast of the Project Area (SDGFP, 2015). As such, potential occurrence in the Project Area is low.

14.2 Aquatic Ecosystem Impacts / Mitigation

14.2.1 Surface Waters and Wetland Resources Impacts / Mitigation

As described in Section 13.2.2, impacts to wetlands are expected to be minimal. The primary potential for impact to aquatic ecosystems would be from increased sedimentation or increased total suspended solids due to soil erosion from the Project during construction. In general, surficial soils on flat areas are less prone to erosion than soils in sloped areas. Construction on or adjacent to steep slope areas can render soils unstable, accelerate natural erosion processes, and cause slope failure.

The Project Area slope ranges from 0 to 40 percent, with the majority of slope at 1 to 6 percent. Care would be taken to avoid or limit excavation in steep slope areas. Because wind turbines are generally located at higher elevations to maximize exposure to wind, excavation in steep slope areas should be

limited to crane paths and small sections of access roads. Crane paths and access roads would generally be sited to avoid steep slopes. Limited trenching of underground cabling in steep slopes may also occur, although that would be limited where possible by directional boring of these areas. During construction, BMPs would be implemented to help avoid impacts to drainageways and streams from sediment runoff from exposed soils during precipitation events.

The BMPs would be implemented to reduce impacts to drainageways and streams by sediment runoff. Because erosion and sediment control would be in place for construction and operation of the Project, no impacts to aquatic ecosystems are expected from the Project.

14.2.2 Federal and State Special-Status Aquatic Species Impacts / Mitigation

It is unlikely that the Topeka shiner, banded killifish, northern redbelly dace, or northern river otter would be directly or indirectly affected by the construction and operation activities associated with the Project since work would occur outside stream beds. BMPs will be designed to control sedimentation and erosion during construction of the Project to prevent downstream water quality impacts.

15.0 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.

The following sections describe the existing land use, sound, and aesthetics within the Project Area, potential land use impacts of the Project, and measures that will be utilized to avoid, minimize, and mitigate potential impacts.

15.1 Land Use

The existing land uses within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project's construction and operation on land use, and avoidance, minimization, and mitigation measures.

15.1.1 Existing Land Use

Land use within the Project Area is predominantly agricultural, with land cover consisting of a mix of cultivated crops and herbaceous vegetation (including grassland). Analyses from the field and grassland reconnaissance documented grassland areas including both native and introduced species (Appendices M and N). The remaining land cover in the Project Area consists of developed land, open space; emergent herbaceous wetlands; hay / pasture land; deciduous forest; open water; and shrub / scrub vegetation; woody wetlands.

Occupied farm sites and rural residences occur within the Project Area, and other scattered rural residences are adjacent to, but outside of, the Project Area. Occupied farm site and rural residence locations were originally identified using satellite imagery, and a follow up field verification of these residences was conducted by Deuel Harvest in the third quarter of 2017. A second field verification was conducted in November of 2018 in which no additional occupied residences were identified. Figure A-14 in Appendix A is a land use map of the Project Area based on the classification system specified in ARSD 20:10:22:18(1). The following land use classifications occur within the Project Area:

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

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

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

In Deuel County in 2011, approximately 47 percent of the land area was cropland, with corn and soybeans being the two most common crops, respectively (NLCD, 2011). Cultivated cropland in Deuel County decreased by 0.1 percent from 190,200 acres in 2006 to 189,840 acres in 2011 (NLCD, 2011). Specific acreages of different crops within the Project Area, which change from year to year, are not available. In Deuel County in 2011, approximately 11 percent of the land area was pastureland (NLCD, 2011). Pastureland decreased 0.1 percent from 43,797 acres in 2006 to 43,677 acres in 2011.

15.1.2 Land Use Impacts / Mitigation

Construction of the Project will result in conversion of a small portion of the land within the Project Area from existing agricultural land uses into a renewable energy resource during the life of the Project. Temporary impacts associated with construction staging and laydown areas, the Transmission Line, and

underground collector lines will also occur. Following construction, the areas will be returned to pre-construction land uses, which primarily consist of cultivated croplands and pastureland / grassland.

The proposed Project is compatible with the existing agricultural land uses in areas surrounding the Project. It is estimated that approximately 722 acres of land would be temporarily impacted by Project construction, and 68 acres of land would be permanently impacted (less than 0.2 percent of the total land within the Project Area). Areas disturbed due to construction that ultimately would not contain Project Facilities would be re-vegetated with vegetation types matching the surrounding agricultural landscape. Agricultural impacts are discussed further in Section 20.2.2.

As discussed in Section 23.0, the facility will be decommissioned after the end of the Project's operating life. Facilities would be removed in accordance with applicable State and County requirements, unless otherwise agreed to by the landowner. Disturbed surfaces will be graded, reseeded, and restored to their preconstruction conditions. After decommissioning for the Project is complete, no irreversible changes to land use would remain beyond the operating life of the Project.

Ninety-one occupied residences occur within the Project Area. Based on the proposed Project layout of turbines, access roads, collector lines, and associated facilities, no displacement of residences or businesses would occur due to construction of the Project Facilities.

15.2 Public Lands and Facilities

The existing public lands and conservation easements within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project's construction and operation, and potential avoidance, minimization, and mitigation measures. Figure A-7 in Appendix A shows public facilities within the Project Area, while Figure A-8 shows public lands within the Project Area.

15.2.1 Existing Public Lands and Conservation Easements

As mentioned in Section 13.1.1.3, based on correspondence with USFWS and the results of conservation easement database searches, several federally administered, State-managed, and private conservation lands occur in the Project Area (CBI, 2012 and 2016).

15.2.1.1 USFWS Lands

The USFWS administers one WPA within the Project Area, the Nelson WPA located approximately 0.5 mile east of turbine 21. Additional WPAs are within a five-mile radius of the Project Area. The other nearby WPAs (Coteau Prairie, Roe, Miller, Stoltenburg, Thompson, Eilen, and Schafer) are adjacent to

the Project Area (within 0.5 mile). The closest facility to a WPA is Turbine 13 and is located approximately 0.25 miles from Coteau Prairie WPA and Schafer WPA.

A parcel of the Dakota Tallgrass Prairie Wildlife Management Area (WMA), Deuel County 51, is located within the Project Area, and the Rome State WMA is a few miles east of the Project Area. NRCS easements are also located near the Project Area: three NRCS easement parcels are located just outside the Project Area boundaries between Clear Lake and Altamont (NRCS, 2018b). The easements contain prairie and wetland communities which provide habitat for grassland and wetland dependent waterfowl, water birds, game birds, raptors which prey upon waterfowl, and shorebirds depending on water conditions and nesting cover available.

TNC owns a private conservation area, the 62-acre Altamont Prairie, that is protected by a USFWS easement and is located in the central-eastern region of the Project Area. Two additional TNC areas are nearby: Jacobsen Fen is a 160-acre preserve located approximately 0.5 mile south of the Project Area; 7-Mile Fen is a 217-acre preserve located approximately 2.5 miles south of the Project Area. Both Jacobsen Fen and 7-Mile Fen include a protected ecoregion containing a mix of tallgrass prairie and pothole habitat of the Prairie Coteau region, but also contain calcareous fens, rare and unique wetlands which are continuously fed by calcium-rich groundwater and support a diverse plant community dominated by calcium-tolerant species.

15.2.1.2 SDGFP Areas

The SDGFP owns and manages the Lake Francis GPA located within the Project Area. The GPAs are managed for production and maintenance of wildlife species for hunting opportunities, including small and big game, and waterfowl (SDGFP, 2018a).

SDGFP contracts with private landowners to provide general hunting access through the WIA program. Landowners who have CRP or other valuable wildlife habitat can open their lands to foot-traffic only hunting in exchange for a small payment and immunity from non-negligent liability (SDGFP, 2018a). The Project Area contains three WIA parcels (SDGFP, 2018b).

15.2.1.3 Public Facilities

No schools, churches, or cemeteries occur within the Project Area, although several schools, churches and cemeteries are located just outside the Project Area (Figure A-7 in Appendix A).

Recreation opportunities in the Project vicinity include Ulven Park and Campground south of the Project Area near Clear Lake, South Dakota; Clear Lake City Park and Campground, also in Clear Lake; and

Toronto City Park south of the Project Area in Toronto, South Dakota. Southeast of the Project Area is the Lake Cochrane Recreation Area, which provides opportunities for camping, boating, fishing, and other outdoor activities (Deuel Area Development, 2018).

15.2.2 Impacts / Mitigation to Public Lands and Facilities

The Applicant coordinated with the USFWS regarding the exact boundaries of the USFWS wetland, grassland, and conservation easements as shown on Figure A-8 in Appendix A. Within the parcels containing wetland easements, the actual easement area is defined and is generally a subset of these parcels (i.e., actual defined wetland areas for wetland easements and the area defined in the lease amendments for the conservation easements). The Project has been designed such that no Project Facilities would be placed on these USFWS wetland or grassland easements, and thus, no direct impacts to these easement areas would occur. In addition, no Project Facilities will be placed on the USFWS WPAs, SDGFP GPAs, or SDGFP WIAs identified above.

15.3 Sound

A Pre-Construction Wind Turbine Noise Analysis was conducted for the Project in November 2018 and is included in Appendix D. The following is information on the existing sound levels within the Project Area, the potential effects of the proposed Project's construction and operation, and potential avoidance, minimization, and mitigation measures.

15.3.1 Existing Sound Levels and Regulatory Framework

The Project Area is located entirely within Deuel County. The Project Area contains cropland, grassland, and rural residences scattered throughout. Farming activities and vehicular traffic are assumed to be the largest contributor to sound, although ambient sound measurements have not been recorded for the Project Area.

15.3.1.1 Acoustical Terminology

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

The human ear is sensitive primarily to the level (loudness) of a noise (sound), but also to its pitch (frequency). Sound consists of small changes in air pressure that our ears detect. The human ear is capable of detecting an incredibly large range of sound pressure changes, from about 20 micropascals (the "threshold of human hearing") to about 20 pascals (the "threshold of pain"). The frequency of a sound is the rate at which it fluctuates in time, expressed in Hertz (Hz), or wave cycles per second.

The compressive decibel scale is used to make the numbers more manageable for discussion. Sound is quantified using the decibel, which can be weighted and expressed in different ways. The most common weighting scale used in environmental noise analysis and regulation is the A-weighted decibel (dBA). This weighting mechanism emulates the human ear's varying sensitivity to the frequency of sound. The human ear is much less sensitive to low frequencies, most sensitive to about 1,000 Hz, and not very sensitive to high frequencies. The A-weighted level represents the sum of the energy across the entire "audible frequency spectrum" (20 to 20,000 Hz), weighted by frequency as the human ear would do. This incorporates the frequencies where wind turbines produce most of their sound (250 to 1,250 Hz). This is a common range for other sources as well, including transportation, industrial, and agricultural equipment. For reference, the A-weighted sound pressure level and subjective loudness associated with some common sound sources are listed in Table 15-1.

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

Sound Pressure Level (dBA)[a]	Subjective Evaluation	Environment	
		Outdoor	Indoor
140	Deafening	Jet aircraft at 75 feet	--
130	Threshold of pain	Jet aircraft during takeoff at a distance of 300 feet	--
120	Threshold of feeling	Elevated train	Hard rock band
110	--	Jet flyover at 1,000 feet	Inside propeller plane
100	Very loud	Power mower, motorcycle at 25 feet, auto horn at 10 feet, crowd noise at football game	--
90	--	Propeller plane flyover at 1,000 feet, noisy urban street	Full symphony or band, food blender, noisy factory
80	Moderately loud	Diesel truck (40 mph)[a] at 50 feet	Inside automobile at high speed, garbage disposal
70	Loud	B-757 cabin during flight	Close conversation, vacuum cleaner
60	Moderate	Air-conditioner condenser at 15 feet, near highway traffic	General office

50	Quiet	--	Private office
40	--	Farm field with light breeze, birdcalls	Soft stereo music in residence
30	Very quiet	Quiet residential neighborhood	Bedroom, average residence (without TV or stereo)
20	--	Rustling leaves	Quiet theater, whisper
10	Just audible	--	Human breathing
0	Threshold of hearing	--	--

Source: Adapted from *Architectural Acoustics*, M. David Egan (1988) and *Architectural Graphic Standards*, Ramsey and Sleeper (1994).
(a) dBA = A-weighted decibels; mph = miles per hour

Turbines do not emit much high frequency noise, and that which is emitted is attenuated by the atmosphere before it reaches even the closest residences. Sounds in the environment vary with time, and the two sound level metrics that are commonly reported in community noise monitoring are:

- L90, which is the sound level in dBA exceeded 90 percent of the time during a measurement period. The L90 is close to the lowest sound level observed. It is essentially the same as the "residual" sound level, which is the sound level observed when there are no obvious nearby intermittent noise sources.

- Leq, the equivalent level, is the level of a hypothetical steady sound that would have the same energy (i.e., the same time-averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level is designated Leq and is commonly A weighted. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is represented on a logarithmic scale and the averaging is done with time-averaged mean square sound pressure values, the Leq is mostly determined by occasional loud noises.

A-weighting is the most appropriate weighting network here because it most closely approximates how the human ear responds to sound at various frequencies (in the 20 to 20,000 Hz range). The A-weighting network is the accepted scale used for community sound level measurements. Further, the applicable noise limit for comparison is A-weighted.

15.3.1.2 Noise Regulations

Deuel County adopted a Zoning Ordinance on May 23, 2017, that limits sound levels of WES to 45 dBA average at Non-Participating Residences.

15.3.1.3 Sound Survey

A sound level modeling study was completed for the Project (Appendix D) to assess the potential impact of the Project and confirm compliance with Deuel County noise regulations. The results of the sound study detailed below show a maximum sound level of 44.9 dBA at a Non-Participating Residence, and a maximum sound level of 49.8 dBA for Participating Residences

15.3.2 Sound Impacts / Mitigation

Following is information on the anticipated sound levels from construction and operation of the Project.

15.3.2.1 Construction and Decommissioning

Construction for a wind farm is expected to include the wind turbine sites, substation, access roads, and underground transmission lines with temporary noise coming from a variety equipment. Table 15-2 provides a list of potential construction equipment for each type, phase and sub-phase for construction of a wind farm project. In general, each individual wind turbine site is estimated to take about one-week to construct, with the substation taking about six months and the entire wind farm around twelve months.

Table 15-2: Potential Construction Equipment to be Employed on a Wind Turbine Project

Type	Phase	Sub-Phase	Equipment
Turbines	Site Preparation	Clearing	Chainsaw, Feller Buncher, Grapple Loader, Log Truck
		Road/Site	Dozer, Excavator, Grader, Roller, Dump Trucks
		Foundation	Drill Rig, Track Hoe, Dozer, RT Crane, Concrete Truck
	Installation	Delivery	Fork Lift, RT Crane, Tractor Trailer
		Components	Crawler Crane
	Site Finishing	---	Dozer, Moto Grader, Skid Steer, Seed Drill
Substation	Site Preparation	Clearing	Chainsaw, Feller Buncher, Grapple Loader, Log Truck
		Road/Site	Dozer, Excavator, Grader, Roller, Dump Truck
		Foundation	Drill Rig, Track Hoe, Dozer, RT Crane, Concrete Truck
	Construction	Delivery	Fork Lift, RT Crane, Tractor Trailer
		Components	Fork Lift, Bucket Truck, Truck Crane
	Site Finishing	---	Dozer, Moto Grader, Skid Steer, Seed Drill
Roadways	Site Preparation	---	Chainsaws, Feller Buncher, Grapple Loader, Log Truck
	Construction	---	Dozer, Moto Grader, Back Hoe, Dump Truck, Roller
	Site Finishing	---	Dozer, Moto Grader, Skid Steer, Seed Drill

Underground Electrical Collections	Trenching	---	Trencher, Track Hoe, HDD machine
	Installation	---	Cable Layer
	Site Finishing	---	Track Hoe, Skid Steer, Seed Drill

Construction noise at off-site receptor locations will usually be dependent on the loudest one or two pieces of equipment in operation at a particular time. Noise levels from diesel-powered equipment at 50 feet generally range from 80 dBA to 95 dBA. Table 15-3 provides a list of common construction equipment, its maximum noise level expected at 50 feet, the typical duration a particular piece of equipment is used in any one-hour period, and the resulting houly equivalent noise level ($L_{eq\ (one\text{-}hour)}$) for the piece of equipment.

Table 15-3: Noise Source Characteristics of the Construction Equipment

Equipment	L_{max} Noise Level at 50 ft (dBA)	Usage Factor (%)	$L_{eq(1\ Hr)}$ Noise Level at 50 ft (dBA)
Back Hoe	82	40	77.6
Belly Dump Truck	88	40	84.0
Bucket Truck	82	20	74.7
Cable Layer	70	50	67.0
Chain Saw	91	20	83.7
Concrete Truck	88	20	81.4
Crawler Crane	89	16	80.6
Dozer	86	40	81.7
Drill Rig	86	20	79.1
Dump Truck	81	40	76.5
Excavator	85	40	80.7
Feller Buncher	89	40	85.0
Fork Lift	69	40	65.0
Grapple Loader	83	40	79.1
Horizontal Drill	88	25	82.0
Log Truck	78	40	74.3
Moto Grader	89	40	85.0
Roller	84	40	80.0
RT Crane	89	16	80.6
Seed Drill	83	50	80.0
Semi-Trucks	78	40	74.3

Skid Steer	83	40	79.1
Track Hoe	82	40	77.6
Tractor Trailer	78	40	74.3
Trencher	83	50	80.4
Truck Crane	87	16	80.6

Construction noise from the Project is not expected to create any significant impacts. That said, in order to minimize the impact of construction noise, the Project will limit any necessary nighttime work near residences to quiet activities such as finishing, maintain equipment to manufacturers' specifications, and minimize backing up on site of delivery trucks.

15.3.2.2 Operation

The sound commonly associated with a wind turbine is described as a rhythmic "whoosh" caused by aerodynamic processes. This sound is created as air flow interacts with the surface of rotor blades. The rhythmic fluctuations of the overall sound levels are less perceivable the farther one gets from the turbine. Additionally, multiple turbines operating at the same time will create the whooshing sound at different times. These non-synchronized sounds will blend together to create a more constant sound to an observer at most distances from the turbines. Another phenomenon that reduces perceivable noise from turbines is the wind itself. Higher wind speed produces noise that tends to mask (or drown out) the sounds created by wind turbines.

15.3.2.3 Acoustical Model Inputs

Noise levels from the Project were predicted using the modeling method set forth in International Organization for Standardization (ISO) Standard 9613-2: Attenuation of Sound During Propagation Outdoors. The method was implemented using the SoundPLAN v7.4 acoustical modeling program and cross-checked with a spreadsheet calculation. Figure 4-1 in Appendix D shows a representative three-dimensional view of the SoundPLAN model of the Project. In the SoundPLAN model, receptors were located at each of the residences located within the Project Area, as well as any residence located within approximately two miles of any turbine or main transformer. Ground elevations were determined using Digital Elevation Model data from the USGS National Elevation Dataset. In accordance with ISO 9613-2, each receptor's height was set to 5 feet above the ground. Acoustical modeling was conducted for the entire Project for the two proposed turbine models. For the analysis, all 124 turbine locations were studied even though a maximum of 112 turbines would be constructed.

15.3.2.4 Acoustical Modeling Results

Sound pressure levels were predicted for the identified receivers in the SoundPLAN noise modeling software using the methods and assumptions listed in Section 4.0 and Section 7.0 of the Acoustic Assessment Report (Appendix D).

The maximum model-predicted L_{eq} sound pressure levels at each receiver (the logarithmic addition of sound levels from each frequency from every turbine) are included in Appendix D, the Acoustic Assessment Report. The results show a maximum sound level of 44.9 dBA at Non-Participating residences. The maximum sound level at participating residences is 49.8 dBA. These values represent only the noise emitted by the wind turbines and do not include any extraneous noises (traffic, etc.) that could be present during physical noise measurements. No exceedances of the identified regulations due to operation of any of the proposed wind turbine locations of the Project are anticipated.

Appendix D-2 contains a graphical representation of the Project's sound levels. The figure depicts the maximum sound levels attributable to the new turbines. Because the wind turbines have been sited to avoid exceeding County regulatory sound level limits, no further mitigation for sound is required.

15.4 Visual Resources

The existing visual resources within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project's construction and operation and mitigation and minimization measures.

15.4.1 Existing Visual Resources

Cropland, grassland, large open vistas, and gently rolling topography visually dominate the Project Area landscape. Vegetation in and near the Project Area is predominantly cropland and grassland / pasture. Existing structures in the Project Area consist of occupied residences dispersed throughout as well as scattered farm buildings.

Visual impacts to the landscape attributable to the Project depend on the extent to which the existing landscape is already altered from its natural condition, the number of viewers (residents, travelers, visiting recreational users, etc.) within visual range of the area, and the degree of public or agency concern for the quality of the landscape. A total of 91 occupied residences (1.2 residences per square mile) occur within the Project Area. Other scattered rural residences and towns occur near, but outside of, the Project Area (Figures A-2 and A-4 in Appendix A). Travelers through the Project Area would include local or regional traffic along U.S. 212, SH 15, and other County and township roads. SDGFP public hunting areas (discussed in Section 15.2.1) are also present within the Project Area.

15.4.2 Visual Impacts / Mitigation

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

Construction, operation, and decommissioning of the proposed Project would potentially introduce visual contrasts in the Project Area that would cause a variety of visual impacts. The types of visual contrasts of concern include the potential visibility of wind turbines, electric transmission structures and conductors, and associated facilities, such as access roads; marker lighting on wind turbines and transmission structures; security and other lighting; modifications to landforms and vegetation; vehicles associated with transport of workers and equipment for construction, O&M activities and facility decommissioning. A subset of potential visual impacts associated with wind turbine generator structures are blade movement, blade glinting[17], and shadow flicker[18]. Shadow flicker is discussed further in Section 15.5.

The primary visual impacts associated with the Project would result from the introduction of numerous vertical lines of the wind turbines into the generally strongly horizontal landscape found in the Project Area. Based on the turbine models selected, the total hub height of the turbines would be approximately 263 feet (GE 2.3-116 turbine), and 291 feet (GE 2.82-127 turbine). The visible structures would potentially produce visual contrasts by virtue of their design attributes (form, color, and line). In addition, marker lighting could cause visual impacts at night.

For nearby viewers including the rural residences dispersed throughout the Project Area, the large sizes and strong geometric lines of both the individual turbines themselves and the array of turbines could dominate views, and the large sweep of the moving rotors would tend to command visual attention. Structural details, such as surface textures, could become apparent, and the O&M building, Project Substation, Interconnection Substation, Transmission Line, and other structures could be visible as well, as could reflections from the towers and moving rotor blades.

As discussed above, viewers within the Project Area include the occupied residences, travelers along U.S. 212, SH 15, County and township roads, and hunters utilizing the public hunting areas. For these

[17] Reflection of sunlight from moving wind turbine blades when viewed from certain angles under certain lighting conditions.

[18] As wind turbine blades spin under certain sunny conditions, they may cast moving shadows on the ground or nearby objects, resulting in alternating light intensity (flickering) as each blade shadow crosses a given point.

viewers, the magnitude of the visual impacts associated with the Project would depend on certain factors, including:

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

To minimize visual impacts of the Project, the Applicant has incorporated setback requirements and commitments into the design of the Project. As identified in Table 9-1, turbines would be set back at least 1,500 feet from currently occupied Participating residences, businesses, and public buildings and at least 4 times the turbine height from Non-Participating residences, per Deuel County Zoning Ordinance requirements. Turbines would also be set back at least 550 feet or 1.1 times the tip height of the turbines from ROW of public roads and from any surrounding property line. In accordance with FAA regulations, the towers would be painted off-white to reduce potential glare and minimize visual impact. The length of the Transmission Line has also been minimized to avoid visual impacts.

At the end of the Project's operating life, the facility would be decommissioned (see Section 24.0), and all wind turbines, electrical cabling, electrical components, roads, and any other associated facilities would be removed in accordance with applicable State and County regulations, unless otherwise agreed to by the landowner. As such, no visual impacts would remain beyond the operating life of the Project.

Scenic resources with sensitive viewsheds can include national parks, monuments, and recreation areas; national historic sites, parks, and landmarks; national memorials and battlefields; national wild and scenic rivers, national historic trails, national scenic highways, and National Wildlife Refuges (NWRs); State- or locally designated scenic resources, such as State-designated scenic highways, State parks, and County parks; and other scenic resources that exist on federal, State, and other non-federal lands, including traditional cultural properties important to tribes. The nearest scenic resources to the Project Area are the Mitchell State Public Shooting Area (SPSA), located on the eastern side of Lake Alice near the middle of the Project Area; the Lone Tree Lake SPSA, on the eastern side of Lone Tree Lake also near the middle of the Project Area; the Altamont SPSA, Nelson State WMA, Rome State WMA, Sharp SPSA, Rush Lake SPSA, Mud Lake SPSA, Ulen Park, Briggs Lake SPSA, and the Lake Francis SPSA. Depending on topography and atmospheric conditions, the Project turbines could be visible from any of these public lands.

15.5 Shadow Flicker

A shadow flicker analysis for the Project was finalized in November 2018 and is included in Appendix F. Following is information from the report on the potential shadow flicker effects of the Project and potential avoidance, minimization, and mitigation measures.

15.5.1 Shadow Flicker Overview

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

The intensity of shadow flicker varies significantly with distance, and as separation between a turbine and receptor increases, shadow flicker intensity correspondingly diminishes. Shadow flicker intensity for distances greater than 10 rotor diameters (i.e., 1,160 meters and 1,270 meters, respectively, for the representative GE 2.3-116 and GE 2.82-127 turbine models) is generally low and considered imperceptible.

Shadow flicker impacts are not currently regulated in applicable State or federal law. Section 1215 of the Deuel County Zoning Ordinance sets the "Limit for allowable shadow flicker at existing residences to no more than 30 hours annually."[19]

15.5.2 Shadow Flicker Impacts / Mitigation

Shadow flicker was modeled for the Project using EMD's WindPRO, an industry-leading software package for the design and planning of wind energy projects. This package models the sun's path with respect to every turbine location during every minute over a complete year. The model accounted for topography and obstacles with certain receptors, and each receptor within 2,000 meters (1.25 miles) of representative turbine locations was modeled using the WindPRO model. This approach provides a conservative estimate of the amount of time when shadow flicker could occur for each receptor. Any shadow flicker caused by each turbine is then aggregated for each receptor for the entire year. All turbine positions were evaluated (124 wind turbines).

Using the inputs and parameters defined in Section 3.0 of the Shadow Flicker Analysis Report, the WindPRO model was used to calculate shadow flicker for the receptors within the Project Area based on 124 operational turbines. Table 15-4 presents a summary of these results for each of the two turbine models in terms of the expected annual cumulative duration of shadow flicker. Detailed tables are

[19] Deuel County Zoning Ordinance § 1215.13(b)

included within the Shadow Flicker Analysis Report (Appendix F) that present estimated hours per hear of shadow flicker by receptor. Additionally, maps are provided in Appendix F which illustrate the shadow flicker contour lines (in hours per year) caused by each Project turbine and Figure F-2 in Appendix A provides the shadow flicker study contour map. No receptor will experience more than 30 hours of shadow flicker per year.

Table 15-4: Summary of Shadow Flicker Analysis Results

Turbine Type	No. of Receptors[20]	No. of Receptors, Flicker ≥ 30 hr/yr
GE 2.3-116	231	0
GE 2.82-127	231	0

15.6 Electromagnetic Interference

The Applicant completed an analysis of the potential effects upon Federal Communications Commission (FCC)-licensed radio frequency (RF) facilities, as well as a microwave study, due to construction and operation of the Project (Appendix P). Using industry standard procedures and FCC databases, a search was conducted to determine the presence of any existing microwave paths within or near the Project Area. The study was conducted to locate existing microwave paths within the Project Area, and this analysis used to design a turbine array that avoids impact to all existing microwave paths.

Seven AM stations, located on three separate physical towers, were located within approximately 18.75 miles (30 km) of the Project Area, based on a Comsearch amplitude modulation (AM) and frequency modulation (FM) Radio Report conducted for the Project (Appendix P). These records represent distinct licensed stations broadcasted out of Milbank and Watertown, South Dakota, to the north and west of the Project Area, respectively. The analysis identified 17 database records of FM stations within the same 18.75-mile (30-kilometer) radius, with only 15 currently licensed and operating. The exclusion distance for AM broadcast stations varies by antenna type and broadcast frequency for directional antennas; it would be the lesser of 10 wavelengths or 1.88 miles (3 km) for non-directional antennas. The closest AM station to the Project Area is more than 14.4 miles (23 km) away, and therefore no impacts on AM stations from Project activities should occur. The maximum exclusion distance for a directional AM antenna broadcasting at 1000 KHz or less is 1.88 miles (3 km). According to the Comsearch analysis, FM stations are generally not susceptible to interference caused by wind turbines, especially at the

[20] Within 2,000 meters (1.25 miles)

distances recorded for those near the Project Area. The closest operational FM station is 8.6 miles (13.8 km) from the Project Area and should have adequate separation to avoid radiation pattern distortion.

A potential exists for communication systems to experience disturbances from electric feeder and communication lines associated with wind farms. Based on a desktop review, 3 communication tower structures and 13 communication antennas were identified within the Project Area using the FCC Antenna Structure Registration (ASR), Universal Licensing System (ULS), national and regional tower owner databases, and the local planning and zoning boards. The 3 tower structures contained 4 of the 13 communication antennas; the remaining antennas may be located on other structure types such as guyed towers, monopoles, silos, rooftops, or portable structures. These structures are used for microwave, cellular, and FM and land mobile services in the area. The turbines are sited so that the rotors are outside of any communication beam paths to avoid disturbances to communication systems. Reasonable distance between communication towers and wind turbine towers is a function of two things: the physical turning radius of the turbine blades and the characteristics of the communication systems on the tower. The Communication Tower Study in Appendix Q suggests the turbines be located away from communication towers at least a setback distance equivalent to the maximum height of the turbine, in case of a turbine tower failure. The Project meets this approach, with the closest communication tower being approximately 1,700 feet from Turbine 13, and the Transmission Line Corridor being approximately 5,870 feet from the closest small FCC registered private communication tower. If, after construction, the Applicant receives information relative to communication systems interference potentially caused by operation of the wind turbines in areas where reception is presently good, the Applicant would resolve such problems on a case-by-case basis.

15.6.1 Microwave Links

An analysis was undertaken to determine the likely effect of the Project upon existing microwave paths, consisting of a Fresnel x/y/z axis study (Microwave Study in Appendix R). For this microwave study, Fresnel Zones were calculated for each microwave path using Comsearch proprietary microwave data, which includes all non-government licensed, proposed and applied paths from 0.9-23 GHz that are registered with the FCC. These Fresnel Zones show the narrow areas of signal swath calculated for each microwave path in the Project Area.

Five unique point-to-point microwave paths from the FCC database were identified within the Project Area and Fresnel Zones created for each, which can be found in Figure BB-3 of the Microwave Study in Appendix R. At the time of study, no turbine locations were provided and any potential obstructions that might exist between the planned wind turbines and the microwave paths could not be determined.

However, Deuel Harvest considered the location of the microwave paths during its design process, and sited towers to avoid any potential obstructions.

15.6.2 Department of Defense Radar

The Department of Defense (DoD) and the Department of Homeland Security Long Range Radar Joint Program Office (JPO) have adopted a "pre-screening tool" to evaluate the impact of wind turbines on air defense long-range radar. This tool indicates that areas of the Project are visible to FAA/DoD long range radar. An in-depth FAA radar impact study after filing with the FAA may be required. Deuel Harvest will work with the DoD to mitigate any concerns. As discussed in greater detail in Section 20.4.2.2, the Project will obtain a Determination of No Hazard from the FAA and any required permits from the South Dakota Aeronautics Commission.

15.6.3 NEXRAD

A pre-screening tool has been developed to evaluate the potential impact of obstructions to the Next-Generation Radar (NEXRAD) Weather Surveillance Doppler Radar Stations. The Project will not impact NEXRAD weather radar, and further weather radar study will not be necessary.

15.6.4 Military Airspace

A preliminary review of the Project Area utilizing the DoD's pre-screening tool does not return any likely impacts to military airspace. (DoD, 2018). According to the Aviation Systems Inc. (ASI) study conducted for the Project Area (Appendix S), the Project Area may be in the Line of Sight (LoS) of one Air Route Surveillance Radar (ARSR), which could trigger extended studies. Further in-depth FAA study may be required after filing with the FAA to determine adverse effect.

The nearest U.S. air military installation is the Grand Forks Air Force Base, located approximately 206 miles north of the Project Area. The nearest South Dakota National Guard Air National Guard installation is the 114th Fighter Wing at Joe Foss Field Base in Sioux Falls, South Dakota, located approximately 80 miles south of the Project Area.

According to the ASI study, the Project will not impact any military airspace such as a Memorandum of Agreement (MOA), Restricted Airspace, or Military Training Routes.

15.6.5 National Telecommunication Information Administration

Operation of radio frequencies for Federal Government use is managed by the National Telecommunications and Information Administration (NTIA), which is part of the U.S. Department of Commerce. The technical specifications for most government facilities are unavailable to the public. The

NTIA has developed a review process, wherein the Interdepartmental Radio Advisory Committee (IRAC), consisting of representatives from various government agencies, reviews new proposals for wind turbine projects for impact on government frequencies. Deuel Harvest began this review process in November 2018 and is currently awaiting a response. IRAC usually issues a determination in approximately 60 days.

16.0 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 on agricultural land in Deuel County, South Dakota. Land use for unincorporated areas in Deuel County is regulated by the Deuel County Zoning Ordinance. Section 1215 of the Deuel County Zoning Ordinance governs WES requirements. Pursuant to the Ordinance, WES's in Deuel County require Special Exception Permits (SEP). Deuel Harvest applied for an SEP for the Project (including both the Wind Farm and Transmission Line) in December 2017, and the Project's SEP was issued in March 2018 (Appendix C).

The Ordinance includes specific requirements concerning setbacks, lighting, decommissioning, and multiple mitigation measures. Deuel Harvest has designed the Project to meet the requirements contained in the Ordinance and will comply with all applicable terms and conditions of the land use permits from Deuel County. Deuel Harvest also plans to enter into road use and maintenance agreements with Deuel County governing the use, improvement, repair, and restoration of roads within the county, as needed, and will obtain any road crossing, approach, and utility permits required for the Project.

Additional details about County and agency coordination are provided in Section 27.2.

17.0 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.*

17.1 Introduction

Groundwater and surface water resources are discussed in Section 12.0. As discussed in Section 12.2.2, the excavation and exposure of soils during the construction and decommissioning of Project Facilities may temporarily cause sediment runoff during rain events; however, erosion control BMPs will keep sediments onsite that might otherwise increase sediment loading in receiving waters.

As discussed in Section 12.2.2.3, construction of the Project would require coverage under the General Permit for Storm Water Discharges Associated with Construction Activities issued by the SDDENR. A condition of this permit is the development and implementation of a SWPPP. Because erosion and sediment control would be in place for construction, operation, and decommissioning of the Project, impacts to water quality are not expected to be significant.

17.2 Water Quality Impacts and Compliance

Potential impacts to water quality are discussed in more detail in Sections 12.0, 13.0, and 14.0.

Excavation and exposure of soils during construction and increases in impervious surface can cause an increase in stormwater runoff and sedimentation in receiving waters during storm events. Coverage under the General Permit for Storm Water Discharges Associated with Construction Activities, administered by the SDDENR, will be required for the Project. A SWPPP will be developed and implemented and BMPs will be used to minimize the negative impacts to receiving waters caused by stormwater discharges associated with the construction activities. Impacts to water quality are not expected to be significant through the implementation of the erosion and sediment controls during Project construction and operation.

18.0 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.*

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

18.1 Existing Air Quality

The entire State of South Dakota is in attainment for all National Ambient Air Quality Standards (NAAQS) criteria pollutants (EPA, 2018b). The nearest ambient air quality monitoring sites to the Project Area are located in Watertown and Brookings, which are west and south of the Project Area in Codington and Brookings Counties, respectively (EPA, 2018c). The primary emission sources that exist within the Project Area include agricultural-related equipment and vehicles traveling along SH 212 and SH 15.

18.2 Air Quality Impacts / Mitigation

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

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

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

The Applicant expects to have the Project operational in the fourth quarter of 2020. A preliminary permitting and construction schedule is included as Table 19-1. Conditions beyond the Applicant's control, such as, but not limited to, delays in interconnection studies, transmission upgrades, or Project financing may delay Project construction and operational dates.

Table 19-1: Preliminary Permitting and Construction Schedule

Milestone	Start Date	Completion Date
Land Acquisition	Q2 2015	Q4 2017
Environmental Studies	Q1 2016	Q2 2018
Special Exception Permit / WES Process with Deuel County	Q4 2017	Q1 2018
SDPUC Wind Energy Facility Permit Process	Q4 2018	Q2 2019
Other Federal, State, and Local Permits	Q2 2019	Q4 2019
Project Construction	Q4 2019	Q4 2020
Commercial Operations	N/A	Q4 2020

The Applicant has entered into long-term lease and easement agreements for placement of the wind turbines and associated Project infrastructure with private landowners within the Project Area. The Applicant anticipates that the life of the Project would be approximately 30 years and reserves the right to extend the life of the Project as well as explore alternatives regarding Project decommissioning. One such option may be to retrofit 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.

20.0 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.

The following sections describe the existing socioeconomic and community resources within the Project Area, the potential community impacts of the proposed Project, and measures to avoid, minimize, and / or mitigate potential impacts.

20.1 Socioeconomic and Community Resources

The existing socioeconomic resources within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

20.1.1 Existing Socioeconomic and Community Resources

The Project Area is located in northeastern South Dakota in Deuel County. In 2017, Deuel County had an estimated population of 4,281 (U.S. Census Bureau, 2017). Clear Lake, with an estimated 2017 population of 1,241, is the largest city in Deuel County (U.S. Census Bureau, 2017). Clear Lake is located approximately 4 miles south of the Project Area. The populations of these communities, as well as other communities close to the Project Area and their distances from the Project Area, are shown in Table 20-1.

Table 20-1: Population Estimates of Communities and Distance from Project Area

Community	2017 Population Estimate	County	Distance and Direction from Project Area
Clear Lake	1,241	Deuel	4 miles south
Watertown	22,222	Codington	15 miles southwest
Milbank	3,133	Grant	17 miles north
Madison	7,322	Lake	15 miles southwest
Canby	1,701	Yellow Medicine	13 miles southeast
Gary	224	Deuel	1 mile south
Altamont	33	Deuel	0.25 mile west
Brandt	105	Deuel	10 miles south
Revillo	107	Grant	5.5 miles north
Goodwin	145	Deuel	7 miles west

Source: U.S. Census Bureau (2017)

The population in Deuel County is predominantly Caucasian (99.7 percent), while 0.3 percent of the population consists of two or more races. In the State of South Dakota as a whole, 84.8 percent of the population is Caucasian, 8.7 percent is American Indian, and 6.5 percent is some other race (U.S. Census Bureau, 2016).

The median household income in 2016 in Deuel County was $54,781. In 2016, 10.6 percent of the population was below the poverty level in Deuel County. By comparison, the median household income for the State was lower ($52,078), and the poverty level (14.0 percent) was higher (U.S. Census Bureau, 2016).

In Deuel County, the top industries in terms of employment in 2016 were: (1) manufacturing (18.6 percent of employment); (2) agriculture, forestry, fishing and hunting, and mining (17.3 percent); and (3) educational services, health care, and social services (15.6 percent of employment). The unemployment rate in Deuel County in August 2018 was 3.2 percent, and the South Dakota unemployment for that same month was 2.8 percent (South Dakota Department of Labor and Regulation [SDDLR], 2018).

20.1.2 Socioeconomic and Community Impacts

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

20.1.2.1 Economic Impacts

The Project is expected to create both short-term and long-term positive impacts to the local economy. Impacts to social and economic resources from construction activities would be short-term. Local businesses, such as restaurants, grocery stores, hotels, and gas stations, would see increased business during this phase from construction-related workers. Local industrial businesses, including aggregate and

cement suppliers, welding and industrial suppliers, hardware stores, automotive and heavy equipment repair, electrical contractors, and maintenance providers, would also likely benefit from construction of the Project. The Project is expected to employ approximately 400 temporary workers over approximately 12 months for approximately 820,000 to 840,000 worker-hours to support Project construction, and approximately 15 direct jobs during operations.

Over its estimated 30-year life, the Project will use approximately 68 acres of land to directly generate more than $150 million in direct economic benefits, including property taxes[21], lease payments, and local staff salaries. Over the 30-year life of the Project, direct payments will be:

- Approximately $87 million to Deuel County landowners, an average of approximately $2.9 million every year;
- Approximately $10.9 million to Deuel County, an average of approximately $365,000 every year;
- Approximately $25.8 million to the State of South Dakota, an average of approximately $860,000 every year;
- Approximately $3.6 million to the local school district in the first 10 years of Project operations; and
- A $30,000 annual scholarship provided to fund for Deuel school, funded by Invenergy (in addition to annual generation tax payments made to the school);

The above direct payment information does not include any multiplying factor of additional income earned being kept in Deuel County or the local area, which is expected to multiply total economic impact of the Project.

The construction crews would include skilled labor, such as foremen, carpenters, iron workers, electricians, millwrights, and heavy equipment operators, as well as unskilled laborers. This diverse workforce would be needed to install all the Project Facilities, including wind turbines, access roads, the underground collector system, O&M building, Project Substation, Interconnection Substation, Transmission Line, and other appurtenant facilities.

The Project will purchase station power for the wind turbines, Project Substation, Interconnection Substation, and O&M building from the local rural electric cooperative where customers are decreasing and cost to maintain the systems continues to increase.

[21] To estimate the generation based property tax portion of payments that comprise the above property tax payments, Deuel Harvest utilized a net capacity factor of 47% that was calculated using the methodologies described in Section 6.1 – Wind Resource Areas.

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

20.1.2.2 Population and Housing

The Applicant anticipates that trained local labor would not be sufficient to fill the number of jobs available. Most of the non-local construction workforce would probably travel within an 85-mile radius, and within that radius, the largest city that would provide workers would be Sioux Falls, South Dakota, followed by Watertown, South Dakota. Workers within the 85-mile radius would likely not need additional temporary or permanent housing at the Project Area but would commute. The Project would have a less than significant impact on overall population and occupation distribution in the Project Area.

20.1.2.3 Property Value Impacts

No impacts to property values is anticipated from the proposed Project. Michael MaRous, a Member of the Appraisal Institute (MAI) appraiser and owner and president of MaRous & Co., prepared a Market Impact Analysis report for the Applicant (Appendix W). Mr. MaRous concluded that there is no market data indicating the Project will have a negative impact on either rural residential or agricultural property values in the surrounding area of the Project in Deuel County. Further, market data from South Dakota supports the conclusion that the Project will not have a negative impact on rural residential or agricultural property values in the surrounding area. For agricultural properties that host turbines, the additional income from the wind lease may increase the value and marketability of those properties. These conclusions were based on the following:

- The Project will meet or exceed the required development and operating standards;
- Controls are in place for on-going compliance;
- There are significant financial benefits to the local economy and to the local taxing bodies from the development of the wind farm;
- The wind farm would create well-paid jobs in the area which would benefit overall market demand;
- An analysis of recent residential sales proximate to existing wind farms, which includes residential sales within three to five times turbine tip height, did not support any finding that proximity to a wind turbine had any impact on property values;

- An analysis of agricultural land values in the area and in other areas of the State with wind farms, which did not support any finding that the agricultural land values are negatively impacted by the proximity to wind turbines;
- Studies indicating that wind turbine leases add value to agricultural land;
- A survey of county assessors in eight South Dakota counties in which wind farms are located, which determined that there was no market evidence to support a negative impact upon residential property values as a result of the development of and the proximity to a wind farm, and that there were no reductions in assessed valuations;
- A survey of county assessors in 18 Illinois counties in which wind farms are located, which determined that there was no market evidence to support a negative impact upon residential property values as a result of the development of and the proximity to a wind farm and that there were no reductions in assessed valuations;
- A survey of county assessors in 26 Iowa counties in which wind farms are located, which determined that there was no market evidence to support a negative impact upon residential property values as a result of the development of and the proximity to a wind farm and that there were no reductions in assessed valuations;
- A survey of county assessors in 8 Minnesota counties in which wind farms are located, which determined that there was no market evidence to support a negative impact upon residential property values as a result of the development of and the proximity to a wind farm and that there were no reductions in assessed valuations; and
- A summary of the findings in literature on peer-reviewed studies of wind farms in North America, although not specific to South Dakota, which are consistent with the conclusion that there is no market evidence to support a conclusion that proximity to wind turbines negatively affects rural residential property or agricultural property values.

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

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

The impact of transmission lines on property values has also been reviewed in the literature. Jackson and Pitts prepared a literature review of empirical studies conducted between 1964 and 2009.[22] Based on the studies reviewed, while having some inconsistencies in their detailed results, there were generally small (two to nine percent reduction in property value), or no effect on sales price due to the presence of electric transmission lines. Where an effect was detected, this effect generally dissipated with time and distance. While this study indicates that a small reduction in property value is possible, the proposed Transmission Facility was sited a distance away from residences; therefore, impacts to property values are not anticipated.

20.2 Commercial, Industrial, and Agricultural Sectors

No commercial or industrial sectors occur within the Project Area. The existing agricultural sector within the Project Area is described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

20.2.1 Existing Agricultural Sector

The Project Area is predominantly agricultural, consisting of a mix of cropland, rangeland, and pastureland. No commercial or industrial land uses are located within the Project Area. In 2012, Deuel County's 664 farms (totaling 341,853 acres of land) produced $177.75 million in agricultural products (USDA, 2012a). Forty-eight percent was from livestock sales and 52 percent was from crop sales. Cattle and calves were the top livestock inventory item in the County, and corn was the top crop in terms of acreage. Deuel County ranked 22nd out of 66 South Dakota counties in total value of agricultural products sold (USDA, 2012a).

20.2.2 Agricultural Impacts Mitigation Measures

Minimal existing agricultural land would be taken out of crop and forage production by the proposed Project. Areas potentially removed from production would be limited primarily to the areas around wind turbine foundations, access roads, Project Substation, and Transmission Facilities. Landowners would be compensated by the Applicant for losses to crop production during construction. Agricultural activities can occur up to the edge of access roads and turbine pads. The buried underground collection system would not alter agricultural activities.

[22] http://www.real-analytics.com/Transmission%20Lines%20Lit%20Review.pdf

Approximately 591 acres of agricultural land (including cropland and grassland) and 23 acres of non-agricultural land would be temporarily impacted by Project construction. It is estimated that approximately 74 acres of agricultural land and 7 acres of non-agricultural land would be impacted during the life of the Project, which constitutes less than 0.2 percent of the total land within the Project Area. Areas disturbed due to construction and that would not host permanent Project Facilities would be re-vegetated to match the surrounding agricultural landscape.

20.3 Community Facilities and Services

The existing community facilities and services within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

20.3.1 Existing Community Facilities and Services

Most community facilities and services (hospitals, police, fire and ambulance services, schools, churches, and parks and recreational facilities) near the Project Area are located in the nearby towns identified in Table 20-1.

Electrical service in the Project Area is provided by H-D Electric Cooperative. The Brookings-Deuel rural water system supplies rural water to the Project Area and maintains a network of distribution lines within the Project Area. Deuel Harvest is currently in discussions with Interstate Telecommunications Cooperative, Inc. (ITC), an owner of existing telephone and telecommunication lines in Deuel County, regarding the Project.

20.3.2 Community Facilities and Services Impacts / Mitigation

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

20.3.3 Emergency Response

The proposed Project is located within a rural portion of Deuel County. During the Project construction period and during subsequent operation, it is expected that the Project would have no significant impact on the security and safety of the local communities and the surrounding area. Some additional risk for worker or public injury may exist during the construction phase, as it would for any large construction

project. However, work plans and specifications would be prepared to address worker and community safety during Project construction. During Project construction, the Project's general contractor will identify and secure all active construction areas to prevent public access to potentially hazardous areas.

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

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

20.4 Transportation

The existing transportation resources within the Project Area are described below, followed by a discussion of the potential effects of the proposed Project and mitigation and minimization measures.

20.4.1 Existing Transportation

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

20.4.1.1 Surface Transportation

The existing roadway infrastructure in and near the Project Area generally follows section lines and is characterized by federal, State, County, municipal, and township roads. The primary access to the Project Area is via U.S. Highway 212 and South Dakota SH 15 which extend through the northern and western portions of the Project Area (Figure A-1 in Appendix A). The Project will enter into Road Use Agreements with each road County and township authority, as required, to define use and restoration of roads utilized during construction of the Project. Roads within the Project Area are summarized in Table 20-2.

Table 20-2: Project Area Roads

Road	Surface Type	Surface Width	Total Lanes
U.S. Highway 212	Paved asphalt	24 feet	2
State Highway 15	Paved asphalt	24 feet	2
Secondary County roads	Gravel or crushed rock / Bituminous	18 to 22	1-2

Road	Surface Type	Surface Width	Total Lanes
Secondary Township roads	Gravel or crushed rock	16 to 20	1-2

Source: South Dakota Department of Transportation (SDDOT) (2018)

Traffic counts in the Project Area were available for U.S. and State highways in 2017, and data were available for select County roads in the Project Area ranging from 2013 to 2017. In 2017, Average Daily Traffic (ADT) volume was 2,737 trips along U.S. 212, to the west of its intersection with SH 15 in the Project Area. Where the two highways run northwards concurrently in the northwestern portion of the Project Area, ADT volume was 3,329 trips, and then decreased to 2,146 trips on U.S. 212 east of where SH 15 runs north on its own. The ADT volume for SH 15 south of Altamont was 2,069 vehicles, and 1,489 vehicles to the north of SH 212. The daily number of vehicles counted on County roads of the Project Area were much lower, however, ranging from a low of 7 vehicles on 169th Street to a high of 164 vehicles on 472nd Avenue (SDDOT, 2017).

20.4.1.2 Aviation

Federal aviation regulations require structures that exceed 200 feet above ground level (AGL) to be submitted to the FAA for an aeronautical study, to determine whether the structures may be a hazard to air navigation. Depending on specific location, vertical limits for wind turbines will range from 1,954 feet to 2,400 above sea level; wind turbines that exceed these limits may receive Notices of Presumed Hazard (NPH) from the FAA, requiring revisions to allow construction.

No public airports are located within the Project Area. The closest airport is Clear Lake Municipal Airport, which is a public airport located in Clear Lake, South Dakota, approximately 2.5 miles south of the Project Area. This airport features two turf runways of 2,130 feet by 150 feet and 3,000 feet by 150 feet, respectively (AirNav, 2018). According to the ASI report done for the Project (Appendix S), which studied potential effects on aviation for wind turbines built to a height of 499 feet, the Clear Lake Municipal Airport (FAA identifier 5H3) is protected by a Traffic Pattern Airspace (TPA) of up to 2,154 feet above sea level, which has implications in the Project Area. In Sectors A-C on Figure 9 of Appendix S, wind turbines will not be able to be constructed because of ground elevation. In the other sectors, 499-foot wind turbines could be constructed where ground elevations do not exceed the following: Sector D, 1,801 feet; Sector E, 1,901 feet; and Sector F, 2,001 feet. The Project Facilities are sited to meet the requirements of the ASI report, and no impacts to public airports are anticipated.

The Project may impact approaches into Milbank Municipal and Myers Field, located 20 miles north and 11 miles southeast of the Project Area respectively, which mostly will not limit turbine heights aside from the southwest corner of the Project Area. Additionally, there is a small portion in the northern portion of

the Project Area that is affected by the Minimum Obstacle Clearance Altitude of Low Altitude Enroute Airway V78 located 1.5 miles north of the Project Area.

The Lake Cochrane Seaplane Base, located on Lake Cochrane approximately 6 miles south-southeast of the Project Area, is a publicly-owned seaplane base with a water runway. The freshwater lake landing strip is registered as having a runway of 3,920 feet by 1,195 feet. A private airstrip, the Stone's Conservation Airport, occurs just outside the southern boundary of the Project Area, on the southwest corner of the intersection of 177th Street and 482nd Avenue. This airstrip features one turf runway of 1,115 feet by 75 feet (AirNav, 2018). Deuel Harvest is aware of a SEP issued to Mr. John Homan by Deuel County for a private use airstrip that is located outside of the Project Area.

The nearest U.S. air military installation is the Grand Forks Air Force Base, located approximately 206 miles north of the Project Area. The nearest South Dakota National Guard Air National Guard installation is the 114th Fighter Wing at Joe Foss Field Base in Sioux Falls, South Dakota, located approximately 80 miles south of the Project Area.

20.4.2 Transportation Impacts / Mitigation

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

20.4.2.1 Ground Transportation

During construction, temporary impacts to some public roads within the Project Area are anticipated. Construction vehicles, including light, medium, and heavy-duty construction vehicles, as well as private vehicles used by construction personnel, will travel to and from the work sites, thereby increasing the daily traffic on the roads. Some activities may require extended construction hours, and nighttime construction may be necessary to meet the proposed Project schedule. Most heavy equipment (cranes and earthmoving equipment) would remain at the site for the duration of construction activities. Some roads may also require temporary expansion along specific routes as necessary to facilitate the movement of equipment. Shipment of construction materials, such as gravel, concrete, and water would not be expected to substantially affect local primary and secondary road networks. Construction activities will increase the amount of traffic using local roadways, but such use is not anticipated to result in adverse traffic impacts.

The Project will not result in any permanent impacts to the area's ground transportation resources. Improvements to most gravel roads and temporary impacts to local roads would occur during the construction phase of the Project. Deuel Harvest expects to enter into Road Use Agreements with road

authorities related to construction of the Project, as applicable. Deuel Harvest will also work with applicable road authorities to obtain the appropriate access and use permits, and to reduce and mitigate the impacts to area transportation.

After construction is complete, traffic impacts during operation of the Project will be minimal. The maintenance crew would drive through the area in pickup trucks on a regular basis in order to monitor and maintain the wind turbines and collector lines, as needed. Heavy equipment may occasionally return to the site if large turbine components need to be repaired or exchanged. A slight, temporary, increase in traffic would occur for occasional turbine, substation, and collector line repair, but traffic flow would not be impacted as a result.

20.4.2.2 Air Traffic

The nearest public airport to the Project is the Clear Lake Municipal Airport, located approximately 2.4 miles south of the Project Area. The air traffic generated by this airport would not be impacted by the proposed Project. The Applicant will mark and light the turbines to comply with FAA requirements. Notification of construction and operation of the Project will be sent to the FAA and Deuel Harvest would comply with FAA regulations. The Applicant would file Notices of Proposed Construction (Form 7460-1) with the FAA for all wind turbines and permanent MET tower(s) locations and updated filings as needed during micro-siting. The Applicant would also file Tall Structures Aeronautical Hazard Applications with the South Dakota Aeronautics Commission for a permit approving the proposed wind turbines and permanent MET tower(s) locations.

The Project will obtain a Determination of No Hazard from the FAA and any required permits from the South Dakota Aeronautics Commission. Deuel Harvest submitted wind turbine locations to the FAA in November 2018 for FAA review, and is currently awaiting a response.

The development of a wind energy facility in active croplands will create a potential collision risk with crop-dusting aircraft. The Applicant will notify local airports about the Project and new towers in the area to reduce the risk to crop dusters. The Transmission Line could create potential hazards for crop-dusting aircraft; however, it will be short in length and span between the Project Substation and Interconnection Substation. The turbines and MET tower(s) are visible from a distance and would be lighted and marked in accordance with FAA guidelines. The Applicant will also work with landowners to coordinate crop dusting activities to further reduce risk to crop dusters.

Permanent MET towers will be free standing with no guy wires. Temporary MET towers will have supporting guy wires which will be marked with colored safety shields for increased visibility.

As mentioned in 20.4.1.2, the Stone's Conservation Airport occurs just outside the southern boundary of the Project Area, on the southwest corner of the intersection of 177th Street and 482nd Avenue. This airstrip features one turf runway of 1,115 feet by 75 feet (AirNav, 2018). The Lake Cochrane Seaplane Base, located on Lake Cochrane approximately 6 miles south-southeast of the Project Area, is a publicly-owned seaplane base with a water runway.

The air traffic generated by these airports would not be impacted by the proposed Project. The Applicant would follow FAA guidelines for marking towers and would implement the necessary safety lighting. Notification of construction and operation of the Project would be sent to the FAA, and the Project comply with FAA requirements. The FAA considers all structures above 199 feet AGL to be obstructions until they have received feedback from the aviation community and completed aeronautical studies. If the aviation community and studies do not reveal any adverse impacts to aviation, the FAA will then issue Determinations of No Hazard on structures above this height.

The Applicant would also file Tall Structures Aeronautical Hazard Applications with the South Dakota Aeronautics Commission for a permit approving the proposed wind turbines and permanent MET tower(s) locations.

20.5 Cultural Resources

The Applicant conducted a Level III Archaeological Survey for all areas that would be physically impacted by the Project that was completed in November 2018. These areas included the proposed footprint of the Project Facilities (Appendices E and H).

In addition to a Level III Archaeological Survey, the Applicant conducted a Historic Architectural Resources Reconnaissance Survey using a 1-mile APE (Appendices H and T). The Historic Architectural Resources Reconnaissance Survey focused on locating standing historic-era buildings, structures, objects, districts, etc. to assess the visual impacts of the Project on their integrity of setting.

All work was conducted to professional standards and guidelines in accordance with the *Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation* (48 FR 44716-44742), the *Secretary's Standard for Identification* (48 FR 44720-44723), and the 2012 *South Dakota Guidelines for Compliance with the National Register of Historic Preservation Act and South Dakota Codified Law 1-19A-11*.

The following sections provide information on cultural resources potentially affected by the construction, operation, and maintenance of Project Facilities and describes how impacts to these resources would be avoided and / or minimized.

20.5.1 Existing Cultural Resources

This section describes previously recorded archaeological, non-archaeological resources, and historic-age non-archaeological resources within a Study Area that extended 1-mile from the Component Footprint, which consists of the Project components plus a buffered corridor defined by Deuel Harvest. Additionally, this section identifies previous archaeological surveys that occurred within the Study Area.

A review of the South Dakota SHPO records, maintained through the Archaeological Resource Management System (ARMS) and housed at the Archaeological Research Center of the South Dakota State Historical Society, acquired by Terri Bruce on July 31, 2018, revealed 18 previously recorded archaeological sites within the Study Area (Table 20-4). Portions of four of the previously recorded archaeological sites (39DE0021, 39DE0118, 39DE0119, and 39DE0120) listed in Table 20-3 are located within the Project Area. The rest are within the 1-mile buffer.

Table 20-3: Previously Recorded Archaeological Sites Recorded Within the Study Area

Site	Date Recorded	Site Type	Cultural Affiliation	NRHP Eligibility Status
39DE0021	6/22/1979	Stone circles / Tipi rings	Possible Dakota	Unevaluated
39DE0022	6/24/1979	Stone foundation	Historic	Unevaluated
39DE0065	3/15/1981	Rock pile / Cairn	Unknown aboriginal	Unevaluated
39DE0071	5/23/1998	Farmstead / Dump	Euroamerican	Unevaluated
39DE0079	7/16/2004	Lithic scatter	Prehistoric	Unevaluated
39DE0080	11/29/2004	Isolated Find-Flake	Unknown aboriginal	Unevaluated

Site	Date Recorded	Site Type	Cultural Affiliation	NRHP Eligibility Status
39DE0087	08/2006	Lithic scatter	Prehistoric	Unevaluated
39DE0088	08/2006	Lithic scatter	Prehistoric	Unevaluated
39DE0115	05/24/2013	Isolated find-Projectile point	Prehistoric	Not eligible
39DE0116	07/08/2013	Stone alignment	Unknown aboriginal	Unevaluated
39DE0117	07/09/2013	Isolated find-Two flakes	Prehistoric	Not eligible
39DE0118	07/09/2013	Artifact scatter	Euroamerican	Not eligible
39DE0119	07/09/2013	Lithic scatter	Prehistoric	Not eligible
39DE0120	07/10/2013	Isolated find-lithic core	Prehistoric	Not eligible
39DE0124	06/03/2015	Isolated find-lithic tool	Prehistoric	Not eligible
39DE0125	06/03/2015	Lithic scatter	Prehistoric	Not eligible
39DE2003	07/16/2004	Railroad	Euroamerican	Eligible
39DE2067	05/23/1998	Road bed	Euroamerican	Unevaluated

Source: South Dakota State Historical Society (2018)

20.5.1.1 Previous Archaeological Surveys

Eleven previous cultural resource surveys have been conducted within the Study Area (Table 20-4). Three previous cultural resource surveys, archive numbers ADE-0067, ESD-0122, and ESD-0452, cross portions of the Component Footprint.

Table 20-4: Previous Cultural Resources Surveys Within the Study Area

Project Title	Archive #	Author(s)	Report Date	Sites Recorded
Cultural Resources Survey of a Bridge Replacement Project in Sections 12 and 13, T117N, R49W Deuel County, South Dakota.	ADE-0009	Messerli	1986	None
A Letter Report on an Intensive Cultural Resource Survey of a Proposed Bridge Replacement Project, BRO 8020(9) PCEMS 4930, Deuel County, South Dakota and Lac Qui Parle County, Minnesota, Contract Investigation Series No. 1283.	ADE-0023	Long, Calvin	1998	None
In Intensive Cultural Resources Survey of a Proposed SDDOT Bridge Replacement Project No. BRF 6297(5), PCEMS 6740, Deuel County, South Dakota.	ADE-0049	Donohue, James	1986	1
A Level III Cultural Resource Letter Report for a Pipeline and Tank Project, T115n; R48W; Sections 3 & 10, Deuel County, South Dakota.	ADE-0052	Vaillancourt, Dana	2007	None
Eilen WPA Fieldstone Piles: A Class II Reconnaissance Survey in Deuel County, South Dakota.	ADE-0063	Williams, Barry	2013	1
An Intensive Cultural Resources Survey of SDDOT Culvert Replacement Project NH 0212(172)401, PCN 03TL, and Mill and PCCP Overlay Project NH 0212(173)397, PCN 04E9, Deuel County, South Dakota. Contract Investigations Series No. 2978.	ADE-0067	Holst, David	2016	None
18.SD.PFW.005 Dean Hunt Pipeline System Project Cultural Resources Inventory, Deuel County, South Dakota.	ADE-0070	Springer, Karri	2017	None
An Intensive Cultural Resources Survey of Sections of Three Proposed Northwestern Public Service Gas Pipeline Projects in Eastern South Dakota.	ESD-0122	Winham, R. Peter, William Ranney and Timothy V. Gillen	1990	None
A Reconnaissance Cultural Resource Survey of the Pat O'Connor Inventory Property, Project 971106002F.	ESD-0199	Downing, Patricia K.	1998	8
Class III Archaeological Inventory for the Big Stone II Transmission Line Project.	ESD-0457	Kennedy, Laura, Michael Justin and Michael Madison	2008	24

Project Title	Archive #	Author(s)	Report Date	Sites Recorded
A Level III Cultural Resources Survey of the Proposed Watertown Area Culvert Repair Project (Project P0012(177), PCN 040U) in Deuel, Hamlin, and Roberts Counties, South Dakota.	ESD-0544	Reece, Suzanne, Troy Kogel and Alec Anton	2015	0

Source: South Dakota State Historical Society (2018)

20.5.1.2 Historic-Age Non-Archaeological Resources

The review of SHPO data identified 21 previously recorded historic-age non-archaeological resources within the Project's visual or indirect Area of Potential Effects (APE), defined as 1-mile from the Component Footprint, including turbines, access roads, and other facilities. None of these are within the Component Footprint (Table 20-5). Four of the properties have been determined ineligible for National Register of Historic Places (NRHP) inclusion, 1 is listed on the NRHP, and the remaining 16 have undetermined eligibility status.

Table 20-5: Previously Recorded Historic-Age Non-Archaeological Resources in the Study Area

Resource Name	SD SHPO Site ID[a]	Determination of Eligibility	Within APE	Within Component Footprint
Nelson's Cemetery; Norwegian Evangelical Lutheran	43277	Undetermined; Recommended Ineligible	Yes	No
Bridge 26-250-238	48381	Undetermined; Recommended Ineligible	Yes	No
Farmstead	647	Undetermined; Recommended Ineligible	Yes	No
Farmstead	710	Undetermined; Recommended Ineligible	Yes	No
Bridge 20-139-040	48221	Undetermined; Recommended Ineligible	Yes	No
Hoffman Brothers Barn	711	NRHP-listed	Yes	No
Bridge 20-176-040	48228	Undetermined; Recommended Ineligible	Yes	No

Resource Name	SD SHPO Site ID[a]	Determination of Eligibility	Within APE	Within Component Footprint
School	327	Undetermined; Recommended Ineligible	Yes	No
Outbuilding	55834	Not Eligible	Yes	No
Danish Barn	55833	Not Eligible	Yes	No
Farm House	28888	Undetermined; Recommended Ineligible	Yes	No
Farm House	28889	Undetermined; Recommended Ineligible	Yes	No
Moritz School, District No. 3; Glenwood Township Hall	672	Undetermined; Recommended Eligible	Yes	No
Moritz Elevator	671	Undetermined; Recommended Eligible	Yes	No
Roger Hovey Farm	641	Undetermined; Recommended Eligible	Yes	No
Abandoned Dwelling	28890	Undetermined; Recommended Ineligible	Yes	No
Clear Lake Rodeo Grounds	640	Undetermined; Recommended Eligible	Yes	No
Crystal Springs Ranch House	639	Undetermined; Recommended Eligible	Yes	No
House	55835	Not Eligible	Yes	No
Bridge 20-200-114	48232	Undetermined; Recommended Ineligible	Yes	No
Barn	55836	Not Eligible	Yes	No

(a) Site ID is an identifier assigned by the South Dakota SHPO to a resource or collection of resources recorded in the State database application, the Cultural Resource Geographic Research Information Display. Source: South Dakota SHPO (2018).

20.5.2 Regulatory Framework

South Dakota state law (SDCL 1-19A-11[1]) requires that state agencies or political subdivisions of the state, or any instrumentality thereof (i.e. county, municipality, etc.) may not undertake any project which

will encroach upon, damage, or destroy any historic property included in the National Register of Historic Places or state registers until the SHPO has been given notice and an opportunity to investigate and comment on the proposed Project. Any permits required by the State, County, or municipalities, including an SDPUC Energy Facility Permit, will invoke this law.

Furthermore, ARSD 20:10:22:23 states that an application for a Facility Permit shall include a forecast of the impact on landmarks and cultural resources of historic, religious, archaeological, scenic, natural, or other cultural significance. The Applicant has completed cultural resources investigations for the Project, as described in the following sections, in accordance with SDCL 1-19A-11(1) and ARSD 20:10:22:23, to enable forecasting of potential impacts, respond with appropriate field studies, and develop impact avoidance or minimization measures.

20.5.3 Level III Intensive Archaeological Survey

Based on the background research for this Project and Burns & McDonnell's cultural resource staff's previous experience in the region, archaeological site probability areas were identified. Areas of high to moderate site probability made up the Survey Area investigated in the field. The Survey Area included historic resources identified from historic-era maps, such as farmsteads, habitations, rural industrial locations, rail lines, and schoolhouses. Areas investigated for prehistoric resources included ridge tops and ridge toes that overlooked streams or rivers and areas around prairie potholes and lakes that could contain temporary campsites and specialized activity areas. The Level III Intensive Archaeological Survey was completed in August, September, and November 2018 (Appendices E and H).

Portions of four previously recorded archaeological sites were mapped within the Survey Area. All four sites (39DE0021, 39DE0118, 39DE0119, and 39DE0120) had been determined not eligible for listing on the NRHP. All four site locations were investigated but none of the sites were identified in their mapped locations.

One newly identified historic archaeological site and one newly identified prehistoric Isolated Find site were identified in the Survey Area. In addition, a newly identified intact portion of a previously recorded site (39DE2003) was identified and a site update form was recorded. All newly identified sites were fully delineated beyond the boundaries of the Survey Area (if necessary) and were investigated for integrity and significance. Burns & McDonnell's recommendations for archaeological sites within the Survey Area are summarized in Table 20-6.

Table 20-6: Archaeological Site Recommendations within Survey Area

Site No.	Site Type	Identified Component	Site Integrity	NRHP Recommendation	Recommendation
39DE0021	Stone rings	Unknown aboriginal	Destroyed	Not eligible	No further investigations for this Project
39DE0118	Historic scatter	Euro-American	Poor	Not eligible	No further investigations for this Project
39DE0119	Lithic scatter	Unknown prehistoric	Poor	Not eligible	No further investigations for this Project
39DE0120	Isolated lithic find site	Unknown prehistoric	Poor	Not eligible	No further investigations for this Project
39DE2003 Update	Rail bed and cut	Late 19th to mid-20th century	Fair	Eligible under Criterion A	Avoidance / No further investigation for this Project
39DE127	Isolated Find Site	Unknown Prehistoric	Poor	Not eligible	No further investigation for this Project
39DE128	Farmstead	Early to mid-20th century	Fair	Not eligible	No further investigation for this Project

All work was conducted to professional standards and guidelines in accordance with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 FR 44716-44742), the Secretary's Standard for Identification (48 FR 44720-44723), and the 2012 South Dakota Guidelines for Compliance with the National Register of Historic Preservation Act and South Dakota Codified Law 1-19A-11.

20.5.4 Historic-Age Non-Archaeological Resource Survey

A historic-age non-archaeological resource survey (Appendices H and T) was completed for the Project in accordance with SDCL 1-19A-11(1) in August, September, and November 2018. During the field survey effort, surveyors sought to document all buildings, structures, objects, districts, etc. constructed prior to 1973 (45 years of age or older) within the APE. The survey was conducted solely from publicly accessible roads unless permissible access was available to private property. All accessible resources within the APE were photo-documented and their locations mapped for further assessment by the

Project's U.S. Secretary of the Interior (SOI)-qualified Principal Investigator. Each resource was evaluated for both State and National designation.

Preliminary NRHP eligibility assessments were based on the U.S. SOI standards for identification and evaluation of historic resources, including the 50-year-age criterion and an assessment of resources' integrity and significance with regard to design or association with recognized historic contexts or significant individuals. This method of survey naturally favored resources that maintain significance for their architectural qualities; however, the historian also identified resources that may merit NRHP consideration for their associations with historic development patterns in the Project vicinity. The historian also tried to determine if any historic agricultural, residential, or commercial districts extended into the Project Area. No such districts were identified during the survey effort.

The historians recorded 338 historic-age non-archaeological resources on 123 properties in the APE (Appendix T). Except for two properties in Grant County (the APE extended into the southern area of Grant County), all the resources are located in Deuel County. Eight resources that were identified as historic-age according to maps and aerial photographs were not accessible from the public ROW. Though some of these resources have unknown eligibility, none would be subject to direct or otherwise adverse effects from the Project. Of the accessible resources, one (the Hoffman Brothers Barn) is currently listed on the NRHP, and four appear to meet NRHP eligibility criteria. The remaining resources lack historical associations and architectural integrity and are not recommended for NRHP inclusion. None of the NRHP-listed or eligible resources would be adversely affected by the Project because their settings do not contribute to their significance and because the Project will not result in direct impacts.

20.5.5 Tribal Communication

Deuel Harvest notified Tribes in the vicinity of the Project Area of the Project via correspondence on November 8, 2018. A sample of this correspondence is included in Appendix B. Deuel Harvest provided details of the Project and offered the opportunity to review the Project's cultural resource survey results. To date, no responses have been received.

20.5.6 Cultural Resource Impacts / Mitigation

For cultural resources identified during the surveys, a recommendation regarding their NRHP-eligibility and effect were made (Table 20-6). Sites or historic architectural resources determined to be NRHP-eligible are avoided by Project Facilities.

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

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

As discussed in Section 20.1.2.1, the Project is expected to employ approximately 400 temporary workers over approximately 12 months for approximately 820,000 to 840,000 worker-hours to support Project construction. It is likely that general skilled labor is available in Deuel County 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, which may be imported from other areas of the State or from other states, as the relatively short duration of construction makes special training of local or regional labor impracticable.

The estimated number of construction jobs by classification and annual employment expenditures during construction are included in Table 21-1; however, the number of jobs during the peak of construction may be higher.

Table 21-1: Anticipated Construction Jobs and Employment Expenditures

Job Classification	Number	Estimated Annual Salary
Crane operators	18	$90,000
Civil workers	65	$85,000
Construction managers	10	$110,000
Collection workers	45	$65,000
Tower erectors	85	$75,000
Transmission workers	55	$75,000
Substation workers	45	$80,000
Foundation workers	35	$70,000
Testing & inspections	22	$85,000
Design engineers	20	$140,000
Total:	**400**	**$32,390,000**

The estimated number of jobs by classification and annual employment expenditures during operation are included in Table 21-2. Annual employment expenditures are anticipated to be the same for each of the first 10 years of commercial operation.

Table 21-2: Anticipated Operation Jobs and Employment Expenditures[a]

Job Classification	Number	Estimated Annual Salary
Facility managers	1	$80,000
Wind turbine technicians	13	$42,000
Administrative	1	$34,000
Total:	**15**	**$660,000**

(a) Invenergy determines annual salary rates based on employee experience level, as such these estimates assume entry level workers and are conservative.

22.0 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.*

With the exception of the final micro-siting flexibility requested in Section 8.1, the Applicant does not have any current plans for future additions to or modifications of the Project.

23.0 DECOMMISSIONING OF WIND ENERGY FACILITIES (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 Decommissioning Cost Analysis for the Project is included in Appendix U, *Decommissioning Cost Analysis.* The estimated net decommissioning costs for the Project are summarized in Table A-1 in Appendix U. The net decommissioning cost (in 2018 U.S. dollars) is estimated to be $3,256,300 assuming salvage and no resale of Project components. The decommissioning cost per wind turbine with salvage and no resale is estimated to be $29,074. The estimates are based on the decommissioning approach outlined in the Decommissioning Cost Analysis. The Decommissioning Cost Analysis also describes the Applicant's plan for decommissioning and removal of Project Facilities.

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

The following sections discuss the reliability and safety of the Project.

24.1 Wind Farm Facility Reliability and Safety

Reliability (Availability) is defined as the ability of the turbine to generate electricity when sufficient wind is available. Invenergy's experienced and highly-skilled personnel operate 7,737 MW of wind, solar and energy storage projects in North America. Invenergy's fleet-wide availability wind portfolio was more than 97% for 2016 and 2017 – among the best in the industry in North America. Invenergy has a department dedicated to monitoring and improving performance of its fleet. Performance monitoring includes fault analysis, predictive analysis and condition monitoring. Additional departments are dedicated for monitoring of blades, gearboxes, generators and oils/greases, and monitoring the fleets centralized SCADA system. Invenergy has won the American Wind Energy Association Award for Achievement in Operations twice, most recently in 2017.

To further improve reliable operation of the region's power grid, wind energy projects are required to provide MISO with short-term forecasts of wind speed and energy that would be produced. Typically, wind projects provide a next-day, next-hour, and next-15 minutes forecast, updated every 15 minutes to the off-taker, balancing authority, or regional transmission operator. These predictions of energy generation, through in-depth, site-specific weather forecasting, are used to integrate wind energy into the region's power grid and to schedule turbine and transmission maintenance windows, improving overall reliability. As wind forecasting has improved, the reliability of wind energy generation forecasts provided to the transmission operators has also improved.

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

- Wind turbines will be sited a minimum of approximately 550 feet from existing roadways, 4 times the turbine height from Non-Participating Residences (approximately 2,000 feet), 1,500 feet from Participating Residences, and 550 feet from Non-Participating property lines per the applicable planned setback requirements described in Section 9.2;
- Security measures will be implemented during the construction and operation of the Project, including temporary (safety) and permanent fencing, warning signs, and locks on equipment and wind power facilities;

- Turbine rotors will sit on solid steel-enclosed tubular towers; access to each tower will be only through a solid steel door that will be locked and accessed only by authorized personnel;
- Tower exteriors will be designed to be unclimbable;
- A professional engineer will certify that the foundation and tower design of the turbines is within accepted professional standards, given local soil and climate conditions;
- Prior to construction, the Project contractor will request utility locates through the One-Call program to avoid impacting existing underground infrastructure;
- Prior to construction, the Project contractor will work with local and County emergency management to develop procedures for response to emergencies and potential incidents concerning Project construction;
- During Project operations, the Project will coordinate with local and County emergency management to develop an emergency management plan to be implemented in the event of an emergency at the Project site;
- The Project will register each turbine location and the O&M building with the rural identification / addressing (fire number) system and 911 systems;
- Following construction, the Project will register Project underground facilities with the One-Call program;
- The Project will use the following method to detect icing conditions on turbine blades: (1) monitoring for deviations in the power curve and (2) confirming meteorological data from onsite permanent meteorological towers, on-site anemometers, and other relevant meteorological sources to determine if ice accumulation is occurring. These control systems would either automatically shut down the turbine(s) in severe icing conditions, or Applicant would manually shut down turbine(s) if severe icing conditions are identified. Turbines would not return to normal operation until the control systems no longer indicate icing is no longer a concern; and
- Conform with GE's setback considerations for wind turbine siting, as identified in Section 7 of Appendix V.

24.2 Transmission Facility Reliability and Safety

Transmission lines are designed to operate for decades, and typically only require moderate maintenance, particularly in the first few years of operation. The estimated service life of the proposed Transmission Facility is approximately 30 years. Transmission Facility infrastructure will include very few mechanical elements, which results in high reliability. The infrastructure is built to withstand weather extremes, with the exception of severe weather, such as tornadoes and heavy ice storms. Transmission lines are automatically taken out of service by the operation of protective relaying equipment when a fault is

sensed on the system. Such interruptions are usually momentary. Scheduled maintenance outages are also infrequent. As a result, the average annual availability of transmission infrastructure is very high, in excess of 99 percent.

The Transmission Facility will be designed in compliance with local, State, and good utility standards regarding clearance to ground, clearance to utilities, clearance to buildings, strength of materials, and ROW widths. The Applicant's contracted crews will comply with local, State, and good utility standards regarding installation of facilities and standard construction practices. Installation of guard structures and signage will be coordinated with the owner of the transportation corridor being protected.

The proposed Transmission Facility will be equipped with protective devices, such as breakers and relays, to safeguard the public from the Transmission Line if it falls or other accident occurs. Breakers and relays are located where the Transmission Line connects to the Interconnection Substation and will de-energize the line in the event of an emergency. In addition to protective devices, proper signage will be posted warning the public of the safety risks associated with the energized equipment.

24.2.1 Electric and Magnetic Fields and Stray Voltage

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

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

Natural and human-made EMFs are present everywhere in our environment. Natural electric fields in the atmosphere range from background static levels of 10 to 120 volts per meter (v/m) to well over several

kilovolts per meter (kV/m) produced by the build-up of electric charges in thunderstorms. The Earth itself has a magnetic field that ranges from approximately 300 to 700 milligauss (mG). In addition to the presence of the Earth's steady state electric field, an average home experiences additional magnetic fields of 0.5 mG to 4 mG which arise from the general wiring and appliances located in a typical home.

The Applicant analyzed the potential EMF that would be emitted by the Transmission Line to be built to interconnect the Wind Farm with the electrical grid. The Transmission Line to be built for the Wind Farm will be similar to one that has been proposed as one alternative design of the Huntley-Wilmarth 345-kV transmission line project in southern Minnesota. The Transmission Line for the Project will be a 345-kV voltage single circuit line using steel H-frame supports. At 300 MW maximum wind farm power output, the maximum current in the 345-kV transmission line would be approximately 600 amperes.

In the Certificate of Need Application for the Huntley-Wilmarth project,[23] dated January 17, 2018, tables and graphs were presented showing the calculated electric and magnetic fields near ground level over a range of distances from the transmission line for several alternative project structure designs and loading. One of these designs involves a 345-kV single circuit with steel H-frame supports, the same as for the Transmission Line. Thus, the calculated values of electric and magnetic fields specified in the Huntley-Wilmarth Certificate of Need Application for the 345-kV single circuit with H-frame supports were used as reference for assessing the EMF values for the Deuel Harvest North Wind Farm Project. The relevant data used for this assessment are in pages 131 through 136 of the Certificate of Need Application. Using the Huntley-Wilmarth data as reference, the estimated electric and magnetic fields are outlined in Table 24-1 below.

Table 24-1: Huntley-Wilmarth Electric and Magnetic Fields

	Maximum in R.O.W.	**Edge of R.O.W. (+/- 75 ft)**
Electric Field	2.37-kV/m	1.24-kV/m
Magnetic Field	148.73 mG	34.13 mG

Impacts from stray voltage are typically related to improper grounding of electrical service to the farm (distribution lines) or on-farm electrical wiring. Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses or residences and they are typically grounded properly.

[23] This document is available at https://www.huntleywilmarth.com/staticfiles/microsites/hw/HW-Certificate-of-Need-Application.pdf

However, transmission lines can induce stray voltage on a distribution circuit that is parallel to and immediately under the transmission line. Appropriate measures, such as proper grounding, will be implemented to prevent stray voltage problems.

25.0 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, 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.

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

- Configuration of wind turbine – Section 8.2;
- Number of wind turbines – Section 8.1;
- Warning lighting requirements for wind turbines – Section 20.4.2.2;
- Setback distances – Section 9.2;
- Sound levels during construction and operation – Section 15.3.2;
- Electromagnetic interference – Section 15.6;
- Site and major alternatives – Section 9.0 and Appendix A, Figures A-2 and A-4;
- Reliability and safety – Section 24.0;
- Right-of-way or condemnation requirements – Sections 8.0 and 9.3;
- Clearing activities – Sections 8.0 and 13.1.2;
- Configuration of interconnection towers and poles – Section 8.7;
- Conductor and structure configurations – Section 8.7; and
- Underground electric interconnection facilities – Section 8.4.

Please refer to the Completeness Checklist (ARSD 20:10:22:33.02, Information concerning wind energy facilities) at the beginning of this application for additional requirement details.

26.0 INFORMATION CONCERNING TRANSMISSION FACILITIES (ARSD 20:10:22:35)

ARSD 20:10:22:35. Information Concerning Transmission Facilities*. If a transmission facility is proposed, the applicant shall provide the following information:*

(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 overhead 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 size, and number of circuits.

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

- Configuration of towers and poles – Section 8.7;
- Conductor configuration and size, length of span, and number of circuits – Section 8.7;
- Proposed transmission site and major alternatives – Sections 9.2;
- Reliability and safety – Section 24.2;
- Right-of-way or condemnation requirements – Section 8.0 and 9.3;
- Necessary clearing activities – Sections 8.15.1; and
- Underground dimensions – Section 8.4.

Please refer to the Completeness Checklist (20:10:22:35, Information concerning transmission facilities) for additional requirement details.

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

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

27.1 Permits and Approvals

The Project must comply with federal, State, and local laws requiring permits or approvals. Table 27-1 lists the permits and approvals that are anticipated as part of the Project.

Table 27-1: List of Potential Permits or Approvals

Agency	Permit / Approval	Description	Status
USFWS	Threatened and endangered species, eagles, migratory birds	Determination of effect on federally listed species	Ongoing
FAA	Form 7460-1, Notice of Proposed Construction or Alteration	Required if construction or alteration is within 6 miles of public aviation facility and for structures higher than 200 feet	Ongoing
USACE	Section 404 permit	Complete an application under the Clean Water Act for impacts to wetlands and waters of the U.S.	Unlikely, but to be determined once layout is finalized
South Dakota SHPO	Non-Section 106 consultation	Determination of effect on archaeological and historical resources	Ongoing
SDPUC	Energy Facility Site Permit	Application required for wind facilities with nameplate capacity greater than 100 MW	Ongoing
SDGFP	Coordination	Voluntary coordination regarding wildlife	Ongoing
SDDENR	401 Water Quality Certification	Complete an application under the Clean Water Act, only if Individual Permit is required for Section 404	Not anticipated unless individual Section 404 permit is needed from USACE
	General Permit for Storm Water Discharges Associated with Construction Activities National Pollutant Discharge Elimination System (NPDES)	Storm water permit required for construction activities	SWPPP will be prepared and Notice of Intent will be submitted after final design is complete

Agency	Permit / Approval	Description	Status
	Temporary Water Use Permit	Temporary permits for the use of public water for construction, testing, or drilling purposes; issuance of a temporary permit is not a grant of water right	If necessary, will be obtained prior to construction
	General Permit for Temporary Discharges	Temporary permit for the use of public water for construction dewatering	If necessary, will be obtained prior to construction
	Water Rights Permit for Non-irrigation Use	Needed if water will be appropriated for O&M building	If necessary, will be obtained prior to construction
SDDOT, Aeronautics Commission	Aeronautical Hazard Permit	Permit lighting plan determined with FAA coordination	Will be completed after final design is complete
SDCL 49-32-3.1	Notice to telecommunications companies	Telecommunication companies review the preliminary electrical layout and may suggest revisions to reduce impact to their systems	Ongoing
SDDOT	Highway Access Permit	Permit required for any access roads abutting State roads	If necessary, will be obtained prior to construction
	Utility Permit	Permit required for any utility crossing or use within State road right-of-way	If necessary, will be obtained prior to construction
	Oversize & Overweight Permit	Permit required for heavy equipment transport over State roads during construction	Will be obtained prior to construction
Deuel County	Special Exception Permit for a Wind Energy System	Permit required for construction of the Project	Obtained
	Individual Building Permits	Permit required for construction of each turbine and building	Will be obtained prior to construction
Counties and Townships	Road use and utility permits	Required for use and crossing of roads	Will be obtained prior to construction

27.2 Agency Coordination

Throughout Project planning and development, the Applicant has coordinated with various federal, State, and local agencies to identify potential concerns regarding the proposed Project. Copies of agency correspondence and meeting summaries are included in Appendix B. Below is a summary of the primary agency meetings completed to date.

27.2.1 USFWS and SDGFP

The Applicant has coordinated closely with the USFWS and SDGFP through meetings, conference calls, electronic communications, and site visits. The primary topics of these coordination efforts are summarized below.

Deuel Harvest coordinated closely with the USFWS and SDGFP as part of the Project planning and development process through meetings, conference calls, electronic communications, and site visits. The USFWS Information, Planning, and Conservation System (USFWS 2015a; IPaC) report was generated and reviewed in September 2015 to conduct an initial review of the Project Area. On March 31, 2016, Deuel Harvest conducted an online presentation and call with the USFWS Madison Wetlands Management District (WMD) to introduce the Project, discuss proposed avian and bat surveys, and to determine if existing grassland and wetland easements may occur in the Project Area. On April 4, 2016, a Project Area shape file was shared with the WMD to identify any USFWS easements. Deuel Harvest had a follow-up phone conversation with the WMD on August 4, 2016, to discuss the USFWS easement resources identified in the Project area, which Deuel Harvest has sited its facilities to avoid.

Deuel Harvest submitted an information request to USFWS South Dakota Ecological Services Field Office and a Natural Heritage Information System (NHIS) data request to the SDGFP on June 20, 2016, for information on federally and State listed species and sensitive natural resources within the Study Area. The USFWS responded to the environmental review request in a letter dated August 16, 2016. The USFWS's August 16, 2016 response can be found in Appendix B. The SDGFP responded to the NHIS request letter on August 10, 2016. The SDGFP letter stated the federally endangered Poweshiek skipperling and the federally threatened Dakota skipper have been documented in Deuel County. No other federally or State listed species were included in the SDGFP response letter.

Deuel Harvest also met with the USFWS and SDGFP on August 12, 2016 to provide an overview of the site characterization study, preliminary results of baseline studies, and discuss additional proposed surveys. The USFWS agreed with the separate survey effort for large and small birds and asked if any survey points were located in grassland away from roads. Deuel Harvest confirmed that it conducted

breeding bird surveys in grassland habitat in June 2016. The USFWS reviewed the northern long-eared bat mist-net protocol and confirmed it followed the 2016 Range Wide Indiana Bat Summer Survey Guidelines. Lastly, SDGFP asked if lek surveys were proposed for greater prairie chicken (*Tympanuchus cupido*) and were to provide known lek locations to Deuel Harvest.

On May 25, 2017, Deuel Harvest met with the USFWS and SDGFP to review the Study Area characteristics, as the boundary had expanded in early 2017, and to discuss the Year 1 study results and ongoing survey protocols for Year 2.

A site visit at the Project Area was conducted by the USFWS with Deuel Harvest on June 27, 2017 to further review site characteristics and potential environmental areas of concern. On January 24, 2018, the WMD contacted Deuel Harvest after reviewing a draft layout and noticing a turbine sited on a USFWS grassland easement. Deuel Harvest responded by removing that turbine from the layout to avoid all impacts to USFWS easements. Deuel Harvest met with the WMD on March 7, 2018 to continue discussions of turbine siting, and obtain copies of USFWS easement information.

Deuel Harvest met with the USFWS and SDGFP on February 13, 2018 to discuss grassland and wetland habitat within the Project Area, and to further assess the recommended minimization measures. Deuel Harvest confirmed they are committed to minimizing impacts, especially to grasslands and wetlands, and have taken reasonable measures to set turbines back from high value environmental areas identified by the USFWS and SDGFP throughout the development process. Deuel Harvest also coordinated with USFWS ahead of its 2018 butterfly habitat surveys in July 2018. Through development, construction, and operation, Deuel Harvest will continue to coordinate with the USFWS and the SDGFP as appropriate.

27.2.2 SHPO

SHPO consultation was conducted outside of Section 106 of the National Historic Preservation Act of 1966. SHPO also noted that it does not have the expertise to recommend an APE or assess the effects of the proposed Project to places of religious and cultural significance to American Indian tribes. A Level III Archaeological Survey was conducted for all areas that will be physically impacted by the Project and a Historic Architectural Resources Reconnaissance Survey was conducted within a 1-mile APE. For cultural resources identified during the surveys, a recommendation of NRHP-eligibility of the resource will be made. Sites determined to be NRHP-eligible will be avoided by the Project. If a site cannot be avoided, the Applicant will work with SHPO to develop appropriate minimization or mitigation measures. As discussed in Section 20.5.5, Deuel Harvest also sent a letter to notify Tribes in the vicinity of the

Project Area of the Project, provide details of the Project and offer the opportunity to review the Project's cultural resource survey results.

27.2.3 Deuel County

The Applicant has consulted with Deuel County representatives through meetings, phone calls, and electronic communications. The primary topics of these coordination efforts are summarized below.

- Project summary and status update presentations to Deuel County Commissioners and Board of Adjustment;
- Communications with County Administration regarding the Deuel County SEP that was submitted December 2017, and approved on March 2, 2018; and
- Communications with County Administration, Township representatives, and the County Highway Superintendent on Road Use Agreements, building permits, and any pre-construction meetings and notification.

27.3 Public and Agency Comments

As discussed in Section 9.0, several potential Project sites in South Dakota were considered before the existing site was selected. The Applicant considered input from agencies and the public in siting the Project Area and in identifying potential turbine locations. Some of the adjustments made during Project siting and design, in response to comments, included:

- Avoidance of impacts to State and federal lands within or near Project Area; and
- Avoidance or minimization of impacts to undisturbed grasslands, wetlands, and other habitats within or near Project Area.

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

As described in Sections 1.0 through 3.0, the Applicant has addressed the matters set forth in SDCL Chapter 49-41B and in ARSD Chapter 20:10:22 (Energy Facility Siting Rules), related to wind energy facilities and transmission facilities.

The Applicant's burden of proof is set forth in SDCL 49-41B-22. The information presented in this Application establishes that:

- The proposed Project would comply with applicable laws and rules;
- The Project would not pose a threat of serious injury to the environment or to the social and economic condition of inhabitants in or near the Project Area;

- The Project would not substantially impair the health, safety, or welfare of the inhabitants; and
- The Project would not unduly interfere with the orderly development of the region, having given consideration to the views of the governing bodies of the local affected units of government.

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

The Applicant is submitting testimony and exhibits in support of this Application. The individuals identified in Table 28-1 are providing testimony in support of the Application. Deuel Harvest reserves the right to provide supplemental and / or rebuttal testimony, as needed, to further support this Application.

Table 28-1: List of Individuals Providing Testimony

Individual	Title	Company	Subject Matter
Michael Svedeman	Project Development Manager	Invenergy	Project development, cultural resources, property values
Andrea Giampoli	Environmental and Wildlife Permitting Manager	Invenergy	Environmental and wildlife
Mike Hankard	President and Principal	Hankard Environmental	Sound
JoAnne Blank	Senior Scientist and Project Manager	Stantec	Shadow flicker
Michael MaRous	President	MaRous & Company	Property values

28.1 Applicant Verification

Jon Saxon, being duly sworn, deposes and states that he is an Authorized Representative of the Applicant and is authorized to sign this Application on behalf of the Project Owner / Applicant, Deuel Harvest Wind Energy LLC.

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

Dated this 30th Day of November, 2018.

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