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Certification Page

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APPENDICES

1.0 Introduction

Three Waters Wind Farm, LLC (Three Waters or Applicant), a Delaware limited liability company and a wholly owned subsidiary of Scout Clean Energy, is requesting a Certificate of Need (CN) and Site Permit (SP) from the Minnesota Public Utilities Commission (Commission or MPUC) for an up to 201-megawatt (MW) wind farm and associated facilities, including a short length of 345-kilovolt (kV) transmission line (~300 feet) (collectively, the Wind Farm) that will be directly adjacent to an existing transmission line at the point of interconnect (POI). The Wind Farm is referred to as the Project. The Applicant respectfully submits this Site Permit Application (SPA or Application) to the Commission to construct and operate the Project.

The proposed Project is a large wind energy conversion system (LWECS), as defined in the Wind Siting Act (Minnesota Statues [Minn. Stat.] Chapter [Ch.] 216F). The Applicant will develop, design, permit, and construct the Project. Development of the Project was initiated in 2016, including land acquisition, initial environmental studies, and other development activities. The Project is scheduled to begin construction in the fourth quarter of 2020, with an anticipated in-service and commercial operation date (COD) in fourth quarter of 2021, pending Commission and related approvals.

The Project would be situated within an approximately 48,087-acre area (Project Area) located southwest of the City of Lakefield in Jackson County, Minnesota (see attached Figure 1). The Project's Minnesota site permit boundary spans land parcels in Ewington, Round Lake, Sioux Valley, Rost, Hunter, and Minneota Townships in Jackson County. The Iowa portion of the Project encompasses approximately 11,000 acres. Three Waters is seeking the CN determination and SP approval for the entire up to 201 MW Project in Minnesota and is working to site all turbines in Minnesota. Three Waters reserves the right to site turbines at alternate turbine locations within Osceola and Dickinson counties in Iowa.

The determination as to the distribution of the Project within Minnesota and Iowa will be made prior to construction and is dependent upon discussions with landowners and land rights, applicable permitting requirements and processes, final micro-siting and engineering. For the purposes of this Application, the analyses presented herein focus on the impacts to Minnesota land and Minnesota residents and include analysis of impacts to Minnesota land and Minnesota residents from turbines sited in Iowa. For example, the noise and shadow flicker models incorporate all proposed turbine locations in Minnesota and Iowa to determine the potential impact on occupied residences in Minnesota.

After analyzing a broader area for wind resource, geographic characteristics, easement availability, landowner interest, environmental resources, transmission availability and economic potential, Three Waters selected the Project Area (Figure 1) because of its available land, proximity to viable interconnection options, and interested local landowners. Additionally, the Project Area is located between and among a number of existing, operating nearby wind farms in an area identified as optimal from wind resource, environmental, and economic perspectives (Figure 1; see also Section 10.4, Figure 21). As shown in Figure 21, the Project can be considered an in-fill wind energy generation project in southwestern Minnesota in and amongst several existing wind farms in Minnesota and Iowa. In addition to completing its own wind resource analysis (see Section 14), Three Waters has assessed

existing wind farm energy generation data which confirms the Project Area is located in a proven, wind-energy rich resource area of Minnesota.

Project components would include:

- Up to 71 primary wind turbine locations and eight alternate locations in Minnesota[1];
- Gravel access roads to each wind turbine;
- An operations and maintenance (O&M) facility;
- Up to two permanent meteorological towers;
- Electrical power underground collection lines and communications system;
- A Project substation;
- A less than 1,500-foot-long, 345-kV transmission line from the Project substation to the POI;
- A switchyard that will be directly adjacent to the Project substation and existing transmission line at the POI;
- An Aircraft Detection Lighting System (ADLS) to the extent approved by the Federal Aviation Administration (FAA) in addition to FAA required turbine lighting; and
- Additional temporary construction areas, including crane paths, pull sites, access roads, a batch plant[2], and a laydown yard.

Three Waters has selected the General Electric (GE) 2.x wind turbine generator, which is currently a 2.82 MW wind turbine generator, as the primary wind turbine model for the Project, and is considering use of the GE 3.x machine, as further discussed in Sections 5.1 and 6.1.

The Project would interconnect with ITC Midwest's (ITC's) existing Raun-Lakefield 345-kV transmission line, with traverses the southeast portion of the Project Area located in Township 101N, Range 37W, Sioux Valley Township, Jackson County, Minnesota. The Applicant is proposing to construct a new, short length of 345-kV transmission line (~300 feet) in Jackson County from the Project substation in Township 101N, Range 37W to a switchyard that will be directly adjacent to and interconnect to ITC's line. The Applicant is currently negotiating an interconnection agreement with ITC and working through the Midcontinent Independent System Operator (MISO) interconnection process to allow the Project to interconnect to ITC's system. The interconnection details will be determined as a result of studies, discussions, and agreements with the MISO and ITC, the transmission owner.

[1] An additional 49 alternate wind turbine locations have been developed in the Iowa portion of the Project.

[2] The need for a batch plant will be determined by the contractor chosen at the time the Project is constructed.

2.0 Applicant Information

Three Waters Wind Farm, LLC is a Delaware limited liability company and a wholly owned subsidiary of Scout Clean Energy. Scout Clean Energy is a North American renewable energy development company focused on utility scale wind development. The Scout Clean Energy team has an extensive track record developing large-scale wind energy projects. Scout Clean Energy was officially formed in July 2016 as an affiliate of Harvest Energy Services, Inc., which is an affiliate through common management.

Project experience since Scout Clean Energy began in 2016 includes the Ranchero 300-MW project in Crockett County, Texas (under construction, anticipated Commercial Operations Date of September 2019), the Persimmon Creek 200-MW project in Woodward County, Oklahoma (Commercial Operations Date of August 2018), and the Bitter Ridge 130-MW Wind Farm in Jay County, Indiana (under construction). Prior to forming Scout Clean Energy, members of the team were integral in the successful development, marketing, and financing of over 5 gigawatts (GW) of utility scale wind facilities across the United States and Canada.

Scout Clean Energy is a portfolio company of Quinbrook Low Carbon Power Fund LP and Quinbrook Low Carbon Power Parallel Fund (US) LP (collectively, the Fund). The Fund is an infrastructure fund with approximately $1 billion in capital raised with investments in the United States, Europe, and Australia. With support from the Fund, Scout Clean Energy has the experience, skills, personnel, financial backing, and proven capability to successfully manage wind project development, construction, and operations and maintenance.

3.0 Certificate of Need

A Certificate of Need from the Commission is required for all "large energy facilities," defined to include generators greater than 50 MW in size. The Applicant proposes to construct a LWECS of up to 201 MW in Minnesota; therefore, a CN is required prior to issuance of the Site Permit and construction of the Project. The Applicant filed for certain exemptions from certain CN application requirements on February 12, 2019 (see MPUC Docket number IP-7002/CN-19-154). On March 26, 2019, the Commission issued an order approving certain exemption requests in this CN docket (Order). In accordance with the Order, the Applicant filed the CN application for the Project on July 31, 2019.

4.0 State Policy

LWECS site permit applications are governed by the Wind Siting Act (Minn. Stat. Ch. 216F) and Minnesota Rules (Minn. R.) Ch. 7854. The Wind Siting Act also requires an application for an LWECS site permit to meet the criteria in Minn. Stat. Ch. 216E.03 subdivision (subd.) 7. This SPA provides information necessary to demonstrate compliance with these criteria and Minn. R. Ch. 7854. In addition, this SPA has been organized following the Minnesota Department of Commerce (DOC) *Application Guidance for Site Permitting of Large Wind Energy Conversion Systems in Minnesota* (Revised July 2019, LWECS Application Guidance).

LWECS are to be sited in an orderly manner compatible with environmental preservation, sustainable development, and the efficient use of resources (Minn. Stat. Ch. 216F.03). The Project Area is located near a number of existing, operating wind farms, as well as existing transmission lines, and development of the Project will increase the efficient use of this wind-rich resource area of southwestern Minnesota (see Section 10.4 and Figure 21). As discussed in this SPA, the Applicant is designing the Project to comply with the Commission's wind turbine setback and siting guidelines.

5.0 Project Description

5.1 PROJECT OVERVIEW

The Project would be located on approximately 48,087 acres of land in Jackson County, southwest of the City of Lakefield, in southwest Minnesota along the Minnesota-Iowa border (Figure 1). The Project Area was selected based upon review and analysis of wind resources, economic considerations, landowner interest, availability of easements, access to transmission routes, interconnection of the Project to existing transmission facilities and lines, geographic features, and environmental resources (see Figures 2 and 3).

The Applicant reviewed the Project Area for critical issues and sensitive resources within which to site the Project, and is taking into account landowner participation, regulatory agency and public comments, land use and infrastructure needs and concerns, efficient and effective use of wind energy, minimization of environmental impacts, and applicable setback requirements. The Project Area includes areas where the Applicant has negotiated, and continues to negotiate, easements with landowners for development of the Project. Of the 48,087 acres within the Project Area, approximately 21,813 acres (45% of the Project Area) are currently under lease for the Project (see Figure 4 and Section 9 below for additional Wind Rights information).

Overall, there has been positive landowner support in Jackson County for the Project, and the Applicant has worked closely with the Minnesota Department of Natural Resources (MNDNR) and the U.S. Fish and Wildlife Service (USFWS) to avoid impacts to critical environmental resources. The Project is located in an area with a strong wind resource and is situated near electric transmission infrastructure (the existing ITC 345-kV Raun-Lakefield transmission line).

The Applicant has been conducting public outreach for the Project since November 2016. Such outreach includes meeting with individual landowners and landowner groups, regulatory agencies, and local governmental units to discuss the Project; identifying support or constraints for the Project; and gathering comments to address in Project planning, design, permitting, and operation (see Section 5.2 for more details).

The Project Area is located in Ewington, Hunter, Minneota, Rost, Round Lake, and Sioux Valley Townships. Figure 2 shows the locations of state, city, and township boundaries relative to the Project Area. Table 1 shows the townships, ranges, and sections that intersect the Project Area.

Table 1 Sections that Intersect the Project Area

Township Name	Township	Range	Sections
Ewington	102N	38	12, 13, 24, 25
Hunter	102N	36	30, 31
Minneota	101N	36	6
Rost	102N	37	7-10, 15-23, 25-36

Township Name	Township	Range	Sections
Round Lake	101N	38	11-15, 20-29, 32-36
Sioux Valley	101N	37	1-35

The Project Area is generally rural agricultural with low population density. Wind turbines and associated facilities are, therefore, primarily sited on agricultural lands. The Project Area consists 89% cropland, 3.8% developed, 3.7% wetlands, 0.8% open water/barren land, 0.5% pasture/grassland, and 2.1% other vegetative cover (mixed or deciduous forest, herbaceous, shrub/scrub). Figure 3 shows the major highways and roads that extend through the area. There are no active railroads or airports within or adjacent to the Project Area; the closest railroad is the Twin Cities-UP (St James - State Line) located approximately 7.5 miles northwest of the Project Area, and the closest airport, Spirit Lake Municipal Airport (IA), is approximately 9.4 miles southeast of the Project Area (Figure 21).

Places of historical significance are discussed in Section 8.6 of this Application. There are three cemeteries, one school, and one place of worship within the Project Area (Section 8.5). The Project Area is primarily drained by the Little Sioux watershed (Figure 18; MNDNR, 2018) and includes small waterbodies. Figures 18 and 19 show the locations of water resources within the Project Area; see also Sections 8.15 to 8.17.

The Project is to include an aggregate nameplate capacity of up to 201 MW, with up to 71 turbine sites (79 proposed turbine locations are included in the Project layout to allow for eight alternate turbine locations)[3]. As discussed in Section 1 above, Three Waters is seeking the CN determination and SP approval for the entire 201 MW Project in Minnesota and is working to site all turbines in Minnesota but reserves the right to locate alternate turbines (not sited in Minnesota) in Osceola and Dickinson counties in Iowa. Three Waters has entered into a power purchase agreement (PPA) with Minnesota Municipal Power Agency (MMPA) whereby MMPA agreed to purchase up to 200 MW of the energy generated by the Project. Three Waters is seeking approval for a name plate capacity of up to 201 MW to account for line losses incurred to the Project delivering its electricity to the Project substation. Three Waters will be limited to 200 MW at the point of interconnection. MMPA is not seeking Commission approval of the Three Waters PPA, nor does MMPA have a Commission-approved resource acquisition process. Accordingly, the Commission has not determined the need for the Project or approved the PPA. Therefore, Three Waters is proceeding with the CN application because the Project is not exempt from the CN requirement (see Section 3.0).

The Applicant proposes to use one of the following two turbine types for the Project: the GE 2.82 MW/127 (89 meter hub height) or the GE 2.82 MW/127 (114 meter hub height) models (see Section 6.2.2 for additional discussion of the turbine characteristics), while reserving the right to select the GE 3.x turbine. Three Waters has selected the GE 2.x wind turbine generator, which is currently a 2.82 MW wind turbine generator, as the primary wind turbine model for the Project (see Section 6.1 and Table 5). If the technology is economical and commercially proven, Three Waters may elect to utilize the GE 3.x machine,

[3] An additional 49 alternate wind turbine locations have been developed in the Iowa portion of the Project.

which is currently a 3.03 MW wind turbine generator, instead. It should be noted that GE and other turbine manufacturers are regularly improving and modifying their turbine technology. In the anticipated year-long SP process, Three Waters expects changes to the turbine technology to make them more efficient and more effective at converting wind to electrical energy such that the nameplate capacity of the turbines could increase. For example, the nameplate for the GE. 2.x machine may change from a 2.82 to a 2.87 MW machine. It is important that this SP Application account for minor changes such as this example.

Three Waters made its turbine selections based on optimization of wind and land resources, as well as cost-efficiency. The turbine selected will have Supervisory Control and Data Acquisition (SCADA) communication technology, which permits automatic, independent operation, and remote supervision that allows simultaneous control of the wind turbines. In addition, Three Waters will maintain a computer program and database to track each wind turbine's operational history.

The Project would also include other permanent facilities, including electric underground collection lines and communication lines, a Project substation, a switchyard, a transmission line to the POI, an O&M facility, access roads connecting turbines and associated facilities, up to two permanent meteorological towers, required FAA lighting, and an ADLS. Temporary facilities required during construction include improvements to public and private roads for delivery of materials and equipment, a laydown yard, and a concrete batch plant (the need for which will be determined by the contractor chosen at the time the Project is constructed). Temporary crane paths will also be used during construction. Figure 3 shows the proposed layout of the proposed LWECS facility. Table 2 lists the sections within the Project Area containing the proposed Project.

Table 2 Sections Containing Project Facilities

Township Name	Township	Range	Sections
Minneota	101N	36	6
Sioux Valley	101N	37	1-5, 8-12, 14-27, 34, 35
Round Lake	101N	38	13-15, 20-22, 24, 25, 27-29, 32-36
Hunter	102N	36	30, 31
Rost	102N	37	16-22, 25-30, 32-36
Ewington	102N	38	30

Figure 3 shows the proposed 71 primary wind turbine locations, as well as the proposed eight alternate turbine locations (see Section 6.1 site configuration alternatives). The current turbine array was designed to avoid wetland/waterbody, sensitive species and habitat and cultural resources identified during surveys completed since 2016 (mainly avian and other species field reviews) and desktop analysis. In the fall of 2019 or spring of 2020, weather dependent, the Applicant will conduct field surveys of the Project layout study area after the harvest, before snow cover, or near spring planting for wetlands/waterbodies, native prairie, other sensitive habitat and potential specific species, cultural resources, and geotechnical soil evaluation.

The results of these studies, and information contained in this SPA, will be used for micro-siting and finalizing the Project layout, as well as for use in preparing and submitting other

applicable permit applications (e.g., U.S. Army Corps of Engineers [USACE]/MNDNR Joint Permit Application for wetland/waterbody resources, Minnesota State Historical Society [SHPO] concurrence/approval, etc.). Additional minor shifts in the turbine locations may be necessary to avoid future identified cultural resources or as a result of geotechnical evaluations, landowner input, or other factors.

Figure 3 also shows the proposed locations of access roads and underground collection and communication lines. As a result of final micro-siting and the utility coordination needed to facilitate Project interconnection, shifts in the access roads and underground collection/communication systems, as well as changes in the locations of the O&M facility, meteorological towers, Project substation, switchyard, and laydown yard, may be necessary. Any changes in the locations of associated infrastructure will be appropriately handled per the site permit conditions and special conditions. Such shifts would involve similar or less impacts than those of the original proposed locations. Prior to implementing these types of changes, the Applicant would file in the docket an amendment indicating the change and demonstrating compliance with the limitations set forth above.

5.2 PROJECT OUTREACH AND AGENCY COORDINATION

Throughout Project planning and development, the Applicant coordinated with various federal, State, and local agencies and governmental authorities to identify a preferred location for the Project and to address potential concerns. Three Waters also opened a local office located in Jackson, Minnesota where Project staff work.

In early June 2019, the Applicant mailed letters to a number of federal, State and local agency representatives to inform them of the Project and request initial comments regarding the planned Project. Copies of Project outreach and requests for comments are included in Appendix A. Agency correspondence/responses and meeting summaries are included in Appendix B. Agency responses are summarized where applicable in the Environmental Analysis (Section 8) of the Application.

A summary of specific agency comments and coordination efforts is provided below.

5.2.1 USFWS and MNDNR

Coordination with the USFWS and MNDNR is summarized in Table 3 below.

Table 3 Summary of USFWS and MNDNR Agency Coordination Activities

Date	Participants[a]	Event / Topic[b]	Discussion / Main Points
May 8, 2017	USFWS, MNDNR, MNDOC, and Applicant	Meeting	Project Introduction, review site conditions and wildlife habitat, and to obtain feedback from the USFWS and MNDNR on project issues and planned studies.
May 11, 2017	MNDNR and Applicant	Consultation	Three Waters obtained a list of threatened, endangered, and special concern species, as well as sensitive and protected habitats within the Project Area.

Date	Participants[a]	Event / Topic[b]	Discussion / Main Points
August 13, 2018	USFWS, MNDNR, and Applicant	Meeting	Project updates, discuss results of avian surveys and bat surveys (including NLEB).
April 6, 2018	MNDNR and Applicant	Consultation	MNDNR provided the Applicant with a list of state threatened and endangered species and sensitive and protected habitats within the Project Area.
December 27, 2018	USFWS, MNDNR, and Applicant	Email Correspondence	The Applicant provided spatial data for raptor nest locations and meeting notes to the USFWS and MNDNR from the August 13, 2018 meeting.
August 5, 2019	MNDNR, Applicant, WEST	Meeting	Project update, review site condition/habitats, review two years of avian and bat survey results, obtain feedback on Project boundary updates.

(a) Applicant = Three Waters Wind Farm, LLC; WEST = Western EcoSystems Technology, Inc.; USFWS = U.S. Fish and Wildlife Service; MnDNR = Minnesota Department of Natural Resources; MNDOC = Minnesota Department of Commerce
(b) NLEB = northern long-eared bat

5.2.2 County

In addition to the above described outreach, the Applicant met a number of times with Jackson County representatives starting in fall 2018 and continuing to the present. The Applicant was routinely on the Jackson County Commission's agenda to provide Project updates and to address any concerns the County Commissioners and the public might have regarding the Project.

On October 16, 2018, Project representatives presented an overview of the Project to County Commissioners and reviewed information regarding Scout Clean Energy, overall project experience, specifics of the Project, and community involvement and Project benefits, and then answered questions. On March 19, 2019, Project team members made a similar presentation to the County Commissioners and updated the Commissioners on development work, design/engineering, field surveys, permitting, land acquisition and overall Project timeline. The Project has consulted and coordinated with landowners with their concerns with the siting of wind facilities throughout the development process.

In addition to the above outreach efforts, the Applicant has been involved in a number of community events, including:

2019 Community Involvement:

- Jackpot Hog Show - Sponsor
- Jackson County Food 4 Kids - Sponsor
- Jackson Motorplex - Sponsor
- Skylar Prochaska Sprint Car - Sponsor
- Duane Hanson Modified Car - Sponsor

- Chamber of Commerce - Member
- Pheasants Forever (Dickinson) - Sponsor
- Pheasants Forever (Jackson) - Sponsor
- Get up and Bowl (Special Olympics) - Sponsor
- Jackson County Farm & Home Show - Exhibitor
- To be continued - additional events in 2019 are also being planned

2018 Community Involvement:

- Jackpot Hog Show - Sponsor
- Jackson County Fair - Beer Garden Sponsor
- Jackson County Youth 4H Livestock Auction - Participant
- Purple Ribbon Auction - Sponsor
- Jackson County Food 4 Kids - Sponsor
- Farmer's Appreciation Days - Sponsor
- Jackson Motorplex - Sponsor
- Skylar Prochaska Sprint Car - Sponsor
- Lakefield Oktoberfest - Sponsor
- Chamber of Commerce - Member

5.3 ENVIRONMENTAL ANALYSIS

In addition to the above described outreach efforts, the Applicant has completed environmental studies, technical studies, and surveys for the Project listed below in Table 4.

Table 4 Environmental Studies and Surveys for the Project

Study	Date	Status[a]
Study Plan	May 2017	Complete
Baseline Avian Study, Year 1 Studies	March 2017 to February 2018	Complete
Baseline Avian Study, Year 2 Studies	March 2018 to February 2019	Complete
Bat Activity Study 2017 (Acoustic)	July to November 2017	Complete
Bat Activity Study 2018 (Acoustic)	April to October 2018	Complete
NLEB Summer Presence/Absence Survey (Acoustic)	June 2017	Complete
Eagle and Raptor Nest Surveys 2017 (Year 1)	March and May 2017	Complete
Eagle and Raptor Nest Surveys 2018 (Year 2)	April and May 2018	Complete
Habitat Mapping (included with SCS)	May 2017	Complete
Site Characterization Study (SCS)	March 2019	Complete
Bird and Bat Conservation Strategy (BBCS)	March to April 2019	In Review
Cultural Resources Phase Ia Background Literature Review	May and September 2019	Complete
Cultural Resources Survey	Spring or Fall 2020	Pending
Historical/Architectural Survey	May-July 2019	Complete

Study	Date	Status[a]
Wetland/Waterbody Delineation/Field Survey	Spring or Fall 2020	Pending
AM and FM Radio Report	May 2019	Complete
Land Mobile & Emergency Services Report	April 2019	Complete
Off-Air TV Analysis	April 2019	Complete
Microwave Study	May 2017 and April 2019	Complete
Obstruction Analysis & Airspace Analysis	August 2018	Complete
Sound Monitoring & Modeling Study	May-June and September 2019	Complete
Shadow Flicker Analysis	May-June and September 2019	Complete
Jobs and Economic Development Impact (JEDI) Model	July 2019	Complete

(a) Although several these studies are listed as "Ongoing," or "In Review", applicable resource and field survey data collected to date from these efforts have been incorporated into the impact conclusions provided in this Application, unless otherwise noted in the respective resource sections.

All planned Tier III studies are complete based upon the Study Plan (Appendix I). The BBCS (dated August 2019) as attached to this Application in Appendix I was sent to the MnDNR and USFWS for review in September 2019 (see Section 8.19 for additional discussion). Additionally, the Study Plan and all Tier III reports were resubmitted to the MNDNR in September 2019 for further review (see Sections 8.19 and 8.20 for additional discussion).

Also, as shown in in Table 4, the cultural resources field survey and wetland/waterbody field delineation are pending. In coordination with the Minnesota SHPO, Level III intensive cultural resource surveys will be conducted in Spring 2020 (before planting, if possible) or Fall 2020 (after harvest, if possible) assuming a cultural resources Area of Potential Effects (APE) based on an initial Project layout. The wetland/waterbody field delineation will be conducted in either Spring 2020 (before planting, if possible) or Fall 2020 (after harvest, if possible), in accordance with applicable USACE and MNDNR protocol, a report prepared and submitted to appropriate agency staff, and evaluation of required permits conducted concerning wetland/waterbody resources. Based on the results of these field surveys, certain wind turbines, access roads, underground collection, interconnection facilities, and crane path(s) may be modified to avoid these resources, which may alter the cultural resources APE or wetland/waterbody development area (see Sections 8.6 and 8.17, respectively, for additional discussion).

6.0 Project Design

The results of the various coordination activities and studies listed above and described herein, along with applicable setback requirements, have been used to inform the site layout and design of the Project. The Project design has been optimized based on wind resource and other factors noted above (see Figure 3). This section provides more detailed Project layout information and applicable setbacks.

Final micro-siting of Project facilities will continue to occur between now and Fall 2020 based upon the: remaining wetland and waterbodies evaluations; cultural resource surveys; ongoing biological studies (e.g., avian, habitat, etc.); Phase I Environmental Site Assessment; geotechnical analysis; landowner input; land acquisition; and final engineering design. Micro-siting will incorporate minor site-specific engineering, construction, environmental and natural resources, and landowner-requested adjustments. As discussed in more detail in the sections that follow, the remaining study work is not anticipated to affect the environmental analysis set forth in this Application, nor would it prevent the Project from meeting applicable federal, State and local permitting and/or approval requirements.

6.1 PROJECT LAYOUT AND SETBACKS

As indicated in Section 4.0 and further discussed in Section 8.2, LWECS in Minnesota are governed by the Wind Siting Act (Minn. Stat. Ch. 216F) and such projects are to be permitted by the Commission under Minn. R. Ch. 7854 and Minn. Stat. Ch. 216E.03. As noted above, the Applicant met with Jackson County starting in fall 2018 and learned of the County's Windpower Management Ordinance (WMO) (Jackson County Zoning Ordinance [JCZO], Section 734, Revised November 12, 2012; see Appendix C). The WMO applies to permitting wind energy facilities with a rated capacity of less than 25 MW. However, to the extent possible, the Applicant is designing the Project to meet County zoning requirements, as described below. The Applicant will submit applications to the County for applicable building, road use, driveway, meteorological tower, etc. permits (see Table 33, Section 16).

As discussed in Section 5.1 above, Three Waters is considering using the GE 2.82/127 turbine model with a hub height of 89 or 114 meters (290 or 374 feet), as the primary wind turbine model for the Project, and may elect to utilize the GE 3.x machine, which is currently a 3.03 MW wind turbine generator, instead. Table 5 summarizes the turbine options and characteristics under consideration. Schematic 1 (see Section 6.2.1 below) is a representative diagram depicting the GE 2.82/127 turbine. Three Waters plans to select the most appropriate technology for the Project in terms of cost efficiency and optimization of wind and land resources.

Table 5 Turbine Options and Characteristics

Model Name	Current Nameplate Capacity (MW)	Hub Height (meters/feet)	Rotor Diameter (meters/feet)	Tip Height (meters/feet)	Swept Area (sq. meters / sq. feet)
GE 2.82/127	2.82	89/292	127/417	152/499	12,668/136,354

Model Name	Current Nameplate Capacity (MW)	Hub Height (meters/feet)	Rotor Diameter (meters/feet)	Tip Height (meters/feet)	Swept Area (sq. meters / sq. feet)
GE 2.82/127	2.82	114/374	127/417	178/584	12,668/136,354
GE 3.03/140	3.03	110/361	140/459	180/591	15,394/165,698

The Applicant incorporated the wind energy conversion facility siting criteria outlined in the Commission's *Order Establishing General Wind Permit Standards*, Docket No. E, G999/M-07-1102 (January 11, 2008) (MPUC General Permit Standards), DOC Site Permit Application Guidance, Jackson County WMO, setback standards, and Three Waters standards and best practices. The Applicant also incorporated avoidance and setback recommendations from the USFWS and the MNDNR. Where setbacks differ for the same feature, the Applicant used the most stringent setback distance. Table 6 summarizes these setbacks, and Figure 3 illustrates them. Proposed Project facilities within the Project Area are shown in Figures 2 and 3.

Table 6 Wind Turbine Setbacks for the Project

Turbine Setbacks	Distance for Setback	Authority	Project Design Setback Distance
Permitting Standards			
Wind Access Buffer – Prevailing Wind Directions	5 x RD (2,083 ft [635 m]) to the N-NW and S-SE	MPUC General Permit Standards.	2,083 ft (635 m)
Wind Access Buffer – Non-Prevailing Wind Directions	3 x RD (1,250 ft [381 m]) to the SW and NE	MPUC General Permit Standards.	1,250 ft (381 m)
Participating Project Boundaries	499 ft (152.1 m) [89 m hub height] 584 ft (178.1 m) [114 m hub height]	Total height of structure including blades per JCZO (Section 734.5, for LWECS).	Not applicable
Non-participating Project Boundaries	3 x RD (1,250 ft [381 m]) non-prevailing wind axis to the SW and NE 5 x RD (2,083 ft [635 m]) to the N-NW and S-SE	3 x RD on non-prevailing wind axis and 5 x RD on prevailing wind axis per JCZO (Section 734.5, for LWECS).	1,250 ft (381 m) 2,083 ft (635 m)

Turbine Setbacks	Distance for Setback	Authority	Project Design Setback Distance
Permitting Standards			
Residences	500 ft (152 m)	MPUC General Permit Standard is 500 ft (152 m), or the distance required to meet the state noise standard of 50 A-weighted decibels (dBA); note JCZO is 750 feet and sufficient distance to meet State noise standards (Section 734.5, for LWECS).	1,320 ft (402 m)
Noise Requirements	Distance must meet the state noise standard of 50 dBA	Minnesota Pollution Control Agency (MPCA), Site Permit condition; note Jackson County has same standard (and County may impose limits relative to impulsive and pure tone noises).	Distance to meet MPCA noise standard
Public Roads & Recreational Trails	250 ft (76 m)	MPUC General Permit Standards; note JCZO is height of structure plus blades with a 250-foot minimum (Section 734.5, for LWECS).	250 ft (76 m)
Public Lands	5 x RD (2,083 ft [635 m]) to the N-NW and S-SE, and 3 x RD (1,250 ft [381 m]) to the SW and NE	MPUC General Permit Standards (similar to Wind Access Buffer setbacks indicated above).	2,083 ft (635 m) 1,250 ft (381 m)
Public Lands Managed as Grasslands	5 x RD (2,083 ft [635 m]) to the N-NW and S-SE, and 3 x RD (1,250 ft [381 m]) to the SW and NE	MPUC General Permit Standards (similar to Wind Access Buffer setbacks indicated above).	2,083 ft (635 m) 1,250 ft (381 m)
USFWS Grassland and Conservation Easements	Avoid ground disturbance impacts on these parcels	USFWS Windom Wetland Management District.	Avoidance
USFWS Wetland Easements	Avoid impacts to wetland basins within easement parcels	USFWS Windom Wetland Management District.	Avoidance
Internal turbine spacing	5 x RD downwind spacing (distance between towers), 3 x RD crosswind spacing (distance between towers),	MPUC General Permit Standards and Site Permit Application Guidance.	2,083 ft (635 m) 1,250 ft (381 m)

Turbine Setbacks	Distance for Setback	Authority	Project Design Setback Distance
Permitting Standards			
	except closer in a few instances[4]. (If required during final micro siting of the turbine towers to account for topographic conditions, up to 20 percent of the towers may be sited closer than the above spacing but the permittee shall minimize the need to site the turbine towers closer.)		
Wetlands (Cowardin classification), Types III, IV and V (If listed on PWI map shoreland setbacks apply)	Height of structure including blades	JCZO Section 734.5.	Avoidance
Protected Waters	1000 feet from the ordinary high water level of a lake, pond, or flowage; and 300 feet from a river or stream	JCZO Sections 610 and 611.	Avoidance
Additional Three Waters Design Standards			
Residences	A minimum of 1,320 ft (402 m)	Three Waters internal standard; note that the MPUC General Permit Standard is 500 ft (152 m), or the distance required to meet the state noise standard of 50 dBA; JCZO distance is 750 feet and sufficient to meet State noise standards (Section 734.5, for LWECS).	1,320 ft (402 m)
Existing Uninhabited Structures & Other Structures (Jackson County)	400 ft (122 m) & 1.25 times height of turbines (Jackson County)	Three Waters internal standard; note JCZO for Other Structures is 1.25 x height of turbine (Section 734.5, for LWECS).	400 ft (122 m) & 1.25 times height of turbines

[4] Per the MPUC General Permit Standards, 20% of the spaces between turbines may be closer. Three Waters will comply with MPUC guidance with regard to turbine spacing.

Turbine Setbacks	Distance for Setback	Authority	Project Design Setback Distance
Permitting Standards			
Public Roads and Trails	500 ft (152 m)	Three Waters internal standard. MPUC General Permit Standards are 250 ft (76 m); note JCZO is height of structure plus blades with a 250-foot minimum (Section 734.5, for LWECS).	250 feet (76 m)
Shadow Flicker	Limit shadow flicker resulting from Project wind turbines at currently occupied residences to 30 hours per year or less, unless waived in writing by the owner/occupant of the occupied residence.	Three Waters internal standard.	Distance to meet 30 hours or less/year shadow flicker or waiver
Microwave Beam Paths	Blade avoidance of Fresnel zone	Three Waters internal standard.	208 ft (63 m)
Overhead Transmission Lines	584 ft (178 m)	Three Waters internal standard.	584 ft (178 m) Or distance required in written agreement between Project and overhead transmission line owner
Pipelines and Wells	208 ft (63 m)	Three Waters internal standard.	208 ft (63 m)
Railroads	208 ft (63 m)	Three Waters internal standard.	208 ft (63 m)
Communication Towers	254 ft (77.5 m)	Recommendation from Comsearch.	254 ft (77.5 m)

As noted above, where setbacks differ, the Applicant used the more restrictive setback unless such more restrictive setback was not practical. In some cases, the Applicant has used setbacks that are more restrictive than all standards. For example, the Applicant has sited turbines at least 1,320 ft (402 m) from occupied residences, which exceeds both the MPUC and Jackson County requirements. Micrositing for the Project will continue through the Fall of 2020 to incorporate minor site-specific engineering, construction, and landowner-necessitated adjustments.

The Project would construct up to 71 turbines in the Minnesota portion of the array, selected from the proposed 71 primary and eight alternate turbine locations in Minnesota[5]. Setback distances are calculated using the hub height, rotor diameters, and tip heights shown in Table 6, and setbacks are measured from the center of the base of the turbine structure. Setback distances are calculated using the maximum potential rotor diameter of 127 meters (417 feet) and hub heights of 89 or 114 meters (292 or 374 feet). The turbine locations would avoid wetland impacts, and cultural resource impacts would be avoided or mitigated in consultation with SHPO. The buildable area for turbines, after considering the setbacks based on the specifications provided in Table 6 are visually depicted on the siting constraints map provided as Figure 3.

While the Applicant is currently planning to utilize the GE 2.82/127 turbine model, GE may adjust the turbine's megawatt output, with all other specifications remaining the same. In the event this occurs, the Applicant may utilize this newer GE turbine. Regardless of the turbine model selected, the turbine locations would be chosen from the same 79 turbine locations, and the Project layout would comply with applicable County and State setback, sound, and shadow flicker requirements and commitments.

Although a maximum of 71 turbines would be installed for the Project, for the purposes of the analyses in this document, impact calculations are based on all potential 79 turbine locations (71 primary and eight alternate). Construction of each turbine would disturb an approximate 225-foot radius area. The permanent turbines and foundations would each impact an approximate 50-foot radius area.

The 79 turbine locations proposed reflect an optimal configuration to capture wind energy within the Project Area, while avoiding impacts to residences, known cultural resources, wetlands, USFWS Wetland and Grassland Easements, and high-quality grasslands (reference Sections 8.18 and 8.20). As discussed in Sections 6.2 and 5.1, final micro-siting could result in minor turbine adjustments. However, the final Project layout would comply with applicable local, State, and federal requirements. The Project layout would remain on land leased for the Project. Project layout would also comply with GE general setback considerations for wind turbine siting.

The Applicant has revised the Project footprint a number of times to reach the 48,087-acre Project Area due to landowner participation, regulatory agency and public comments, efficient and effective use of wind resources, minimization of environmental impacts, and applicable setback requirements. Three Waters will also use the results of pending geotechnical, wetland/waterbody, native prairie, cultural resources and other ongoing biological studies during micrositing activities for the Project. The Project Area includes areas where the Applicant has negotiated, and continues to negotiate, easements with landowners for development of the Project. Three Waters will continue to negotiate and secure necessary easements for the Project by meeting with and discussing the Project with applicable landowners and others; land rights will include new wind energy leases, wind easements/good neighbor agreements or setback waivers. Three Waters will regularly update the Commission as site control is completed and provide updates to the status of site control for the Project. Micrositing will be performed once the land rights are optimized

[5] Three Waters has also identified up to 49 alternate turbine locations in Iowa and reserves the right to site alternate turbines within Dickinson and Osceola counties in Iowa.

and additional studies are completed (e.g., geotechnical, wetland/waterbody, cultural resources, etc.).

6.2 TURBINES AND TOWERS

Each wind turbine consists of three major components: the tower, the nacelle, and the rotor. These components are mounted on a concrete foundation, also known as a turbine pad, to provide structural support to the assembled turbine.

The tubular towers proposed for the Project would be conical steel structures or a combination of steel and concrete depending on final turbine selection. Each tower has a lockable access door, internal lighting, and an internal ladder and lift to access the nacelle. In accordance with FAA regulations, the towers would be painted off-white to minimize visual impact.

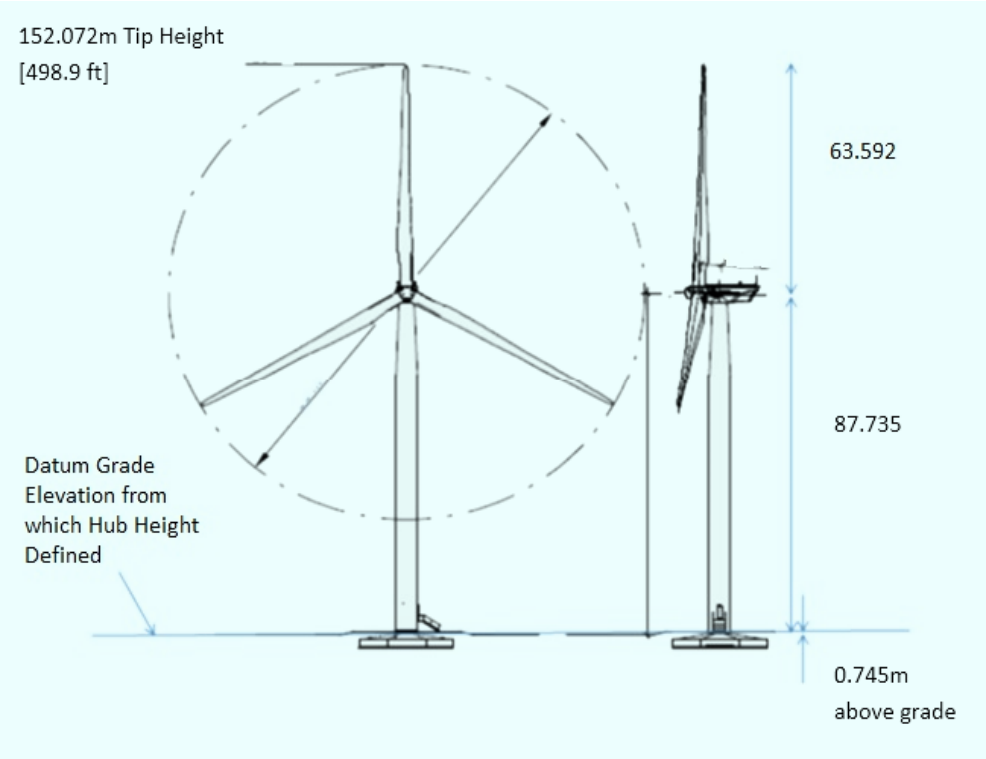
The nacelle sits atop the tower. The main mechanical and electrical components of the wind turbine are housed in the nacelle. The nacelle is mounted on a sliding ring that allows it to rotate, or "yaw," into the wind to maximize energy capture. The nacelle components include the drive train, gearbox, generator, and generator step-up transformer. The nacelle is housed in a steel-reinforced fiberglass shell that protects internal machinery from the environment. The housing is designed to allow for adequate ventilation to cool internal machinery. It is externally equipped with an anemometer and a wind vane to measure wind speed and direction. The generated electricity is conducted through cables within the tower to a switch enclosure mounted at the base of the turbine tower. To comply with SP requirements, Three Waters will apply light mitigation technology (i.e., an ADLS), unless the FAA, in its determination, requires a traditional turbine lighting system.

A rotor assembly is mounted on the drive shaft and operates upwind of the tower. The drive shaft is connected to the gearbox and generator contained within the nacelle. Electric motors within the rotor hub vary the pitch of each blade according to wind conditions to maximize turbine efficiency at varying wind speeds. Additional details regarding the turbines and towers follows.

6.2.1 Turbine Models, Design and Operation

As discussed above in Sections 5.1 and 6.1, Three Waters is considering using the GE 2.82/127 turbine model with a hub height of 89 or 114 meters (290 or 374 feet), while reserving the right to use the GE 3.x turbine model. Table 5 summarizes the turbine options characteristics under consideration. Figure 3 is a representative diagram depicting the GE 2.82/127 turbine layout. Schematic 1 below depicts the GW 2.82/127 turbine model. Three Waters plans to select the most appropriate technology for the Project in terms of cost efficiency and optimization of wind and land resources.

Schematic 1: GE Renewable Energy 2.82 MW/127 Turbine (89-m HH)



While the Applicant is currently planning to utilize the GE 2.82/127 turbine model, GE may adjust the turbine's megawatt output, with all other specifications remaining the same. In the event this occurs, the Applicant may utilize this newer GE turbine (see Section 5.1). The Applicant also requests the flexibility to select a different GE turbine model other than the GE turbine model currently under consideration. Regardless of the turbine model selected, the turbine locations would be chosen from the same 81 turbine locations, and the Project layout would comply with applicable County and State setback, sound, and shadow flicker requirements and commitments.

Although a maximum of 71 turbines would be installed for the Project, for the purposes of the analyses in this document, impact calculations are based on all potential 79 turbine locations (71 primary and eight alternate). Turbine assembly will require an approximately 225-foot radius gravel crane pad[6] extending from the access road to the turbine foundation, in addition to approximately 20 acres for component laydown, rotor assembly and concrete batch plant (if the contractor elects to use a concrete batch plant). The permanent turbines and foundations would each impact a 50-foot radius area.

6.2.2 Turbine Spacing

[6] Pending applicable landowner approval, these crane pads will most likely remain once construction is complete, and have been included in the permanent impact calculation.

As discussed in Section 6.1, with the exception of isolated occasions where field conditions dictate and in accordance with MPUC requirements, the Project layout complies with MPUC General Permit Standards concerning internal turbine spacing (5 x RD downwind spacing [distance between towers], and 3 x RD crosswind spacing [distance between towers]). According to the MPUC General Permit Standards, up to 20% of spacing between turbines may be closer to account for topographic conditions. In the future, Three Waters may revise internal turbine spacing due to micrositing or other layout constraints; if this occurs, no more than 20% of turbine spacings will be less than the required 3x5 RD spacing, and such cases will be subject to wake loss review and approval by the turbine manufacturer.

6.2.3 Towers

The portion of the foundation that is above ground is 15 to 16 ft wide at the base of the tower. The turbine towers, on which the nacelle is mounted, consist of three or four sections manufactured from certified steel plates. All welds are made by automatically controlled power welding machines and 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.

The wind turbines' freestanding approximate 292 (89 m) or 374 (114 m)-foot tubular towers will be connected by anchor bolts to an underground concrete foundation. Geotechnical surveys, turbine tower load specifications, and cost considerations will dictate final design parameters of the foundations.

6.2.4 Foundations

The wind turbines' tubular towers will be connected by anchor bolts to a concrete foundation. Turbine foundations consist of anchor bolts and reinforced steel bar that are placed within the excavated portion of the turbine footing and filled with concrete. The turbine base is fastened to the anchor bolts that protrude from the concrete pad surface. Foundations for similarly sized turbines are generally circular, approximately 40 feet across at the base (depending on soil conditions) and extend 7 to 10 feet below grade. The Project foundation design will be prepared after geotechnical soil analysis has been completed and final turbine locations identified. The wind turbine foundation will be designed by a registered professional engineer licensed to practice in the State of Minnesota.

6.3 ELECTRICAL AND FIBER OPTIC COMMUNICATION SYSTEMS

Each of the wind turbines would have a transformer either pad-mounted outside the tower at the base of the turbine, mounted in the nacelle, or mounted within the tower. The proposed turbines would be connected to the Project substation by approximately 100 miles of 34.5-kV underground collection lines, including an occasional aboveground junction box. At the Project substation, the power would be converted from 34.5 to 345-kV and then transmitted via an approximate 300-foot long aboveground 345-kV transmission line to a new switchyard that will be adjacent to the existing ITC 345-kV Raun-Lakefield transmission line, located within the central portion of the Project Area.

A fiber-optic communication line and an additional separate ground wire will be installed with the underground collection lines, within the same trench, providing communication between the wind turbines, Project substation, O&M facility, and the electrical grid. Aboveground junction boxes would be installed as required for connections or splices,

approximately every 8,000 feet. The communication line will also allow for the use of the SCADA system, which will enable the full control and monitoring of the performance and reliability of the turbines not only by local operations and maintenance staff, but also by staff of a 24/7 remote operations facility.

Safety and control mechanisms are included in the Project design. These mechanisms are generally monitored using a supervisory control and data acquisition (SCADA) system. Each turbine is connected to the SCADA system via fiber-optic cable, which allows the turbines to be monitored in real time by the O&M staff as well as remotely. The fiber-optic cable would be installed in the same trench as the underground collection lines. The SCADA system allows the Project to be remotely monitored, thus increasing oversight, as well as the performance and reliability of the turbines. Not only would the local O&M office have full control of the wind turbines, but a 24/7 remote operations facility would also have control of the individual turbines. These two teams coordinate to operate the wind turbines safely and efficiently.

The turbines themselves also operate as mechanisms for safety and control. Each turbine monitors the wind speed and direction to ensure its current position is most efficient to produce electricity. This data is also used for feathering the blades, applying the brakes in high wind speeds or if there is ice build-up on the blades, and to tell the turbine when the wind is strong enough to begin turning the generator and producing electricity at the "cut-in" wind speed.

7.0 Associated Facilities

Additional facilities will be constructed to support operation and maintenance of the Project. Three Waters is seeking Commission approval through the LWECS Site Permit for the following Project associated facilities:

- Access roads and crane paths;
- Collection and communication lines;
- O&M facility;
- Project substation, transmission line and switchyard/interconnection site;
- Permanent meteorological stations; and
- Temporary construction laydown yard, and concrete batch plant (if determined it is needed by construction contractor).

7.1 ACCESS ROADS AND CRANE PATHS

Existing public roads, private roads, and field paths would be used to access the Project facilities. The existing roads may require improvements before, during, or following construction. Where necessary, new access roads would be constructed between existing roadways and Project components. The permanent access roads would be all-weather, gravel surfaced, and generally 16 feet in width for the drivable area and additional width for the shoulder and drainage (if necessary). During construction, some of the access roads would have temporary widths generally not exceeding 50 feet.

Whereas existing public roads, private roads and field paths will be used to the greatest extent practicable, road improvements will be made where necessary, and new, permanent all-weather access roads will be constructed to provide access to wind turbines for the purposes of maintenance. The proposed access road network was designed to efficiently serve the Project, minimize permanent impacts, incorporate landowner input to create the least interference with farming operations, and, where possible, actually improve farming operations by having a well-sited road that farmers can use for loading grain trucks during harvest and for other farm activities.

Road improvements will generally consist of temporary expansion of intersections to allow for additional turning radii to be used by trucks carrying oversized equipment. The private, permanent access roads will be low-profile to allow for easy crossing by farm equipment, and the final access road design will be dependent on final road use agreements, geotechnical information obtained during the engineering phase, and final turbine placement. Three Waters estimates the access road network for all 71 primary turbines will be approximately 22 miles.

In several instances, separate access will be required for the cranes used to erect the wind turbines. In such cases, temporary 36-foot-wide crane paths will be constructed between turbine locations. Following completion of construction, the temporary crane paths will be removed (if required), and the areas restored (as needed) in accordance with industry standards.

7.2 COLLECTION LINES

Each wind turbine within the Project Area will be interconnected by communication and electrical power collection circuit facilities. These facilities would include underground collection lines that would collect wind-generated power from each wind turbine and deliver it to the Three Waters-owned Project substation. Collection lines consist of an underground electrical cable network that is approximately 100 miles in total length traveling between the individual turbines and the Project substation. The collection lines, designed for operation at 34.5 kV, will be installed underground via trenching, plowing, or directional boring at a depth of approximately 42 inches to avoid potential impact on existing land uses. The collection lines will require the installation of aboveground junction boxes along field edges or in the ROW, as appropriate, for the purposes of connections or splices in the collection line.

The conceptual layout of collection lines is shown on Figures 2 and 3. Construction of the underground collection lines for all turbines (primary and alternate) will disturb a 30-foot-wide path for approximately 100 miles. Some of the construction disturbance for the underground collection system will be shared with that required for other features (e.g., crane paths) where these efforts overlap. Permanent impacts from the underground collection lines during the operational life of the Project will be approximately 5 by 5 feet for each of the approximately 66 aboveground junction boxes.

7.3 OPERATION AND MAINTENANCE BUILDING

To support operation and maintenance of the Project, an approximately 4-acre O&M facility will be constructed near the Project substation/switchyard (Figure 2). The approximate 3-acre Project substation and approximate 10-acre switchyard site (see Section 7.4) will be constructed directly adjacent to one another and the POI, totaling approximately 13 acres of permanent impacts within the Project Area (see Figure 3).

The O&M facility will be a single- or two-story building of approximately 6,000 square feet that will house operating personnel, offices, operations and communication equipment, parts storage, maintenance activities, a vehicle parking area, and any other equipment necessary to operate and maintain the Project. The O&M facility will be surrounded by a gravel parking area that will be used for storage and parking. The proposed O&M facility location was selected due to its central location relative to the turbines thereby minimizing transportation time to perform turbine maintenance, as well as the Project substation for maintenance and operational reasons.

7.4 PROJECT SUBSTATION, TRANSMISSION LINE AND SWITCHYARD / INTERCONNECTION SITE

During construction of the Project substation approximately 3 acres of disturbance may occur. Once operational, the Project substation will be fenced, and will consist of one substation transformer, circuit breakers, switching devices, auxiliary equipment, a control enclosure (containing equipment for proper control, protection, monitoring, and communications), and associated equipment and facilities. The principal function of the Project substation is to increase the voltage from the underground collection system (34.5

kV) to the voltage of the Lakefield-Raun transmission line[7] (345 kV). Strategically located adjacent to the existing ITC transmission line, the Project substation will be a permanent fenced site with graveled access areas. Fencing will be designed and constructed in accordance with industry standards to provide safety and security.

Three Waters will use 795 Aluminum Conductor Steel Reinforced (ACSR) conductors or conductors of comparable capacity to construct the short length of Project transmission line (~300 feet); the number of transmission line poles needed for the Project will be dictated by the MISO study. Fiber optic cable will run the full length of the Project transmission line for communications.

The Project will have a switchyard which will serve as the electrical interconnection between the Project and the electrical grid. The Project substation will be located adjacent to the switchyard, and the switchyard is adjacent to the ITC transmission line (Figures 2 and 3). The switchyard will be constructed on approximately 10 acres and operated on approximately 8 acres in the Project Area adjacent to the existing Lakefield-Raun 345-kV transmission line (Figure 3). Three Waters will have a Generator Interconnection Agreement with ITC and MISO. The switchyard will be constructed by ITC (or constructed by Three Waters utilizing ITC specifications in accordance with the Interconnection Agreement).

The proposed Project substation, Project switchyard and transmission interconnection site are located in Sioux Valley Township (T101, Range 37W, Section 22). The locations of proposed facilities are depicted in Figure 2. According to the JCZO, these areas are zoned Agricultural Preservation and while approval for the Project substation, switchyard and transmission line would normally be subject to Jackson County review, the County has indicated that for these Project facilities (which involve electrical/power generation and transmission activities associated with the Project), the MPUC is the permitting authority under applicable regulation associated with this SPA[8].

The Project wind turbines would require power for operation. During calm wind periods, wind turbine power demand can include the yaw motor, control system, cold weather package, lighting, and hydraulic pump and amount to a maximum of 40 kilowatts for each turbine if all loads are operating at the same time. The power would be supplied by back-feed power from the POI with the existing Lakefield-Raun 345-kV transmission line. The Applicant will enter into service agreements with the transmission operator and the local electric cooperatives for station power energy. The Project substation back-up power and power for the O&M facility will be supplied through local distribution systems.

The Applicant will secure other county approvals as needed (e.g., building permits, road use agreement, driveway permits, etc.) once an LWECS Permit is secured. See Table 33 for a summary of permits and approvals that may be required.

[7] Per Minn. Stat. Ch. 216E, the Project transmission line does not meet the definition of a high-voltage transmission line because it is less than 1,500 feet in length, thereby precluding the need for a Route Permit under Minnesota Administrative Rules (Minn. R.) Ch. 7850.

[8] See JCZO, Section 603.2 (Permitted Uses - Essential Service & Appurtenant Structures except those listed as Conditional Uses) and Section 604.4 (Conditional uses - Power Transmission Lines in excess of 35 KV and Electrical Substation). See also correspondence in Appendix B regarding review of County permitting of such facilities.

7.5 PERMANENT METEOROLOGICAL STATIONS

Three Waters is proposing to construct up to two permanent meteorological towers to obtain wind data for performance management. The meteorological towers will be free-standing, with heights not to exceed the hub height of the wind turbines. In accordance with FAA requirements, the towers will be marked and lighted. Additionally, one or two ADLS radar towers will be installed at locations that will be determined by the selected ADLS vendor, in coordination with applicable landowners and Three Waters.

Construction of each meteorological tower will result in ground disturbance of an approximately 150-foot radius area, with permanent impacts of up to 35 by 35 feet for the tower. Permanent access roads to each tower will also be required for the purposes of maintenance.

7.6 TEMPORARY CONSTRUCTION LAYDOWN YARD AND ASSOCIATED FACILITIES

Three Waters is proposing to use an approximately 20-acre temporary construction laydown yard for storage and staging of equipment and materials where they will remain until they are needed for construction of the necessary Project components. The temporary construction laydown yard location will be negotiated with and approved by the affected landowner. At the time that equipment and materials are needed, they will be loaded onto trailers, moved from the laydown yard, delivered to the appropriate location, and placed within the right-of-way. The same laydown yard may also be used for construction of the Project transmission line. Upon completion of construction, the approximately 20-acre temporary construction laydown yard will be restored to pre-construction conditions, in accordance with permit conditions and landowner wishes.

A temporary concrete batch plant may be used during construction of the Project, as determined by the selected construction contractor. If needed, the batch plant would be sited near a water source, provide for ingress/egress of construction vehicles and materials, and be located in proximity to the Project site. Three Waters would enter into an agreement with the applicable landowner for temporary use of the site. Additionally, Three Waters would select a site (if needed) to avoid wetlands/waterbodies, cultural resources and other sensitive natural resources, to the extent practicable, and obtain required any necessary approvals needed for use of the site. If a temporary batch plant site is used, Three Waters would restore the site to pre-construction conditions once use has ceased, in accordance with the temporary use agreement and landowner requirements.

8.0 Environmental Analysis

This section provides a description of the environmental conditions that exist within the Project Area. Consistent with Commission procedures on siting LWECS and with applicable portions of the Minnesota Power Plant Siting Act (Minn. Stat. Ch. 216E), various exclusion and avoidance criteria were considered in selecting the Project Area. This section is consistent with Minnesota Administrative Rules Chapter 7854.

8.1 DEMOGRAPHICS

8.1.1 Resources

The Project Area is located in the southwestern portion of Jackson County, Minnesota (see Figure 1). The Project components are distributed throughout Sioux Valley, Rost, Round Lake, Ewington, Hunter and Minneota Townships. According to the 2010 United States Census, the population of Jackson County was 10,266 (U.S. Census, 2010). In 2010, Jackson County had 5,008 housing units available. Of these, 4,531 (90.5 percent) were occupied and 477 (9.5 percent) were vacant. The average household size was 2.30 persons per household.

A summary of the population demographics for Jackson County and the individual townships included in the Project Area are provided in Table 7.

Table 7 Summary of Demographics in Project Area

Jurisdiction	1990 Population[1]	2010 Population[2]	2017 Population[3]	2010-2017 Population Increase (+) / Decrease (-)	1990-2017 Population Increase (+) / Decrease (-)	Number of Households Occupied / Vacant[3]	Average Household Size[4]
Jackson County	11,677	10,266	10,104	-1.6%	-13.5%	4,350/701	2.35
Sioux Valley Township	287	192	226	+17.7%	-21.3%	78/12	2.87
Rost Township	271	211	184	-12.8%	-32.1%	54/20	3.08
Round Lake Township	204	166	186	+12.0%	-8.8%	80/4	2.39
Ewington Township	286	244	243	-0.4%	-15.0%	111/4	2.00
Hunter Township	309	224	210	-6.3%	-32.0%	81/19	2.56
Minneota Township	245	259	245	-5.4%	0.0%	118/83	2.12

1 1990 Census of Population
2 2010 Demographic Profile
3 2013-2017 American Community Survey 5-Year Estimates
4 2013-2017 American Community Survey 5-Year Estimates - Owner-occupied units

At the County level, a majority of the population (6,106 or 59.5 percent) resides in municipal/urban centers, with the remaining 4,160 (40.5 percent) residing in rural areas. The Project Area is situated entirely within the rural areas of Sioux Valley, Rost, Round Lake, Ewington, Hunter and Minneota Townships, with 100 percent of the population residing in rural areas. There are no municipal centers located within or immediately adjacent to the Project Area, although Round Lake, a community with a population of 376, is located approximately one mile west of the Project Area, and Lakefield, with a population of 1,694, is located approximately four miles northeast.

The population of Jackson County has been declining for at least the past 27 years. As reflected in Table 7 above, the population was reported at 11,677 in 1990, reported at 10,266 in 2010, and estimated to be 10,104 in 2017. This trend represents an approximately 1.6 percent population decline in the County from 2010 - 2017 and a cumulative population decline of 13.5 percent since 1990. The County Seat, the City of Jackson, experienced a reduction in population over the past 27 years with an overall population decline of 309 individuals, representing an 8.7 percent drop. The rate of population decline in Jackson (City) is consistent with that of the County in that the decline has been slower in recent years (1.5 percent decline between 2010 - 2017) than that of the period between 1990 – 2010 (7.3 percent decline). Population trends between 1990 – 2017 in the other cities of Jackson County are varied, with some (Heron Lake, Round Lake and Wilder) experiencing declines, while others (Lakefield, Okabena and Alpha) have experienced population growth.

Estimated population densities within the Project Area range from 5.1 people per square mile in Rost Township, to 6.8 people per square mile in Ewington and Minneota Townships. The average population density of the six townships included in the Project Area is 6.0 people per square mile.

A summary of the population densities for the six townships within the Project Area and the adjacent townships is provided in Table 8 below.

Table 8 Summary of Population Densities

Township, County, State	People Per Square Mile[1]	Location	Township, Range / Relative Position to Project Area
Sioux Valley Township, Jackson County, MN	6.2	Project Township	101/37
Rost Township, Jackson County, MN	5.1	Project Township	102/37
Round Lake Township, Jackson County, MN	5.2	Project Township	101/38
Ewington Township, Jackson County, MN	6.8	Project Township	102/38
Hunter Township, Jackson County, MN	5.9	Project Township	102/36
Minneota Township, Jackson County, MN	6.8	Project Township	101/36

Township, County, State	People Per Square Mile[1]	Location	Township, Range / Relative Position to Project Area
Alba Township, Jackson County, MN	5.4	Adjacent Township	103/38 - northwest
West Heron Lake Township, Jackson County, MN	3.0	Adjacent Township	103/37 – north
Heron Lake Township, Jackson County, MN	6.2	Adjacent Township	103/36 - northeast
Des Moines Township, Jackson County, MN	6.4	Adjacent Township	102/35 - east
Middletown Township, Jackson County, MN	5.7	Adjacent Township	101/35 – east
Diamond Lake Township, Dickinson County, IA	10.3[2]	Adjacent Township	100/37 – southeast
Silver Lake Township, Dickinson County, IA	42.8[3]	Adjacent Township	100/38 – south
Fairview Township, Osceola County, IA	12.0[2]	Adjacent Township	100/39 – southwest
Indian Lake Township, Nobles County, MN	6.8	Adjacent Township	101/39 – west
Lorain Township, Nobles County, MN	9.6	Adjacent Township	102/39 - west

[1] Based on 2017 ACS 5-Year Population Estimate
[2] Based on data in www.city-data.com
[3] Based on data in www.niche.com

There is a total of 381 occupied residences within the Project Area (see Figure 2). A review of the demographic characteristics of the Project Area do not indicate that minority or low-income residents are concentrated in any portion of the Project. As currently designed, the Project components will not be constructed in areas occupied by any economic or ethnic minority populations.

8.1.2 Impacts

The construction and operation of the Project are not anticipated to displace any current residences or alter the demographic character of the Project Area.

8.1.3 Mitigation

No mitigation efforts will be required as no impacts are anticipated.

8.2 LAND USE

The Project Area is located entirely within Jackson County within portions of six townships (Sioux Valley, Rost, Round Lake, Ewington, Hunter and Minneota) and adjacent to 10

townships, as reflected in Table 8 and depicted in Figure 1. Three Waters used applicable local zoning, a regional comprehensive plan, and conservation easement information as a guide to site wind turbines and associated facilities as described below. As discussed herein, Section 734 (Windpower Management) of the JCZO does not apply to the overall Project because the Project is subject to siting and oversight by the State of Minnesota pursuant to Minn. Stat. Ch. 216F, WECS, which preempts local zoning, building, and land use ordinances (see Sections 1, 4, and 6.1 above).

8.2.1 Resources (Zoning, Ordinances and Easements)

None of the townships within or adjacent to the Project Area have adopted zoning regulations. Round Lake and Lakefield, the two cities near but not within the Project Area, have adopted ordinances. However, zoning code for these two cities applies only within their municipal boundaries, and Three Waters is not aware of any orderly annexation agreements or other plans that would expand these zoning regulations into the Project Area.

In preparing this Application, Three Waters reviewed applicable comprehensive plans, zoning ordinances, and land use controls completed for municipalities within and adjacent to the proposed Project Area (Table 9). Figure 6 depicts the County Zoning Map within the Project Area.

Table 9 Land Use Plans Relevant to the Project Area

Agency	Name of Plan	Year Adopted / Amended
Jackson County	Jackson County Zoning Ordinance	2017
	Jackson County Comprehensive Plan	2010
Sioux Valley Township	NA	NA[1]
Rost Township	NA	NA[1]
Round Lake Township	NA	NA[1]
Ewington Township	NA	NA[1]
Hunter Township	NA	NA[1]
Minneota Township	NA	NA[1]
City of Lakefield	City of Lakefield, MN Code of Ordinances	2018
Round Lake City	Round Lake City Zoning Ordinance and Building Code	2019
Alba Township (Adjacent)	NA	NA[1]
West Heron Lake Township (Adjacent)	NA	NA[1]
Heron Lake Township (Adjacent)	NA	NA[1]
Des Moines Township (Adjacent)	NA	NA[1]
Middletown Township (Adjacent)	NA	NA[1]

Agency	Name of Plan	Year Adopted / Amended
Nobles County (Adjacent)	Nobles County Zoning Ordinance	2006
	Nobles County Comprehensive Plan	2001
Indian Lake Township (Adjacent)	NA	NA[2]
Lorain Township (Adjacent)	NA	NA[2]

[1] While these townships have not adopted their own local code/ordinance or comprehensive plan, they are included in the 2017 Jackson County Zoning Ordinance and the Jackson County Comprehensive Plan.
[2] While these townships have not adopted their own local code/ordinance or comprehensive plan, they are included in the 2006 Nobles County Zoning Ordinance and the Nobles County Comprehensive Plan.
NA = not applicable

Jackson County teamed with the Southwest Regional Development Commission to facilitate, create and ultimately adopt the Jackson County Comprehensive Plan (JCCP). The purpose of the plan was to provide a framework for land use and help guide future growth in Jackson County.

The JCCP provides a method for the County "to examine current and future growth needs, assess development-related assets and liabilities, learn about best practices for the use of the land, air and water, and set visionary goals for the future" (JCCP, 2010). The JCCP serves many purposes, including but not limited to, providing a basis for County land use controls and ordinances that should be consistent with the JCCP. The JCCP identifies key issues expressed by residents through public input, addresses planning areas of housing, agriculture, business/economic development, transportation, natural resources/parks/recreation and County services, considers social and economic issues, and guides County staff and others making decisions related to development in the County.

The JCCP identifies that agriculture is the County's primary economic driver. One of the plan's goals is the "preservation of commercial agriculture as a viable, permanent land use and an essential long-term permanent activity in the county" (JCCP, 2010). Considering natural resource protection, the JCCP outlines a policy of promoting "the orderly development of our wind energy resources in a manner that does not diminish neighboring property values or have a negative impact on our natural resources in the area" (JCCP, 2010).

The JCZO includes management directives related to agricultural preservation, floodplains, and shoreland, among others (see Appendix C for Section 609, 610, 611 and 734 of the JCZO). Section 734 of the JCZO was established to set forth a process for permitting wind energy facilities with a rated capacity of less than 25 megawatts. As stated above, the ordinance applies only to systems that are not otherwise subject to siting and oversight by the MPUC and therefore does not apply to the overall Project. Nonetheless, the Project has been designed to comply with the setbacks outlined in Section 734.5 to the extent practicable (see Table 6 above). The Project will require a CUP for the Project's permanent meteorological towers and O&M facility.

Section 609 of the JCZO establishes the Flood Plain District, created for the purpose of protecting the public health and safety and to minimize property damage and pollution from flood waters (Appendix C). The Flood Plain Zoning District is divided into three Districts: Floodway District, Flood Fringe District and General Flood Plain District (Figure 6). The County Zoning Map depicts the Districts within the County, and the JCZO outlines the permitted uses and conditional uses within each District. The majority of the land within the Project Area is designated as Zone C, which are areas of minimal flood hazard, outside Special Flood Hazard Areas and higher than the elevation of the 0.2-percent-annual-chance flood. Some areas along river and ditch systems in the southern portion of the Project Area, including the Little Sioux River, County Ditch 1, and other low areas in the vicinity of Rush and Skunk lakes, are designated as Zone A floodplains, which are areas subject to inundation by the 1-percent-annual-chance flood event (FEMA, 2019). Floodplains within the Project Area are depicted in Figure 7. Three Waters is currently not planning to construct permanent structures or place fill within floodplains and will work with the County to ensure adherence to JCZO requirements.

The Shoreland Zoning District is presented in Section 610 of the JCZO and includes six categories for the purposes of shoreland management (Appendix C). The six categories include three lake categories (Natural Environment Lakes, General Development and Recreational Development), and three river categories (transitional, agricultural or tributary). Under Subdivision 302-27 of the ordinance, "shoreland" means land located within the following distances from public waters:

- 1,000 ft from the ordinary high-water level of a lake, pond, or flowage; and
- 300 ft from a river or stream, or the landward extent of a floodplain designated by ordinance on a river or stream, whichever is greater.

The limits of shorelands may be reduced whenever the waters involved are bounded by topographic divides which extend landward from the waters for lesser distances and when approved by the Commissioner of the MNDNR. The "Shore impact zone" means land located between the ordinary high-water level of a public water and a line parallel to it at a setback of 50 percent of the structure setback. Unless otherwise exempt, as applies to this Project and Application, a Land Use Permit is required from the County for the placement of fill or excavation of materials within the floodplain or shoreland. Three Waters will complete field surveys to identify wetlands and water resources in fall 2019 or spring 2020 (weather dependent) and will coordinate with the Jackson County to avoid and minimize impacts to floodplain and shore impact zones.

Conservation easements are voluntary legal agreements between a landowner and a land trust or other qualified organization which places use restrictions on the land to protect its natural value. Conservation easements may be sold or donated by a landowner to state, federal, or non-governmental organizations to meet conservation objectives. Conservation easements may or may not require public access as part of the easement agreement; they are flexible and tailored to meet a landowner's needs and vision for the land. The landowner retains ownership of the property and all rights and privileges for its use, except for the uses restricted under the easement.

Jackson County offers conservation programs that compensate landowners for setting aside wetlands and grasslands for conservation purposes or employing conservation practices on their land. These programs provide another source of income for local farms and landowners. Some of these programs include the Conservation Reserve Program (CRP),

Reinvest in Minnesota (RIM), Wetland Reserve Program (WRP), and the Environmental Quality Incentive Program (EQIP), the Conservation Stewardship Program (CSP) and the Vegetative Management & Enhancement Cost Share Program. These programs vary in their requirements, payments, and the length of time for which a piece of property must be enrolled. Some of these easements are perpetual in nature. Figure 5 indicates the location of lands enrolled in these programs within the Project Area.

The Minnesota Board of Water & Soil Resources (BWSR) administers the RIM conservation program. The program is a critical component of the state's efforts to improve water quality by reducing soil erosion and phosphorus and nitrogen loading and improving wildlife habitat and flood attenuation on private lands. Three Waters reviewed available public data for conservation easements and identified seven RIM easements within the Project Area (see Figure 5).

Based on publicly available information (U.S. Geological Survey [USGS] Protected Areas Database, 2016), there are 10 USFWS wetland or grassland easements in the Project Area (Figure 5). The Applicant also coordinated with the USFWS Windom Wetland Management District to identify any new USFWS easements or fee-title properties enrolled since 2016 in the Project Area. No additional easements were identified by the USFWS (Figure 5). Also, review of the Minnesota BWSR Wetland Banking Tool confirmed that there are no wetland bank easements in the Project Area at this time (BWSR, 2017).

Three Waters continues to review land title records of participating properties to identify conservation easements that are not recorded in other public databases on properties within the Project Area. As of this date, no other easements have been identified. If additional easements are found, Three Waters will review them and assess whether the Project layout is impacted.

Following receipt of the Site Permit, Three Waters will apply for applicable CUPs from Jackson County for the Project meteorological towers and O&M facility and any other permits required for additional facilities. Three Waters will comply with all terms and conditions of the CUPs and also plans to enter into a Road Haul Agreement with the county and affected townships governing the use, improvement, repair, crossing with Project infrastructure, and restoration of roads within the county, as needed. In addition, Three Waters will obtain from each road authority any road crossing, approach, and/or utility permits required for the Project.

8.2.2 Impacts

Project impacts to local zoning, land use plans, and conservation easement lands are expected to be minimal. To the extent practicable, the Applicant has sited Project turbines and routed access roads, collection lines, and associated facilities in compliance with applicable requirements of the JCZO and JCCP. Field surveys are scheduled for fall 2019 or spring 2020 (weather dependent), and minor layout adjustments will be made to further avoid or minimize impacts.

The Project has been designed to avoid impacts to known conservation easements. No impacts are anticipated to federally owned lands or grassland easements, and no impacts are anticipated to state conservation lands such as RIM. In the event that potential impacts occur to CRP lands, Three Waters will work with the landowner and CRP easement holder to identify options to minimize and mitigate Project impacts (e.g., reimburse for taking land

out of CRP). Three Waters will continue to review land title information to identify conservation lands and review the Project layout to avoid or minimize potential impacts.

The Applicant will coordinate with Jackson County to secure required permits as necessary. Project impacts to resources such as groundwater and surface water, and issues such as erosion and sediment control, pollutants, drainage management, and flooding are discussed in Section 8.14 (Soils) and Section 8.15 (Geologic and Groundwater Resources). The Project will allow for continued agricultural use of the Project Area and will improve the local economy by providing revenue for landowners, potential temporary jobs for local residents, and local government tax benefits.

8.2.3 Mitigation

As described in Section 6.1, in designing the Project layout, Three Waters incorporated the MPUC General Permit Standards as well as additional County setbacks, requirements and standards to the extent possible, and best practices developed by Three Waters. Three Waters also incorporated avoidance and setback recommendations from the USFWS and the MNDNR. Where setbacks differ for the same feature, the Applicant used the most stringent setback distance. Table 6 summarizes setbacks applied to the Project, and Figure 2 illustrates them.

Three Waters will coordinate with Jackson County and Sioux Valley, Rost, Round Lake, Ewington, Hunter and Minneota townships to address local concerns related to development, road use, and drainage systems through a development, road use, and drainage agreement. The agreements will include protocol for use and repair of public infrastructure, as well as adherence to local zoning and siting in effect at the time of filing this SPA. Three Waters has begun preliminary discussions with local officials and plans to enter into such agreements prior to the start of construction.

Additionally, Three Waters plans to avoid and minimize impacts to lands enrolled in RIM, WRP, and EQIP, CSP or other public or private conservation easement land, and to avoid impacts to lands enrolled in CRP to the extent possible. If public or private conservation easement land is impacted, the Applicant will work with the applicable landowner and regulatory agency to identify and implement appropriate mitigation or, if necessary, remove the impacted portion of the parcel from that conservation program.

Measures to avoid, minimize, and mitigate any potential impacts to resources such as groundwater and surface water, and issues such as erosion and sediment control, pollutants, drainage management and flooding are discussed in Sections 8.16 and 8.17.

8.3 NOISE

Noise is measured in units of decibels (dB) on a logarithmic scale. The audible range of humans spans from 20 hertz (Hz) to 20,000 Hz. Human hearing is not equally sensitive to all frequencies of sound and certain frequencies are given more or less "weight" than others.

The A-weighted decibel scale (dBA) is commonly used to represent the sensitivity of human hearing when measuring sound. This scales the physical sound levels that are measured as a pressure wave to match an equivalent "loudness" level across the audible spectrum that more closely resembles what a human ear would perceive. The A-weighted scale effectively puts more relative weight on the range of frequencies that the average human ear

perceives clearly (e.g., mid-level frequencies) and less weight on those that humans do not perceive as well (e.g., very high and lower frequencies).

Sound from wind turbines is generated primarily from the blades interacting with the atmosphere. Mechanical and electrical components within the nacelle can also produce sound, but modern wind turbines are designed to reduce the transmission of internal nacelle sound to the outside. Noise produced by the blades depends on their design, rotational speed, blade pitch and a variety of factors, with maximum noise emissions typically occurring at 85-95% of rated power.

In Minnesota, sound from a wind farm cannot cause the sound levels at nearby properties to exceed the statutory sound level limits at nearby properties (see Minn. R. Ch. 7030), which are established according to the land use activity at the location of the receiver. The MPCA establishes acceptable sound levels based on time of day and the use of an area. For example, higher sound levels are acceptable in industrial areas during the day than residential areas during the night. The sound level limits in Minn. R. Ch. 7030 apply to the total sound levels that include sound from background sources and the wind farm. If the background sound levels alone approach the sound level limits, the sound attributable to the wind farm cannot cause the total sound levels to exceed the limits.

In Minnesota, statistical sound levels (L_n metrics) are used to evaluate sound levels and identify noise impacts within a time period of interest (here, one hour). The L_{50} is defined as the sound level exceeded 50% of the time, or for 30 minutes in an hour. The L_{10} is the sound level exceeded 10% of the time, or for 6 minutes in an hour, also expressed in dBA. These are called statistical sound levels.

Under Minn. R. Ch. 7030.0040, land uses are divided into four categories referenced as noise area classifications (NACs):

- NAC-1: Residential housing, religious activities, camping and picnicking areas, health services, hotels, educational services;
- NAC-2: Retail, business and government services, recreational activities, transit passenger terminals;
- NAC-3: Manufacturing, fairgrounds and amusement parks, agricultural and forestry activities; and
- NAC-4: Undeveloped and unused land.

Table 10 below provides the established daytime and nighttime noise standards for each NAC category (Minn. R. Ch. 7030.0040, Noise Standards). The standards are expressed as a range of permissible dBA within a one-hour period.

Table 10 State of Minnesota Standards

Noise Area Classification	Daytime (7:00 am – 10:00 pm)		Nighttime (10:00 pm – 7:00 am)	
	1-Hour L_{10} (dBA)	1-Hour L_{50} (dBA)	1-Hour L_{10} (dBA)	1-Hour L_{50} (dBA)
1	65	60	55	50
2	70	65	70	65
3	80	75	80	75
4	None	None	None	None

According to Minnesota Rules Chapter 7030.0040, night time sound levels in a NAC 1 must be below 50 dBA 50 percent of the time within an hour (referred to as L_{50}), and below 55 dBA 90 percent of the time within an hour (referred to as L_{10}).[9]

As indicated above, land areas such as picnic areas, churches, or commercial spaces are assigned to an activity category based on the type of activities or use occurring in the area. The NAC is listed in the MPCA noise regulations to distinguish the categories.[10] The discussion below provides a description of the resource and results of noise modeling of the Project. Three Waters will be required to show through field measurements and modeling that noise from the Project will meet statutory requirements at all times during construction and operation.

8.3.1 Resources

As described in other parts of this Application, the Project Area is located in a predominately rural agricultural area (primarily corn and soybean with some livestock operations) bordered on the north by interstate highway I-90 and the south by the Minnesota-Iowa border. The landscape and ground cover is primarily farmland and open fields, with farmstead and residential dwellings interspersed within the Project Area. Terrain in the area is mostly flat.

Existing noise sources include farm machinery and equipment, agricultural vehicle operations, recreational activities, (such as hunting and all-terrain vehicles), motor vehicle traffic, aircraft overflights, and road construction activities. The City of Round Lake (approximately 2 miles west of the Project Area), Lakefield (approximately 4.5 miles northeast of the Project Area), and Jackson (and Jackson Municipal Airport, approximately 11.2 miles northeast of the Project Area), are other sources of sound in the vicinity of the Project.

Background sound levels in the Project Area are typical of those in rural settings, where existing nighttime sound levels are commonly in the 25 to 40 dBA range. The dBA scale is A-weighted decibels based on the sensitivity of human hearing discussed above. Low to mid-30 dBA are relatively low background sound levels at night and are generally representative of the site. Higher levels exist near roads and other areas of human activity.

As further described below, a total of 380 receptors were considered as sound receptors in the preliminary noise compliance assessment of the Project conducted by Three Waters (Figure 8). Receptors confirmed to be uninhabited were excluded. Of the total number of identified receptors, there were 343 receptors in Minnesota within 2 miles (3.2 kilometers) of the Project and 37 receptors in Iowa within 2 miles (3.2 kilometers) of the Minnesota-Iowa border.

8.3.2 Impacts

[9] Household units, including farming houses, are classified in NAC 1. Minn. R. 7030.0050. subp. 2.

[10] For reference, in Jackson County, Minnesota, the noise level from a Wind Energy Conversion System (WECS) is to comply with MN R. Ch. 7030 requirements, which (at a minimum) shall not exceed 50 dBA average A-Weighted Sound pressure at farm residences. See Jackson County Zoning Ordinance, Sections 734.5 and 734.6.

Construction and operation of the Project will contribute to sound levels in the area. Sound levels depend on the distance from the noise source and the attenuation of the surrounding environment. Table 11 below provides an estimate of decibel levels of common noise sources.

Table 11 Common Noise Sources and Levels

Sound Pressure Level (dBA)	Common Indoor and Outdoor Noise Sources
100-110	Rock band (at 16.4 ft [5 m]) Jet flyover (at 984.3 ft [300 m])
90-100	Gas lawnmower (at 3.28 ft [1 m])
80-90	Food blender (at 3.28 ft [1 m])
70-80	Shouting (at 3.28 ft [1 m]) Vacuum cleaner (at 9.84 ft [3 m])
60-70	Normal speech (at 3.28 ft [1 m])
50-60	Large business office Dishwasher next room, quiet urban daytime
40-50	Library, quiet urban nighttime
30-40	Quiet suburban nighttime
20-30	Bedroom at night
10-20	Quiet rural nighttime Broadcast recording studio
0	Threshold of hearing

Source for Common Indoor/Outdoor Noise Sources: *A Guide to Noise Control in Minnesota*, Minnesota Pollution Control Agency (November 2015).

Noise related to wind turbine operation is often cited as a concern when LWECS are developed in rural areas. Some earlier wind turbine designs did not consider noise impacts and sited turbines too close to residential receivers. With improvements in turbine engineering, new equipment, such as the use of serrated trailing edges (i.e. LNTE) in certain instances, improved modeling methodologies, and the use of sufficient setbacks to residences, many of the historic impact issues have been resolved.

When in motion, wind turbines emit a perceptible sound. The level of this sound varies with the speed of the turbine rotor and the distance of the listener from the turbine. Sound is generated from the wind turbine at points near the hub or nacelle, and from the blade tips and trailing edges of the blades as they rotate. The wind turbines to be used within the Project site are warranted to generate a maximum apparent sound power level no greater than 110 dBA. This translates to a sound pressure level of approximately 60 dBA at the base of the wind turbine.

Sound levels decrease as the sound moves further away from the turbine. The turbines are expected to generate less than 50 decibels between 1,050 and 1,500 feet. At a relatively close distance, the sound a turbine makes can be described as a "whoosh" sound when the

rotors are moving. There is more noise on relatively windy days; however, the turbine sound levels can be masked, at times, by the same wind that creates the increased noise.

To evaluate the potential impacts of the Project, Three Waters conducted a preliminary noise assessment of the Project and prepared a Preliminary Noise Compliance Assessment Report (Noise Report; see Appendix D). The assessment is based upon Project facilities partially located in Jackson County, Minnesota, as well as a portion in Iowa. The Noise Report includes a description of the Project, discussion of applicable sound level standards, discussion of sound issues that are particular to wind farms, background sound level monitoring procedure and results, sound propagation modeling procedures and results, and conclusions.

Background sound level monitoring was conducted throughout the Project Area to quantify the existing sound levels, including the nighttime L_{50}, and to identify existing sources of sound. Given that monitoring was conducted in June of 2019, monitoring locations were selected per the guidance provided in the Department of Commerce's "Guidance for Large Wind Energy Conversion System Noise Study Protocol and Report," October 2012, but were also checked to conform to the Department of Commerce's July 2019 version of the same document. The guidance recommends a minimum of three locations within the Project area. For this Project there were a total of five onsite and two offsite monitor locations. The guidance also recommends that one monitor location be in proximity to the worst-case modeled receptor. Based on the preliminary layout for the Project, Monitor C was selected as being representative of the worst-case modeled area (see Noise Report, Appendix D). A map of all the monitor locations is provided in the Noise Report, as well as a description of each monitor location. The monitoring information was used in the noise modeling, described below.

The A-weighted sound levels are listed for all seven monitoring sites, as well as the C-weighted sound levels. The reported levels represent all valid periods, that is, all periods that were not excluded due to weather or anomalous activity. For both A-weighted and C-weighted levels, the equivalent continuous levels (L_{EQ}) at night are less than (or equal to) daytime levels at all sites, which is typical and indicate the influence of human activity on the measured sound levels during the day. For some locations, the large difference between L_{EQ} and 10^{th}-percentile levels (L_{90}) indicate that the soundscapes are often dominated by transient or intermittent sounds (such as aircraft overflights or passing automobiles). The average existing nighttime L_{50} across the project area was 33 dBA.

Noise modeling was completed for the GE 2.82 MW machine using CadnaA (from Datakustik GmbH) sound propagation modeling software to determine the sound levels at each of the identified receptors. Coordinates for the center point of each receptor are included in the Noise Report.

Modeling for the Project was in accordance with the standard ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation." The model takes into account source sound power levels, surface reflection and absorption, atmospheric absorption, geometric divergence, meteorological conditions, walls, barriers, berms, and terrain. The acoustical modeling software (CadnaA from Datakustik GmbH) used here is a widely accepted acoustical propagation modeling tool, used by many noise control professionals in the United States and internationally. ISO 9613-2 also assumes downwind sound propagation between every source and every receiver, consequently, all wind directions, including the prevailing wind directions, are taken into account. Model input

parameters are listed in the Noise Report including the modeled sound power spectra for each turbine model.

For this analysis, a ground absorption factor of G=0.7 was used, which is appropriate for comparing modeled results to the L_{50} metric used in the state standard, particularly when summing model results with the monitored L_{50} levels[11]. A 2-dB uncertainty factor was added to the turbine sound power per typical manufacturer warranty confidence interval specifications.

Two distinct receiver heights are included in the analysis; different receiver heights result in different sound levels as a result of source proximity and relative exposure. Residences are modeled as discrete receivers at 4 meters (13 feet) above ground level. The 4-meter (13-foot) receiver height mimics the height of a second story window. A total of 343 Minnesota residences were modeled, at locations within 3.2 kilometers (2 miles) of the Project, and 37 Iowa residences were modeled within 3.2 kilometers (2 miles) of the state border. The grid, represented in the results map by sound pressure level contours, is calculated at a height of 1.5 meters (5 feet), to represent one's average listening height when standing outside.

The model included the sound emissions of all of the primary and alternate Project turbine locations in Minnesota and Iowa. Select turbines were modeled with LNTE blades. Given that not all of the primary and alternate locations will be constructed, in some locations the projected sound levels are higher than would actually occur if a given turbine is not constructed. The model also included the sound emissions from 26 turbines at NextEra's Endeavor Wind Farm in Osceola County, Iowa southwest of the proposed Project.

Modeling results are presented in the Noise Report (Appendix D) and shown as contour lines representing 5-dB increments of calculated A-weighted sound pressure levels in Figure 8. The Noise Report also includes a list of the calculated sound pressure levels at each receiver in tabular format and a map showing all receiver identification numbers for reference in the appendix table, as well as a summary of the sound propagation model results. All modeled residences are projected to have sound levels at or below 50 dBA. The highest modeled sound level (L_{50}) at a residence is 50 dBA, and the average sound level (L_{50}) across all residences is 40 dBA. A summary of the model results is provided in Table 12.

Table 12: Summary of Sound Propagation Model Results

Statistic	Modeled Turbine-Only Sound Level (dBA) by Residence Classification		
	All Residences	Participating Residences	Non-Participating Residences
Average L_{50}	40	46	38
Maximum L_{50}	50	50	50
Minimum L_{50}	25	32	25

[11] Generally accepted wind turbine modeling procedure calls for a ground absorption factor of G = 0.5, with a 2-dB uncertainty factor added to the manufacturer's guaranteed levels, to predict a maximum $L_{EQ(1\text{-}hr)}$. In this case, the state limit utilizes an L_{50} metric instead of maximum $L_{EQ(1\text{-}hr)}$, which means a ground factor of G=0.7 can be used.

To assess compliance with state noise regulations, the model results must be summed (logarithmically)[12] with the monitored overall nighttime L_{50} results to determine the projected cumulative sound level (L_{50}) that could occur when the Project is operating. This analysis is presented in the Noise Report (see Table 8 of the Noise Report) for each monitor location; the model results summed with the overall nighttime L_{50} for each background monitor location are less than 50 dBA.

The background L_{50} does and will vary from hour to hour, as shown in the monitor results in the Noise Report. The average overall nighttime L_{50} across all the monitor sites was 33 dBA, but there were some nighttime hours during the monitoring period when the L_{50} was above 40 dBA and as high as 48 dBA for a few hours. Thus, the model results are summed with a range of potential background L_{50} values ranging from 30 dBA to 45 dBA in 5 dB increments (see Appendix C in the Noise Report).

Conclusions of the preliminary noise assessment are as follows:

1. Background sound levels vary around the Project site during the day but are generally consistent across the area at night. The overall nighttime L_{50} across the Project area ranged from 29 dBA at Monitor B to 35 dBA at Monitor C. The average overall nighttime L_{50} across the site was 33 dBA. During the day, the overall L_{50} across the Project area ranged from 34 at Monitor B to 41 at Monitor D with an average overall daytime L_{50} of 38 dBA;
2. Minimum 1-hour nighttime L_{50}s were between 19 and 28 dBA across the Project area, while maximum 1-hour nighttime L_{50}s were between 42 and 48 dBA;
3. State noise regulations require that wind power generation facilities show compliance with a nighttime limit of 50 dBA (L_{50}) and a daytime limit of 60 dBA (L_{50}) at residences;
4. Sound propagation modeling was performed in accordance with ISO 9613-2 at a total of 380 discrete receivers (343 in Minnesota within 2 miles of the Project, 37 in Iowa within 2 miles of the state border) with spectral ground attenuation and a ground factor of G=0.7. These modeling parameters are meant to represent the L_{50} of the proposed facility;
5. Modeling was completed for the anticipated turbine model, the GE 2.82/127 with a hub height of 89 meters;
6. Projected sound levels from the Project, including all primary and alternate turbine locations in Minnesota and Iowa, in combination with modeled sound levels from the Endeavor Wind Farm in Osceola, Iowa, are 50 dBA or less at all residences with the highest projected sound level (L_{50}) at a residence of 50 dBA. The average sound level (L_{50}) across all modeled residences is 40 dBA; and
7. When added to the overall nighttime L_{50} from monitored locations, sound levels remain below 50 dBA, but the background L_{50} does and will vary from hour to hour, as shown in the monitor results.

[12] $L_{p1,2} = 10 \times \log_{10}\left(10^{L_{p1}/10} + 10^{L_{p2}/10}\right)$

In summary, results from the modeling indicated that the maximum sound pressure level (L_{50}) at any occupied residential receiver in Minnesota was 50 dBA. The analysis indicates that operation of the proposed Project would not cause sound levels greater than 60 dBA during the daytime or greater than 50 dBA during the nighttime at any modeled receptor in Minnesota. In addition, the cumulative impact of background sound levels and turbine operational sound levels on any residence would be less than 60 dBA during the day and less than 50 dBA during the night when applying the measured average background level L_{50} of 38 dBA during the day and 33 dBA during the night.

The sound profile for the GE 3.x MW machine is not yet available. If Three Waters elects to use the GE 3.x MW machine it will provide sound modeling to demonstrate the maximum sound pressure level at any occupied residential receiver in Minnesota is less than or equal to that which was modelled for the GE 2.82 MW machine.

8.3.3 Mitigation

In summary, all modeled sound levels at the provided occupied residences in Minnesota are anticipated to be at or below 50 dBA for all scenarios (i.e., all layouts, all turbine models, all ambient noise scenarios), therefore the proposed Project would be in compliance with Minnesota's allowable sound levels as described in Minnesota Rules Chapter 7030.

Impacts to nearby residents and other potentially affected parties in terms of noise are being taken into account and will continue to be taken into consideration during all subsequent turbine siting effort and Project design iterations. Unless other arrangements have been made with specific residents, Three Waters proposes siting turbines the minimum 1,320 ft from residences and any additional distance required to comply with the MPCA limit of a 50 dBA L_{50} noise level (MPCA, 2017). The preliminary layout has been modeled to help ensure cumulative impacts from all wind turbines are below the MPCA's L_{50} noise limit of 50 dBA at residential receptors.

If changes are made to the turbine layout or Three Waters determines use of a louder turbine model or operating mode, then the Project noise assessment will be updated, and compliance demonstrated for the updated layout. If needed, mitigative measures available to the Project to reduce noise levels at any given residence may include the use of LNTE blades on select turbine(s) and operation of select turbine(s) in low noise mode (reduced rotational speed and power output).

8.4 VISUAL IMPACTS

8.4.1 Resources

As described in Section 8.13, topography of the Project Area is generally flat with some gently rolling hills with elevations ranging from 1,394 to 1,568 ft above sea level (Figure 9). Agricultural fields, farmsteads, and gently rolling topography visually dominate the Project Area. The landscape can be classified as rural open space. Topography within the Project Area is depicted in Figure 9.

Within the Project Area, the local vegetation cover is dominated by agricultural crops (Figure 10). In Jackson County, corn (51 percent) and soybeans (48 percent) account for the majority of acreage planted in 2017, with alfalfa and hay accounting for the remaining 1 percent (USDA, 2019a). A mix of deciduous and coniferous trees planted for windbreaks

surround many of the regional farmsteads. Typically, these isolated windrows have been established and maintained by the landowners to limit wind erosion and to shelter dwellings.

The level of development in this area of southwestern Minnesota consists predominantly of farmsteads, farm buildings and rural residential properties (both inhabited and uninhabited). From a visual perspective, these farmsteads and residences are focal points in the sparse, open space of the region. The existing visual character of the Project Area and surrounding region is that of an agricultural landscape and contains a number of operating wind farms to the northeast, west and south. The construction and operation of these adjacent wind farms has created a new visual character to the landscape in which turbines are a component. Based on significantly positive local support from landowners and government officials, this landscape has been accepted into the local character.

8.4.2 Impacts

The proposed Project layout consists of 128 GE 2.82/127 wind turbines with either a 114- or 89-meter hub height. Except for the height, the turbine models to be installed for the Project appear identical and include a tubular tower topped with a single hub with three blades attached to the nacelle. The Project is designed to produce a nameplate capacity of up to 201 MW. The current layout proposes using the above turbine model at either 114- or 89-meter hub height, and the 114-meter hub height would represent the worst-case maximum shadow impacts.

The topography in the vicinity is relatively flat, and the agricultural vegetation has a low profile, which makes objects with comparably high profiles potentially viewed as visual disruptions. Visual impacts will be most evident to people who live in and near the Project and to people traveling through the Project Area. While people living in or traveling through the area are accustomed to viewing wind turbines at existing wind farms, the Project will add to the cumulative visual impacts by adding up to 71 new turbines in Minnesota (Figures 3 and 21).

Construction of the proposed wind turbines will impact the visual surroundings of the Project Area (Figures 2 and 3). The perceived degree of visual impact will vary based on personal preferences and subjective human responses. For some viewers, the Project may be perceived as a visual intrusion; others may view the Project as a positive aesthetic feature on the landscape. The operation of the Project will generate minimal vehicle traffic and will not significantly increase day-to-day human activity in the area; the Project Area will retain its basic rural character. While the form and purpose of the Project is associated with clean energy generation technology, the proposed wind turbines are compatible with the agricultural and rural heritage of the area, which includes other high-profile – although smaller – vertical features such as windmills, barns and farm outbuildings, silos, and grain elevators.

Some Project proposed turbines will be located within the viewshed of MNDNR-managed Wildlife Management Areas (WMAs) or other natural areas and may be seen by people using those areas. Figures 5 and 20 identify recreation and wildlife areas within the Project's vicinity, and Tables 19 and 20 summarize the same information. There are three WMAs within the Project Area (24 WMAs within 10 miles), eight Waterfowl Production Areas (WPAs) within the Project Area (29 WPAs within 10 miles), and no Scientific and Natural Area (SNA) within 10 miles of the Project Area. Further information regarding recreational lands in relation to the Project Area is found in Section 8.7. While wind turbines will impact the visual surroundings of the Project Area, the degree and nature of the visual impact will

vary based upon personal perceptions and preferences. Additionally, several wind turbines associated with other commercial wind energy generation projects predominately located to the northeast and south of the Project Area in both Minnesota and Iowa (Figure 21). These existing wind energy projects also impact the visual surroundings of the Project Area, so the Project would not be introducing a new type of visual feature into the landscape.

The FAA requires obstruction lighting or marking of structures more than 200 ft above ground to provide safe air navigation (FAA, 2015). Three Waters will apply to the FAA for approval of ADLS light-mitigating technology that is compliant with FAA requirements, and wind turbines will be lit in accordance with FAA standards. The ADLS are sensor-based systems designed to detect aircraft as they approach an obstruction or group of obstructions; these systems automatically activate the appropriate obstruction lights until they are no longer needed by the aircraft. This technology reduces the impact of nighttime lighting on nearby communities and migratory birds and extends the life expectancy of obstruction lights. ADLS operate by providing continuous 360 degree radar surveillance of the airspace around a wind farm (and other installations that require aircraft obstruction lighting) from the ground level to above aircraft flight altitudes, automatically issuing signals to activate obstruction lighting when aircraft are detected at a defined outer perimeter. The ADLS will consist of one or two ADLS radar towers designed to detect aircraft within a certain distance of the Project (as determined by ADLS contractor specifications). To reduce light pollution, turbine lights will remain off until the detection of aircraft, upon which time lights are turned on. It is anticipated that lights will remain off approximately 98 percent of the time. FAA requires synchronized flashing of red lights for wind turbines. See Section 8.8 for information on the FAA permitting process for turbines over 499 ft tall.

The number of turbines with visibility lighting will be minimized, according to FAA requirements. FAA-approved lighting uses the shortest allowable flash duration and the minimum allowed flashes per minute. All lights will flash at the same time so that nocturnal migrating birds are not disoriented by lights. With wind turbine visibility lights remaining off approximately 98 percent of the time, light pollution will be minimized, and further mitigation will not be necessary. Lighting at the O&M facility, Project substation, and other installations will be minimized and designed so that light is directed downward (toward the access or work area) and will be hooded to prevent light from shining into the sky and attracting or disorienting nocturnal migrants. Motion or heat-activated lighting will be used where practicable.

8.4.3 Shadow Flicker

Shadow flicker from wind turbines occurs when rotating wind turbine blades move between the sun and the observer. Shadow flicker is generally experienced in areas near wind turbines where the distance between the observer and wind turbine blade is short enough that sunlight has not been significantly diffused by the atmosphere. When the blades rotate, this shadow creates a pulsating effect, known as shadow flicker. If the blade's shadow is passing over the window of a building, it will have the effect of increasing and decreasing the light intensity in the room at a low frequency in the range of 0.5 to 1.2 Hz, hence the term "flicker."

In this case, with a maximum rotation speed of 15.7 rpm for the GE 2.82/127, the frequency would be 0.785 Hz. This flicker effect can also be experienced outdoors, but the effect is typically less intense, and becomes less intense when farther from the wind turbine causing the flicker. The moving shadow of a wind turbine blade on the ground is similar to

the effect one experiences when driving on a road when there are shadows cast across the road by an adjacent row of trees.

Shadow Flicker Analysis and Results

Three Waters engaged EAPC Wind Energy to conduct a shadow flicker analysis for the proposed Project. A copy of the "Final Report-Three Waters Wind Farm-Shadow Flicker Study" (September 28, 2019) is included in Appendix E (SF Report).

The analysis was performed utilizing windPRO[13], a sophisticated wind modeling software program, and in conjunction with MNDOC *Application Guidance for Site Permitting of Large Wind Energy Conversion Systems in Minnesota* (July 2019) (LWECS Application Guidance). windPRO has the ability to calculate detailed shadow flicker maps across an entire area of interest or at site-specific locations using shadow receptors. A summary of realistic shadow flicker distribution is included in Table 13. The number of occupied residences registering more than 30 hours per year for 114-meter hub-height turbines was 18, ranging from 30 hours to 73 hours and 33 minutes. The number of occupied residences registering more than 30 hours per year for 89-meter hub-height turbines was 13, ranging from 30 hours to 78 hours and 23 minutes. Graphical results of the analysis are presented in Figures 11a and 11b (see also Appendix E for additional details).

Table 13 Residential Structures Realistic Shadow Flicker Distribution

Realistic Shadow Flicker (hrs/year)	GE 2.82-127 114 m Hub Height		GE 2.82-127 89 m Hub Height	
	Total # Participating	Total # Non-Participating	Total # Participating	Total # Non-Participating
0	13	185	13	188
0 to 5	11	40	12	44
5 to 10	4	22	5	18
10 to 15	6	16	6	15
15 to 20	5	10	4	9
20 to 25	4	4	5	7
25 to 30	3	2	3	1
30+	9	9	7	6

The Project layout consists of 128 GE 2.82/127 wind turbines with either a 114- or 89-meter hub height. Except for the height, the turbine models to be installed for the Project appear identical and include a tubular tower topped with a single hub with three blades attached to the nacelle. The Project is designed to produce a nameplate capacity of up to 201 MW. The current layout proposes using the above turbine model at either 114- or 89-meter hub height, and the 114-meter hub height would represent the worst-case maximum shadow impacts

[13] windPRO is the world's leading software tool for wind farm design including shadow flicker analysis.

It is likely that not all turbines would be using the 114-meter hub-height towers so the results of this study based on the 114-meter hub height will be conservative. One array was analyzed (79 in Minnesota and 49 across the border in Iowa). Coordinates for 343 dwellings which could potentially experience shadow flicker from the proposed Wind Farm were supplied by Three Waters.

Shadow flicker frequency calculations for the Project were modeled by 343 residences (receptors) in Minnesota with a windPRO model utilizing digital elevation data, the GE 2.x model turbine with a 114-meter tall tower. If an 89-meter tower is used, then shadow flicker frequency would likely decrease. Results are presented as realistic shadow flicker, which accounts for weather impacts on turbine operation. The maximum predicted shadow flicker impacts that occurred at a Minnesota residence for each turbine layout are included in Appendix B of the SF Report.

The likelihood and duration of the shadow flicker effect depends on a number of variables, including (but not limited to), the orientation of the building relative to the turbine, wind direction, distance from the turbine, turbine height and rotor diameter, time of year and day, weather conditions, vegetation and other obstacles that mask shadows, and operational status of the turbines.

This flicker effect is most noticeable within approximately 1,000 meters of the turbine and becomes more and more diffused as the distance increases. There are no uniform standards defining what distance from the turbine is regarded as an acceptable limit beyond which the shadow flicker is considered to be insignificant. The same applies to the number of hours of flicker that is deemed to be acceptable.

Shadow flicker is typically greatest in the winter months when the angle of the sun is lower and casts longer shadows. The effect is also more pronounced around sunrise and sunset when the sun is near the horizon and the shadows are longer. A number of factors influence the amount of shadow flicker on the shadow receptors. One consideration is the environment around the shadow receptor. Obstacles such as terrain, trees or buildings between the wind turbine and the receptor can significantly reduce or eliminate shadow flicker effects. Deciduous trees may block the shadow flicker effect to some degree, depending on the tree density, species present and time of year. Deciduous trees can lead to a reduction of shadow flicker during the summer when the trees are bearing leaves. However, during the winter months, these trees are without their leaves and their impact on shadow flicker is not as significant. Coniferous trees tend to provide mitigation from shadow flicker year-round. For this study, no credit was taken for any potential shading effects from any type of trees or other obstacles that would reduce the number of shadow flicker hours at the structures.

Another consideration is the time of day when shadow flicker occurs. For example, it may be more acceptable for private homes to experience the shadow flicker during daytime hours when family members may be at work or school. Likewise, a commercial property would not be significantly affected if all the shadow flicker impact occurred before or after business hours.

The climate also needs be considered when assessing shadow flicker. In areas with a significant amount of overcast weather, there would be less shadow flicker, as there are no shadows if the sun is blocked by clouds. Also, if the wind is not blowing, the turbines would not be operational and, therefore, not creating shadow flicker.

In summary, 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 occurrence and 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. The model assumed homes had clear walls and any flicker outside the home would be noticed inside the home.
- 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 – i.e., it will be stationary -- thereby eliminating shadow flicker. The turbines for this Project will not rotate during these conditions and will be stationary.
- 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. No credit was assumed in the model for any blockage due to obstacle, making the results of the study slightly more conservative.
- 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. No credit was assumed in the model for any blockage due to topography, making the results of the study slightly more conservative.

While the State of Minnesota has no requirements concerning exceedance limits of shadow flicker impacts from wind projects, the MNDOC LWECS Application Guidance requires an analysis and discussion of shadow flicker and include isopleths for 100, 50, and 25 hours per year of potential shadow flicker. The MNDOC guidance also requires a listing of methods and assumptions used in the analysis, but it does not prescribe a specific method to use for the analysis. MNDOC guidance also requires a figure illustrating the likely hours of shadow flicker per year and a table showing potential shadow durations per day at each residential receptor potentially affected by the Project. Additionally, there are no LWECS shadow flicker requirements in applicable Jackson County ordinances.

8.4.4 Mitigation

General Visual Mitigation

Three Waters will avoid or minimize visual impacts during the final design and siting of the Project to the extent practicable and will work directly with landowners to identify and address concerns related to Project aesthetics. The following mitigation measures are proposed to reduce the level of visual impacts from the proposed Project:

- Turbines will be uniform in color;
- Project siting will minimize impacts to native habitats to the maximum extent practicable;
    - Turbines will be sited in agricultural fields to minimize impacts to grassland, forest, wetland and other native vegetation communities.
    - For the proposed turbine layout, all native prairie will be avoided to the maximum extent practicable.
- Turbines will be lit in accordance with FAA requirements with appropriate light mitigating technology, i.e., ADLS (with wind turbine visibility lights remaining off approximately 98 percent of the time, light pollution will be minimized, and further mitigation will not be necessary);
- Collector lines will be buried to the extent practicable to minimize aboveground structures within the turbine array;
- Existing roads will be used for construction and maintenance where possible to minimize the number of new roads constructed; and
- Access roads created for the Project will be located on gentle grades to minimize the amount of erosion, visible cuts, and fills.

Shadow Flicker Mitigation

In addition to general visual mitigation described above, Three Waters will implement the following measures to avoid or minimize shadow flicker impacts from the Project:

- Any shadow flicker impacts over 30 hours per year will be mitigated either through curtailment of the contributing turbine(s) or by further refinement of the array; and
- Limit shadow flicker resulting from Project wind turbines at currently occupied residences to 30 hours per year, unless waived in writing by the owner of the occupied residence.

8.5 PUBLIC SERVICES AND INFRASTRUCTURE

8.5.1 Resources (Roads, Telecommunications, Other Infrastructure and Services)

The Project is located in a sparsely populated, predominantly rural and agricultural area in southwest Minnesota. Public services supporting rural residences and farmsteads within the Project Area include transportation/roadways, electric and telephone/telecommunications (Figures 2 and 12).

The Project is centrally located between two cities, with the City of Jackson approximately 10 miles east of the easternmost portion of the Project, and the City of Worthington 10.5 miles west of the westernmost portion of the Project. The City of Jackson (population 10,104) is the home of the Jackson County Sheriff's office, the Jackson Fire Department, and the Sanford Jackson Medical Center. Worthington (population 13,142) in neighboring Nobles County, is the home of the Nobles County Sheriff's Office, the Worthington Fire Department, and the Sanford Worthington Medical Center. Two incorporated cities (Lakefield City and Round Lake City) are located within 5 miles of the Project Area; these communities receive public services from Jackson County.

The Project is expected to have minimal effect on existing services and infrastructure of the area. Construction and operation of the Project will be in accordance with associated federal, state, and local permits and laws, as well as industry construction and operation standards and best practices. The Project is designed to have manageable temporary effects on existing infrastructure during Project construction and operation. Because only minor impacts are expected, extensive mitigation measures are not anticipated. The following sections describe specific impacts that may occur to public services and infrastructure and how they will be mitigated.

Roads

Description of Resources

Existing roadway infrastructure in and around the Project Area consists primarily of county and township roads that generally follow section lines, with private unpaved farmstead driveways and farming access roads (Figure 2). Interstate Highway 90 provides the main access to nearby cities and bisects the Project's northern boundary. Various County State Aid Highways (CSAHs), county and township roads (two-lane paved and gravel roads) provide access to the Project Area. Throughout most of the Project Area, many landowners use private, single-lane farm roads and driveways on their property. A listing of the major roads and their classification (federal, state, county, or township) is provided in Table 14, and existing traffic volumes on the area's state and county roads (CR) and highways are provided in Table 15.

Table 13 Miles of Roads, By Type, in the Project Area

Road Type	Miles in the Project Area
Federal	9.1
State	0.0
County State Aid Highway	33.3
County	11.4
Township	80.4
Ramp or Connector	1.0
Total	**135.2**

Of the roads within or adjacent to the Project Area, Interstate Highway 90 has the highest Annual Average Daily Traffic (AADT) count at 8,400 to 8,600 vehicles per day, as reported by the Minnesota Department of Transportation (MnDOT, 2018). As indicated in Table 15, other roadways in the vicinity of the Project have AADTs ranging from as few as 45 on County Road 68 to as many as 430 cars per day on CSAH 34. Three Waters has consulted with the Minnesota Department of Transportation (MnDOT) via email and in a meeting to confirm there will be no need for USDOT involvement and regarding working with MnDOT all permits impacting roads. These emails and meeting summary are presented in Appendix B.

Table 14 Average Annual Daily Traffic for Primary Roads in Project Vicinity

Roadway Segment Description	Existing Annual Average Daily Traffic
Interstate 90 E of TH264 & CSAH1	8,600
Interstate 90 E of CSAH9	8,400
CSAH34 W of E JCT CSAH9	430
CSAH9 S of Interstate 90	360
CSAH4 E of CSAH1	315
CSAH5 N of CR68	285
CSAH9 1.5 MI S of CSAH34	255
CSAH9 S of CSAH4	200
CSAH4 E of CR69	175
CR68 W of TH86	75
CR67 N of CSAH4	60
CR68 W of CSAH5	45

Impacts

Some temporary impacts on public roads within the Project Area during construction are anticipated. Roads will be affected by the normal use of vehicles employed to deliver Project components, construction materials and equipment to and from Project locations. Specific routes may also be impacted by the temporary expansion of road widths and/or intersections to facilitate the safe and efficient delivery of Project facility components and associated construction equipment.

Primary access to the Project Area will be via U.S. Interstate 90, with exits to Minnesota Highway 264, Minnesota Highway 86, or Jackson County Road 9 providing access to the Project Area. Secondary access to turbine locations will be via existing county and township roads that will connect to private access roads. These county and township roads will be assessed for strength and condition prior to construction. Three Waters will enter into a road use agreement with each road authority, as required, to define use and restoration of roads utilized during Project construction.

Three Waters anticipates that at the peak of construction, the local roads may experience an increase in daily traffic of up to 1,000 additional vehicle trips per day. For purposes of comparison, the functional capacity of a two-lane paved rural highway with reasonably unimpeded operations ranges from 3,800 vehicles per day on highways with reduced passing opportunities due to terrain, to 5,000 vehicles per day for highways under level

conditions that allow for higher speeds and significant passing opportunities (HCM, 2010). As indicated in Table 15, with the exception of Interstate 90, area roadways within or proximal to the Project have AADTs currently well below capacity. As such, while the additional 1,000 vehicle trips throughout the Project Area during construction would be perceptible, but likely comparable to traffic loads experienced during peak planting and harvest periods.

Following construction and during Project operation, maintenance crews will drive through the Project Area to monitor and maintain the wind facility. Operation, maintenance and repair activities are not anticipated to adversely impact normal traffic in the Project Area. Where maintenance needs dictate that heavier equipment be used, traffic control measures and coordination with local authorities will be implemented to ensure public health and safety is protected with respect to the Project.

Mitigative Measures

Turbines will be setback from the edge of public road rights-of-way as required by MPUC standards the road authority to ensure safety for travelers (Table 6). Prior to construction, Three Waters will coordinate with the applicable local and state road jurisdictional authorities to ensure that the increased traffic and additional weights being applied to area roads are acceptable, and to obtain all relevant permits for access and utility installation. Three Waters will work with the cities and townships in Jackson County and MnDOT, as necessary, regarding access road locations, roadway concerns, ROW work (if any), and setbacks during construction of the Project. Three Waters will also work closely with the landowners in the placement of access roads to minimize land use disruptions during construction and operation of the Project to the maximum extent possible.

Designated haul-roads will be reviewed with the local authority having jurisdiction and Three Waters will negotiate in good faith to execute a comprehensive road use agreement that will be used to identify suitable travel routes, traffic control measures, methods for evaluating, monitoring and restoring roads, and mitigation measures to ensure roads used for oversize/overweight loads are properly identified, monitored and stabilized. Construction-related impacts are further described in Section 11.

Three Waters will ensure that the general contractor communicates with the relevant road authorities throughout the construction process, particularly regarding the movement of equipment on roads and the terms of the potential road agreement.

Telecommunications

Telecommunications refers to the types of voice, data and video transmission that are exchanged over significant distances by electronic means. Telecom is a broad term that includes a wide range of information transmitting technologies such as telephones (wired and wireless), microwave communications, fiber optics, satellites, radio and television broadcasting, the internet, and telegraphs. Telecommunication providers in the Project Area include Frontier Communications of Minnesota, Inc., Qwest Corporation, and Centurytel of Minnesota, Inc. DBA CenturyLink (Minnesota Geospatial Commons, 2016).

Description of Resources

Emergency Services

Emergency services in the Project Area were evaluated by Comsearch in 2019 (Appendix F). The study evaluated the registered frequencies for first responder entities including police, fire, emergency medical services, emergency management, hospitals, public works, transportation, and other state, county, and municipal agencies (Figure 12). Industrial and business land mobile radio and commercial Emergency 911 operators within the Project Area were also identified. There are nine land mobile and emergency service sites in and immediately adjacent to the Project Area. There are 7 licensees that operate on the bands for area-wide first responders in the Project Area. Additionally, there are 10 mobile phone carriers with Emergency 911 service in the Project Area.

Telephone

Telephone service is provided by CenturyLink and other local telephone companies to farmsteads, rural residences, and businesses in the area. Mobile phone carriers include AT&T, T-Mobile, Verizon, Standing Rock Telecommunications, Sprint, and Dish Network (Appendix F).

AM/FM Radio

On behalf of Three Waters, Comsearch analyzed amplitude modulation (AM) and frequency modulation (FM) radio broadcast stations whose service could potentially be affected by the proposed Three Waters Wind Project. Comsearch found five database records for AM stations within approximately 30 kilometers (18.6 miles) of the Project Area. These records represent stations KKOJ broadcasting out of Jackson, Minnesota, as well as KWOA out of Worthington, and KDOM out of Windom. KWOA and KDOM are both licensed separately for daytime and nighttime operations, with a higher transmit power permitted during daytime hours. Comsearch determined that there were 15 records for FM stations within approximately 30-kilometers of the Project Area, 14 of which are currently licensed and operational, and four of which are translators that broadcast with limited range. A listing of the nearest AM and FM stations are provided in the attached AM and FM Radio Report (see Appendix F).

Television

According to a 2019 study by Comsearch (Appendix F), there are a total of 126 off-air television stations that are currently licensed and operating within 150 kilometers (93 miles) of the Project Area, 109 of which are low-power stations or translators. Translator stations are low-power stations that receive signals from distant broadcasters and retransmit the signal to a local audience.

Microwave Beam Path

Microwave bands operate over a wide frequency range (900 MHz – 23 GHz), comprising the "telecommunication backbone" of the country, providing long-distance and local telephone service, backhaul for cellular and personal communication service, data interconnects for mainframe computers and the Internet, network controls for utilities and railroads, and various video services. A 2019 study by Comsearch (Appendix F) identified ten microwave paths that intersect the Project Area. Microwave paths and buffers (Fresnel zone as calculated by Comsearch) are depicted on Figure 12 and described in Appendix F.

Other Infrastructure and Services

There are currently two existing 345-kV electric transmission lines located within the Project Area. ITC's existing Raun-Lakefield 345-kV transmission line traverses the southeast portion of the Project Area, and Xcel Energy's 345-kV Split Rock to Lakefield Junction transmission line traverses the Project Area along the north side of the I90 corridor (see Figure 3). The Raun-Lakefield 345-kv transmission line is the proposed interconnection line for the Project. There are additional 69- and 161-kV transmission lines also crossing the Project Area (Figure 3).

There are no existing railroads in the Project Area.

Townships within the Project Area have limited public infrastructure services. Homes and farmsteads in this area typically utilize on-site water wells and septic systems for individual household and farming needs. Lincoln Pipestone Rural Water (LPRW) services the individuals and families that reside within the majority of the Project Area, while Red Rock Rural Water System (RRRWS) services the area immediately adjacent to the northeast portion of the Project Area. At Three Waters' request, LPRW and RRRWS both provided shapefiles of existing pipe locations; LPRW specifically stated that the locations are approximations. With civil surveys and underground utility locating, Three Waters will ensure that rural water system infrastructure is not impacted. Correspondence with both LPRW and RRRWS is included in Appendix B.

8.5.2 Impacts

Emergency Services

First responder, industrial/business land mobile sites, area-wide public safety, and commercial Emergency 911 communications are typically unaffected by the presence of wind turbines, and no significant harmful effect to these services in the Project Area are anticipated. Many land mobile systems are designed with multiple base transmitter stations covering a large geographic area with overlap between adjacent transmitter sites so that any signal blockage caused by the wind turbines does not materially degrade reception because the end user is likely receiving signals from multiple transmitter locations. Additionally, the frequencies of operation for these services have characteristics that allow the signal to propagate through wind turbines. As a result, very little, if any, change in coverage should occur when the wind turbines are installed.

Telephone

As mentioned above in Emergency Services, many land mobile systems are designed with multiple base transmitter stations, and therefore, any signal blockage caused by the wind turbines would not perceptibly degrade reception. Construction and operation of the proposed Wind Farm is not expected to impact telephone service to the Project Area.

AM/FM Radio

As described in the Comsearch study (Appendix F), the exclusion distance for AM broadcast stations varies as a function of the antenna type and broadcast frequency. For directional antennas, the exclusion distance is calculated by taking the lesser of 10 wavelengths or 3 kilometers. For non-directional antennas, the exclusion distance is simply equal to 1 wavelength. Potential problems with AM broadcast coverage are only anticipated when AM

broadcast stations are located within their respective exclusion distance limit from wind turbine towers.

The closest operational AM station to the Project, KKOJ, is more than 17.8 kilometers from the nearest wind turbine. Because no operational AM stations are found within 3 kilometers of the Project, which is the maximum possible exclusion distance based on a directional AM antenna broadcasting at 1000 kilohertz or less, the Project should not impact the coverage of local AM stations.

The coverage of FM stations is generally not susceptible to interference caused by large objects such as wind turbines, especially when they are sited in the far field region of the radiating FM antenna, which mitigates the risk of distorting the antenna's radiation pattern. Within the antenna's near field region, radiation pattern distortion can become a factor.

The nearest operational FM station to the Project, KITN, is located approximately 873 meters from the nearest turbine. Based on the KITN antenna configuration, Comsearch calculated a conservative near-field radius of 642 meters. The distance from the estimated rotational sweep of the turbine blades to the KITN antenna is approximately 809 meters, clearing the near field region by approximately 167 meters. As such, the station should not be impacted by the proposed turbines. The next closest FM stations, KUQQ and KUOO, are both more than 17.2 kilometers from the nearest turbine and well out of range of impact.

Television

Based on a contour analysis of the licensed stations within 150 kilometers of the Project Area, Comcast determined that eight of the full-power stations and fifteen of the low-power stations may have their reception disrupted in and around the Project Area. The areas primarily affected would include TV service locations within 10 kilometers of the Project Area with clear line-of-sight to a proposed wind turbine but not to the respective station. Following Project construction, homes and communities in these locations may experience degraded reception of these stations due to multipath interference caused by signal scattering as TV signals are reflected by the rotating wind turbine blades and mast.

Microwave Beam Path

Comsearch's Licensed Microwave Study for the Project Area (Appendix F) indicates that the construction of wind turbines in areas within the calculated Fresnel zone should be avoided. Comsearch's study was based on a preliminary layout of wind turbine locations, which has since changed. Three Waters is committed to constructing wind turbines outside the Fresnel zone to avoid impacts to microwave beam paths.

Other Infrastructure and Services

As covered in Section 8.5.1, LPRW services the individuals and families that reside within the majority of the Project Area, while RRRWS services the area immediately adjacent to the northeast portion of the Project Area. Three Waters will ensure that rural water system infrastructure is not impacted by Project activities by performing civil surveys and underground utility locating, in addition to referring to infrastructure location shapefiles received from both LPRW and RRRWS and obtaining crossing agreements where required.

Three Waters will also work with owners of other existing infrastructure and services as necessary to ensure that there are no impacts from construction and operation of the

Project to existing electric transmission, railroads, pipelines, or other public infrastructure that exists in the Project Area.

8.5.3 Mitigation

Emergency Services

If a public safety entity believes its coverage has been compromised by the presence of the Project, signal coverage to the area can be optimized by using a nearby base station or adding a repeater site. Utility towers, meteorological towers or wind turbine towers within the wind Project Area can serve as the platform for a base station or repeater site. In order to appropriately communicate with applicable emergency service entities, Three Waters will develop a notification plan, which will provide written notification to public safety entities, telephone companies, radio stations and television stations that operate within the Project Area. This notice could assist in handling landowner and/or customer complaints for both Three Waters and the affected entities. These notices would be sent to these parties if the Site Permit is issued for the Project.

Telephone

Three Waters will not locate any turbines within 254 ft (77.5 m) of land mobile fixed-base stations to avoid any possible impact to the communications services provided by these stations. This distance is based on FCC interference emissions from electrical devices in the land mobile frequency bands.

AM/FM Radio

Because there are no AM/FM radio stations operating in close enough proximity to the Project that would typically cause impacts to reception, no mitigation is proposed at this time. Should issues arise, Three Waters will work closely with area stations regarding mitigation options.

Television

While TV signals are reflected by wind turbines, modern digital TV receivers have undergone significant improvements to mitigate the effects of signal scattering. When used in combination with a directional antenna, it becomes even less likely that signal scattering from wind farms will cause interference to digital TV reception.

Nevertheless, certain areas, and especially areas with line-of-sight to at least one wind turbine but not to TV station antenna, could experience signal scattering. In the event that interference is observed in any of the TV service areas, a high-gain directional antenna may be used, preferably outdoors, and oriented towards the signal origin in order to mitigate the interference. Both cable service and direct broadcast satellite service will be unaffected by the presence of the wind turbine facility and may be offered to those residents who can show that their off-air TV reception has been disrupted by the presence of the wind turbines after they are installed.

Three Waters, at its own expense, will resolve any disruptions to over-the-air television viewing caused by the Project, by relocating household antennae to receive a better signal, installation of a better outside antenna or one with higher gain, or installation of satellite or cable television. Three Waters will take appropriate actions to minimize any such

interference and shall make a good faith effort to restore or provide reception levels equivalent to reception levels in the immediate areas just prior to construction of the Project. This mitigation requirement shall not apply to any dwellings or other structures built following completion of the Project.

Microwave Beam Path

Three Waters will ensure the Project's turbines are sited in a manner that avoids identified microwave beam paths and communication systems. Three Waters will not operate the wind project in a manner that will cause microwave, radio, or navigation interference contrary to Federal Communications Commission (FCC) regulations or other law.

Other Infrastructure and Services

Three Waters will use the infrastructure location shapefiles received from LPRW and RRRWS and will perform civil surveys and underground utility locating to identify Project facilities that cross existing LPRW and RRRWS system infrastructure before beginning construction. Prior to construction and as a part of the development of any crossing agreements, Three Waters will work with each organization to ensure rural water services are not impacted.

No other impacts are anticipated for other infrastructure and, therefore, no other mitigation is proposed. If impacts to other existing infrastructure and services are identified later, Three Waters will work with the affected providers to discuss mitigative measures.

8.6 CULTURAL AND ARCHAEOLOGICAL RESOURCES

8.6.1 Resources

To initiate consultation and coordination of cultural and archaeological resource review, Three Waters sent a letter to the SHPO on August 12, 2019, describing the Project and requesting comments (Appendix A). The SHPO sent a response letter (dated September 10, 2019) and recommended that a Phase IA literature review and archaeological assessment be completed to assess the potential for intact archaeological sites in the Project Area (Appendix B). The SHPO indicated that if the assessment recommended a Phase I archaeological survey, that survey should be completed. Three Waters engaged In Situ Archaeological Consulting, LLC (In Situ) to conduct a literature review based on the Project Area and a 2-mile buffer (Study Area) in preparation for environmental review and design of the Project and as requested by SHPO. A copy of the Cultural Resource Literature Review (CR Report, dated September 16, 2019) for the Project is included in Appendix G. As requested by SHPO, a hardcopy of the CR Report was delivered to SHPO on September 23, 2019, for review and comment. As of the date of this Application, the SHPO has not yet provided comments on the CR Report.

The literature review was conducted between May 14 and 16, 2019, and updated on September 16, 2019, using the site data files and previous inventory files maintained at the Minnesota Office of the State Archaeologist (OSA) and at SHPO. The entire proposed Project Area is located within Jackson County, Minnesota, however a portion of the literature review study area extends into Nobles County, MN and Osceola and Dickinson counties, Iowa. Therefore, additional literature reviews were conducted using the site data files and previous inventory files maintained at the Iowa OSA and at Iowa SHPO.

The Project is located within the Prairie Lake South archaeological sub-region, which includes Brown, Cottonwood, Jackson, Lac Qui Parle, Lyon, Martin, Redwood, Watonwan, and Yellow Medicine counties, and portions of Blue Earth, Faribault, Lincoln, Murray, Nobles, and Pipestone counties (Anfinson, 1990). According to Gibbon, Johnson, and Hobbs (2002) archaeological resource sites are hypothesized to be numerous in this region and generally located on lakeshores and along river terraces.

In Situ collected cultural resource data from the Minnesota SHPO and OSA site files in St. Paul, Minnesota, Iowa SHPO in Des Moines, IA, and Iowa OSA in Iowa City, IA regarding documented archaeological sites, standing historic structures, and previously executed cultural resource surveys. In addition, background research was completed by reviewing publicly available National Register of Historic Places (NRHP) data, historic maps, cemetery/burial records, atlases, current aerial photographs, soil maps, topographic and geomorphic data, and other sources that might provide information for the locations of historic-era sites, areas of prior disturbance, etc. The CR Report includes cultural resource literature review maps illustrating the Study Area around the Project Area and the previous cultural resource locations and cultural resource inventories as briefly described below (see also Figure 13).

The records search revealed 25 previously recorded archaeological sites (Table 16), 25 previously recorded historic structures (Table 17), and 14 previous cultural resource inventories (Table 18) within the Study Area. Of these resources, eight previously recorded cultural resources and 13 previously recorded historic structures are located within the proposed Project Area. This information is being used to identify site types that may be encountered and landforms or areas that have a higher potential for containing significant cultural resources, which will inform planned field survey efforts (see below). Collected data includes archaeological site files, architecture inventory files, and previous cultural resources studies and reports.

Table 15 Previous Cultural Resources within 2 Miles of the Project Area

Site Number	Legal Location	Cultural Affiliation	Site Type	NRHP Eligibility	Within Project Area
13DK006	E NE NE Section 24, T100N, R39W	Prehistoric	Habitation	Unevaluated	No
13DK026	S SW Section 18, T100N, R38W	Prehistoric	Artifact Scatter; Camp	Unevaluated	No
13DK173	SW SE Section 18, T100N, R38W	Prehistoric Archaic	Artifact Scatter	Unevaluated	No
13DK174	NW NW Section 19, T100N, R38W	Prehistoric Paleo-Indian, Archaic	Artifact Scatter	Unevaluated	No
13OA002	NE SW Section 9, T100N, R39W	Prehistoric Archaic	Artifact Scatter; Camp	Unevaluated	No
13OA003	SE NW Section 9, T100N, R39W	Prehistoric	Village	Unevaluated	No
13OA043	NW SW Section 10, T100N, R39W	Prehistoric Woodland	Artifact Scatter	Unevaluated	No

Site Number	Legal Location	Cultural Affiliation	Site Type	NRHP Eligibility	Within Project Area
13OA044	SE SE Section 13, T100N, R39W	Prehistoric	Artifact Scatter	Unevaluated	No
21JK003	W NE NE, SW SE SE Section 17, T101N, R38W	Prehistoric Woodland	Habitation	Unevaluated	No
21JK005	NW Section 31, T101N, R38W	Prehistoric	Habitation	Unevaluated	No
21JK007	S SW SE SW Section 10, NW NE NW Section 15, T101N, R38W	Prehistoric Woodland	Habitation; Mound	Unevaluated	No
21JK008	N NE Section 27, SE SE SW, SW SW SE Section 22, T101N, R37W	Prehistoric Late Woodland	Artifact Scatter	Unevaluated	Yes
21JK009	NW Section 32, T101N, R37W	Prehistoric	Habitation	Unevaluated	Yes
21JK018	SW SE SW Section 31, T101N, R36W	Historic Euro-American	Artifact Scatter	Not Eligible	No
21JK029	SW SE NE SW, NW NE SE SW Section 32, T101N, R37W	Prehistoric	Artifact Scatter	Unevaluated	Yes
21JK039	SE SE SE Section 9, T101N, R38W	Prehistoric	Artifact Scatter	Unevaluated	No
21JK040	SW SW NE Section 22, T101N, R37W	Prehistoric	Artifact Scatter	Unevaluated	Yes
21JK041	SW NW SW Section 2, T101N, R38W	Prehistoric	Artifact Scatter	Unevaluated	No
21JK047	SW NW SW SW Section 16, T101N, R38W	Prehistoric	Artifact Scatter	Unevaluated	No
21JK050	SW SW NW NW Section 1, T102N, R37W	Prehistoric	Artifact Scatter	Unevaluated	No
21JKo	SE NW NW NW Section 27, T101N, R37W	Prehistoric	Campsite – Site Lead	Unevaluated	Yes
21JKq	SW Section 29, NW Section 32, T101N, R37W	Prehistoric	Campsite – Site Lead	Unevaluated	Yes
21JKs	NW NE, SE NE NW, N NE SE NW Section 15, T101N, R38W	Prehistoric	Campsite – Site Lead	Unevaluated	No
21JKt	SE Section 30, T101N, R37W	Prehistoric	Habitation – Site Lead	Unevaluated	Yes

Site Number	Legal Location	Cultural Affiliation	Site Type	NRHP Eligibility	Within Project Area
21JKv	W NE Section 27, T101N, R37W	Unknown	Artifact Scatter – Site Lead	Unevaluated	Yes

Table 16 Previous Historic Structures within 2 Miles of the Project Area

Site	Site Name/Type	Address/ Location	NRHP Eligibility	Within Project Area
30-00183	Bridge # 145305	Approx. 6 miles NE of Lake Park	Not Eligible	No
JK-EWT-002	Grace Lutheran Church	Off Twp. Rd.	Unevaluated	No
JK-RLT-003	Round Lake Town Hall	Off Twp. Rd.	Unevaluated	Yes
JK-RST-001	St. Paul's Church	Off Co. Hwy. 12	Unevaluated	Yes
JK-RST-002	St. Paul's School	Off Co. Hwy. 12	Unevaluated	Yes
JK-RST-003	St. Paul's Teacherage	Off Co. Hwy. 12	Unevaluated	Yes
JK-RST-004	Rost Town Hall	NW corner U.S. Hwy. 16 & Co. Rd. 9	Unevaluated	No
JK-RST-005	Richard Voehl Farmhouse	Off Twp. Rd.	Unevaluated	No
JK-RST-006	Richard Voehl Barn	Off Twp. Rd.	Unevaluated	No
JK-RST-007	Richard Voehl Granary	Off Twp. Rd.	Unevaluated	No
JK-RST-008	Richard Voehl Corncrib	Off Twp. Rd.	Unevaluated	No
JK-RST-009	Richard Voehl Metal-Sided Barn	Off Twp. Rd.	Unevaluated	No
JK-RST-010	Bridge No. 0593	Carries unpaved TR over Little Sioux River	Not Eligible	Yes
JK-SXV-001	Log Cabin Steak House & Dance Hall	Off Co. Hwy. 9	Unevaluated	Yes
JK-SXV-002	Sioux Valley Store	SW corner Co. Hwy. 4 & Co. Hwy. 9	Unevaluated	Yes
JK-SXV-003	Sioux Valley Creamery	Off Co. Hwy. 9	Unevaluated	Yes
JK-SXV-004	Trinity Lutheran Church	SE corner Co. Hwy. 9 & Co. Hwy. 4	Unevaluated	Yes
JK-SXV-005	Sioux Valley School	SW corner Co. Hwy. 4 & Co. Rd. 9	Unevaluated	Yes

Site	Site Name/Type	Address/ Location	NRHP Eligibility	Within Project Area
JK-SXV-006	Sioux Valley Teacherage No.1	SW corner Co. Hwy. 4 & Co. Rd. 9	Unevaluated	Yes
JK-SXV-007	Sioux Valley Teacherage No. 2	SW corner Co. Hwy. 4 & Co. Rd. 9	Unevaluated	Yes
JK-SXV-008	Bridge No. 89254	Carries unpaved CH62 over West Fork of Little Sioux River on Iowa border	Not Eligible	Yes
NO-RLC-001	State Bank of Round Lake	194 Main St.	Eligible	No
NO-RLC-002	Grocery	SW corner 2nd St. & Main St.	Unevaluated	No
NO-RLC-003	Meat Market	Main St.	Unevaluated	No
NO-RLC-004	Jim's Tap	Main St.	Unevaluated	No

Table 17 Previous Cultural Resource Surveys within 2 Miles of the Project Area

Manuscript Number	Title	Authors	Year	Overlap with Project Area
19780230432	IA 2SB OXT 2 001602 Channel Fill West Fork, Little Sioux River, Dickinson County. Iowa	Till, Anton	1978	No
19800330033	L-278 Grading and Draining Dickinson County. Iowa	Fokken, Michael J.	1980	No
19900530013	A Phase I Archaeological Survey of Local Systems Project L-446 and Bros-9030(5)—5F-30 A.K.A. FHWA 145305 Dickinson County, Iowa and Jackson County, Minnesota	Artz, Joe A.	1990	No
19960930031	Phase I Archaeological Survey of Two Proposed Borrow Areas for Project L-FM-453(9) in Section 10, T100N-R38W, Dickinson County	Morrow, Toby A	1996	No
19980600059	Archaeological Investigation at Nine DNR Tracts in Dickinson, Hancock, and Wright Counties, Iowa	Peterson, Cynthia L.	1998	No

Manuscript Number	Title	Authors	Year	Overlap with Project Area
JK-87-01	Interim Report, Order Number 30181 01075 FY87, Cultural Resource Investigation, Jackson, Meeker, Kandiyohi, and Stearns Counties, Minnesota	Unknown	1987	No
JK-91-02	Minnesota Department of Natural Resources, Trails & Waterways Unity Water Access Program Cultural Resource Review – Preliminary Report: Skunk Lake Public Water Access	Emerson, Patricia	1991	Yes
JK-06-01	Phase I Cultural Resources Survey for the Lakefield and Windom Lines – County Road 34 Relocations Project, Jackson County, Minnesota	Bielakowski, Andrew	2006	No
JK-09-01	Report of Archaeological Reconnaissance Survey: Proposed Building Site Clean-Up in the Sangl WMA, Jackson County, Minnesota	Allan, Stacy and Michael A. Magner	2009	No
JK-09-02	Phase I Archaeological Reconnaissance Survey of the Lakefield Wind Project, Jackson County, Minnesota	Grohnke, Ryan P. and Kevin J. Mieras	2009	No
JK-10-02	Phase I Archaeological Reconnaissance Survey of the Lakefield Wind Project, Jackson County, Minnesota	Grohnke, Ryan P. and Kevin J. Mieras	2010	No
JK-15-01	Cultural Resource Reconnaissance Survey for Proposed Water Control Structure Replacement in the Sioux Valley WMA, Jackson County, Minnesota	Allan, Stacy and Michael A. Magner	2015	Yes
Mult-12-05	A Combined Phase IA Field Review and Phase I Archaeological Field Investigation on Parts of Jackson and Martin Counties, Minnesota	Stemper, Clifford A.	2012	No
Mult-16-04	A Combined Phase 1A and Phase 1 Archaeological Field Investigation for Rural Electric Land Corridors on Parts of Jackson and Martin Counties, Minnesota	Stemper, Clifford A	2016	Yes

Of these resources, eight previously recorded resources and 13 previously recorded historic structures are located within the proposed Project Area. The archaeological sites include:

21JK008, 21JK009, 21JK029, 21JK040, 21JKo, 21JKq, 21JKt, and 21JKv. All of the archaeological sites within the proposed Project Area are *unevaluated* for the NRHP.

The historic structures include: JK-RLT-003, JK-RST-001, JK-RST-002, JK-RST-003, JK-RST-010, JK-SXV-001, JK-SXV-002, JK-SXV-003, JK-SXV-004, JK-SXV-005, JK-SXV-006, JK-SXV-007, JK-SXV-008. Architectural resources JK-RST-010 and JK-SXV-008 are *not eligible* for the NRHP and the remaining 11 architectural resources are *unevaluated* for the NRHP. Three of the previous cultural resource investigations (JK-91-02, JK-15-01, and Mult-16-04) overlap with portions of the Project Area.

As indicated above, an archaeological survey will be conducted of the Project design and construction corridors with the Project Area during the Fall 2019/Spring 2020, which will utilize this information in preparing for the field work. A survey report will be prepared and provided as a supplement to the Application which will provide detailed results and evaluation of the effect of the Project on archaeological resources. This report will be submitted to the Minnesota SHPO for review and comment late fall 2019 or spring 2020.

8.6.2 Impacts

Potential Project impacts to archaeological resources will be evaluated using the CR Report findings and the planned field survey to be completed Fall 2019 or Spring 2020. Direct impacts to archaeological resources may occur due to Project construction within the turbine footprint, cable trenching, access roads, and borrow areas, and construction could also impact unknown archaeological resources. However, Three Waters will revise the Project design and layout to the extent possible to avoid and/or minimize such impacts. In addition, construction of turbines or other protruding structures may impact viewshed integrity from existing architecture inventory resources, which will also be evaluated during fall 2019 or spring 2020 field survey activities.

8.6.3 Mitigation

Based upon the completed CR Report findings, the Project Area has the potential to contain archaeological resources. Further detailed evaluation of these resources will be conducted in Spring 2020 (before planting, if possible) or Fall 2020 (after harvest, if possible), and it is expected that these archaeological resources would most likely be located on or near elevated landforms and areas near permanent water sources. Three Waters has submitted the initial CR Report to SHPO and is cooperatively working with SHPO and OSA staff.

The Spring 2020/Fall 2020 field survey of archaeological resources will focus on areas proposed for Project construction, including wind turbine locations, associated access roads, electrical collection lines, Project substation, Project O&M facility, interconnection facilities, and other construction disturbance areas. These investigations will be conducted by a professional archaeologist meeting the Secretary of the Interior's (SOI) Standards for Archaeology as published in Title 36 Code of Federal Regulations Part 6. Survey strategies (pedestrian and/or shovel probing and/or deep testing) for the archaeological resource inventory will depend on surface exposure and the characteristics of the landforms proposed for development. After receiving the proposed turbine, access road, and electrical cable layouts, archaeologists will design an appropriate survey strategy for archaeological resources. This proposed survey strategy will be shared with SHPO to gather their input on the methodology prior to completing the study.

As indicated above, it is anticipated that the Phase I Archaeological Survey will be conducted during Spring or Fall of 2020, when ground surface visibility is optimum for visual survey (e.g., before spring planting or after fall harvest, if possible). The goal of the survey will be to identify previously undocumented cultural resources located within the current construction footprint of the Project Area. Should such resources be identified, Three Waters will make efforts to alter the Project design to avoid impacts to both previously documented and newly recorded cultural resources.

Should previously undocumented cultural resources be identified during the survey, field staff will delineate the boundaries of the resource and record coordinates so that Project design and/or construction plans can be adjusted. Project modifications may include alterations in turbine siting, collection line routes, access roads, and the application of construction practices focused on minimizing impacts (i.e., construction matting). If Project construction plans cannot be adjusted, additional investigation of the resource may be required and further coordination with SHPO, and possibly OSA, will be required. In the event that human remains are encountered, work in the immediate vicinity of the specific find site location will be stopped. In accordance with Minn. Stat. 307.08, the Private Cemeteries Act, local law enforcement must be notified, and a professional archaeologist will evaluate the find and recommend treatment in consultation with the OSA. Work at the specific site of the discovery of remains would not resume until all issues are resolved.

8.7 RECREATION

8.7.1 Resources

Recreational opportunities in Jackson County include hiking, biking, boating, fishing, camping, swimming, horseback riding, snowmobiling, hunting, and nature viewing. Figure 5 shows the locations of state and county parks, WMAs, SNAs, and WPAs near the Project Area.

There is one state park 10.7 miles northeast of the Project Area: Kilen Woods State Park contains small creeks, prairie grasslands and oak savannas for visitors who can enjoy camping, canoeing, fishing, picnicking and hiking.

Minnesota's WMAs are managed to provide wildlife habitat, improve wildlife production, and provide public hunting and trapping opportunities. These MNDNR lands were acquired and developed primarily with hunting license fees. WMAs are closed to all-terrain vehicles and horses. There are three WMAs within the Project Area. Table 19 presents WMAs within the Project Area and those located within 10 miles of the Project Area boundary.

Table 18 Wildlife Management Areas within Ten Miles of the Project Area

Distance from Project Area (Miles)	WMA Name	General Location	WMA Area (Acres)
Within	Illinois Lake WMA	Within	107
Within	Sioux Valley WMA	Within	403
Within	Skunk Lake WMA	Within	238
0.3	Little Sioux WMA	E	307
0.5	Husen WMA	E	79
0.5	Pletz Slough WMA	E	118
1.9	Minneota WMA	E	214
2.3	Sangl WMA	E	342

2.4	Round Lake WMA	W	37
3.0	Summers WMA	E	162
3.3	Heron Lake WMA	N	865
3.7	Pavelko WMA	E	58
4.3	Dead Horse WMA	E	40
7.2	Toe WMA	E	342
7.5	Wachter WMA	W	287
7.8	James Willey WMA	W	138
8.2	Oxbow WMA	NW	332
8.5	Heron Meadows WMA	N	200
8.5	Lake Bella WMA	W	317
8.5	Valleau WMA	N	309
8.7	Bootleg Lake WMA	NE	87
8.8	John Erickson WMA	W	121
9.0	Peterson WMA	E	274
9.1	Graham Creek WMA	NW	90
9.2	Teal Lake WMA	N	124
9.5	Crosse WMA	N	37
9.8	Libra WMA	N	26

SNAs are areas designed to protect rare and endangered species habitat, unique plant communities, and significant geologic features that pose exceptional scientific or educational values. There are no SNAs located within 10 miles of the Project.

Aquatic management areas (AMAs), as defined by Minnesota Statute 86A.05, Subd. 14 (2018) are areas established to "protect, develop, and manage lakes, rivers, streams, and adjacent wetlands and lands that are critical for fish and other aquatic life, for water quality, and for their intrinsic biological value, public fishing, or other compatible outdoor recreational uses". There are no AMAs within the Project Area, and two AMAs are located within 10 miles of the Project Area: Rush Lake AMA, measuring 39 acres in size, is located 4.1 miles east of the Project Area, and Loon Lake AMA is 6.2 miles east of the Project Area and measures less than one acre.

WPAs are federal lands 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. As presented in Table 20, there are eight WPAs within the Project Area and several others within 10 miles of the Project Area boundary.

Table 20 Waterfowl Production Areas within 10 Miles of the Project Area

Distance from Project Area (miles)	WPA Name	General Location	WPA Area (Acres)
Within	Minnesota WPA	Within	316
Within	Rost WPA	Within	33
Within	Sioux Valley WPA	Within	103
Within	Skunk Creek WPA	Within	207

Distance from Project Area (miles)	WPA Name	General Location	WPA Area (Acres)
Within	Skunk Lake WPA	Within	28
Within	Ulbricht WPA	Within	80
Within	West Fork WPA	Within	83
Within	Wetland	Within	630
0.3	Sioux Forks WPA	East	947
0.5	Bisaillon WPA	East	82
0.5	Pletz Marsh WPA	East	129
0.8	Little Sioux WPA	East	183
1.2	Round Lake WPA	West	141
1.8	Diamond Lake WPA	East	511
2.5	Holy Trinity WPA	East	317
2.5	Hunter WPA	East	199
2.9	Cory Marsh WPA	South	71
3.0	Minneota WPA	East	32
3.9	Santee Prairie WPA	South	454
3.9	Welsh Lake WPA	Southeast	753
4.1	Unnamed	North	415
4.6	Rush Lake WPA	East	88
4.8	Dugout Creek WPA	South	789
5.7	McClurg WPA	Southeast	119
5.8	Jemmerson Slough WPA	Southeast	538
6.1	Jerry Schotzko WPA	East	162
6.1	Kettleson Hogsback WPA	Southeast	143
6.3	West Lake Okoboji WPA	Southeast	140
6.4	Loon Lake WPA	East	193
6.4	Yager Slough WPA	South	539
6.5	Spirit Lake WPA	East	163
6.9	Cayler Prairie WPA	South	71

Distance from Project Area (miles)	WPA Name	General Location	WPA Area (Acres)
7.1	Iowa National Heritage Foundation WPA	Southeast	81
8.2	Boot Lake WPA	East	435
9.0	Lake Bella WPA	West	73
9.6	Timber Lake WPA	North	51
9.6	Worthington WPA	West	43

The MNDNR offers a Walk-In Access (WIA) Program for public hunting on private land, and the MNDNR administers state game refuges, which prohibit the hunting or trapping of some or all wild animals within the refuge. There are no WIA parcels within the Project Area; one state game refuge, the Ocheda State Game Refuge, is located 1 mile west of the Project Area.

Although the Jackson County 2018 Official Visitor and Information Guide indicates the snowmobile club maintains 120 miles of trails within the County, there are no snowmobile trails within the Project Area (Figure 5).

8.7.2 Impacts

The Project will avoid all WMAs, AMAs, WPAs, and WIAs and has been designed to maintain the 3 x 5 RD wind access buffer from all public lands. In general, recreational impacts will be visual in nature, affecting individuals using public land within or near the Project Area for recreation. Section 8.4 provides further discussion of visual impacts and proposed mitigative measures.

8.7.3 Mitigation

Project turbines and associated access roads, collection lines, and crane paths will avoid WMAs, WPAs, and WIAs. Turbines will be set back from public lands owned and managed for conservation purposes based on a minimum of the 3 RD by 5 RD setbacks from all non-leased properties per the MPUC siting guidelines (MPUC, 2008). Therefore, no mitigative measures are proposed.

8.8 PUBLIC HEALTH AND SAFETY

8.8.1 Resources (EMF and Stray Voltage, Air Traffic, Safety and Security)

Electromagnetic Fields and Stray Voltage

Electromagnetic fields (EMF) are electric and magnetic fields present around all electrical devices. Electric fields exist wherever an electric charge exists, and electric field strength is proportional to the voltage of the source. A magnetic field exists when that charge is in motion (i.e., the flow of electrons to produce an electric current), while the intensity of the magnetic field is related to the current flow along the conductors. Natural sources of EMFs

include the earth's magnetic field, lightning, and visible light, while human-made sources include transmission lines, power collection lines, substation transformers, house wiring, electrical appliances, WiFi, cell phones, etc.

Stray voltage is a natural phenomenon that results from low levels of electrical current flowing between two points that are not directly connected. 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. The proposed Project transmission line from the Project substation to the POI will be a relative short distance and not located near regular agricultural operations or facilities.

Air Traffic

There are 7 airports within 20 miles (32 km) of the Project Area, including one private airport located within the Project Area. Information reviewed indicates the Nauerth Land Ranch Airport contains a turf runway measuring 1,940 feet in length and 75 feet in width and is located in the northeastern portion of the Project. The Worthington Municipal Airport is located 9.8 miles west/northwest of the Project Area and the Jackson Municipal Airport is located 11.1 miles east. There are two hospital helipads within 20 miles of the Project Area, including Sanford Jackson Medical Center 10.1 miles east and Windom Area Hospital, 18.4 miles north/northeast. Two municipal airports in Iowa are within 20 miles of the Project Area, including the Spirit Lake Municipal Airport 9.2 miles southeast of the Project Area, and Fuller Municipal Airport 12.3 miles southeast in Milford, Iowa. Airport setbacks must be in accordance with MnDOT, Office of Aeronautics, and FAA requirements. Three Waters consulted with MnDOT Office of Aeronautics and with FAA during Project design. Correspondence received from MnDOT on August 14, 2019 included the Minnesota Airspace Obstructions brochure and a request for more site-specific information to review and comment on the Project. Consultation with the FAA resulted in the receipt of a Determination of No Hazard (DNH) from the FAA on March 8, 2017. The DNH has since expired and Three Waters will refile a Project layout/array, likely to coincide with the SPA process.

Safety and Security

The Project is located in a rural, agricultural setting. Three Waters is coordinating with applicable emergency and non-emergency response staff for the area, such as local law enforcement agencies, Emergency 911 services, fire departments, and ambulance services. Construction and operation of the Project is anticipated to have minimal impacts on the safety and security of local residents and the general public.

8.8.2 Impacts

Electromagnetic Fields and Stray Voltage

No impacts due to EMFs or stray voltage are anticipated. No dairy farms are located within the Project Area.

Concerns about health effects of EMF were first raised in the late 1970s. Since then, considerable research has been conducted to determine if exposure to magnetic fields causes biological responses and health effects. 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) conducted a review of health implications from magnetic fields (WHO, 2007) and reconfirmed a 1992 report from the National Institute of Environmental Health Sciences (NIEHS) that concluded "Virtually all of the laboratory evidence in animals and humans and most of the mechanistic work done in cells fail to support a causal relationship between exposure to extremely low frequency-EMF at environmental levels and changes in biological function or disease status." (NIEHS, 1992).

EMFs are vector quantities, which means they have a strength and a specific direction. The strength of an EMF decreases dramatically with increasing distance from the source (NIEHS, 2018). EMFs may exist within the Project wind turbines, substation, and switchyard of the Project during operation. However, Three Waters has incorporated setback requirements and commitments into the design of the Project in compliance with State requirements and the turbine manufacturer's (GE) recommendations. Furthermore, the Project substation and switchyard would be located on a fenced site on private property and would not be accessible to the public.

EMF from underground electrical collection lines dissipates close to the lines because they are installed below ground, geometrically close to each other, and wound with copper wires in their jackets. The electrical fields around these lines are negligible and the small magnetic field directly above the lines dissipates within 20 ft (6.1 m) on either side of the installed cable, based on engineering analysis. Collection lines will be buried underground to a depth of at least 42 inches (with the exception of junction boxes) and will be located no closer than 110 ft (34 m) from a residence. Wind turbine interconnection cables will be setback from residences in excess of state standards of at least 110 ft (34 m), where EMF will be at background levels, EMF associated with the transformers within the nacelle dissipates within 5 ft (1.5 m).

Air Traffic

Three Waters will coordinate with the Jackson Municipal Airport and the Worthington Municipal Airport and will obtain the required permits from the FAA and the MnDOT Office of Aeronautics and Aviation prior to construction of the proposed turbines.

In addition to commercial flights associated with the above listed airports, air traffic associated with crop dusting of agricultural fields may occur near the Project Area. Crop dusting is generally conducted during the day by highly maneuverable airplanes or helicopters. Installing wind turbine towers, aboveground transmission lines, or other associated aboveground facilities in active croplands would create the potential for collisions with crop-dusting aircraft. The aboveground transmission line associated with the Project is anticipated to be routed along edges of fields, roadways, or other existing linear infrastructure, similar to existing distribution lines.

An Obstruction Evaluation and Airspace Study (Appendix H) was prepared for the Project Area to identify obstacle clearance surfaces established by the FAA that could limit the placement of wind turbines. 14 CFR Part 77.9 requires that all structures exceeding 200 feet above ground level be submitted to the FAA so that an aeronautical study can be conducted. The end result of an aeronautical study is the issuance of a determination of "hazard" or "no hazard".

The Obstruction Evaluation and Airspace Study identified potential constraints in the Study Area. The FAA uses level and sloping imaginary surfaces to determine obstructions to air navigation. Although the imaginary surfaces of public-use airports do not overlie the Project Area, the proposed height of the wind turbines would exceed 499 feet above ground only if the tall towers (114 m) hub height are used, and as such the wind turbines will be identified as obstructions. Also, obstacle clearance surfaces associated with instrument approach or departure procedures for Worthington Municipal Airport and Huron Regional Airport overlay the Project Area and range from 2,300 to 3,300 feet AMSL. USGS elevation data indicates that these surfaces should not limit the placement of wind turbines of the height that Three Waters is proposing in the Project Area.

The FAA has previously issued "No Hazard" determinations for wind turbines within the Project area and Three Waters anticipates that the FAA review of the updated Project wind turbine layout will result in a "No Hazard" issuance determination.

Safety and Security

Construction and operation of the Project is not anticipated to have any significant impacts to the safety and security of the local population. Current turbine technology, proactive maintenance, and regular facility inspections have reduced the risk to insignificant rates.

In the event that emergency services are needed at local residences during construction, construction activities will be stopped and relocated so that emergency vehicles may have unfettered access to the emergency site.

8.8.3 Mitigation

Electromagnetic Fields and Stray Voltage

No impacts due to electromagnetic fields and stray voltage are anticipated, and no mitigation is proposed for such. Three Waters has designed the Project with the goal of siting turbines and associated facilities to avoid impacts to health and safety. Three Waters will design, construct, and operate all electrical equipment, including turbines, transformers, collection lines, and transmission lines in accordance with applicable codes, manufacturer specifications, and required setbacks. Because no impacts due to EMF or stray voltage are anticipated, no mitigation is proposed.

Air Traffic

Setbacks to airport facilities must be in accordance with MnDOT Department of Aviation and FAA requirements. Further, Three Waters will appropriately mark and light the turbines, permanent met towers, as required, to comply with all FAA requirements. One or more ADLS radar towers will be installed at locations that will be determined by the selected ADLS vendor, in coordination with applicable landowners and Three Waters, and with wind turbine visibility lights remaining off approximately 98 percent of the time, light pollution will be minimized and further mitigation will not be necessary. Permanent meteorological towers will be freestanding or guyed. Any remaining temporary meteorological towers have supporting guy wires which are marked with alternating red and white paint at the top and colored marking balls on guy wires for increased visibility.

Safety and Security

Three Waters will coordinate with regional air ambulance, sheriff's offices, and fire services to develop a safety plan during construction and operations of the Project. Three Waters will provide information about the Project and answer any questions first response teams may have regarding Project plans and details.

As discussed in other sections of this SPA, the following security measures will be enacted to reduce personal injury or property damage:

- All Project facilities will be equipped with sufficient security measures throughout construction and during operation of the Project. These measures may include temporary and/or permanent fencing, warning signs, and secure locks on equipment and facilities;
- Security measures will be constructed where deemed necessary by Three Waters at the request of landowners;
- Necessary safety training will be provided to construction and operation staff;
- Regular maintenance and inspections of the turbines and associated facilities will be conducted to assess potential blade failures and minimizing blade throw potential; and
- Setbacks from roads, property lines, homes, and other infrastructure have been included in Project design. The applied setback distances promote safety and mitigate potential damage from any unanticipated and unlikely tower or blade failures.

8.9 HAZARDOUS MATERIALS

8.9.1 Resources

The Project Area is primarily rural and used for agriculture. Potential hazardous materials within the Project Area may be associated with agricultural activities and material uses, including herbicides, pesticides, petroleum products (fuel and lubricants), solid and liquid waste disposal, and water supply wells (domestic and agricultural). Farmstead facilities may also contain lead-based paint, asbestos (shingles, insulation, etc.), and polychlorinated biphenyls (in electrical transformers). Trash and farm equipment dumps are also common in rural settings and may be present in the Project Area.

Three Waters conducted a preliminary review of the MPCA's "What's in My Neighborhood?" (2019) database to identify state listed sites that may have environmental impacts. Review of this information indicates the following designated sites are located within the Project Area:

- 105 feedlot sites;
- 2 construction stormwater permit sites;
- 1 industrial wastewater permit; and
- 1 multiple activities site (underground tank and petroleum remediation leak site).

The above-listed sites will be avoided by the Project.

8.9.2 Impacts

Three Waters will conduct a Phase I Environmental Site Assessment (Phase I ESA) in accordance with American Society for Testing and Materials E1527-13 on properties acquired for the Project. The Phase I ESA will identify known recognized environmental conditions or historical recognized environmental conditions that may require additional action prior to or during construction. The Phase I ESA will be conducted prior to construction to locate and avoid hazardous waste sites.

During construction of the Project, equipment and vehicles used in construction will use petroleum products and related lubricants. During construction, some solid and fluid wastes will be generated from construction activities. These wastes will be properly contained and disposed of following applicable state and local requirements.

Spill-related impacts from construction are primarily associated with fuel storage, equipment refueling, and equipment maintenance. To avoid spill-related impacts, Three Waters will develop a SPCC Plan that will outline measures that will be implemented to prevent accidental releases of fuels and other hazardous substances and describes response, containment, and cleanup procedures.

Operation of the Project turbines will require the use of petroleum products including gear box oil (either mineral based or synthetic based upon manufacturer and application), hydraulic fluid, and gear grease. The turbines will be regularly serviced and any waste fluids that are generated with this service will be managed and disposed of (if needed) or recycled in compliance with applicable waste disposal laws and regulations.

During operation of the Project, turbine hydraulic oils and lubricants will be contained within the wind turbine nacelle and within service vehicles. The turbine transformers in the nacelle are the dry type (i.e., cooled by air). The Project will monitor fluids during maintenance at each turbine and transformer. A small volume of hydraulic oil, lube oil, grease, and cleaning solvent will be stored in the O&M facility. When fluids are replaced, the used products will be handled according to applicable regulations and disposed of or recycled through an approved waste disposal firm.

8.9.3 Mitigation

Because the Project will avoid identified hazardous waste sites, no mitigative measures are proposed. Wastes, fluids, or pollutants that are generated during construction and operation of the Project will be handled, processed, treated, stored, and disposed of in accordance with Minn. R. Ch. 7045 and local requirements.

8.10 LAND-BASED ECONOMICS

8.10.1 Resources (Agriculture/Farming, Forestry, Mining)

Agriculture/Farming

The majority of the Project Area is agricultural (see Figure 10). Cultivated land comprises approximately 42,850 acres (89.1%) of the Project Area. Pastureland comprises approximately 228 acres (0.5%) of the Project Area.

The market value of crops, including nursery and greenhouse crops grown throughout Jackson County in 2017 was $182,899,000, representing 58 percent of the total market value of agricultural products sold in the County. Livestock, poultry, and associated products

accounted for $131,611,000, or 42 percent of the total market value of agricultural products sold (USDA, 2017). Within the Project Area, the trend has been toward fewer individual farms, dropping from 969 in 2007 to 826 in 2012 (USDA, 2012) and to 799 in 2017, along with an increase in farms of greater acreage, from an average of 413 acres per farm in 2007 to 433 acres in 2012 and 446 acres in 2017 (see Section 8.1.1 above). Conversion of cropland to the Conservation Reserve Program (CRP) and the Reinvest in Minnesota (RIM) program is another source of farm income. CRP and RIM lands are cropland planted to conserve grasses and legumes to protect and improve the soil with limited harvesting or pasturing allowed on CRP land. CRP land is generally enrolled for 10-year periods, whereas RIM conservation easements are permanent.

Approximately 93% of the soil within the Project Area is prime farmland (see Section 8.14; Figure 14). The U.S. Department of Agriculture (USDA) Natural Resource Conservation Service identifies prime farmland as land that has the best combination of both physical and chemical characteristics for the production of food, livestock feed and forage, fiber, and oilseed crops and is available for these agricultural uses. Important farmlands consist of prime farmland, unique farmland, and farmland of statewide or local importance (USDA, 2019b).

Forestry

According to the MNDNR Division of Forestry (MNDNR, 2016) commercial or industrial forestry resources are not located within the Project Area. Local forested land within the Project Area is generally associated with homes in the form of shelterbelts or woodlots and gallery forests along the water courses. These, however, are not considered economically significant forest resources.

Mining

Sand and gravel resources are regularly exploited in areas dominated by glacial till and outwash deposits. Based on MnDOT County Pit Maps and topographic maps, there is one active aggregate pit and one inactive aggregate pit located within the Project Area (MnDOT, 2018) (see Figure 9).

8.10.2 Impacts

Agriculture/Farming

The construction and operation of the Project will not significantly impact the current agricultural land use or character of the area.

Including the turbines themselves along with turbine access roads, approximately 1-2 acres of land will be removed from agricultural production for each turbine constructed. Small portions of land will be removed from agricultural production at turbine locations and along proposed access roads as described above. The use of larger turbines results in fewer turbines for the same total nameplate capacity and less overall land disturbance. Individual landowners will be able to continue to plant crops and graze livestock up to the turbine pads. In some instances, agricultural practices may be impacted by creating altered maneuvering areas for agricultural equipment around turbine structures and access roads, but access roads will be designed with landowner input for minimal agricultural impact. For example, access roads are placed along fence lines wherever possible, and if they do go through fields, they are generally oriented to be parallel with farming directions. In many

cases, access roads are longer than absolutely necessary so as to minimize agricultural impact via selection of a route that minimizes agricultural equipment maneuvering changes.

If construction activities are executed outside of winter months, temporary impacts to agriculture fields may occur. These temporary impacts may include limited planting opportunity, crop damage, drain tile damage, and soil compaction.

As stated above, approximately 93% of the soil within the Project Area is considered prime farmland or farmland of statewide importance. The loss of agricultural land resulting from the construction of the Wind Farm will reduce the amount of land that can be cultivated. Approximately 0.002% of the Project Area will be converted to non-agricultural land use. Similarly, approximately 43.82 acres (less than 0.004%) will be converted out of prime farmland. This will not significantly alter crop production in the Project Area or in Jackson County.

Negotiations with property owners have produced land agreements mutually agreeable to both parties that address agricultural impacts such as crop damage, soil compaction, and drain tile repairs. Drain tile will be repaired according to the agreement between Three Waters and the owner of any damaged tile. Three Waters will strive to avoid impacts to RIM lands and avoid or minimize impacts to CRP lands where practicable.

Forestry

Shelterbelts and woodlots associated with residential areas will not be impacted during construction or operation of the Project. No commercial or industrial quality forestry resources are located within the Project Area.

Mining

No impacts to mining are anticipated.

8.10.3 Mitigation

Agriculture/Farming

Only areas occupied by turbines, the Project substation, O&M facility, and access roads will be removed from crop production. All land surrounding the constructed facilities can still be farmed. The permanent loss of up approximately 68 acres of agricultural land will not result in the loss of any agriculture-related jobs or any net loss of income. Revenue lost from the removal of land in agricultural production will be more than offset by lease payments to landowners hosting the Project facilities. As a result of land payments to landowners hosting facilities and landowners without facilities but with Wind Rights agreements, significant new agricultural income will enter the County from the Project.

Three Waters will coordinate with property owners to identify features on their property, including drain tile, which can be avoided. Three Waters recognizes that the excavation and heavy equipment associated with construction may cause damage to known or unknown drain tiles. In the event that there is damage to drain tile as a result of construction activities or operation of the Project, Three Waters will work with affected property owners to repair the damaged drain tile in accordance with the easement agreements.

Three Waters will avoid or minimize impacts to mapped CRP lands. If CRP land is impacted, Three Waters will work with the landowner and the Natural Resource Conservation Service to remove the impacted portion of the enrolled parcel from the CRP program. There will be no impacts to RIM land at this time; therefore, no mitigation will be necessary.

Forestry

No forestry resource mitigation efforts will be required as no impacts to forestry resources are anticipated.

Mining

With no impacts to mining resources anticipated, no mitigation efforts will be necessary.

8.11 TOURISM

8.11.1 Resources

According to the Jackson County 2018 Official Visitor and Information Guide, tourism in the County focuses primarily on the area's historical attractions, parks and trails, indoor and outdoor recreation, racing, hunting and fishing, health and wellness, and industry and agriculture. The historical attractions revolve primarily around the early settlers and pioneers, while parks and trails offer biking, hiking, swimming, camping, canoeing and wildlife viewing, among others. The Jackson Motorplex offers weekly race nights from mid-May through September. Jackson County Parks include Anderson Park, Brown Park, Browns Park South, Robertson Park, Sandy Point Park, Belmont Park, Clear Lake Recreational Area, Community Point Park, Obie Knutson Park, and Sparks Park. Kilen Woods State Park lies within the County, 10.7 miles northeast of the Project Area. The nearest County Park is Browns Park South, which is located 5.8 miles east of the Project Area.

Jackson County also hosts a variety of festivities and cultural events throughout the year. These include Winterfest, the Farm and Home Show, the Memorial Day Parade, Town and Country Days, Summerfest, the Jackson County Fair, and Fort Belmont Pioneer Days. Gross sales related to leisure and hospitality industry in the County totaled $12,917,925 in 2015, up from $10,815,664 in 2011 (Minnesota Department of Revenue, 2017 & 2012).

8.11.2 Impacts

Because all Project facilities will generally be located on private lands, there will be no direct impacts to recreational facilities, public lands, or other tourism-related activities. Proposed setbacks from recreational trails, public roads, and non-leased properties (including public lands) are summarized in Table 6 and will minimize any indirect impacts. The Project is not anticipated to have a significant effect on area tourism. See Sections 8.4 and 8.7, which discus visual impacts and recreational resources.

8.11.3 Mitigation

Because no significant impacts are anticipated, no mitigation beyond the turbine setbacks is proposed.

8.12 LOCAL ECONOMICS AND COMMUNITY BENEFITS

8.12.1 Resources

According to the U.S. Census Bureau (U.S. Census, 2017), the largest industries employing residents of Jackson County are: 1) educational services, health care and social assistance services (20.7 percent), 2) manufacturing (19.2 percent), and 3) agriculture, forestry, fishing and hunting, and mining (11.0 percent).

The 2017 per capita income for Jackson County was $31,010. Round Lake Township, Minneota Township, and Ewington Township all exhibit per capita incomes higher than that of the County at $35,959, $34,067, and $33,295, respectively. Sioux Valley Township has a per capita income in line with that of the County at $30,878, while Hunter Township ($24,368) and Rost Township ($20,915) have per capita incomes lower than that of the County. Round Lake, Minneota and Ewington townships exhibit lower percentages of family poverty rates (3.4 percent, 1.1 percent and 0.0 percent, respectively) than the County, which is at 5.4 percent. Sioux Valley Township exhibits a family poverty rate higher than the County, at 7.0 percent, while Rost Township exhibits a relatively high family poverty rate at 23.1 percent. Hunter Township has a per capita income ($24,368) that is lower than that of the County while exhibiting a lower family poverty rate (3.7 percent) than that of the County.

8.12.2 Impacts

Three Waters is expected to create both short-term and long-term positive impacts to the local economy. Construction activities will result in short-term positive impacts to social and economic resources. Local businesses, such as restaurants, grocery stores, hotels, and gas stations, will experience increased business during this phase from construction-related workers. Local industrial businesses, including aggregate and cement suppliers, welding and industrial suppliers, hardware stores, and automotive and heavy equipment repair, are also likely to benefit from construction of the Project.

Construction and operation of a typical wind farm results in the injection of millions of dollars into the local economy both immediately and throughout the life of the Project. These investments will provide benefits throughout the community, including at hotels, restaurants, gas stations, auto repair companies, tire companies, grocery stores, and other local businesses. During construction, a typical 200-MW wind project, such as the proposed Project, typically generates an immediate need for up to 200 temporary construction jobs over 12 months equaling approximately 400,000 to 420,000 labor-hours to support Project construction. The construction crews would include skilled labor, such as foremen, carpenters, iron workers, electricians, millwrights, and heavy equipment operators, as well as unskilled laborers. During operation, the facility would employ approximately eight to ten full-time personnel as facility managers, site managers, and turbine technicians.

The Project will provide landowners and farmers with an opportunity to increase land and agricultural profitability, and to diversify sources of income. Wind energy generation provides a long-term, annual benefit to participating landowners. Landowners involved with the Project, as well as those who have leased their wind rights to the Project, will receive a royalty or lease payment annually for the life of the Project, thereby diversifying and strengthening the local economy. Three Waters estimates the Project landowners will receive Wind Lease payments of approximately $25.0 million over the life of the Project.

In addition to creating jobs and supplementing personal income, the Project will pay a wind energy production tax to local units of government. Long-term benefits to the county's tax

base as a result of the construction and operation of the Project will contribute to improving the local economy. For example, the Project will pay a Wind Energy Production Tax to the local units of government of $0.0012 per kWh of electricity produced, resulting in an annual Wind Energy Production Tax of approximately $1 million; over the life of the Project, Jackson County and the affected Townships will benefit from approximately $35.1 million in direct economic benefit.

No impacts to property values are anticipated from the Project. Prior studies have found that large-scale wind energy facilities do not have a negative impact on the value of agricultural properties that host wind turbines or on rural residential or agricultural properties surrounding wind facilities (Hoen et al., 2009; Hoen et al., 2013; MaRous & Company, 2018).

8.12.3 Mitigation

No adverse economic impacts are anticipated from the Project, and therefore no mitigation is proposed. Economic impacts associated with the Project will be primarily positive with an influx of wages and expenditures made at local businesses during Project construction and an increase in the county's tax base from the construction and operation of the wind turbines.

The Project is not anticipated to create negative impacts on property values within or near the Project, and therefore no mitigation is proposed.

8.13 TOPOGRAPHY

8.13.1 Resources

The topography of the Project Area is generally flat with some gently rolling hills bisected by several drainage features (e.g., predominately West Fork Little Sioux River, Little Sioux River, Judicial Ditches 13 and 28 and County Ditches 1 and 11) with elevations ranging from 1,394 to 1,568 ft above sea level (Figure 17). The Project Area is located within the Coteau Moraine Subsection (251Bb), a subsection within the North Central Glaciated Plains Section (251B) of the biogeographic province known as the Prairie Parkland Province (251) under the Ecological Classification System developed by the MNDNR and the U.S. Forest Service. Subsection boundaries delineate a significant regional change in geology, topography, and vegetation. The Coteau Moraine Subsection is a wedge-shaped bedrock plateau that covers eastern South Dakota and southwestern Minnesota and consists of an area of transition from shallow deposits of windblown silt (loess) over glacial till to deeper deposits of loess (MNDNR, 2019).

8.13.2 Impacts

No impacts to topography from the Project are anticipated. Wind turbines and access roads will not require significant modification to the existing topographic features. The Project substation, O&M facility and transmission facility sites may require some grading before construction and installation of these facilities.

8.13.3 Mitigation

No mitigative measures are necessary as no impacts are anticipated.

8.14 SOILS

8.14.1 Resources

The soils within the Project Area primarily consist loamy soils with clay components, as well as silty-clay complexes and sand-loam complexes. The soils in the Project Area are not highly susceptible to erosion and are generally conducive to crop production (USDA, 2019c). The soils in the Project Area are both well drained and poorly drained, but the majority (about 56 percent) are poorly drained. Approximately 43.1 percent of the soils have a significant hydric component, and 92.6 percent are considered prime farmland soils (USDA, 2019c). Table 21 lists the soil types within the Project Area and the characteristics of these soils, and Figure 14 illustrates the soil types and distributions within the Project Area.

Table 19 Soil Types within the Project Area

Soil Type	Soil Texture	Drainage	Acreage in Project Area[1]
Clarion loam, 2 to 6 percent slopes	Loam	Moderately well drained	12,605.45
Waldorf silty clay loam, 0 to 2 percent slopes	Silty Clay Loam	Poorly drained	5,839.89
Collinwood silty clay loam, 1 to 3 percent slopes	Silty Clay Loam	Somewhat poorly drained	4,022.37
Lura silty clay, nearly level	Silty Clay	Poorly drained	3,334.11
Clarion loam, 2 to 6 percent slopes, moderately eroded	Loam	Moderately well drained	2,887.20
Delft clay loam, 0 to 2 percent slopes	Clay Loam	Poorly drained	2,728.98
Spicer-Lura complex	Complex	Poorly drained	2,456.97
Nicollet clay loam, 1 to 3 percent slopes	Clay Loam	Somewhat poorly drained	2,416.11
Lura silty clay, 0 to 1 percent slopes	Silty Clay	Very poorly drained	1,753.89
Truman silt loam, 2 to 6 percent slopes	Silt Loam	Well drained	1,430.85
Clarion-Storden complex, 6 to 10 percent slopes, moderately eroded	Complex	Well drained	1,048.87
Glencoe clay loam, ponded	Clay Loam	Very poorly drained	829.01
Zook silty clay loam, 0 to 2 percent slopes, frequently flooded	Clay Loam, 0 To 2 Percent Slopes	Poorly drained	801.45
Canisteo clay loam, 0 to 2 percent slopes	Clay Loam	Poorly drained	729.81
Coland clay loam, 0 to 2 percent slopes, frequently flooded	Loam, 0 To 2 Percent Slopes	Poorly drained	628.28
Crippin loam, 1 to 3 percent slopes	Loam	Somewhat poorly drained	596.89
Webster clay loam, 0 to 2 percent	Clay Loam	Poorly drained	573.40

Soil Type	Soil Texture	Drainage	Acreage in Project Area[1]
slopes			
Coland clay loam, 0 to 2 percent slopes, occasionally flooded	Loam, 0 To 2 Percent Slopes	Poorly drained	447.62
Dickinson sandy loam, 1 to 6 percent slopes	Sandy Loam	Well drained	411.54
Estherville sandy loam, 2 to 6 percent slopes	Sandy Loam	Somewhat excessively drained	305.76
Blue Earth mucky silt loam, 0 to 1 percent slopes	Mucky Silt Loam	Very poorly drained	236.35
Wadena loam, 2 to 6 percent slopes	Loam	Well drained	234.50
Omsrud-Storden complex, 10 to 16 percent slopes, moderately eroded	Complex	Well drained	219.88
Spillville loam, 0 to 2 percent slopes, occasionally flooded	Loam	Somewhat poorly drained	207.31
Kingston silty clay loam, 1 to 3 percent slopes	Silty Clay Loam	Somewhat poorly drained	159.14
Klossner muck, 0 to 1 percent slopes	Muck	Very poorly drained	140.94
Udorthents-Pits complex	Complex	Drainage undetermined	120.01
Millington clay loam, frequently flooded	Clay Loam	Poorly drained	96.88
Clarion-Swanlake loams, 12 to 18 percent slopes	Loams	Well drained	82.29
Dickman sandy loam, 2 to 6 percent slopes	Sandy Loam	Somewhat excessively drained	70.61
Terril loam, 2 to 6 percent slopes	Loam	Well drained	57.61
Dickinson sandy loam, 6 to 12 percent slopes	Sandy Loam	Well drained	56.73
Clarion-Swanlake loams, 6 to 12 percent slopes	Loams	Well drained	50.43
Belview loam, 22 to 40 percent slopes	Loam	Well drained	47.20
Estherville sandy loam, 6 to 12 percent slopes	Sandy Loam	Somewhat excessively drained	45.44
Lakefield silty clay loam	Silty Clay Loam	Somewhat poorly drained	40.79
Estherville sandy loam, 0 to 2 percent slopes	Sandy Loam	Somewhat excessively drained	25.64
Dickman sandy loam, 6 to 12 percent slopes	Sandy Loam	Somewhat excessively drained	22.60
Biscay clay loam, 0 to 2 percent	Clay Loam	Poorly drained	18.25

Soil Type	Soil Texture	Drainage	Acreage in Project Area[1]
slopes			
Glencoe clay loam, 0 to 1 percent slopes	Clay Loam	Very poorly drained	16.50
Wadena loam, 0 to 2 percent slopes	Loam	Well drained	10.19
Mayer loam, 0 to 2 percent slopes	Loam	Poorly drained	9.33
Belview loam, 16 to 30 percent slopes	Loam	Well drained	5.45
Grand Total			47,822.51[2]

[1] Acreage for open water was excluded in total Project acreage for soils.
[2] Sum of addends may not equal total Project Area due to rounding and due to open water omission.

8.14.2 Prime Farmland

Natural Resources Conservation Service farmland classifications include prime farmland which is land that has the best combination of physical and chemical characteristics for the production of crops. Most of the soil in the Project Area is classified as prime farmland (92.6 percent) and also includes soils classified as "prime farmland if irrigated," "farmland of statewide importance", and "prime farmland if protected by flooding". The remaining 6.2 percent is "not prime farmland". Farmland soil types within the Project Area are shown in Table 22 (also see Figures 14 and 15).

Table 20 Farmland Soil Types Within the Project Area

Prime Farmland Type	Acreage in Project Area[2]	Percent in Project Area
Prime Farmland[1]	44,867.2	93.3
Not Prime Farmland	3,219.5	6.7
Total	48,086.7	100

[1] Prime farmland includes prime farmland, farmland of statewide importance, prime farmland if drained, and prime farmland if protected from flooding.
[2] Acreage for open water was excluded from Prime Farmland.

8.14.3 Impacts

Construction of the wind turbine pads, access roads, O&M facility, permanent meteorological towers, underground collection lines, substation, switchyard, ADLS, and temporary construction areas would result in approximately 518 acres of temporary disturbance (access roads, collection lines, laydown yard, etc.). Permanent impacts to surface soils within the Project Area total approximately 69 acres (~43 acres are needed for gravel access roads, ~2 acres for the turbine pads/transformer pads/gravel parking, 20 acres for the Project substation/switchyard, and ~four acres for the O&M Facility). Temporary impacts during construction include removing vegetation in the areas where the wind facilities would be installed, making the soils in the immediate vicinity susceptible to erosion and compaction.

8.14.4 Mitigation

The Applicant would design the Project to limit cut-and-fill work, and the turbines and facilities have ben sited to avoid steep slope areas. Silt and clay soils are especially susceptible to compaction, as such, the Applicant may include use of erosion and sediment control Best Management Practices (BMPs) during and after construction, noxious weed control, segregating topsoil from subsurface materials, reseeding of disturbed areas based on agency recommendations, the use of construction equipment appropriately sized to the scope and scale of the Project, verifying grades fit closely with the natural terrain, proper onsite disposal of soil cuttings from turbine foundation construction, and maintaining proper drainage through the Project Area.

Construction of the Project would require coverage under the General Permit for Storm Water Discharges Associated with Construction Activities issued by the MPCA. A condition of this permit is the development and implementation of a Storm Water Pollution Prevention Plan (SWPPP) which would be developed during civil engineering design of the Project and would prescribe BMPs to control erosion and sedimentation including, but not limited to, silt fence, straw wattles, erosion control blankets, temporary storm water sedimentation ponds, and vegetation restoration.

The Project would be decommissioned at the end of its operating life in accordance with applicable regulations (see Section 15). Project components would be removed, graded back to pre-construction contours, reseeded, and restored, such that no irreversible changes to soil resources remain.

8.15 GEOLOGIC AND GROUNDWATER RESOURCES

The geological and groundwater resources within the Project Area are detailed below, followed by a discussion of the potential impacts that may occur and mitigation and minimization measures.

8.15.1 Surficial Geology

Bedrock underlying the Project Area is of Cretaceous age and consists of undifferentiated conglomerate, sandstone, mudstone, shale, marlstone, siltstone, and minor lignite, deposited in marine and non-marine settings (Jirsa, 2011) The surficial materials are chiefly glacial deposits and overlie the bedrock surface and range in thickness from less than 200 feet to over 550 feet. Depth to bedrock within the Project Area is 100 to 500 feet (Figure 16). Two surficial geologic units are mapped within the Project Area (USGS, 2019; Minnesota Geological Survey [MNGS], 2011) including Ku and Ꞓmu:

- Ku – Undifferentiated – Conglomerate, sandstone, mudston, shale, marlstone, siltstone, and minor lignite, deposited in marine and non-marine settings; likely Cenomanian to Campanian age.
- Ꞓmu – Middle and Upper Cambrian – Sandstone, siltstone, and shale; includes the Wonewoc Sandstone, Eau Claire Formation, and Mt. Simon Sandstone.

8.15.2 Bedrock Geology

Bedrock underlying the Project Area is of Cretaceous age and consists of undifferentiated conglomerate, sandstone, mudstone, shale, marlstone, siltstone, and minor lignite, deposited in marine and non-marine settings (Jirsa, 2011). Depth to bedrock within the Project Area is 100 to 500 feet (Figure 16). The bedrock elevation varies from 994 to 1460 feet above mean sea level (AMSL; Figure 17).

8.15.3 Aquifers and Wells

Minnesota is divided into six groundwater provinces based on bedrock and glacial geology, and the Project Area lies within the Western Province, which is comprised of clayey glacial drift overlying Precambrian and Cretaceous bedrock. The aquifers within this province occur in two general geologic settings such as bedrock or unconsolidated sediments deposited by glaciers, streams, and lakes. The glacial drift and Cretaceous bedrock contain limited sand and sandstone aquifers, respectively (MNDNR 2001). Recharge to the water table occurs throughout the region via infiltration of precipitation, surface water runoff from areas of lower to higher infiltration, and subsurface groundwater movement from adjacent areas. Sources of recharge include some lakes and wetlands and short reaches along stream segments. The Lincoln-Pipestone Rural Water System operates a water treatment plant, associated water wells, and a water pipeline within the Project Area.

The Applicant has reviewed the Project Area for U.S. Environmental Protection Agency (EPA) designated sole source aquifers (SSA), wells listed per the Minnesota County Well Index (CWI), and Minnesota Department of Health (MNDH) wellhead protection areas.

8.15.3.1 Sole Source Aquifers

The EPA defines a SSA or principal source aquifer area as one that supplies at least 50% of the drinking water consumed in the area overlying the aquifer, where contamination of the aquifer could create a significant hazard to public health and where there are no alternative water sources that could reasonably be expected to replace the water supplied by the aquifer exist (USEPA 2016a). There are currently no United States Environmental Protection Agency (USEPA)-designated SSAs crossed by the Project Area (USEPA 2019).

8.15.3.2 County Well Index

The CWI is the most complete record of well construction and location in Minnesota and is kept up-to-date and maintained by the MNGS, in cooperation with the MNDH. A search of the CWI identified 55 domestic wells within the Project (MNGS 2017; Figure 18).

Most of the wells listed in the CWI are screened in buried outwash deposits which are at least 20 feet thick. The wells in the CWI are screened in the Cretaceous sandstones ranging in depth from 12 feet to 575 feet below the ground surface. Yields from Cretaceous wells range from a few gallons per minute to of gallons per minute (Olcott, 1992). Domestic groundwater supply appears to be fairly accessible in the Project Area, however, these yields vary significantly depending on the source, depth, and intended use.

8.15.3.3 Wellhead Protection Areas

Under the Safe Drinking Water Act 42 United States Code (U.S.C.) §300.f. *et seq.* (1974), each state is required to develop and implement a Wellhead Protection Program in order to identify the land and recharge areas contributing to public supply wells and prevent the contamination of drinking water supplies and was subsequently updated in 1986. A Wellhead Protection Area (WHPA) encompasses the area around a drinking water well where contaminants could enter and pollute the well.

Public and non-public community water supply source-water protection in Minnesota is administered by the MNDH through the Wellhead Protection Program under Minnesota Statues Parts 4720.5100 to 4720.5590. WHPAs for public and community water-supply

wells are delineated on the basis of a zone of capture for 10-year groundwater time-of-travel to the well. This data is available through a database maintained by MNDH (MNDH 2017); one WHPA is located within the Project Area, the Lakefield Wellhead Protection Area (Figure 18).

8.15.4 Impacts

Construction of the Project may require minimal dewatering of excavated areas due to shallow groundwater, particularly for wind turbine foundations or collector line trenches. Construction dewatering may temporarily lower the water table in the immediate area and nearby surface waters depending on the proximity and connectivity of groundwater and surface water, and extent of the dewatering activities. Excavation is not expected to occur below the water table. As such, there are no changes in water levels and/or turbidity in these aquifers expected. Impacts to the Lincoln-Pipestone Rural Water System will be avoided and the Applicant will consult with representatives to ensure development of this Project do not have adverse effects to the water system. Construction dewatering may be required at certain locations; if needed, the Applicant will conduct dewatering in accordance with applicable rules and regulations (i.e., Applicant will obtain an MNDNR Water Appropriation Permit or a National Pollutant Discharge Elimination System [NPDES] permit from the MPCA).

Although unlikely, 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. No operation impacts to ground water are anticipated. The Applicant will develop a SPCC Plan.

8.15.5 Mitigative Measures

The Applicant has sited turbines and other Project components at higher elevations where groundwater is further below the ground surface. Dewatering activities, if needed, would be handled properly through the MDNR Temporary Projects General Permit 1997-0005, and be properly handled to allow sediments to settle out and be removed before the water is discharged, to reduce sedimentation of surface waters.

Additionally, the Applicant would prepare a SPCC Plan in case of an accidental release of construction related chemicals or fuels into surface and ground waters, which could have an adverse effect to ground water and nearby surface wells. The SPCC Plan would implement BMPs to avoid and minimize impacts such as storing fuels within secondary containment devices, checking vehicles and equipment for leaks, performing refueling and equipment maintenance away from wells, maintaining a spill response kit, and appropriate reporting protocols for any spills.

If required, the Applicant will obtain a NPDES permit from the from the MPCA and BMPs will be used during construction and operation of the Project to protect aquifers, wells, and wellhead protection areas.

8.16 SURFACE WATER AND FLOODPLAIN RESOURCES

The surface water resources within the Project Area are described below, followed by the potential impacts of the proposed Project and mitigative measures that will be undertaken.

8.16.1 Resource (Outstanding Resource Value Waters, Floodplain, Public Waters Inventory, Impaired Waters, Wildlife Lakes)

The Project Area is within the Upper Missouri River Basin and Des Moines Sub basin (MNDNR 2019a). Surface water within the Project Area flows southeast towards the Little Sioux River. The Applicant reviewed the USGS National Hydrography Dataset (NHD) waterbody data (NHD undated), USFWS National Wetland Inventory (NWI), MNDNR Public Waters Inventory (PWI), and MNDNR lake data (MNDNR 2017a) to assess the presence of waterbodies within the Project Area via desktop analysis. The desktop analysis revealed that a total of 165 waterbodies are within the Project Area; one ephemeral waterbody, 52 intermittent waterbodies, 81 perennial waterbodies, 27 lakes, and four wetlands/ponds. Table 23 and Figure 19 identifies desktop delineated waterbodies within the Project Area.

Table 21 Waterbodies within the Project Area

Flow Regime	Count of Waterbodies within the Project Area	Acreage within Project Area
Ephemeral	1	<0.1
Intermittent	52	79.1
Perennial	81	141.5
Lake	27	1,105.2
Wetland/Pond	4	0.4
Total	**165**	**1,326.2**

In order to more accurately characterize the surface water resources within the Project Area, a waterbody delineation/investigation will be completed in the third or fourth quarter of 2019, or during the second quarter of 2020, weather dependent. The results of that investigation will be made available upon its completion.

8.16.2 Public Waters Inventory

In Minnesota, rivers, streams, and lakes may be designated as Public Waters (Minnesota Statutes § 103G.005, Subdivision 15). These waters are listed in the PWI database and meet the criteria set forth in Minnesota Statutes Section 103G.005, Subdivision 15. A total of 19 PWI resources are within the Project Area including nine basins (lakes) and nine waterbodies (Figure 19).

8.16.3 Outstanding Resource Value Waters

Minnesota designates certain surface waters as outstanding resource value waters (ORVWs) because of their exceptional qualities, and these waters are under purview of the MPCA. According to Minnesota Rules 7050.0180, ORVWs are defined as waters within the Boundary Waters Canoe Area Wilderness; Voyageur's National Park; MNDNR designated scientific and natural areas, wild, scenic, and recreational river segments; Lake Superior; specific portions of the Mississippi River; and other waters of the state with high water quality, wilderness characteristics, unique scientific or ecological significance, exceptional recreational value, or other special qualities which warrant stringent protection from pollution. As specified in Minnesota Rules, wild, scenic, and recreational river segments comprise a part of the definition of ORVWs. No waterbodies within the Project Area are listed as a state wild, scenic, or recreational river (MNDNR 2016).

8.16.4 Nationwide Rivers Inventory

The National Park Service (NPS) maintains a Nationwide Rivers Inventory (NRI) which lists more than 3,400 free-flowing river segments in the U.S. that are believed to possess one or more outstandingly remarkable natural or cultural values judged to be of more than local or regional significance. Under a 1979 Presidential Directive and related Council on Environmental Quality procedures, all federal agencies must seek to avoid or mitigate actions that would adversely affect one or more NRI segments (NPS 2019). There are no NRI listed rivers within the Project Area. The nearest NRI segment to the project area is the Des Moines River, West Fork, which is 10 miles to the east.

8.16.5 Trout Waters

Trout waters are governed by the MNDNR under Minnesota Rules 6264.0050, Subpart 4, which provides a list of designated trout streams in Minnesota and protects sensitive trout waters including those with gravel substrates. The Applicant reviewed the MNDNR's Trout Waters database and determined that no trout waters are located within the Project Area (MNDNR 2019b).

8.16.6 Floodplains

Land within the Project Area is within Federal Emergency Management Agency (FEMA) designated Zone A (100-year) floodplain (Figure 7). These areas occur along the Little Sioux River, Little Sioux River-West Fork, Skunk River, and Rush River. No FEMA designated 500-Year floodplain area occurs within the Project Area (Figure 7; FEMA 2017).

8.16.7 Wildlife Lakes

The MNDNR may formally designate lakes for wildlife management under the authority of Minnesota Statues 97A.101 subdivision 2. This designation allows the MNDNR to periodically and temporarily lower lake levels to improve wildlife habitat and to regulate motorized watercraft and recreational vehicles on designated lakes. No designated wildlife lakes are present within the Project Area (MNDNR 2019c).

8.16.8 Impaired Waters

Under Section 303(d) of the Clean Water Act, states are required to assess all waters of the state to determine if they meet water quality standards, list waters that do not meet

standards and update the list biannually, and conduct total maximum daily load studies (TMDL) to set pollutant-reduction goals needed to restore waters to the extent that they meet water quality standards for designated uses. Little Sioux River-West Fork, which flows southeast near the southern border of the Project Area, as shown in Figure 18, is listed as impaired on the 2016 303(d) list for E. Coli. A TMDL study has been approved by the EPA. Judicial Ditch 13, which runs southeast from through the center of the Project area, as shown in Figure 18, is listed on E. Coli and turbidity. A TMDL study has been approved by the USEPA. Little Sioux River, which runs south through the north central portion of the Project Area, as shown in Figure 19, is also listed based on E. Coli. A TMDL study has been approved by the USEPA. (MPCA 2019).

8.16.9 Impacts

The Applicant has sited turbines and other Project components at higher elevations where surface waters are generally absent, however, underground collection lines would temporarily impact surface waters where crossings were unavoidable. A total of 3,468 linear feet of intermittent waterbodies and 201.3 linear feet of perennial waterbodies will be temporarily impacted by the Project for construction including collection lines, access roads, turbine construction, and the switchyard. Permanent impacts due to the construction and operation of access roads include 84.7 linear feet of intermittent streams and 16.3 linear feet of perennial waterbodies.

Surface water impacts may include lower water quality through means of sedimentation during construction, impacts to drainage patterns, increased runoff due to an increase of impervious surfaces, and stream bank erosion. The wind turbines/transformer pads/gravel parking would create ~2 acres of impervious surfaces, the access roads would create ~43 acres, the meteorological towers would create 0.02 acre, the Project substation/switchyard would create ~20 acres, and the O&M facility would create ~4 acres subsequently increasing the volume and rate of stormwater runoff in the immediate vicinity of these features.

8.16.10 Mitigation

Where stream/drainage crossings cannot be avoided for construction of access roads or collector lines, appropriately designed culverts or low water crossings would be placed to maintain the free flow of water. As such, the Wind Farm would not result in changes to existing drainage patterns in the Project Area.

As discussed in Section 8.14.3, appropriate BMPs would be implemented and Three Waters would prepare a SWPPP to address stormwater concerns.

8.17 WETLANDS

The wetland resources within the Project Area are described below, followed by the potential impacts of the proposed Project and mitigative measures that will be undertaken.

8.17.1 Resources

The Applicant reviewed the USFWS NWI database to assess the presence of waterbodies within the Project Area via desktop analysis (Table 24; Table 21). The desktop analysis revealed that a total of 796 wetlands are within the Project Area including 112 ponds, of which 37 are palustrine aquatic bed (PAB) wetlands and 75 are palustrine unconsolidated

bottom (PUB) wetlands. Palustrine emergent (PEM) wetlands are most dominant within the Project Area totaling 636, 21 palustrine scrub shrub (PSS) wetlands, and 24 palustrine forested (PFO) wetlands. Additionally, three wetland complexes were identified by NWI including two PEM/PFO wetlands and one PEM/PSS wetland. Table 24 and Figure 21 outlines the NWI wetlands within the Project Area.

Table 22 Wetland Resources within the Project Area

Flow Regime	Count of Waterbodies within the Project Area	Acreage within Project Area
PAB	37	45.9
PUB	75	99.8
PEM	636	2,281.8
PEM/PSS Complex	1	2.7
PEM/PFO Complex	2	4.1
PSS	21	17.6
PFO	24	17.9
Total	**796**	**2,469.8**

In order to more accurately characterize the surface wetland resources within the Project Area, a wetland delineation/investigation will be completed in the third or fourth quarter of 2019, or during the second quarter of 2020, weather dependent. The results of that investigation will be made available upon its completion.

8.17.2 Impacts

The Project would be sited to minimize impacts to wetland resources. Wind turbines will be built on higher elevation and ridges and will avoid wetlands on the lower positions in the landscape impacts to wetlands and streams would be minor. A total of 11.67 acres of temporary impacts of wetlands will be incurred for construction including access roads, collection lines, and turbine construction; 11.64 acres would be to PEM wetlands, less than 0.1 acres would be to PUB wetlands, and less than 0.1 acres of PFO wetlands. 0.6 acres of permanent wetland impacts are expected for the Project for access roads, the substation and switch yard, and turbines, all of which are to PEM wetlands. These impacts are anticipated to be authorized under a Joint Permit Application through the USACE and MNDNR, as well as local units of government that administer the Wetland Conservation Act (WCA) in the State of Minnesota. As details of the Project layout are developed the Applicant will continue to work to minimize and avoid wetland impacts to the extent practicable.

8.17.3 Mitigation

The Applicant will design the Project to avoid or minimize wetland impacts and will apply erosion control measures identified in the MPCA Stormwater BMPs Manual, such as using silt fence to minimize impacts to adjacent water resources. Disturbed surface soils will be stabilized at the completion of the construction process to minimize the potential for sedimentation in wetlands.

According to Section 404 of the Clean Water Act, any discharge of dredged or fill materials into jurisdictional waters of the U.S. requires a permit from the USACE. Many of the wetlands crossed by the Project are likely to be jurisdictional Waters of the United States. Wetlands permits and licenses, letters of no jurisdiction, or exemptions may be required from the USACE, MNDNR Division of Waters, and local units of government that administer WCA. Pending the final layout and final wetland impacts, appropriate wetland permits, and consultations will be prepared and constructed with applicable agencies, and mitigation requirements will be executed by the Applicant per direction of those agencies.

8.18 VEGETATION

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

8.18.1 Resources (Land Cover, Native Prairie, Native Plant Communities)

The Project Area is located in the Western Cornbelt Plains Level III EcoRegion and the Des Moines Lobe Level IV EcoRegion (USEPA 2015). According to the USGS National Land Cover Database (NLCD; USGS, 2016) cultivated crops compose the majority of the Project Area at 89%, followed by developed (3.8%), herbaceous wetlands (3.7%), herbaceous uplands (1.5%), and barren land, hay/pasture, upland shrub/scrub, forested, open water, and woody wetlands (Table 25 and Figure 10).

Table 23 Land Cover Types and their Relative Abundance in in the Project Area

Land Cover	Total Area (acres)	Percent of Project Area
Barren Land	14.7	0.03%
Cultivated Crops	42,855.0	89.12%
Hay/Pasture	227.7	0.47%
Developed	1820.7	3.79%
Herbaceous	729.4	1.52%
Shrub/Scrub	18.7	0.04%
Forested	268.3	0.56%
Open Water	379.5	0.79%
Emergent Herbaceous Wetlands	1759.9	3.66%
Woody Wetlands	13.8	0.03%
TOTAL	**48,087**	**100%**

An initial query of the MNDNR Natural Heritage Information System (NHIS; MNDNR 2019d) on August 22, 2019 indicated that three sites of biodiversity significance (moderate quality) and four sites of biodiversity significance (below average quality). Two of the three site of moderate biodiversity significance are also considered lakes of biodiversity significance and one is also an upland prairie system. The Applicant is in the process of obtaining MNDNR NHIS concurrence regarding the Project; as of the date of this Application, concurrence is pending. Details of this response will be included once received.

Moderate sites of biodiversity contain occurrences of rare species, moderately disturbed native plant communities, and/or landscapes that have strong potential for recovery of native plant communities and characteristic ecological processes. Below average sites of biodiversity significance lack occurrences of rare species and natural features but may include areas of conservation value at the local level, such as habitat for native plants and animals, corridors for animal movement, buffers surrounding higher-quality natural areas, areas with high potential for restoration of native habitat, or open space. Native prairies, pursuant to Minnesota Statue Section 84.02 Subdiv. 5, means land that has never been plowed where native prairie vegetation originating from the site currently predominates or, if disturbed, is predominantly covered with native prairie vegetation that originated from the site. Unbroken pastureland used for livestock grazing can be considered native prairie if it has predominantly native vegetation originating from the site and conservation practices have maintained biological diversity. (MNDNR 2019d).

Details related to the NHIS sites of biodiversity significance are detailed in 8.20, Rare and Unique Natural Resources. According the USFWS Information for Planning and Conservation (IPaC), prairie bush clover (*Lespedeza leptostachya*) is listed as threatened within Jackson County, Minnesota. Details related to the prairie bush clover are detailed in Section 8.19.

Noxious weeds in Minnesota are regulated by the MNDA under Minnesota Statutes 18.75-18.91 to protect residents from the injurious effects of noxious weeds to public health, agriculture, roads, crops, livestock, and other properties. The MNDA lists 23 plants as noxious weeds under two regulatory lists; prohibited eradicate and prohibited control (Table 26; MNDA 2019a). Jackson County does not list any invasive or noxious weeds in addition to the MNDA (MNDA 2019b).

Table 24 Noxious Weeds in Minnesota

Common Name	Scientific Name
Palmer Amaranth	*Amaranthus palmeri*
Oriental Bittersweet	*Celastrus orbiculatus*
Diffuse Knapweed	*Centaurea diffusa*
Brown Knapweed	*Centaurea jacea*
Yellow Star Thistle	*Centaurea solstitialis*
Meadow Knapweed	*Centaurea x moncktonii*
Poison Hemlock	*Conium maculatum*
Black Swallow Wort	*Cynanchum louiseae*
Grecian Foxglove	*Digitalis lanata*
Common Teasel	*Dipsacus fullonum*
Cutleaved Teasel	*Dipsacus laciniatus*
Giant Hogweed	*Heracleum mantegazzianum*
Japanese Hops	*Humulus japonicus*
Dalmatian Toadflax	*Linaria dalmatica*
Common Barberry	*Berberis vulgaris*
Narrowleaf Bittercress	*Cardamine impatiens*
Plumeless Thistle	*Carduus acanthoides*
Spotted Knapweed	*Centaurea stoebe*

Common Name	Scientific Name
Canada Thistle	*Cirsium arvense*
Leafy Spurge	*Euphorbia esula*
Purple Loosestrife	*Lythrum salicaria*
Wild Parsnip	*Pastinaca sativa*
Common Tansy	*Tanacetum vulgare*

8.18.2 Impacts

Vegetation will be removed for the installation of turbine foundations, access roads, and the O&M facility. Approximately 13 acres of vegetation will be permanently impacted in association with the construction of turbine pads, and approximately 37 acres of permanent impacts would be associated with the construction of access roads. Approximately three additional acres of vegetation impacts will be used for construction of the proposed substation, 10 acres for the proposed switchyard and another four acres of vegetation would be impacted with construction of the proposed O&M facility. Approximately 20 additional acres of vegetation will be temporarily impacted for the construction laydown area and batch plant. These areas will be reseeded to blend with existing vegetation.

Impacts to wetlands and wetland vegetation, including restoration, will be inserted in this paragraph pending final site design. Field surveys are planned for the third or fourth quarter 2019 or the second quarter 2020, weather dependent.

The Project has been designed to avoid permanent impacts to MNDNR mapped native prairie, native plant communities, and all sites of biodiversity significance ranked outstanding, high, moderate, and below. As such, there are no turbines, access roads, or the O&M facility within these natural features.

Project activities have the potential to result in the spread of noxious weed species from construction equipment introducing seeds into new areas, or erosion or sedimentation due to clearing ground in the construction areas. The Applicant will work together with all Project construction subcontractors entering the Project Area to control and prevent the introduction of invasive species.

8.18.3 Mitigation

The following measures, plans, permits, and actions will be used to avoid and minimize potential impacts to land within the Project during siting, construction, and operation, to the extent practicable:

- Avoid impacts to sites of biodiversity significance;
- Avoid and minimize impacts to native prairie habitats to the extent practicable (including areas with suitable habitat for the federally threatened prairie bush clover);
- Avoid and minimize disturbance of wetlands during construction and operation of the Project. If jurisdictional wetland impacts are proposed, then the Applicant will obtain applicable wetland permits;
- Prepare a construction SWPPP and obtain an NPDES Permit;
- Design the Project to minimize the need to remove trees;

- Implement BMPs during construction and operation of the Project to protect topsoil and adjacent resources and to minimize soil erosion; and
- Revegetate non-cropland and range areas using native vegetation which may include cropland and range areas with wildlife conservation species and, wherever feasible, planting native tall grass prairie species in cooperation with landowners.

The spread of noxious weeds would be managed by using appropriate seed mixes in non-cultivated areas and in compliance with the Project SWPPP to restore vegetation in disturbed areas. If listed noxious weed infestations are found in non-cultivated areas after construction activities are completed each area would be evaluated and addressed in coordination with landowners. Areas temporarily disturbed due to construction would be re-vegetated with native vegetation types matching the surrounding landscape. Restoration would be initiated immediately following the completion of construction activities are completed.

8.19 WILDLIFE

The wildlife resources within the Project Area are described below, followed by the potential impacts of the proposed Project and mitigative measures that will be undertaken.

8.19.1 Resources (Tier I and II Results, Tier III Studies, Eagle Conservation Plan Guidelines, Birds, mammals, Reptile, Amphibians, Insects)

On March 23, 2012, the USFWS issued the Land-Based Wind Energy Guidelines (WEG; USFWS 2012). The WEG provide a structured, scientific process for addressing wildlife conservation concerns at all stages of land-based wind energy development. They also promote effective communication among wind energy developers and federal, state, and local conservation agencies and tribes. The 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 I: Preliminary evaluation or screening of sites (landscape-level screening of possible project sites; generally based on readily available public information);
- Tier II: 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 III: 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 IV: Post-construction mortality studies (to evaluate direct fatality impacts); and
- Tier V: 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; e.g., post-construction displacement and/or use studies, curtailment effectiveness studies, etc.).

8.19.1.1 Tier I and II Surveys

An informal WEG Tier 1 and Tier 2 analysis, consisting of a review of available desktop information, was completed to assess species of concern and their habitats. Data sources included the USFWS Information for Planning and Conservation (IPaC) website and MNDNR NHIS. Based on these initial data reviews and comments received from the USFWS and MNDNR, additional Tier 3 field surveys were conducted to further evaluate wildlife resources at the Project (see Section 13.2.1.4). The review of the information above is consistent with the Tiered approach of the WEG.

Federal and State Listed Threatened and Endangered Species, and Critical Habitat

According to the USFWS IPaC that was obtained on August 25, 2019 (USFWS 2019a; Appendix I) and the MNDNR NHIS (consultation was submitted in January 2018 and the MNDNR responded on April 6, 2018, and then a new initial query was run with the revised Project Area on August 22, 2019), several species have the potential to occur within the Project Area including five federally listed species and seven state listed species (Table 27). Additionally, the Applicant has considered the bald eagle (*Haliaeetus leucocephalus)* and golden eagle (*Aquila chrysaetos)* given their protection under the Bald and Golden Eagle Protection Act. Federally listed species are described in this section and state listed species are detailed in section 8.20 Rare and Unique Natural Resources.

Table 25 Federally and State Listed Species Potentially Occurring in the Project Area

Common Name	Scientific Name	Federal Status	State Status
Bald eagle	*Haliaeetus leucocephalus*	*	
Golden eagle	*Aquila chrysaetos*	*	
Northern long-eared bat	*Myotis septentrionalis*	Threatened	Special Concern
Rusty patched bumble bee	*Bombus affinis*	Endangered	
Prairie bush clover	*Lespedeza leptostachya*	Threatened	
Poweshiek skipperling	*Oarisma poweshiek*	Critical Habitat	
Topeka shiner	*Notropis topeka (=tristis)*	Critical Habitat	
Tri-colored bat	*Perimyotis subflavus*		Special Concern
Big brown bat	*Eptesicus fuscus*		Special Concern
Little brown bat	*Myotis lucifugus*		Special Concern
Trumpeter swan	*Cygnus buccinator*		Special Concern
Forster's tern	*Sterna forsteri*		Special Concern
Henslow's sparrow	*Ammodramus henslowii*		Endangered
* Both bald and golden eagles are protected under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.			

Bald Eagle

Preferred nesting, foraging, and roosting bald eagle habitats include large, mature trees near water with abundant fish and waterfowl prey, especially in undisturbed riparian areas. The bald eagle is a resident species throughout Minnesota and have been observed within the Project Area. A total of eight active eagle nests were observed, one inactive eagle nest, and two empty stick nests that are likely used by eagles were observed during aerial nest surveys in 2017 and 2018 (Appendix I). Wintering bald eagles feed primarily on fish near water resources but may also be found during migration and winter periods in areas away from water resources if sufficient forage is available. If waterfowl concentrate in an area during winter, they could serve as a food base for eagles. The larger wetlands, lakes, and waterbodies within the Project Area provide potential foraging habitat for bald eagles.

Northern Long-eared Bat

During winter months NLEB hibernate in caves or abandoned mines (Foster and Kurta 1999). The northern long-eared bat (NLEB) is federally listed as threatened due to marked population declines caused by white-nose syndrome. Suitable roosting, forage, and travel habitat in the summer consists of a wide variety of forested and wooded habitats. Additional suitable summer habitat may also include adjacent, interspersed, and non-forested areas such as emergent wetlands and adjacent edges of agricultural fields, old fields, and pastures. While roosting, NLEB is generally found in deep crevices in areas such as forests and woodlots (i.e., live trees and/or snags greater than or equal to three inches diameter at breast height (dbh) that have exfoliating bark, cracks, crevices, and/or cavities) as well as linear features such as fencerows, riparian forests, and other wooded corridors. NLEB roosts in both live trees or snags (Sasse and Perkins 1996, Foster and Kurta 1999, Owen *et al.* 2003).

Rusty Patched Bumble Bee

Rusty patched bumble bees occupy grasslands and tallgrass prairies within the Upper Midwest, with suitable habitat containing pollen flowers and nectar. Rusty patched bumble bees collect pollen and nectar from various flowering plants, with emergence in early spring and hibernation later in the season. They need a consistent supply and various flowers blooming April through September for optimal nectar and pollen consumption. Overwintering sites for hibernation, which includes underground soil, mammal burrows and grass clumps for nests (USFWS 2019b).

Prairie Bush-clover

Prairie bush clover is native to tallgrass prairies, a member of the bean family and known to occur within the upper Mississippi River Valley. Flowers bloom in mid-July, exhibiting its distinguished pink flowers and slender leaves (USFWS 2019c). Fruiting occurs in early August through early September, with August being the optimal time for species identification (Wisconsin Department of Natural Resources 2019).

Poweshiek Skipperling

Poweshiek Skipperlings are smaller butterflies found within native prairies of Iowa, Minnesota, North Dakota, South Dakota, Michigan and Wisconsin. Suitable habitat includes high quality tallgrass and mixed grass prairie ranging from upland, dry areas to low, moist areas including prairie fens (USFWS 2019d). Adult butterflies consume nectar from native

prairie species like purple coneflowers (*Echinacea purpurea*), black-eyed susans (*Rudbeckia sp.*), and palespike lobelia (*Lobelia spicata*) within prairies. Larvae typically select native, fine-stemmed grasses and sedges including little bluestem (*Schizachyrium scoparium*) and prairie dropseed (*Sporobolus heterolepis*) (USFWS 2019d).

Topeka Shiner

The Topeka shiner is a smaller minnow living primarily in small to intermediate sized prairie streams within pool and run areas. Preferred habitat for shiners also includes vegetation and areas of exposed gravel (USFWS 2019e). Suitable streams contain high water quality and cool to moderate temperatures. Within parts of the Midwest, they also can live in oxbows and off-channel pools. The substrates within these waters consist of sand, gravel, or rubble with a layer of silt; Topeka shiners consume larvae and small invertebrates. (USFWS 2019b). Spawning occurs in the late spring and summer, with sexual maturity occurring during the summer after hatching (NatureServe Explorer, 2019c).

8.19.1.2 Tier III Studies

In coordination with the USFWS, MNDNR, and MNDOC the Applicant conducted several Tier III wildlife surveys in 2017 and 2018 to support the initial SPA. An initial Site Characterization Study was conducted in 2017 utilizing both desktop and field reconnaissance data collection methods and analysis, which is included as Appendix J.

Agency consultations with the USFWS, MNDNR, and MNDOC began in 2017 and are ongoing as Three Waters finalizes the Project layout (Table 28); meeting notes, associated PowerPoint presentations, and agency correspondences are included in Appendix I. Tier 3 studies were compliant with USFWS WEG, USFWS *Eagle Conservation Plan Guidance* (ECPG; USFWS 2013), and MNDNR's *Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota* and *Guidance for Commercial Wind Energy Projects* (MNDNR 2014), as well as the *USFWS 2017 Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2017), which is also used for NLEB presence/probable absence surveys and the *USFWS NLEB Interim Conference and Planning Guidance* (USFWS 2014). As such, studies included aerial raptor nest surveys, avian use studies, bat acoustic studies, NLEB-specific acoustic studies, as well as bird and bat conservation planning and a site characterization study (Table 29).

Table 26 Summary of Natural Resource Agency Consultations for the Project

Agency Consultation	Date(s)
Project Introduction, Review and discuss avian and bat Study Plan – USFWS, MNDNR, MNDOC	May 8, 2017
State Threatened and Endangered Species Consultation – MNDNR NHIS	May 11, 2017
MNDNR Division of Ecological & Water Resources – Response	May 11, 2017
Year 1 Survey Results and Year 2 Study Plan – USFWS, MNDNR, MNDOC	August 13, 2018
MNDNR NHIS Response	April 6, 2018
Raptor Nest Locations	December 27, 2018
Environmental Review for Natural resources – IADNR	January 24, 2019

Project Update – MNDNR	August 5, 2019

Table 27 Summary of Tier 3 Studies for the Project

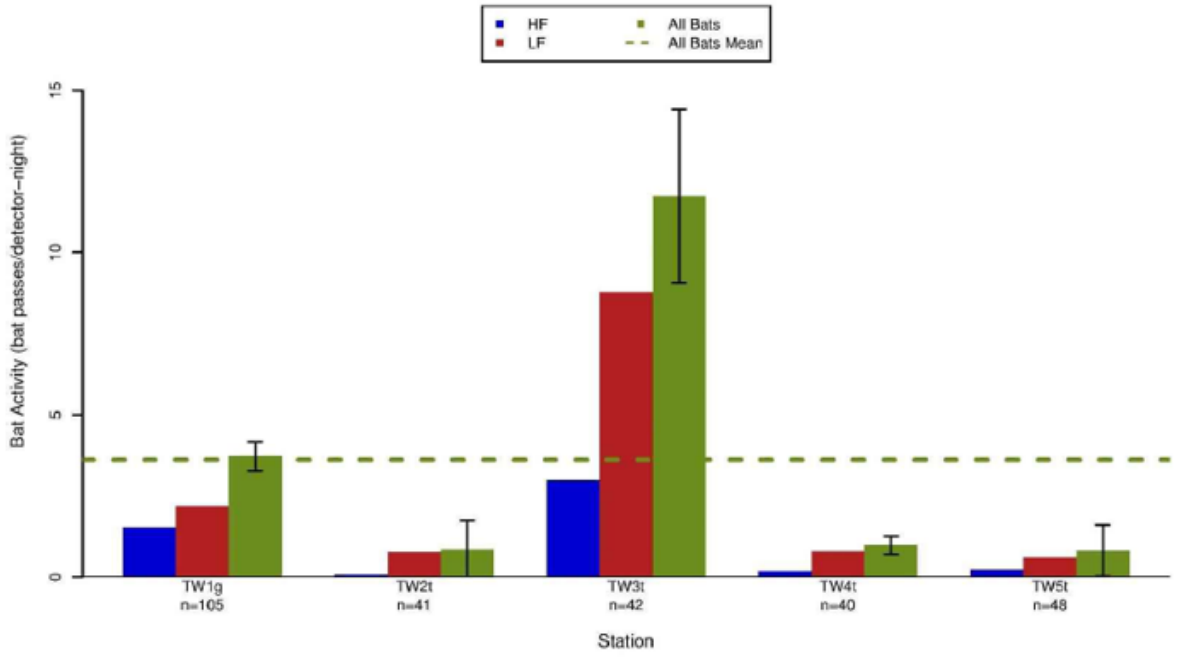
Survey Type	Date(s)
Site Characterization Study	November 2017
Aerial Raptor Nest Survey	March – May 2017
Aerial Raptor Nest Survey	April 2018
Year 1 Avian Use Report	March 2017 – February 2018
Year 2 Avian Use Report	March 2018 – February 2019
Bat Acoustic Activity Studies	July – November 2017
Bat Acoustic Activity Studies	April – October 2018
Summer Bat Survey Report for NLEB	June 2017
BBCS	March 2017 – September 2019

The Applicant conducted aerial eagle nest surveys via helicopter in 2017 from March 29 through April 1, and again on May 3, 2017. The intent of was to conduct an aerial raptor nest aerial survey to record eagle and other non-eagle raptor nests within the designated Project Area and designated buffer of 10 miles. Results indicated that a total of four nests were found within the Project Area; two were unoccupied stick nests and two were active red-tailed hawk (*Buteo jamaicensis*) nests. No eagle nests were observed within the Project Area, all were identified along the southeast and northern sections of the 10-mile buffer area. Aerial eagle nest surveys via helicopter were conducted again in 2018 from April 9 to April 10, 2018 within the Project Area and 10-mile buffer. Results show that three active red-tailed hawk nests and one active great-horned owl (*Bubo virginianus*) were identified during surveys.

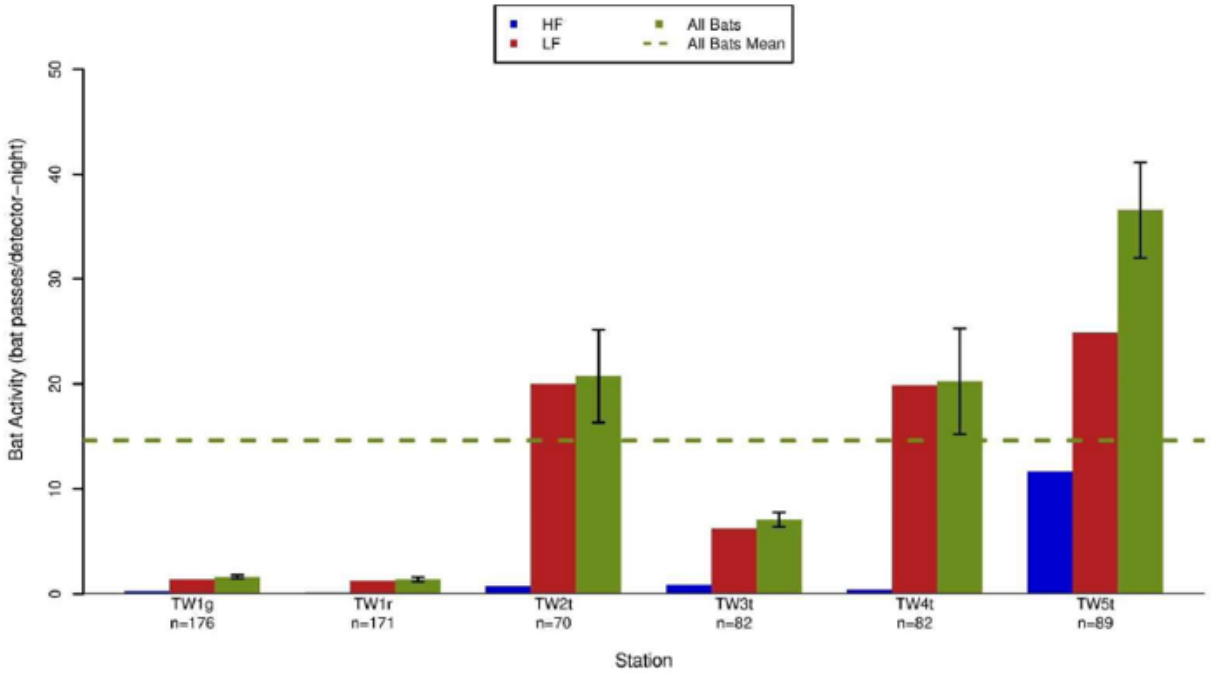
Avian Use Studies were completed by the Applicant in both 2017 (Year 1) and 2018 (Year 2) to provide site-specific avian use data that could help evaluate potential impacts from development and operation of the Project, to provide site-specific avian use data that could help evaluate potential impacts from development and operation of the Project, and to estimate temporal and spatial patterns using the ECPG. Eagle and large bird surveys in 2017 recorded 3,850 large bird observations; 1,769 waterfowl, 1,405 gulls/terns, and 104 diurnal raptor observations. Eagle and large bird surveys in 2018 yielded 13,869 large bird observations; 10,078 waterfowl, 1,307 gulls/terns, and 1,116 waterbirds. Small bird use surveys in 2017 identified a total of 36 small bird species within the Project Area and 45 species in 2018, where the number of small bird species recorded was highest in summer, followed by spring, fall and winter. Details of the specific species, count data, and diversity and richness are included as Appendix I in the Year 1 and Year 2 Avian Use Reports.

Bat acoustic surveys were conducted to estimate the level of bat activity throughout the Project Area by the Applicant in 2017 and 2018. The first round of bat acoustic surveys were completed from July 6 to November 11, 2017. The majority (691 passes or 69.3%) of bat passes within the Project Area were of low frequency bat species such as big brown bats (*Eptesicus fuscus*), hoary bats (*Aeorestes cinereus*), silver-haired bats (*Lasionycteris noctivagans*), as shown in Graph 1. The remaining bat passes (301 passes or 30.7%) were high frequency bat species such as eastern red bat (*Lasiurus borealis*), little brown bats (*Myotis lucifugus*), NLEBs, and tri-colored bats (*Perimyotis subflavus*) (Graph 1). In 2018 the results were similar in the majority 6,204 (83%) of bat passes were low frequency

species (e.g., big brown bats, hoary bats, and silver-haired bats) and the remaining 1,269 (17%) of bat passes were high frequency species (e.g., eastern red bats, little brown bats, NLEBs, and tri-colored bats), as shown in Graph 2.



Graph 1 **Number of high-frequency (HF) and low-frequency (LF) bat passes per detector-night recorded at detectors in the Three Waters Wind Farm, July 6 – November 11, 2017. The bootstrapped standard errors are represented by the black error bars on the 'All Bats' columns.**



Graph 2 Number of high-frequency (HF) and low-frequency (LF) bat passes per detector-night recorded at detectors in the Three Waters Wind Farm, April 23 – October 15, 2018. The bootstrapped standard errors are represented by the black error bars on the 'All Bats' columns.

In addition to the acoustic surveys, the Applicant performed presence/probable absence surveys for the federally threatened NLEB to determine the summer presence/probable absence of the NLEB in the Project Area, to determine sites where follow-up mist-net surveys for NLEB should be conducted if warranted, to capture NLEB in order to confirm sex, age, and reproductive status of individual bats, and to locate NLEB roost trees within the Project should individuals be captured. Surveys were conducted from June 17 to 20, 2017 and suggest that the NLEB is likely absent from the Project Area based on acoustic data as no calls recorded were indicative of NLEB. Since no NLEB calls were identified, mist-netting surveys were not conducted for the Project.

Based on the Site Characterization Study that was conducted for the Project, in conjunction with the results of the Eagle Nest Surveys (2017 and 2018), Acoustic Bat Studies (2017 and 2018), Avian Use Studies (2017 and 2018), and the Project's BBCS, the Project is considered a low risk to avian and bat populations. All of these reports are attached to this Application as Appendices I and J. The Applicant bases a low risk determination from several USFWS and MNDNR guidelines including the USFWS WEG and ECP, and the MNDNR *Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota.*

As part of the Site Characterization Study the Applicant considered the risk assessment questions of the WEG and ECP. The WEG Tier II studies help to identify potential issues that need to be addressed for a Project; the Applicant addressed the questions which are detailed in Appendix J. Notably, one of the Tier II questions asks, "*Is there potential for significant adverse impacts to species of concern based on the answers to the questions above, and considering the design of the proposed project?*" The Applicant considered the results of the avian and bat studies and determined that the potential for significant adverse

impacts to species of concern is low for the Project, as direct impacts are most likely to affect migrating songbirds and migratory tree bats. The USFWS ECPG provides questions that should be considered to help place a prospective project into an appropriate risk category; the Applicant the Applicant addressed the questions of the ECPG which are detailed in Appendix J, and determined that The potential for significant adverse impacts to eagles from construction and operation of the Project appears to be low. Bald eagles may occur in the Project during all seasons, but with seasonal fluctuations in abundance.

Furthermore, the Applicant considered the MNDNR's Avian and Bat Survey Protocols for Large Wind Energy Conversion Systems in Minnesota, which define high, moderate, and low risk determinations (MNDNR 2014):

- *High risk projects contain habitat that would congregate birds or bats, listed species or species of greatest conservation need are present, and acoustic data indicates high bat passes or migratory tree bat presence, avian flight paths exist, or migratory corridors are present.*
- *Moderate or low risk projects contain features similar to high risk but are concentrated in a portion of the project area or of lower quality.*

The USFWS and MNDNR are currently reviewing the final Tier III Reports, which are included as Appendix I, all of which suggest the Project Area is a low-risk site for wind turbines. The USFWS and MNDNR are also reviewing the BBCS, which sets forth a WEG Tier IV avian and bat post-construction monitoring plan. The Applicant will continue to work closely with the USFWS MNDNR to finalize details of the Project layout, listed species, sensitive habitats, and avoidance and mitigation measures

8.19.2 Impacts

The potential for habitat fragmentation impacts is low because the Project is sited on a previously disturbed landscape. Furthermore, the Project has been designed to avoid placing turbines and associated facilities on MNDNR-mapped native prairie and sites of biodiversity significance, as defined in Section 8.18.

Project operation may result in avian and bat mortality from collision with the Project's turbines. The Project has the potential to cause displacement of some avian species from the Project Area due to the presence of turbines and increased human activity, although clearing of habitat (e.g., trees or grasslands) will be minimal.

The Project area is dominated by cropland and lacks features that would attract high bald eagle use such as mature trees. Bald eagle use was generally low during both years of avian use surveys. No bald eagle concentration areas were identified within the Project area, but bald eagle use was higher during migration. All bald eagle nests were located outside of the proposed Project Area and one-mile buffer, and almost all were located along the larger lakes in the southeast and northern sections of the 10-mile buffer area (Appendix I). As such, bald eagle mortality is expected to be low for the Project.

Diurnal raptor use within the Project Area was low compared to other wind farm facilities (Appendix I). A detailed comparative use analysis of diurnal raptor use was performed by the Applicant comparing the data collected during Avian Use Surveys to 49 other wind farms of similar scale; The Project ranked 42 out of the 49 wind energy facilities it was compared to. As such, mortality rates of raptors are expected to be low (Appendix I).

Passerines are the most common bird types found at wind energy facilities in the United States due to their large overall abundance (Erickson et al. 2014). Many of the most-observed passerine bird species within the Project Area were common, disturbance-tolerant species, but localized mortality due to operation won't affect bird species at the population level. The risk of collisions with wind turbines for passerines would most likely be greatest during migration but would be overall low.

Bat activity rates in the Project area were low-moderate based on two years of acoustic surveys (Appendix I) and based on limited suitable habitat for tree roosting species. As such, mortality rates are expected to be low to moderate (Appendix I) with the anticipated mortality to be highest for migratory tree roosting bat species, low frequency bats, and bats within the *Myotis* genus based on presence and absence surveys conducted for the Project (Appendix I). Since forested habitats and Bat fatality rates in the US range from 0.10 (Tierney 2007) to 39.70 bats/MW/year (Fiedler et al. 2007), however, three is little research to correlate bat activity (e.g., bat passes) to mortality during operation. Construction or operational impacts to the NLEB are not anticipated, as summer acoustic survey (2017) indicated assumed absence from the Project Area. Generally, NLEB have low potential to occur in the Project Area based on the general lack of suitable habitat in the Project area and the absence of known hibernacula or maternity roosts.

Due to the limited areas of native prairie and grass land habitats within the Project Area, there is low potential for the rusty patched bumble bee, prairie bush-clover, or Poweshiek skipperling to occur within the Project Area. Water resources including perennial streams are present within the Project Area which may provide habit for the Topeka shiner, as such there is moderate potential for this species to occur.

8.19.3 Mitigative Measures

The Applicant will implement the following measures to the extent practicable to help avoid and minimize potential impacts to wildlife in the Project Area during the selection of turbine locations and subsequent Project development and operation:

- Avoid placement of turbines in upland native prairie;
- Avoid and minimize disturbance of wetlands or drainage systems during construction. Wetland delineations will be completed prior to construction to identify the wetland boundaries within the vicinity of Project infrastructure;
- Protect existing trees and shrubs by avoiding tree removal for turbines, access roads, and collection lines;
- Setback the turbines from applicable conservation lands owned by the government or non-profits by at least the minimum three by five RD;
- Place turbines an adequate distance from wetlands and waterbodies;
- Minimize turbine lighting in accordance with FAA requirements;
- Continue to coordinate with the USFWS and MNDNR as the Project layout is developed;
- Prepare and implement a BBCS during construction and operation of the Project. A draft BBCS is attached to this Application as Appendix I;
- All turbines will be feathered up to cut-in speed from April 1 to October 31, from one-half hour before sunset to one-half hour after sunrise;
- All turbines will be capable of having operational cut-in speeds adjusted.; and
- The Applicant will implement the BBCS for the Project which will include post-construction fatality monitoring.

8.20 RARE AND UNIQUE NATURAL RESOURCES

The rare and unique resources within the Project Area are described below, followed by the potential impacts of the proposed Project and mitigative measures that will be undertaken.

8.20.1 Resources

The MNDNR maintains the NHIS database through their Natural Heritage Program, which serves as the official source of data on Minnesota's rare, endangered, or otherwise significant plant and animal species, plant communities, and other rare natural features (MNDNR, 2019d). An initial NHIS consultation was performed by Three Waters in January 2018 using a preliminary Project Boundary; a response was received on April 6, 2018 indicating that three site of moderate biodiversity significance, and several sites of biodiversity significance (of below average quality) are present within the Project Area, as well as the northern long-eared bat (*Myotis septentrionalis*), tricolored bat (*Perimyotis subflavus*), big brown bat (*Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), trumpeter swan (*Cygnus buccinator*), and Henslow's sparrow (*Ammodramus henslowii*). Three Waters has since revised the Project Area and re-ran an initial NHIS query digitally on August 22, 2019 which indicated that three sites of biodiversity significance (moderate quality) and four sites of biodiversity significance (below average quality), as well as three bird species (trumpeter swan, Henslow's sparrow, and Forster's tern [*Sterna forsteri*]), as described in Table 30 and Figure 21. Three Waters is in the process of performing a concurrence consultation with the MNDNR to confirm the initial NHIS query that was run on August 22, 2019; this consultation will be sent to MNDNR in Fall 2019.

As part of its NHIS database, the MNDNR also maps rare and unique plant communities (MNDNR 2019d). Two of the three sites of moderate biodiversity significance are also considered lakes of biodiversity significance and one is also an upland prairie system (Figure 21). These records may represent relatively rare habitats (e.g., prairie) or higher quality or good examples of more common plant communities (e.g., wet meadow). Many of these native communities also provide essential habitat for rare species of fauna, such as those listed in Table 30, below. While most native plant communities have no legal protection in Minnesota, these areas may have the potential to contain undocumented populations of rare species, which may be protected under Minnesota's state endangered species law (Minn. Stat. 84.0895). Furthermore, the NHIS response that Three Waters received in April 2018 suggests that the site of biodiversity significance should be avoided.

Based on review of the USFWS IPaC, the NLEB (federally threatened and state special concern), rusty patch bumble bee (federally endangered), and prairie bush clover (federally threatened) are listed, and two species are identified as having critical habitat within the Project Area; Poweshiek skipperling and Topeka shiner. Federally listed species are described in detail in Section 8.19 Wildlife.

Table 30 State Listed Threatened, Endangered, and Special Concern Species within the Project Area, per NHIS Consultations

Common Name	Scientific Name	State Status
Northern long-eared bat	*Myotis septentrionalis*	Special Concern*
Tri-colored bat	*Perimyotis subflavus*	Special Concern
Big brown bat	*Eptesicus fuscus*	Special Concern

Little brown bat	*Myotis lucifugus*	Special Concern
Trumpeter swan	*Cygnus buccinator*	Special Concern
Henslow's sparrow	*Ammodramus henslowii*	Endangered
Forster's tern	*Sterna forsteri*	Special Concern
* Northern long-eared bat is discussed in Wildlife (Section 8.19)		

Tri-Colored Bat

Tri-colored bats prefer edge habitats of forested areas adjacent to mixed agricultural use sites, and often roost in foliage, high tree cavities, and crevices within trees or grain silos. This species cannot withstand freezing temperatures and are the first bat species to enter winter hibernation in caves or abandoned mines. Tri-colored bats have a high loyalty to hibernation sites; caves or mines must be warm and have stables temperatures. (Bat Conservation International 2019).

Big Brown Bat

Big brown bats prefer edge habitats of forested areas within cities, towns, rural areas, and agricultural areas. This species roosts in summer months in tree cavities, rock ledges, as well as barns, silos, and churches. In winter months, big brown bats hibernate in highly insulated caves with stable temperatures and can be found in human dwellings (attics, siding, etc.). (Mulheisen and Berry 2000).

Little Brown Bat

Little brown bats roost in trees, wood piles, buildings, and rocks within summer months, where forested lands abut water resources. Winter hibernacula includes caves or abandoned mines with above-freezing temperatures and high humidity. (Havens 2006).

Trumpeter Swan

Trumpeter swans prefer herbaceous wetlands, shallow waters, and riparian wetlands within freshwater areas on lakes and sheltered bays or estuaries (NatureServe Explorer, 2019a). They begin nesting in late April to early May where nests contain a large mass of plant material and utilize the same nesting sites for years after establishment. Nests are typically built surrounded by water on previously established structures such as beaver dams, vegetation mats, islands, or manmade areas. (Cornell Lab of Ornithology, 2017a). Trumpeter swans typically arrive in nesting areas in the North in early May and migrate South in late September to early October (NatureServe Explorer, 2019a).

Forster's Tern

Forster's Terns are typically found in freshwater, brackish, and saltwater marshes throughout breeding season, with nesting occurring in marsh edges and small islands. Other nesting sites range from floating vegetation to beaches nearby marshes. Colonies prefer to be within wetlands with open water for foraging depending on water levels and disturbances. After fledgling occurs, the species typically moves more toward ocean coasts, shorelines, rivers, and freshwater marshes. Roosting occurs on beaches and mudflats when foraging is not occurring. Nests are established on the ground within marsh vegetation,

weeds, dead vegetation, or animal lodges (Cornell Lab of Ornithology, 2017b). Terns feed on small fish that they obtain from diving into water. They can also hunt from perches on vegetation pilings, bridges, or other manmade structures. They only dive for prey when they notice them from their perching spots. Fish that they forage include shiner perch, yellow perch, sunfish, stickleback, and minnows. Insects may also be a part of their diet during nesting season (Cornell Lab of Ornithology, 2017b).

Henslow's Sparrow

Henslow's sparrows prefer open field and meadows containing grass and shrubby vegetation, especially in damp and lower areas near marshes, as well as areas with tall, dense grass and herbaceous vegetation. Within the Midwest, breeding habitat includes grassy fields, pastures, and meadows containing hayfields or vegetation with dense covering (NatureExplorer, 2019b). During wintering and migratory periods, habitat consists of grassy areas nearby pine woods or second-growth woods (NatureExplorer, 2019b). Nests are typically placed within a layer of grass litter above ground and consist of loosely woven dry grasses (Cornell Lab of Ornithology 2017c).

8.20.2 Impacts

Based on preliminary site assessments via desktop resources and field reconnaissance on November 15, 2017, the Project Area is mostly cultivated cropland, hayfields, or heavily grazed pasture, with interspersed water features and associated riparian areas. Desktop analyses in Fall 2017 coupled with Site Characterization Study field reconnaissance surveys on November 15, 2017, Acoustic Bat Studies (2017 and 2018), and Avian Use Studies (performed in 2017 [Year 1] and 2018 [Year 2]) indicate that state listed species and sensitive habitats will not be adversely affected by the Project, and that the Project can be considered a low risk to bird and bats based on USFWS and MNDNR guidance (as described in Section 8.19).

Acoustic Bat Studies, performed for the project in 2017 and 2018, indicated NLEB have low potential to occur in the Project Area based on the general lack of suitable habitat, the absence of known hibernacula or maternity roosts near the Project Area, and summer 2017 NLEB acoustic studies determined that there was likely summer absence of NLEB (Appendix I). Furthermore, bat fatalities due to wind turbines are expected to be low for the project, including the tri-colored bat, little brown bat, and big brown bat based on two years of acoustic surveys. However, there is a higher chance of collision for low frequency species (e.g., big brown bats) to be more susceptible to collision because they tend to fly at higher altitudes and were more prevalent within the Project Area during Acoustic Bat Surveys (Arnett et al. 2008; Appendix I). Additionally, research indicates that most fatalities are expected to be migratory tree-roosting bats such as little brown bats (Arnett et al. 2008).

Trumpeter swans are unlikely to occur within the Project Area as suitable habitat is not present within the Project Area; trumpeter swans were only incidentally observed during Year 2 Avian Use Studies. Forster's tern was not observed during the Year 1 or Year 2 Avian Use Studies, and no suitable habitat was noted during the desktop and field Site Characterization Studies; therefore, this species will not be impacted by the Project. The potential for Henslow's sparrow to occur within the Project Area is low as there is limited grassland and meadow habitat present, and only one individual was recorded during Year 1 Avian Use Surveys.

8.20.3 Mitigation

The Applicant will continue to coordinate with the USFWS and MNDNR on sites of biodiversity significance, lakes of biodiversity significance, and upland prairie systems. The Applicant will avoid the rare and unique resources identified to the extent practicable including the following avoidance measures:

- Avoid placement of turbines in upland native prairie;
- Avoid and minimize disturbance of wetlands or drainage systems during construction. Wetland delineations will be completed prior to construction to identify the wetland boundaries within the vicinity of Project infrastructure;
- Setback the turbines from applicable conservation lands owned by the government or non-profits by at least the minimum three by five RD;
- Continue to coordinate with the USFWS and MNDNR as the Project layout is developed.; and
- The Applicant will implement the BBCS for the Project which will include post-construction fatality monitoring.

9.0 Wind Rights

Three Waters has been working with landowners in Jackson County to obtain wind energy leases, wind easements/good neighbor agreements or setback waivers required to permit, construct and operate the Project since Fall 2016. These rights include but are not limited to the rights to construct the wind turbines (including turbine access roads, underground collection lines, and crane paths) as well as Project facilities (e.g., O&M facility, Project substation and switchyard). Three Waters has also executed and continues to pursue good neighbor agreements and setback waivers from Project landowners (see Figure 3).

Three Waters requests a variance to site up to 10% of the total number of Project turbine sites no greater than 200 feet within the 3 x 5 RD setback of a non-participating parcel, provided the owner of the non-participating parcel executes an affidavit consenting to such turbine setback encroachment. For example, if the 3 x 5 RD setback extended fifty feet into a non-participating parcel and the owner of the non-participating parcel signed an affidavit consenting to the fifty-foot encroachment, this turbine location would be allowed.

The Commission requires a 3x5 RD wind access setback from non-participating land. In its Order Establishing General Wind Permit Standards (the "Wind Standards"; January 11, 2008 at 4 Docket No. M-07-1102), the Commission noted that the 3x5 RD wind access buffer setback is an external setback from lands and wind rights outside of an applicant's control, to protect the wind and property rights of persons within the Project boundary who are not participating in the Project. In the past decade the wind turbine manufacturers have continued to increase the RD and efficiency of the wind turbines. As a result, the 3x5 RD setback from non-participating landowner parcels has increased along with the increase in turbine manufacturers RD.

The use of a 3x5 RD setback has resulted in a significant increase in turbine setbacks from conservation lands over time as wind turbines, and RDs, have grown in size. For example, in Exhibit A to the Wind Standards, the 3x5 RD wind access buffer at the time the Wind Standards were established was estimated to be between 760 – 985 feet for 3 RDs and 1,280 – 1,640 feet for 5 RDs. In comparison, the use of the GE 2.x MW turbine when generating the Project layout has resulted in a minimum 3x5 RD setback of 1,250 feet for 3 RDs and 2,083 feet for 5 RDs. The result is that the wind access buffer applied on the Project is an estimated 27% increase of the 3x5 RD wind access buffer originally contemplated in the Wind Standards (using the higher 3x5 RD Wind Standard limit). The increase in effective setback distances has resulted in an over-protection of adjacent landowner rights. Therefore, the slight encroachment of setbacks for non-participating landowners will not have an impact on the air flow across a non-participating property line. Moreover, a setback waiver affidavit signed by a landowner indicates that landowner is consenting to the setback waiver and as such is essentially a 'participant' in the Project because it is expressly consenting to the siting of a turbine closer than the Commission required 3x5 RD.

Three Waters requests approval to use voluntary setback waivers with certain landowners where the 3x5 RD setbacks to such landowners cannot be met at specific turbine sites. The setback waivers would only apply to up to 200 feet of land being waived from the setback requirement, and further limited to only up to 10% of total number of Project turbine sites.

Project facilities (turbines, turbine access roads, underground collection lines, etc.) will be constructed on leased land while the Project substation and O&M facility sites will be located on property that the Applicant will purchase. The Project switchyard (transmission POI) will be owned by ITC. Prior to construction, the Applicant will have all necessary land agreements for construction and operation of the proposed facilities and will allow for flexibility in siting turbines that may be needed to avoid natural resources, homes, and other sensitive features (Figure 4). Figures 2 and 3 illustrate the proposed Project facilities, underlying parcels required to site the Project following applicable setbacks, leased lands, and other requirements. As stated above, as of the filing of this SPA, Three Waters has approximately 21,813 acres of the 48,087 acres (~45%) within the Project Area under lease. Three Waters is continuing to work with landowners to obtain additional participation agreements as necessary within the Project Area, including setback waivers, leases and good neighbor agreements.

10.0 Project Site Characterization

The following describes site meteorological and wind characteristics of the Project and associated information. The following analyses were conducted using GE 2.82 MW/127 (89 m) turbine machine as Three Waters has selected this to be the primary wind turbine model for the Project and results would be representative of similar turbine models.

10.1 GENERAL MINNESOTA WIND CHARACTERISTICS

In addition to Applicant's wind resource studies since 2017 and data acquired since 2005 (see below), other studies have been done including the United States Department of Energy and the DOC studies in Minnesota (initiated in 1982), and the 2014 National Renewable Energy Laboratory Wind Integration National Dataset (which provides modeled wind resource and power production data for over 100,000 grid points across the continental United States (Draxl et al., 2015)). Predicted wind speeds are included in model data at hub heights of 89 and 114 m above ground level. Near the Project Area, the mean annual wind speed at 89 m (263 ft) above ground level is predicted to be (8.25 m/s).

10.2 SPECIFIC WIND CHARACTERISTICS IN PROJECT AREA

Wind characterization studies and analysis have been completed in or near the Project Area since 2005. The wind data helped to determine site selection of the Project, along with other factors, such as community and landowner interest, environmental concerns, and landowners, and access to cost effective transmission. A number other existing and operating wind energy generation projects are located in the vicinity of the Project, and development of this Project advances maximum use of Minnesota's wind resources in a cost-effective manner.

Wind data from seven (7) temporary meteorological monitoring stations (Site ID's 2301, 2302, 2303, 2321, 2322, 2323, and 2324) were collected within the Project Area. Three masts were historical met masts between 2005-2011 that provided long-term measurement datasets, and 4 new masts were installed in 2017 and 2018 to obtain additional and more recent data. These temporary towers will be removed during construction, and up to (2) permanent meteorological towers will be installed (Section 7.5; Figure 2). The earliest data collected within the Project Area is from January 2005.

Table 31 below summarize locational information for the temporary meteorological stations used in the wind resource characterization. The Applicant used the most modern and advanced methodology for characterizing the wind resource regime at the site. This included running a suite of Numerical Weather Prediction (NWP) simulations to reconstruct and back cast several decades of meteorological conditions over the wind project area. To capture the spatial variability of the wind resource, a mesoscale model (WRF-the Weather Research Forecast model) was used at a horizontal resolution of 500 meters initially and then downscaled to a horizonal resolution to 90m using a Time Varying Microscale (TVM) model to provide the highest resolution wind resource grid for the site. The long-term variability was then determined by running mesoscale model simulations at a 4.5km horizontal resolution. The resulting datasets were statistically combined to generate a single multi-decade, 90m resolution meteorological dataset at each temporary met tower and wind turbine location. The observed data from all met towers were used to correct and adjust the

raw modeled output using a Model Output Statistics (MOS) correction technique to remove bias and adjust the variance of the model output in order to provide the most accurate and validated wind resource dataset for the Project Area and at all wind turbine locations.

Table 28 Temporary Meteorological Stations

Temporary Met Tower ID	Latitude (deg)	Longitude (deg)	Elevation (m)	Sensor Elevation (m)	Operation Dates
2301	43.501033	-95.251717	50	10, 30, 50	1/2005-7/2009
2302	43.544817	-95.378667	50	10, 30, 50	1/2006-2/2011
2303	43.547950	-95.293167	50	10, 30, 50	1/2006-1/2011
2321	43.58871	-95.283752	100	30.25, 60,80, 98	9/2017- 4/2019
2322	43.620640	-95.313343	60	22, 46, 59	10/2018-Present
2323	43.54469	-95.35701	60	22, 46, 59	9/2017-Present
2324	43.58711	-95.23404	60	22, 46, 59	9/2017-Present

Three Waters retained the services of Vaisala, Inc. to perform a Wind Energy Resource Assessment report for the Project Area. To obtain an accurate representation of the wind resources, Vaisala, Inc. performed a comprehensive analysis using the following data:

- Onsite data collected at the Project's historical and active temporary meteorological towers;
- Three long-term global reanalysis datasets used as inputs in Vaisala's NWP model for the long-term characterization of the site. These include: data from the NCEP/NCAR Reanalysis Project (NNRP), the ERA-I European ReAnalysis Intermin data set which is produced by the European Center for Medium-Range Weather Forecasts (ECMWF) program, and National Aeronautics and Space Administration's Modern Era Retrospective-Analysis for Research and Application;
- Project Area topographic and land cover data;
- Potential turbine locations within the Project Area;
- Power and Ct thrust curves from GE included the GE 2.82/127 turbine model with a hub height of 89 meters (292 feet) and 114m (374 feet); and,
- State and county standards and setbacks.

Data from onsite meteorological ("met") towers was collected in two primary timeframes. Three 50-meter met towers were originally installed in 2005 and 2006 to collect onsite meteorological data for the area. Measurements at these three met towers ended in 2009 and 2011, and the met towers were removed. More recently, three 60-meter met towers and one (1) 100m tall tower were installed in the Project Area to resume the onsite measurement program in November 2017 and 2018. The 100-meter met tower was removed in May 2019 after being damaged in a heavy ice storm in April 2019. The three 60-meter met towers are still installed and collecting data at the Project site.

Based on the data collected in both met campaign timeframes (Jan 2005 to Feb 2011 and Sep 2017 to present), wind speeds at the Project Area are highest from October through April and lowest from June through August. For a hub height of 89 meters, composite mean annual wind speeds average between 7.9 and 8.7 meters per second (m/s) from October through April, and average between 6.3 and 7.8 m/s from June through August. For a hub

height of 114 meters, composite mean wind speeds average between 8.4 and 9.2 m/s from October through April, and average between 6.7 and 8.3 m/s from June through August.

Hub-height wind speeds are highest during the overnight hours (8:00 P.M. to 6:00 A.M.) and lowest during the midday hours (8:00 A.M. to 4:00 P.M.), with decreasing wind speeds from Sunrise to midday and increasing wind speeds from midday to the evening. These are typical diurnal wind speed patterns observed in the upper northern Great Plains region, due to the diurnal differences in heating and cooling of the surface and lower atmosphere throughout the day.

The Project is classified as an International Electrotechnical Commission (IEC) Classification Class II wind site. IEC Classifications are a set of design requirements that ensure wind turbines are engineered against damage from hazards within their planned lifetime. An IEC Class II wind site has a 10-minute extreme wind speed potential of no higher than 42.5 m/s. The Three Waters 10-minute extreme wind speed potential is 39.0 m/s at the hub height level of 89.0 meters.

Vaisala, Inc. initially screened and quality controlled all onsite met data and used this data to correct and adjust the raw modeled NWP output using a MOS correction technique to remove bias and adjust the variance of their proprietary model output. This method of using time series numerical weather simulation models have been shown to reduce the uncertainty associated with long-term correction and spatial interpolation of wind speeds at the project site beyond the measurement locations as compared to traditional techniques. This technique and process lends confidence to the assessment in that the site-specific data can accurately be placed in a long-term climatological context.

Once a validated long-term wind resource grid of the area at hub height was created, Vaisala calculated the energy produced for the specific turbines using the provided power and thrust curves for each turbine model and hub height. The wake effects from both internal and external wind turbines were calculated using Vaisala's proprietary Time Vary Wake (TVW) model that considers the impact of wakes on the net power production from each turbine on an hourly basis. Losses for turbine availability, electrical and environmental losses, and degradation of the power curve due to turbulence intensity, icing and any expected curtailment are factored in as appropriate. The analysis concludes with a detailed accounting of uncertainty and probability of exceedance values using Vaisala's Energy Risk Framework (ERF) process. In this proprietary process, each source of uncertainty is treated as a separate model that interacts within the framework through overlying covariance models. The resulting total project uncertainty values are utilized to compute the probability of exceedance values for one-year periods and a 20-year period for the Wind Farm.

10.2.1 Interannual Variation

The interannual variation is the expected variation in wind speeds from one year to the next. The interannual variation for the Project site is expected to be 2.3%.

10.2.2 Seasonal Variation

The seasonal variation is how the wind speed changes between seasons. Wind speeds are expected to be higher in the winter and lower in the summer. Table 32 below shows the monthly average wind speeds for the Project Area at the predicted hub height of 89 meters (292 feet):

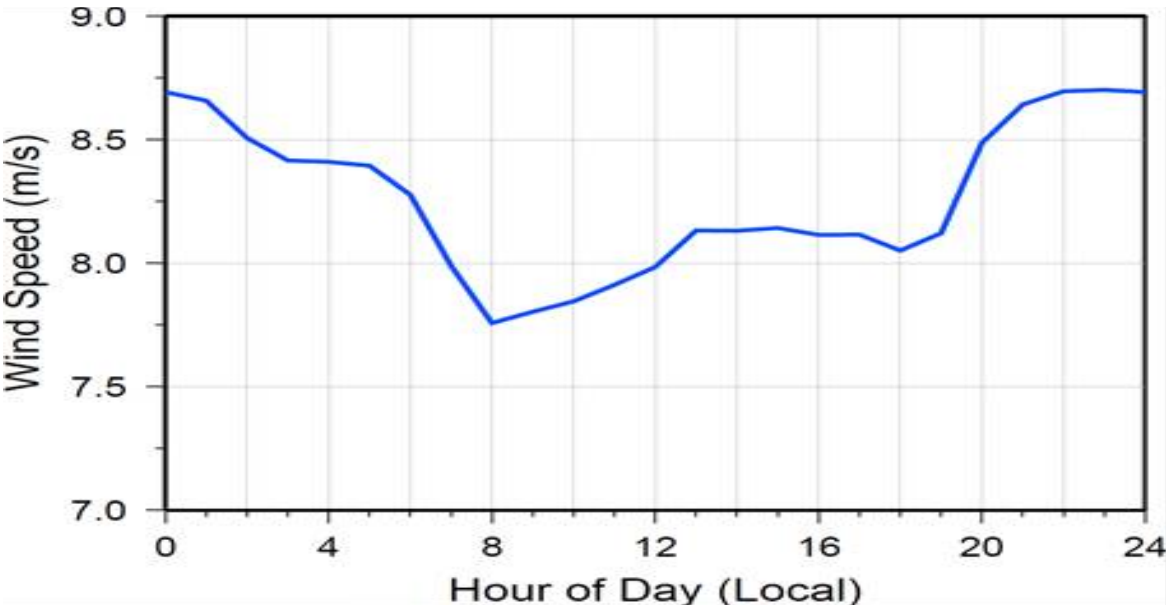
Table 29 Monthly Average Wind Speeds for the Project Area

Month	Wind Speed (m/s)
January	8.86
February	8.74
March	9.01
April	9.16
May	8.58
June	7.58
July	6.72
August	6.80
September	7.74
October	8.32
November	8.79
December	8.70
Annual Average	8.25

10.2.3 Diurnal Conditions

The diurnal variation is how the wind speed changes hourly (day vs. night). Normally wind speeds are lower in the daylight hours and higher at nighttime. Schematic 2 in the graph below shows the expected variation of wind speeds (per local standard hour) for the Project Area at a predicted hub height 89 meters (292 feet).

Schematic 2: Expected Variation of Wind Speeds in the Project Area



10.2.4 Atmospheric Stability

A stable and neutral atmosphere lack vertical motion in the lower atmosphere while an unstable atmosphere has vertical movement. The observed environmental lapse rate calculated for the Project Area is 6.23 degrees (°) per km. An environmental lapse rate of 6.23 degrees (°) per km is considered 'Conditionally Unstable', where the observed lapse rate is > the moist adiabatic lapse rate but lower than the dry adiabatic lapse rate.

10.2.5 Hub Height Turbulence

Turbulence intensity is measured as standard deviation of wind speed over the mean wind speed. The average turbulence for the Project site at a hub height of 89.0 meters is 9.3% at 15 meters per second.

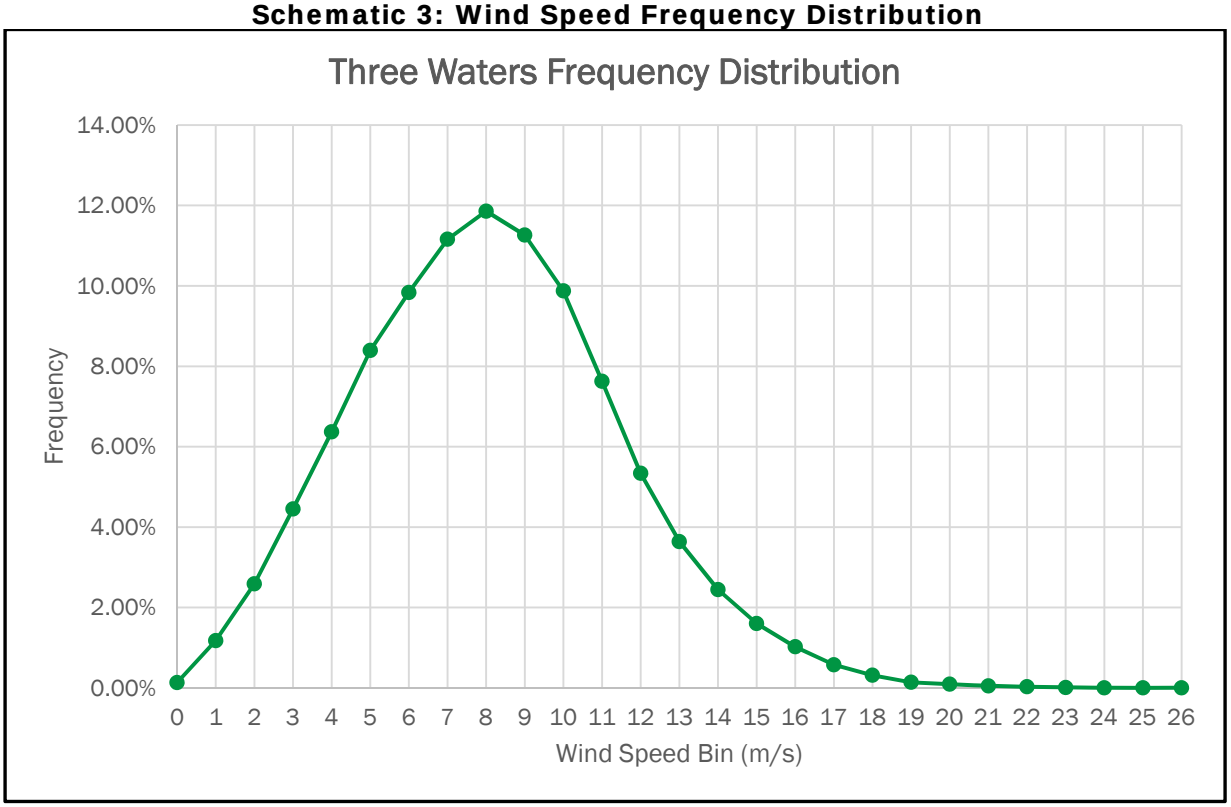
10.2.6 Extreme Wind Conditions

The maximum hourly wind speed measured at the Project Area was 39.0 m/s at the expected hub height of 89 meters (292 feet). The site's predicted 3 second extreme wind gust for a 1 in 50-year event is 49.0 m/s and a 10 min maximum wind speed of 39.0 m/s at the expected hub height of 89 meters (292 feet).

10.2.7 Wind Speed Frequency Distribution

Schematic 3 in the graph below shows the wind speed frequency distribution calculated from 10-minute data collected on-site scaled to the annual average at the expected hub height of 89 meters (292 feet).

Schematic 3: Wind Speed Frequency Distribution



10.2.8 Wind Variation with Height

Wind shear is the change in wind speed with height. Shear is calculated using the power law as follows:

$$\alpha = \ln(V/V_0)/\ln(H/H_0)$$

Where:

V is the wind speed,
H is the height,
α is the power shear coefficient.

The shear coefficient for the Project Area varies between 0.187 and 0.238.

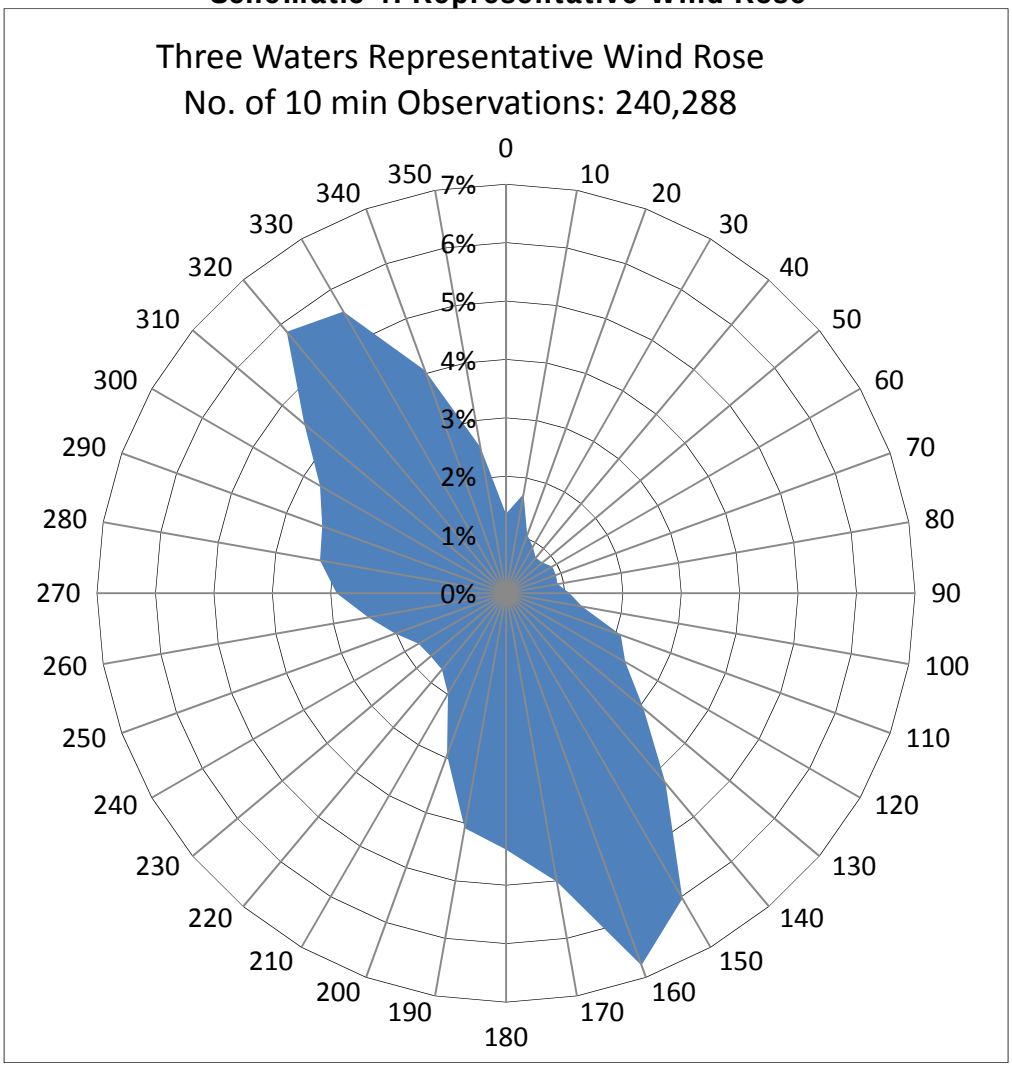
10.2.9 Spatial Wind Variation

Spatial wind variation over the Project Area was modeled using Vaisala's proprietary wind flow modeling tools. With three historical met towers and four additional and more recent met mast locations collecting data, the spatial coverage of the measuring devices around the Project Area is considered excellent by industry best practices and results in a reduced uncertainty due to spatial variations. The installed meteorological stations are representative of 100% of the anticipated wind turbine locations. Vaisala calculated an overall spatial modeling uncertainty of only 1.9% for the Three Waters site.

10.2.10 Wind Rose

A wind rose represents the wind speed frequency by which direction the wind is coming from. The long-term representative wind rose from meteorological tower "(Site 2303)" is shown in Schematic 4 below. The prevailing winds are (from the NW and SSE) and the non-prevailing winds are (NE and SW).

Schematic 4: Representative Wind Rose



10.3 OTHER METEOROLOGICAL CONDITIONS (TEMPERATURE, RAINFALL, SNOWFALL, AND EXTREME WEATHER CONDITIONS)

Three Waters reviewed the National Oceanic and Atmospheric Association's (NOAA) National Climatic Data Center's (now the National Centers for Environmental Education) average temperatures and precipitation from the Lakefield Station (USC00214453) located approximately 6 miles northeast of the Project Area. Average minimum temperatures in the Project Area range from 3.2 degrees Fahrenheit in January to 60.4 degrees in July; average maximum temperatures range from 22.8 degrees in January to 81.6 degrees in July. Average precipitation in the Project Area ranges from 0.5 inches in January and February to 4.3 inches in June (NOAA, 2019).

Extreme weather events, such as thunderstorms, windstorms, tornadoes, hail, heavy snow and ice, extreme cold, heat waves, flash floods/floods, heavy rain, lightning, and drought occur in the Project Area.

The State of Minnesota experiences an average of 45 tornadoes per year (NOAA, 2019_b). Climate records in Jackson County include 93 thunderstorms, 24 high wind events, and 21 tornadoes from 1950 to 2019 (NOAA, 2019_c). Thunderstorms in southern Minnesota are usually of short duration and localized, leading to damage in small geographic areas.

Turbines under consideration for this Project are capable of withstanding most of the extreme weather conditions that occur in the area. All turbines being considered have lightning protection systems, turbine blades that "feather" into the prevailing wind direction during high wind events to minimize the risk of damage, and turbines that shut down above the cut-out wind speed (generally 30 m/s).

During winter, there is potential for icing events to result in ice accumulation on turbine blades with variable frequency. Although the turbines are not equipped with specific ice-sensing equipment, the turbines measure multiple operational parameters that allow the onboard controllers to determine if icing is building up on the blades causing the turbine to operate outside the normal envelope of operations. The turbine will stop turning if significant ice accumulation causes an imbalance or excessive vibrations in the rotor, or a mismatch between the expected energy generation for a given wind speed and actual energy generation is observed – the difference being attributable to deformation of the airfoil due to ice formation. These mechanical safeguards and industry standard turbine setback distances used here mitigate the potential hazard associated with ice throw, and minimize the potential that ice thrown from turbine blades could reach public roads and residences. Ice throw is not expected to be a hazard for the Project.

10.4 OTHER WIND TURBINES WITHIN TEN MILES OF PROJECT AREA

As discussed in Section 1, the Project is located in a wind-energy rich resource area of southwestern Minnesota and the Project location was chosen based upon the wind resource, geographic characteristics, easement availability, landowner interest, environmental resources, transmission availability and economic potential (Figure 1). The Project is located There are 11 existing wind farms within 10 miles of the Project, and an additional 14 wind farms between 10-20 miles of the Project Area (Figure 21). As shown in Figure 21, the Project can be considered an in-fill wind energy generation project in southwestern Minnesota.

Existing wind projects surrounding the Project Area (Figure 21), include:

- Northeast – Lakefield (MN);
- Southeast – Spirit Lake and Iowa Lakes Superior Wind (IA);
- South – Flying Cloud (IA);
- Southwest – Endeavor, Endeavor II, Sibley Wind Farm, Sibley Hills, and Zachary Ridge (all IA);
- West – Cisco, South Fork, Ewington, and Missouri River Energy Services (all MN); and
- Northwest – Farmer's and Nobles Cooperative Electric.

The Farmer's and Nobles Cooperative Electric wind turbines are the closest at 1.5 miles west of the Project Area (see Figure 21). Based on data from the United States Wind Turbine Database (USWTDB) (https://eerscmap.usgs.gov/uswtdb/), there are 272 known commercial scale wind turbines in operation within ten miles of the Project Area, with most of those located northeast and southwest/south of the Project Area. The USWTDB lists 650 existing turbines within twenty miles of the Project Area (including the 272 turbines within

the ten-mile boundary). Three Waters conducted a search across Jackson and surrounding Minnesota counties for other new wind energy projects that are not built but have submitted a LWECS Site Permit Application to the Commission (MNDOC, Energy Facility Permitting 2019) and found none were filed in 2019.

11.0 Project Construction

Once the CN and SPA are approved and other local, county, State, and federal approvals are obtained, Three Waters will complete engineering-scale design of the turbine foundations, access roads, construction areas, and the electrical components. This design would be used for construction of the Project.

In coordination with selected engineers, contractors and construction team, Three Waters will complete a number of activities prior to the proposed COD, including equipment ordering, design and construction of the facility. Generally, pre-construction, construction, and post-construction activities include:

- Order turbine towers, nacelles, blades, foundations, and electric transformers;
- Complete field surveys to microsite turbines, access roads, and other Project facilities;
- Install geotechnical soil borings, testing, and analysis for proper foundation design and materials;
- Construct access roads for use during construction and O&M;
- Install and connect underground collection lines;
- Design and construct Project substation and switchyard facilities;
- Install turbine tower foundations;
- Install underground and aboveground junction boxes;
- Place towers and wind turbines;
- Test Project facilities; and
- Commence commercial operation.

Three Waters personnel and its contractors would confer and coordinate closely with MnDOT, Jackson County, and affected townships to manage construction traffic and safely deliver the various turbine components. As applicable, Utility Accommodation Permit on Trunk Highway ROW, Access/Driveway, and Utility Permits would be obtained from MnDOT and/or Jackson County prior to construction, and contractors would be required to obtain any necessary overheight or overweight haul permits. Prior to construction, Three Waters shall work with the County and townships on the applicable agreement, such as a Road Haul Use Agreement, to permit right-of-way occupancy, utility crossings, road approaches, and overweight loads.

The following paragraphs describe construction management and construction of the proposed Wind Farm facilities (turbines, access roads, O&M facility, Project substation/switchyard, meteorological towers, and electrical system).

11.1 CONSTRUCTION MANAGEMENT

Three Waters and its engineering and design contractors are performing the engineering and design for the Project. Three Waters will select a balance of plant (BOP) contractor for the construction of the Project. Local contractors will be used, where possible, to assist in constructing the Project. In coordination with Three Waters, the BOP contractor and local contractors will conduct the following activities:

- Obtain building, electrical, grading, road, and utility permits;
- Perform detailed civil, structural, and electrical engineering;

- Schedule and coordinate construction activities; and
- Forecast labor requirements and budgeting.

The BOP contractor will coordinate and interface with selected subcontractors, as well as oversee the installation of all Project facilities (e.g., foundations, turbine towers, turbine nacelle/blades, access roads, communication and power collection lines, substation and switchyard, etc.) and material receiving, inventory, staging, and distribution/delivery at the Project site. The BOP contractor will manage local subcontractors (if necessary) to complete construction.

An on-site construction project manager will provide direct supervision of on-site construction with the assistance of local contractors, if necessary. The on-site construction project manager will also coordinate other aspects of the Project, including ongoing communication with local officials, citizens groups, and landowners.

The Three Waters construction team will be on site to oversee safety, materials purchasing, construction, quality control, testing, and start-up. Ongoing coordination will occur between the proposed Project development and the construction teams throughout construction. Before the Project becomes fully operational, O&M staff will be integrated into the construction phase of the Project. The construction project manager and the O&M manager will work together to transition from construction through commissioning, and then Project operations.

11.2 CONSTRUCTION METHODS

Prior to construction, geotechnical soil borings at final turbine sites will be completed once turbine micro-siting and other field surveys are complete. The borings will provide information to determine soil suitability to support turbine foundations and foundation design.

Construction activities would be staged from a laydown yard. The laydown yard would be restored post-construction and will likely be located in Sioux Valley Township (see Section 7.6 and Figure 3).

During construction, a number of types of light, medium, and heavy-duty construction vehicles, as well as private vehicles (used by construction personnel) will access the Project site. Three Waters estimates that there would be approximately 500 additional trips per day in the area during peak construction periods. Peak volume construction traffic would occur when the majority of the road, foundation, and turbine tower assembly is taking place. As each construction phases ends, construction equipment and vehicles will be removed from the site or reduced in number.

Turbine access roads as described in Sections 7.1 and 8.10 will be constructed along planned turbine strings or arrays. Access roads will be sited in consultation with participating landowners and completed in accordance with local building requirements where they intersect with public roads. They will be a low-profile design and located to facilitate both construction (crane paths) and continued O&M of the Project. For Project access road construction, topsoil would be removed and stockpiled in the temporary construction areas. If necessary, for drainage and access, temporary culverts and field approaches would be installed. Turbine access roads will be built adjacent to the turbine towers, allowing access to turbines and associated Project facilities during and after construction. After completion of construction, access roads will be approximately 16 feet

wide (including shoulders), covered with an aggregate surface, and be able to support maintenance vehicles. Final turbine placements will determine the amount of private roadway that will be constructed for the Project.

For turbine foundation installation, topsoil and subsoil would be removed, separated, and stockpiled at each turbine site. After construction, the subsoil and topsoil would be restored over the temporary construction areas and the turbine pad foundation.
Underground collection lines would be installed by trenching or boring. If delineated wetlands and waterbodies would have to be crossed by underground collector lines, the wetlands would be bored.

Wind turbine tubular towers will be connected by anchor bolts to a concrete foundation. Turbine foundations consist of anchor bolts and reinforced steel bars that are placed within the excavated portion of the turbine footing and filled with concrete. The turbine base is fastened to the anchor bolts that protrude from the concrete pad surface.

Turbine assembly will require an approximately 60 by 165-ft gravel crane pad extending from the access road to the turbine foundation, in addition to approximately 15,000 square ft (0.3 acre) for component laydown and rotor assembly, depending on turbine vendor and BOP contractor requirements.

Construction of the onsite roads, tower foundations, O&M facility, underground collection lines, and Project substation would take approximately 7 to 9 months. The installation of the turbines would take approximately 2 to 3 months. Temporary construction areas would be restored after construction, including removing gravel, decompaction of subsoil (if necessary), and replacing topsoil. Where necessary, temporary and permanent stabilization measures would be implemented, including mulching, seeding with appropriate seed mix, and installing slope breakers. Three Waters would work closely with affected landowners to maintain fences and protect livestock not only during construction activities, but throughout operation of the Project.

11.2.1 Electrical Collection System, Project Substation and POI Construction

The Project substation and switchyard will be directly adjacent with one another (Figures 2 and 3), and the switchyard will connect the Project to the existing ITC 345-kV Raun-Lakefield transmission line at the POI. The following describes site preparation, construction, restoration, operations, and maintenance activities for the collection line, Project substation, interconnection facilities and POI (collectively, the Project electrical system).

Once applicable federal, State and local approvals have been obtained, soil conditions are established, and final design is completed, construction of the Project electrical system would begin. Precise timing of construction of the Project components would consider various requirements that may be in place due to permit conditions, system loading issues, weather, and available workforce and materials.

For each Project component, 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 Project substation, switchyard and transmission pole foundation excavations and collection line installation begin, including notification through the One-Call system to verify third-party utilities and adjacent pipelines are properly marked. Equipment and vehicles needed for construction of the Project electrical system would be transported

to the Project Area and staged at the temporary laydown yard. During construction activities, dust control measures would be conducted in accordance with Jackson County's "Road Use and Repair Agreement". In addition, safety would be a top priority during all aspects of construction activities, especially on public roads.

Three Waters has conducted pre-construction natural community surveys, which included observations of noxious and invasive weeds (see Section 8.18). BMPs will be implemented as necessary to limit the introduction and spread of noxious and invasive weeds during construction and ongoing operations.

Potable water and sanitary facilities would be established to support the construction crews at the construction site. Potable water would be provided from offsite facilities, and sanitary facilities would be provided in the form of portable latrines by an outside vendor.

The construction workspaces associated with the Project electrical system would be disturbed during the normal course of work (as is typical of most construction projects), which can take several weeks in any one location. Three Waters would take the steps necessary to lessen the impact of the collection lines, Project substation and interconnection facilities on the surrounding environment by restoring areas disturbed by construction in accordance with BMPs and the Project's permit conditions. After construction is completed, disturbed areas would be restored to their original condition. As mentioned previously, Three Waters would limit the spread of noxious and invasive weeds through appropriate BMPs to be implemented during construction and ongoing operations.

Three Waters or its contractor will install the Project electrical system in accordance with the requirements in the wind energy leases, wind easements/good neighbor agreements or setback waivers, including reclamation and remediation once construction is complete. If damage were to occur to crops, fences, or the property, Three Waters would repair or fairly compensate the landowner for the damages sustained in accordance with the terms and conditions agreed upon in the Wind Lease or other agreement entered into by Three Waters and the landowner. In some cases, Three Waters may engage an outside contractor to restore the damaged property.

Portions of permanent vegetation disturbed or removed during construction of the Project electrical system would be re-established to pre-disturbance conditions. Resilient species of common grasses and shrubs typically re-establish naturally with few problems after disturbance. Areas with significant soil compaction and disturbance from construction activities would require assistance in re-establishing vegetation and controlling soil erosion. Commonly used BMPs to control soil erosion and assist in re-establishing vegetation 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.

Collection Lines

As described in Section 7.2, the approximate length of collection lines for the proposed Project turbine layout is approximately 100 miles. All collection lines will be installed underground via trenching, plowing, or directional bores, as needed. The collection lines will

be installed as a network between turbine locations and the Project substation. In general, the electrical collection lines will be buried in trenches or plowed underground. Where electrical collection lines meet public road right-of-way, sensitive environmental resources, or conflicts with underground utility or other infrastructure, they will be installed with directional bores, where necessary.

Project Substation

The Project substation is described in Section 7.4. Construction of the Project substation will consist of constructing an access road to the site, clearing the site footprint, preparing the subsurface with compacted fill material, placement of a transformer and related electrical equipment, installation of connections between collection lines, transformer and interconnection facilities, and installing a gated security fence around this equipment. As described above, 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. Areas temporarily disturbed during construction of the Project substation will be revegetated with appropriate seeds or other vegetation.

11.2.2 Wind Turbine Assembly

Construction of towers will be in accordance with applicable specifications and vendor requirements. Towers will consist of three sections bolted together; after the tower is assembled, the nacelle, rotor, and three blades will be installed using a construction crane.

11.2.3 Plant Energization and Commission

In coordination with applicable equipment vendor requirements and transmission and regulatory authorities, Three Waters will commission the Project after completion of the construction phase. Detailed inspection and testing procedures of Project facilities will be performed prior to final turbine commissioning. Inspection and testing will occur for each component of the wind turbines, as well as the communication system, meteorological system, obstruction lighting, switching equipment, high voltage collection and feeder system, and the SCADA system.

11.2.4 Construction Clean-Up

During and at the completion of construction, Three Waters and its contractors will clean-up disturbed temporary construction sites and debris associated with the Project. Post-construction activities will also involve regrading, filling and dressing roads, as needed. Temporary construction areas, such additionally widened access road areas and turn radii, collection line trenching corridors, and the laydown yard/staging area will also be restored. The temporary disturbance areas will be graded to natural contours and soil will be loosened and seeded, if necessary.

11.3 OPERATION AND MAINTENANCE

The Project would be operated and maintained by a team of approximately eight to ten personnel, including facility managers, a site manager, and a crew of certified technicians. This team would be at the Project site or O&M facility during normal business hours and would perform routine checks, respond to issues, and optimize the performance of the Wind Farm. The team would also have specified personnel on-call 24 hours per day, 7 days per week, should an issue arise outside of normal business hours. The onsite team would work

with offsite operations staff (see below). The onsite team would also conduct frequent visual assessments of the wind turbines to check for issues impacting performance of the Wind Farm. A plan for addressing emergency incidents will be in place to address these issues.

11.3.1 Operation Management, Control, and Service

The onsite team would work in coordination with offsite operations staff at a Remote Operation Control Center in accordance with Federal Energy Regulatory Commission guidelines. This offsite team would assist in identifying turbines operating at non-peak efficiency and helping onsite staff quickly locate turbines with potential operating issues so they could be quickly resolved to ensure safety and optimal performance of the Wind Farm.

Three Waters will operate the wind energy facility for the life of the proposed Project. Approximately 8-10 people will be employed to operate and maintain the facility. O&M staff will have full responsibility for the facility to ensure O&M are conducted consistent with the applicable permits, prudent industry practice, and equipment manufacturer recommendations for the turbines.

The Project will install a Supervisory Control and Data Acquisition (SCADA) control system to operate the Project. The SCADA system offers access to wind turbine generation or production data, availability, meteorological, and communications data, as well as alarms and communication error information. Performance data and parameters for each machine (generator speed, wind speed, power output, etc.) can also be viewed, and machine status can be changed. A "snapshot" facility that collects frames of operating data to aid in diagnostics and troubleshooting of problems.

The primary functions of the SCADA system are to:

- Monitor wind farm status;
- Allow for autonomous turbine operation;
- Alert operations personnel to wind farm conditions requiring resolution;
- Provide a user/operator interface for controlling and monitoring wind turbines;
- Collect meteorological performance data from turbines;
- Monitor field communications;
- Provide diagnostic capabilities of wind turbine performance for operators and maintenance personnel;
- Collect wind turbine and wind farm material and labor resource information;
- Provide information archive capabilities;
- Provide inventory control capabilities; and
- Provide information reporting on a regular basis.

11.3.2 Maintenance Schedule

During operations, the O&M staff would perform scheduled, preventive maintenance on the turbines. This is typically done by personnel from the turbine manufacturer for the first 1 to 3 years. For the proposed GE turbine model, visual inspections and system checks would be performed annually and consist of lubrication, fluid checks, electrical inspections, and turbine functionality assessments. In addition, every 36 months, the torque requirements of the downtower assembly cabinet and downtower frame grounds, incoming power cables, and outgoing power cables would be checked. The onsite operations team also would drive throughout the Project on a regular basis conducting unrecorded visual inspections of the Project.

11.3.3 General Maintenance

General field duties include performing all scheduled and unscheduled maintenance, including periodic operational checks and tests, regular preventive maintenance on all turbines, related plant facilities and equipment, safety systems, controls, instruments, and machinery, including:

- Maintenance of the wind turbines and of the mechanical, electrical power, and communications system;
- Performance of all routine inspections;
- Maintenance of all oil levels and changing oil filters;
- Maintenance of the control systems, all proposed Project structures, access roads, drainage systems, and other facilities necessary for the Project operation;
- Maintenance of all O&M field maintenance manuals, service bulletins, revisions, and documentation for the proposed Project;
- Maintenance of all parts, price lists, and computer software;
- Maintenance and operation of Project substation facilities;
- Provision of all labor, services, consumables, and parts required to perform scheduled and unscheduled maintenance on the wind farm, including repairs and replacement of parts and removal of failed parts;
- Cooperation with avian and other wildlife studies as may be required, to include reporting and monitoring;
- Management of lubricants, solvents, and other hazardous materials as required by local and/or state regulations;
- Maintenance of appropriate levels of spare parts to maintain equipment. Order and maintain spare parts inventory;
- Provision of all necessary equipment including industrial cranes for removal and reinstallation of turbines;
- Hiring, training, and supervision of a work force necessary to meet the general maintenance requirements; and
- Implementation of appropriate security methods.

12.0 Costs

12.1 CAPITAL AND OPERATIONAL COSTS

The current estimated capital cost of the Project is approximately $243 million based on indicative construction and wind turbine pricing cost estimates for the proposed GE 2.82/127 turbine layout. This estimate includes lease acquisition; permitting, engineering, procurement, and construction of the Project and associated facilities; and Project financing.

Ongoing Wind Farm O&M costs for the Project are estimated to be approximately $4 million per year, including payments to landowners for wind easement rights.

12.2 SITE AND DESIGN DEPENDENT COSTS

Site and design dependent costs will be driven primarily by site-specific subsurface conditions as well as avoidance of environmental and cultural resources. This will determine access road design, turbine foundation design, turbine array layout, difficulty of working underground, and electrical collection system cost.

13.0 Schedule

Several activities must be completed prior to the proposed commercial operation date. The majority of this activity relates to permitting/approvals, equipment ordering lead-time, as well as design and construction of the facility. A preliminary schedule of pre-construction, construction, and post-construction activities for the proposed Project includes:

- Ordering of all necessary components including turbine towers, nacelles, blades, foundations, and transformers;
- Complete survey to microsite locations of structures and roadways;
- Soil borings, testing, and analysis for proper foundation design and materials;
- Complete construction of access roads, to be used for construction and maintenance;
- Construction of underground collection lines;
- Design and construction of the proposed Project substation facilities;
- Installation of turbine tower foundations;
- Installation of underground and aboveground junction boxes;
- Turbine tower placement and wind turbine setting;
- Acceptance testing of facility; and
- Commencement of commercial operation.

The Applicant expects to have the Project operational by December 31, 2021. A preliminary permitting and construction schedule are included in Table 33.

Table 30 Preliminary Permitting and Construction Schedule

Milestone	Start Date	Completion Date
Land Acquisition and Title Curative	Q4 2016	Q4 2020
Environmental Studies	Q1 2017	Q1 2021
Site Permit Application	Q3 2019	Q3 2020
Certificate of Need	Q3 2019	Q3 2020
Project Construction	Q4 2020	Q4 2021
Commercial Operation	Q4 2021	--

13.1 LAND ACQUISITION

Land acquisition for the Project began in 2016. Approximately 21,813 acres have been secured for lease at the time of this Application. As needed, the Applicant will continue to acquire wind energy leases, wind easements/good neighbor agreements or setback waivers, as well as transmission easements in 2019 and 2020 throughout the permit process.

13.2 PERMITS

Three Waters expects the Site Permit to be issued from the Commission within approximately 9 months of filing this Application. Preconstruction surveys and studies are currently underway and will continue through at least spring 2020. The Applicant will be

responsible for undertaking all required environmental review and will obtain all permits and approvals that are required following issuance of the LWECS Site Permit.

13.3 EQUIPMENT PROCUREMENT, MANUFACTURE AND DELIVERY

Three Waters is currently negotiating the purchase of turbines for the Project. Upon completion of turbine acquisition, turbine deliveries could commence in the second or third quarter of 2021.

13.4 CONSTRUCTION

Three Waters will construct, own, and operate the Project. The construction will take approximately 12 months to complete. Construction will include installation of access roads, electrical and communication work, turbine installation, and site restoration. Three Waters currently holds the land rights and interconnection requests necessary to facilitate development of the Project as proposed. Michael Rucker is the Managing Member of Three Waters, which is a wholly owned subsidiary of Scout Clean Energy. Mark Wengierski, Senior Project Manager, is managing development of the Project.

13.5 FINANCING

In May 2019, Three Waters completed a PPA with MMPA for the purchase of 200 MW of renewable energy from the Project. Construction financing will be accomplished by the fourth quarter of 2020.

13.6 EXPECTED COMMERCIAL OPERATION DATE

Depending on permitting and construction timeframes, Three Waters anticipates that the Project will begin commercial operation by the end of the fourth quarter 2021.

14.0 Energy Projections

The following provides a summary of the energy expected to be generated by the Project. Three Waters will comply with applicable federal, state, and local wind turbine siting and zoning requirements. Constraints implemented for the Project layout design are often more restrictive that what is required. Examples of constraints include, but are not limited to, distance from roads, overhead transmission lines, residences, other public infrastructure and Project non-participants. In addition to applying industry turbine siting best practices for the Project, other environmental constraints have been identified through third-party consultants and professional surveyors as described in this Application.

14.1 PROPOSED ARRAY SPACING FOR WIND TURBINES

As further described in Section 6, the internal array spacing is a minimum of three RD spacing in the non-prevailing direction and a minimum of five RD spacing in the prevailing direction, with no more than 20% of turbines planned to be spaced closer than the 3x5 RD in accordance with MPUC General Permit Standards (see Section 6.1 and Figures 2 and 3). Three Waters will work to minimize the need to site turbines closer than the 3x5 RD to other Project turbines if any future turbine siting changes are required and will do so in compliance with MPUC guidance.

14.2 BASE ENERGY PROJECTIONS

Based upon the turbine array and type, the Project includes up to 71 turbines with an aggregate nameplate generation capacity of up to 201 MW and a net capacity factor (NCF) of between approximately 46% and 50%. Calculation of the NCF include losses due to availability, electrical, degradation, environmental, curtailment and other factors. The final layout and turbine model will determine the annual energy production, which ranges from approximately 810 GWh to 875 GWh.

15.0 Decommissioning and Restoration

The Applicant has entered into long-term lease and easement agreements for placement of the wind turbines and associated Project infrastructure with private landowners within the Project Area. The Applicant anticipates that the life of the Project would be approximately 35 years (including a potential repower and/or retrofit of the turbines and power system with upgrades based on new technology) and it requests the right to re-apply for a LWECS Site Permit and continue operation of the Project upon expiration of the original LWECS Site Permit. As the Project reaches the design life of the turbines, issues of decommissioning versus repowering will be evaluated.

The Project would be decommissioned in accordance with applicable State and County regulations and the wind energy leases, wind easements/good neighbor agreements or setback waivers. Decommissioning efforts will include the removal of all above-ground wind facilities. Wind turbines, underground collection lines and other Project facilities would be removed in accordance with applicable State and County regulations, and turbine access roads would be removed unless otherwise agreed to by the landowner. Disturbed surfaces would be graded or restored as nearly as possible to their pre-construction conditions.

The Applicant has developed a Draft Decommissioning and Restoration Plan (Draft Plan) in accordance with the requirements of Minn. R. 7836.0500, Subp. 13 (Appendix K). As discussed in the Draft Plan, sufficient funds will be set aside to fund Project decommissioning and site restoration. A decommissioning cost estimate for the Project is included in the Draft Plan for the planned use of the GE 2.82 MW/127 turbines based on the decommissioning approach and an assumed salvage value of wind turbine and transmission facility components. Additional details concerning decommissioning and site restoration activities are discussed in the Draft Plan.

The Applicant also reserves the right to explore alternatives regarding decommissioning at the end of the proposed Project's Site Permit term. For example, retrofitting the turbines and power system with upgrades based on new technology may allow the Wind Farm to produce efficiently and successfully for many more years. Any retrofitting or repowering that might occur during or after the permit term would be subject to the LWECS Site Permit and could require a new LWECS Site Permit from MPUC at that time.

16.0 Identification of Other Potential Permits/Approvals

The federal and state permits or approvals that have been identified as potentially being required for the construction and operation of the Project are shown in Table 34. Permits dependent on the final site layout will be applied for after receiving PUC approval, but prior to construction.

Table 31 Potential Permits and Approvals Required for Construction and

Agency		Name and Type of Approval
Federal	U.S. Army Corps of Engineers	Clean Water Act, Section 404 Permit (for discharges of dredged or fill material into waters of the United States, and adjacent wetlands) and Section 10 Permit
		Jurisdictional Determination
		Wetland Delineation Approvals/Concurrence
	U.S. Fish and Wildlife Service	Review for Threatened & Endangered Species under Section 7 of the Endangered Species Act
		Wetland and Grassland Easement(s)
	Federal Aviation Administration	Notice of Proposed Construction or Alteration (within six miles of Public Aviation Facility and structures over 200 feet to complete a 7460 Proposed Construction or Alteration Form)
		Determination of No Hazard (Form 7460-1)
		Notice of Actual Construction or Alteration (Form 7460-2)
	Natural Resources Conservation Service	Prime Farmland Permit
	USEPA Region 5 (in coordination with MPCA)	Spill Prevention, Control and Countermeasure (SPCC) Plan
	Federal Lead Agency (National Historic Preservation Act)	Section 106 Review, if necessary (Class I Literature Review/Class III Cultural Resource Field Study)

Agency		Name and Type of Approval
	Federal Emergency Management Agency	Review Flood Plain Designation
Federal (cont.)	U.S. Department of Agriculture	Conservation, Grassland, Wetland Easements and Reserve Program Releases and Consents; FSA mortgage and associated environmental review; Farmland Impact Conversion Rating (Form AD-1006)
	Federal Communications Commission	Non-federally licensed microwave study; National Telecommunications and Information Administration (U.S. Department of Commerce) communications study
	U.S. Department of Transportation – Federal Highway Administration	Utility line crossing license/approval
	Federal Energy Regulatory Commission	Exempt Wholesale Generator Self Certification; Market-Based Rate Authorization; Waiver of Open Access Transmission Tariff, Open Access Same-Time Information System, and Standards of Conduct for transmission providers
	Department of Defense	Federal airways and airspace review near military bases
	Federal Land Manager (BLM, US Forest Service, U.S. Bureau of Reclamation, etc.)	Right-of-Way Grant over Federal Lands
State of Minnesota	Minnesota Public Utilities Commission	Large Wind Energy Conversion System (LWECS) Site Permit
		Large Electric Generating Facilities (LEGF) Certificate of Need
	Minnesota Department of Natural Resources	Public Water Works Permit
		Utility License to Cross Public Lands and Waters
		Native Prairie Protection Plan
		Endangered species consultation and Biological Surveys
		Avian and Bat Protection Plan
		Water Appropriation Permit (construction dewatering)

Agency		Name and Type of Approval
		Well construction preliminary assessment
	Minnesota Board of Water and Soil Resources (or applicable Local Government Unit)	Minnesota Wetland Conservation Act (WCA) Approval
State of Minnesota (cont.)	Minnesota Pollution Control Agency	NPDES Permit for Construction Activities and Storm Water Pollution Prevention Plan (SWPPP)
		License for Very Small-Quantity Generator of Hazardous Waste
		Aboveground Storage Tank (AST) Notification Form
		Section 401 Water Quality Certification
	Minnesota State Historic Preservation Office	Cultural and Historical resources review; State and National Register of Historic Sites review
	Minnesota Department of Transportation	Utility Accommodation Permit on Trunk Highway Right-of-Way
		Access/Driveway Permit for MnDOT Roads
		Aviation clearance from MnDOT Office of Aeronautics (review and approval of FAA 7460 permit, if needed); Airspace Obstruction Permit /Tall Structure Permit (only applicable if structures exceed 500 feet or the minimum safe altitude)
		Oversize/Overweight Permit for State Highways
	Minnesota Department of Health	Plumbing Plan Review
		Water Well Permit
		Well Construction Notification (construction dewatering)
		Environmental Bore Hole
	Minnesota Department of Agriculture	Informal consultation and review of impacts to agricultural lands
	Minnesota Department of Labor and Industry	Electrical Plan Review, Permits, and Inspections
Local	Jackson County	Building Permit(s)
		Address Request (for O&M facility)
		Conditional Use Permit (meteorological towers and O&M facility)

Agency		Name and Type of Approval
Local (cont.)		Individual Septic Tank Systems (ISTS) Permits
		Driveway Permit
		Utility Permit / Road Use and Repair Agreement
		Moving Permit
		Ditch Work Order
		Overwidth/Overweight Permits
	Jackson Soil and Water Conservation District	Minnesota Wetland Conservation Act (WCA) Approval
	Townships	Right-of-way permits, crossing permits, driveway permits for access roads, oversize/overweight permits for township roads
Other	Midcontinent Independent System Operator (MISO)	Turbine Change Study
		Generator Interconnection Agreement

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18.0 Definitions and Acronyms

Acronym	Definition	Acronym	Definition
AADT	Annual Average Daily Traffic	NPDES	National Pollutant Discharge Elimination System
ACS	American Community Survey	NPS	National Park Service
ACSR	Aluminum Conductor Steel Reinforced	NRHP	National Register of Historic Places
ADLS	Aircraft Detection Lighting System	NRI	Nationwide Rivers Inventory
AM	Amplitude Modulation	NWI	National Wetlands Inventory
AMAs	Aquatic management areas	NWP	Nationwide Permit
AMSL	above mean sea level	O&M	operations and maintenance
APE	Area of Potential Effects	ORVW	Outstanding Resource Value Waters
Applicant	Three Waters Wind Farm, LLC	OSA	Office of the State Archaeologist
Application	Site Permit Application	PAB	palustrine aquatic bed
AM	Amplitude Modulation	PEM	palustrine emergent wetland
BBCS	Bird and Bat Conservation Strategy	PFO	palustrine forested wetland
BMPs	Best Management Practices	PGA	peak ground acceleration
BWSR	Minnesota Board of Water & Soil Resources	Phase I ESA	Phase I Environmental Site Assessment
CFR	U.S. Code of Federal Regulations	POI	Point of Interconnection
Ch.	Chapter	PPA	Power Purchase Agreement
COD	commercial operation date	Project	Three Waters Wind Farm
Commission	Minnesota Public Utilities Commission	Project Area	Approximately 48,087-acre area in Jackson County, MN
CN	Certificate of Need	PSS	palustrine scrub-shrub wetland
CR	County Roads	PUB	palustrine unconsolidated bottom
CRP	Conservation Reserve Program	PWI	Minnesota Public Waters Inventory
CSAH	County State Aid Highways	RD	Rotor Diameter
CSP	Conservation Stewardship Program	RIM	Reinvest in Minnesota
CWI	County Well Index	rpm	Revolutions per minute
dB	decibels	RRRWS	Red Rock Rural Water System
dBA	A-weighted decibels	SCADA	supervisory control and data acquisition
DNH	Determination of No Hazard	SCS	Site Characterization Study
DOC	Department of Commerce	SHPO	Minnesota State Historic Preservation Office
ECPG	Eagle Conservation Plan Guidance	SNA	Scientific and Natural Area
EMF	Electromagnetic fields	SOI	U.S. Secretary of the Interior
EPA	U.S. Environmental Protection Agency	SHPO	Minnesota State Historic Preservation Office
EQIP	Environmental Quality Incentive Program	SNA	Scientific and Natural Area
FAA	Federal Aviation Administration	SOI	U.S. Secretary of the Interior
FCC	Federal Communications Commission	SP	Site Permit
FEMA	Federal Emergency Management Agency	SPA	Site Permit Application

Acronym	Definition	Acronym	Definition
FM	Frequency Modulation	SPCC	Spill Prevention Control and Countermeasure
ft	Feet	SSA	Sole Source Aquifers
Fund	Quinbrook Low Carbon Power Fund LP and Quinbrook Low Carbon Power Parallel Fund (US) LP	subd.	Subdivision
g	standard gravity	SWPPP	Storm Water Pollution Prevention Plan
GE	General Electric	Three Waters	Three Waters Wind Farm, LLC
Guidelines	Range-Wide Indiana Bat Summer Survey Guidelines	TMDL	total maximum daily load
GW	gigawatts	USACE	United States Army Corps of Engineers
Hz	hertz	U.S.C.	United States Code
IEC	International Electrotechnical Commission	USDA	United States Department of Agriculture
IPaC	Information for Planning and Conservation (USFWS)	USEPA	United States Environmental Protection Agency
ITC	ITC Midwest	USFWS	United States Fish and Wildlife Service
JCCP	Jackson County Comprehensive Plan	USGS	United States Geologic Service
JCZO	Jackson County Zoning Ordinance	WCA	Minnesota Wetland Conservation Act
JEDI	Jobs and Economic Development Impact	WECS	Wind Energy Conversion System
km	kilometers	WEG	Wind Energy Guidelines
kV	kilovolt	WEST	Western EcoSystems Technology, Inc.
kW	kilowatt	WHPA	Wellhead Protection Area
L_{10}	sound pressure level exceeded 10 percent of the measurement period	WHO	World Health Organization
L_{50}	sound pressure level exceeded 50 percent of the measurement period	WIA	Walk-In Access
L_{90}	sound pressure level exceeded 90 percent of the measurement period	Wind Farm	up to 201-megawatt (MW) wind farm and associated facilities, including a short length of 345-kilovolt (kV) transmission line (~300 feet)
L_{eq}	sound equivalence level	WMA	Wildlife Management Area
LNTE	Low-Noise Trailing Edges	WMO	Windpower Management Ordinance
LPRW	Lincoln Pipestone Rural Water	WPA	Waterfowl Production Area
LWECS	Large Wind Energy Conversion System	WRP	Wetland Reserve Program
m	meter		
m/s	meters per second		
MISO	Midcontinent Independent System Operator		
MMPA	Minnesota Municipal Power Agency		
MNDOC	Minnesota Department of		

Acronym	Definition	Acronym	Definition
	Commerce		
MNDH	Minnesota Department of Health		
MNDNR	Minnesota Department of Natural Resources		
MnDOT	Minnesota Department of Transportation		
MNGS	Minnesota Geological Survey		
MPCA	Minnesota Pollution Control Agency		
MPUC	Minnesota Public Utilities Commission		
MW	Megawatt		
Minn. R.	Minnesota Administrative Rules		
Minn. Stat.	Minnesota Statutes		
NA	Not Applicable		
NAC	Noise Area Classification		
NHIS	Natural Heritage Information System		
NHD	National Hydrography Dataset		
NIEHS	National Institute of Environmental Health Sciences		
NLCD	National Land Cover Database		
NLEB	northern long-eared bat		
NOAA	National Oceanic and Atmospheric Administration		

Appendix A

Requests for Comments & Agencies Contacted Regarding Project

Appendix B

Correspondence and Responses

Appendix C

Jackson County Ordinances – Sections 609, 610, 611 & 734

Appendix D

Preliminary Noise Compliance Assessment Report

Appendix E

Shadow Flicker Study

Appendix F

Telecommunication Studies

Appendix G

Cultural Resource Literature Review

Appendix H

Obstruction Evaluation and Airspace Analysis

Appendix I

Threatened & Endangered Species, Agency Consultations and Wildlife Studies

Appendix J

Site Characterization Study

Appendix K

Draft Decommissioning and Restoration Plan

WENCK

Responsive partner.
Exceptional outcomes.