December 2017

South Dakota Public Utilities Commission

Facility Permit Application

Crocker Wind Farm

Clark County, South Dakota

GERONIMO® ENERGY

CROCKER WIND FARM

Clark County, SD

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

Crocker Wind Farm

Clark County, South Dakota

December 15, 2017

CROCKER WIND FARM, LLC

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Definition
ADLS	Aircraft Detection Lighting System
APLIC	Avian Power Line Interaction Committee
Applicant	Crocker Wind Farm, LLC
Application	Facility Permit Application
ARSD	Administrative Rules of South Dakota
AWWI	American Wind Wildlife Institute
BBCS	Bird and Bat Conservation Strategy
BCC	Birds of Conservation Concern
BCR	Bird Conservation Region
BGEPA	Bald and Golden Eagle Protection Act
BMP	best management practice
BO	Biological Opinion
CFR	Code of Federal Regulations
C&I	commercial, industrial, and institutional
Commission	South Dakota Public Utilities Commission
Crocker	Crocker Wind Farm, LLC
CUP	Conditional Use Permit
CWA	Clean Water Act
dBA	A-weighted decibels
DOC	United States Department of Commerce
DOE	United States Department of Energy
DOJ	United States Department of Justice
EA	Environmental Assessment
ECPG	Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2
EIA	United States Energy Information Administration
ELF	extremely low frequency
EMF	electromagnetic field
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency

Acronym/Abbreviation	Definition
FSA	Farm Service Agency
g	units of acceleration due to gravity
GAP	Gap Analysis Program
GE	General Electric
Geronimo	Geronimo Energy, LLC
GIS	Geographic Information System
GPA	Game Production Area
GW	gigawatts
IPAC	Information, Planning and Consultation
HUC	Hydrologic Unit Code
ITC	Interstate Telecommunications Cooperative, Inc.
JEDI	Jobs and Economic Development Impact
kV	kilovolt
kV/m	kilovolt per meter
kW	kilowatts
Lazard	Lazard Levelized Cost of Energy Analysis (version 10.0)
LBNL	Lawrence Berkeley National Laboratory
LiDAR	Light Range Detection and Ranging
m	meters
MBTA	Migratory Bird Treaty Act
mG	milligauss
MISO	Midcontinent Independent System Operator
m/s	meters per second
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NIEHS	National Institute of Environmental Health Sciences
NOAA	National Oceanic and Atmospheric Administration
NLEB	northern long-eared bat
NPDES	National Pollutant Discharge Elimination System
NPS	National Park Service
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NRI	Nationwide Rivers Inventory
NTIA	National Telecommunications and Information Administration

Acronym/Abbreviation	Definition
NWI	National Wetlands Inventory
O&M	Operations and Maintenance
PEIS	Upper Great Plains Wind Energy Final Programmatic Environmental Impact Statement
Project	Crocker Wind Farm Facility and Transmission Facility
Project Area	29,331-acre Project boundary
RES	Renewable Electricity Standards
rpm	rotations per minute
SARC	South Dakota Archaeological Research Center
SCADA	Supervisory Control and Data Acquisition
SDCL	South Dakota Codified Law
SDDENR	South Dakota Department of Environment and Natural Resources
SDDOA	South Dakota Department of Agriculture
SDDOT	South Dakota Department of Transportation
SDGFP	South Dakota Department of Game, Fish, and Parks
SDGS	South Dakota Geologic Survey
SDPUC	South Dakota Public Utilities Commission
SDSHS	South Dakota State Historical Society
SDSU	South Dakota State University
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SoDAR	Sonic Detection and Ranging
SPCC	Spill Prevention, Control, and Countermeasures Plan
SPP	Southwest Power Pool, Inc.
SSURGO	Soil Survey Geographic Database
SWAP	State Wildlife Action Plan
SWPPP	Stormwater Pollution Prevention Plan
Tetra Tech	Tetra Tech, Inc.
UGP	Upper Great Plains
U.S.	United States
USACE	United States Army Corps of Engineers
USC	United States Code
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey

Acronym/Abbreviation	Definition
WEG	Wind Energy Guidelines
WES	Wind Energy System
WEST	Western Ecosystems Technology, Inc.
Western	Western Area Power Administration
WIA	Walk-In Area
WHO	World Health Organization
WNS	White Nose Syndrome
WPA	Waterfowl Production Area
WRA	Wind Resource Area
WTS	Wind Turbine Syndrome
v/m	volt per meter

1.0 INTRODUCTION

1.1 Project Overview

Crocker Wind Farm, LLC ("Crocker" or "Applicant") respectfully submits this Facility Permit Application (the "Application") to the South Dakota Public Utilities Commission ("Commission" or “SDPUC”) for Energy Facility Permits to construct and operate the Crocker Wind Farm, a wind energy facility as defined under South Dakota Codified Law (“SDCL”) 49-41B-2(13), and an associated 5.2-mile 345 kilovolt (“kV”) transmission facility, as defined under SDCL 49-41B-2.1 (the "Project"). The Project is located within an approximately 29,331-acre Project boundary on privately owned land in Clark County, South Dakota ("Project Area"), approximately 8 miles north of Clark, South Dakota (Figure 1).

The proposed Project includes up to 120 wind turbines, up to 4 meteorological towers, associated access roads and temporary crane paths, temporary laydown/staging area, an operations and maintenance (“O&M”) facility, collector and communication systems, and a new Project electrical substation (“Wind Farm Facility”). The Transmission Facility includes a 345-kV transmission line, temporary staging area, and switchyard. The 5.2 miles of overhead transmission will run from the Project substation in Section 30 of Township 119N, Range 58W to the switchyard, which is located approximately 2 miles north of the town of Crocker in Section 9 of Township 119N, Range 58W, in Clark County, South Dakota. At the switchyard, the power will transfer to the Basin Electric Groton-to-Watertown 345 kV transmission line, part of the Southwest Power Pool, Inc. ("SPP")/Western Area Power Administration (“Western”) Transmission line portfolio. The Project would generate utility scale electric power for residential, commercial, and industrial consumers. Power from the Project would help meet the growing generation needs of the region for several decades and provide a significant economic benefit to the local community and government.

Crocker is a wholly owned subsidiary of Geronimo Energy, LLC (“Geronimo”). Geronimo is a North American utility-scale renewable energy development company headquartered in Edina, Minnesota and is a privately held Delaware limited liability company. Geronimo has developed multiple operating wind farms and solar projects throughout the United States. Approximately 1,400 megawatts (“MW”) of wind projects and 200 MW of solar projects developed by Geronimo are either currently under construction or operational. Geronimo has a multi-gigawatt development pipeline of wind and solar projects in various stages of development throughout the United States. Geronimo provides custom renewable energy development solutions for utilities, independent power purchasers and corporations looking to harness renewable energy for business growth. With deep roots in agriculture, Geronimo prides itself on developing renewable energy projects that are farmer-friendly, community-driven, and beneficial for rural communities.

1.2 Names of Participants (ARSD 20:10:22:06)

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

- Brett Koenecke and Kara Semmler
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1.3 Name of Owner and Manager (ARSD 20:10:22:07)

The Applicant will be the sole owner of the proposed Project. Melissa Schmit and Betsy Engelking are the primary contacts.

1.4 Facility Permit Application Content and Organization

On July 25, 2017, Crocker submitted a prior application to the Commission for Energy Facility Permits for the Crocker Wind Farm and associated 345 kV Transmission Line (Docket EL17-028). On October 25, 2017, the Commission granted a motion to dismiss the prior application. Concerns raised included uncertainty regarding the Project's layout due to Crocker's pending challenge of the setback from residences included in Clark County's Conditional Use Permit ("CUP") for the Project, and the need for approval of turbine locations on United States Fish and Wildlife Service ("USFWS") grassland easements. In addition, the Commission noted a concern regarding lack of public access to information provided in response to data requests from Commission Staff after the application was filed.

In the current Application, Crocker has addressed the concerns noted above. First, the Project layout has been revised to comply with a three-quarter-mile setback between turbines and nonparticipating residences. Second, the number of turbines located on USWFS grassland easements has been reduced from 41 to 14, and those turbine locations will only be used to the extent that they are approved by the USFWS. Third, the relevant information provided in response to the Commission Staff's data requests has been incorporated into the Application. A more detailed description of the various components of the Wind Farm Facility and Transmission Facility, including construction, restoration, operations and maintenance procedures are provided in Section 4.0.

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

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

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

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

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

1.4.1 Completeness Check

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

Table 1-1: Completeness Checklist

SDCL	ARSD	Required Information	Location
49-41B-11(1) thru (12); 49-41B-35(2)	20:10:22:05	**Application contents.** The application for a permit for a facility shall contain a list of each permit that is known to be required from any other governmental entity at the time of the filing. The list of permits shall be updated, if needed, to include any permit the applicant becomes aware of after filing the application. The list shall state when each permit application will be filed. The application shall also list each notification that is required to be made to any other governmental entity.	Section 12.1
49-41B-11(1)	20:10:22:06	**Names of participants required.** The application shall contain the name, address, and telephone number of all persons participating in the proposed facility at the time of filing, as well as the names of any individuals authorized to receive communications relating to the application on behalf of those persons.	Section 1.2
49-41B-11(7)	20:10:22:07	**Name of owner and manager.** The application shall contain a complete description of the current and proposed rights of ownership of the proposed facility. It shall also contain the name of the project manager of the proposed facility.	Section 1.3
49-41B-11(8)	20:10:22:08	**Purpose of facility.** The applicant shall describe the purpose of the proposed facility.	Chapter 2.0
49-41B-11(12)	20:10:22:09	**Estimated cost of facility.** The applicant shall describe the estimated construction cost of the proposed facility	Chapter 3.0
49-41B-11(9)	20:10:22:10	**Demand for facility.** The applicant shall provide a description of present and estimated consumer demand and estimated future energy needs of those customers to be directly served by the proposed facility. The applicant shall also provide data, data sources, assumptions, forecast methods or models, or other reasoning upon which the description is based. This statement shall also include information on the relative contribution to any power or energy distribution network or pool that the proposed facility is projected to supply and a statement on the consequences of delay or termination of the construction of the facility.	Chapter 2.0
49-41B-11(2)	20:10:22:11	**General site description.** The application shall contain a general site description of the proposed facility including a description of the specific site and its location with respect to State, county, and other political subdivisions; a map showing prominent features such as cities, lakes and rivers; and maps showing cemeteries, places of historical significance, transportation facilities, or other public facilities adjacent to or abutting the plant or transmission site.	Chapter 4.0

SDCL	ARSD	Required Information	Location
49-41B-11(6); 49-41B-21; 34A-9-7(4)	20:10:22:12	**Alternative sites.** The applicant shall present information related to its selection of the proposed site for the facility, including the following: (1) The general criteria used to select alternative sites, how these criteria were measured and weighed, and reasons for selecting these criteria; (2) An evaluation of alternative sites considered by the applicant for the facility; (3) An evaluation of the proposed plant, wind energy, or transmission site and its advantages over the other alternative sites considered by the applicant, including a discussion of the extent to which reliance upon eminent domain powers could be reduced by use of an alternative site, alternative generation method, or alternative waste handling method.	Chapter 7.0
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:13	**Environmental information.** The applicant shall provide a description of the existing environment at the time of the submission of the application, estimates of changes in the existing environment which are anticipated to result from construction and operation of the proposed facility, and identification of irreversible changes which are anticipated to remain beyond the operating lifetime of the facility. The environmental effects shall be calculated to reveal and assess demonstrated or suspected hazards to the health and welfare of human, plant and animal communities which may be cumulative or synergistic consequences of siting the proposed facility in combination with any operating energy conversion facilities, existing or under construction. The applicant shall provide a list of other major industrial facilities under regulation which may have an adverse effect on the environment as a result of their construction or operation in the transmission site, wind energy site, or siting area.	Chapter 9.0

SDCL	ARSD	Required Information	Location
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:14	**Effect on physical environment.** The applicant shall provide information describing the effect of the proposed facility on the physical environment. The information shall include: (1) A written description of the regional land forms surrounding the proposed plant or wind energy site or through which the transmission facility will pass; (2) A topographic map of the plant, wind energy, or transmission site; (3) A written summary of the geological features of the plant, wind energy, or transmission site using the topographic map as a base showing the bedrock geology and surficial geology with sufficient cross-sections to depict the major subsurface variations in the siting area; (4) A description and location of economic deposits such as lignite, sand and gravel, scoria, and industrial and ceramic quality clay existent within the plant, wind energy, or transmission site; (5) A description of the soil type at the plant, wind energy, or transmission site; (6) An analysis of potential erosion or sedimentation which may result from site clearing, construction, or operating activities and measures which will be taken for their control; (7) Information on areas of seismic risks, subsidence potential and slope instability for the plant, wind energy, or transmission site; and (8) An analysis of any constraints that may be imposed by geological characteristics on the design, construction, or operation of the proposed facility and a description of plans to offset such constraints.	Section 9.1

SDCL	ARSD	Required Information	Location
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:15	**Hydrology.** The applicant shall provide information concerning the hydrology in the area of the proposed plant, wind energy, or transmission site and the effect of the proposed site on surface and groundwater. The information shall include: (1) A map drawn to scale of the plant, wind energy, or transmission site showing surface water drainage patterns before and anticipated patterns after construction of the facility; (2) Using plans filed with any local, State, or Federal agencies, indication on a map drawn to scale of the current planned water uses by communities, agriculture, recreation, fish, and wildlife which may be affected by the location of the proposed facility and a summary of those effects; (3) A map drawn to scale locating any known surface or groundwater supplies within the siting area to be used as a water source or a direct water discharge site for the proposed facility and all offsite pipelines or channels required for water transmission; (4) If aquifers are to be used as a source of potable water supply or process water, specifications of the aquifers to be used and definition of their characteristics, including the capacity of the aquifer to yield water, the estimated recharge rate, and the quality of ground water; (5) A description of designs for storage, reprocessing, and cooling prior to discharge of heated water entering natural drainage systems; and (6) If deep well injection is to be used for effluent disposal, a description of the reservoir storage capacity, rate of injection, and confinement characteristics and potential negative effects on any aquifers and groundwater users which may be affected.	Section 9.2
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:16	**Effect on terrestrial ecosystems.** The applicant shall provide information on the effect of the proposed facility on the terrestrial ecosystems, including existing information resulting from biological surveys conducted to identify and quantify the terrestrial fauna and flora potentially affected within the transmission site, wind energy site, or siting area; an analysis of the impact of construction and operation of the proposed facility on the terrestrial biotic environment, including breeding times and places and pathways of migration; important species; and planned measures to ameliorate negative biological impacts as a result of construction and operation of the proposed facility.	Section 9.3

SDCL	ARSD	Required Information	Location
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 9.4
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) Pasture lands 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.	Sections 8.0 and 9.5

SDCL	ARSD	Required Information	Location
49-41B-11(2,11); 49-41B-28	20:10:22:19	**Local land use controls.** The applicant shall provide a general description of local land use controls and the manner in which the proposed facility will comply with the local land use zoning or building rules, regulations or ordinances. If the proposed facility violates local land use controls, the applicant shall provide the commission with a detailed explanation of the reasons why the proposed facility should preempt the local controls. The explanation shall include a detailed description of the restrictiveness of the local controls in view of existing technology, factors of cost, economics, needs of parties, or any additional information to aid the commission in determining whether a permit may supersede or preempt a local control pursuant to SDCL 49-41B-28.	Chapter 8.0
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:20	**Water quality.** The applicant shall provide evidence that the proposed facility will comply with all water quality standards and regulations of any Federal or State agency having jurisdiction and any variances permitted.	Section 9.2
49-41B-11(2,11); 49-41B-21; 49-41B-22	20:10:22:21	**Air quality.** The applicant shall provide evidence that the proposed facility will comply with all air quality standards and regulations of any Federal or State agency having jurisdiction and any variances permitted.	Section 9.6
49-41B-11(3)	20:10:22:22	**Time schedule.** The applicant shall provide estimated time schedules for accomplishment of major events in the commencement and duration of construction of the proposed facility.	Chapter 6.0

SDCL	ARSD	Required Information	Location
49-41B-11(11); 49-41B-22	20:10:22:23	**Community impact.** The applicant shall include an identification and analysis of the effects the construction, operation, and maintenance of the proposed facility will have on the anticipated affected area including the following: (1) A forecast of the impact on commercial and industrial sectors, housing, land values, labor market, health facilities, energy, sewage and water, solid waste management facilities, fire protection, law enforcement, recreational facilities, schools, transportation facilities, and other community and government facilities or services; (2) A forecast of the immediate and long-range impact of property and other taxes of the affected taxing jurisdictions; (3) A forecast of the impact on agricultural production and uses; (4) A forecast of the impact on population, income, occupational distribution, and integration and cohesion of communities; (5) A forecast of the impact on transportation facilities; (6) A forecast of the impact on landmarks and cultural resources of historic, religious, archaeological, scenic, natural, or other cultural significance. The information shall include the applicant's plans to coordinate with the local and State office of disaster services in the event of accidental release of contaminants from the proposed facility; and (7) An indication of means of ameliorating negative social impact of the facility development.	Section 9.7
49-41B-11(4)	20:10:22:24	**Employment estimates.** The application shall contain the estimated number of jobs and a description of job classifications, together with the estimated annual employment expenditures of the applicants, the contractors, and the subcontractors during the construction phase of the proposed facility. In a separate tabulation, the application shall contain the same data with respect to the operating life of the proposed facility, to be made for the first ten years of commercial operation in one-year intervals. The application shall include plans of the applicant for utilization and training of the available labor force in South Dakota by categories of special skills required. There shall also be an assessment of the adequacy of local manpower to meet temporary and permanent labor requirements during construction and operation of the proposed facility and the estimated percentage that will remain within the county and the township in which the facility is located after construction is completed.	Section 9.7.1

SDCL	ARSD	Required Information	Location
49-41B-11(5)	20:10:22:25	**Future additions and modifications.** The applicant shall describe any plans for future modification or expansion of the proposed facility or construction of additional facilities which the applicant may wish to be approved in the permit.	Chapter 10.0
49-41B-35(3)	20:10:22:33.01	**Decommissioning of wind energy facilities.** Funding for removal of facilities. The applicant shall provide a plan regarding the action to be taken upon the decommissioning and removal of the wind energy facilities. Estimates of monetary costs and the site condition after decommissioning shall be included in the plan. The commission may require a 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.	Chapter 5.0
49-41B 11(2,11)	20:10:22:33.02	**Information concerning wind energy facilities.** If a wind energy facility is proposed, the applicant shall provide the following information: (1) Configuration of the wind turbines, including the distance measured from ground level to the blade extended at its highest point, distance between the wind turbines, type of material, and color; (2) The number of wind turbines, including the number of anticipated additions of wind turbines in each of the next five years; (3) Any warning lighting requirements for the wind turbines; (4) Setback distances from off-site buildings, rights-of-way of public roads, and property lines; (5) Anticipated noise levels during construction and operation; (6) Anticipated electromagnetic interference during operation of the facilities; (7) The proposed wind energy site and major alternatives as depicted on overhead photographs and land use culture maps; (8) Reliability and safety; (9) Right-of-way or condemnation requirements; (10) Necessary clearing activities; (11) Configuration of towers and poles for any electric interconnection facilities, including material, overall height, and width; (12) Conductor configuration and size, length of span between structures, and number of circuits per pole or tower for any electric interconnection facilities; and (13) If any electric interconnection facilities are placed underground, the depth of burial, distance between access points, conductor configuration and size, and number of circuits	Chapter 4.0 includes (1), (2), (3), (9), (10), (11), (12), and (13) Section 8.0 addresses (4) Section 9.5.4 addresses (5) Chapter 11.0 addresses (6) and (8) Chapter 7.0 addresses (7)

SDCL	ARSD	Required Information	Location
49-41B-11(2,11)	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.	Chapter 4.0
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, 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 and size, and number of circuits.	Chapter 4.0 addresses (1), (2), (5), (6), and (7) Chapter 7.0 addresses (3) Chapter 11.0 addresses (4)
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.	Chapter 12.0
49-41-B-35; 49-41B-11	20:10:22:39	**Testimony and exhibits.** Upon the filing of an application pursuant to SDCL 49-41B-11, an applicant shall also file all data, exhibits, and related testimony which the applicant intends to submit in support of its application. The application shall specifically show the witnesses supporting the information contained in the application.	Chapter 13.0
49-41B-22	N/A	**Applicant's burden of proof.** The applicant has the burden of proof to establish that: (1) The proposed facility will comply with all applicable laws and rules; (2) The facility will not pose a threat of serious injury to the environment nor to the social and economic condition of inhabitants or expected inhabitants in the siting area; (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	Chapters 8.0 and 9.0

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

Crocker is actively marketing the sale of electricity to third parties, including utilities and large power consumers/marketers, and is currently in discussions with three potential off-takers. The Project may sell power in the form of a power purchase agreement or the Project could be owned directly by a utility.

As an independent power producer, Crocker is not limited to the needs of one region and is able to bid into multiple wholesale markets across the region. For example, over the past year, Crocker was eligible to bid into eight utility and eight corporate/industrial power supply proposal requests in the region. Utilities seeking to diversify and build their energy generation portfolios are attracted to wind energy projects because of long-term competitive pricing, environmental benefits, and existing and potential (State and Federal) renewable energy policies. Continuous study of the wind resource since 2010 has proven this Project Area to be one of South Dakota's premier wind development sites thereby allowing the proposed Project to compete with other projects.

As discussed below, the proposed Project would install up to 400 MW of wind generating capacity in South Dakota that would contribute to satisfying utilities' and consumers' demands for renewable energy, and meet utility renewable requirements or individual sustainability goals. If the proposed Project is not constructed or delayed, potential power purchaser's efforts to obtain renewable energy in a cost-effective and reliable manner would be in jeopardy. In addition, both the Production Tax Credit and Investment Tax Credit started to phase down starting at the end of 2016, meaning that an extended delay could result in increased costs. Additionally, project costs are subject to commodity flux and rise. Therefore, if the Project is delayed, the probability of commodity price increase is greater.

2.1 National and State Energy Demand

The electric power sector is the largest consumer of primary energy in the United States ("U.S.") (United States 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 5.6 percent (84 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 United States (Pew Research Center, 2016).

In 2015, the DOE established Wind Vision goals of using wind energy to generate 10 percent of the nation's electricity demand by 2020, 20 percent by 2030, and 35 percent by 2050. As of 2015, to meet these objectives, 113 GW of generating capacity would be required by 2020, 224 GW by 224, and 404 GW by 2050 (DOE, 2015); or an increase of 29, 140, and 320 GW, respectively, from currently installed capacity.

The projected benefits associated with meeting the Wind Vision goals are:

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

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.

Some States have enacted Renewable Electricity Standards ("RES") to support the development of renewable energy projects. In February of 2008, South Dakota enacted legislation establishing an objective that 10 percent of all retail electricity sales in the state be obtained from renewable and recycled energy by 2015 with reporting required through 2017 (SDCL 49-34A-101). In 2009, the policy was amended to allow conserved energy as a component. According to the 2016 SDPUC's Annual Report, only seven out of 12 utilities in the state had met this objective (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 here: http://programs.dsireusa.org/system/program?fromSir=0&state=SD&.

The Project also could help meet the RES of neighboring states. For example, Minnesota has an RES of 25 percent by 2025 for all utilities except Xcel Energy, which has an 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.

2.2 Renewable Power Demand by Utilities

The Lazard Levelized Cost of Energy Analysis (version 10.0) ("Lazard") provides an in-depth study of the levelized cost of all types of energy production, including renewable energy resources and more traditional technologies (Lazard, 2016).

Based on this analysis, wind energy provides the most cost-effective electricity source for customers, making it desirable to utilities. New wind energy facilities are less expensive to construct than new conventional energy sources, even without government subsidies. Table 2-1 provides a comparison of the unsubsidized levelized cost of energy for both alternative and conventional energy sources. In general, alternative energy sources provide lower costs per MW-hour than conventional sources.

Table 2-1: Unsubsidized Levelized Cost of Energy

	Energy Source	Levelized Cost ($/MW hour)
Alternative Energy	Fuel Cell	$106-167
	Geothermal	$79-117
	Solar Photovoltaic – Crystalline Utility Scale	$49-61
	Solar Photovoltaic – Thin Film Utility Scale	$46-56
	Biomass Direct	$77-110
	Wind	$32-62
Conventional Energy	Diesel Reciprocating Engine	$212-281
	Natural Gas Reciprocating Engine	$68-101
	Gas Peaking	$165-217
	Nuclear	$97-136
	Coal	$60-143

Source: Lazard, 2016

Competitive wind energy pricing results in clean and cost-effective energy that can replace the decline in older conventional energy facilities such as coal plants. Wind energy provides a solution to fill the production void in the Midwest with competitively priced power. A review of regional utilities' integrated resource plans, requests for proposals, and similar documents confirms that utilities are seeking additional renewable generation resources in the next several years (Xcel Energy, 2014; Minnesota Power, 2015; Otter Tail Power Company, 2016). For example, in the Midcontinent Independent System Operator ("MISO") region, utilities have expressed a need for thousands of megawatts of renewable energy (including wind) before 2020 (MISO, 2016). The SPP region is also seeing demand for renewable energy (including wind) confirmed with requests for proposals and other market indicators. As utilities continue to retire older plants, we expect that they will continue to require new renewable energy generation between 2020 and 2030. Additionally, as the cost for renewable energy has decreased, commercial, industrial, and institutional ("C&I") demand for renewable energy has increased, creating a new market to obtain power purchasers. In 2016, approximately 1,600 MW of wind energy was purchased by the C&I sector (Renewable Choice Energy, 2017). Given this demand

for renewable energy, a market exists for independently produced electricity generated from wind and other renewables, including the energy to be generated by the Project.

2.3 Additional Considerations

2.3.1 Socially Beneficial Uses of Energy Output

Energy produced by the Project will provide significant, numerous, and varied societal benefits. As mentioned above and described by the DOE, the shift to wind energy decreases air pollution, greenhouse gas emissions, conserves water resources, increases U.S. energy security by development of diversified generation resources, reduces fossil fuel demands, reduces energy costs to consumers, and generates well-paying jobs.

The Project will also provide a supplementary source of income for the rural landowners and farmers on whose land the Project will be sited. The landowners in the Project footprint will receive payments based on acres in the activated Project Area. Additionally, the landowners who host turbines will receive annual lease payments for each turbine sited on their property. Because only a small portion of the land will be used for the Project, agricultural operations can continue largely undisturbed. Less than one percent of the acres within the Project boundary will be removed from agricultural use over the life of the Project.

2.3.2 Effects of Facility in Inducing Future Development

The Project is not expected to have material negative impacts on other possible developments in Clark County. However, the Project will provide significant benefits to the local economy and local landowners. At 400 MW, the Project would benefit landowners in the Project Area with average annual lease payments of approximately $2.3 million for the first 20 years totaling approximately $46 million. Additional wind energy infrastructure will also provide an additional source of revenue in to the State, school districts, county and townships in which the Project is sited. This same size project is estimated to pay approximately $1.8 million per year in wind farm capacity and production taxes, totaling approximately $36 million over 20 years.

Crocker has announced and is committed to creating an independently directed community fund and providing that fund with $200 per MW per year for 20 years (400 MW Project would generate $80,000 per year). The Crocker Community Fund, a 501(c)(3) organization, is advised by a local board nominated by landowners. Its purpose is engaging in, assisting with, and contributing money to exclusively charitable activities and opportunities within the communities of South Dakota connected to the Project. The Project will also provide significant income opportunities for local residents. Based on the National Renewable Energy Laboratory's Jobs and Economic Development Impact ("JEDI") model and internal projections, construction of the 400 MW Wind Farm and associated transmission line is anticipated to generate approximately 250 construction related jobs at peak demand and JEDI projects 18 permanent operations and maintenance positions. The Project has already created significant landowner payments along with consulting, management, and environmental work.

Once constructed, the additional economic impact of the Project to the area will provide resources that can be used to invest in future development opportunities. The Project also has the

potential to help contribute to making the energy those residents rely upon less susceptible to volatility (DOE, 2014, 2015). The development of wind energy technology now makes wind power price competitive with new natural gas and coal generation (EIA, 2015). The development of wind energy in South Dakota reduces dependence on fossil fuel markets and helps keep energy dollars in South Dakota (DOE, 2015).

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

3.1 Capital and Operational Costs

The total installed capital costs for the Wind Farm Facility are estimated to be approximately $1.5 million per MW with project cost depending on project size and other variables including wind turbines, associated electrical and communication systems, and access roads. Ongoing operations and maintenance costs and administrative costs are estimated by JEDI model to be approximately $13 to 14 million per year when including direct landowner agreement payments and annual capacity and production taxes due for the wind farm.

The total installed capital costs for the Transmission Facility are estimated to be approximately $5 million. Ongoing operations and maintenance costs and administrative costs are estimated to be approximately $100,000 per year, including payments to landowners for easement rights.

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

4.1 Site Location and Overview

Crocker is proposing to construct a wind energy facility located within a Project Area of approximately 29,331 acres of privately owned land in Clark County, South Dakota, approximately 8 miles north of Clark, South Dakota (Figure 2). The Wind Farm Facility includes up to 120 wind turbines, up to 4 permanent meteorological towers, associated access roads and temporary crane paths, temporary laydown/staging area, an O&M facility, collector and communication systems, and a new Project electrical substation. The associated Transmission Facility is described in more detail in Section 4.3. The Project will generate utility scale electric power for residential, commercial, and industrial consumers.

Table 4-1 lists the counties, townships, sections, and ranges that are included in the Project Area. Figure 1 shows the Project's location; Figure 2 shows the preliminary project layout.

Table 4-1: Project Location

County Name	Township Name	Township	Range	Sections
Wind Farm Facility				
Clark	Spring Valley	119N	58W	3-10, 15-19, 25-26,30-31, 33-36
Clark	Warren	119N	59W	23-27, 34-36
Clark	Ash	118N	59W	1-3, 10-15
Clark	Woodland	118N	58W	1-12, 14-16, 21-23, 26, 34
Clark	Cottonwood	119N	57W	29-32
Transmission Facility				
Clark	Spring Valley	119N	58W	9-10, 15-19, 30

4.2 Wind Farm Facility

The Project would consist of up to 120 turbines producing up to 400 MW. The proposed Project configuration is shown in Figure 2 and Figures 2a-2d show more detail. As discussed further in Sections 8.0 and 9.5.4, all proposed turbine locations meet all applicable State and county setback and noise requirements for all of the proposed turbine models.

Crocker's layout is based on a detailed analysis of the Project Area and has been sited so as to avoid or minimize potential impacts. However, a limited amount of field survey work, construction micro-siting, and a geotechnical analysis of the proposed locations will be required to finalize the locations, which could necessitate minor shifts. To accommodate this final micro-siting, Crocker requests that the permit allow turbines to be shifted within 1,000 feet of their current proposed location, so long as specified noise and shadow flicker thresholds at occupied

residences are not exceeded, cultural resources and sensitive species habitat are avoided, and wetland impacts are avoided to the extent practicable. If turbine shifts are greater than 1,000 feet, exceed the noted thresholds, or do not meet the other limitations specified, Crocker would either not use the turbine location or obtain Commission approval of a proposed turbine location change. In all cases, the final turbine locations constructed would adhere to all applicable local, State, and Federal regulations and requirements.

As a result of final micro-siting, shifts in the access roads and collector system, as well as temporary facilities (e.g., concrete batch plant and laydown/staging areas), may also be necessary to accommodate turbine shifts, avoid identified resources, incorporate landowner input, or to address other factors. Therefore, Crocker requests that the permit allow those facilities to be shifted, as needed, so long as they are located on leased land, cultural resources are avoided, sensitive species habitat is avoided, wetland impacts are avoided to the extent practicable, and all other applicable regulations and requirements are met.

4.2.1 Wind Turbines

Wind Turbine Generators

The proposed Project would consist of up to 120 three-bladed, horizontal-axis wind turbines (Figure 2). Crocker has not yet finalized the specific turbine choice for the Project. Crocker requests the ability to select the turbine model prior to construction to ensure a viable, cost-effective and optimal turbine selection for the Project given the known conditions of the Project Area and the turbines that are commercially available when the Project is constructed. Turbine supply agreements reflect a large capital investment in the Project, and are frequently entered into after most major permits are received. Specifying a single turbine option at this time would make it difficult for Crocker to negotiate the best price for wind turbines. Negotiating turbine supply agreements in a competitive process with a number of suppliers will reduce the overall cost of the Project and benefit the Project offtakers. Further, since turbine technology is continually evolving, flexibility in selecting a turbine model will enable the Project to take advantage of the latest technology advancements.

The turbines Crocker is considering for the Project span the energy production range of 2.0 MW to 4.0 MW. The decision will be finalized prior to construction in order to create the most viable, cost-effective and optimal design for the Project given the known conditions of the Project Area and the turbines that are commercially available when the Project is constructed. The configuration illustrated in Figure 2 would be the same for any of the four turbine models and all locations comply with the SDPUC rules and Clark County provisions with respect to setbacks and noise. A typical turbine schematic is filed as confidential with the Commission as the turbine manufacturer has labeled it as proprietary. Detailed schematics of turbine models are not typically available until contract negotiations with vendors is underway.

Table 4-2 shows the range of characteristics for the four representative turbines.

Table 4-2: Wind Turbine Characteristics

Characteristic	Turbine			
	Gamesa G126	Vestas V136-3.45	GE 2.5-116	Vestas V110
Nameplate capacity (kW)	2625	3450	2500	2000
Hub height (m)[1]	84	82	90	80/95
Rotor Diameter (m)	126	136	116	110
Total height (m)[2]	147	150	148	135/150
Cut-in wind speed (m/s)[3]	3	3	3	3
Rated capacity wind speed (m/s)[4]	10	10	11	11
Cut-out wind speed (m/s)[5]	25	21	25	20
Maximum sustained wind speed (m/s)[6]	52.5	52.5	52.5	52.5
Wind Swept Area (m^2)	12,469	14,526	10,568	9,503
Rotor speed (rpm)	6.0-11.6	6.6-12.5	8.0-15.7	6-17.0

GE = General Electric
kW = kilowatts
m = meters
m/s = meters per second
rpm = rotations per minute
[1] Hub height = the turbine height from the ground to the top of the nacelle. Tower heights may range from 80 to 95 m.
[2] Total height = the total turbine height from the ground to the tip of the blade in an upright position.
[3] Cut-in wind speed = wind speed at which turbine begins operation
[4] Rated capacity wind speed = wind speed at which turbine reaches its rated capacity
[5] Cut-out wind speed = wind speed above which turbine shuts down operation
[6] Maximum sustained wind speed = wind speed up to which turbine is designed to withstand

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

All proposed turbine models have Supervisory Control and Data Acquisition ("SCADA") communication technology to control and monitor the Project. The SCADA communications system permits automatic, independent operation and remote supervision, allowing the simultaneous control of the wind turbines.

Operations, maintenance, and service arrangements between the turbine manufacturer and the Applicant will be structured to provide timely and efficient operations and maintenance. The computerized data network will provide detailed operating and performance information for each

wind turbine. The Applicant will maintain a computer program and database for tracking each wind turbine's operational history.

Other turbine specifications include:

- Rotor blade pitch regulation;
- Gearbox with three-step planetary spur gear system;
- Double fed three-phase asynchronous generator;
- A braking system for each blade and a hydraulic parking brake (disc brake);
- Yaw systems that are electromechanically driven.

Wind Turbine Towers

The towers are conical tubular in shape and are painted a non-glare white, off-white or gray. The turbine tower, where the nacelle is mounted, consists of three to four 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 sandblasted, 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 connecting four platforms and equipped with a fall arresting safety system.

Wind Turbine Foundations

The wind turbines' freestanding tubular towers will be connected by anchor bolts to a concrete foundation. Turbine foundations will use a pad-and-pier tower mounting system consisting of top and bottom templates. These templates consist of anchor bolts and reinforcing steel bar (rebar); they are placed within the excavated portion of the turbine footing and filled with concrete. The anchor bolts protrude from the concrete pad surface and the turbine base is fastened to these bolts. The excavated portion of the concrete turbine pad ranges from approximately 291 to 737 cubic yards depending on soil requirements and turbine size. The turbine pad dimensions are approximately 20 feet in above-ground diameter and typically range in depth from eight to nine feet. An approximate height of one-half to one foot of the turbine pad remains above grade. Geotechnical surveys, turbine tower load specifications, and cost considerations, among other factors will dictate final design parameters of the foundations. A typical turbine foundation is included in Appendix A.

In addition, turbine assembly will require a 40- by 120-foot gravel crane pad extending from the access road to the turbine foundation, which will be graded to a maximum of one percent, and an approximate 260- by 260-foot to 335- by 335-foot area for component laydown and rotor assembly centered close to the turbine foundation, which will be graded to a maximum of five percent.

Generator Step-up Transformers

At the base, or within each turbine, a step-up transformer will be installed to raise the voltage of the electricity generated by the turbine to the power collection line voltage of 34.5 kV. In some turbine models (e.g., Gamesa G126, Vestas V110, and Vestas V136-3.45), the step-up transformer is located within the nacelle. If external transformers are used (e.g., for the General Electric ["GE"] 2.5-116), then small, concrete slab foundations will be constructed, to support the transformers, within the gravel area at the turbine base. The exact dimensions of the transformers, concrete pad and concrete fill will be dependent upon transformer manufacturer specifications and site-specific engineering requirements.

4.2.2 Meteorological Towers and SoDAR or LiDAR Units

Three temporary meteorological towers were permitted and installed within the Project Area to study the wind resources at the site (one in 2010 and two in 2016). Crocker proposes to construct up to four permanent meteorological towers with the potential for a Sonic Detection and Ranging ("SoDAR") and/or a Light Range Detection and Ranging ("LiDAR") unit(s). Met towers may be used for monitoring wildlife activity as well as meteorological data. The preliminary locations of the four permanent meteorological towers or SoDAR/LiDAR units are shown on Figure 2. Final locations will be determined once the turbine model is chosen and the layout is final. The permanent met towers are expected to be free-standing and will be equal to the turbine hub height. The location of the temporary and preliminary permanent meteorological towers and SoDAR/LiDAR units currently in the Project Area are shown on Figure 2.

4.2.3 Access Roads and Crane Paths

The Project will include permanent all-weather gravel roads that provide access to the wind turbines. The primary function of the access roads is to provide accessibility to the turbines for turbine maintenance crews. The access roads will be low-profile to allow farm equipment to cross. Crocker will install temporary culverts and field approaches where needed to access the route and to maintain adequate access and drainage throughout construction. The construction corridor for access roads will be approximately 120 feet wide. Roads will initially be 34 feet wide to accommodate transportation of heavy construction equipment during construction. Once Crocker completes construction of the turbines, the access roads will be reduced to their permanent width of up to 20 feet. Total access road length will be up to approximately 43.6 miles.

Due to the size and weight of the large crane used to install the mid- and top-tower sections of the turbine, the crane cannot drive along public roads. Instead, cross-country paths must be created, called crane paths. Crane paths are designed to use the shortest path between turbine sites, while avoiding significant changes in grade, trees, wetlands, and waterways. Crane paths will be approximately 65 feet wide to accommodate the cranes during construction. Once construction is complete, crane paths will be restored.

Crocker designed the access road and crane path network to serve the Project most efficiently while incorporating landowner input, agency consultation, and other factors on road locations into consideration. Crocker has attempted to co-locate the access roads and crane network with

existing disturbance (e.g., farm roads, fencerows, section lines, utility corridors) as much as possible. Proposed access roads and crane path network are illustrated in Figure 2.

In addition, improvements to existing public and private roads and bridges may be required to allow for the safe and efficient transport of the wind turbine tower, nacelle, and blades by flatbed trucks to the Project site. Existing bridges may need to be replaced or reinforced, and roads widened, graded, and/or graveled. Crocker is in the process of identifying the best haul route to the Project site and where existing road improvements may be required. Crocker will work with the appropriate Federal, State, and/or local agencies to obtain the permits required for these improvements.

4.2.4 Temporary Laydown/Staging Areas/Temporary Concrete Batch Plant

Crocker will grade a temporary laydown/staging area of approximately twelve acres. The preliminary location is in the southeast portion of the Project Area (see Figure 2). As discussed in Section 4.2, if the location of the laydown/staging area should change, it will avoid be sited to avoid impacts to sensitive resources, and will be located on land under lease. The laydown/staging area will serve both the Wind Farm Facility and Transmission Facility construction, and will provide parking for construction personnel, staging area for large equipment deliveries, and potentially maintain an on-site temporary concrete batch plant during construction. Due to the volume of concrete needed to construct the turbine foundations, it is more efficient to mix concrete on-site. This will require a staging area for dry constituents (sand, aggregate) to be hauled to the site from off-site borrow areas. Water will be supplied from municipal or other off-site sources and trucked to the site. The appropriate water appropriation permits will be obtained to source the water. Electrical power for the batch plant will be supplied by portable generators or the local electrical distribution system.

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

4.2.5 O&M Facility

An O&M building will be co-located with the Project substation and will provide access and storage for Project maintenance and operations. Construction of the approximately 5-acre O&M facility will require a building permit from Clark County. The buildings typically used for this purpose are approximately 5,000 to 6,000 square feet and house the equipment to operate and maintain the Project. Ambient conditions within the O&M building would need to be maintained to meet equipment operating requirements and/or to support the presence of maintenance personnel. Heating of all occupied structures would be provided by propane stored on site. Although the electric power demands of the O&M building and the operating equipment would be supplied from the grid, emergency power generation would also be available on-site via a

diesel engine/generator set. The parking lot adjacent to the building is typically approximately 3,000 square feet.

4.2.6 Electrical Collector System

From the step-up transformers at each turbine, which raise the voltage to 34.5 kV, power will run through an underground and/or aboveground system of collection cables, collector buses, and feeder breakers, referred to as a collector system, that connects to the Project substation. The Project substation will raise the voltage to 345 kV in order to tie-in to the grid. Up to 157 miles of underground circuits will be installed by trenching, plowing, or, where needed, directionally boring the cables underground to avoid sensitive environmental conditions or meet other requirements. Generally, the electrical collection lines will be buried with marking tape and tracer wire per appropriate national electrical code and the Project will register the appropriate underground facilities with the South Dakota One-Call system. Additionally, collector system cabling may go aboveground when conflicts with existing underground utilities or other infrastructure cannot be resolved and aboveground cabling will resolve the conflict. Where electrical collectors meet public road rights-of-way, the power collection lines will likely continue underground, or the appropriate collection facilities could be raised as required to become aboveground facilities (if requested by the road authority, or if shallow bedrock, underground utilities or other infrastructure are encountered). The collection lines will occasionally require an aboveground junction box when the lines from separate spools need to be spliced together.

The proposed collector system layout based on the proposed turbine configuration is shown on Figure 2.

4.2.7 Fiber Optic Communication System

When installing the collector system, Crocker will also install fiber optic communication systems that will connect each of the Project's wind turbines to the Project's substation and provide communications between the wind turbines, substation, O&M facility and electrical grid as part of SCADA (see Section 4.5.10). If underground, the electrical and fiber optic cables will be placed in the same trench wherever possible and will include occasional aboveground junction boxes. All of the collection circuits will connect to Crocker's substation which will have a fiber optic connection to the O&M building and a communication system to the grid operator.

4.2.8 Project Electrical Substation

The power delivered to the Project's electrical substation via the collector system will be converted to 345 kV. The Project electrical substation will be designed according to good utility practices. The substation will include a weather protected control structure, power transformers, switches, metering and other equipment needed for safe electrical operations of the Wind Farm Facility. The area around the substation will be graveled and fenced. The substation area once completed will be approximately 500 feet by 500 feet.

4.3 Information Concerning Transmission Facilities (ARSD 20:10:22:35)

4.3.1 Configuration of Poles and Conductors

The 5.2-mile long single circuit transmission line will be constructed primarily on steel monopole structures. Crocker anticipates using Type 2-bundle 954 aluminum conductor steel reinforced conductors or conductors of comparable capacity. Monopole structures are generally placed on foundations measuring between 6 to 11 feet in diameter and will typically be between 100 and 120 feet tall. Spacing intervals will be between 400 and 1,000 feet. Diagrams of typical structures to be used on this Project are shown in Appendix B.

Preliminary locations of the transmission line structures are shown on Figure 3. To allow flexibility for final micro-siting (e.g., to avoid impacts to previously unrecorded cultural resources, incorporate geotechnical data, and accommodate potential landowner requests, Crocker requests the permit allow structures to be shifted so long as they remain within the easement acquired (see Section 4.2), impacts to cultural resources and sensitive habitat are avoided, and wetland impacts are avoided to the extent practicable.

4.3.2 Transmission Corridor

The 5.2-mile 345 kV overhead transmission will run from the Project substation in Section 30 of Township 119N, Range 58W to a switchyard located approximately 2 miles north of the town of Crocker in Section 9 of Township 119N, Range 58W, in Clark County, South Dakota (Figure 3). At the switchyard, the power will transfer to the Basin Electric Groton-to-Watertown 345 kV transmission line, part of the SPP/Western Transmission line portfolio. No portion of the Transmission Line will require underground transmission.

The typical easement area for the transmission line corridor is 150-feet-wide plus the adjacent right of row when applicable. Temporary construction impacts along the transmission line corridor are anticipated to be approximately 100 feet wide along the route. Permanent impacts will be limited to the area required for the transmission line structures. Additional temporary construction workspace may be required to allow for access to the easement area, cable-pulling, or stringing the transmission line on the conductors. All temporary construction workspace will be restored once construction is complete. Vegetation in the easement area will be maintained to protect the lines, allow for ground-based inspections, and access to transmission structures when maintenance is required.

4.3.3 Temporary Laydown/Staging Area

As discussed in Section 4.2.4, a preliminary 12-acre temporary laydown/staging area has been identified for use by the Wind Farm Facility and Transmission Facility construction (Figure 2). The staging area will be required to store equipment and vehicles, and to pre-assemble the pole structures. The laydown/staging area would be temporary and would be restored once construction is complete.

4.3.4 Switchyard

The interconnecting utility will construct a switchyard that will tie-in the Wind Farm Facility to the existing electrical grid (Figure 2). The switchyard will require a construction workspace of approximately 16.8 acres, with the final fenced in area anticipated area to be approximately 500 feet by 500 feet. Because the switchyard will be constructed by the interconnecting utility, the exact location of the fenced in area is pending. For the purposes of this Application, Crocker conservatively assumed permanent impacts of the 16.8 construction workspace. The switchyard components will be mounted on concrete pads. For electrical and fire safety, the switchyard will be will be graveled to maintain the area free of vegetation. The area will be fenced to prevent unauthorized entry by individuals and wildlife. Once construction is complete, the switchyard would be maintained and operated by the interconnecting utility.

4.4 Land Requirements

Table 4-3 describes both the temporary and permanent land requirements by Project component for the Wind Farm Facility, Transmission Facility, and the Project overall.

Table 4-3: Project Land Requirements

Project Component	Temporary (acres)	Permanent (acres)
Wind Farm Facility		
Turbine Foundations[1]	735.9	21.6
Access Roads	408.1	103.5
Crane Path Network	177.6	0.0
Electrical Collector and Communication Systems	444.1	0.0
Temporary Laydown/Staging Area	12.0	0.0
O&M Facility	0.0	5.5
Project Substation	0.0	9.4
Meteorological Towers	0.2	<0.1
Wind Farm Facility Subtotals	**1,777.9**	**140.1**
Transmission Facility		
Transmission Workspace	54.2	0.0
Structures	0.0	0.2
Switchyard	0.0	16.8
Transmission Facility Subtotals	**54.2**	**16.9**
Project Totals	**1,832.1**	**157.1**

[1] *Includes the crane pad area adjacent to the turbine foundation.*

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

Crocker did not use eminent domain powers to acquire easements for the Project. All land rights required for the wind energy facility and transmission facility were obtained through voluntary leases with property owners. Private land and public road rights-of-way 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.

4.5 Wind Farm Facility Construction, Restoration, Operations and Maintenance Procedures

Once Crocker has received all appropriate federal, state, and local permits and approvals, Crocker would initiate construction. Construction is expected to require between 12 to 18 months to complete; however, depending upon seasonal or weather-related constraints (i.e., minimal work would occur during winter months) it may take more or less time. Construction could commence on site as early as second quarter 2018.

4.5.1 Mobilization and Site Preparation

First, the workspace would be surveyed, staked, and prepared for clearing. The workspace would then be cleared and graded, as necessary, to provide construction access and safe movement of equipment and personnel during construction. Silt fence and other erosion control measures would be installed in accordance with the Project's Stormwater Pollution Prevention Plan ("SWPPP") and applicable permit conditions, and sensitive areas would be marked for avoidance. Appropriate safety measures would be implemented before excavation begins, including notification through the One-Call system to ensure third-party utilities and adjacent pipelines are properly marked. Equipment and vehicles will be transported to the Project Area and staged at the temporary laydown or staging area. During construction activities, dust control measures will be applied to manage dust along access roads, laydown/staging areas, and construction workspaces.

Crocker will conduct pre-construction surveys of the construction workspace to identify noxious and invasive weeds. A Noxious and Invasive Weed Management Plan will be developed to identify and establish the procedures to prevent the introduction and spread of noxious and invasive weeds during construction and ongoing operations.

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

4.5.2 Roadwork

Crocker will build gravel access roads to each turbine location. The construction corridor for access roads will be approximately 120 feet wide. Roads will initially be 34 feet wide to accommodate transportation of heavy construction equipment during construction. Before the access road is graveled, topsoil will be removed and stockpiled in the temporary construction workspace, subsoil will be compacted, and a geotextile matting will be placed. Crocker will install temporary culverts and field approaches where needed to access the route and to maintain adequate access and drainage throughout construction.

After construction is completed, temporary access roads will be converted to narrower, permanent access roads that could be up to 20 feet wide. The temporary portion of the access road will be restored by removing the gravel and geotextile fabric, decompacting the subsoil, and replacing the stored topsoil. Permanent access roads to turbine locations will be maintained to facilitate access to the turbine for ongoing operation and maintenance.

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

Public roads may also need improvements to allow for the safe and efficient access of flatbed trailers carrying the turbine tower components to the Project site. Crocker is in the process of identifying the best haul route to the Project site and where existing road improvements may be required. Crocker will work with the appropriate Federal, State, and/or local agencies to obtain the permits required for these improvements. Refer to Section 9.7.3 for more information.

4.5.3 Installation of Turbine Foundations

Crocker will next initiate the construction of the wind turbine foundations by clearing, and removing and stockpiling the topsoil and subsoil from each turbine site. Topsoil and subsoil will be stored separately in a semicircle around the foundation. Foundations are constructed by excavating a hole, placing reinforcing steel, and pouring concrete into the excavation. Next, the subsoil and topsoil are replaced over the concrete foundation, leaving only the center of the foundation will be above the surface grade.

Crocker will clear, grade, and develop a 40- by 120-foot crane pad area extending from the access road to the turbine foundation that will be used to erect the turbine tower. After construction, a 50-foot radius around each turbine will be maintained and graveled to prevent potential damage to the underground foundation and cabling that extends to each turbine. The remaining temporary construction area around each wind turbine will be restored and returned to its pre-construction use to the extent practicable.

4.5.4 Installation of Electrical Collector and Communication Systems

To install the underground collection lines and fiber optic cables, Crocker would trench, plow, or, where needed, directionally bore the cables underground to avoid sensitive environmental conditions or to address other needs. Trenching and plowing are anticipated to be the primary methods of installation. Typical collector lines will be installed at least 4 feet below grade. Generally, the electrical collection lines will be buried with marking tape and tracer wire per appropriate national electrical code and the project will register the appropriate underground facilities with the South Dakota One-Call system. Lines are typically plowed in using bull dozers and associated plowing equipment. Where trenching is appropriate, topsoil would be segregated according to applicable permit conditions. The cables would be placed into the trench and backfilled. During backfilling, subsoil would be replaced first and then the topsoil would be replaced.

4.5.5 Tower Deliveries and Erection

The first sections of the turbine to be delivered and erected are the base and mid-section of the tower. These will be transported to the Project Area by semi-truck, and then assembled by crane in the crane pad area. The typical process includes the following steps. First, the two tower sections are assembled, and the base is bolted to the foundation. Next, the top tower section is erected, and then the nacelle is raised and bolted to the top. Finally, the blades are connected to the hub, collectively called the rotor assembly, which is then connected to a shaft that passes into the nacelle. Each turbine takes approximately 4 to 5 days to erect from offload to pre-assembly and effecting staging of components. Once installed, Crocker will mark and light the turbines to comply with Federal Aviation Administration ("FAA") requirements. Construction of O&M Facility and Project electrical substation.

4.5.6 Construction of O&M Facility

The O&M Facility will require initial civil and grading work to establish the building pad and create positive drainage for the parking and yard area. Underground foundations will be installed along with below grade mechanicals. The building will be erected, internal finishes will commence, aggregates will be installed in the parking and yard area. Water supply facilities and septic will be installed.

4.5.7 Construction of Project Electrical Substation

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

4.5.8 Installation of Permanent Meteorological Towers

Similar to turbines, the meteorological towers will be erected using a crane with the base being bolted to a foundation. A 75- by 75-foot square of temporary workspace will be required for foundation installation and stacking the meteorological tower. Foundations will be a 15- by 15-foot square and permanent access roads will not be required. The Applicant will paint meteorological towers as required by applicable regulations and best practices to improve visibility and will notify local airports about the Project and new towers in the area to reduce the risk to crop dusters. Permanent meteorological towers will be free-standing with no guy wires and equipped with FAA approved lighting/markings.

4.5.9 Restoration Procedures

Once construction is complete, the construction workspace will be cleaned up and restoration activities would commence. All temporary construction workspaces, such as the crane paths, temporary access roads, temporary laydown/staging area, and extra workspace areas (e.g., crane

pad) will be restored by removing gravel (where applicable), decompacting the subsoil, and replacing stored topsoil to pre-construction conditions to the maximum extent practicable. Temporary and permanent stabilization measures, such as slope breakers, mulching, and seeding with the appropriate seed mix will then be implemented.

Crocker will compensate landowners for damages from Project construction to crops, tile, fences or other property.

4.5.10 Operations and Maintenance

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

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

Other activities will include the regrading and graveling of access roads, routine electrical inspections, and application of herbicides to control noxious and invasive weeds as outlined in Crocker's Noxious and Invasive Weed Management Plan. Crocker will also conduct routine preventative maintenance testing of on-site emergency power generators, and maintain fuel levels of on-site propane and fuel tanks.

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

4.6 Transmission Facility Construction, Restoration, Operations and Maintenance Procedures (ARSD 20:10:22:34 and ARSD 20:10:22:35)

4.6.1 Mobilization, Site Preparation, and Clearing

Construction will begin after applicable Federal, State, and local approvals have been obtained, property and rights-of-way are acquired, soil conditions are established, and final design is completed. The 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 corridor has been routed to minimize tree clearing to the extent feasible. Isolated trees may need to be cleared to allow safe operation of the transmission line. Surveyors will stake the construction corridor within the approved construction workspace and the pole locations of the approved alignment in preparation for the construction crew arriving on site. Once the construction crew arrives; they will begin by clearing and grubbing out the workspace to ensure that vegetation meets the standards and that the construction crew will have easy access to the construction site. The crew will use chain saws, lifts, tractors and bulldozers only where needed to clear vegetation. The crew will install temporary culverts and field approaches where needed to access the route and to maintain adequate access and drainage throughout construction. 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 ensure third-party utilities and adjacent pipelines are properly marked. Equipment and vehicles will be transported to the Project Area and staged at the temporary laydown or staging area. During construction activities, dust control measures will be applied to manage dust along access roads, laydown/staging area, and construction workspaces.

Crocker has conducted pre-construction natural community surveys, which included observations of noxious and invasive weeds (see Section 9.3.1). A Noxious and Invasive Weed Management Plan will be developed to identify and establish the procedures to prevent the introduction and spread of noxious and invasive weeds during construction and ongoing operations.

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

4.6.2 Transmission Line Construction Procedures

Transmission line structures are generally designed for installation at existing grades. Typically, structure sites with ten percent or less slope will not be graded or leveled. Sites with more than ten percent slope will have working areas graded level or fill brought in for working pads. Crocker anticipates that only minimal grading will be needed because the route has very little elevation change. Where grading is required, the topsoil will be removed and stored for replacement after construction is complete. If the landowner permits, it is preferred to leave the leveled areas and working pads in place for use in future maintenance activities. If permission is not obtained, the site will be graded back to as close to its original condition as possible, and all imported fill, including temporary culverts and road approaches, will be removed from the site and disturbed areas will be returned to pre-disturbance conditions.

The staging area required for construction of the Transmission Facility will be partially shared with the associated Wind Farm Facility. Staging involves delivering the equipment and materials to construct the new transmission line facilities. Structures are delivered to staging areas, sorted and loaded onto structure trailers for delivery to the staked location. The materials are stored until they are needed for the Project. Sufficient rights to use the temporary laydown areas outside

of the transmission line right-of-way will be obtained from affected landowners through rental agreements. Insulators and other hardware are attached to the structure while it is on the ground in the laydown area.

When it is time to install the poles, structures are moved from the staging areas, delivered to the staked location and placed within the right-of-way until the structure is set. Typically, access to the transmission line right-of-way corridor is made directly from existing roads or trails that run parallel or perpendicular to the transmission line right-of-way. In all cases where construction traffic and activities are within close proximity to local, county or State roadways, the contractor will coordinate with the governing body on traffic control and safety measures. In some situations, private field roads or trails are used. Permission from the property owner is obtained prior to accessing the transmission line corridor outside of public rights-of-way. Where necessary to accommodate the heavy equipment used in construction (including cranes, concrete cement trucks, and hole-drilling equipment), existing access roads may be upgraded, or new roads may be constructed. Once construction is complete the temporary field approaches and access roads installed for the transmission corridor will be removed and revegetated. The construction workspace will be allowed to regenerate naturally so long as it does not encroach on typical utility best practice prescribed clearances.

The monopole structures for the Project will be secured using concrete foundations. Then, the topsoil and subsoil will be excavated for the pole foundation, concrete poured, and pile driven to establish the foundation. The spoils from the excavated foundation will be removed from site unless other arrangements are made with the landowner. The concrete foundation is typically one foot above grade.

4.6.3 Switchyard Construction Procedures

The Project has a Generator Interconnection Agreement that specifies that the interconnecting utility will be responsible for constructing the switchyard to interconnect the Project onto the transmission grid.

4.6.4 Restoration Procedures

The construction workspace will be disturbed during the normal course of work (as is typical of most construction projects), which can take several weeks in any one location. Crocker 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 best management practices (“BMPs”) and the Project’s permit conditions. As construction on each parcel of land is completed, disturbed areas will be restored to their original condition to the extent practicable. In addition, Crocker will develop a Noxious and Invasive Weed Management Plan to prevent the spread of noxious and invasive weeds during construction and ongoing operations.

Crocker or their 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 Project. If damage has occurred to crops, fences or the property, Crocker will fairly compensate the landowner for the damages sustained in accordance with the terms and conditions agreed upon in the Transmission Easement Agreement entered into by Crocker and the landowner.

In some cases, the Applicant may engage an outside contractor to restore the damaged property to its original condition to the extent practicable. Portions of permanent vegetation that are disturbed or removed during construction of transmission lines will be reestablished to pre-disturbance conditions to the extent practicable. Resilient species of common grasses and shrubs typically reestablish naturally with few problems after disturbance. Areas with significant soil compaction and disturbance from construction activities along the route will require assistance in reestablishing the vegetation stratum and controlling soil erosion. 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 native species.

4.6.5 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 forty years. However, high-voltage transmission lines are seldom completely retired. Crocker anticipates that the line could potentially, and would likely be broadly integrated into the transmission system over time, ultimately providing wider utility than just interconnecting the Wind Farm Facility into the electrical grid.

The principal operating and maintenance cost for transmission facilities is the cost of inspections, which will be performed semi-annually by either truck, utility terrain vehicle, on foot, or by air**.** Inspections will be conducted to ensure that the transmission line is fully functional, and that no vegetation has encroached so as to violate good utility best practice prescribed clearances. Crocker will prune or remove vegetation as required to prevent physical contact between the transmission lines and nearby vegetation that could cause the transmission line to fail. Annual operating and maintenance costs for 345 kV transmission lines in South Dakota and the surrounding states are expected to be approximately $300 to $600 per mile. Actual line-specific maintenance costs depend, the amount of vegetation management necessary, storm damage occurrences, structure types, materials used, and the age of the line.

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

At the end of commercial operation, Crocker or the Project owners will be responsible for removing wind facilities, and removing the turbine foundations to a depth of four feet below grade. In this case, a decision may be made on whether to continue operation with existing equipment or to retrofit the turbines and power system with upgrades based on newer technologies.

5.1 Anticipated Life of the Project

The anticipated Project life is approximately 30 years beyond the date of first commercial operation.

5.2 Cost to Decommission

A conservative decommissioning cost estimate in current dollars is between $100,000 to $150,000 per turbine after salvage value, including associated facilities. This cost estimate is based on on-site experience, labor costs, and material prices from Geronimo's operating project's decommissioning plans. An estimated breakdown per turbine follows:

- Labor: ~$53,500
- Shipping/Disposal: ~$100/ton
- Site Restoration: ~$6,000
- Salvage Value: ~$35,000

Crocker will be responsible for all costs to decommission the Project and associated facilities. The cost to decommission will depend upon the prevailing rates for salvage value of the equipment and labor costs. Because of the uncertainties surrounding future decommissioning costs and salvage values, Crocker will review and update the cost estimate of decommissioning and restoration for the Project every five years after Project commissioning.

5.3 List of Decommissioning and Restoration Activities

Consistent with the terms of the wind lease and easement agreements with individual landowners, Crocker will complete the following list of decommissioning and restoration activities:

Turbine removal - Access roads to turbines will be widened to a sufficient width to accommodate movement of appropriately-sized cranes, trucks and other machinery required for the disassembly and removal of the turbines. Control cabinets, electronic components, and internal cables will be removed. The rotor, nacelle and tower sections will be lowered to the ground where they may be transported whole for reconditioning and reuse, or disassembled/cut into more easily transportable sections for salvageable, recyclable, or disposable components.

Turbine and substation foundation removal - Topsoil will be removed from an area surrounding the foundation and stored for later replacement, as applicable. The typical depth of a turbine foundation is between 4 to 6 feet below grade. Turbine foundations will be excavated to a depth sufficient to remove all anchor bolts, rebar, conduits, cable, and concrete to a depth of 48 inches below grade. See Appendix A for a drawing of a typical foundation and the wind turbine structure for the Vestas V136 turbine model (the largest design).

Removal of turbine foundations to a depth of 48 inches is standard within the industry. A four-foot depth of removal ensures the foundation will not interfere with farming in the area, the root zones of most crops, or the construction of roads and the installation of utilities. Additionally, the turbine foundations are sloped downward from the center so they will not impede drainage. Removal beyond 48 inches would result in additional land impacts, and the associated impacts and cost are not necessary for restoration of the land to its prior use.

The remaining excavation will be filled with clean subgrade material of quality comparable to the immediate surrounding area. The sub-grade material will be compacted to a density similar to surrounding sub-grade material. All unexcavated areas compacted by equipment used in decommissioning shall be de-compacted in a manner to adequately restore the topsoil and sub-grade material to the proper density consistent and compatible with the surrounding area.

Underground collection cables - As part of the decommissioning, these items will be removed to a depth of at least 48 inches. All cable and conduit buried greater than 48 inches will be left in place and abandoned.

Substation and interconnection facilities - Disassembly of the substation and interconnection facilities will include only the areas owned by Crocker. Components (including steel, conductors, switches, transformers, fencing, control houses, etc.) will be removed from the Project Area and reconditioned and reused, sold as scrap, recycled, or disposed of appropriately, at Crocker's sole discretion. To remove foundations and underground components without damaging or impacting adjacent facilities to the extent possible, such foundations and underground components will be removed to a depth of 48 inches and the excavation area filled, contoured and re-seeded, if the area will not be farmed after restoration).

Access roads - Unless otherwise requested by the landowner, permanent access roads constructed to accommodate the Project will be removed. Ditch crossings connecting access roads to public roads will be removed unless the landowner requests they remain in place. Improvements to township and county roads that were not removed after construction will remain in place.

Crocker will restore and reclaim the site to its pre-Project topography and topsoil quality to the extent practicable using BMPs consistent with those outlined by 2012 USFWS Land-Based Wind Energy Guidelines (“WEG”) (USFWS, 2012). The goal of decommissioning will be to restore natural hydrology and plant communities to the extent practical while minimizing new disturbance and removal of native vegetation. The decommissioning BMPs that may be employed on the Project include:

1. Minimize new disturbance and removal of native vegetation to the greatest extent practicable.

2. Remove foundations to four feet below surrounding grade, and cover with soil to allow adequate root penetration for native plants, and so that subsurface structures do not substantially disrupt ground water movements.

3. Reuse topsoil that is removed during decommissioning and use as topsoil when restoring plant communities. Once decommissioning activity is complete, restore topsoil to assist in establishing and maintaining pre-construction native plant communities to the extent possible, consistent with landowner objectives.

4. Stabilize soil and re-vegetate with native plants appropriate for the soil conditions and adjacent habitat, and use local seed sources where feasible, consistent with landowner objectives.

5. Restore surface water flows to pre-disturbance conditions, including removal of stream crossings, roads, and pads, consistent with stormwater management objectives and requirements.

6. Remove any unnecessary overhead electrical lines and associated poles.

7. After decommissioning, install erosion control measures in all disturbance areas where potential for erosion exists, consistent with stormwater management objectives and requirements and until the site has been stabilized.

8. Remove fencing unless the landowner requests it stay.

9. Decommissioning and restoration activities will be completed within 12 months after the date the Project ceases to operate.

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

6.1 Land Acquisition

Crocker is responsible for all land acquisition and has obtained the necessary easements, leases or purchase agreements from landowners for the Project. Crocker has agreements in place to either lease or purchase the necessary parcels for the substation, switchyard, and O&M facilities. The temporary laydown and staging areas are secured with existing wind lease agreements and Crocker will continue to coordinate with these landowners as needed.

6.2 Sale of Power

Crocker is actively marketing the sale of the electricity to third parties, both utilities and large power consumers/marketers. The sale of the electricity may take the form of a power purchase agreement or a sale of the Project to a utility. Crocker's target completion for the initial phases of this sale are in the first quarter of 2018. This sale will drive the timelines for many of the major financial commitments such as equipment procurement and construction contracting.

6.3 Equipment Procurement, Manufacture and Delivery

Crocker previously began procurement of Project-specific equipment and is in the process of negotiating and procuring turbines for the Project. A specific turbine will be secured and allocated to the Project after sufficient permits and approvals are received for financing purposes including this SDPUC permit, and additional meteorological and economic studies are completed to achieve the best match of turbines for the Project. Some supplies and equipment could start arriving on site as early as second quarter 2018.

6.4 Construction

Crocker personnel will oversee the primary contractors performing onsite Project construction, including, but not limited to, roads, wind turbine assembly, electrical, and communications work. Construction is expected to require between 12 to 18 months to complete; however, depending upon seasonal or weather-related constraints (i.e., minimal work would occur during winter months) it may take more or less time. Construction could commence on site as early as second quarter 2018.

6.5 Construction Financing

The Applicant will be responsible for financing all predevelopment, development, and construction activities. The Applicant anticipates financing the cost of all predevelopment activities through internal funds. Construction will be financed with internal funds or a combination of internal funds and third-party sources of debt and equity capital.

6.6 Permanent Financing

Permanent financing will be provided with the Applicant's internal funds or a combination of internal funds and third-party sources of debt and equity capital.

6.7 Expected Commercial Operation Date

The Applicant anticipates that the Project would begin commercial operation by fourth quarter 2019. The commercial operation date is dependent on the completion of the interconnection process, permitting and other development activities.

7.0 ALTERNATIVE SITES AND SITING CRITERIA (ARSD 20:10:22:12 and ARSD 20:10:22:35)

Crocker started when a group of local landowners identified wind energy as the best method for maximizing and diversifying use of their land. These landowners contacted Geronimo regarding potentially developing a wind energy facility on their land. Since wind developers need voluntary easements, and enter into a long-term relationship with project landowners, Geronimo was interested in working with the landowners' to further analyze the potential for project development on their land. Therefore, no other broader site alternatives were evaluated. However, Crocker did evaluate alternatives for site expansion and refinement.

The following sections describe the various criteria that were considered in determining the development potential of the site, identifying the appropriate Project Area to develop, and designing the Project's proposed configuration within the Project Area. Included is a summary of how Crocker has voluntarily followed the USFWS Land-Based WEG (USFWS, 2012) to minimize risks to species of concerns.

7.1 Site Evaluation Process and Project Boundary Refinement

Development of a wind energy project is an iterative process that involves: 1) site identification; 2) project boundary refinement; and 3) micro-siting of project infrastructure within the project boundaries. The identification of the Project Area was primarily driven by:

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

Each of these factors is discussed further below.

Wind Resource

Wind resource at the Project is significantly better than an average site in the upper Great Plains, making the Project very competitive on a regional basis. Areas with an annual average wind speed around 6.5 meters per second ("m/s") and greater at 80-m height are generally considered to have a wind resource suitable for development. According to the DOE wind resources within the Project's region range from 8.0 to 9.0 m/s at Crocker's proposed turbine hub heights (80 meters ["m"] to 100 m) (DOE, 2017b). Crocker initiated its internal wind resource and energy assessment using data collected by meteorological towers installed in and around the Project Area in 2010. Long-term data was available from the National Weather Service Automated Surface Observing Systems Network in Redwood Falls (Minnesota), and Sioux Falls, Sisseton and Watertown (South Dakota) stations. This site-specific wind analysis indicates the Project Area has a highly-suitable wind resource for economical, sustainable, and reliable production of power.

Transmission Grid Access

An initial evaluation of the transmission system was conducted to determine where to cost effectively connect new energy generation in South Dakota. The Project's interconnection feasibility and transmission suitability also drew Crocker to the Project Area. The Project is situated to allow economic delivery of power to the electrical transmission system.

Land Use and Environmental Compatibility

The Project Area was selected following a review of the surrounding land use and regional constraints. Other wind development was underway north of the Project Area, south of the Project Area was eliminated due to uninterested landowners and proximity to the Clark airport, and land to the east and west of the Project Area was not considered due to the lower wind resource and existing leases with other companies. All of these considerations were evaluated prior to selecting the proposed Project site.

Once the initial site location was selected, the project boundary was modified over time based on landowner interest, and to avoid environmental concerns based on consultations with Federal, State, and local agencies. As illustrated in Figure 4, major refinements to the Project boundary included:

- Based on consultation with the USFWS, the Project boundary shifted west to avoid Mallard Slough and other large waterbodies to the east of the Project Area that provide habitat to waterfowl in the area;
- Avoidance of nearly 10,000 acres of USFWS easement lands including 2,404 acres of USFWS grassland easements and 7,482 acres of land with wetland easements);
- Avoidance of Crocker airport runway approaches and restricted airspace; and
- Avoidance of additional State Game Production Areas ("GPAs").

7.1.1 USFWS Land-Based Wind Energy Guidelines

In order to reduce the potential impacts of wind energy facilities on wildlife species and habitat, the USFWS has developed a set of voluntary guidelines for wind developers called the Land-Based WEG (USFWS, 2012). These voluntary guidelines provide a structured, scientific process for addressing wildlife conservation concerns at all stages of land-based wind energy development.

These guidelines also promote effective communication among wind energy developers and Federal, State, and local conservation agencies and tribes. The Land-Based WEGs are founded upon a tiered approach for assessing potential impacts to wildlife and their habitats. The tiered approach is an iterative decision-making process for collecting information in increasing detail, quantifying the possible risks of proposed wind energy projects to wildlife and habitats, and evaluating those risks to make siting, construction, and operation decisions. Subsequent tiers refine and build upon issues raised and efforts undertaken in previous tiers. At each tier, a set of questions is provided to help the developer identify potential problems associated with each phase of a project, and to guide the decision process. The tiered approach is designed to assess

the risks of project development by formulating questions that relate to site-specific conditions regarding potential species and habitat impacts. The tiers are outlined briefly as:

- Tier 1: Preliminary evaluation or screening of sites (landscape-level screening of possible project sites; generally based on readily available public information);
- Tier 2: Site characterization (comprehensive characterization of one or more potential project sites; generally based on consulting with the appropriate agencies/authorities and one or more reconnaissance level site visits by a wildlife biologist);
- Tier 3: Field studies to document site wildlife conditions and predict project impacts (site-specific assessments at the proposed project site; quantitative and scientifically rigorous studies; e.g., acoustical monitoring, point count avian surveys, raptor nest surveys, lek surveys, etc.);
- Tier 4: Post-construction mortality studies (to evaluate direct fatality impacts); and
- Tier 5: Other post-construction studies (to evaluate direct and indirect effects of adverse habitat impacts, and assess how they may be addressed; not done for most projects.

This tiered approach allows developers to determine whether they have sufficient information, whether and/or how to proceed with development of a project, or whether additional information gathered at a subsequent tier is necessary to make those decisions. The Land-Based WEGs indicate that wind energy developers who voluntarily adhere to these guidelines will be undertaking a robust level of wildlife impact analysis, and have a shared responsibility with the USFWS to ensure that the scientific standards of the guidelines are upheld and used to make wise development decisions.

It is important to note that not all of the five tiers are recommended or necessary for all projects. If data are deemed insufficient at a tier, more intensive study is conducted in the subsequent tier until sufficient data are available to decide whether to abandon the project, modify the project, or proceed with or expand the project (USFWS, 2012). Results of the Land-Based WEG Tier 1, 2, and 3 analysis and baseline avian and bat data are outlined in the Project's Bird and Bat Conservation Strategy ("BBCS"; Appendix A). Crocker will continue to coordinate with USFWS and South Dakota Department of Game, Fish & Parks ("SDGFP") on Tier 3 data and the BBCS.

Tiers 1 through 3 of the Guidelines include actions that have resulted in the shifting of the locations of project infrastructure in order to avoid impacts to environmentally sensitive features. The following describes Crocker's implementation of Tiers 1 through 3:

Tier 1: Preliminary Site Evaluation

Crocker initiated consultation with the USFWS and the SDGFP in April 2016 to introduce the proposed Project and to request information on species of concern. Crocker reviewed Natural Heritage Program records for rare species within the vicinity of the proposed Project, and publicly available landscape data, such as National Wetland Inventory ("NWI") data, land cover data, and Federal and State lands data. The USFWS identified four Endangered Species Act ("ESA")-listed species with the potential to occur in the Project Area (whooping crane, rufa red knot, northern long-eared bat ["NLEB"], and Poweshiek skipperling). No critical habitat areas

were identified by the USFWS as occurring in or in proximity to the Project Area. Bald eagles, Birds of Conservation Concern ("BCC"), and other grassland birds were also identified as having the potential to occur in the Project Area. In addition, SDGFP indicated that there are South Dakota Species of Greatest of Conservation Need ("SGCN") with the potential to occur in the Project Area.

Tier 2: Site Characterization

Crocker conducted an in-field initial Site Characterization Study in April 2016 to assess the potential presence of species of concern and their habitat within the Project Area. The Site Characterization Study indicated that the majority of the Project Area is grassland, although the majority is managed as either hay or pasture at varying levels of intensity, consistent with the surrounding area. The Site Characterization Study indicated that due to the prevalence of grassland within the Project Area, there was a potential for species of concern to occur, therefore, additional species-specific surveys were recommended.

Tier 3: Field Studies and Impact Prediction

Crocker continued consultations with the USFWS and the SDGFP to design the survey protocols for the biological surveys identified above, including pre-construction avian surveys, grassland bird surveys, Dakota skipper and Poweshiek skipperling habitat assessments and individual surveys, and NLEB acoustic presence/absence surveys. No Federal- or State-listed species have been observed in the Project Area to date. Bald eagles have been observed; however, no nests are located within 3.2 miles of the Project Area. Crocker has observed some Federal BCC and South Dakota SGCN. The results of these surveys are documented in Section 9.3.2.

Based on the surveys conducted to date, there were no species identified as high concern, meaning that the Project would not pose a significant risk to any resources that could not otherwise be avoided, minimized, or mitigated. The Project is anticipated to pose a moderate risk to birds protected under Migratory Bird Treaty Act ("MBTA") due to the potential for collision of some individuals with the turbines in proposed grassland habitat and in the vicinity of wetlands. As discussed above, Crocker modified the proposed Project layout to avoid direct impacts to wetland habitat, and has significantly reduced the number of proposed turbine locations from grassland easements, leaving only 14 turbines on grassland easements (prior layouts presented in consultations with the USFWS included 41 proposed turbines on grassland easements). There have been no Dakota skipper or Poweshiek skipperling observed to date in areas of potentially suitable habitat. Further details on potential impacts to species of concern and proposed minimization and mitigation measures are described in Sections 9.3.3 and 9.3.4. Tiers 4 and 5 of the USFWS Land-Based WEG include post-construction studies to estimate impacts, and other studies and research. These measures are also discussed, as appropriate, in Sections 9.3.3 and 9.3.4.

The 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 USFWS Land-Based WEG, but also provide guidance for other non-wildlife resources (e.g., land use, noise, visual resources, soil erosion and water quality).

7.2 Pre-construction Studies and Micro-siting Process

Once the site was selected and secured, Crocker identified preliminary turbine locations based on wind resource analysis, design efficiency, initial site inspection, topography, known environmentally-sensitive areas and cultural resources, and communications with local, State and Federal agencies.

Crocker initiated consultations with applicable Federal, State, and local agencies in April 2016 to introduce the proposed Project, to identify surveys or studies required for the Project, and the appropriate permits and authorizations (refer to Section 12.0). Section 12.1 identifies the current list of permits and authorizations that Crocker is seeking, and their status.

Table 7-1 identifies the pre-construction surveys and studies have been completed or are in progress to confirm the feasibility of the proposed actions and to identify alternatives to avoid or minimize impacts to existing human and environmental resources. As outlined above in Section 7.1.1, Tiers 1 through 3 are intended to acquire site-specific baseline information, including agency coordination, as a means to avoid impacts to sensitive features. Crocker has incorporated information from studies completed in Tiers 1 through 3 into the design to avoid and minimize impacts.

Table 7-1: Summary of Pre-Construction Studies at the Crocker Wind Project

Study	Status
Communication Tower Study	Complete
Microwave Beam Path Study	Complete
Shadow Flicker Assessment	Complete
Noise Compliance Report	Complete
Grassland Avian Use Study	Complete
Avian Use Studies	Ongoing until March 2018
Eagle and Raptor Nest Surveys	Complete
Eagle Monitoring	Ongoing until March 2018
Sharp-tailed Grouse and Greater Prairie Chicken Lek Surveys	Complete
Dakota Skipper and Poweshiek Skipperling Habitat Assessment	Complete
Dakota Skipper Presence/Absence Surveys	Complete
General Bat Acoustic Survey	Complete
NLEB Presence/Absence Acoustic Surveys	Complete
Wetland and Waterbody Delineations	78% complete; to be completed Spring 2018
Natural Community Inventory	78% complete; to be completed Spring 2018
Archaeological and Cultural Studies	80% complete; to be completed Spring 2018

The data acquired through site-specific studies, as well as agency, landowner, and other feedback received, was incorporated into Project layout design. The Project initially started with 219 potential turbine locations, and that number has been reduced to the proposed 120 locations. As

discussed above, Crocker modified the proposed Project layout to avoid direct impacts to wetlands, and has removed 27 proposed turbine locations from grassland easements, leaving only 14 turbines on grassland easements (see Figure 4). Design changes were also made to avoid newly identified cultural resource sites, USFWS protected wetland basins, and to account for county and State setback requirements and other constraints. Crocker has also worked with the USFWS and SDGFP to realign linear corridors, such as the access roads, collector system, crane pathways, and transmission lines to follow existing disturbed corridors (e.g., roads, transmission lines, fence rows) in an effort to reduce habitat fragmentation. As reflected in Section 9.3.1.2, this has resulted in the avoidance of approximately 80 percent of the natural vegetation communities located within the Project Area.

While a limited amount of field survey work is ongoing, the remaining study work is not anticipated to affect the environmental analysis set forth in this Application, or the conclusion that the Project will meet all applicable local, State and Federal permitting requirements.

7.3 Transmission Facility Alternatives

As described in Section 4.3, the Transmission Facility connects the Project substation to the interconnect switchyard in the most direct route while collocated along existing rights-of-way and sited on participating land. Therefore, few alternates were evaluated. However, Crocker evaluated an alternate segment exiting the Project substation (Figure 4). This alternative segment provides an alternate crossing location of the existing natural gas pipeline in the event it is required. This route exits the south side of the Project substation for approximately 0.4 miles before turning east for a quarter of a mile. On the west side of 419th Avenue, the alternate segment turns north paralleling this road for 0.7 miles before connecting to the preferred route described in Section 4.3. This alternate route would add approximately 1 mile of transmission line and up to 19 additional transmission structures. Additionally, the alternate would add 0.4 miles of north-south parallel transmission lines approximately a quarter mile, which is generally unfavorable to the wildlife agencies. Conversely, landowners originally favored the alternate route in an attempt to run the transmission line along a proposed access road but are open to the preferred route as well. The alternate route was evaluated, but it is not preferred due to the increased length, number of additional structures required that are not directly adjacent to an access road and additional environmental impacts. The analysis in this Application considers the preferred route described in Section 4.3.

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

Per the Clark County Zoning Ordinance, a wind energy facility and associated transmission facility located in the Agricultural Zoning District must obtain a CUP. In February 2017, Crocker applied for a CUP with Clark County for the Project. Crocker obtained a CUP in April of 2017. Crocker has sought relief in Circuit Court from certain permit conditions, and is also seeking clarification of certain permit terms. Crocker's current configuration has been designed to comply with county setbacks and other applicable requirements, as outlined in Table 8-1 below and displayed on Figure 5 and detailed on Figures 5a-d. A letter dated December 1, 2017 was transmitted to Clark County indicating Crocker intends to comply with the setbacks established by the Board of Adjustment as condition of the CUP and wishes to resolve outstanding clarification of permit terms (Refer to Appendix H).

Chapter 4.21 of the Clark County Zoning Ordinance, the Wind Energy System ("WES") Requirements, outlines a number of general provisions including but not limited to: mitigation measures, setbacks, electromagnetic interference, lighting, turbine spacing, footprint minimization, collector lines, towers, noise, etc. Crocker will comply with all provisions and setback requirements. Table 8-1 outlines the local, state, and voluntary Project setbacks.

Table 8-1: Wind Turbine Setback Requirements for the Project

Turbine Setback Requirement	Requirements	Proposed Setbacks
Clark County		
4.21.03 (2)(a) Off-site residences, businesses, churches, and buildings owned and/or maintained by governmental entity	3,960 feet	3,960 feet
4.21.03 (2)(a) Buildings on-site or lessor's residences	500 feet	1,000 feet plus any distance needed to meet noise requirement and shadow flicker commitment
4.21.03 (2)(b) Centerline of public roads	500 feet or 110 percent the height of the wind turbine	550 feet minimum and 110 percent of turbine height should the turbine be taller
4.21.03 (2)(c) Any property line	500 feet or 110 percent the height of the wind turbine, whichever is greater	County requirement for non-participants, setback has been waived for participants
Setback from cemeteries (condition of CUP)	1 mile	1 mile
Noise requirement	Distance from receptors must meet the noise standard of 50	Crocker will site turbines at the distance required to

Table 8-1: Wind Turbine Setback Requirements for the Project

Turbine Setback Requirement	Requirements	Proposed Setbacks
	A-weighted decibels ("dBA")	meet the 50-dBA standard
South Dakota		
SDCL 43-13-24 Property lines	500 feet or 1.1 times the height of the tower, whichever is greater	Turbines are sited to meet this standard
Voluntary		
Shadow Flicker	Not regulated by State, Federal or local law	Distance required to meet voluntary commitment of 30 hours per year or less at any residence

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

The following sections provide a description of the existing environment at the time of the Application submittal, potential impacts to the existing environment as a result of the construction and operation of both the Wind Farm Facility and Transmission Facility (collectively referred to as the "Project Area"), and the mitigation measures that Crocker would implement to avoid or minimize these impacts.

Generally, the existing environment of the Project Area described in the following sections is based on publicly available information from agencies and other academic studies. Crocker conducted field surveys within an environmental survey corridor that encompasses the construction workspace, proposed access roads, crane pathways, and aboveground facility construction footprints for both the Wind Farm Facility and Transmission Facility to provide site-specific information on terrestrial resources. The results of these surveys are summarized in the applicable sections below. Impacts are quantified where possible based on either publicly available information or field survey data. Temporary construction impacts were calculated based on the following workspace dimensions (see Section 4.0 for additional information; note that several linear features are collocated to minimize impacts):

- 300-foot radius at each wind turbine location, which includes 40-foot by 120-foot crane pad area at each turbine;
- 120-foot-wide temporary access roads;
- 65-foot-wide crane paths;
- 75-foot-wide construction workspace to install collector and communication systems;
- 12-acre temporary laydown/staging area;
- 75-foot by 75-foot meteorological tower workspace;
- 100-foot-wide transmission line corridor workspace.

Operational impacts during the life of the Project were calculated based on the following dimensions (see Section 4.0 for additional information):

- 50-foot-radius at each wind turbine location;
- 20-foot-wide permanent access roads;
- 5.5-acre O&M facility, which includes a building and adjacent parking lot;
- 9.4-acre Project electrical substation footprint;
- 16.8-acre interconnect switchyard footprint;
- 11-foot diameter transmission pole foundation spaced 400 feet between each pole;
- 15-foot by 15-foot meteorological tower.

ARSD 20:10:22:13 requires that, "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 of siting the proposed facility in combination with any operating energy conversion facilities, existing or under construction".

There are two operating energy conversion facilities in proximity to the Project Area (Figure 1):

- The Day County Wind Energy Center is located within a mile of northwest corner of the Project Area. This NextEra Energy Resources wind farm consists of 66-1.5 MW turbines and became operational in 2010.
- The 20 MW Oak Tree Wind Farm, consisting of eleven 1.85 MW turbines, is located approximately 1.5 miles southeast of the Project Area. This project became operational in December 2014.

The cumulative effects associated with these two wind facilities are discussed in the following sections where the ongoing operations of these projects impact a resource category that will also be potentially affected by the proposed Project, namely, ongoing impacts to wildlife species such as birds, and visual resources.

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

9.1.1 Geological Resources

9.1.1.1 Existing Geological Resources

Regional Landforms/Physiography

Crocker lies entirely within the Central Lowland province, the largest of the physiographic provinces in the United States extending from northwestern New York west through Michigan, southern Wisconsin, and south and western Minnesota to the Missouri Escarpment in eastern North Dakota, South Dakota, Nebraska, and Kansas. The province extends south into Ohio, Indiana, Illinois, Iowa, through the northern portion of Missouri, central Oklahoma and into northcentral Texas, with features extending into Canada along its northern boundary (Fenneman, 1916). In South Dakota, the Central Lowland province is further subdivided into the Coteau des Prairies ("Prairie Coteau"), Minnesota Valley, and James Basin divisions. The Project is situated along the western margins of the Coteau des Prairies, a broad, flat-iron shaped glacial derived highland exhibiting a gently rolling to undulating surface (Rothrock, 1943).

Surficial Geology

The surficial geology of the of Clark County and the Project Area consists of glacial deposits associated with the late Wisconsin age drift, which forms an up to 300-foot-thick mantle of primarily till and lesser amounts of stratified drift, such as outwash and lacustrine sediment (Christensen, 1987). Figure 6 illustrates the surficial geology present within the Project Area, which consists of (Martin et al., 2004):

- Stagnation moraine till ("Qlts"): This is a compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature that is characterized by

hummocky terrain with abundant sloughs resulting from stagnation of ice sheets. Composite thickness of upper Wisconsin till may be up to 300 feet.

- End moraine till ("Qlte"): A compact, silty, clay-rich matrix with sand- to boulder-size clasts of glacial origin. A geomorphic feature that is characterized by elevated linear ridges with hummocky terrain locally at former ice sheet margins. Composite thickness of upper Wisconsin till may be up to 300 feet.
- Ground moraine till ("Qltg"): A compact, silty, clay-rich matrix with sand- to boulder-sized clasts of glacial origin. A geomorphic feature that is characterized by smooth, rolling terrain. Composite thickness of upper Wisconsin till may be up to 300 feet.
- Minor moraine till ("Qltm"): A compact, silty clay-rich matrix with sand- to boulder-size clasts of glacial origin. A geomorphic feature that is characterized by elevated linear ridges including minor, washboard, or recessional moraines. Composite thickness of upper Wisconsin till may be up to 300 feet.
- Undifferentiated outwash ("Qlo"): A heterogeneous mixture of sand and gravel, with minor clay and silt. Deposits of glaciofluvial origin including outwash plains, kames, kame terraces, and other undifferentiated deposits. Thickness up to 30 feet.
- Collapsed outwash ("Qloc"): A heterogeneous mixture of sand and gravel of glaciofluvial origin. Deposited as outwash sediments that collapsed due to melting of buried ice. Thickness up to 90 feet.

Bedrock Geology

Upper Cretaceous age Pierre shale is the first bedrock encountered beneath the glacial deposits within Clark County and the Project Area. Pierre shale is a blue-gray to dark-gray, fissile to blocky shale with persistent beads of bentonite, black organic shale, and light-brown chalky shale. Contains minor sandstone, conglomerate, and abundance carbonate and ferruginous concretions. It extends to a maximum thickness of 1,000 feet (Christensen, 1987; Tomhave and Schulz, 2004). Cross sections depicting the bedrock and surficial geology in the Project Area are shown on Figures 7a and 7b.

Mineral Resources/Economic Deposits

Commercial mineral deposits within the Project Area are limited to sand, gravel and construction aggregate enterprises. Information from the South Dakota Department of Environment and Natural Resources ("SDDENR") Minerals and Mining Program and a review of United States Geological Survey ("USGS") 7.5-minute quadrangle mapping indicates that two sand and gravel operations are located within the Project Area operated by the Clark County Highway Department. Both of the identified active sand and gravel deposits are located in the northern half of Section 10 in Woodland Township (Township 118 North, Range 58 West) in the east-central portion of the Project Area (SDDENR, 2016a) (Figure 6). These sand and gravel operations have a license to operate through December 30, 2020. There are no economic deposits along the Transmission Line Route.

A review of the online information from the SDDENR Oil and Gas Initiative Program Geographic Information System ("GIS") Website reveals that the Project Area does not lie

within an oil and gas field; nor have any oil and gas permits been issued or wells developed in Clark County. The nearest identified oil and gas field is the Lantry field located in west central Dewey County, South Dakota, approximately 200 miles due west of the Project (SDDENR, Undated). No other active or historic economic mineral deposits have been identified within the vicinity of the Project.

Seismic Risks

The risk of seismic activity in the vicinity of the Project Area is extremely low to negligible. According to the USGS 2014 Long-Term Model, the Peak Ground Acceleration with a 2 percent chance of exceedance in 50 years is 0.02 g to 0.04 g ("g" are units of acceleration due to gravity) (Petersen et al., 2015).

According to the South Dakota Geologic Survey ("SDGS"), no earthquakes have been recorded in Clark County, South Dakota from 1872 to 2013 (SDGS, 2013). A review of the geologic mapping and information provided by the USGS Earthquake Hazards Program indicate that there are no active or inactive faults in the vicinity of the Project (USGS, 2016).

Subsidence Potential

The potential for subsidence within the Project Area is negligible. The Pierre Shale bedrock is buried beneath an approximately 300-foot-thick layer of till across the entire Project vicinity (Christensen, 1987). Additionally, the bedrock does not exhibit karst topography or contain subsurface geologic layers or members that are identified as susceptible to dissolution by water (Schultz et al., 1980). Crocker is not aware of any documented historic underground mining operations within the Project vicinity, which could indicate a potential subsidence risk.

9.1.1.2 Impacts to Geological Resources

Construction of the Wind Farm Facility and Transmission Facility would result in negligible impacts on geological resources. Excavation and trenching would be required to install the wind turbines and associated collection and communications systems. Crocker would also clear vegetation and grade construction workspaces, access roads, and crane paths.

The average depth to bedrock within the Project Area ranges from 30 to 300 feet (see Section 9.1.1.1), therefore, excavation of 4 to 6 feet required for the installation of the wind turbines and collection and communication systems is unlikely to encounter or impact the underlying bedrock.

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

Construction and operation of the Project would not interfere with the ongoing operation of the two sand and gravel pit operations located within the Project Area, which appear to be accessed via County Road 2 (421st Avenue) and 161st Street. The closest sand and gravel operation is located approximately 1,000 feet from proposed turbines (Figure 6).

9.1.1.3 Mitigation Measures for Geological Resources

As discussed in section 9.1.1.2, the Project is not anticipated to impact bedrock as the depths of excavation are shallower than the estimated depth of bedrock in the Project Area. Therefore, blasting is not anticipated.

It is not anticipated that the Project will impact the sand and gravel operations in the Project.

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

9.1.2 Soil Resources

9.1.2.1 Existing Soil Resources

Soil characteristics within the project area were assessed using the Soil Survey Geographic Database ("SSURGO") (Soil Survey Staff, Natural Resources Conservation Service ["NRCS"], United States Department of Agriculture ["USDA"], 2017). The SSURGO database is a digital version of the original county soil surveys developed by NRCS for use with GIS. It provides the most detailed level of soils information for natural resource planning and management. The majority of the details were gathered at a scale of 1:12,000. Soil maps are linked in the SSURGO database to information about the component soils and their properties (Soil Survey Staff, NRCS, USDA, 2017).

Table 9-1 lists the soil types located within the Project Area, which are also displayed on Figure 8.

Prime Farmland

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

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

by the appropriate State agencies, typically in association with local soil conservation districts or other local agencies.

Approximately 37 percent of the Project Area is classified as "not prime farmland," and approximately 36 percent of the Project Area is classified as "prime farmland." Approximately 22 percent of the Project Area is classified as "farmland of statewide importance". The remaining 5 percent of the Project Area is considered "prime farmland if drained" or "prime farmland if irrigated".

Table 9-1: Soil Map Units within the Project Area

Map Unit Symbol	Map Unit Name	Acres in Project Area	Percent of Project Area
BcB	Barnes-Buse-Svea loams, 1 to 6 percent slopes	4,527.1	15.4%
BcB	Barnes-Buse-Svea loams, 1 to 6 percent slopes	4,527.1	15.4%
BrD	Buse-Barnes loams, 9 to 20 percent slopes	4,369.3	14.9%
BcC	Barnes-Buse-Svea loams, 2 to 9 percent slopes	4,306.0	14.7%
FnB	Forman-Buse-Aastad loams, 1 to 6 percent slopes	2,598.3	8.9%
FnC	Forman-Buse-Aastad loams, 2 to 9 percent slopes	1,675.6	5.7%
Ss	Southam silty clay loam, 0 to 1 percent slopes	1,269.1	4.3%
Pa	Parnell silty clay loam	934.2	3.2%
RsC	Renshaw-Sioux complex, 6 to 9 percent slopes	904.1	3.1%
RsB	Renshaw-Sioux complex, coteau, 2 to 6 percent slopes	607.7	2.1%
RfB	Renshaw-Fordville loams, coteau, 2 to 6 percent slopes	523.8	1.8%
BuE	Buse-La Prairie, channeled-Barnes loams, 0 to 40 percent slopes	515.1	1.8%
BzE	Buse-Sioux complex, 9 to 40 percent slopes	511.0	1.7%
G171B	Barnes-Buse-Svea loams, 0 to 6 percent slopes	482.6	1.6%
At	Aastad-Tonka complex	453.3	1.5%
SrD	Sioux-Renshaw complex, coteau, 9 to 15 percent slopes	423.9	1.4%
BdB	Barnes-Svea loams, 1 to 6 percent slopes	419.7	1.4%
ByE	Buse-Langhei complex, 15 to 40 percent slopes	299.3	1.0%
Od	Oldham silty clay loam	290.6	1.0%
FmB	Forman-Aastad loams, 1 to 6 percent slopes	278.1	0.9%
RfA	Renshaw-Fordville loams, coteau, 0 to 2 percent slopes	275.9	0.9%
BdA	Barnes-Svea loams, 0 to 2 percent slopes	235.8	0.8%
La	La Prairie loam	234.7	0.8%
PrB	Poinsett-Rusklyn-Waubay silty clay loams, 1 to 6 percent slopes	230.0	0.8%
KrB	Kranzburg-Buse-Waubay complex, 1 to 6 percent slopes	217.5	0.7%
Aa	Aastad loam	210.7	0.7%
BbB	Barnes-Buse loams, 2 to 6 percent slopes	183.5	0.6%
EgB	Egeland-Embden complex, 2 to 6 percent slopes	171.2	0.6%
BbC	Barnes-Buse loams, 6 to 9 percent slopes	141.4	0.5%

Table 9-1: Soil Map Units within the Project Area

Map Unit Symbol	Map Unit Name	Acres in Project Area	Percent of Project Area
G171C	Barnes-Buse-Svea loams, 1 to 9 percent slopes	139.7	0.5%
PoC	Poinsett-Rusklyn silty clay loams, 6 to 9 percent slopes	137.0	0.5%
Hb	Hamerly-Tonka complex	126.1	0.4%
HaA	Hamerly loam, 0 to 2 percent slopes	117.8	0.4%
G143A	Barnes-Svea loams, 0 to 3 percent slopes	113.2	0.4%
G559A	La Prairie-Fairdale loams, channeled, 0 to 2 percent slopes, frequently flooded	106.0	0.4%
W	Water	105.5	0.4%
Va	Vallers-Hamerly loams	90.4	0.3%
FdA	Fordville loam, coteau, 0 to 2 percent slopes	89.2	0.3%
Lo	Lowe loam	84.8	0.3%
BsE	Buse-Barnes loams, 9 to 40 percent slopes, very stony	83.2	0.3%
FmA	Forman-Aastad loams, 0 to 3 percent slopes	80.7	0.3%
G155B	Barnes-Svea loams, 0 to 6 percent slopes	68.2	0.2%
MaC	Maddock-Egeland sandy loams, 6 to 9 percent slopes	56.4	0.2%
Lf	La Prairie-Fairdale loams, channeled	50.7	0.2%
To	Tonka silty clay loam, 0 to 1 percent slopes	45.5	0.2%
G143F	Buse-Barnes loams, 15 to 35 percent slopes	41.7	0.1%
Mw	Minnewaukan loamy sand	40.8	0.1%
EgA	Egeland-Embden complex, 0 to 2 percent slopes	40.6	0.1%
G189A	Aastad loam, 0 to 3 percent slopes, drainageway	35.5	0.1%
Og	Orthents, gravelly	33.3	0.1%
G274A	Renshaw-Fordville loams, 0 to 2 percent slopes	32.2	0.1%
Cw	Cubden-Tonka silty clay loams, coteau, 0 to 2 percent slopes	31.3	0.1%
G374A	Egeland-Embden complex, 0 to 2 percent slopes	29.5	0.1%
Re	Rauville silty clay loam	29.2	0.1%
G561A	La Prairie loam, 0 to 2 percent slopes, occasionally flooded	25.7	0.1%
G143D	Barnes-Buse-Langhei loams, 9 to 15 percent slopes	23.8	0.1%
Pm	Playmoor silty clay loam	21.3	0.1%
Ba	Badger-Tonka silty clay loams, coteau, 0 to 1 percent slopes	20.9	0.1%
MtB	Minnewasta sandy loam, 2 to 6 percent slopes	18.8	0.1%
PwB	Poinsett-Waubay silty clay loams, 1 to 6 percent slopes	17.0	0.1%
PwA	Poinsett-Waubay silty clay loams, 0 to 2 percent slopes	15.5	0.1%
G276A	Renshaw-Sioux complex, 0 to 2 percent slopes	15.2	0.1%
G521A	Lowe loam, 0 to 1 percent slopes, occasionally flooded	14.8	0.1%
G274B	Renshaw-Fordville loams, 2 to 6 percent slopes	14.2	<0.1%
G100A	Hamerly-Tonka complex, 0 to 3 percent slopes	8.9	<0.1%
G276C	Renshaw-Sioux complex, 6 to 9 percent slopes	7.5	<0.1%
Wa	Waubay silty clay loam, 0 to 2 percent slopes	6.8	<0.1%

Table 9-1: Soil Map Units within the Project Area

Map Unit Symbol	Map Unit Name	Acres in Project Area	Percent of Project Area
G997	Water, intermittent	4.7	<0.1%
G003A	Parnell silty clay loam, 0 to 1 percent slopes	4.5	<0.1%
G004A	Southam silty clay loam, 0 to 1 percent slopes	3.7	<0.1%
G996	Water	3.4	<0.1%
Cv	Cubden-Badger silty clay loams, coteau, 0 to 2 percent slopes	2.4	<0.1%
G144B	Barnes-Buse loams, 3 to 6 percent slopes	1.7	<0.1%
G380C	Maddock-Egeland sandy loams, 6 to 9 percent slopes	0.6	<0.1%
HmA	Hetland silty clay loam, 0 to 2 percent slopes	0.4	<0.1%
G651E	Udarents loamy, abandoned gravel pits, 0 to 25 percent slopes	0.3	<0.1%
G276B	Renshaw-Sioux complex, 2 to 6 percent slopes	0.3	<0.1%
MtA	Minnewasta sandy loam, 0 to 2 percent slopes	0.1	<0.1%
Totals		**29,330.7**	**100 %**

Drainage Class

The drainage class identifies the natural drainage condition of the soil. It refers to the frequency and duration of wet periods and provides a guide to the limitations and potentials of the soil for field crops, forestry, range, wildlife, and recreational uses. The class roughly indicates the degree, frequency, and duration of wetness, which are factors in rating soils for various uses (Soil Survey Staff, NRCS, USDA, 2017). Approximately 75 percent of the Project Area is classified as well drained.

Erosion by Wind and Water

Erosion is a natural process where surface soils are worn away, generally resulting from water and wind forces that can be accelerated by human disturbance. Factors that influence the magnitude of erosion include soil texture, soil structure, length and percent of slope, existing vegetative cover, and rainfall. The most erosion-prone soils are generally bare or sparsely vegetated, non-cohesive, fine textured, and situated on moderate to steep slopes. Soils on steep, long slopes are much more susceptible to water erosion than those on short slopes because the steeper slopes accelerate the flow of surface runoff. Soils more resistant to erosion include those that are well-vegetated, well-structured with high percolation rates, and situated on flat to nearly level terrain. Approximately 20 percent of the Project Area is classified as water erodible.

Susceptibility to wind erosion is less affected by slope angles and is more directly influenced by physical soil factors including moisture, texture, calcium carbonate content, and organic matter; and landform and landscape conditions including soil roughness factors, unsheltered distance, and vegetative cover. Less than 0.1 percent of the Project Area is classified as wind erodible.

Steep Slopes

The slope gradient of a soil influences several characteristics such as the ability of a soil to retain water and the potential for accelerated erosion or subsidence (Soil Survey Staff, NRCS, USDA, 2017). The slope gradient of a soil is used to assess soils with high water erosion potential and is a factor used to identify soils that may have revegetation concerns.

Maximum constructed slopes for constructability typically range from 3:1 to 4:1. Slopes beyond this range present soil stability as well as revegetation and stabilization concerns. The Project layout was developed in consultation with civil engineers at Westwood Professional Services to identify slopes in the Project Area that would present construction challenges and avoided placing facilities in those areas. Steep slopes were identified from aerial topography and will be verified through geotechnical studies.

9.1.2.2 Impacts to Soil Resources

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

Table 9-2 provides a summary of the significant soil characteristics identified within the temporary and permanent footprints associated with aboveground facilities, such as the wind turbines, O&M facility, Project substation, transmission poles, switchyard, and permanent access roads. The 157.1 acres permanently impacted by the installation of these facilities would be converted to impervious surfaces, thereby permanently altering the soil composition at these locations.

Table 9-2: Summary of Soil Characteristics Affected by the Project

Soil Characteristics	Wind Farm Facility		Transmission Facility		Totals	
	Perm.	Temp	Perm.	Temp	Perm	Temp
Project Totals	**140.1**	**1,917.9**	**17.0**	**71.2**	**157.1**	**1,989.1**
Prime Farmland [a]	80.2	969.7	14.9	36.8	95.1	1,006.5
Farmland of Statewide Importance [b]	32.4	453.1	0.0	8.9	32.5	462.1
Water Erodible [c]	19.5	346.0	2.1	14.7	21.5	360.7
Wind Erodible [d]	0.0	0.0	0.0	0.0	0.0	0.0

Table 9-2: Summary of Soil Characteristics Affected by the Project

Soil Characteristics	Wind Farm Facility		Transmission Facility		Totals	
	Perm.	Temp	Perm.	Temp	Perm	Temp

Note: Sum of addends may not match due to rounding. Soils may have more than one characteristic and therefore the column totals will not equal the project totals presented.

[a] Includes soils that meet the prime farmland or prime farmland if a limiting factor is mitigated.

[b] Includes soils classified as farmland of statewide importance by SSURGO.

[c] Includes soils with a slope greater than 15 percent or soils with a K value of greater than 0.35 and slopes greater than 5 percent.

[d] Includes soils in wind erodibility group designation of 1 or 2.

Prime Farmland Soil and Soils of Statewide Importance

Construction of the Project will temporarily impact 1,006.5 acres of prime farmland soils and an additional 462.1 acres of soils classified as farmland of statewide importance. Areas of prime farmland or farmland of statewide importance that are temporarily impacted and currently in agricultural production will return to that use after construction.

The Project will permanently impact 95.1 acres of prime farmland and 32.5 acres of farmland of statewide importance, which comprise less than 1 percent of the Project Area.

Water and Wind Erodible Soils

Based on the soil analysis, 360.6 acres of soils susceptible to water erosion would be temporarily affected by constructing the Project. The Project would permanently impact 21.5 acres of water erodible soils. The Project will not impact wind erodible soils.

9.1.2.3 Mitigation Measures for Soil Resources

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

Once construction is complete, Crocker would backfill graded and excavated areas with the stored native material and return surface conditions to pre-construction conditions to the extent practicable. Crocker would also implement erosion control measures and seed and mulch the construction workspace consistent with the Project's SWPPP.

9.2 Effect on Hydrology (ARSD 20:10:22:14, 20:10:22:15)

9.2.1 Existing Hydrology

9.2.1.1 Hydrogeology Resources

The Project Area is located within the Northern Great Plains aquifer system. The aquifer system extends more than 300,000 square miles, underlying most of North Dakota and South Dakota, and parts of Montana and Wyoming. Five major aquifers comprise the permeable rocks of the aquifer system, including: lower Tertiary, upper Cretaceous, lower Cretaceous, upper Paleozoic, and lower Paleozoic (USGS, 1996).

According to Hamilton (1986), the principal aquifers within the Project Area are the Prairie Coteau 1 and Altamont Aquifer 2. The Prairie Coteau 1 aquifer is the shallowest of the three aquifers on the Coteau des Prairies, has a range in depth of 0 to 40 feet, an aerial extent of 80 square miles, and a storage of 200,000 acre-feet of water. The Altamont Aquifer 2 is located at a lower altitude, is the medium-depth aquifer of the three Altamont aquifers, and has a range in depth of 10 to 480 feet, aerial extent of 630 square miles, and a storage of 3,230,000 acre-feet of water. Recharge of both aquifers is from infiltration of precipitation as well as from lateral inflow. Groundwater in both aquifers generally contains more than 1,000 milligrams per liter of dissolved solids, such as calcium, magnesium, sodium, bicarbonate, and sulfate, with the Altamont Aquifer showing higher readings (Hamilton, 1986).

Jensen (2001), developed a more detailed map for Clark County that identifies areas underlain by aquifer material based on Hamilton (1978, 1986), Christensen (1987), Schroeder (1977), and SDGS lithologic logs database. This map indicates that the majority of the Project Area is underlain by sand and gravel, with first occurrence of aquifer material generally greater than 100 feet below land surface; although it may not be uniform in depth and thickness. There are areas of shallow aquifer material in the northern portion of the Project Area between Twin Sloughs and Lone Tree Lake, which is underlain with sand and gravel, with first occurrence of aquifer material generally at the land surface. Eastern portions of the Project Area west of Bradley, and running generally north and south from Round Lake to Baileys Lake are also underlain by shallow aquifers composed of sand and gravel with first occurrence generally at land surface (Jensen, 2001) (Figure 9).

9.2.1.2 Watersheds

The Project Area is located within the Missouri River Basin. The Missouri River Basin consists of sub-region, basin, and sub-basin drainages (Hydrologic Unit Code [HUC] 4, 6, and 8 respectively). The Project Area is within the James and Missouri-Big Sioux Sub-Regions (HUC-4), James and Big Sioux Basins (HUC-6), and the Mud, Middle James, and Upper Big Sioux Sub-Basins (HUC-8) (USGS, 2013).

Mud Sub-Basin (HUC-8 1060005)

The northern-most portion of the Project Area is located within the Mud Sub-Basin (Figure 10). The Transmission Facility is not within this Sub-Basin. Topography is undulating within this

Sub-Basin, with small lake basins and prairie pothole wetlands, along with an overall northeasterly drainage.

Middle James Sub-Basin (HUC-8 10160006)

The majority of the Project Area, including the Transmission Facility are located within the Middle James Sub-Basin (Figure 10). Topography within the Sub-Basin indicates that drainage generally flows in a gradual manner from the northeast to the southwest with a series of small lake basins and prairie pothole wetlands. In the southwestern portion of the Project Area, topography increases to reduce the number of wetlands, and a variety of springs and unnamed waterbodies drain off the Coteau des Prairies and join to form Fountain Creek, a tributary to Timber Creek and then the James River.

Upper Big Sioux Sub-Basin (HUC-8 10170201)

The eastern-most portion of the Project Area is located within the Upper Big Sioux Sub-Basin (Figure 10). The Transmission Facility is not within this Sub-Basin. Topography of the Project Area within this Sub-Basin is fairly gentle throughout, and indicates a slight west to east direction of drainage, with a more southwest to northeast drainage in the southeastern-most portion of the Project Area. Small lake basins and prairie pothole wetlands are present throughout.

9.2.1.3 Waterbodies

Wetlands are defined by the United States Army Corps of Engineers ("USACE") as a subset of waters of the U.S and are addressed in Section 9.2.1.4. Other waters of the U.S. include unvegetated waterways and other waterbodies with a defined bed and bank, such as tide channels, drainages, ponds, creeks, rivers, and lakes (Environmental Laboratory, 1987); these other waters of the U.S. are addressed in this section. The USACE has the authority to regulate the discharge of dredged and fill material into jurisdictional waters of the U.S. Impacts to waters of the U.S. are reviewed, permitted, and mitigated through the Clean Water Act ("CWA") Section 404 permitting process.

The National Hydrography Dataset represents U.S. drainage networks and related features, such as rivers, streams, canals, lakes, ponds, glaciers, coastlines, dams, and stream gauges (USGS, 2017). A review of this dataset indicates that there are 38.5 miles of waterbodies in the Project Area, which include 3.6 miles of artificial paths (e.g., canals), 34.4 miles of intermittent waterbodies, and 0.6 acres of perennial waterbodies (Figure 10).

Crocker conducted an analysis of drainage areas in the Project. The analysis highlights flow direction and small watershed areas based on LiDAR contour data. The results of this analysis are illustrated in Appendix C.

9.2.1.4 Wetlands

The Project Area lies within the 276,000-square-mile Prairie Pothole Region, which extends from Alberta, Saskatchewan, and Manitoba, Canada, south into eastern North Dakota and South Dakota, and extends east and south into Minnesota and Iowa. This region is defined by the

abundance of shallow wetlands known as potholes, glacial potholes, kettles, or kettle lakes, which can be temporary or semipermanent (Prairie Pothole Joint Venture, 2005).

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

Wetlands and other waters of the U.S. within the Project Area were identified by reviewing digital NWI data, which provides more accurate and detailed data on the extent of wetland coverage than USGS (2011) Gap Analysis Program ("GAP") data. NWI data are produced by the USFWS and provide reconnaissance level information including location, type, and size of these resources.

According to NWI data (USFWS, 2017), approximately 8 percent of the Project Area is mapped as wetlands (Figure 11). NWI wetlands are classified by type according to the Cowardin Classification System (Cowardin et al., 1979). Based NWI mapping, the Project Area contains nearly 1,400 wetlands and waterbodies (Figure 11; USFWS, 2017). According to NWI data, there are 47.8 acres of lakes within the Project Area (Figure 11). All wetland types in the Project Area are part of the Palustrine System, which include all non-tidal wetlands. Five Palustrine vegetation classes are found in the Project Area, including:

- Palustrine Unconsolidated Bottom Wetland ("PUB"): wetland bottom with at least 25 percent cover of particles smaller than stones and vegetative cover less than 30 percent.

- Palustrine Aquatic Bed Wetlands ("PAB"): Plants that primarily grow on or below the surface of the water (i.e., submergents) are the uppermost life form layer with at least 30 percent areal coverage.

- Palustrine Emergent Wetland ("PEM"): Emergent plants (i.e., erect, rooted, herbaceous hydrophytes, excluding mosses and lichens) are the tallest life form with at least 30 percent areal coverage. Usually dominated by perennial plants. During wet years, these can become open water wetlands.

- Palustrine Scrub-Shrub Wetlands ("PSS"): Woody plants less than 6 m (20 feet) tall with at least 30 percent areal coverage. Shrubs can include tree shrubs or saplings, and may represent a successional stage leading to a forested wetland.

- Palustrine Forested Wetlands ("PFO"): Trees (woody plants at least 6 m [20 feet] in height) are the dominant life form with at least 30 percent areal coverage.

The wetland classification and total area of wetlands by type occurring with the Project Area are shown on Table 9-3. The USACE has the authority to regulate the discharge of dredged and fill material into jurisdictional waters of the U.S. Impacts to waters of the U.S. are reviewed, permitted, and mitigated through the CWA Section 404 permitting process.

Table 9-3: NWI Mapped Wetlands in the Project Area

Wetland Type (Cowardin Class)	Area (acres)
Palustrine Aquatic Bed Wetland ("PAB")	124.1
Palustrine Emergent Wetland ("PEM")	2,205.6
Palustrine Scrub-Shrub Wetland ("PSS")	12.9
Palustrine Forested Wetland ("PFO")	15.9
All Wetland Types	**2,358.5**

9.2.1.5 Existing and Planned Water Rights

Crocker reviewed the SDDENR Water Rights, Location Notices, and Well Completion Report databases to identify where there are existing water uses within the Project Area (SDDENR, 2017a, b, and c). Water Right Permits are required for water use exceeding 25,920 gallons per day or a peak pump rate of 25 gallons per minute, or for non-domestic uses regardless if it is appropriated from surface or groundwater resources. If appropriating from surface waters, a Water Rights Permit is required for dams that impound more that 25-acre feet of water at the primary spillway elevation, diversions serve some use other than reasonable domestic use, or the proposed dam is on a navigable stream. A Location Notice is required for proposed dams that impound 25-acre feet or less at the primary spill way elevation, the water impounded is used for in-place uses such as stock watering, or fish and wildlife habitat, and the dam is constructed on a dry draw or non-navigable stream (SDDENR, 2017d). There are three Water Rights Permits, 63 Location Notices, and eight wells in the Project Area.

Based on a review of SDDENR's Pending Applications to Appropriate Water and Future Use Reviews, there are no pending water right applications in Clark County (SDDENR, 2017e).

9.2.1.6 Floodplains

Floodplains perform many natural functions, including the storage of excess water and reduction of flow velocity during times of flood, groundwater recharge, provision of habitat, and removal of excess sediment, nutrients, and other pollutants. The placement of fill into floodplains reduces the effectiveness of these functions.

The Federal Emergency Management Agency ("FEMA") has not completed a study to determine flood hazards in Clark County, South Dakota (FEMA, 2017).

9.2.1.7 National Park Service Nationwide Rivers Inventory

Pursuant to Section 5(d) of the National Wild and Scenic Rivers Act, the National Park Service ("NPS") maintains the Nationwide Rivers Inventory ("NRI"), a listing of more than 3,400 free-flowing river segments in the United States that are believed to possess one or more "outstandingly remarkable" natural or cultural values judged to be of more than local or regional significance. The NRI includes river segments that potentially qualify as national wild, scenic, or recreational river areas (NPS, 2011). There are no NRI-listed rivers within the Project Area; the

closest NRI segment listed is the James River in Spink County, approximately 23 miles southwest of the Project Area.

9.2.1.8 Impaired Waters

CWA Section 303(d) requires that each state review, establish, and revise water quality standards for all surface waters within the state. Waters that do not meet their designated beneficial uses because of water quality standard violations are considered impaired.

There are no 303(d)-listed waterbodies within the Project Area. However, there are three lakes located within Clark County that are impaired for mercury in fish tissue (SDDENR, 2016b). Reid Lake is 0.45 mile southeast of the Project Area, Swan Lake is approximately 6.7 miles northeast, and Antelope Lake is approximately 10.0 miles southeast. The South Dakota Mercury Total Maximum Daily Load lists point sources of water pollution into mining, non-stormwater National Pollutant Discharge Elimination System ("NPDES") permitted facilities, and Municipal Separate Storm Sewer Systems (SDDENR, 2015). The same study attributes nonpoint sources of mercury pollution to wet and dry atmospheric deposition throughout the world. Because the proposed Project does not fit into or impact any of the above listed mercury sources, the Project will not be restricted by the wasteload allocation or load allocation established in the Total Maximum Daily Load.

9.2.2 General Construction and Operation Impacts on Hydrology

This section describes the potential effects of the Project on hydrological resources within the Project Area, including the effect on current or planned water uses and surface or groundwater resources.

9.2.2.1 Impacts to Hydrogeological Resources

Construction of the Project is not anticipated to have long-term impacts on groundwater resources. As discussed in Section 4.0, disturbances associated with Project construction activities are primarily limited to the upper 4 to 6 feet, which is above the water table of most of the aquifers in the Project Area (Section 9.2.1.1). Construction activities such as trenching and backfilling and dewatering that encounter shallow surficial aquifers may result in negligible to minor short-term and very localized fluctuations in groundwater levels within the aquifer. Once the construction activity is complete, the groundwater levels typically recover quickly.

Because wind turbines and transmission line structures are typically located at higher elevations where water tables tend to be deeper, minimal trench dewatering is anticipated. As discussed in Section 9.2.1.1, there are three areas of shallow aquifers at the ground surface in the northern and southeastern portions of the Project Area (Figure 9) where dewatering activities will likely be required. The introduction of contaminants into groundwater due to accidental release of construction related chemicals, fuels, or hydraulic fluid during construction could have an adverse effect on groundwater quality, most notably near shallow water wells. Spill-related affects are primarily associated with fuel storage, equipment refueling, and equipment maintenance.

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

9.2.2.2 Impacts to Waterbodies and Water Quality (ARSD 20:10:22:20)

Construction could affect surface waters in several ways. Clearing and grading of stream banks, topsoil disturbance, in-stream trenching, trench dewatering, backfilling, and development of access roads and crane pathways could result in increased sedimentation and erosion, modification to hydrological flow, releases of chemical and nutrient pollutant from sediments, and introduction of chemical contaminants such as fuel and lubricants.

In 2016 and 2017, Tetra Tech, Inc. ("Tetra Tech") conducted wetland and waterbody delineations within the environmental survey corridor according to the USACE Wetlands Delineation Manual (Environmental Laboratory, 1987) and applicable Regional Supplements. Delineations have been completed on 78 percent of the environmental survey corridor. Where surveys have not been completed, NWI data are used to calculate impacts. As presented in Table 9-4, Crocker would temporarily impact approximately 0.1 acre of ephemeral waterbodies, meaning that these waterbodies do not have continuous year-round flow. Construction activities would also temporarily impact lacustrine (lake) systems at the edge of a temporary access road and along the transmission line corridor. The transmission line would span the 0.4-acre delineated lake system, thereby avoiding any permanent impacts.

Table 9-4: Summary of Impacts to Waterbodies in the Project Area

Source	Wetland Type	Permanent Impacts (acres)	Temporary Impacts (acres)
Wind Farm Facility			
Delineated	Lacustrine (lake)	0.0	<0.1
	Subtotal	**0.0**	**<0.1**
NWI	Riverine (ephemeral)	0.0	0.1
	Subtotal	**0.0**	**0.1**
Wind Farm Facility Subtotal		**0.0**	**0.1**
Transmission Facility			
Delineated	Lacustrine (lake)	0.0	0.4
	Subtotal	**0.0**	**0.4**
Transmission Line Facility Subtotal		**0.0**	**0.4**
Project Total		**0.0**	**0.5**

Construction of the Project will result in up to approximately 157.1 acres of new impervious surfaces (turbine foundations, permanent access roads, Project substation, interconnection switchyard, O&M facility) in the Project Area. The creation of impervious surfaces reduces the ability of soils to infiltrate precipitation to groundwater, potentially increasing the volume and rates of stormwater runoff. Infiltration will be inhibited within these newly created impervious surfaces, and incremental increases in stormwater runoff may be exhibited immediately adjacent to these surfaces.

9.2.2.3 Impacts to Wetlands

As discussed in Section 9.2.2.2, Tetra Tech conducted wetland and waterbody delineations within the environmental survey corridor according to the USACE Wetlands Delineation Manual (Environmental Laboratory, 1987) and applicable Regional Supplements in 2016 and 2017. Wetland delineations have been completed on 78 percent of the environmental survey corridor. Where surveys have not been completed, NWI data are used to calculate impacts. Prior to construction, the remainder of the environmental survey corridor will be surveyed for wetlands. Once surveys are complete, Crocker may further refine the Project layout to avoid wetland features to the extent practicable. Access roads, operations facility and substations will be designed to avoid impacts to wetlands whenever feasible. Temporary impacts associated with crane walkways will also be minimized. Installation of underground utilities is expected to avoid impacts by boring under water features as necessary and will minimize impacts to wetlands or where possible make them coincident with other impacts (e.g., crane walks). Crocker will acquire all needed wetland permits from applicable Federal and State agencies prior to construction.

Approximately 23.8 acres of PEM wetland, 0.2 acres of PSS wetland, and 1.6 acres of PUB wetland would be temporarily affected by construction of the Project (Table 9-5). Crocker anticipates that there would be no long-term impacts on emergent wetlands. The wetlands would be restored to pre-construction conditions, and the herbaceous vegetation would be allowed to vegetate naturally in these areas. Temporary impacts may also result from construction matting to access certain locations.

Approximately 0.2 acres of PSS wetland would be cleared and temporarily disturbed during construction of the Project (Table 9-5). The impacts on scrub-shrub wetlands and forested wetlands would be of a longer duration than emergent wetlands because the woody vegetation would require a longer time to reestablish in the construction workspace after restoration.

Turbines, step-up transformers, and meteorological towers will be constructed on higher elevation portions of the Project Area to maximize the wind resource, and as such, generally avoid direct impacts to wetlands, which tend to be in lower topographic positions. Similarly, because transmission structure spans will range from 400 feet to 1,000 feet, Crocker anticipates siting structures in upland areas only, avoiding any wetlands along the Transmission Line Route. Construction of these aboveground facilities would result in the permanent impact of only 0.2 acres of wetlands (Table 9-5).

Table 9-5: Summary of Impacts to Wetlands in the Project Area

Source	Wetland Type	Permanent Impacts (acres)	Temporary Impacts (acres)
Wind Farm Facility			
Delineated	PEM	0.2	23.7
	PSS	0.0	0.2
	PUB	0.0	1.6
	Subtotal	**0.2**	**25.5**
NWI	PEM	0.0	3.8
	Subtotal	**0.0**	**3.8**
Total		**0.2**	**29.3**
Transmission Facility			
NWI[1]	PEM	0.0	0.1
	Subtotal	**0.0**	**0.1**
Total		**0.0**	**0.1**
Project Total		**0.2**	**29.4**

[1] *There are no permanent or temporary impacts to delineated wetlands*

9.2.2.4 Impacts on Current or Planned Water Use

The Project will not appropriate from surface waters in the Project Area, and will not conduct permanent dewatering, or deep well injection, and water storage, reprocessing, or cooling for either construction or operation of the facilities. Water that will be required for dust control and potentially for the concrete batch plant will be obtained from municipal or other sources outside of the Project Area. Crocker will seek and comply with the conditions of the applicable permits for water appropriation.

Due to the lack of a rural water supply for the O&M facility, a water supply well will be required. Water usage at the O&M facility will be similar to a household volume, or approximately 400 gallons per day (United States Environmental Protection Agency [“EPA”], 2016). Crocker will seek and comply with the conditions of the South Dakota Water Right Permit for the water supply well. In compliance with the Clark County Zoning Ordinance, a private wastewater treatment system that meets the requirements of the SDDENR would be installed for the O&M facility (Clark County, 2014). However, use of water for operations will be negligible and will not create undue burden so no mitigation is proposed.

Based on a review the SDDENR Well Completion Report databases (SDDENR, 2017c), there are 6 wells that are within 1,000 feet of proposed construction workspace or facilities (Table 9-6 and Figure 9); this may include wells that are located outside of the Project Area, but within 1,000 feet of Project components. Because domestic water uses that do not exceed 25,920 gallons per day or a peak pump rate of 25 gallons per minute do not require a permit (SDDENR, 2017d).

Table 9-6: Summary of Wells within 1,000 Feet of Project Facilities

Feature ID (FID)	Owner Name	T/R/S	Well Depth (feet)	Use Type	Distance (feet) from Project	Type of Facility Component
216	Jhones	118N, 58W, S5	24	Stock Well	8	Collector System
732	Hillcrest Colony	118N, 58W, S23	80	Irrigation	245	Crane Path
247	Hagen	119N, 57W, S31	425	Stock Well	268	Temporary Access Road
726	Hillcrest Colony	118N, 58W, S23	100	Plugged	350	Crane Path
489	Ragels	119N, 59W, S26	342	Domestic	358	Temporary Access Road
545	KXAB TV (Conde)	119N, 59W, S23	370	Domestic	712	Temporary Access Road

[1] *T/R/S = Township / Range / Section*
Source: SDDENR, 2017c

Potential construction-related impacts on wells could include localized decreases in groundwater recharge rates through changes to overland water flow, contamination, decreased well yields, decreased water quality (such as increased turbidity or odor in the water), interference with well mechanics, or complete disruption of the well. These impacts could result from trenching, equipment traffic, or hazardous materials spills. However, Crocker does not anticipate impacting residential domestic wells because wind turbines will be setback a minimum of 3,960 feet from non-participating residences and 1,000 feet from participating residences. Furthermore, excavation will only occur between 4 to 6 feet and known wells in the Project Area are generally drilled deeper than 24 feet (see Table 9-6).

Potential impacts to surface water diversions identified would be similar to the impacts described for waterbodies in Section 9.2.2.2. Based on a review of SDDENR's Pending Applications to Appropriate Water and Future Use Reviews, there are no pending water right applications in Clark County (SDDENR, 2017e).

9.2.2.5 Impacts to Flood Storage Areas

As discussed in Section 9.2.1.6, floodplains have not been mapped by FEMA in Clark County. Although the Federal government has not officially mapped floodplains in the county, it is unlikely the Project would impact floodplains. Wind turbines, transmission line structures, access roads, the O&M facility, the Project substation, and interconnection switchyard 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.

9.2.3 Mitigation Measures for Hydrology

Crocker has conducted formal wetland and waterbody delineations within the Project Area in areas of proposed infrastructure. With layout revisions, 78 percent of the final layout reflected in this Application has been field-delineated. Based on this information, the Project has been designed to avoid and minimize wetland and waterbody impacts. The remainder of the Project will be delineated during Spring 2018. Wetlands and waterbodies will be avoided to the extent possible during the construction phase of the Project. If wetland or waterbody impacts cannot be avoided, the Applicant will submit a permit application to the USACE for dredge and fill within waters of the U.S. under Section 404 of the CWA.

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

Construction dewatering will be conducted in accordance with the General Permit for Temporary Discharge Activities (Permit No.: SDG0700000) and Temporary Permit to Use Public Waters from the SDDENR and through the implementation of industry-accepted BMPs to minimize sediment withdrawal during dewatering activities and erosion and sediment release at the discharge point. Regarding potential impacts to wells, in the case that water supply wells are located near potential construction dewatering locations, provisions would be made to ensure that an adequate supply of water is provided until construction dewatering activities have ceased.

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

Terrestrial ecosystem data were collected from literature searches, Federal and State agency reports and consultations, and natural resource databases. Biologists from Western Ecosystems Technology, Inc ("WEST") and Tetra Tech, Inc. conducted field surveys on behalf of Crocker within an environmental survey corridor that encompasses the construction workspace, proposed access roads, crane pathways, and aboveground facility footprints for both the Wind Farm Facility and Transmission Facility to provide site-specific information on terrestrial resources. The results of these surveys are summarized in the applicable sections below.

9.3.1 Vegetation

9.3.1.1 Existing Vegetation

The Project Area is located within the Prairie Coteau Level IV Ecoregion of South Dakota (EPA, 1996). The landscape of the Project Area has changed since European settlement from a landscape dominated by tallgrass prairie dotted with pothole wetlands of various shapes and sizes, to a landscape primarily composed of cultivated crops, hay fields, and pastures grazed by livestock. In addition to direct conversion of the native ecosystem, human activity has also altered or interrupted the natural disturbance processes of this tallgrass prairie ecosystem, including suppressing fire and altering historic grazing practices (relative to historic bison herd

grazing) (SDGFP, 2014). Based on USGS (2011) GAP data, vegetation classes within the Project Area are summarized in Table 9-7 and displayed on Figure 12. Based on the GAP data, approximately 54 percent of the Project Area is classified as agricultural, including pasture/hay, cultivated cropland, and managed tree plantation.

Table 9-7: Summary of USGS GAP Vegetation Classes within the Project Area

Vegetation Class	Total Acres	Percent of Project Area
Agricultural Vegetation Subtotal	15,910	54.2%
Shrubland & Grassland Subtotal	6,000	20.5%
Introduced & Semi Natural Vegetation Subtotal	3,784	12.9%
Open Water Subtotal	2,811	9.6%
Developed & Other Human Use Subtotal	675	2.3%
Forest & Woodland Subtotal	151	0.5%
Project Total	**29,331**	**100.0%**

The Developed & Other Human Use class consists of increasing levels of development starting with open space areas dominated by lawn (e.g., golf course, large-lot residences, parks) at the lowest intensity, to areas of increasing coverage of impervious surfaces from 20-49 percent (low intensity), 50-79 percent (medium intensity), to 80-100 percent (high intensity). Vegetation in these areas generally lack diversity, consisting largely of invasive and noxious species (some intentionally introduced), or lack vegetation all together (USGS, 2011). This class is not discussed further in this section (see Section 9.5.1). Similarly, agricultural vegetation types are altered non-natural vegetation communities and are discussed further in Section 9.5.1.

Shrubland and Grassland

Within the shrubland and grassland class, Central Tallgrass Prairie is the most abundant land cover type (19.6 percent) in the Project Area (USGS, 2011). Tallgrass prairie is dominated by big blue-stem (*Andropogon gerardii*), little bluestem (*Schizachyrium scoparium*), Indiangrass (*Sorhastrum nutans*), and switchgrass (*Panicum virgatum*). Tallgrass prairie is considered one of the most endangered ecosystems in the U.S. comprising less than 1 percent of its historic range. These prairies are found on deep, rich soils, which have made them ideal for conversion to agriculture. Fire suppression has increased shrub and tree invasion of the prairie and has also contributed to this ecosystem's decline (USGS, 2011; Higgins et al., 2001). South Dakota has retained approximately 15 percent of historic range. The remaining remnants tend to be scattered and highly fragmented. A floristic inventory study conducted in eastern South Dakota, which included Clark County and sites in proximity to the Project Area, found that remaining prairie tracts had reduced floristic diversity due to extreme fragmentation and intensive use, usually season-long grazing. This study also concluded, however, that these remnants retained a sufficient number of plant species that would enable some rehabilitation (Higgins et al., 2001).

South Dakota State University ("SDSU") conducted a four-phased study that reviewed the South Dakota Farm Services Agency's ("FSA") data and aerial photography to map potentially undisturbed grassland and woodland in 44 counties in South Dakota. Undisturbed land for this

study was defined as lands where the soils have not been mechanically manipulated through actions such as cultivation, anthropogenic development and use or extraction of natural resources. Grazing on pasture lands were not considered disturbances for this study (Bauman et al., 2016).

Based on 2013 data, there are 13,260 acres of potentially undisturbed grassland, and 27 acres of potentially undisturbed woodland within the Project Area. The USFWS grassland and wetland easement program protect 5,014 acres of potentially undisturbed grassland (37.8 percent of potentially undisturbed grassland in the Project Area), and 3 acres of potentially undisturbed woodland (10.7 percent of potentially undisturbed woodland in the Project Area). The USFWS easement program is discussed in Section 9.5.3.

Crocker contracted Tetra Tech to conduct on-the-ground natural community classification and land use assessment of the environmental survey corridor. The assessment evaluated plant species diversity (high, medium, and low), grazing intensity (light, moderate, and heavy), and community composition (native, native and non-native, and non-native) to give each patch an overall quality score. Land use was also noted to reflect the most current uses in the survey corridor. The typical habitat for each quality class is summarized in Table 9-8. Note that as stated above, this analysis was conducted within the environmental survey corridor; therefore, is not extrapolated to the entire Project Area. The results of this survey with respect to the construction- and operation-related impacts are provided in Section 9.3.1.2.

Table 9-8: Tetra Tech Vegetation Community Quality Classification

Quality Score	Quality Class	Typical Habitat
3 to 4	Low	Heavily disturbed/grazed, low diversity, dominated by non-native species
5 to 7	Moderate	Moderately disturbed/grazed, moderate diversity, mixture of native and non-native dominant species
8 to 9	High	Minimally disturbed/lightly grazed, moderate to high diversity, dominated by native species

Noxious and Invasive Species (Introduced & Semi Natural Vegetation)

According to the USGS (2011) GAP data, approximately 12.9 percent of the Project Area is dominated by invasive grass and forb species. Noxious and invasive weeds are regulated by State (SDCL 38-22) and Federal (7 Code of Federal Regulations [CFR] 360) rules and regulations designed to stop the spread of plants that are detrimental to the environment, crops, livestock, and/or public health. According to the South Dakota Department of Agriculture ("SDDOA"), 9 listed species of noxious weeds have the potential to occur and are regulated within Clark County (SDDOA, 2017a and 2017b). Three of these species are listed statewide, and the remaining six species are locally listed for Clark County (Table 9-9).

Table 9-9: State and Local Noxious Weeds of South Dakota

Common Name	*Scientific Name*	State Weed Status	Recorded at Crocker?
Absinth wormwood	*Artemisia absinthium*	Local noxious weed	Yes
Plumeless thistle	*Carduus acnthoides*	Local noxious weed	No
Musk thistle	*Carduus nutans*	Local noxious weed	Yes
Spotted knapweed	*Centaurea stoebe*	Local noxious weed	No
Canada thistle	*Cirsium arvense*	State noxious weed	Yes
Bull thistle	*Cirsium vulgare*	Local noxious weed	Yes
Field bindweed	*Convolvulus arvensis*	Local noxious weed	Yes
Leafy spurge	*Euphorbia esula*	State noxious weed	Yes
Perennial sow	*Sonchus arvensis*	State noxious weed	Yes

Source: SDDOA 2017a and 2017b

In 2017, Crocker conducted plant community surveys within the environmental survey corridor to characterize landscape-level patterns in plant abundances. The Natural Community Inventory is 78 percent complete and will be completed in Spring 2018, prior to construction. During these surveys, incidental observations of noxious weeds were recorded (Table 9-9). Crocker primarily observed noxious weeds in roadside ditches, heavily grazed pasture areas, and within wetlands that would typically be inundated, but were observed to have little or no water due to drought conditions. Lower abundance of noxious weeds was observed in areas of light to moderate grazing. The most common noxious weeds observed were absinth wormwood and Canada thistle. Absinth wormwood was a dominant plant within some very heavily grazed pasture areas, but was observed in lower abundance in heavily grazed areas and more infrequently in moderately and lightly grazed areas. Canada thistle was commonly observed in low to moderate abundance independent of grazing intensity. Other noxious weeds observed more infrequently included perennial sow thistle, field bindweed, leafy spurge, bull thistle, and musk thistle.

Forest & Woodland

The Forest & Woodland class comprises approximately 0.6 percent, or 163 acres, of the Project Area. Wooded areas in the Project Area are primarily associated with farmsteads and shelter belts.

9.3.1.2 Impacts to Vegetation

The Project will permanent impact 157 acres of vegetation and temporarily impact 1,832 acres of vegetation. Table 9-10 identifies the acreages of USGS (2011) GAP vegetation classes that would be directly affected by construction and operation of the Project. Overall, 80 percent of the Project's construction and operations-related impacts would occur in vegetation types that have experienced prior disturbance or alteration, including Agricultural Vegetation, Developed & Other Human Uses, and Introduced & Semi Natural Vegetation classes. Additionally, based field surveys of the proposed construction workspace, Shrubland & Grassland ecological systems

that would be impacted by the proposed Project also have experienced various levels of disturbance and degradation largely related livestock grazing (see additional discussion below).

Permanent impact acreages provided in Table 9-10 refer to where vegetation will be permanently removed and replaced by wind turbine foundations, meteorological towers, O&M facility, Project substation, transmission poles, permanent access roads, and the switchyard. All temporary impact acreages identified in Table 9-10 will be restored following construction, and allowed to naturally revegetate.

Table 9-10: Summary of Wind Farm Facility and Transmission Facility Impacts to USGS GAP Ecological Systems

Vegetation Class	Permanent Impacts (acres)	Temporary Impacts (acres)
Wind Farm Facility		
Agricultural Vegetation	99.2	1,170.7
Shrubland & Grassland	25.2	358.8
Introduced & Semi Natural Vegetation	11.6	203.9
Open Water	0.0	1.4
Developed & Other Human Use	4.1	42.4
Forest & Woodland	<0.1	0.5
Wind Farm Facility Subtotal	**140.1**	**1,777.8**
Transmission Facility		
Agricultural Vegetation	3.3	23.1
Shrubland & Grassland	2.0	6.7
Introduced & Semi Natural Vegetation	11.1	14.9
Open Water	0.0	0.7
Developed & Other Human Use	0.7	8.8
Forest & Woodland	0.0	0.1
Transmission Facility Subtotal	**17.0**	**54.2**
Project Total	**157.1**	**1,832.1**

Shrubland and Grassland

Based on the USGS (2011) GAP data, the Project construction activities would disturb 365.5 acres of vegetation classified as shrubland & grassland (Table 9-10) and permanently impact 27.2 acres of shrubland & grassland vegetation. Based on field the Tetra Tech natural community assessment of non-cultivated area, impacts to grasslands are primarily to those with low to moderate quality scores (Table 9-11). To further characterize the state of the potentially undisturbed grassland impacted by the Project, we intersected the SDSU (Bauman et al., 2016) data with the Tetra Tech Vegetation Community Quality Classification (described in Section 9.3.1.1, Table 9-8), which describes intensity of current land use, species diversity, and native versus non-native species composition based on field verification. By intersecting

these data sets, we are able to more accurately characterize the historic and current land uses, and the quality of the vegetation communities that would be impacted by the Project.

Table 9-11: Summary of Wind Farm Facility and Transmission Facility Impacts to Potentially Undisturbed Grasslands

Tetra Tech Quality Class [1]	Permanent Impacts (acres)	Temporary Impacts (acres)	Total (acres)
Wind Farm Facility			
Low	20.6	316.5	337.1
Moderate	24.2	401.5	425.7
High	0.0	0.1	0.1
Unsurveyed	4.4	34.2	38.6
Wind Farm Facility Subtotal	**49.2**	**752.3**	**801.5**
Transmission Facility			
Low	<0.1	14.5	14.5
Moderate	0.1	9.3	9.5
High	0.0	0.0	0.0
Unsurveyed	<0.1	6.6	6.6
Transmission Facility Subtotal	**0.2**	**30.5**	**30.7**
Total	**49.4**	**782.8**	**832.1**

[1] *Tetra Tech Quality Class descriptions are as follows:*
Low = heavily disturbed/grazed, low diversity, dominated by non-native species
Moderate = moderately disturbed/grazed, moderate diversity, mixture of native and non-native dominant species
High = minimally disturbed/lightly grazed, moderate to high diversity, dominated by native species

Tetra Tech surveys indicate that of the 832.1 acres of potentially disturbed grassland surveyed, 42 percent (351.6 acres) is low quality, meaning it is heavily disturbed or grazed with low species diversity and dominated by non-native species. An additional 52 percent (435.2 acres) is of moderate quality, in a state of moderate disturbance with moderate species diversity and mixture of native and non-native dominant plant species. Less than 1 percent (0.1 acre) of the potentially undisturbed grassland that would be impacted by the Project is high quality grassland; this would be impacted temporarily during the installation of the collector system. Approximately 5 percent (45.3 acres) of potentially undisturbed grassland that would be impacted by the proposed Project have not been field verified.

Based on the Tetra Tech surveys completed to date, there is only 0.1 acre of high quality native prairie dominated by native species that would be impacted by the Project. The remaining 832.0 acres of potentially undisturbed grassland is degraded prairie, dominated by non-native or a mixture of native and non-native species. Clearing of degraded prairie, non-native grassland, or other herbaceous vegetation during construction is anticipated to result in a short-term impact to vegetation. Active revegetation measures and rapid colonization by

annual and perennial herbaceous species in the disturbed areas would restore most vegetation cover within the first growing season.

Noxious and Invasive Weeds (Introduced & Semi Natural Vegetation)

Based on the USGS (2011) GAP data, the Project would temporarily impact approximately 218.9 acres during construction and 22.6 acres permanently for operations of vegetation that is currently dominated by invasive grass and forb species. During pre-construction field surveys, Crocker incidentally reported seven of the nine State and local noxious weeds with potential to occur in Clark County within the Project Area (Table 9-9).

Forest & Woodland

As demonstrated in Tables 9-10 and 9-11, Crocker has avoided impacts to 99.6 percent of the Forest & Woodland ecological systems in the Project Area. Forested vegetation would be removed for the construction of access road, collector system, wind turbine workspace, and transmission corridor. Woody shrubs and trees would be allowed to recolonize the temporary workspace. Woody vegetation would also be allowed to regenerate where improvements were made to temporary access roads. However, recolonization of disturbed areas by woody shrubs and trees would be slower than recolonization by herbaceous species. As natural succession is allowed to proceed in these areas, the early successional or forested communities present before construction would eventually reestablish.

9.3.1.3 Mitigation Measures for Vegetation

Crocker has worked with the USFWS and SDGFP to redesign the site layout to avoid impacts to high quality prairie communities, and to realign linear corridors, such as the access roads, collector system, crane pathways, and transmission lines to follow existing disturbed corridors (e.g., roads, transmission lines, fence rows) in an effort to reduce fragmentation. As reflected in Section 9.3.1.2, this has resulted in the avoidance of approximately 80 percent of the natural vegetation communities located within the Project Area. Crocker will coordinate with the agencies and landowners on seed mixes for revegetation. Additionally, Crocker will initiate restoration of disturbed soils and vegetation as soon as possible after construction activities are completed. Crocker will restore areas of disturbed soil using weed-free native grasses, forbs, and shrubs, in consultation with land managers and appropriate agencies such as State or County extension offices or weed boards.

Shrubland and Grassland

Crocker has designed the site layout to avoid impacts to high quality native prairie communities within the Project Area by shifting turbine and associated infrastructure locations, and co-locating infrastructure with existing disturbances (e.g., farm roads, utility corridors). Previously disturbed “go back” prairie and other non-native grasslands would be temporarily impacted, but would be restored following construction. Crocker would enhance these habitats by developing and implementing a Noxious and Invasive Weed Management Plan which would eradicate invasive species within the construction workspace, and control noxious and invasive weeds within the permanent right-of-way for the life of the Project.

Noxious and Invasive Weeds (Introduced & Semi Natural Vegetation)

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

Forest & Woodland

As described in Section 9.3.1.2, woody vegetation would be allowed to regenerate within the temporary workspace (0.3 acres), but would be periodically trimmed or removed from the remaining 0.3 acres along the collector system and transmission corridor.

9.3.2 Wildlife

9.3.2.1 Existing Wildlife

Wildlife Survey Results

Project-specific wildlife surveys began in April 2016 and are ongoing (Table 9-12). Crocker consulted with the USFWS and SDGFP to identify which species and/or habitat surveys were needed and to design the survey protocols. These wildlife surveys satisfy the Tier 3 studies recommended by the USFWS Land-Based WEG (USFWS, 2012). Survey types, and dates of surveys are summarized in Table 9-8. Reports of the studies in Table 9-12 were submitted to the USFWS and SDGFP; these reports include detailed discussion of the methodology and results of the Tier 3 wildlife surveys.

Table 9-12: Summary of Tier 3 Studies at the Crocker Wind Project

Survey Type	Dates
Bird Surveys	
Avian Use Studies	**April 2016-March 2018**
Grassland Avian Use Study	June 7-July 4, 2017
2016 Eagle and Raptor Nest Surveys	April 4-5, 2016
2016 Sharp-tailed Grouse and Greater Prairie Chicken Lek Surveys	April 25-May 11, 2016
2017 Eagle and Raptor Nest Survey	April 13, 14, 18 2017
Bat Surveys	
General Bat Acoustic Survey	April 14-October 27, 2016
Threatened and Endangered Species Surveys	
NLEB Presence/Absence Acoustic Surveys	July 22-27, 2016
Dakota Skipper and Poweshiek Skipperling Habitat Assessment	September 21-22 and 26-28, 2016 May 29 and June 7-11, 2017 June 29-July 13, 2017

Table 9-12: Summary of Tier 3 Studies at the Crocker Wind Project

Survey Type	Dates
Dakota Skipper Presence/Absence Surveys	June 29-July 13, 2017

In addition to these wildlife surveys, habitat assessments have informed the turbine siting process to minimize impacts to quality habitats. Turbines will not be sited in the GPAs or Waterfowl Productions Areas ("WPA"). One turbine and associated infrastructure is sited in the privately-owned hunter Walk-In Area ("WIA"). Modification of this WIA may be required on a temporary basis for the safety of the construction and operation staff.

Migratory Birds

MBTA is the cornerstone of migratory bird conservation and protection in the United States. The MBTA implements four treaties that provide for international protection of migratory birds. The MBTA was enacted in 1918 for the purpose of prohibiting the use of birds and bird parts in the millinery industry. Under the MBTA, it is illegal "to pursue, hunt, take, capture, kill … possess, offer for sale, sell … purchase … ship, export, import …transport or cause to be transported… any migratory bird, any part, nest, or eggs of any such bird …" (16 United States Code ["USC"] 703). The word "take" is defined by regulation as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect" (50 CFR 10.12). The USFWS maintains a list of all species protected by the MBTA at 50 CFR 10.13. This list includes over one thousand species of migratory birds, including eagles and other raptors, waterfowl, shorebirds, seabirds, wading birds, and passerines (USFWS, 2015).

As discussed in Sections 9.3.1.1 and 9.2.1.4, there is both upland grassland and wetland habitat in the Project Area that support both migratory and resident bird species for resting, foraging, or breeding activities. The Prairie Pothole Region provides habitat for potentially high concentrations of both waterfowl and grassland birds. The Project is located to the southeast of the highest concentrations of waterfowl breeding pairs that have been mapped in the Prairie Pothole Region.

During the first year of Avian Use Studies, a total of 124 avian species were observed during fixed-point bird use surveys within the Project Area from April 2016 through March 2017. Species use was diverse; the most abundant species were red-winged blackbird and common grackle. Raptor use was relatively low. The most common type of raptor documented was red-tailed hawk; other raptor species observed included American kestrel, Swainson's hawk, northern harrier, bald eagle, and Cooper's hawk. Waterfowl use was highest during the migration periods. Six species composed 91 percent of the waterfowl use during the spring: greater scaup, snow goose, Canada goose, mallard, lesser scaup, and blue-winged teal.

Crocker also reviewed SDGFP's online Breeding Bird Atlas which provides the results of the second South Dakota Breeding Bird Atlas surveys which took place from 2008-2012 (Drilling et al., 2016). The Atlas provides information on which bird species nest in the state, where they are found, and the habitats they utilize during the breeding season. The survey effort required surveyors to visit a pre-selected 3-mile by 3-mile 'block' during the breeding season. All habitats within each block were surveyed for both evidence of breeding and presence of all bird species. Surveyors were asked to make a total of three daytime visits and one evening visit, and spend a

total of at least 15 hours surveying a block. Visits were at least 10 days apart, and could be spread over multiple breeding seasons. The goal of the surveys was to document all breeding birds within each block. A portion of the Crocker Block overlaps with the northeastern portion of the Project Area. Within this block, 28 bird species were confirmed, 26 species were considered probably present, 18 species were possibly present, and 5 species were observed, but no evidence of breeding in the block was found (Drilling et al., 2016). There is substantial overlap between the species observed during the Breeding Bird Atlas and the Project-specific surveys at Crocker (year 1 of avian point counts and grassland breeding bird surveys).

It is anticipated that the species identified during these surveys and the Breeding Bird Atlas to date are representative of bird use in the Project vicinity and adequately predict and document the bird presence and use of the Project Area. Nonetheless, Crocker will continue to conduct avian use studies through March 2018 and will provide the results of those studies to the USFWS and SDGFP.

Grassland Birds

Grassland breeding bird surveys were conducted June 7 through July 4, 2017 to gather information on species presence and relative abundance within the Project Area during the breeding and nesting season. Crocker surveyed a random sample of 30 proposed turbine locations where land cover (USGS, 2011) was dominated by grassland and hay/pasture; 30 percent of the surveyed areas were located on land identified as potentially undisturbed lands by the Bauman et al. (2016). In total, 48 species were identified during 176 transect surveys. Eight species comprised 74 percent of the observations: grasshopper sparrow, western meadowlark, bobolink, dickcissel, brown-headed cowbird, clay-colored sparrow, red-winged blackbird, and chestnut-collared longspur.

Birds of Conservation Concern

The 1988 amendment to the Fish and Wildlife Conservation Act mandates that the USFWS "identify species, subspecies, and populations of all migratory nongame birds that, without additional conservation actions, are likely to become candidates for listing under the ESA of 1973." As a result of this mandate, the USFWS created the BCC list (USFWS, 2008). The goal of the BCC list is to prevent or remove the need for additional ESA bird listings by implementing proactive management and conservation actions and coordinating consultations in accordance with Executive Order 13186. Nine BCC in Bird Conservation Region ("BCR") 11 (Prairie Potholes) were documented during avian use surveys: marbled godwit, upland sandpiper, American bittern, black tern, Swainson's hawk, bald eagle, chestnut-collared longspur, dickcissel, and grasshopper sparrow. In addition, six BCC in BCR 11 (Prairie Potholes) were documented during grassland bird surveys: upland sandpiper, marbled godwit, Swainson's hawk, chestnut-collared longspur, dickcissel, and grasshopper sparrow.

Lek Surveys

Aerial lek surveys were conducted throughout the Project Area during two separate survey periods from April 14 through May 12, 2016 to evaluate the potential for impacts on greater prairie-chicken and sharp-tailed grouse from Project construction and operation. No greater

prairie-chicken or sharp-tailed grouse leks were documented within the Project Area. SDGFP records showed ten leks located 1 to 5 miles to the south and southwest of the Project Area, in relatively flat terrain to the west of the Prairie Coteau region. These SDGFP lek locations were not assessed during aerial surveys because they were more than 1 mile from the boundary of the Project Area.

Eagles

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

Wind energy developers and wildlife agencies have recognized a need for specific guidance to help make wind energy facilities compatible with eagle management and the laws and regulations that protect eagles. The USFWS has developed the Eagle Conservation Plan Guidance, Module 1 – Land-based Wind Energy, Version 2 ("ECPG") (USFWS, 2013a) to specifically address impacts to bald eagles from wind energy facilities. The ECPG suggests specific questions that should be considered to help place a prospective project site into an appropriate risk category. These questions are addressed in the Project's BBCS (Appendix D).

Bald eagles were recorded during fixed-point avian use studies; between April 2016 and November 2017, 16 bald eagles were recorded during 542 hours of survey for a combined total of 37 flight minutes. No golden eagles were documented. Crocker anticipates that bald eagle use during April 2016-November 2017 is representative of future eagle use in the Project Area. Crocker is continuing to record eagle use in the Project Area through March 2018.

Aerial survey for bald eagle nests were conducted in Spring 2016 and 2017 to document bald eagle nests within 10 miles of the Project. No bald eagle nests were identified within the Project Area during either year of surveys. In 2016, two active bald eagle nests were identified within 10 miles of the Project, and in 2017, four active bald eagle nests and one inactive bald eagle nest were documented within 10 miles of the Project Area.

Bats

Thirteen bat species are known to occur in South Dakota; they include the hoary bat (*Lasiurus hispidus*), eastern red bat (*Lasiurus borealis*), big brown bat (*Eptesicus fuscus*), silver-haired bat (*Lasionycteris noctivagans*), NLEB (also referred to as northern myotis) (*Myotis septentrionalis*), tri-colored bat *(Perimyotis subflavus*) and little brown bat (*Myotis lucifugus*) (SDGFP, Undated). Both the silver-haired bat and NLEB are South Dakota SGCN, and the NLEB is also listed as threatened under ESA (Section 9.3.3).

Crocker conducted pre-construction bat acoustic surveys within the Project Area to evaluate the presence and abundance of bats. Bat activity was assessed from April 14 through October 27, 2016. Bat activity was highest in the fall, peaking in early August. Activity during the standardized fall migration period (July 30 through October 14) was 2.80 ± 0.42 bat passes per detector-night at stations. Low-frequency bats were the most commonly recorded species (66.8 percent) among all stations, suggesting that these species are relatively more abundant than high-frequency species in the Project Area. Low-frequency species included big brown bats, hoary bats, and silver-haired bats. High-frequency bats composed 33.2 percent of bat passes recorded; high-frequency bat species included tri-colored bats, eastern red bats, and *Myotis* species.

9.3.2.2 Impacts to Wildlife

Impacts to birds and bat species are generally the primary concern associated with the construction and operation of wind energy facilities and associated transmission lines. Construction and operation of the Project may result in localized minor impacts to birds, such as grassland birds, as further outlined below. These impacts may be direct, such as those resulting from collision into meteorological towers or wind turbines during operations, or habitat loss, or indirect, including impacts that may result from displacement, habitat degradation, or fragmentation. Impacts due to Project construction and operations on bats are expected to be minimal, based on Project-specific survey results and habitat in the vicinity of the Project. The sections below further describe potential impacts on birds and bats with the potential to occur in the Project Area based on recent published research and project-specific survey results.

Birds

Birds may be impacted directly or indirectly as a result of the construction and operation of wind facilities. Direct impacts may result from collision with operating turbines and from the clearing and construction of the Project. Indirect impacts on birds may occur through displacement or avoidance of habitat, habitat fragmentation, and edge effects.

Few recent studies are available in comparable landscapes that provide both pre- and post-construction data from which to draw correlative inferences about potential impacts to birds. However, studies conducted at other wind energy facilities in the Midwest can be instructive and provide useful comparisons. The purpose of these post-construction studies was to estimate the avian fatality rates and identify patterns related to habitat and land use. The results summarize post-construction fatality patterns for birds, including waterfowl and grassland birds, at wind energy facilities in North Dakota, South Dakota, western Minnesota.

- Post-construction mortality monitoring at PrairieWinds ND1 near Minot, North Dakota in 2010 and 2011 found waterfowl mortality per MW to be 0.38 and 0.44, respectively (Derby et al., 2011, 2012a). The Project is located in a dense complex of prairie pothole wetlands.
- PrairieWinds SD1 near Crow Lake, South Dakota is also located in prairie pothole wetland habitat similar to PrairieWinds 1. Post-construction mortality surveys conducted in 2011-2012, 2012-2013, and 2013-2014 found bird mortality to be 0.45, 0.78, and 0.45 large birds/MW/year, respectively (Derby et al., 2012b, 2013, 2014). Estimates for waterfowl fatalities were not calculated; however, fewer waterfowl/waterbirds were

documented during scheduled searches, and as such, waterfowl mortality rates are believed to be lower than the totals reported for each year.

- Surveys of spring mortality conducted in 2013 and 2014 at Tatanka Wind Farm in North and South Dakota found waterfowl mortality to be 0.79 birds/MW/study period (Graff, 2015). These studies were conducted in spring only; mortality over the course of a year may be higher.
- Post-construction fatality monitoring was conducted at the Prairie Rose Wind Farm in Rock County, Minnesota during spring (April 15 to June 15) and fall (August 15 to October 31) in 2014 (Chodachek et al., 2015). Post-construction fatality estimates provided for Prairie Rose are defined per study period (i.e., 8 weeks during spring migration and 10 weeks during fall migration) and not extrapolated to per year. Post-construction fatality monitoring in 2014 estimated 0.44 birds/MW/study period.
- Post-construction fatality estimates in 2013 at the Big Blue, Grand Meadow, and Oak Glen Wind Farms in Minnesota were 0.40, 0.53, 0.51 birds/MW/study period (Chodachek et al., 2014). The study period was July through October.
- Studies at Buffalo Ridge Wind Resource Area ("WRA") in Minnesota in 2001 and 2002 (Johnson et al., 2002) estimated avian fatality, while also assessing impacts to grassland breeding birds. Avian mortality appeared to be low in the vicinity of the project area at nearby Buffalo Ridge WRA compared to other wind facilities in the United States. Researchers found an overall avian mortality of 0.98 birds per turbine per year. Avian mortality was primarily related to nocturnal migrants. Resident bird mortality was very low and involved common species. The researchers stated that "based on the estimated number of birds that migrate through Buffalo Ridge each year, the number of wind plant related avian fatalities at Buffalo Ridge is likely inconsequential from a population standpoint" (Johnson et al., 2002).

In addition to the above post-construction mortality studies, Gue et al. (2013) assessed potential impacts of operating wind turbines on breeding waterfowl at the Tatanka Wind Farm and an adjacent reference site in the Missouri Coteau of the Prairie Pothole Region on the border of North Dakota and South Dakota. The researchers documented one collision among 77 radio-tagged female mallards and no collisions among of 88 radio-tagged blue-winged teals during the 2009 and 2010 nesting seasons. In comparison, 8 female mallards and 15 female blue-winged teal were killed by predators during the same time period. Gue et al. (2013) concluded that mortality for female mallards and blue-winged teal due to collision with wind turbines was likely a limited threat. Most avian fatalities due to wind turbines are small passerines, about 60 percent of avian fatalities in publicly available reports in the U.S. Furthermore, small birds may have lower detection rates so the actual percentage of fatalities due to small passerines is not known and may be greater than 60 percent. Fatality rates of migratory passerines increase in the spring and fall during migration (American Wind Wildlife Institute ["AWWI"], 2017).

Overall, adjusted fatality rates for all bird species vary between 3 to 6 birds/MW/year for the majority of post-construction fatality studies (AWWI, 2017). Fatality estimates are relatively constant across the country except for in the Great Plains where there appears to be lower avian fatality rates and the Pacific region where there may be slightly higher fatality rates (AWWI, 2017). Based on the post-construction fatality studies outlined above, national averages for post-

construction fatalities, and the AWWI's conclusions about geographic trends, Crocker anticipates that avian fatalities due to the Project will be below the national average and may result in limited localized impacts on some groups of birds, such as small passerines.

Direct impacts to birds may also result from collisions with the transmission line and from electrocution. Mortality of birds from collision and electrocution due to transmission lines is well documented. The risk of collision is related primarily to specific behaviors; in particular, courtship displays, flushing, and aerial displays may increase the risk of collision because the birds are distracted. Risk is also increased if a powerline is between roosting, feeding, or nesting areas. Bird species with poor vision, that are young or less agile, or that are unfamiliar with the area may also be at increased risk of collision with transmission lines. Electrocutions typically result when a bird's wingspan is such that is equal to or greater than the distance between two energized and/or grounded components of a transmission line (Avian Power Line Interconnection Committee [APLIC], 2012).

In addition to potential direct impacts from collision with operating turbines or the transmission line and the risks from electrocution, birds may also be directly impacted if clearing and construction of the Project occurs during their nesting season. Direct impacts on birds may occur during construction because of the vulnerability of eggs, chicks, and active nests during the nesting season. Crocker does not anticipate direct impacts on sharp-tailed grouse and greater prairie-chicken leks due to the absence of leks within the Project Area. The Conservation measures described in Section 9.3.2.3 would facilitate the avoidance and minimization of direct impacts on eggs, chicks, and active nests of other species due to clearing and construction.

Collision risk is generally low for waterfowl and waterbird species because studies and observations indicate that waterfowl and waterbirds can see and avoid turbines during flight. Given the data collected during the survey and the Project's location in the Prairie Pothole region, it appears that the Project will have higher use by waterfowl in spring, followed by summer; risk to these species may be higher during these seasons. Various studies show differing risk of direct impacts to waterfowl species, and it is possible that post-construction studies at the Project may show that waterfowl comprise a higher percentage of mortalities than at other locations in the Midwest in more agricultural settings. However, Gue et al., (2013) concluded that mortality for female mallards and blue-winged teal due to collision with wind turbines was likely a limited threat. In addition, in the Graff (2016) study which documented waterfowl as the primary avian fatality in spring migration, the rates (0.79 waterfowl per MW per spring) did not appear to approach levels that would affect populations (overall 48.4 million breeding ducks, 13.5 million migrating mallards in 2016, as documented in the USFWS' Waterfowl Population Status report).

Overall, there is a moderate risk from the Project on birds related to collision. Given the relative diversity of passerine species documented at the Project, it is anticipated that the Project would result in direct impacts to passerines, likely spread out in relatively low numbers across multiple passerine species. The results of the first year of avian use surveys further indicate that risk to passerines may be higher in the spring and summer, and fatalities would likely include species common to both agricultural and grassland landscapes. There are no known raptor migration routes near the site. Due to the general low raptor use documented in the first year of avian use

surveys and typical raptor mortality rates, it is unlikely that significant numbers of raptors would be killed in the Project Area.

Eagles

Bald eagles may be present year-round in the Project Area. Data from avian use surveys indicates relatively low use of the Project Area by bald eagles. Between April 2016 and November 2017, 16 bald eagles were recorded during 542 hours of survey for a combined total of 37 flight minutes. Golden eagles are less common in this area and may rarely be found during migration. No golden eagles have been observed during avian use surveys or incidentally during other survey efforts of the Project. Crocker will continue to monitor bald eagle use within the Project Area through March 2018 and evaluate the risk to eagles based on the data collected. Conservation measures described below would facilitate the avoidance and minimization of impacts on eagles due to collision.

Overall, there is a low level of risk for potential bald eagle mortality at the site. The bald eagle is protected under the BGEPA, and is a State-listed threatened species. The Project occurs within the nesting, migration, and winter range of the bald eagle. There are four occupied bald eagle nests within 10 miles of the site as documented in the April 2017 eagle nest survey; no bald eagle nests are located within three miles of the Project Area. Most observations of bald eagle occurred in the spring, followed by single observations in winter and fall, and none during the summer. Bald eagles were documented using Reid Lake during fall migration in October and November 2017; however, increased eagle use within the Project Area during the migration was not documented based on avian use surveys. Thus, bald eagle use to date appears to be relatively low.

Bats

Crocker conducted pre-construction acoustic surveys for bats in the Project Area from April 14 through October 27, 2016. Activity during the standardized fall migration period (July 30 – October 14) was 2.80 ± 0.42 bat passes per detector-night at stations. These rates are lower than the average rate of bat activity at most Midwest wind projects (6.97 bat passes per detector-night) and the national median rate (7.68 bat passes per detector-night), which were recorded. Bat activity measured during pre-construction surveys may be positively correlated to post-construction fatalities, although few studies documenting pre-construction activity and documenting post-construction mortality are available for comparison.

The collision risk of bats in the Project Area may also be estimated using the post-construction fatality rates of wind farms with similar habitats that are located in northeastern South Dakota or southwestern Minnesota, including Buffalo Ridge WRA, Buffalo Ridge II, Prairie Rose, Big Blue, Grand Meadow, and Oak Glen:

- Post-construction bat mortality at the Buffalo Ridge WRA in 2001 and 2002 was 2.16 bats/turbine/year (Johnson et al., 2003). Approximately 82 percent of the bat mortality occurred from mid-July to the end of August. The researchers concluded that “both the bat detector and mist net data indicate there are relatively large breeding populations of bats in close proximity to the wind plant that experienced little to no wind plant related

collision mortality" (Johnson et al., 2003). Instead, most bat mortality at Buffalo Ridge involved migrating bats. Researchers highlighted that bat mortality increased with reduced distance between turbines and wetlands or woodlands.

- The Buffalo Ridge II Wind Facility in Brookings County, South Dakota is located approximately 60 miles from the Project Area. Pre-construction studies estimated bat activity at 1.75 bats/detector-night Fatality estimates based on post-construction monitoring were 2.81 bats/MW/year (Derby et al., 2012c).
- Post-construction fatality monitoring was conducted at the Prairie Rose Wind Farm in Rock County, Minnesota during spring (April 15 to June 15) and fall (August 15 to October 31) in 2014. Post-construction fatality estimates provided for Prairie Rose are defined per study period (i.e., 8 weeks during spring migration and 10 weeks during fall migration) and not extrapolated to per year. Post-construction fatality monitoring in 2014 estimate 0.41 bats/MW/study period at the Prairie Rose Wind Farm in Rock County, Minnesota (Chodachek et al., 2015).
- Post-construction fatality monitoring in 2013 at the Big Blue, Grand Meadow, and Oak Glen Wind Farms in Minnesota in 2013 estimated the adjusted bat fatalities as 6.3, 3.1, and 3.1 bats/MW/year, respectively (Chodachek et al., 2014). Bat fatalities appeared to peak twice: in late July/early August and in late August/early September. Fatalities were primarily composed of migratory tree-roosting bats, including the eastern red bat and the hoary bat.

Based on the above data, the land cover types within the Project Area, and the similarity of species composition, the impact of the Project on bats is expected to be similar to the post-construction fatality rates at the above wind facilities. Tree-roosting bats that migrate including the hoary bat, silver-haired bat, and eastern red bat, which were detected during the Project's pre-construction studies, may have the highest risk of collision based on previous bat fatality studies (AWWI, 2017). In general, the fatality rate for bats is highest during fall migration (late summer and early fall) in the northern portion of the U.S. (AWWI, 2017).

Overall, risk of mortality to bats in the Project Area is likely to be greatest on nights during fall migration, when bat migration rates are the highest. During the fall migration, weather conditions that are most conducive to higher mortality rates occur with warm temperatures (greater than 50 degrees Fahrenheit) and low wind speeds (less than 6.5 m/s) (Baerwald et al., 2009, Arnett et al., 2010, Good et al., 2011, Cryan and Brown 2007). In addition, risk is higher on the first night following the passage of a low-pressure system when the prevailing wind shifts from a southerly to a northerly direction (Cryan and Brown 2007, Good et al., 2011). Conservation measures described in Section 9.3.2.3 would avoid and minimize of impacts on bats due to collision.

Cumulative and synergistic impacts on wildlife may occur to wildlife species and groups that are at risk of being impacted by this Project. Based on the above review and the review in the BBCS (Appendix D), migratory birds are at moderate risk of collision due to the Project. Cumulative or synergistic impacts on migratory birds due to collision may result from the construction and operation of this Project, given the two operating wind facilities near to the Project, the Day County Wind Energy Center and Oak Tree Wind Farm. Given the location of the Project, potential impacts may be greatest on grassland birds and waterfowl, although research suggests that operating turbines may be a limited threat to waterfowl (Gue et al., 2013). Cumulative and

synergistic impacts with the other two wind facilities may be limited, based on the relatively small size of the two neighboring facilities. The Oak Tree Wind Farm has 11 wind turbines, and the Day County Wind Energy Center has 66 operating turbines. Other cumulative and synergistic impacts on wildlife are not expected because of the low-level or minor risk to the wildlife resources due to the Project (see above discussions and BBCS (Appendix D), including indirect impacts on migratory birds and direct impacts on bats and eagles.

9.3.2.3 Mitigation Measures for Wildlife

As discussed in Section 9.3.1.3, Crocker has worked with the USFWS and SDGFP to redesign the site layout to avoid impacts to high quality prairie habitat, and to realign linear corridors, such as the access roads, collector system, crane pathways, and transmission lines to follow existing disturbed corridors (e.g., roads, transmission lines, fence rows) in an effort to reduce fragmentation. As reflected in Section 9.3.1.2, this has resulted in the avoidance of approximately 80 percent of the natural vegetation communities located within the Project Area.

Crocker has also prepared a draft BBCS that will be implemented during construction and operation of the Project (Appendix D). This BBCS consists of Crocker's corporate standards for minimizing impacts to avian and bat species during construction and operation of wind energy projects. The BBCS has been developed in a manner that is consistent with the USFWS Land-Based WEG (USFWS, 2012). It includes Crocker's commitments to wind farm siting and transmission route suitability assessments, construction practices and design standards, operational practices, permit compliance, and construction and operation worker training.

In addition, Crocker has implemented or will implement the following mitigation measures to avoid or minimize potential impacts to wildlife in the Project Area during Project construction, operation, and decommissioning. Crocker continues to consult with the USFWS and SDGFP regarding appropriate mitigation measures for wildlife impacts.

Construction:

- Minimize the size of areas in which soil would be disturbed or vegetation would be removed.
- Minimize siting turbines in native prairie and native plant communities.
- Avoid or minimize disturbance of individual wetlands during Project construction. Wetland delineations will be conducted prior to construction to identify the limits of wetland boundaries in the vicinity of Project activities.
- Minimize the number of road miles of new road construction needed for the Project.
- Maintain, at a minimum, the 500-foot setback or property line setback (if greater depending on the turbine model selected) from GPAs and WPAs (non-participating parcels) to reduce risk to waterfowl and waterbirds and grassland-associated birds when siting turbines in the Project Area. The closest distance of a turbine to a WPA or GPA is 568 feet (Section 9.5.2).
- Design transmission facilities based on the APLIC guidance to minimize the risk of electrocution of birds by power lines (APLIC, 2012). Adequate spacing of the line

diminishes the risk of electrocution. The collector system will be placed underground, minimizing the risk of electrocution. In areas with transmission lines, flight diverters and other devices will be employed to reduce collision and electrocution.

- Guy wires will not be used on permanent meteorological towers.
- Construct wind turbines using tubular monopole towers.
- Light turbines according to FAA requirements.
- Reduce habitat disturbance by keeping vehicles on access roads and minimizing foot and vehicle traffic through undisturbed areas.
- Consult with the appropriate natural resource agencies to avoid scheduling construction activities during important periods for wildlife courtship, breeding, and nesting that are applicable to sensitive species within the Project Area.
- Instruct employees, contractors, and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. Pets will not be allowed in the Project Area.
- If site evaluations show that proposed construction activities would pose a significant risk to avian or bat species of concern, establish buffer zones around known raptor nests, bat roosts, and biota and habitats of concern.
- Maintain sound water and soil conservation practices during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion. To minimize erosion during and after construction, BMPs for erosion and sediment control will be used. These practices include silt fencing, temporary seeding, permanent seeding, mulching, filter strips, erosion blankets, grassed waterways, and sod stabilization (Section 9.2.3).
- Crocker will initiate habitat restoration of disturbed soils and vegetation as soon as possible after construction activities are completed. Restore areas of disturbed soil using weed-free native grasses, forbs, and shrubs, in consultation with land managers and appropriate agencies. On grassland easements, the mix will be USFWS-approved.

Operations:

- Conduct post-construction mortality monitoring for a minimum of one year. The survey will include searcher efficiency and carcass removal trials, and the overall mortality rate will be adjusted based on the trial results. This protocol is based on guidelines from the USFWS Land-Based WEG (USFWS, 2012) and the National Wind Coordinating Collaborative Comprehensive Guide to Studying Wind Energy/Wildlife Interactions (Strickland et al., 2011). Estimates of mortality will follow either the Schoenfeld or Huso method as appropriate per Strickland et al. (2011).
- Turn off unnecessary lighting at night to limit attraction of migratory birds. Follow lighting guidelines, where applicable, from the USFWS Land-Based WEG (USFWS, 2012). This includes using lights with timed shutoff, downward-directed lighting to minimize horizontal or skyward illumination, and avoidance of steady-burning, high-intensity lights.

- Instruct employees, contractors, and site visitors to avoid harassment and disturbance of wildlife, especially during reproductive (e.g., courtship and nesting) seasons. Pets will not be allowed in the Project Area.

Decommissioning:

- All turbines and ancillary structures will be removed from the site.

- Salvage and reapply topsoil excavated during decommissioning activities to disturbed areas during final restoration activities.

- Reclaim areas of disturbed soil using weed-free native shrubs, grasses, and forbs. Restore the vegetation cover, composition, and diversity to values commensurate with the ecological setting.

- Facilities constructed on Federal lands will follow the decommissioning recommendations provided in the USFWS Land-Based WEG (USFWS, 2012).

9.3.3 Federally-listed Species

9.3.3.1 Existing Federally-listed Species

The ESA directs the USFWS to identify and protect endangered and threatened species and their critical habitat, and to provide a means to conserve their ecosystems. Among its other provisions, the ESA requires the USFWS to assess civil and criminal penalties for violations of the ESA or its regulations. Section 9 of the ESA prohibits take of Federally-listed species. Take is defined as "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct" 16 USC 1532. The term "harm" includes significant habitat alteration which kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering, 50 CFR 17.3. Projects involving Federal lands, funding or authorizations will require consultation between the Federal agency and the USFWS, pursuant to Section 7 of the ESA. Because some of the Project facilities are proposed to be built on USFWS easements, a Federal nexus will occur in connection with the associated right-of-way review process.

Crocker developed a Project-specific list of Federally listed species that may occur in the Project Area based on consultations with the USFWS South Dakota Field Office and information available online from the USFWS Information, Planning and Consultation ("IPAC") system (www.fws.gov/ipac). In a letter dated May 18, 2016, the USFWS South Dakota Field Office provided a Project-specific list of Federally endangered and threatened species that may occur in the Project Area; this list included the NLEB, Poweshiek skipperling, rufa red knot, and whooping crane (Table 9-13). Crocker's review of the USFWS IPAC system also indicated that these four species may occur in Clark County; in addition, the IPAC system also indicated that Topeka shiner may occur in Clark County (Table 9-13). Dakota skipper was not included in the list provided by the USFWS South Dakota Field Office or in the list for Clark County in the IPAC system. However, this species may occur in Day County, which is immediately north of Clark County. Based on the recommendations of species' experts, surveys were conducted for

Dakota skipper in suitable habitat within the Project Area because of the distributional uncertainty for skipper species. Designated critical habitat is not present within the Project Area.

Table 9-13: Federally-Listed Species That May Occur in Clark County

Scientific Name	Common Name	ESA Status
Myotis septentrionalis [a,b]	Northern long-eared bat	Threatened
Hesperia dacotae [c]	Dakota skipper	Threatened
Oarisma poweshiek [a,b]	Poweshiek skipperling	Endangered
Notropis topeka [a]	Topeka shiner	Endangered
Calidris canutus rufa [a,b]	Rufa red knot	Threatened
Grus americana [a,b]	Whooping crane	Endangered

[a] Listed as a species that may occur in Clark County according to the USFWS Information for Planning and Consultation system (https://ecos.fws.gov/ipac/)
[b] Included in the list of species that may occur in the Project Area by the USFWS South Dakota Field Office in correspondence dated May 18, 2016.
[c] Dakota skipper are not documented in Clark County; however, there are Dakota skipper records from Day County, which is immediately north of Clark County. Given the distributional uncertainty for skipper species, surveys were conducted for Dakota skipper in suitable habitat within the Project Area.

Section 4.6.4 of the Upper Great Plains ("UGP") Wind Energy Final Programmatic Environmental Impact Statement ("PEIS") describes the plant and animal species that are listed as threatened or endangered under the ESA, or that are proposed or candidates for listing under the ESA, and that could occur within the UGP Region. The UGP Wind Energy Programmatic Biological Assessment, prepared in conjunction with the PEIS, provides biological and habitat descriptions for the NLEB, Dakota skipper, Poweshiek skipperling, Topeka shiner, rufa red knot, and whooping crane. At the time the PEIS was prepared, the NLEB was proposed for listing; the NLEB has since been listed as threatened with a 4(d) rule and associated Programmatic Biological Opinion ("BO").

Species-specific information and results of the preconstruction evaluations and wildlife surveys, conducted for the Project are reported in the Tier 3 study reports that have been submitted to the USFWS, including the Bat Acoustic Survey Report for the Crocker Wind Farm and Dakota Skipper and Poweshiek Skipperling Habitat Assessment Report (Table 9-12).

Northern Long-eared Bat

On April 1, 2015, the USFWS listed the NLEB as threatened under the ESA and simultaneously published an interim 4(d) rule; the final listing and interim 4(d) rule took effect as of May 4, 2015. On January 14, 2016 the USFWS published the final 4(d) rule identifying prohibitions that focus on protecting the bat's sensitive life stages in areas affected by White Nose Syndrome ("WNS") (USFWS, 2016a; 2016b). The 4(d) rule allows incidental take of the species resulting from otherwise lawful activities, including wind energy facility construction and operation. The 4(d) rule and the associated BO is intended for use by agencies to streamline consultation for NLEB. Under the provisions of the 4(d) rule, incidental take is not prohibited for wind energy facility construction and operation that is located more than 0.25 mile from known hibernacula and more than 150 feet from known maternity roost trees within areas of the country affected by

WNS. With the discovery of a WNS infected hibernacula in Becker County, Minnesota in the winter of 2016/2017, the USFWS WNS buffer zone was expanded to include portions of eastern South Dakota, including Clark County.

Acoustic surveys were conducted for NLEB within the Project Area from July 22 to 27, 2016. Surveys were completed at two sites in suitable NLEB habitat. Qualitative analysis of the acoustic data did not detect NLEB at either site. The USFWS has indicated that no further surveys are required; this species is likely absent from the Project Area.

Dakota Skipper and Poweshiek Skipperling

Dakota skippers and Poweshiek skipperlings are obligates of high-quality prairie habitat that is dominated by native species and is untilled (Royer and Marrone, 1992; Cochrane and Delphey, 2002; USFWS, 2014a). Grassland parcels within the environmental survey corridor were initially assessed using desktop analysis and preliminary field review to evaluate habitat suitability for Dakota skipper and Poweshiek skipperling. The desktop assessment and preliminary field review documented 65 areas of potentially suitable habitat. Ground-based field assessments during the species' flight period further assessed these 65 areas of potentially suitable habitat for habitat features required by Dakota skipper and Poweshiek skipperling. Field assessments during the species' flight period indicated that approximately 34 areas of grassland habitat within the environmental survey corridor were suitable for the Dakota skipper or Poweshiek skipperling. Individual butterfly surveys were conducted in these 34 areas between June 29 and July 13, 2017 during the species' flight period. No Dakota skipper or Poweshiek skipperling were documented during these surveys.

Topeka Shiner

Topeka shiner are found in prairie streams with good water quality and cool temperatures. They are typically found in perennial streams, but may be found in pools of intermittent streams that are maintained by percolation through the stream bed, spring flow, or groundwater seepage when surface water flow ceases in stream reaches (USFWS, 2013b).

Critical habitat has been designated for the Topeka shiner, but is not present in the Project Area. Field surveys were not conducted for this species; a review of the South Dakota Natural Heritage Program database did not identify any records of Topeka Shiner in the Project Area. Known Topeka shiner streams in Clark County include Shue Creek, Pearl Creek, Middle Pearl Creek, South Fork Pearl Creek, and Redstone Creek, none of which are in the Project Area.

Rufa Red Knot

The occurrence of rufa red knots in South Dakota is unpredictable, and the number of migrating shorebirds documented in the interior can vary dramatically due to high inter-annual availability in water levels and habitat quality at mid-continental wetlands. Suitable stopover habitat is present in the Project Area, however, species-specific studies for this species are not typically completed (USFWS, 2014b). No rufa red knot were observed during the first year of avian studies.

Whooping Crane

Whooping cranes do not live year-round in South Dakota; individuals in the Aransas-Wood Buffalo Population are present during their twice-yearly migration between their summer breeding habitat and wintering habitat (Canadian Wildlife Service and USFWS, 2007). Specifically, whooping cranes have been documented migrating through South Dakota between March 24 to May 19 and September 14 and November 18 (Western and USFWS, 2015a). Whooping cranes use wetlands and cropped lands during migration. The Project Area is 10 miles from the eastern edge of the corridor where 95 percent of the whooping crane sightings have been documented, according to the USFWS. Based on the USFWS Whooping Crane Database, which includes data through Spring 2016, whooping crane have been documented within 20 miles of the Project Area four times:

- In November 2000, 2 adults were reported 10.5 miles east of the Project near Garden City in Clark County;
- In May 1993, 1 adult was reported 20 miles west of the Project Area near Brentford in Spink County;
- In October 1985, 3 adults were observed 15 miles southeast of the Project Area near Clark in Clark County; and
- In April 1973, 4 adults were documented 15 miles east of the Project Area near Wallace in Codington County.

9.3.3.2 Impacts to Federally-listed Species

As further detailed in the below sections, impacts on Federally threatened and endangered species due to Project construction and operations are anticipated to be minimal due to the low likelihood or frequency of species presence in the Project Area and implementation of species-specific conservation measures, as appropriate.

Northern Long-eared Bat

Suitable habitat for the NLEB is limited in the Project Area. The species is forest-dependent and requires forested areas for roosting and foraging in summer. Acoustic surveys did not identify the presence of NLEBs within the Project Area, and the species is considered likely absent from the Project Area during summer. The species overwinters in hibernacula and is not present on the landscape in winter months. Desktop analysis did not identify features (i.e., caves or mines) that would provide suitable winter habitat within the Project Area.

As described in Section 9.3.1.2, a minimal amount (0.6 acres) of forest vegetation would be removed during construction, mostly along access roads. In addition, collisions with operating turbines also present a potential risk to NLEBs. However, based on the negative acoustic survey results, it is not likely that NLEBs are roosting in the Project Area; and therefore, would not be harmed by tree clearing or operating turbines. Per the Final 4(d) Rule for the NLEB (USFWS, 2016b), the Project will not result in prohibited incidental take because Crocker will not be clearing known maternity roost trees or trees within 150 feet of known maternity roost trees

between June 1 and July 31 and will not remove trees within 0.25 mile of a known hibernacula at any time of the year.

Dakota skipper and Poweshiek skipperling

Crocker conducted desktop assessments and field-based surveys to determine if occupied suitable habitat is present within the environmental survey corridor. Species-specific surveys for individuals were conducted during the species' flight period to determine presence or probable absence in areas of suitable habitat. No Dakota skipper or Poweshiek skipperling were documented during these surveys. Thus, no impacts on Dakota skipper and Poweshiek skipperling are expected. Overall, although it is possible that these species are located within the overall Project boundary or adjacent to the Project, it appears that they are relatively rare or absent, and therefore the risk of impacts is low.

Topeka shiner

There are no known Topeka shiner streams within the Project Area, and no there are no records of Topeka shiner from the South Dakota Natural Heritage Program database in the Project Area. Thus, no impacts on the Topeka shiner are anticipated.

Rufa red knot

During migration, the red knot may stop opportunistically to forage and roost; however, their occurrence is infrequent and not predictable. If the species was to occur in the Project Area, it would likely be a few individual migrants stopping at ponds or wetlands to forage and roost (USFWS, 2014b). The Project is unlikely to impact the species due to the location and the small number of migrants utilizing this migration corridor. There are no South Dakota Natural Heritage Program database records for the species in the vicinity of the Project, and no rufa red knots have been observed during avian surveys. Thus, impacts on rufa red knot are discountable, and there is a low level of risk for rufa red knots associated with the Project.

Whooping crane

The Project Area is located on the eastern edge of the 95 percent whooping crane migration corridor South Dakota. Land within and surrounding the Project Area is scattered with intermittent wetlands and row crops that may provide stopover habitat and foraging opportunities for whooping cranes. By siting the Project on the edge of the 95 percent migration corridor and away from the more concentrated use areas in the center of the corridor, Crocker significantly reduced the likelihood of whooping crane stopovers and associated potential impacts. Based on the USFWS' database of whooping crane sightings in South Dakota through Spring 2016, only four whooping cranes have been documented within 20 miles of the Project Area within the past 40 years. Thus, the likelihood of a whooping crane using the Project Area as stopover habitat during migration is low. In addition, no whooping crane mortality has been observed at wind energy facilities to date. Based on a three-year study of sandhill crane and whooping crane behavior at a wind facility in South Dakota, the researchers concluded that both species of cranes are at low risk of colliding with turbines because of their ability to fly around, through, and over turbine strings (Nagy et al., 2012). Whooping cranes may visually navigate and avoid obstacles on the landscape such as wind turbines. Yet, if cranes are flying between foraging and roosting

sites near wind turbines during migration or in periods of poor visibility, they may not be able to respond in time to avoid a turbine (USFWS, 2009). Overall, according to the PEIS, "the risk of death of cranes from colliding with wind turbines is expected to be discountable because whooping cranes typically avoid human activity or developments and because the relatively small numbers of whooping cranes are spread over a large geographic area (pg. 155)". If whooping cranes use sites within or near the Project during migration, Crocker will avoid impacts on whooping crane by implementing the general conservation measures for birds and species-specific conservation measures for whopping cranes outlined below. Overall, although it is possible that whooping cranes would use the Project Area during migration, it is not likely due to the location of the Project in the whooping crane migration corridor and the few documented sightings near the Project. Thus, the risk from this Project on whooping cranes is low.

9.3.3.3 Mitigation Measures for Federally-listed Species

Conservation measures outlined above for wildlife would also apply to Federally-listed species in the Project Area. No species-specific conservation measures are currently proposed for the NLEB, Dakota skipper, Poweshiek skipperling, Topeka shiner, or rufa red knot because no impacts are anticipated on these species. Species-specific conservation measures for the whooping crane are included in the BBCS.

9.3.4 State-listed Species

9.3.4.1 Existing State-listed Species

Within South Dakota, the SDGFP is the agency responsible for managing game and non-game wildlife and habitat, including species listed under the State Endangered Species Law (SDCL Chapter 34A-8). South Dakota's endangered species law regulates the taking, importation, transportation, and sale of State endangered or threatened species. SDGFP administers the State list of rare, threatened, and endangered species. There is one State-listed species that may be present in Clark County, South Dakota – the northern river otter, which is listed as threatened.

Element Occurrence Records provided by the SDGFP Wildlife Diversity Program on March 14, 2016 indicate no occurrences of State sensitive or tracked invertebrate and/or vertebrate species within the Project Area. State species of concern were documented within two miles of the Project Area; these species are not afforded protections under the State endangered species law statute. The record included a colonial waterbird nesting colony for snowy egret, great egret, great blue heron, and black-crowned night heron.

The SDGFP has developed the South Dakota State Wildlife Action Plan ("SWAP") (SDGFP, 2014), which is a comprehensive planning document that establishes the framework and information for setting conservation priorities for the State of South Dakota. The SWAP identifies and focuses on SGCN and ecosystems that require conservation strategies to avoid future ESA listing. SGCN are not afforded protections under the State endangered species law statute. Seven SGCN were documented during avian and grassland bird surveys in the Project Area: marbled godwit, American white pelican, bald eagle, chestnut-collared longspur, willet, black tern, and Wilson's phalarope (SDGFP, 2014).

9.3.4.2 Impacts to State-listed Species

The northern river otter is the only State-listed species that may occur in Clark County. The species was formerly found in riparian areas throughout South Dakota. This mammal was likely extirpated from the state as a result of habitat loss and trapping. The species prefers large rivers with permanent flow and a low gradient (Kiesow and Dieter, 2005). Suitable habitat is not present in the Project Area; as such, impacts on the northern river otter are not anticipated.

Potential impacts to SGCN bird species are addressed in Section 9.3.2.2.

9.3.4.3 Mitigation Measures for State-listed Species

No State-listed species have been documented in the Project Area. Thus, no conservation measures specific to State-listed species are necessary. Mitigation measures that would apply to SGCN bird species are described in Section 9.3.2.3.

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

9.4.1 Existing Aquatic Ecosystem

The Waubay National Wildlife Refuge Complex, within which the Project Area is located, supports over 100 species of freshwater fish occupying warmwater fisheries. Due to the shallowness of lakes and wetlands found in this region, there is a high probability of winterkill. The majority of species that occupy this area are minnows, carps and suckers, with low numbers of game species such as northern pike, walleye, and yellow perch. Wetlands in the area also support high invertebrate populations including worms, crustaceans, snails, and insects, which provide an important protein food source for waterfowl, water birds, and shorebirds. Common wetland plants that can be found in these aquatic environments including free-floating duckweed, bladderwort, and coontail; submergent plants such as pondweed, water milfoil, waterweed, and widegongrass; and emergent vegetation such as arrowhead, cattail, common reed, and bulrush. Due to the shallowness of many of the wetlands found in the Project Area, there are amphibious plants that are adapted to both submergent and emergent conditions, and that tolerate temporary dry habitats when the water levels drop. These include yellow water-crowfoot, pepperwort, and water smartweed (USFWS, 2002). Additional information on wetlands is provided in Section 9.2.1.4.

As discussed in Section 9.2.1.3, most of the streams in the Project Area are intermittent or ephemeral, and the majority of wetlands described in Section 9.2.1.4 are emergent wetlands that are only temporary or seasonally flooded; therefore, fishery habitat is limited (Figure 11). There are approximately 47.8 acres of lake habitat within the Project Area (Figure 10). Baileys Lake and the Reid/Round Lake complex within or adjacent to the Project Area are public fishing lakes and are managed by the SDGFP (Table 9-14). As discussed in Section 9.2.1.8, Reid Lake is impaired for mercury, and there is a mercury fish consumption advisory on walleye above 23 inches for this waterbody (SDGFP, 2017a).

Table 9-14: Summary of Fisheries in the Project Area

Waterbody Name	Primary Fish Species	Total Surface Acres
Baileys Lake	Walleye, yellow perch, black bullhead, bluegill, green sunfish, largemouth bass, white sucker	200
Reid/Round Lake Complex	Walleye, yellow perch, black bullhead, green sunfish, northern pike, rock bass	1,280

The Federally-listed Topeka shiner has the potential to occur in Clark County, however, suitable habitat for this species is not found within the Project Area (Section 9.3.3).

9.4.2 Impacts to Aquatic Ecosystems

As discussed in Sections 9.2.2.2 and 9.2.2.3, the Project would temporarily impact 0.4 acres of lake habitat, 0.1 acres of ephemeral waterbodies, and 1.6 acres of unconsolidated bed/open water (PUB) wetlands. If present, aquatic vegetation would be removed from shallow wetland areas, and lake and stream edges during construction. Ephemeral waterbodies would not provide sustainable aquatic habitat as it only provides seasonal water flow. Similarly, unconsolidated bed wetlands found in the Project Area are generally shallow and likely freeze during the winter, causing winterkill of some aquatic species.

The Project would avoid direct impacts to Baileys Lake and the Round Lake/Reid Lake completed; however, construction activities in the vicinity of these waterbodies and wetlands may temporarily increase sedimentation due to erosion, and from changes in runoff patterns and water volumes due to increased impervious surfaces. This could temporarily degrade the water quality of aquatic habitat supporting these species. Impacts are anticipated to be short term and localized.

9.4.3 Mitigation Measures to Aquatic Ecosystems

The mitigation measures described in Section 9.2.3 for waterbodies and wetlands would also serve to avoid and minimize impacts to aquatic species and their habitat.

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

9.5.1 Land Use and Ownership

9.5.1.1 Existing Land Use and Ownership

The Project Area is predominantly private land. Of the 29,331 acres in the Project Area, only 240 acres are publicly owned (less than 1 percent of the Project Area). These include two 80-acre GPAs and one 80-acre SD School and Public land parcels. These are described in more detail in Section 9.5.2. While there are several conservation easements in the Project Area, these are private lands. Conservation easements are described in more detail in Section 9.5.3.

The Project Area is zoned as an Agricultural District in Clark County. Per Section 2.04.04 of the Clark County zoning ordinance, a WES is permitted as long as it meets the requirements established in Chapter 4.21 of the zoning ordinance (Clark County, 2014). These requirements

are described in Section 8.0. Crocker will comply with all these requirements to ensure compatibility of the Project with the Agricultural District.

According to USDA (2017) National Agricultural Services Statistics data, grassland/pasture and cropland compose approximately 87.1 percent of the Project Area (Table 9-15; Figure 13). Site visits and field studies confirm much of the Project Area mapped as prairie and grassland is actively grazed pasture; although, as described in Section 9.3.1.1, approximately 45 percent (13,260 acres) of grassland within the Project Area is potentially undisturbed, meaning that it has never been mechanically manipulated (e.g., tilled) (Bauman et al., 2016). Developed areas are primarily associated with roads, farms, and concentrated around small towns.

The Project Area is dotted with wetlands, and open water ponds and lakes (Figures 10 and 11), and there are small, discontinuous patches of deciduous oak forest also found throughout the Project Area. These natural vegetation communities, including grassland and prairie are described in Section 9.3.1.1, and waterbodies (e.g., open water ponds and lakes) and wetlands are described in Sections 9.2.1.3 and 9.2.1.4, respectively. These land cover types will not be further discussed in this section.

Table 9-15: Summary of Land Use in the Project Area

Land Cover Category	Land Cover Type	Total Acres	Percent of Total Cover
Grassland/Pasture	Grassland/Pasture	15,784	53.8%
	Grassland/Pasture Total	**15,784**	**53.8%**
Cropland	Soybeans	4,152	14.2%
	Corn	3,370	11.5%
	Other Hay/Non Alfalfa	834	2.8%
	Spring Wheat	417	1.4%
	Fallow/Idle Cropland	301	1.0%
	Rye	254	0.9%
	Alfalfa	241	0.8%
	Oats	174	0.6%
	Winter Wheat	29	0.1%
	Sunflower	1	<0.1%
	Sorghum	<1	<0.1%
	Cropland Total	**9,773**	**33.3%**
Open Water/Wetland	Open Water	2,798	9.5%
	Herbaceous Wetlands	110	0.4%
	Open Water/Wetland Total	**2,908**	**9.9%**
Developed	Developed, Open Space	684	2.3%
	Developed, Low Intensity	11	<0.1%
	Developed, Medium Intensity	6	<0.1%
	Developed, High Intensity	1	<0.1%
	Developed Total	**702**	**2.4%**

Table 9-15: Summary of Land Use in the Project Area

Land Cover Category	Land Cover Type	Total Acres	Percent of Total Cover
Deciduous Forest	Deciduous Forest	165	0.6%
	Deciduous Forest Total	**165**	**0.6%**
	Total	**29,331**	**100.0%**

Source: USDA (2017)

Based on the 2012 Census of Agriculture in South Dakota, both the number and average size of farms in Clark County increased by 3 percent and 16 percent respectively from 2007 to 2012. Soybeans, corn, forage-land (hay, grass silage, greenchop), and wheat are the top crops grown in Clark County by acreage. Pasture land in Clark County supports cattle and other livestock operations; cattle and pigs are the top livestock raised in the county by number (USDA, 2012). Pasture/hay areas include areas in which naturally occurring or planted grasses, legumes, or grass-legume mixtures used for livestock grazing or the production of seed or hay crops. Cultivation generally occurs in the flatter outwash plains and on gentler slopes void of rocks (USGS, 2011).

There are no irrigated lands (center-pivot), major industries, or areas zoned for residential or commercial land uses in the Project Area. There are 35 residences within the Project Area, which, as defined in Section 9.5.4 are the only noise-sensitive receptors. The Transmission Facility is co-located with existing county roadways or along existing property lines for nearly the entire route.

9.5.1.2 Land Use Impacts

All Project impacts are on private land; the Project will not impact any publicly owned land. Based on the USDA (2017), Project construction would temporarily impact a total of 687.3 acres of cultivated cropland, and permanently remove 78.2 acres from production for the life of the Project (Table 9-16). Construction would also temporarily impact 1,081.6 acres of grassland/pasture, and permanently remove 74.4 acres from production. In developed areas, construction would disturb 58.9 acres, and permanently occupy 4.4 acres.

Table 9-16: Summary of Wind Farm Facility and Transmission Facility Impacts to Land Use

	Crop Type	Permanent Impacts (acres)	Temporary Impacts (acres)
Wind Farm Facility			
Cropland	Soybeans	31.5	282.0
	Corn	16.7	237.4
	Other Hay/Non Alfalfa	6.2	69.1
	Spring Wheat	2.5	30.5
	Rye	1.9	19.8
	Alfalfa	1.7	31.6
	Oats	0.7	8.2

Table 9-16: Summary of Wind Farm Facility and Transmission Facility Impacts to Land Use

	Crop Type	Permanent Impacts (acres)	Temporary Impacts (acres)
	Winter Wheat	0.2	1.2
	Fallow/Idle Cropland	0.0	<0.1
	Cropland Subtotal	**61.4**	**679.8**
Pasture land	Grassland/Pasture	74.3	1,045.7
	Pasture land Subtotal	**74.3**	**1,045.7**
Developed	Developed/Open Space	4.2	48.6
	Developed/Low Intensity	<0.1	0.1
	Developed Subtotal	**4.2**	**48.7**
Wind Farm Facility Subtotal		**140.0**	**1,774.2**
Transmission Facility			
Cropland	Soybeans	0.5	2.1
	Corn	16.3	0.2
	Other Hay/Non Alfalfa	0.0	5.0
	Fallow/Idle Cropland	0.0	0.1
	Cropland Subtotal	**16.7**	**7.4**
Pasture land	Grassland/Pasture	0.1	35.9
	Pasture land Subtotal	**0.1**	**35.9**
Developed	Developed/Open Space	0.2	10.0
	Developed/Low Intensity	0.0	0.2
	Developed Subtotal	**0.2**	**10.2**
Transmission Facility Subtotal		**17.0**	**53.5**
Project Total		**157.0**	**1,827.7**

Source: USDA (2017)
Note: there are no impacts to sunflower or sorghum from the Wind Farm Facility; there are no impacts to spring wheat, rye, alfalfa, oats, winter wheat, sunflower, or sorghum from the Transmission Facility

There are 35 occupied residences within the Project Area. As designed, the proposed Project layout of turbines, access roads, collector lines, and associated facilities will not cause displacement of residences or businesses due to construction of the Project. The closest participating residence to a turbine is 1,045 feet; the closest non-participating residence to a turbine is 3,962 feet. The closest residence to the Transmission Facility is nearly 2,180 feet or 0.4 miles. The construction corridors and placement of facilities meet or exceed industry standards established for protection of the health and welfare of residences and businesses in and around the Project.

9.5.1.3 Mitigation Measures for Land Use

During construction, the construction workspace located on cultivated cropland and grassland/pasture lands would be removed from productivity; however, following construction these would be restored and would return to its prior agricultural use. Fencing or grazing

deferment in pasture lands within or adjacent to the construction workspace may also be necessary to prevent livestock from injury by entering the construction area. Crocker will work with landowners on the following issues: installation of gates and cattle guards where access roads cross existing fencelines, access control, signing of open range areas, traffic management (e.g., vehicle speed management), and location of livestock water sources. Additionally, the following BMPs will be used:

- Excess concrete (excluding belowground portions of decommissioned turbine foundations intentionally left in place) will not be buried or left in active agricultural areas.
- Vehicles will be washed outside of active agricultural areas to minimize the possibility of the spread of noxious weeds.
- Topsoil would be stripped from any agricultural area used for traffic or vehicle parking—segregating topsoil from excavated rock and subsoil—and replaced during restoration activities.
- Drainage problems caused by construction will be corrected to prevent damage to agricultural fields.
- Following completion of construction and during decommissioning, subsoil will be decompacted.

9.5.2 Recreation

9.5.2.1 Existing Recreation

Recreational opportunities in Clark County include hunting, biking, hiking, boating, fishing, camping, swimming, horseback riding, cross country skiing, snowmobiling, and nature viewing. As discussed in Section 9.4, Baileys Lake and the Reid/Round Lake complex are public fisheries located within or adjacent to the Project Area. The public access sites for these lakes are outside of the Project Area (SDGFP, 2015a, 2015b).

The Clark Area Chamber of Commerce (Undated) describes Clark County as a “sportsman’s paradise”. Clark County has over 20,000 acres of public lands and another 10,000 acres of private WIAs available for hunting throughout the county. Common large game species hunted in Clark County include white-tailed deer, which can be hunted in several different seasons include archery (September 26 - January 15), youth and mentored youth (September 12 - January 15), muzzleloader (December 1 - January 15), and East River firearm (November 21 - December 6; December 26-January 3). The Waubay National Wildlife Refuge also allows deer hunting (Huxoll, 2016a).

Small game species hunted in Clark County include pheasant, partridge, grouse, mourning dove, tundra swan, various species of duck, Canada geese, and light geese. Clark County was amongst the counties with the highest reported harvests for tundra swan, duck, Canada goose and light goose in 2015 (Huxoll, 2016b). Furbearers, including coyote, red fox, raccoon, muskrat, mink, badger, opossum, striped skunk, and spotted skunk, were also trapped or hunted in Clark County in 2016 (Huxoll, 2017).

Figure 14 shows the locations of WPAs, GPAs, WIA hunting areas, and School and Public Lands in the Project vicinity, which are all public lands open for hunting.

USFWS WPAs are managed to protect breeding, forage, shelter, and migratory habitat for waterfowl or wading birds, such as ducks, geese, herons, and egrets. WPAs provide opportunities for viewing wildlife and intact ecosystems and also provide hunting opportunities. WPAs located in the Project vicinity are listed in Table 9-17 and displayed on Figure 14 There are no WPAs in the Project Area; the closest WPA is two miles southeast of the Project boundary.

Table 9-17: Waterfowl Production Areas in the Project Vicinity

WPA Name	Distance and Direction from Project Boundary	WPA Area (Acres)
Schmit WPA	3.2 miles Northeast	63.7
Thompson WPA	2.5 miles North	78.8
Graves WPA	2 miles Southeast	147.5
Bristol Grazing Association WPA	2.25 miles North	44.0

South Dakota GPAs are managed to provide wildlife habitat, improve wildlife production, and provide public hunting and trapping opportunities. There are two GPAs within the Project Area, and two GPAs within the vicinity of the Project Area identified in Table 9-18.

Table 9-18: Game Production Areas in the Project Vicinity

GPA Name	Distance and Direction from Project Boundary	GPA Area (acres)
Wagner GPA, Clark County	Within	80
Spring Valley GPA, Clark County	Within	80
Sherwood GPA/WA, Clark County	Adjacent, East	400
Bailey Lake GPA/WA, Clark County	Adjacent, Southeast	32
Crocker GPA, Clark County	Adjacent, North	80
Lily GPA, Day County	1-mile Northeast	480
Cottonwood Lake GPA, Clark County	3.75 miles East	484

Reid Lake State Waterfowl Refuge is located one-half mile southeast of the Project Area. This Refuge was changed from a State Game Refuge in 2014. The change prohibits boating from October 20 through December 31, which allows for additional fall fishing opportunity while still serving its purpose to minimize disturbance to waterfowl during the peak of fall migration.

The SDGFP offers a WIA Program for public hunting on private land. There is one 81.2-acre WIA parcel within the northern portion of the Project Area adjacent to the Spring Valley GPA.

The Transmission Facility is adjacent to this parcel (Figure 14). The WIA Program includes walk-in agreements with the landowner that typically last one to three years.

The South Dakota Office of School and Public Lands manages over 750,000 acres of land in the State. These lands are available to the public for hunting and fishing. There is one 80-acre School and Public Lands parcel in the eastern portion of the Project Area.

9.5.2.2 Impacts to Recreation

Lake access to Baileys, Reid, and Round Lake are outside of the Project Area and Project construction and operation are not anticipated to restrict this access. The Wind Farm Facility and Transmission Facility will avoid direct impacts to all GPAs, WPAs, Reid Lake State Waterfowl Refuge, and School and Public Lands. There is one turbine and associated access road and collector line proposed on the WIA parcel located in the northern portion of the Project Area. Access on this parcel would be temporarily restricted during construction; however no long-term impacts to use are expected.

Operation of the wind energy facility could disrupt movements of terrestrial wildlife, particularly during migration. Herd animals, such as white-tailed deer could be affected if linear rows of turbines intersect migration paths between winter and summer ranges or in calving areas (National Wind Coordinating Committee, 2002). Robling (2011, as cited in SDGFP, 2017b) found that white-tailed deer in Clark County, South Dakota generally demonstrate shorter migration distances relative to other regions of South Dakota due to the high abundance of suitable habitat. Based on the abundance of suitable habitat in the Project Area and non-linear nature of the wind turbine layout, impacts to white-tailed deer anticipated to be negligible. Therefore, impacts to the availability or distribution of deer for hunting in the Project Area is anticipated to be negligible. See Section 9.3.2.2 for a discussion on the potential impacts of the Project on waterfowl and other bird species that are hunted in the Project Area.

In general, recreational impacts will be visual in nature potentially affecting individuals using public land in the Project vicinity for recreation. See Section 9.5.5 for additional discussion of visual impacts and proposed mitigation measures.

9.5.2.3 Mitigation Measures for Recreation

The Project will avoid all publicly owned recreation lands including GPAs, WPAs, Reid Lake State Waterfowl Refuge, and School and Public Lands. One turbine will be sited on a privately owned WIA. Crocker will ensure that adequate safety measures are established for recreational visitors to the WIA during construction and operation. These may include access control and traffic management. Crocker will work with the landowner of the WIA and SDGFP to address safety issues associated with the WIA. The landowner will need to consent to impacts that may affect their land interests.

9.5.3 Conservation Easements

9.5.3.1 Existing Conservation Easements

The USFWS holds some easements on private lands that have wetlands and/or grassland habitat. A grassland easement is a legal agreement that pays landowners to keep their land in grass. Land covered by a USFWS grassland easement may not be cultivated and mowing, haying, and grass seed harvesting must be delayed until after July 15 each year. This restriction is to help grassland nesting species, such as ducks and pheasants, complete their nesting before the grass is disturbed. Grazing is not restricted. Similarly, the wetland easement program pays landowners to permanently protect wetlands. Wetlands covered by a wetland easement cannot be drained, filled, leveled, or burned. When these wetlands dry up naturally, they can be farmed, grazed, or hayed. A USFWS wetland easement protects the wetland basin of a parcel; however, the upland area outside the wetland is not covered by the easement. The wetland easements help provide crucial habitat for many types of wildlife including ducks, pheasants, and deer. Hunting and trapping are allowed on both grassland and wetland easements, and the easements do not affect landowners' mineral rights. These are permanent agreements between the USFWS and all present and future landowners (USFWS, 2010a and b). Crocker is coordinating with the USFWS to construct and operate Project facilities on grassland easements (Figure 15). There are 5,582 acres of grassland easements and 2,439 acres of protected wetland basins in the Project Area.

Crocker proposes to construct and operate some of the facilities on USFWS easement land. Therefore, in addition to this Application, the USFWS is preparing an Environmental Assessment ("EA") for the Project in accordance with the applicable requirements and standards of the National Environmental Policy Act ("NEPA"). The EA will tier off the UGP Wind Energy Final PEIS, prepared jointly by Western and the USFWS (2015b). The PEIS assesses environmental impacts associated with wind energy development and identifies management practices to address impacts. The EA for the Project will focus on site-specific issues that are not already addressed in sufficient detail in the PEIS. Crocker is currently preparing a Draft Applicant-Prepared EA that will be reviewed by the USFWS, and is anticipated to be issued to the public for review in first quarter 2018.

9.5.3.2 Conservation Easement Impacts

The Project has been designed to avoid permanent impacts to USFWS wetland basins (Table 9-19). The Project will temporarily impact 13.4 acres of USFWS wetland basins. Crocker and the USFWS conducted field reviews of protected wetland basins November 21 and 22, 2017. This field review assessed historic wetland basins compared to delineated wetland basins in the vicinity of proposed infrastructure. Note that the USFWS wetland basins reflect protected basins at the time the easement was established, and therefore may not line up exactly with field-verified wetland delineations. As such, there are temporary impacts to "historic" basins where current ground conditions do not indicate hydrographic features.

There are 14 turbines and associated access roads sited on USFWS grassland easements (Figure 15). As displayed in Table 9-19 below, the Project will permanently impact 15.1 acres and temporarily impact 260.5 acres on grassland easements. Access roads, collection lines, and crane

paths are collocated on grassland easements. The Project will permanently impact less than one percent of the grassland easements in the Project Area.

Table 9-19: Impacts to USFWS Grassland Easements and Protected Wetlands

Easement Type	Permanent Impacts (acres)	Temporary Impacts (acres)
Wind Farm Facility		
Grassland	15.1	248.3
Wetland	0	13.0
Wind Facility Subtotal	**15.1**	**261.3**
Transmission Facility		
Grassland	<0.1	12.2
Wetland	0	0.4
Transmission Facility Subtotal	**<0.1**	**12.6**
Project Total	**15.1**	**273.9**

9.5.3.3 Mitigation Measures for Conservation Easements

Crocker and the USFWS held a conference call on November 27, 2017 to discuss minimizing the impacts of turbines and associated infrastructure on grassland easements. The layout reflected in this Application incorporates design suggestions by the USFWS while balancing setbacks, constructability, noise, shadow flicker, cultural resources, sensitive habitat, and other factors. Design suggestions included collocating access roads, collection lines, and crane paths with existing disturbances, such as roads, utility corridors, and fencerows. The USFWS also suggested shifting turbines out of local flyways or closer to a grassland edge. Temporary impacts from collector lines and crane paths have been designed to avoid and minimize potential fragmentation. In some cases, this may have resulted in more acres of impact due to a longer route; however, the habitat impacted is generally of lower quality because it is located on an existing edge.

Upon completion of the NEPA process, Crocker will conduct an easement exchange with the USFWS to mitigate for permanent impacts to grassland easements. As such, Crocker will offset the permanent impact acreage at a 1:1 ratio with funding for the Service to purchase a grassland easement elsewhere. Crocker is coordinating with the Service to voluntarily mitigate at a higher ratio than is required by the easement exchange program. The easement exchange acreage is based on the acreage of impacts from the post-construction "As-Built" civil engineering survey, not the impact estimates provided in the EA or this Application. As such, the easement exchange will not be completed until after construction.

Temporary impacts on grassland easements and to protected wetland basins on wetland easements will be authorized through a Special Use Permit from the USFWS. The construction-related impacts authorized by the Special Use Permit will be based on impacts described in the EA and would be issued after the NEPA process is complete, and prior to construction. Crocker will comply with the conditions established by the USFWS in the Special Use Permit.

9.5.4 Noise

9.5.4.1 Existing Noise

The term ambient acoustic environment refers to the all-encompassing sound in a given environment or community. The outdoor ambient acoustic environment is a composite of sound from varying sources, distances, and directions. Crocker has conducted background sound level monitoring throughout the Project Area to quantify the existing sound levels and to identify existing sources of sound. Monitoring was conducted at three locations distributed throughout the Project Area (Appendix E). Daytime sound levels in the Project Area generally ranged between 41 and 50 A-weighted decibels ("dBA") while nighttime sound levels were generally between 36 and 52 dBA. The range of daytime L_{EQ} across the Project Area was 41 to 50 dBA, and the range of nighttime L_{EQ} was 36 to 51 dBA. Common sources of sound included wind rustling through vegetation, roadway traffic, aircraft overflights, occasional farming operations, and biogenic sources such as birds and insects.

Higher sound levels typically exist near roadways and near areas that experience greater human activities such as farming. Agricultural/rural areas with higher wind resources generally experience higher sound levels compared to agricultural/rural areas with lower wind resources. Different communities can experience a wide variety of sound levels within their given ambient acoustic environments, and the variability of sound sources creates their respective spectral content. A comparison of typical noise generators is outlined below in Table 9-20.

Table 9-20: Decibel Levels of Common Noise Sources

Sound Pressure Level (dBA)	Noise Source
140	Jet Engine (at 25 meters)
130	Jet Aircraft (at 100 meters)
120	Rock and Roll Concert
130	Jet Plane Taking Off (at 200 feet)
120	Operating Heavy Equipment
110	Night Club
100	Construction Site
90	Boiler Room
80	Freight Train (at 100 feet)
70	Classroom
60	Conversational Speech
50	Urban Residence
40	Soft Whisper
30	North Rim of the Grand Canyon
20	Silent Study Room

Source: OSHA 2016.

A variety of construction related equipment will be used at differing times and for various lengths of time. The majority of these activities would not occur at the same time. Crocker expects a maximum sound level during construction to range between 85 and 95 dBA at 50 feet

for a short duration. Sound levels are expected to be quieter for areas where activities are occurring at distances greater than 50 feet from the facility.

South Dakota has not adopted statewide noise standards and therefore noise restrictions for private activities are unregulated unless local standards exist. Clark County has defined noise standards for the operation of WES. The adopted standard is set forth in the Zoning Ordinance for Clark County and specifies that noise levels may not exceed 50 dBA, average A-weighted sound pressure from existing off-site residences, businesses, and buildings owned and/or maintained by a governmental entity. For the noise analysis, noise sensitive receptors were limited to participating and non-participating residences, as no off-site businesses or buildings owned and/or maintained by a governmental entity are present in the modeling area.

9.5.4.2 Impacts from Noise

Construction and Decommissioning

Potential noise associated with construction and decommissioning of the Project would include site preparation, foundation excavation, concrete work, and affiliated construction activities. Impacts from construction related noise would be minimized by scheduling the heavy construction work during daylight hours. It is anticipated that some construction operations may be conducted outside of normal working hours. In these cases, the necessary construction efforts generally require activities that must be completed, in their entirety, once initiated (i.e., pouring concrete). All construction and decommissioning related noise producing activities would be undertaken as to comply with applicable State and County regulatory obligations and ordinances.

Operation

When in motion, the wind turbines emit audible sound. The level of this sound varies with the speed of the turbine and the distance of the listener from the turbine. Sound is generated primarily from aerodynamic flow around the blades and secondarily from the mechanical and electrical equipment in the nacelle. The most stringent noise restriction, as defined in the Clark County Zoning Ordinance is a 50 dBA, A-weighted sound pressure limit at the perimeter of the principal and accessory structures of existing off-site residences, businesses, and buildings owned and/or maintained by a government entity (Section 4.21.03(13)) (Clark County, 2014).

Crocker has conducted a sound level assessment of the Project in accordance with International Standard Organization 9613-2, the international standard for modeling outdoor sound attenuation. The model was developed using a software program called Cadna-A to determine the sound levels at receptors within the Project Area. The monitoring methodologies and results are detailed in Appendix E. The Cadna-A acoustical analysis software is designed for evaluating environmental noise from stationary and mobile sources and was used to calculate the L_{EQ} for all four turbine models for each conceptual layout. Assuming that wind speeds are at the maximum sound power level wind speed for each turbine model and are constant for an entire one-hour period, the L_{EQ} calculated by Cadna-A was compared to the County.

The analysis accounted for all noise generating elements associated with the various proposed wind turbine types and conceptual layouts for the Project. It also accounts for uncertainty both from the turbine manufacturer and internal model error making for an overall conservative noise

level estimate for the Project. All proposed wind turbines (noise sources) were modeled in Cadna-A and Project-related noise levels were calculated at 69 noise-sensitive receptors within the Project Area (Appendix E). Table 9-21 presents analysis results. Note that Crocker has filed two Appendix E's to this Application because Appendix B of the Sound Level Assessment contains confidential sound power level data (noise emission data) from Vestas, GE, and Gamesa which the manufactures consider confidential or proprietary information. Crocker used that information in its study. As such, the public version contains the label that proprietary information is excluded from the noise report's Appendix B. The Sound Level Assessment provided in Appendix E also includes a discussion on low frequency noise and infrasound from wind turbines and a brief summary of low frequency model results.

Table 9-21: Summary of Noise Assessment

Turbine Model		Residence Classification		
		dBA Levels at All Residences	dBA Levels at Participating	dBA Levels at Non-Participating
Vestas V110	Avg L_{EQ} Modeled	40	44	36
	Max L_{EQ} Modeled	49	49	40
	Min L_{EQ} Modeled	30	33	30
GE 2.5-116	Avg L_{EQ} Modeled	40	44	36
	Max L_{EQ} Modeled	49	49	40
	Min L_{EQ} Modeled	30	33	30
Gamesa 126	Avg L_{EQ} Modeled	40	44	36
	Max L_{EQ} Modeled	50	50	41
	Min L_{EQ} Modeled	29	33	29
Vestas 136-3.45	Avg L_{EQ} Modeled	39	43	35
	Max L_{EQ} Modeled	48	48	40
	Min L_{EQ} Modeled	29	32	29

The maximum calculated noise level, based on assumptions incorporated into the Cadna-A model and the turbine layout, results in a 50 dBA L_{EQ} at the nearest noise-sensitive receptor, which is a participating residence. All non-participating residences are projected at 41 dBA or less from the proposed Project. Average Project-related sound pressure levels at residences for all turbine models range from 39 to 40 dBA, on an hourly L_{EQ} basis. As depicted in the multi-turbine constraint maps, all proposed conceptual turbine layouts comply with Clark County noise guidelines at residential receptors. Maximum calculated noise levels at all non-participating residential receptors for all turbine models are well below the noise limit of 50 dBA.

Health and Safety

The term Wind Turbine Syndrome ("WTS") pertains to the self-published work of Nina Pierpont associated with her phone interviews of 10 case families consisting of 23 individuals with self-reported problems. Ms. Pierpont has a hypothesis that WTS is caused by infrasound affecting the vestibular organs of the inner ear. WTS is not recognized by the United States Centers for

Disease Control and Prevention or any other world health body and has been based on anecdotal evidence rather than facts or research. Her work is not supported by any peer-reviewed studies.

Peer-reviewed papers (McCunney et al., 2014; Leventhall, 2017; Leventhall, 2013) examining wind turbine and human interactions have identified issues with the credibility of the claims associated with her research. Issues identified with Ms. Pierpont's study include selection bias (as she invited families to participate in the study if they thought they had the symptoms she associates with WTS), and lack of noise measurements or medical examinations. McCunney et al. (2014) and Leventhall (2013) contend that there has been no demonstration that humans can perceive sub-audible infrasound, citing the relative insensitivity of the inner ear (where the vestibular system is located) to airborne sound and the presence of other low to moderate magnitude infrasound sources in the body and the environment.

9.5.4.3 Mitigation Measures for Noise

Since sound levels are anticipated to be at or below 50 dBA at residences, Crocker does not anticipate that noise mitigation will be necessary. However, Crocker will establish a process for documenting, investigating, evaluating, and resolving Project-related noise complaints. With respect to the short-term construction-related noise, mitigation measures will include maintaining all equipment in good working order in accordance with manufacturer specifications (e.g., suitable mufflers and/or air-inlet silencers should be installed on all internal combustion engines and certain compressor components); and enforcing speed limits for all vehicles and construction equipment traveling within and around the Project Area.

9.5.5 Visual Resources

9.5.5.1 Existing Visual Resources

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

Private lands crossed by Project are not subject to known Federal, State, or county visual management standards. Sensitive viewsheds are generally associated with scenic resources and can include state or national parks, monuments, and recreation areas or historic sites and landmarks. Recreational users in the Project Area and vicinity may include hunters accessing GPAs, WPAs, WIAs, Reid Lake State Waterfowl Refuge, and School and Public Lands, and recreationists accessing Bailey, Round, and Reid lakes. There are 35 occupied residences within the Project Area and other scattered rural residences adjacent to, but outside, the Project Area. Travelers through the Project vicinity include local or regional traffic along State Highway 20 or other local roads. There are no designated scenic byways in the Project Area (Federal Highway Administration, Undated).

The Day County Wind Energy Center is located within a mile of northwest corner of the Project Area (Figure 1). This NextEra Energy Resources wind farm consists of 66-1.5 MW turbines and became operational in 2010. Additionally, the 20 MW Oak Tree Wind Farm, consisting of eleven 1.85 MW turbines, is located approximately 1.5 miles southeast of the Project Area (Figure 1). This project became operational in December 2014. Additionally, the Basin Electric

Groton-to-Watertown 345 kV transmission line bisects the northern portion of the Project Area (Figure 4).

9.5.5.2 Impacts to Visual Resources

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

As previously discussed, Crocker has collocated linear Project features such as access roads, crane paths, and collector and communication systems with existing disturbances to the extent practicable. This is consistent with the South Dakota Bat Working Group's and SDGFP's (Undated) Siting Guidelines for Wind Power Projects in South Dakota for reducing impacts to visual resources. Similarly, operation of the Project will not introduce new visual components into the Project vicinity. The Project vicinity already includes wind turbines from the Day County Wind Energy Center and the Oak Tree Wind Farm, as well as existing transmission lines. Crocker has reduced the number of turbines for the Project and the transmission line is sited along roads for the length of the route.

The cumulative effect of the proposed Project and existing projects may be perceived as increasing the "industrial" appearance of the wind farms in the Project Area and the areas from which they will be seen. In addition, the presence of the wind farms within the viewsheds of GPAs, WPAs, WIAs, Reid Lake State Waterfowl Refuge, and School and Public Lands, and Bailey, Round, and Reid lakes may diminish the natural quality of those areas and the experience of the persons utilizing those areas, and may be perceived as a negative impact. However, the operation of the Project will not generate much traffic or noticeable increase in day-to-day human activity; therefore, the Project Area will retain the rural sense and remote characteristic of the vicinity. Furthermore, the proposed land use will not involve any ongoing industrial use of non-renewable resources or emissions into the environment. Although the turbines are high-tech in appearance, they are compatible with the rural, agricultural heritage of the area.

Due to the presence of existing wind farms in the vicinity of the Project Area, significant adverse impacts to visual resources are not anticipated. Depending on topography and atmospheric conditions, the Project turbines and transmission line structures may be visible. However, the Project would not cause large visual contrasts in the landscape at this distance and would not be noticeably visible, if visible at all.

9.5.5.3 Mitigation Measures for Visual Resources

Crocker does not anticipate adverse impacts to visual resources and therefore no mitigation measures are proposed.

9.5.6 Shadow Flicker

9.5.6.1 Existing Shadow Flicker

Shadow flicker caused by wind turbines is defined as alternating changes in light intensity at a given stationary location, or receptor, such as the window of a home. In order for shadow flicker

to occur, three conditions must be met: (1) the sun must be shining with no clouds to obscure it; (2) the rotor blades must be spinning and must be located between the receptor and the sun; and (3) the receptor must be sufficiently close to the turbine to be able to distinguish a shadow created by it. Shadow flicker intensity and frequency at a given receptor are determined by a number of interacting factors:

- Sun angle and sun path – As the sun moves across the sky on a given day, shadows are longest during periods nearest sunrise and sunset, and shortest near midday. They are longer in winter than in summer. On the longest day of the year (the summer solstice), the sun's path tracks much farther to the north and much higher in the sky than on the shortest day of the day (the winter solstice). As a result, the duration of shadow flicker at a given receptor will change significantly from one season to the next.
- Turbine and receptor locations – The frequency of shadow flicker at a given receptor tends to decrease with greater distance between the turbine and receptor. The frequency of occurrence is also affected by the sightline direction between turbine and receptor. A turbine placed due east of a given receptor will cause shadow flicker at the receptor at some point during the year, while a turbine placed due north of the same receptor at the same distance will not, due to the path of the sun.
- Cloud cover and degree of visibility – As noted above, shadow flicker will not occur when the sun is obscured by clouds. A clear day has more opportunity for shadow flicker than a cloudy day. Likewise, smoke, fog, haze, or other phenomena limiting visibility would reduce the intensity of the shadow flicker.
- Wind direction – The size of the area affected by shadow flicker caused by a single wind turbine is based on the direction that the turbine is facing in relation to the sun and location of the receptor. The turbine is designed to rotate to face into the wind, and as a result, turbine direction is determined by wind direction. Shadow flicker will affect a larger area if the wind is blowing from a direction such that the turbine rotor is near perpendicular to the sun-receptor view line. Similarly, shadow flicker will affect a smaller area if the wind is blowing from a direction such that the turbine rotor is near parallel to the sun-receptor view line.
- Wind speed – Shadow flicker can only occur if the turbine is in operation. Turbines are designed to operate within a specific range of wind speeds. If the wind speed is too low or too high, the turbine will not operate, eliminating shadow flicker.
- Obstacles – Obstacles, such as trees or buildings, which lie between the wind turbine and the receptor have a screening effect and can reduce or eliminate the occurrence of shadow flicker.
- Contrast – Because shadow flicker is defined as a change in light intensity, the effects of shadow flicker can be reduced by increasing the amount of light within a home or room experiencing shadowing flicker.
- Local topography – Changes in elevation between the turbine location and the receptor can either reduce or increase frequency of occurrence of shadow flicker, compared to flat terrain.

The shadow flicker frequency was created using the WindPro Modeling program (Version 2.9.285) using the typical assumptions for distribution of wind direction and sunshine probability (Tables 9-22 and 9-23). The assumptions are specific to the Project Area.

Table 9-22: Wind Direction Distribution Assumptions for Shadow Flicker Model

Direction	N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW
Percent Blowing in Direction	8.9	6.1	5.3	6.6	8.2	10.7	15.2	8.1	5.1	5.8	9.1	11.0

Table 9-23: Probability of Sunshine Assumptions for Shadow Flicker Model

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Sunshine Probability	52%	54%	58%	63%	65%	66%	74%	78%	68%	59%	51%	51%

Data gathered from National Climatic Data Center for Huron, SD, the closest, most representative station (1956-1983)

9.5.6.2 Shadow Flicker Impacts

Shadow flicker frequency calculations for the Project were modeled at 69 residences (receptors) located within and outside of the Project Area using WindPRO 2.9.285. The average and maximum predicted shadow flicker impacts that occurred at each residence for each turbine model are show in Table 9-24. Appendix F provides the full results of the shadow flicker assessment.

Table 9-24: Shadow Flicker Model Results

Hours / Year	Turbine Model			
	Vestas V110	GE 2.5-116	Gamesa G126	Vestas V136-3.45
Average - Participant	5.5	5.9	6.1	6.8
Average – Non-Participant	3.7	3.9	4.1	4.6
Max - Participant	20.6	21.4	24.1	27.3
Max – Non-Participant	12.6	13.7	14.5	16.3

WindPRO 2.9.285 calculates the number of hours per year as well as the maximum minutes per day during which a given receptor could realistically expect to be exposed to shadow flicker from nearby wind turbines.

An analysis of potential shadow flicker impacts from the Crocker Wind Farm on nearby receptors indicates that the effects are expected to be minor and well within tolerances that do not present concerns for nuisance. No residences are expected to experience over 30 hours per year of shadow flicker.

At a distance of 3,960 feet or greater for non-participants and 1,000 feet or greater for participants (the Project minimum setback for residences), receptors will typically experience shadow flicker only when the sun is low in the sky, and only when the factors described above are present. If a receptor does experience shadow flicker, it most likely will be only during a few days per year from a given turbine, and for a total of only a fraction (typically less than 1 percent) of annual daylight hours.

Shadow flicker from the proposed turbines is not harmful to the health of photosensitive individuals, including those with epilepsy. The frequency of shadow flicker due to wind turbines is a function of the rotor speed and number of blades, and it is generally no greater than approximately 1.5 hertz (i.e., 1.5 flashes per second). The Epilepsy Foundation has determined that generally, the frequency of flashing lights most likely to trigger seizures is between 5 and 30 flashes per second (Epilepsy Foundation, 2006).

9.5.6.3 Mitigation Measures for Shadow Flicker

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

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

9.5.7 Telecommunications

9.5.7.1 Existing Telecommunications

Crocker has conducted a microwave beam path analysis, which identified seven paths intersecting the Project Area (Appendix G and Figure 2). Other communication signals licensed by the Federal Communications Commission ("FCC") in and in the vicinity of the Project are listed in Table 9-25.

Table 9-25: FCC Licensed Signals in the Project Vicinity

Communication System Type	Number of Signals
ASR (Antenna Registration System)	3
FM (FM Radio Signals)	0
Microwave (Radio wave Transmission)	2
Cellular	0
LM broadcast (Land mobile broadcast tower)	4

Source: Comsearch

Crocker submitted a Project notification letter to the United States Department of Commerce ("DOC") National Telecommunications and Information Administration ("NTIA") on March 16, 2016 and on November 16, 2017 (Section 12.2 and Appendix H) for the agency to review potential impacts to Federal telecommunications.

Additionally, Crocker initiated coordination with the Interstate Telecommunications Cooperative, Inc. ("ITC") on April 18, 2016 (Section 12.2 and Appendix H). Crocker received shapefiles from ITC on October 26, 2016 of the utility's facilities to assist in the design and crossing agreements. ITC expressed concerns with inductive interference, which can happen when collector lines of the wind farm parallel telephone lines; crossings have not proved to have the same effect as paralleling.

9.5.7.2 Telecommunication Impacts

Because of their height, modern wind turbines have the potential to interfere with existing communications systems licensed to operate in the United States. Comsearch conducted a Licensed Microwave Study for the Wind Farm Facility. Turbines have been sited in a manner that avoids all identified microwave beam paths and communication systems. The construction and operation of the Project will not result in interference to microwave, radio, or navigation signals.

Crocker received a response letter from the NTIA on May 13, 2016 (Appendix H). The agency indicated no Federal agencies identified any concerns regarding blockage of their radio frequency transmissions. The USDA and United States Department of Justice ("DOJ") provided responses to NTIA stating "No Harmful Interference Anticipated." The DOC and the DOE expressed concerns the Project may obstruct radio frequency transmissions or weather radar.

The DOC, which includes National Oceanic and Atmospheric Administration ("NOAA"), provided comments specific to potential weather radar impacts. The DOC noted that a portion of the Project falls within the Notification Zone. That is, due to the proximity of the Project to the Aberdeen Weather Surveillance Radar – 1988 Doppler, NOAA's Radar Operations Center would like to reevaluate the Project when turbines are sited, and track the Project to completion. Turbine placement may impact the radar's precipitation estimates over the northern portion of the Project Area.

The DOE noted the Project has potential to interfere with DOE Western operations. Western has three paths that run through the Project Area from the Clark Repeater. However, in a December 1, 2017 letter, the agency notes the Project will not cause problems for Western.

In consultation with the ITC, Crocker modified its collection lines to minimize the distance of paralleling the ITC's copper telephone lines. Following a second review of the Project's collection lines, the ITC indicated on December 6, 2017 that Crocker's proposed collection routes have the potential to cause inductive interference.

9.5.7.3 Mitigation Measures for Telecommunications

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

Crocker will implement the suggested mitigation strategies to reduce impacts to radar listed in the response from the DOC, which includes aligning turbines so that rows of turbines point towards/away from the radar. Crocker will provide a final layout to the agencies for review and implement further mitigation, as necessary. Additional potential mitigation to ensure accurate rainfall measurements could include installing rain gauges or additional weather stations in the northern portion of the Project Area where precipitation estimates may be impacted. Crocker does not anticipate mitigation will include moving turbine locations. Additionally, the FAA review circulates to the weather radar operators allowing them to map the layout on their radar system to create a mask that then allows them to screen the interference from their forecasting. NOAA does not anticipate impacts to critical tornado detection and, therefore, will not request mitigation.

Crocker is coordinating with DOE and Western on turbine placement to avoid impacts with Western operations and beam paths.

In the event the Wind Farm Facility or its operation causes interference to communication systems, Crocker will take the steps necessary to correct the problem. If interference is identified during or after construction of the Project, Crocker will address the interference on a case-by-case basis.

Crocker is in the process of negotiating an agreement with the ITC to ensure any inductive interference will be mitigated through replacing copper with fiber lines. The draft agreement provided by the ITC at the Crocker CUP Hearing on March 7, 2017 contains provisions that required further negotiation and clarification. The draft agreement lacks details including verified testing procedures and information on the current level of service. In addition, the agreement does not quantify potential impacts based on the Project's layout. As field surveys continue and the Project moves through permitting, changes to collection line routes may occur. Therefore, Crocker has requested that an agreement with the ITC be executed once detailed design work on the layout has been completed. The Project's CUP with Clark County require an agreement is in place prior to construction and Crocker will satisfy this requirement following proper due diligence. Crocker is committed to an agreement with ITC that protects ITC's customers and appropriately addresses impacts specific to the Project's interactions with ITC's network.

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

9.6.1 Existing Air Quality

In accordance with EPA requirements, the SDDENR operates an ambient air monitoring network of samplers. The nearest monitoring location to the Project is located in Watertown, Codington County, approximately 35 miles southeast (SDDENR, 2016c). The primary emission sources that exist within the Project Area include agriculture equipment, and vehicle use along State Highway 20.

9.6.2 Air Quality Impacts

Construction activities could release air emissions of criteria pollutants, volatile organic compounds, greenhouse gas emissions (e.g., carbon dioxide), and small amounts of hazardous air pollutants. During construction of the Project, fugitive dust emissions would temporarily increase due to truck and equipment traffic in the Project Area. Additionally, there would be short-term emissions from diesel trucks and construction equipment. Air quality effects caused by dust would be short term, limited to the time of construction or decommissioning, and would not result in National Ambient Air Quality Standards ("NAAQS") exceedances or significantly contribute to greenhouse gas emissions.

There would be no direct air emissions from operating wind turbines, because no fossil fuels are combusted. Negligible amounts of dust, vehicle exhaust emissions, and combustion-related emissions from diesel emergency generators would occur during maintenance activities. These emissions would not cause exceedances of air quality standards or have any negative impacts on climate change. Operation of the Project and interconnection substations could produce minute amounts of ozone and nitrogen oxides emissions as a result of atmospheric interactions with the energized conductors. Impacts on ambient air quality from these minor emissions during operation would be negligible. The Project substation and interconnection substation would employ sulfur hexafluoride-filled circuit breakers. Sulfur hexafluoride is a greenhouse gas, and therefore, equipment leaks could contribute to air quality impacts.

9.6.3 Mitigation Measures for Air Quality

A general air quality permit may be required if the Project elects to install a concrete batching plant. Approval of the application typically takes up to 30 days. Crocker or Crocker's construction contractor would obtain the permit prior to the commencement of construction.

While Project construction is underway, fugitive dust emission may occur due to vehicular traffic in the Project Area. Due to vehicular and equipment operation, there may also be short-term emissions from diesel fuel equipment during construction. Any air quality effects resulting from construction would be short term, and limited to the time of construction activities and would not result in NAAQS exceedances for particulate matter. Construction and operation of the Project would not result in a violation to Federal, State, or local air quality standards. Operation of the project would not produce air emissions which would impact the Project Area's ambient air quality. Additionally, best management practices will be implemented during construction to suppress fugitive dust emissions to the extent practicable and equipment would undergo routine

inspection and preventative maintenance to minimize such leaks, and if leaks did occur, the sulfur hexafluoride would be captured to prevent entering the atmosphere.

9.7 Community Impact (ARSD 20:10:22:23 and ARSD 20:10:22:24)

9.7.1 Existing Socioeconomic and Community Resources

9.7.1.1 Existing Communities

The Project Area is located in northeastern South Dakota in Clark County. Clark County had an estimated population of 3,659 in 2015 (United States Census Bureau, 2016). The largest city in Clark County, South Dakota is the City of Clark which, in 2010, had an estimated population of 1,139 (31 percent of Clark County). Clark is located approximately 7 miles southeast of the Project Area. Crocker, a town of 19 people in 2010 is located two miles from the Project Area. An additional seven municipalities are located within 10 miles of the Project Area. The populations of communities in the Project vicinity are listed in Table 9-26 and shown on Figure 1.

Table 9-26: Populations of Communities in the Project Vicinity

Community, County	2010 Population	Distance and Direction from Project Area
Crocker, Clark County	19	Adjacent
Clark, Clark County	1,139	7 miles southeast
Bradley, Clark County	72	3.5 miles east
Raymond, Clark County	50	8.0 miles southwest
Garden City, Clark County	53	9.5 miles southeast
Lily, Day County	21	5.5 miles northeast
Butler, Day County	17	8.5 miles northeast
Turton, Spink County	61	8.0 miles west
Conde, Spink County	187	9.5 miles northwest

Source: United States Census Bureau, 2016

The median household income in Clark County reported in the 2010 census data was $30,208. Within the County, 10.9 percent of the people are reported living at or below the poverty level. In comparison to the state as a whole, the median household income for the State was slightly higher ($35,282) while the state poverty rate was slightly lower (9.3 percent) (United States Census Bureau, 2016). The unemployment rate in Clark County in October 2017 was 3.2 percent, which was slightly higher than the unemployment rate in South Dakota for the same month (3.0 percent) (South Dakota Department of Labor and Regulation, 2017).

9.7.1.2 Impacts to Communities

The Project is anticipated to provide positive short-term and long-term impacts to the local economy. The impacts in the application are based on The Project at 400 MW. Construction

activities for the Project would be limited to short-term effects. Increased patronage of local commercial businesses, such as restaurants, grocery stores, hotels, and gas stations, will result in increased business from construction related workers. Local contractors and suppliers will be used for portions of the construction. Total wages and salaries paid to contractors and workers in Clark County will contribute to the total personal income of the region. Additional personal income will be generated for residents in the county and state by circulation and recirculation of dollars paid out by Crocker for business expenditures and for state and local taxes. Expenditures made for equipment, fuel, operating supplies, and other products and services benefit businesses in the county and the state.

Jobs

Construction crews would include a variety of skilled and unskilled laborers. This diverse workforce would include foremen, carpenters, iron workers, electricians, millwrights, heavy equipment operators and others. The increased labor force would be necessary for the installation of the various Project components, including wind turbines, access roads, underground collector and communication systems, O&M buildings, and transmission line structures. Based on the JEDI model and internal projections, construction of the 400 MW Wind Farm and associated transmission line is anticipated to generate approximately 250 jobs during construction (~200 jobs for Wind Farm, ~50 jobs for Transmission) at peak demand. These numbers are estimates and will vary from the projections based on actual project need. The Project will provide new temporary job opportunities for the local work force, however the percent of jobs filled by state and local residents is unknown at this time. Current unemployment in the area is low, however jobs created by the Project may enable people who work in these fields to work closer to home during construction. Some job categories during construction include foundation, erection, electrical, management/supervision, and substation/interconnection. The JEDI model estimates labor will cost approximately $15.8 million and includes hourly wages plus other employer costs including but not limited to: health benefits, workers compensation, disability insurance, and social security.

Crocker anticipates that a majority of the short-term construction positions would be filled by a labor force from outside the local community as there would not be sufficient trained local labor to fill the number of jobs available. A significant portion of the construction workforce would likely originate from within 55 miles of the Project. It is anticipated that many of the short-term construction laborers would commute to the Project Area and limit the need for additional temporary or permanent housing at the Project Area.

The JEDI model projects that during operation and maintenance the Project will create approximately 18 full time jobs paying around $1.1 million per year. The JEDI model projection also estimates approximately 80 percent of the permanent operation and maintenance jobs will live within 50 miles of the Project Area. It is unknown at this time the number of individuals that will live in Clark County or specific townships. South Dakota has several wind energy technician education programs that provide specialized training related to wind farm service and operation. The Project hopes to benefit from graduates of these programs and provide job opportunities for South Dakota residents that want to work in the renewable energy industry and live near the Project Area. The Project will also create new local job opportunities for various trade professions that live and work in the area. It is typical to advertise locally to fill required

construction positions. It is unlikely the local population will fill all the required construction jobs and additional workforces are expected to move to the area for the construction phase of the Project as needed. It is also anticipated that the operations and maintenance of the Project will require specially trained individuals that will move within the project vicinity to be driving distance from the Project Area.

Economic Impact

Long-term beneficial impacts to the state and local tax base as a result of the operation of the Project will contribute to improving the local economy in this area of South Dakota. In addition to the creation of jobs and personal income, the Project will pay capacity and production taxes which will benefit the State of South Dakota, School Districts, Clark County, and the townships in the Project Area with wind turbines.

The 400 MW project is projected to have the following direct economic impacts.

Direct Project Economic Impacts over 20 years of Operation (based on 400 MW project):

- Landowners Payments: ~$46 million over 20 years (~$2.3 million average per year)
- Capacity and Production Tax: ~ $36 million over 20 years (~$1.8 million per year) *Tax allocation details provided below.
- Community Fund: $1.6 million over 20 years ($80,000 per year)
- Full-Time Jobs: ~15-20 full time jobs totaling up to $24 million over 20 years

Capacity and Production Tax Information Details:

The yearly tax projection is based on the Wind Farm Production and Capacity tax defined in SDCL Chapter 10-35 (16-21). The estimates are based on Crocker operating 400 MW's of nameplate capacity and an operations profile designed by Crocker's experienced development team. The actual amount paid will be based on current law and real operations of the year in question. Allocations to taxing jurisdictions are projected below with conservative production measures.

The total projected annual capacity and generation tax is projected to be around $1.8 million per year totaling ~$36 million over 20 years distributed as follows:

- State of South Dakota: Approximately $480,000 per year totaling $9.6 million over 20 years
- Clark County: Approximately $462,000 per year totaling $9.24 million over 20 years
- Townships: Approximately $198,000 per year totaling $3.96 million over 20 years
- School Districts: Approximately $660,000 per year totaling $13.2 million over 20 years

- Part of the total School Districts amount above will be additional revenue for local school district (years 1-9 only): Amounts vary per year totaling $4.6 million in additional tax revenue over the first 9 years.
- Part of the total School Districts amount above will be local revenue projected to offset state funding needs (years 6-20+): Amount varies per year totaling $8.6 million over years 6-20.
- Note: SDCL Chapter 13-13 specifies how the school district's portion of tax revenue is allocated over time. In summary, one hundred percent is retained by the school district to which the tax revenue is allocated; however, after the first five years of operation, how the tax revenue allocation is treated in the school funding formula changes. As a result, the amount of tax revenue outside of the state funding formula decreases by 20 percent per year until the entire tax revenue allocation is included in the funding formula to offset the need for state aid.

Construction Phase:

The JEDI model calculated state and local economic impact during Crocker's construction phase to be in the tens of millions of dollars. The primary impact areas are construction labor, construction services, turbine or other supply chain impacts, and direct payments to landowners during construction (see the Jobs subsection above for more details). The economic benefit will vary based on products and services available in the state and local area, project size, time of construction, contractor selected, turbine model purchased, and other variables. Crocker plans to utilize as many local resources as possible when commercially reasonable.

Negative long-term impacts to the socioeconomic status of the Project Area are not anticipated. The short-term construction force will have a minimal to negligible effect on industry, housing, local labor market, regional health facilities, public infrastructure (water and sewer systems), solid waste facilities, schools, fire protection, law enforcement, or other community, government, or recreational facilities.

Property Values – Wind Farms

A review of academic literature pertaining to wind project development and its impact on property values was completed for the Project by Mark A. Thayer of San Diego State University (Thayer, 2017; Appendix I). The report summarized the results of two Hedonic Price Model studies (Hoen, et.al. 2009; Hoen, et.al. 2013) conducted by the Environmental Energy Technologies Division of the Lawrence Berkeley National Laboratory ("LBNL") and included a review of additional studies providing supportive and critical views. The 2009 LBNL study determined that there was no significant impact to sale values of properties over time due to proximity of wind-energy project development. The 2013 follow-up study examined changes in property values of 51,276 home sales from 27 counties in nine states within 10 miles of 67 individual wind energy projects. This study found no statistical evidence for differences in home values from pre- to post-construction. The summary report is provided in Appendix I.

The 2009 and 2013 LBNL studies evaluated wind farms in a variety of landscapes, including agricultural areas. The studies examined 36 unique counties in the United States (Table 9-27). Note that 21 of the 36 unique counties are considered more than 50 percent rural, whereas only four counties (Benton, WA; Walla Walla, WA; DeKalb, IL; Atlantic, NJ) are less than 22 percent rural (City Data, 2017). Sixteen unique counties have a percentage rural greater than or equal to 59 percent, the raw average of the South Dakota counties. Sac County, IA is considered 100 percent rural, which is the same as Clark County, SD. Additionally, Clark County's landcover is 26 percent pasture land and several counties that were examined have land cover dominated by pasture land (over 50 percent) including Grady, OK; Custer, OK; Kittitas, WA; and Howard, TX (USDA, 2012).

Table 9-27: Comparative Demographic Data for Counties with Wind Farms

County	State	Population	Population/ Square Mile	Median Age	Median Income	Median Home Value	% Rural
LBNL 2009							
Buena Vista	IA	20,578	36	37	46,469	99,744	44
Lee	IL	34,735	48	42	51,682	140,291	53
Livingston	IL	37,903	36	40	55,287	102,523	41
Madison	NY	72,369	110	39	52,300	135,300	59
Oneida	NY	232,871	192	40	43,702	113,600	33
Custer	OK	29,500	30	31	45,179	114,228	30
Umatilla	OR	76,705	24	35	48,514	138,600	29
Somerset	PA	76,218	71	44	43,429	103,900	71
Wayne	PA	51,401	70	45	47,932	179,354	88
Howard	TX	36,651	41	38	47,906	67,485	20
Benton	WA	184,486	109	35	48,997	176,500	11
Walla Walla	WA	58,844	47	36	45,875	186,784	17
Door	WI	27,766	58	49	50,586	187,484	69
Kewaunee	WI	20,444	60	42	52,929	145,344	72
Average*	**LBNL 2009**	**68,605**	**66.6**	**39.5**	**$49,342**	**$132,510**	**45.5**
LBNL 2013							
Carroll	IA	20,562	36	42	50,074	107,911	52
Floyd	IA	16,077	32	43	44,152	92,087	53
Franklin	IA	10,436	18	42	48,715	89,330	60
Sac	IA	10,035	17	46	48,451	81,367	100
DeKalb	IL	105,462	166	29	52,867	160,600	20
Livingston	IL	37,903	36	40	55,287	102,523	41
McLean	IL	174,06	147	32	61,846	160,300	16
Cottonwood	MN	11,633	18	44	45,949	83,197	62
Freeborn	MN	30,840	44	44	46,698	99,683	43
Jackson	MN	10,629	15	44	52,428	93,644	69
Martin	MN	20,220	29	45	51,865	98,341	54
Atlantic	NJ	275,209	491	39	52,127	218,600	13

Table 9-27: Comparative Demographic Data for Counties with Wind Farms

County	State	Population	Population/ Square Mile	Median Age	Median Income	Median Home Value	% Rural
Clinton	NY	81,632	79	39	43,892	121,200	64
Franklin	NY	51,262	31	39	45,580	93,529	63
Herkimer	NY	63,744	45	42	43,754	89,098	52
Lewis	NY	27,220	21	40	47,990	103,257	87
Madison	NY	72,369	110	39	52,300	135,300	59
Steuben	NY	98,394	71	41	47,046	90,900	60
Wyoming	NY	41,188	69	40	50,949	96,515	64
Paulding	OH	18,989	46	40	44,650	89,619	82
Wood	OH	129,590	210	35	51,680	147,300	30
Custer	OK	29,500	30	31	45,179	114,228	30
Grady	OK	53,854	49	38	50,677	111,956	64
Fayette	PA	134,086	170	43	38,903	89,100	48
Somerset	PA	76,218	71	44	43,429	103,900	71
Wayne	PA	51,401	70	45	47,932	179,354	88
Kittitas	WA	42,522	19	31	43,849	234,150	40
Average*	**LBNL 2013**	**62,766**	**79.3**	**39.9**	**$48,454**	**$118,037**	**55.0**
South Dakota Counties							
Clark	SD	3,645	4	45	48,511	72,127	100
Codington	SD	27,938	41	37	46,361	140,909	22
Grant	SD	7,241	11	45	48,354	105,054	55
Average*	**SD**	**12,941**	**18.7**	**42.3**	**$47,742**	**$106,030**	**59.0**

** unweighted*

Because none of the previous academic research or literature on the impact of large-scale wind farms on nearby property values has included South Dakota wind projects, to predict what might occur near South Dakota wind facilities requires the transfer of existing research from similar areas. The LBNL studies were constructed with transferability specifically in mind as they used a wide range of community types so that the results would be applicable to the maximum number of alternative sites.

The range of counties studied in the LBNL studies include counties like those in South Dakota. Table 9-27 lists common socioeconomic measures (population, population per square mile, median age, and percent rural are from 2014, whereas median income and median home value are 2013 levels). The table includes three panels, with the upper panel listing the counties in the 2009 LBNL study, the middle panel the counties in the 2013 LBNL study, and the bottom panel the counties in South Dakota where the proposed wind facilities are to be built, respectively. Clark County is similar to some of the LBNL counties (see measures such as median age and median income), which implies that the LBNL studies are a reasonable transfer source. In general, the South Dakota counties have lower average population per square mile, median income, and median home values than the average county in either the 2009 or 2013 LBNL

studies. The South Dakota counties are very similar to their Minnesota and Iowa counterparts, especially Cottonwood and Jackson counties, Minnesota, and Franklin and Sac counties, Iowa.

Table 9-28 provides a more detailed examination between the three South Dakota counties and Cottonwood and Jackson counties, Minnesota, and Franklin and Sac counties, Iowa. Two additional measures of similarity are presented – mean size of farms and the percent of the workforce employed in agriculture, broadly defined. In addition, the calculated averages are weighted by population. As is evident, the percent employed in agriculture is very close between the comparison group and the South Dakota counties. Mean farm size is larger in the South Dakota counties but the percent rural is larger in the comparison group. This group-wise comparison suggests that the LBNL studies do include information from counties similar to those evaluated in South Dakota.

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

Table 9-28: Additional Comparative Demographic Data for Counties with Wind Farms in Iowa, Minnesota, and South Dakota

County	State	Population	% Rural	Mean Size of Farms*	% Agriculture Employment**
Sac	IA	10,436	60	429	9.1
Franklin	IA	10,035	100	409	12.5
Cottonwood	MN	11,633	62	450	3.7
Jackson	MN	10,629	69	402	11.0
Weighted Average* **			**72.2**	**423.3**	**8.9**
Clark	SD	3,645	100	894	25.4
Codington	SD	27,938	22	557	4.9
Grant	SD	7,241	55	639	16.7
Weighted Average* **			**36.3**	**606.7**	**9.3**

** Acres*
*** Agriculture, Fishing, Forestry, and Hunting*
**** Weighted by population*

While studies exist that demonstrate there could be a potential negative impact to property values within or near a wind farm project area, there are no large-scale statistical studies completed using data from areas in the United States and/or Canada that consistently show a significant negative impact from wind facilities on nearby property values after the wind facility is constructed and operable.

The studies included in the literature review utilized generally accepted statistical analysis, implying the database was sizeable (thousands of observations, i.e., utility scale operations), must use market data, and used accepted methodologies (e.g., hedonic price method). Therefore, "studies" that use inappropriate statistical methods such as small sample sizes, non-transparent sample selection process, failure to control for obvious variables, failure to under understand

statistical significance, or were not subject to peer-review were not included. As such, studies from Gardner (2009) and Kielisch (2011) were not included due to these inconsistencies.

To draw the most accurate comparison to South Dakota, studies analyzing areas outside of the United States and Canada were also not considered. While there have been European and United Kingdom studies that show possible negative property value impacts from wind facilities, the estimated impacts are small (3-7 percent) (Sunak and Madlener, 2012; Jensen et al., 2014; Gibbons, 2014). These impacts cannot be explained by data size, quality, or estimation methods and therefore have led to speculation that community involvement and compensation levels differ from standard practice in the United States and Canada bringing the relevance of these studies into question.

Lastly, the literature review focused on estimated property value impacts after the wind facilities are fully constructed and operational. There is some evidence that the post-announcement/pre-construction phase of wind facility development could have a negative effect on nearby property values, however this has been labeled "anticipation stigma" and the effects are small and dissipate completely after the facility is operational (Hoen et al., 2011; Hinman, 2010; Heintzelman and Tuttle, 2012).

A recent 2017 study was included in the literature review that examines the impact of wind turbines on nearby property values on both sides of the United States/Canada border that finds inconsistent results (Heintzelman et al., 2017). The study provided there are no significant property values in Canada for either turbine view or proximity to turbines; however, indications of negative property value effects primarily for turbine view were noted in the United States. The results for the proximity to turbine variables generally do not support the turbine view results as neither the full sample nor the restricted 10-mile sample show negative property value effects. The authors do not provide a definitive rationale for the overall results disparity (Canada vs. US, turbine view vs. proximity) but do offer some speculation about when negative effects might be expected. These include: the quality of view prior to turbine construction, the relative quantity of vacation homes and/or waterfront properties, the level on involvement by the local residents, and the level of compensation to the local community. The results of this study indicate there will be no negative impacts on nearby property values from wind developments under the following conditions: the view prior to construction is not of water, there are relatively few vacation or waterfront homes, local residents are active participants in the turbine facility development, and if there is some positive compensation to the local community.

Property Values – Transmission Lines

Similarly, the impact of transmission lines on property values was reviewed. Jackson and Pitts (2010) prepared a literature review of empirical studies conducted between 1964 and 2009. Based on the studies reviewed, while having some inconsistencies in their detailed results, there were generally small (2 to 9 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 avoids residences; therefore, impacts to property values are not anticipated.

9.7.1.3 Mitigation Measures for Community Impacts

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

9.7.2 Commercial, Industrial, and Agricultural Sectors

9.7.2.1 Existing Commercial, Industrial, and Agricultural Sectors

The Project Area is agricultural (predominantly grassland/pasture and cultivated crops). No commercial, industrial, mining, or institutional land uses are located within the Project Area. In 2012, Clark County's 597 farms encompassed a total of 608,805 acres (average farm size of 1,020 acres) and produced $249.4 million in agricultural products (USDA, 2012). Sixty-four percent of sales were from crop sales, and 36 percent was livestock sales. The majority of crop acreage was soybean and corn. Cattle and calves were the largest livestock component in the County. Clark County ranked 11th of the 66 South Dakota counties in total value of agricultural products sold.

9.7.2.2 Impacts to Commercial, Industrial, and Agricultural Sectors

Minimal existing agricultural land would be permanently removed from crop and forage production by the proposed Project, primarily the area around wind turbine foundations, access roads, interconnection facilities, and transmission structures. Landowners would be compensated by Crocker for losses to crop production during construction. Agricultural activities can occur up to the edge of access roads and turbine pads. The buried underground collection system would not alter agricultural activities.

Approximately 1,768 acres of agricultural land (including cropland and pastureland identified in Table 9-16 in Section 9.5.1.2) would be temporarily impacted by Project construction for collection lines and workspace around each turbine foundation. It is estimated that approximately 152.5 acres of agricultural land would be permanently impacted, which constitutes less than 1 percent of the total land within the Project Area. Approximately 95 acres of prime farmland would be permanently impacted, which constitutes less than 1 percent of the total land within the Project Area. Areas disturbed due to construction that will not host permanent Project facilities would be restored and would returned to its prior its prior agricultural use.

9.7.2.3 Mitigation Measures for Commercial, Industrial, and Agriculture Sectors

The mitigation measures for impacts to agricultural lands are described in Section 9.5.1.3.

9.7.3 Transportation

9.7.3.1 Existing Transportation

Ground Transportation

In general, the existing roadway infrastructure in and around the Project Area is characterized by State, county, and township roads that generally follow section lines. Various county and township roads provide access to the Project and include both two-lane and gravel roads. In the agricultural areas, many landowners use private, single-lane farm roads and driveways on their property. Roads within and that comprise the Project Area boundary are summarized in Table 9-29. The Transmission Line Facility parallels 419th Avenue, State Highway 20, a two-track road, and property lines for most of the route.

Table 9-29: Summary of Roadways within the Project Area

Road Type	Miles within Project Boundary
Federal Highways	0
State Highways	4.0
County Highways/Roads	17.0
Township Roads	41.7
Total	**62.7**

Aviation

The Clark County airport (public airport) is located approximately 7 miles southeast of the Project Area. This airport hosts an asphalt runway at an elevation of 1,793 feet. There are no other public airports in proximity to the Project Area (South Dakota Department of Transportation ["SDDOT"], 2015). Crocker has not identified any private airstrips within the Project Area; however, there is one private airstrip within one mile to the south.

Air traffic may be present near the Project Area for crop dusting of agricultural fields. Crop dusting is typically carried out during the day by highly maneuverable airplanes or helicopters. The installation of wind turbines, a transmission line, and aboveground collector lines, if needed, will create a potential for collisions with crop-dusting aircraft. However, aboveground collector lines are expected to be similar to existing distribution lines (located along the edges of fields and roadways) and the turbines themselves would be visible from a distance and lighted according to FAA guidelines. Crocker has received preliminary Determinations of No Hazard for turbine positions from the FAA. To comply with the Clark County CUP Aircraft Detection Lighting System ("ADLS") condition outlined in Section 8.0, Crocker was required to refile the Project with the FAA. Crocker will provide updated determinations to the SDPUC when received.

9.7.3.2 Impacts to Transportation

Ground Transportation

The Project will require up to 43.6 miles of new access roads. During the construction phase, temporary impacts are anticipated on some public roads within the Project Area, however local traffic will continue to have safe access though the area. Roads will be affected by the transportation of equipment to and from the Project. Construction traffic will use the existing county and State roadway system to access the Project and deliver construction materials and personnel. Some roads may also be temporarily expanded along specific routes as necessary to facilitate the movement of equipment. Crocker expects to enter into road use agreements with the county and townships, and to have a bond set by the Commission in accord with State law. Construction activities will increase the amount of traffic using local roadways, but such use is not anticipated to result in adverse traffic impacts. Operation and maintenance activities will not noticeably increase traffic in the Project vicinity.

The Project may also temporarily affect traffic numbers in the area due to construction traffic. During the construction phase, several types of light, medium, and heavy-duty construction vehicles will travel to and from the Project Area, as well as private vehicles used by construction personnel. The Applicant estimates that there will be 375 large truck trips per day and up to 875 small-vehicle (pickups and automobiles) trips per day in the area during peak construction periods.

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

Aviation

The closest public airport to the Project is the Clark County airport, located approximately 7 miles southeast. Crocker will coordinate with the Clark County airport, the FAA, and SDDOT prior to construction to understand potential impacts.

The Project has received “Determination of No Hazard” responses from the FAA for the proposed turbine locations up to 499 feet. Crocker has re-filed the Project with the FAA to determine the feasibility of installing ADLS technology. If taller turbines are used or if the Project layout changes from what has been previously provided to the FAA, the Project will re-file with the FAA.

The installation of wind turbine towers in active croplands and installation of aboveground collector lines, if needed, will create a potential collision risk with crop-dusting aircraft. However, aboveground collector lines are expected to be similar to existing distribution lines (located along the edges of fields and roadways). The Applicant will notify local airports about the Project including locations of new towers in the area to minimize impacts and reduce potential risks to crop dusters.

9.7.3.3 Mitigation Measures for Transportation

Ground Transportation

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

Crocker will develop a Transportation Plan that identifies the measures that will be implemented to comply with Federal, State, and county regulations and permit conditions. This will typically address the transport of turbine components, main assembly crane, and other large pieces of equipment. The plan will also consider specific object size, weight, origin, destination, and unique handling requirements and should evaluate alternative means of transportation (e.g., rail or barge). The plan will also include a traffic management plan for the Project's access roads to ensure that no hazards would result from increased truck traffic and that traffic flow would not be adversely impacted. This plan will identify measures that will be implemented to comply with any Federal or State Department of Transportation requirements, such as informational signs, flaggers when equipment may result in blocked throughways, and traffic cones to identify any necessary changes in temporary lane configurations. Signs will be placed along roads to identify speed limits, travel restrictions, and other standard traffic control information. To minimize impacts on local communities, consideration will be given to limiting construction vehicles on public roadways during the morning and late afternoon commute times.

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

Project personnel and contractors will be instructed and required to adhere to speed limits commensurate with road types, traffic volumes, vehicle types, and site-specific conditions to ensure safe and efficient traffic flow. During construction, operations and maintenance, and decommissioning phases, traffic will be restricted to designated project roads. Use of other unimproved roads will be restricted to emergency situations.

The cost estimate to repair roads back to preconstruction conditions is done as part of final engineering and will depend on the plans for road upgrades as well as the turbine delivery plan. Crocker will enter road agreements with Clark County and the impacted townships prior to construction and are expected to provide detailed engineering and financial security. Pursuant to SDCL 49-41B-38, Crocker will furnish an indemnity bond to secure the restoration and repair of roads after construction.

Aviation

One private airstrip is located outside of the Project boundary in Township 118N, Range 58W, Section 18. There are no State or Federal protections for private airstrips, and private airstrip owners are responsible for acquiring any aviation easements needed for unrestricted use of airspace above neighboring lands. Thus, while not required, Crocker voluntarily eliminated a turbine location in the southeast quarter of Township 118N, Range 59W, Section 13 and shifted another turbine in the southwest quarter of the same section (which has subsequently been removed) following discussions with the private airstrip owner.

Crocker will mark and light the turbines to comply with FAA requirements. Crocker will paint meteorological towers red at the top to improve visibility and will notify local airports about the Project and new towers in the area to reduce the risk to crop dusters. Crocker will work with landowners on coordinating crop dusting activities. Permanent meteorological towers will be free-standing with no guy wires and equipped with dual beacons at the top of the tower (white flashing during the day and red strobes at night) and continuous red beacons at approximately one-half the tower height. Temporary meteorological towers have supporting guy wires which will be marked with safety shields (colored balls) for increased visibility.

A condition of the Clark County CUP requested a study to determine the feasibility of installing ADLS. In order to complete this study, Crocker was required to re-file the Project with the FAA. When a project is refiled, the FAA deletes the previous determinations because they prohibit cumulative evaluation of radar impacts. The study is unknown as the FAA does not have a timeline to complete their reviews. Crocker is also evaluating a number of issues related to ADLS, including installation requirements, which include additional lattice towers to mount the radars, and if acceptable terrain is present for adequate radar coverage. Crocker has been working with a technology vendor to determine the suitability/cost requirements of the technology and an analysis will be provided to Clark County once complete.

9.7.4 Cultural Resources

9.7.4.1 Existing Cultural Resources

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

Crocker initiated consultation with the South Dakota State Historical Society ("SDSHS") in April 2016; the SDSHS recommended conducting a record search from the South Dakota Archaeological Research Center ("SARC"), Level III Intensive Survey prior to ground disturbance, completing an analysis of the visual effects on cultural resources, and contacting the Tribal Historic Preservation Officers in South Dakota.

Archaeological Resources

Tetra Tech performed a Level I Records Search of archaeological resources within the environmental survey corridor and a 1-mile buffer around the environmental survey corridor (i.e., the Archaeological Study Area). The file review was received from the SARC in October 2016. This file review included identification of archaeological sites recorded during previous surveys within the environmental survey corridor and within the Archaeological Study Area.

The literature review identified one previously recorded archaeological resources within the environmental survey corridor (Table 9-30) and 12 previously recorded archaeological sites within the Archaeological Study Area (Table 9-30). Site 39CK0048, a former Euro-American farmstead, is located within the survey corridor for the proposed Transmission Facility. No proposed transmission poles are located in the site boundary, therefore, no direct impacts to the site are anticipated. Due to the sensitivity of this data, it is provided on a confidential Figure to the Commission.

The 12 sites include 1 Native American stone feature site with a burial, 2 Native American sites with stone circles and artifact scatters, 2 Native American sites with stone circles, 3 Native American sites with artifact scatters, 1 Native American surface feature, 2 Euro-American sites associated with abandoned farmsteads, and 1 Euro-American isolated find (Table 9-30).

Table 9-30: Previously Recorded Archaeological Sites within the Environmental Survey Corridor and the Archaeological Study Area

Site Number	Site Type	Cultural Affiliation	NRHP Eligibility	Survey Corridor/Study Area	Recommendation
39CK0003	Stone Circle, Cairn, Burial	Native American	Unevaluated	Study Area	Site is located outside the survey corridor
39CK0008	Artifact Scatter	Native American	Unevaluated	Study Area	Site is located outside the survey corridor
39CK0010	Artifact Scatter/Stone Circle	Native American	Unevaluated	Study Area	Site is located outside the survey corridor
39CK0013	Surface Feature	Native American	Unevaluated	Study Area	Site is located outside the survey corridor

Table 9-30: Previously Recorded Archaeological Sites within the Environmental Survey Corridor and the Archaeological Study Area

Site Number	Site Type	Cultural Affiliation	NRHP Eligibility	Survey Corridor/Study Area	Recommendation
39CK0014	Stone Circle	Native American	Unevaluated	Study Area	Site is located outside the survey corridor
39CK0019	Artifact Scatter	Native American	Unevaluated	Study Area	Site is located outside the survey corridor
39CK0020	Isolated Find	Euro-American	Unevaluated	Study Area	Site is located outside the survey corridor
39CK0023	Artifact Scatter	Native American	Unevaluated	Study Area	Site is located outside the Project survey corridor
39CK0024	Artifact Scatter/ Stone Circle	Native American	Unevaluated	Project Area	Site is located outside the survey corridor
39CK0030	Stone Circle	Native American	Unevaluated	Project Area	Site is located outside the survey corridor
39CK0033	Foundation	Euro-American	Unevaluated	Project Area	Site is located outside the survey corridor
39CK0048	Farmstead/ Dump	Euro-American	Unevaluated	Project Area	Site is located in the survey corridor, but will not be impacted

Architectural Resources

Tetra Tech performed a Level I Records Search of architectural resources within the environmental survey corridor and a 1-mile buffer around all aboveground facilities, including the proposed wind turbines and meteorological tower locations (i.e., Historic Structures Review Area). No previously documented architectural resources were identified in the environmental survey corridor; however, three previously documented architectural resources are documented within the Historic Structures Review Area (Table 9-31). The documented resources include the NRHP-listed Bradley First Lutheran Church (NPS Reference Number: 00001213; State Historic Preservation Office ["SHPO"] ID. CK00000007) and Cemetery (SHPO ID. CK00000008), and a bridge (SHPO ID. CK00000045), which is considered not eligible for listing on the NRHP.

Table 9-31: Previously Recorded Architectural Resources within the Historic Structures Review Area

SHPO ID	Property Name	Property Category	NRHP Eligibility
CK00000007	Bradley First Lutheran Church	Religion	National Register Listed
CK00000008	Bradley First Lutheran Cemetery	Religion	National Register Eligible
CK00000045	Bridge	Transportation	Not Eligible

Class III Cultural Resources Inventory of Architectural Resources

Through consultation with Ms. Paige Olsen of the SDSHS, it was determined that the structures within the Historic Structure Review Area for the Project did not need to be reassessed based on the results of a 2016 county-wide survey. A Findings of Effects Study is recommended to determine potential impacts from the proposed Project to one NRHP-listed resource. This study will be conducted after the Area of Potential Effect for visual effects is confirmed with the USFWS.

Once complete, the Findings of Effects Study will be submitted to the USFWS and SDSHS for review and concurrence, and will also be provided to SDPUC.

Class III Cultural Resources Inventory of Archaeological Resources

A Level III Intensive Survey of the environmental survey corridor is underway to identify archaeological resources. The survey is 80% complete and will be completed during Spring 2018. The pedestrian survey for the Level III Intensive Survey resulted in the documentation of 97 archaeological resources including 37 Native American Resources, 59 Euro-American resources, and 1 Native American/Euro-American resource. The Native American resources include 5 lithic scatters, 13 suspected cairns, 1 stone circle, and 18 isolated finds. The Euro-American resources include 13 sites associated with abandoned farmsteads, 12 dumps (8 of which appeared to contain modern debris only), 9 field stone lines, 8 farm machinery isolated finds, 9 field stone piles (6 of which also appeared to contain modern and historic debris), 6 segments of railroad grade associated with Site 39CK2003, 1 depression containing field stones, and 1 artifact scatter associated with a former airfield. The Native American/Euro-American site is a lithic scatter mixed with an early twentieth century artifact scatter. Modern cultural materials were recorded during the survey, which includes the eight modern dumps and the nine fieldstone piles; Tetra Tech does not consider these to represent archaeological sites and does not intend to pursue site numbers for these resources.

Of the 97 cultural resources documented during the pedestrian survey, 70 resources and their associated avoidance buffer have been avoided and are no longer within the environmental survey corridor. Of the remaining 27 resources located in the environmental survey corridor, avoidance is not recommended for five Euro-American isolated finds, four Euro-American fieldstone piles, and one modern dump. Due to a prominent topographic position, avoidance is

recommended for one Euro-American fieldstone pile (CR_47), and avoidance is also recommended for Native American lithic scatter 39CK0073. A determination of eligibility assessment is recommended for the 5 railroad grade segments in the survey corridor, and shovel testing is recommended for the 10 Native American isolated finds in the survey corridor.

Tetra Tech shovel tested 15 proposed wind turbine locations in October 2017 within portions of the environmental survey corridor located on non-USFWS easement parcels. Subsurface lithic scatters consisting of non-temporally diagnostic materials were documented at 8 of the 15 proposed turbines. All of the documented sites have been avoided.

Once complete, the Level III Intensive Survey will be submitted to USFWS and SDSHS for review and concurrence, and will also be provided to SDPUC.

9.7.4.2 Impacts to Cultural Resources

Architectural Resources

A Findings of Effect Study is underway to determine if one NRHP-listed resource will be adversely visually impacted by the Project. If an adverse effect is found, the Applicant will work with the USFWS and the SDSHS to develop an appropriate mitigation plan.

Archaeological Resources

The Applicant is committed to avoidance of all archaeological resources potentially eligible for listing in the NRHP, sites deemed culturally sensitive, or sites that have not been evaluated for eligibility following the guidelines outlined by SDSHS. Avoidance buffers will be placed around archaeological resources that fall within these categories to ensure that the Project exerts no adverse impacts on these resources.

9.7.4.3 Mitigation Measures for Cultural Resources

The Project will avoid impacts to cultural resources. Any sites will be fenced along the avoidance buffer perimeter to reduce potential that they would be inadvertently disturbed during construction. An Unanticipated Discovery Plan will be prepared for the proposed Project outlining the procedure to follow in order to prepare for and address any unanticipated discoveries of cultural resources, including previously undiscovered archaeological sites and possible human remains. This plan will provide direction to on-site personnel and their contractors as to proper procedure to follow if unanticipated discoveries occur during construction of the Project. Therefore, no significant impacts on cultural resources are anticipated from the Project.

If human remains are identified during construction of the Project, work would immediately halt within a minimum of 100 feet of the site, and the site would be protected until SDSHS and the SARC are consulted, in addition to any involved Tribes that express interest in the proposed Project and identify a potential impact.

If confirmed or potential human skeletal remains are discovered, the Clark County Sheriff's office will be contacted. The Sheriff will call the South Dakota State Forensic Examiner to

determine whether the remains are associated with a crime scene. If the remains are determined not to be part of an active crime scene or investigation, the South Dakota Chief Archaeologist will be contacted.

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

With the exception of the turbine model and micro-siting flexibility requested in Section 4.2, Crocker does not have any current plans to add to or modify the Project.

11.0 RELIABILITY AND SAFETY

11.1 Wind Farm Facility Reliability and Safety (ARSD 20:10:22:33.02)

The Project will be available at least 97 percent of the time, consistent with other utility-scale wind projects.

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

- The towers will be setback from occupied homesteads as described in this Application and the applicable regulations identified herein. Distances from participating homes are considered to be safe based on developer experience, and are consistent with prior Facility Permits. Setbacks from non-participating residences exceed industry standards and any impacts from turbines is negligible.
- Security measures will be taken during the construction and operation of the Project including temporary (safety) and permanent fencing, warning signs, and locks on equipment and wind power facilities.
- Regular maintenance and inspections will be implemented to minimize the potential for blade failures.
- Turbines will sit on steel enclosed tubular towers within which all electrical equipment will be located, except for the pad-mounted transformer where applicable.
- Access to the interior of the tower is only though a solid steel door that will be locked when not in use.
- Permanent meteorological towers will be free-standing. The guy wires on temporary meteorological towers will have color sleeves at ground level to increase visibility.
- Where necessary or requested by landowners, the Applicant will construct gates or fences.
- Safety training will be conducted and standardized practices will be implemented for construction crews and on-site personnel.

Crocker and its construction team will coordinate with first responders, including but not limited to air ambulance, local sheriff's office(s) and local fire services, to develop an emergency management plan during construction and operations of the Project. The emergency management plan will cover actions to be taken in the event of an accidental release of contaminants. The Project will have minimal waste as a result of operation and all required permits for handling

contaminants will be obtained. Crocker has and will be in contact with local first responders to offer information about the Project and to answer any questions response teams may have regarding project plans and details. Crocker will also coordinate with South Dakota One-Call and pipeline companies before construction begins

11.1.1 Electromagnetic Fields and Stray Voltage

The term electromagnetic field ("EMF") refers to electric and magnetic fields that are present around any electrical device, including household appliances. Electric fields arise from the voltage or electrical charges and magnetic fields arise from the flow of electricity or current that travels along transmission lines, power collection (feeder) lines, substation transformers, house wiring, and electrical appliances. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the current flow through the conductors (wire). EMF can occur indoors and outdoors. However, there are no discernible health impacts from power lines (National Institute of Environmental Health Sciences ["NIEHS"], 1999). The proposed interconnection transmission line will be located adjacent to the O&M facility. Wind turbine generators and associated interconnection cables will be setback from residences in excess of State standards, where EMF will be at background levels.

EMF from underground electrical collection lines dissipates very close to the lines because they are installed below ground within insulated shielding. The electrical fields are negligible, and there is a small magnetic field directly above the lines that, based on engineering analysis, dissipates within 20 feet on either side of the installed cable. EMF associated with the transformers at the base of each turbine completely dissipates within 500 feet, so the 3,960 feet minimum turbine setback from non-participating residences and 1,000 feet setback from participating residences will be adequate to avoid any EMF exposure to homes.

Stray voltage is a natural phenomenon that is the result of low levels of electrical current flowing between two points that are not directly connected. Electrical systems, including farm systems and utility distribution systems, must be adequately grounded to the earth to ensure continuous safety and reliability, and to minimize this current flow. Potential effects from stray voltage can result from a person or animal coming in contact with neutral-to-earth voltage. Stray voltage does not cause electrocution and is not related to ground current, EMF, or earth currents. Problems are usually related to the distribution and service lines directly serving the farm or the wiring on a farm affecting confined farm animals.

In those instances where distribution lines have been shown to contribute to stray voltage, the electric distribution system directly serving the farm or the wiring on a farm was directly serving the farm or the wiring on a farm was directly under and parallel to the transmission line. These circumstances are considered in installing transmission lines and can be readily mitigated. Problems related to distribution lines are also readily managed by correctly connecting and grounding electrical equipment.

No impacts due to electromagnetic fields or stray voltage are anticipated and, therefore, no mitigation is proposed.

11.2 Transmission Facility Reliability and Safety (ARSD 20:10:22:35)

11.2.1 Transmission Line Reliability

As previously mentioned, transmission lines are designed to operate for decades. Typically, they require only moderate maintenance, particularly in the first few years of operation. The estimated service life of the proposed Transmission Line is approximately forty years. Transmission infrastructure includes very few mechanical elements, which results in reliability. It 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.

11.2.2 Transmission Line Safety

The Transmission Line Route 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 right-of-way widths. The Applicant's contracted crews will comply with local, State, and good utility standards regarding installation of facilities and standard construction practices. Crocker will use proper signage and guard structures when stringing wire across roads and railroads. Installation of the guard structures and signage will be coordinated with the owner of the transportation corridor being protected. Guard structures can be temporary wood poles with a cross arm or line trucks with their booms used to hold the wire and protect the lanes of traffic.

The proposed transmission line will be equipped with protective devices, such as breakers and relays, to safeguard the public from the transmission line if a transmission line or pole falls or other accident occurs. Breakers and relays are located where the line connects to the 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.

11.2.2.1 Electromagnetic Fields and Stray Voltage

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

Concerns about health effects of EMF from power lines were first raised in the late 1970s. Since then, considerable research has been conducted to determine if exposure to magnetic fields, such as those from high-voltage power lines, causes biological responses and health effects. Initial epidemiological studies completed in the late 1970s showed a weak correlation between

surrogate indicators of magnetic field exposure (such as wiring codes or distance from roads) and increased rates of childhood leukemia (Wertheimer 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 electromagnetic fields are present everywhere in our environment. Natural electric fields in the atmosphere range from background static levels of 10 to 120 volts per meter ("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.

Crocker conducted an EMF study for the transmission line and estimated the maximum magnetic field at 62.98 mG, which occurs at approximately 10 feet from the proposed transmission line centerline. The maximum electric field for the Crocker transmission line is calculated to be 6.73 kV/m at 15 feet from the proposed transmission line centerline. At 75 feet from the proposed transmission line centerline (the edge of the proposed right-of-way), the calculated electric field is 1.11 kV/m. The results of this study are presented in Appendix J.

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. 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 taken to prevent stray voltage problems.

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

12.1 Permits and Approvals

Crocker is responsible for undertaking all required environmental review and will obtain all permits and licenses that are required following issuance of the Facility Permit. The potential permits or approvals that have been identified as being required for the construction and operation of the Project are shown in Table 12-1.

Table 12-1: Permits and Approvals

Regulatory Authority	Permit/Approval	Status
Federal Approvals		
USFWS – Lead Federal Agency, Waubay Wetland Management District	Easement Exchange Program	4th Quarter 2019
	Special Use Permit for temporary impacts on wetland and grassland easements	3rd Quarter 2018
USFWS, Region 6 Ecological Field Office	ESA Section 7 Consultation on threatened and endangered species	2nd Quarter 2018
USFWS in coordination with the SDSHS and Tribal Historic Preservation Offices	National Historic Preservation Act Section 106 Review (Class I Literature Review / Class III Cultural Field Study)	4th Quarter 2017
USACE	Wetland Delineation Approvals	2nd Quarter 2018
	Jurisdictional Determination	2nd Quarter 2018
	CWA Section 404 and Section 10 Permit(s)	2nd Quarter 2018
EPA (Region 8) in coordination with the South Dakota Department of Health	SPCC Plan	2nd Quarter 2018
FAA	Form 7460-1 Notice of Proposed Construction or Alteration (Determination of No Hazard)	Ongoing – future revisions may be required depending on layout
	Notice of Actual Construction or Alteration (Form 7460-2)	As required by the FAA
FCC	Non-Federally Licensed Microwave Study	Completed
	NTIA Communication Study	Completed
Federal Energy Regulatory Commission	Exempt Wholesale Generator Self Certification	Before operations

Table 12-1: Permits and Approvals

Regulatory Authority	Permit/Approval	Status
	Market-Based Rate Authorization	Before operations
FEMA	Floodplain Designation	1st Quarter 2018
State of South Dakota Approvals		
South Dakota Aeronautics Commission	Aeronautical Hazard Permit	2nd Quarter 2018
SDPUC	Application for Facility Permit	2nd Quarter 2018
SDSHS	Cultural and Historic Resources Review and Review of State and NRHP and Archeological Survey	4th Quarter 2017
SDDENR	Section 401 Water Quality Certification	2nd Quarter 2018
	NPDES General Stormwater Permit for Construction Activity	2nd Quarter 2018
	Temporary Water Use Permit for Construction Activities	Ongoing during construction
	Water Rights Permit for Nonirrigation Use	2nd Quarter 2018
	Temporary Discharge Permit	2nd Quarter 2018
	Air Quality Permit	2nd Quarter 2018
SDDOT	Utility Permits on Trunk Highway Right-of-way	2nd Quarter 2018
	Oversize/Overweight Permit for State Highways	Ongoing during construction
	Tall Structure Permit	2nd Quarter 2018
Local Approvals		
Clark County	Right-of-way permits, crossing permits, driveway permits for access roads, building permit for O&M building, oversize/overweight permits for County Roads, conditional use permit and building permit for WES and transmission line	2nd Quarter 2018
Townships	Right-of-way permits, crossing permits, driveway permits for access roads, oversize/overweight permits for township roads	2nd Quarter 2018

12.2 Agency Coordination

Crocker has coordinated with various Federal, State, and local agencies to identify agency concerns regarding the proposed Project in various manners of communication. Project notification letters were sent to these agencies on April 18, 2016 and October 24, 2016. Additionally, Crocker has been coordinating with Clark County and the townships within the Project Area, including Ash Township, Cottonwood Township, Spring Valley Township, Warrant Township, and Woodland Township. A summary of agency comments and coordination is provided below. Agency response letters are provided in Appendix H.

12.2.1 United States Fish and Wildlife Service

The USFWS provided comments on the Project on May 18, 2016 and November 29, 2016. Additionally, Crocker has coordinated closely with USFWS Ecological Services and the Waubay Wetland Management District through meetings, conference calls, and site visits. The USFWS's applicable comments are summarized below. Crocker provides a response to each of the topics below, and elsewhere (as indicated) in this Application:

- USFWS easements: The Project is within the USFWS' Waubay Wetland Management District. There are numerous grassland and wetland easements in the Project Area. To determine the exact locations of these properties, coordination with the Waubay office is required.
    - Crocker been coordinating with the Waubay Wetland Management District to obtain grassland and wetland easement data, coordinate field reviews, and review various iterations of the Project design. Crocker and the USFWS conducted field reviews of protected wetland basins November 21-22, 2017. This field review assessed historic wetland basins compared to delineated wetland basins. Additionally, Crocker and the USFWS had a conference call on November 27, 2017 to discuss minimizing the impacts of turbines and associated infrastructure on grassland easements. The layout reflected in this Application incorporates design suggestions by the USFWS to the extent practicable, while balancing setbacks, constructability, noise, shadow flicker, cultural resources, sensitive habitat, and other factors.
- Threatened/Endangered species: The whooping crane, rufa red know, NLEB, and Poweshiek skipperling may occur in the Project Area.
    - Whooping crane: During 18 months of avian use surveys, Crocker has not observed any whooping cranes. Per USFWS guidance, Crocker will implement a whooping crane monitoring plan. Additionally, Crocker will coordinate with the USFWS regarding conservation measures identified for transmission lines in the Region 6 guidance and APLIC (2012) standards.
    - Rufa red knot: The USFWS did not provide specific guidance on this species and it has not been observed to date at the Project during 18 months of avian surveys.
    - NLEB: Crocker conducted acoustic presence/absence surveys for the NLEB during 2016. No NLEBs were detected (Section 9.3.3).

  - Poweshiek skipperling: Crocker evaluated potential habitat for this species and Dakota skipper using a tiered approach. First, potential habitat was identified through a desktop analysis with various GIS datasets. Second, in-field habitat assessments were conducted at potentially suitable habitat locations identified in the desktop analysis; and third, presence/absence surveys were completed in areas supporting potentially suitable habitat (i.e., appropriate forage and larval plant species) during the flight period 2017. No Poweshiek skipperlings or Dakota skipper were recorded (Section 9.3.3).

- Bald Eagles
  - Crocker conducted bald eagle nest and use surveys in 2016 and 2017. There are no nests in the Project Area and current use survey data indicates low use within the Project Area (Section 9.3.2).
- BCC and Other Grassland Birds: The Migratory Birds Division of the USFWS has published BCC (USFWS, 2008), which identifies species in need of coordination and proactive conservation. Primary threats to these species in South Dakota are habitat loss and fragmentation. The USFWS recommends avoidance, minimization, and, if necessary, compensation to reduce impacts to species protected by the MBTA.
  - Section 9.3.2 and the BBCS (Appendix D) includes a discussion on BCC as well as grassland birds.

12.2.2 United States Army Corps of Engineers

The USACE provided comments on the Project on June 22, 2016. The agency's comments are specific to Section 404 of the CWA, which calls for Federal regulation of the discharge of dredged or fill material into certain waterways, lakes and/or wetlands (i.e., waters of the United States). If the project involves either the discharge of dredged or fill material into waters of the U.S., Crocker will be required to apply for a Department of Army permit.

As discussed in Section 9.2.2.3, Crocker has completed wetland delineations to identify waters of the U.S. for 78 percent of the Project and will complete the remaining delineations during Spring 2018. Project facilities have been sited to avoid and minimize permanent and temporary impacts to wetlands and waterbodies.

12.2.3 South Dakota Game, Fish, and Parks

In its letter dated March 14, 2016 (likely a misprint on date as this precedes Crocker's initial project notification letter), the Wildlife Division provided several comments on wildlife and their habitats. Crocker provides a response to each of the topics outlined in the SDGFP March 14, 2016 letter below, and elsewhere (as indicated) in this Application:

- Recommended conducting appropriately-timed pre-construction wildlife surveys to document current site conditions and assess any potential impacts to wildlife habitat using established survey protocols and those written reports be submitted to SDGFP.
  - Crocker has conducted several avian and bat studies, including avian use studies, raptor and eagle nest surveys, lek surveys, bat acoustic surveys, NLEB

presence/absence acoustic surveys, grassland avian use surveys, and Dakota skipper and Poweshiek skipperling habitat assessment and presence/absence surveys. Crocker is committed to completing two years of pre-construction avian use surveys. Protocols for these surveys are consistent with the USFWS Land-Based WEG (USFWS, 2012) and/or have been coordinated with SDGFP and USFWS. Reports have been submitted to the agencies as they become available.

- Grasslands: Remnant prairie tracts have high conservation value, especially those that contain a high diversity of both plant and animal species with non-native, invasive plant species being rare or absent. The Agency recommended surveys for untilled tracts of native prairie and to site turbines in cultivated areas and that Crocker minimize habitat fragmentation by avoiding placement of turbines and roads in contiguous blocks of grassland. Finally, SDGFP recommended that Crocker limit ground disturbance to decrease the opportunity for introduction and establishment of non-native, invasive plant species, and should use native seed sources to stabilize any soil disturbance to reduce non-native, invasive plant species encroachment.
    - The Project footprint has been evaluated for natural communities. In untilled areas, the field assessment documented grazing (light, moderate, or heavy), diversity (low, moderate, or high), community composition (native dominant, non-native dominant, and native and non-native), use (grassland, hay, pasture, hunting, treeline), and overall quality (ranking between 3-9). This data is described and analyzed for the Project layout in Section 9.3.1;
    - Crocker will coordinate with SDGFP, USFWS, USDA NRCS, and landowners on seed mixes to be used during restoration.
- Grassland birds: SDGFP indicated that the placement of a wind farm in the proposed Project Area may reduce habitat suitability for grassland birds (increase habitat fragmentation and invasive species) and modify behavior (e.g., avoidance). SDGFP recommend conducting properly timed, species-appropriate surveys for breeding grassland birds (songbirds and grouse).
    - Crocker has conducted grassland avian use surveys and lek surveys (Section 9.3.2).

12.2.4 South Dakota Department of Environment and Natural Resources

Crocker has received several responses from SDDENR's various programs. Overall, SDDENR indicated in its May 9, 2016 letter that the construction of the Project, using conventional construction techniques, should not cause violation of any statutes or regulations administered by SDDENR. The agency notes that appropriate erosion and sediment control measures must be installed to control the discharge of pollutants from the construction site. If the Project disturbs more than one acre, the Project will require authorization under the General Permit for Storm Water Discharge Associated with Construction Activities. Additionally, a Surface Water Discharge Permit may be required if any construction dewatering should occur as a result of the Project. Finally, impacts to tributaries and wetland should be avoided or minimized, if possible.

On April 22 and November 11, 2016, the Surface Water Program indicated that based on the information provided in the Project notification letters, the Project will have little or no impact

on waste management in the area, including hazardous waste, solid waste, and asbestos. Similarly, on April 27 and October 28, 2016, the surface water program determined that based on the information in the Project notification letters, the Project will not have adverse environmental effects to drinking water in this area. Both letters recommend coordination with the local rural water system to ensure no impacts to existing lines. Crocker has been coordinating with the Clark Rural Water System and will continue to work with them throughout project development.

The Air Quality Program provided comments on the Project on April 25, 2016 and indicated the project will not cause a significant impact on the air quality of South Dakota and the Project is approved. The agency also notes that if the Project requires a temporary batch plant, a general permit will be required to operate.

The Ground Water Quality Program provided responses on May 2 and November 10, 2016. Both letters indicate SDDENR does not anticipate adverse impacts to ground water quality by this project. The Program also identified one petroleum or other chemical release in the vicinity of the Project Area in the April 2016 project notification letter; an additional release was identified in proximity to the Project based on the expanded Project Area in the October 2016 project notification letter. These releases are associated with farmsteads in the Project Area and will not be impacted. Finally, the Program notes that in the event contamination is encountered during construction activities or is caused by construction activity, Crocker or its designated representative, must report the contamination to SDDENR. The contaminated soil must be temporarily stockpiled and sampled to determine disposal requirements. The Ground Water Quality Program response requested notification once a transmission line route was established. Crocker provided notification the transmission line will be located within the Project Area and the SDDENR indicated they had no additional comments or need for review.

Crocker will obtain authorization under the General Permit for Storm Water Discharge Associated with Construction Techniques. Crocker anticipates submitting its permit application during second quarter of 2018. If the Project will require a batch plant, Crocker will apply for a general permit from the Air Quality Program.

12.2.5 South Dakota State Historical Society

SDSHS provided comments on May 9 and November 7, 2016. The agency recommended several steps be taken to identify cultural resources including obtaining a record search from the SARC, conducting a Level III Intensive Survey prior to ground disturbance, completing an analysis of the visual effects on cultural resources, and contacting the Tribal Historic Preservation Officers in South Dakota.

Crocker has completed the record search from SARC (see Section 9.7.4). The Level III Intensive Survey is 80 percent complete and expected to be completed during Spring 2018, as weather permits. Crocker continues to coordinate with SDSHS on the Project.

12.2.6 National Telecommunications and Information Administration

The NTIA provided comments on May 16, 2016. After a 45+ day period of review, the Agency received responses from the USDA and DOJ stating, “no harmful interference anticipated.” The DOE and DOC identified concerns regarding blockage of their radio frequency transmissions.

The DOE noted the Project has potential to interfere with DOE Western operations. Western has three paths that run through the Project Area from the Clark Repeater. Western indicated on December 1, 2017 that the Project will not cause problems for Western and the Clark Repeater. Additional analysis may be required for Basin Electric and East River Cooperative, both utilities Western coordinates with.

The DOC, which includes NOAA, provided comments specific to potential weather radar impacts. The Agency notes that a portion of the Project falls within the Notification Zone. That is, due to the proximity of the Project to the Aberdeen Weather Surveillance Radar – 1988 Doppler, NOAA's Radar Operations Center would like to reevaluate the Project when turbines are sited, and track the Project to completion. Turbine placement may impact the radar's precipitation estimates over the northern portion of the Project Area. However, the Agency does not anticipate impacts to critical tornado detection and will not request mitigation.

Crocker submitted an updated project boundary to NTIA for review on November 16, 2017 and a response is pending. The Applicant will continue to coordinate with NOAA on turbine placement and avoiding or minimizing potential impacts to weather radar. Refer to Section 9.5.7.3 for potential mitigation measures.

12.2.7 Interstate Telecommunications Cooperative, Inc.

ITC provided comments on the Project on October 26, 2016. The utility commented on concerns with inductive interference, which can happen when collection lines of the wind farm parallel telephone lines; crossings have not proved to have the same effect as paralleling. The utility provided data for their facilities and locations of concern based on a previous layout. Consultation on the current layout is underway and Crocker will execute an agreement with the ITC prior to construction to mitigate potential impacts. Additional information is located in Section 9.5.7.

12.2.8 Clark County

As discussed in Section 8.0, Crocker has been coordinating with Clark County and received a CUP in April 2017. Informal communication occurred with the Highway Superintendent of Clark County while attending regularly scheduled Clark County Commission meetings. For instance, it was communicated that Crocker will be reaching out following permitting to begin formal coordination on a road use agreement. Additionally, Crocker responded to a March 2017 e-mail from County staff on behalf of the Highway Superintendent regarding projected road use and construction methods, and offered to have a meeting with the appropriate County staff and the Highway Superintendent to continue discussion on road use. A reply from Clark County was not received. As required by the Project's CUP, road use agreements will be in place and provided to Clark County 60 days prior to construction.

12.2.9 Ash, Cottonwood, Spring Valley, Warren, and Woodland Townships

Following the distribution of project notification letters, Crocker placed follow-up calls to townships to address any questions/concerns and offered to attend a township meeting. None of the townships at least partially within the Project Area, including Ash, Cottonwood, Spring Valley, Warren, and Woodland Townships, have provided comments on the Project. Crocker

will coordinate with townships in the Project Area to execute road agreements in 2018 prior to construction.

12.3 Local Community Input

Non-participating community members have expressed concern regarding turbine setbacks from residences and a privately-owned airstrip located outside of the Project boundary. The Clark County Zoning Ordinance stipulated a minimum setback of 1,000 feet from non-participating residences, which sufficiently protects the health and welfare of residents in and around the Project. This has been demonstrated through various studies conducted by industry experts. Crocker conducted a noise study to ensure the Project's maximum noise levels would not exceed the Clark County Zoning Ordinance noise standard of 50 dBA at specified receptors, including any non-participating residence. Crocker also conducted a shadow flicker study, which is not required or regulated at the local, State, or Federal level, to ensure shadow flicker levels are 30 hours or less (less than 1 percent of daylight hours) for non-participating residences. Additionally, an EMF study was conducted for the transmission line and concluded the projected electric field intensity are well-within industry standards, and no adverse impacts are expected (refer to Appendix J of the application). Additionally, Crocker voluntarily eliminated a turbine location and shifted a second turbine location to accommodate concerns raised by a private airstrip owner located outside of the Project boundary during the CUP process.

Despite compliance with applicable standards, the Project has been further modified to comply with the ¾ mile setback condition established by Clark County as a condition to the CUP. Further, as a result, the turbine shifted to accommodate the private airstrip owner has been eliminated.

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

As described in Section 1.4, 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.

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

Accompanying this Application are prefiled testimony and accompanying exhibits from the following individuals:

- Barry Fladeboe;
- Betsy Engelking;
- Rob Copouls;
- Brie Anderson;
- Eddie Duncan;
- Michael Morris; and
- Dr. Mark Thayer.

Crocker reserves the right to provide supplemental and/or rebuttal testimony, as needed, to further support this Application.

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