Paulding Wind Farm IV LLC
Case No. 18-91-EL-BGN

Application Part 1 of 11

__Part 1 includes__:

- **Letter**
- **Affidavit of Ryan J. Brown, Executive Vice President, Paulding Wind Farm IV LLC**
- **Application Narrative**

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July 2, 2018

Ms. Barcy F. McNeal, Secretary
Ohio Power Siting Board
Docketing Division
180 East Broad Street, 11th Floor
Columbus, Ohio 43215-3797

Re: Application
Case No. 18-91-EL-BGN
In the Matter of the Application of Paulding Wind Farm IV LLC for a Certificate of Environmental Compatibility and Public Need to Construct a Wind-Powered Electric Generation Facility in Paulding County, Ohio

Dear Ms. McNeal:

Accompanying this letter is an application by Paulding Wind Farm IV LLC ("Applicant") for a Certificate of Environmental Compatibility and Public Need to Construct a Wind-Powered Electric Generation Facility in Paulding County, Ohio. The original application was electronically filed, and the required number of copies both in hard copy and electronic have been provided to the Docketing Division.

Along with this filing, we also provided the Docketing Division copies of the redacted portions of the application, and have filed a Motion for Protective Order and Memorandum in Support requesting protective treatment of the confidential information contained therein.

The Applicant further notes that there have been no revisions to the information presented in the preapplication notification letter.

In accordance with Ohio Administrative Code Rule 4906-2-04, we make the following declarations:

Name of the applicant:

Paulding Wind Farm IV LLC
(EDP Renewables North America LLC)
129 East Market Street
Suite 600
Indianapolis, Indiana 46204

Name and location of the facility:

Timber Road IV Wind Farm
Crane, Harrison, Paulding, Benton, and Blue Creek Townships
Paulding County, Ohio

Name of authorized representative:

Christine M.T. Pirik
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Notarized Statement:

See attached Affidavit of Ryan J. Brown
Executive Vice President, Paulding Wind Farm IV LLC

Respectfully submitted,

/s/ *Christine M.T. Pirik*
Christine M.T. Pirik (0029759)
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(*Counsel agrees to receive service by email.*)

Attorneys for Paulding Wind Farm IV LLC

CMTP:AP
Enclosures

COLUMBUS 56242-8 92696v2

BEFORE THE
OHIO POWER SITING BOARD

In the Matter of the Application of Paulding Wind Farm IV LLC for a Certificate of Environmental Compatibility and Public Need to Construct a Wind-Powered Electric Generation Facility in Paulding County, Ohio	)))))	Case No: 18-91-EL-BGN

AFFIDAVIT OF EXECUTIVE VICE PRESIDENT OF PAULDING WIND FARM IV LLC

STATE OF INDIANA :
: ss
COUNTY OF MARION :

I, Ryan J. Brown, being duly sworn and cautioned, state that I am over 18 years of age and competent to testify to the matters stated in this affidavit and further state the following based on my personal knowledge:

1. I am the Executive Vice President, Eastern Region and Canada for Paulding Wind Farm IV LLC, which is a wholly-owned subsidiary of EDP Renewables North America LLC.

2. I have reviewed Paulding Wind Farm IV LLC's Application for a Certificate to Construct a Wind-Powered Electric Generation Facility in Paulding County, Ohio.

3. To the best of my knowledge, information, and belief, the information and materials contained in the above-referenced Application are true and accurate.

4. To the best of my knowledge, information, and belief, the above-referenced Application is complete.

Ryan J. Brown
Ryan J. Brown, Executive Vice President,
Eastern Region and Canada

Sworn to before and signed in my presence this 29th day of June 2018.

Andrew David Magner
Notary Public

ANDREW DAVID MAGNER
Notary Public, State of Indiana
Hamilton County
Commission # 681595
My Commission Expires
March 09, 2024

STATE OF INDIANA NOTARY SEAL

TJB

APPLICATION

TO THE

OHIO POWER SITING BOARD

FOR A

CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY & PUBLIC NEED

FOR THE

PAULDING WIND FARM IV

Townships of Crane, Harrison, Paulding, Benton, and Blue Creek,
Paulding County, Ohio

Case No. 18-91-EL-BGN
July 2018

TIMBER ROAD
WIND FARM

Applicant: Paulding Wind Farm IV LLC, a subsidiary of EDP Renewables
129 East Market Street
Suite 600
Indianapolis, Indiana 46204
Contact: Ryan J. Brown
317.636.0866

Prepared By: Environmental Design and Research,
Landscape Architecture, Engineering, & Environmental Services D.P.C. (EDR)
217 Montgomery Street, Suite 1000
Syracuse, New York 13202
Contact: Benjamin Brazell, Principal
315.471.0688

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EXHIBITS

COMMONLY USED ACRONYMS and ABBREVIATIONS

amsl	Above Mean Sea Level
AEP	AEP Ohio Transmission Company, LLC
ASTM	American Society for Testing and Materials
BMP	Best Management Practice
CFR	Code of Federal Regulations
CWA	Clean Water Act
dBA	Decibels, A-weighted
EAP	Emergency Action Plan
EDR	Environmental Design and Research, Landscape Architecture, Engineering, & Environmental Services
ESRI	Environmental Systems Research Institute
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Administration
GIS	Geographic Information System
HDD	Horizontal Directional Drilling
Hz	Hertz
ISA	Interconnection Service Agreement
ICSA	Interconnection Construction Service Agreement
JEDI	Jobs and Economic Development Impact Model
kV	Kilovolt
kW	Kilowatt
MW	Megawatt
MWh	Megawatt hour
NAAQS	National Ambient Air Quality Standards
NAIP	National Agricultural Imagery Program
NPDES	National Pollutant Discharge Elimination System
NREL	National Renewable Energy Laboratory
NRHP	National Register of Historic Places
NTIA	National Telecommunications and Information Administration
NWI	National Wetlands Inventory
OAC	Ohio Administrative Code
ODA	Ohio Departmnet of Agriculture
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation
Ohio EPA	Ohio Environmental Protection Agency
O&M	Operations and Maintenance

OPSB	Ohio Power Siting Board
ORAM	Ohio Rapid Assessment Method for Wetlands
ORC	Ohio Revised Code
OS/OW	Over sized/over weight
PJM	PJM Interconnection
PPA	Power Purchase Agreement
POI	Point of interconnection
ROW	Right-of-way
RUA	Road Use Agreement
SPCC	Spill Prevention Control and Countermeasures Plan
SWPA	Source Water Protection Area
SWP3	Stormwater Pollution Prevention Plan
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
VIA	Visual Impact Analysis

4906-4-01 PURPOSE AND SCOPE

(A) REQUIREMENTS FOR FILING CERTIFICATE APPLICATIONS

Paulding Wind Farm IV LLC (the Applicant), a Delaware limited liability company (a wholly-owned subsidiary of EDP Renewables North America LLC, a Delaware limited liability company [EDPR]), is proposing to construct the Timber Road IV Wind Farm, a wind-powered electric generator located in Paulding County, Ohio (the Facility). The materials contained herein and attached hereto constitute the Applicant's submittal (Application) for a Certificate of Environmental Compatibility and Public Need (hereafter referred to as the Certificate), prepared in accordance with the requirements for the filing of standard certificate applications for electric generation facilities as prescribed in the Ohio Administrative Code (OAC) Chapter 4906-4.

This Application has been prepared by the Applicant, with support from Environmental Design and Research, Landscape Architecture, Engineering & Environmental Services, D.P.C. (EDR) of Syracuse, New York. EDR has 20 years of experience with siting and permitting wind-powered electric generation facilities. The Applicant also prepared the Application with the support of Dickinson Wright PLLC.

(B) WAIVERS

The Ohio Power Siting Board (OPSB) may, upon an application or motion filed by a party, waive any requirement other than a requirement mandated by statute. No waivers have been requested in this case, and as such, this section is not applicable.

(C) DEFINITIONS

As used in this Application, specific terms will have the meanings set forth below.

(1) Paulding Wind Farm I facility

"Paulding Wind Farm I facility" means the facility that received its certificate of environmental compatibility and public need to construct a wind-powered electric generation facility in Paulding County from the OPSB on August 23, 2010, in Case No. 09-980-EL-BGN. (Note: The Paulding Wind Farm facilities are also referred to in the Application Exhibits and Figures as Timber Road.)

(2) Paulding Wind Farm II facility

"Paulding Wind Farm II facility" means the facility that was constructed by Paulding Wind Farm II LLC, which received its certificate of environmental compatibility and public need to construct a wind-powered electric generation facility in Paulding County from the OPSB on November 18, 2010, in Case No. 10-369-EL-BGN.

On February 28, 2011, in Case No. 10-369-EL-BGN, the OPSB granted the request to bifurcate Paulding Wind Farm II LLC, with Paulding Wind Farm II LLC retaining a portion of the capacity and the remaining capacity going to Paulding Wind Farm III LLC.

(3) Paulding Wind Farm III facility

"Paulding Wind Farm III facility" means the facility that was constructed by Paulding Wind Farm III LLC that was bifurcated from Paulding Wind Farm II LLC in Case No. 10-369-EL-BGN by OPSB order issued February 28, 2011. In addition, on February 22, 2016, in Case No. 09-980-EL-BGN, the OPSB granted the request to transfer the certificate of environmental compatibility and public need to construct a wind-powered electric generation facility issued to Paulding Wind Farm I LLC in Case No. 09-980-EL-BGN to Paulding Wind Farm III LLC.

4906-4-02 PROJECT SUMMARY AND APPLICANT INFORMATION

(A) PROJECT SUMMARY

The Applicant is proposing to construct the Facility in a rural portion of Paulding County, Ohio. The Facility will consist of wind turbine generators, private access roads, electric collection cables, a new Facility collection substation, a temporary laydown yard for construction staging, and up to three permanent meteorological towers. The Applicant intends to permit 54 wind turbine locations; however, the Applicant does not expect to construct more than 37 turbines. The Facility will generate 125.1 MW, which will be delivered to two collection substations: a new collection substation and an existing collection substation currently utilized by the Paulding Wind Farm III facility. The power will be delivered from the collection substations to one point of interconnection (POI) at the existing Logtown 138 kV switching station.

(1) General Purpose of the Facility

The general purpose of the Facility is to produce wind-powered electricity that will maximize energy production from wind resources in the Project Area (which is defined below) in order to deliver clean, renewable electricity to the Ohio bulk power transmission system to serve the needs of electric utilities and their customers.

(2) Description of the Facility

The Project Area consists of approximately 20,400 acres of private land in Crane, Harrison, Paulding, Blue Creek, and Benton Townships in Paulding County, Ohio. The Facility presented herein consists of 54 wind turbine generator locations, each with a nameplate capacity rating of up to 4.2 megawatts (MW). The total output capacity for the Facility will not exceed 125.1 MW. Therefore, the number of turbines to be constructed will be dependent on the final turbine models selected, and not anticipated to exceed 37 locations. The Facility is expected to operate with an average annual capacity factor of 34% to 38%, generating a total of approximately 370,000 to 420,000 megawatt-hours (MWh) of electricity each year, depending on the final turbine model(s) selected for the Facility. Figure 03-2 depicts the proposed Facility. A detailed description of the Facility, including each Facility component, can be found in Section 4906-4-03(B) of this Application.

(3) Description of the Suitability of the Site

A suitable potential site for wind power facilities must have adequate wind resource, be located proximate to electric transmission lines with available capacity, and be situated in locations that can accommodate setbacks, land use, and environmental considerations. The primary factors evaluated to determine the suitability of the Project Area for the Facility are described briefly below:

- Adequate wind resource – the Applicant determined through initial screening and on-site measurements that the Project Area has an adequate wind resource (see Exhibit A).

- Adequate access to the bulk power transmission system – from the standpoints of proximity and ability of the system to accommodate the interconnection, and to accept and transmit the power from the Facility at a reasonable cost, the Applicant determined that the existing transmission infrastructure was adequately accessible (see Exhibits B, C, D, and E).
- Willing land lease participants and host communities – the Applicant has obtained private lease agreements, and the Applicant has engaged local and state stakeholders and the local community to educate and share information. A public information meeting was held near the Project Area on April 4, 2018 to share information and gather feedback.
- Site accessibility – the Project Area is served by an existing network of public roads (see Exhibit F).
- Appropriate geotechnical conditions – significant geotechnical constraints for the planned construction of the Facility are not anticipated (see Exhibit G).
- Limited population/residential development – the Project Area and the surrounding communities have a low population density as compared to statewide estimates. Areas with limited residential development generally have more available space for siting wind turbines once constraints related to setbacks, sound levels, and shadow flicker are taken into account. See Section 4906-4-08(C)(4)(e) and Exhibit H of this Application for additional detail on demographics in the vicinity of the Project Area. For additional information on sound, see Sections 4906-4-08(A)(3) and 4906-4-09(F) of this Application and Exhibits I and J. For additional information on shadow flicker, see Sections 4906-4-08(A)(9) and 4906-4-09(H) of this Application and Exhibit K.
- Compatible land use – the Project Area is predominantly rural agricultural land, which is compatible with the proposed Facility (see Section 4906-4-08(C) of this Application).
- Limited sensitive ecological resources – the proposed Facility is not expected to result in significant adverse impacts to ecological resources (see Section 4906-4-8(B) of this Application and Exhibits L, M, N, O, P, Q, R, S and T).
- Cultural resources – the proposed Facility is not expected to physically impact any identified existing cultural resources. For additional information on cultural resources, see Section 4906-4-08(D) and Exhibit U of this Application.

Additional information about the site selection process and the suitability of the Project Area for the Facility can be found in Section 4906-4-04 of this Application.

(4) Project Schedule

Acquisition of land and land rights began in 2008 and will continue through 2019. A pre-application meeting was held with OPSB on December 7, 2017 to discuss the Project. A public information meeting was held on

April 4, 2018 to facilitate public interaction with the Applicant and expert consultants, and included information on visual/aesthetics, ecological studies, and wind turbine technology. This Certificate Application was officially submitted in July 2018 and it is anticipated that the Certificate will be issued in the first quarter of 2019. Construction is anticipated to begin in the second quarter of 2019, be completed within 7-9 months. The Applicant anticipates the Facility will be placed in service in the fourth quarter of 2019. Additional information and a Gantt-style chart about the Project schedule can be found in Section 4906-4-03(C)(1) of this Application.

(B) APPLICANT INFORMATION

(1) Plans for Future Generation Capacity at the Site

The Applicant has no future plans for additional capacity at this site. The maximum power generation at this site is 125.1 MW.

(2) Description of Applicant and Operator

The Applicant, Paulding Wind Farm IV LLC, a Delaware limited liability company (a wholly-owned subsidiary of EDPR), plans to both construct and operate the proposed Facility. Developing wind farms since 1996, EDPR is a renewable energy company focused on solar and wind development to generate and deliver clean electricity. Currently, EDPR business operations take place in 12 different countries, including the United States (U.S.) (part of EDPR North America [NA]). EDPR developments reached the U.S. in 2007 and can be found in the following states: California, Illinois, Indiana, Iowa, Kansas, Minnesota, New York, Ohio, Oklahoma, Oregon, Texas, and Washington. The U.S. is currently EDPR's largest market in terms of installed capacity and production of renewable energy. EDPR is the second largest owner/operator of wind farms in Ohio with 265 MWs of operating facilities located in Paulding and Hardin Counties. As of 2016, installed renewable energy capacity in the U.S. reached 4,382 MW. EDPR NA has developed a total of 30 wind farms and 4 solar farms across the U.S.

4906-4-03 PROJECT DESCRIPTION AND SCHEDULE

(A) PROJECT AREA DESCRIPTION

The following sub-sections provide information on the Project Area's geography, topography, population centers, major industries, and landmarks. The Project Area is located within a predominantly agricultural area in the Central Lowland Physiographic Region of Ohio. Elevations in the Project Area range from 570 feet to 800 feet above mean sea level (amsl).

(1) Geography and Topography Map

Figure 03-1 depicts the geography and topography of the Project Area, and the surrounding area within a 2-mile radius. This mapping was developed from the U.S. Geological Survey (USGS) topographic maps via ESRI's (Environmental Systems Research Institute) "USA Topo Maps" Map Service, which provides seamless, scanned images of USGS 7.5 minute, 1:24,000 paper topographic maps. The mapping used in Figure 03-1 consists of digital versions of Antwerp, Payne, Latty, Woodburn North, Woodburn South, Dixon, and Convoy quadrangles. Among other information, Figure 03-1 shows the following features:

(a) *The proposed facility*
(b) *Population centers and administrative boundaries*
(c) *Transportation routes and gas and electric transmission corridors*
(d) *Named rivers, streams, lakes, and reservoirs*
(e) *Major institutions, parks, and recreation areas*

(2) Area of All Owned and Leased Properties

Of the approximately 20,400-acre Project Area, a total of 198 properties consisting of 12,819 acres are owned, currently under lease, or will be under lease by the Applicant for construction and operation of the proposed Facility. However, the Facility footprint will occupy a much smaller area. Table 03-1 presents the estimated area of disturbance for each Facility component, based on the Applicant's experience with the construction and operation of other wind power facilities.

Table 03-1. Impact Assumptions

Facility Components	Typical Area of Vegetation Clearing	Area of Total Soil Disturbance (temporary and permanent)	Area of Permanent (fill/structures) Disturbance
Wind Turbines and Workspaces	263-foot radius per turbine	263-foot radius per turbine	0.3 acre per turbine (pedestal plus crane pad)
Access Roads	40 feet wide per linear foot of road	36 feet wide per linear foot of road	16 feet wide per linear foot of road
Buried Electrical Collection Cable[1]	25 feet wide per linear foot of cable	10 feet wide per linear foot of cable	none
Laydown Yard	18 acres	18 acres	none
Substation	2 acres	2 acres	2 acres
Meteorological Towers[2]	1 acre per tower	0.04 acre per tower	0.04 acre per tower

[1] These values represent averages for clearing and soil disturbance. Some sections of buried electrical cable will be wider than 25 feet because of the number of collection circuits that need to convene near the collection substation. However, in many other locations the disturbance will be less than 25 feet, resulting in an overall average of 25 feet across the Project Area.

[2] As described below in Section 4906-4-03(B)(2)(h), the Facility will require up to three permanent meteorological towers. While the impact assumptions in Table 03-1 are per tower, all impacts presented in this Application account for three meteorological towers.

Approximately 516 acres of land will be disturbed during construction. Much of this disturbance will be temporary, and subject to restoration activities at the end of Facility construction. Following restoration, the permanent operating footprint of the Facility will be approximately 54 acres of built facilities, or approximately 0.3% of the total leased lands.

(B) DETAILED DESCRIPTION OF PROPOSED FACILITY

(1) Description Details for the Project

(a) *Type and Characteristics of Generation Equipment*

A specific turbine model has not yet been selected for the Facility. However, turbine models that have been determined to be suitable for this site include:

- Siemens Gamesa 126 (2.625 MW)
- Siemens Gamesa 132 (3.55 MW)
- Siemens Gamesa 145 (4.2 MW)
- Vesta 136 (3.6 MW)
- Vesta 150 (4.2 MW)
- Acciona 132 (3.465 MW)
- Acciona 132 (3.0 MW)

- Acciona 140 (3.0 MW)

Market factors such as availability and cost will affect this determination and could dictate use of an alternate turbine. However, any turbine ultimately selected will be essentially equivalent to those referenced above in terms of its dimensions, appearance, and electrical output. If the Applicant utilizes a turbine model that is not included in the above list, the Applicant will provide the turbine specifications to the OPSB prior to construction.

The Applicant is proposing to permit 54 wind turbine locations. However, the number of turbines to be constructed will be dependent on the final turbine model selected. The Applicant does not expect to construct more than 37 turbines. The wind turbines will begin generating energy at wind speeds as low as 3 meters per second (m/s) (6.7 miles per hour [mph]) and cut out at maximum wind speeds of 25 m/s (55.9 mph). Accounting for a total generating capacity of 125.1 MW and an annual capacity factor of 34 - 38%, preliminary analysis indicates that the turbines will operate for approximately 370,000 to 420,000 MWh annually.

Heat rate is not applicable to wind energy facilities.

(b) *Turbine Dimensions*

Table 03-2 presents the dimensions in feet and meters for each of the turbine models under consideration, for the turbine height, tip height, rotor diameter, and blade length.

Table 03-2. Approximate Turbine Dimensions by Model

Turbine Model	Rated Power	Hub Height	Rotor Diameter	Blade Length	Tip Height
Siemens Gamesa 126	2.625 MW	84 meters (276 feet)	126 meters (413 feet)	63 meters (206.5 feet)	147 meters (482 feet)
Siemens Gamesa 132	3.55 MW	114 meters (374 feet)	132 meters (433 feet)	66 meters (216.5 feet)	180 meters (591 feet)
Siemens Gamesa 132	3.5 5MW	84 meters (276 feet)	132 meters (433 feet)	66 meters (216.5 feet)	150 meters (492 feet)
Siemens Gamesa 145	4.2 MW	107.5 meters (353 feet)	145 meters (476 feet)	72.5 meters (238 feet)	180 meters (591 feet)
Vestas 136	3.6 MW	105 meters (344 feet)	136 meters (446 feet)	68 meters (223 feet)	173 meters (568 feet)
Vestas 136	3.6 MW	82 meters (269 feet)	136 meters (446 feet)	68 meters (223 feet)	150 meters (492 feet)

Turbine Model	Rated Power	Hub Height	Rotor Diameter	Blade Length	Tip Height
Vestas 150	4.2MW	105 meters (344 feet)	150 meters (492 feet)	75 meters (246 feet)	180 meters (591 feet)
Acciona 140	3.0 MW	105 meters (344 feet)	140 meters (459 feet)	70 meters (230 feet)	175meters (574feet)
Acciona 132	3.0 MW	112.5 meters (369 feet)	132 meters (433 feet)	66 meters (216.5 feet)	178.5 meters (586 feet)
Acciona 132	3.465 MW	84 meters (276 feet)	132 meters (433 feet)	66 meters (216.5 feet)	150 meters (492 feet)

(c) *Fuel Quantity and Quality*

Wind turbines generate electricity without burning fuels. Therefore, this section is not applicable to the Facility.

(d) *List of Pollutants Emissions and Quantities*

Wind turbines generate clean, emission-free electricity without releasing airborne pollutants. Therefore, this section is not applicable to the Facility.

(e) *Water Requirement, Source, and Discharge Information*

Wind turbines generate electricity without the use of water. Therefore, no water is treated or discharged, and this section is not applicable to the Facility.

(2) Description of Major Equipment

The Applicant is permitting 54 wind turbine locations. Dependent on the final turbine model selected, it is anticipated that no more than 37 turbines will be constructed. In addition to the turbines, the Facility will include approximately 17 miles of access roads, approximately 63 miles of buried electrical collection cable, a collection substation, a temporary laydown yard for construction staging, and up to three permanent meteorological towers. Additional information about each of these Facility components, including the construction method, site preparation and reclamation method, materials, color and texture of surfaces, and dimensions is presented below.

(a) *Wind Turbines, Including Towers and Foundations*

In order to excavate foundations and erect turbines, access roads will first be built. Once the access roads are complete for a particular group of turbine sites, the initial activity at each tower site will involve removing vegetative cover as necessary and grading topsoil within a 263-foot radius workspace around each tower (the exact placement of this workspace can be adjusted to avoid sensitive ecological resources). In agricultural land, the topsoil within a 263-foot radius of each tower will be stripped and stockpiled. An excavator will then be used to dig a foundation hole. Excavated subsoil and rock will be segregated from topsoil. If bedrock is encountered, it is anticipated to be rippable (i.e., excavated using mechanical means). If the bedrock is not rippable, it will be excavated by pneumatic jacking, hydraulic fracturing, or blasting. As indicated in Section 4906-4-08(A)(5)(a), blasting is not expected to be necessary. However, if blasting is required, it will be conducted in accordance with all applicable laws and regulations. If necessary, dewatering of foundation holes will involve pumping the water to a discharge point, which will include measures to slow water velocities and trap any suspended sediment. Dewatering activities will not result in the direct discharge of water into any streams or wetlands.

Foundation construction occurs in several stages, as dictated by the type of foundation to be used (suitable turbine foundation systems will be designed upon completion of the detailed geotechnical exploration). The most likely type of foundation will be spreadfoot. Construction of the foundation occurs in several stages, which is anticipated to include outer form setting, rebar and bolt cage assembly, casting and finishing of the concrete, removal of the forms, backfilling and compacting, and site restoration. The excavation area around and over the foundation will be backfilled with material excavated from on-site. The top of the foundation will be a nominal 17 to 20-foot diameter pedestal that typically extends 6 inches above grade and is surrounded by a 10 to 20-foot wide gravel skirt. At the base of each tower, an area approximately 60 feet by 100 feet will be developed as a level, permanent crane pad.

Each turbine foundation results in an operational footprint of approximately 0.3 acres (See Table 03-1 above).

Descriptions of each of the turbine components are provided below.

Tower: The tubular towers used for megawatt-scale turbines are smooth tubular conical steel structures manufactured in multiple sections. Each tower will have an access door in the base section and internal lighting, along with an internal ladder and/or mechanical lifts to access the nacelle. The towers will be painted white in accordance with Federal Aviation Administration (FAA) regulations designed to make the structures more visible to aircraft when viewed from above, as light colors contrast sharply against the dark-colored ground. This also has the benefit of reducing visibility from ground vantage points, by making them difficult to see against the pale background of the sky.

Nacelle: The main mechanical components of the wind turbine are housed in the nacelle. These components include the drive train, gearbox, and generator. The nacelle is housed in a smooth steel reinforced white painted fiberglass shell that protects internal machinery from the environment and dampens noise emissions. The housing is designed to allow for adequate ventilation to cool internal machinery. The nacelle is equipped with an external anemometer and a wind vane that signals wind speed and direction information to an electronic controller. Attached to the top of some of the nacelles, per specifications of the FAA, will be a medium intensity aviation warning light. The exact lighting configuration has yet to be determined and will depend on the final turbine model selected. The turbines will be lit with the minimum lighting required by the FAA. These lights are anticipated to be flashing red strobes (L-864) that operate only at night. The nacelle is mounted on a yaw ring bearing that allows it to rotate ("yaw") into the wind to maximize wind capture and energy production.

Rotor with blades: Each rotor consists of three (3) composite blades that will be up to 246 feet (75 meters) in length, with a maximum rotor diameter of up to 492 feet (150 meters). The rotor and the blades will have a smooth texture and painted white. The rotor attaches to the drive train at the front of the nacelle. Hydraulic motors within the rotor hub feather each blade according to wind conditions, which enables the turbine to operate efficiently at varying wind speeds. The rotor can spin at varying speeds to operate more efficiently. Depending on the turbine model selected, the wind turbines will begin generating energy at wind speeds as low as 3 m/s (6.7 mph), and cut out at maximum wind speeds of 25 m/s (55.9 mph). Rotor speed will be in the range of 4.9 to 15.3 revolutions per minute (RPM).

Hub: The hub of the wind turbine is the center portion of the rotor assembly that that connects the blades to the main shaft and ultimately to the rest of the drive train. Hubs are generally made of steel.

Beyond the tower, nacelle, and rotor blades, other smaller wind turbine components include cabling, control panels, and internal facilities such as lighting, ladders, etc. All turbine components will be delivered to the Facility on transport trucks, with the main components typically off-loaded at the individual turbine sites. However, if required due to schedule or weather issues, some turbine components may be delivered to the laydown yards.

Turbine erection is performed in multiple stages including setting of the bus cabinet and ground control panels on the foundation; erection of the tower sections; erection of the nacelle; assembly and erection of the rotor; connection and termination of the internal cables; and inspection and testing of the electrical system prior to energization. Turbine assembly and erection involves mainly the use of large track-mounted cranes, smaller rough terrain cranes, boom trucks, and rough terrain fork-lifts for loading and off-loading materials. The tower sections, rotor components, and nacelle for each turbine will be delivered to each site by specialized trailers and unloaded by crane. A large erection crane will set the tower segments on the foundation, then place the nacelle on top of the tower, then place the rotor with blades onto the nacelle. The erection crane(s) will most likely move from one tower to another along private access roads or collection routes where ever possible. If an erection crane(s) needs to be outside of the designed access roads or collection routes, then the Applicant will share the alternate crane path 30 days prior to the OPSB preconstruction meeting.

(b) *Fuel, Waste, Water, and Other Storage Facilities*

Fuel tanks may be stored in the laydown yards during Facility construction, in order to store fuel to fill up construction vehicles. However, wind turbines generate electricity without the use of fuel or water, and without generating waste. As such, the proposed Facility does not include any significant facilities for fuel, waste, water, or other storage.

(c) *Fuel, Waste, Water, and Other Processing Facilities*

Wind turbines generate electricity without the use of fuel or water, and without generating waste. Therefore, the proposed Facility does not include any fuel, waste, water, or other processing facilities.

(d) *Water Supply, Effluent, and Sewage Lines*

The construction trailers at the laydown yard will use water and generate sewage and wastewater comparable to a typical small business office. Waterborne wastes will be disposed of through use of a septic system or municipal sewage treatment system and, if necessary, the Applicant will obtain a Permit to Install (PTI) on-site sewage treatment under OAC Chapter 3745-42. No other Facility components will use measurable quantities of water or discharge measurable quantities of wastewater.

(e) *Associated Electric Transmission and Distribution Lines and Gas Pipelines*

The generator lead line will be permitted separately and, therefore, is not addressed in detail in this Application. There are no electric distribution lines or gas pipelines associated with this Facility.

(f) *Electric Collection Lines*

The wind turbine transformer will raise the voltage of electricity produced by the turbine generator up to the 34.5 kilovolts (kV) voltage level of the underground collection system. From the transformer, cables will join the collector circuit and turbine communication cables to form the electrical collection system. Collector cables will be buried to a minimum depth of 48 inches below the surface. The location of the proposed collection system is depicted on Figure 03-2. This 34.5 kV collection system will connect the individual turbines to either the proposed collection substation or an existing collection substation originally built for the Paulding Wind Farm III facility. The total length of the buried 34.5 kV collector lines carrying electricity to the collection substation will be up to 63 miles[1], buried on privately-owned land leased by the Applicant and, to a lesser extent, in public road right-of-ways (ROWs) (i.e., when crossing public roads between two participating parcels).

Electrical collection routes will generally parallel Facility access roads, and field edges; yet collection routes may cut directly across fields in some places. The proposed layout of the collection system is illustrated on Figure 03-2. Where buried cable is proposed to cross active agricultural fields, an attempt will be made avoid damage to filed tiles by determining the location of any subsurface drainage tiles through consultation with the landowner and/or review of public records. Any drainage tiles damaged during construction will immediately be identified, documented, and repaired. It is anticipated that a local drain tile contractor or the farmer tending the land will be involved in repair activities.

Collection line install can be done with the use of direct burial, horizontal directional drilling or open trench.

Direct burial methods through the use of a trencher will be used during the installation of underground collection lines. The trencher uses a large blade or “saw” to excavate an open trench. A trench, generally 24 to 36 inches wide, is opened with a side cast area immediately adjacent to the trench. Direct burial installs the cable between 48 inches and 60 inches deep, and requires only minor clearing and surface disturbance (up to 25 feet wide for the installation machinery and access).

Collection line installation may include the use of a trenchless excavation method known as horizontal directional drilling (HDD). HDD may be used in some locations to avoid impacting sensitive resources, including streams or wetlands. This technique accomplishes the installation of buried utilities with minimal impact, by routing the utility under a sensitive feature (such as a stream, river, or wetland).

Installation of collection lines in an open trench will be used in areas where the previously described direct burial methods are not practicable. Areas appropriate for open trench installation will be determined at

[1] In many areas, multiple circuits will be buried in parallel. The linear distance where one or more circuits will be installed consists of approximately 50 miles.

the time of construction and may include areas with unstable slopes, excessive unconsolidated rock, standing or flowing water, and/or suspected drainage tiles. Open trench installation is generally performed with a backhoe and generally results in a disturbed trench approximately 36 inches wide and a minimum of 48 inches deep. However, the overall temporary footprint of vegetation and soil disturbance will average 25 feet in width, due to machinery dimensions and backfill/spoil pile placement during installation. In agricultural areas, all topsoil within the work area will be stripped and segregated from excavated subsoil. Replacement of soil material will occur after installation of the buried collection lines. Subgrade soil will be replaced around the cable, and topsoil will be replaced at the surface. Any damaged tile lines will be repaired, and all areas adjacent to the open trench will be restored to original grades and surface condition. Restoration of these areas will be completed through seeding and mulching of all exposed soils, or by other appropriate farming methods in active agricultural fields.

(g) *Substations, Switching Substations, and Transformers*

A new collection substation will be constructed for the Facility. The collection substation will be located at the intersection of Town Highway 52 and Town Highway 59 in Blue Creek Township. The substation will step up voltage from 34.5 kV to 138 kV. The substation will include dead-end structures, circuit breakers, air break switches, metering units, relaying, communication equipment, and a control house. The collection substation will be approximately 335 feet by 236 feet in size and will be built on 4 acres of land that the Applicant will purchase and own.

In addition, an existing collection substation (currently utilized by the existing Paulding Wind Farm III facility) will be used by the Facility. The substation will deliver electricity to the same POI as the new collection substation.

(h) *Temporary and Permanent Meteorological Towers*

Up to three 374-foot (114 meter) permanent meteorological wind measurement towers will be installed to collect wind data and support performance testing of the Facility. These towers will be galvanized steel structures equipped with wind velocity directional measuring instruments at three different elevations and a red aviation warning lighting mounted at the top. Each tower will be self-supporting (i.e., they will be non-guyed, free standing structures). Locations for the meteorological towers have been identified and are depicted on Figure 03-2.

(i) *Transportation Facilities, Access Roads, and Crane Paths*

The Facility will require the construction of new or improved roads to provide access to the proposed turbines. The proposed location of Facility access roads is shown on Figure 03-2. The total length of private access roads required to service all proposed wind turbine locations is approximately 17 miles. The roads will be gravel-surfaced and typically 16 feet in finished width.

Wherever feasible, existing roads and farm drives will be upgraded for use as Facility access roads, to minimize impacts to active agricultural areas, natural communities, and wetland/stream areas. Where an existing road or farm drive is unavailable or unsuitable, new gravel-surfaced access roads will be constructed, also in locations selected to minimize potential impacts. Road construction will involve topsoil stripping and grubbing of stumps, as necessary. Stripped topsoil will be stockpiled along the road corridor for use in site restoration. Any grubbed stumps will be removed, chipped, or buried. Following removal of topsoil, subsoil will be graded, compacted, and surfaced with gravel or crushed stone (depth to be determined on a case-by-case basis), and a geotextile fabric or grid will be installed beneath the road surface, if necessary, to provide additional support. To the extent practicable, local sources will be used to obtain gravel and other construction materials that may be needed (e.g., sand) in support of Facility construction.

The finished access road will be about 16 feet in width with occasional wider pull-offs to accommodate passing vehicles, and earthen shoulders on either side to accommodate crane traffic. Appropriately sized culverts will be placed at stream crossings, if necessary, in accordance with state and federal permit requirements. For any road crossings over waterbodies, culverts will be used to assure that the roads do not impede cross drainage. Where access roads are adjacent to (or cross) wetlands, streams, or drainage ditches/swales, appropriate sediment and erosion control measures (e.g., silt fence) will be installed.

During construction, access road installation and use could result in vegetative clearing disturbance of a maximum width of 40 feet and temporary soil disturbance of a maximum width of 36 feet. In agricultural areas, topsoil will be stripped and wind-rowed along the access road to prevent construction vehicles from driving over undisturbed soil and adjacent fields. Once construction is complete, temporarily disturbed areas will be restored, including removal of excess road material and rocks greater than 12 inches, and returned to their approximate preconstruction contours.

(j) *Construction Laydown Areas*

Facility construction will require the development of a temporary laydown yard for construction staging, to be located on leased private lands (see Figure 03-2 for laydown yard location). The laydown yard will accommodate material and equipment storage, parking for construction workers, and construction management trailers. The area of the laydown yard will not exceed approximately 18 acres. The area will be cleared of all vegetation and graded, if necessary. Upon completion of the Facility, any structures will be removed and the area will be regraded and respreads with stockpiled topsoil. Then the landowner or Applicant will reseed with the landowner's selected crops. Security lights will be installed at the laydown yard.

(k) *Security, Operations, and Maintenance Facilities or Buildings*

The Project will use an existing operations and maintenance (O&M) facility located along State Route 49 in Paulding Township. The Facility was originally permitted and constructed as part of the Paulding Wind Farm II facility. The O&M Facility is currently being used as an O&M facility for the existing Paulding Wind Farm II and Paulding Wind Farm III facilities.

(l) *Other Pertinent Installations*

There are no additional Facility components beyond those already described in the previous subsections of 4906-4-03(B)(2).

(3) Need for New Transmission Lines

The Applicant will construct approximately 2.89 miles of new 138 kV overhead generator lead line, to transmit electricity from the new collection substation to the existing Paulding Wind Farm III facility generator lead line which will then take power to the existing Logtown POI switching station. The new line will be located within leased agricultural land and will be permitted separately. In accordance with Ohio Revised Code (ORC) Title 4906 and OAC 4906, the Applicant will file an application with the OPSB for a certificate to construct the new generator lead line.

(4) Project Area Map

The proposed layout of all Facility components is illustrated on Figure 03-2. Prepared at a 1:12,000 scale, Figure 03-2 illustrates the Project Area, along with the following information:

(a) *Aerial Photograph*

This mapping was developed using 2017 aerial photographs from the U.S. Department of Agriculture (USDA) National Agricultural Imagery Program (NAIP) Ohio 0.5-meter orthoimagery map service.

(b) *The Proposed Facility*

This mapping illustrates Facility components, as discussed above in Section 4906-4-03(B)(2).

(c) *Road Names*

(d) *Property Lines*

(C) DETAILED PROJECT SCHEDULE

(1) Schedule

A Gantt-style chart is presented below, illustrating major activities and milestones including:

(a) *Acquisition of Land and Land Rights*

Acquisition of land and land rights began in June 2008 and will continue through April 2019.

(b) *Wildlife Surveys/Studies*

Wildlife surveys/studies began in May 2016 and continued through July 2018.

(c) *Receipt of Grid Interconnection Studies*

Grid interconnection studies began in 2008 and the final Interconnection Service Agreement (ISA)/Interconnection Construction Service Agreement (ICSA) is anticipated by September 2018, as discussed in Section 4906-4-05 of this Application.

(d) *Preparation of the Certificate Application*

Preparation of the Application occurred from winter through summer of 2018, with data and analyses added as various studies were completed. A public information meeting was held April 4, 2018.

(e) *Submittal of the Application for Certificate*

This Application was officially submitted in July 2018

(f) *Issuance of the Certificate*

It is anticipated that the Certificate will be issued in the first quarter of 2019.

(g) *Preparation of the Final Design*

It is expected that final designs and detailed construction drawings will be completed in the second quarter of 2019.

(h) *Construction of the Facility*

Construction is anticipated to begin in the second quarter of 2019 and be completed within 7 to 9 months.

(i) *Placement of the Facility in Service*

The Facility will be placed in service upon completion of construction, anticipated for the fourth quarter of 2019.

(2) Construction Sequence

Project construction is anticipated to proceed in the following sequence, with multiple activities being performed concurrently:

- Public road improvements;
- General clearing and construction of access roads, crane pads, and turn-around areas;
- Grading of the field construction office, laydown yards, and substation areas;
- Installation of the electrical collection system;
- Construction of turbine tower foundations;
- Assembling and erection of the wind turbines;
- Construction and installation of the substations;
- Plant commissioning and energization;
- Final grading and drainage; and
- Restoration activities.

Facility construction will be initiated by clearing (as necessary) all tower sites, access roads, and interconnect routes. As described in Table 03-1 it is assumed that up to a 263-foot radius will be cleared around each tower, a 40-foot-wide corridor will be cleared along access roads, and a 25-foot-wide corridor will be cleared along all underground electric interconnect routes that do not parallel access roads. The actual cleared area will vary on a case-by-case basis depending on factors such as topography and vegetation and, where possible, adjusted to avoid sensitive ecological resources. In addition, approximately 2 acres will be cleared for the substation, a total of up to 1 acre for the meteorological towers, and up to 18 acres for the laydown yard. Section 4906-4-08(B)(2) of this Application quantifies anticipated temporary and permanent impacts from construction activities, including vegetation removal, to ecological communities in the Project Area.

Graded areas will be smoothed, compacted, freed from irregular surface changes, and sloped to drain. Final earth grade adjacent to equipment and buildings will be below the finished floor slab and sloped away from the building to maintain proper drainage. Slopes of embankments shall be protected against rutting and scouring during construction in a manner similar to that required for excavation slopes. Site grading will be compatible with the general topography and use of adjacent properties, ROWs, setbacks, and easements.

In addition, a stringent soil erosion and sedimentation control plan will be developed and implemented as part of the Stormwater Pollution Prevention Plan (SWP3) required by the National Pollutant Discharge Elimination System (NPDES) General Permit for the Facility. To protect surface waters, wetlands, groundwater, and storm water quality, erosion and sediment control measures will be installed and maintained throughout site development. Such measures could include silt fence, hay bales, and/or temporary siltation basins. The location of these features will be detailed on the construction drawings, approved by the Ohio Environmental Protection Agency (Ohio EPA) as part of the NPDES review, and reviewed by the contractor prior to construction. A duly qualified individual will also inspect these features throughout the period of construction to assure that they are functioning properly until completion of all restoration work (final grading and seeding). Based upon field conditions, additional sediment and erosion control measures may be required, beyond what is depicted on the drawings. Further information on storm water drainage can be found in Section 4906-4-07(C) of this Application.

Construction of turbine tower foundations, turbine erection and assembly, access road construction, and installation of collection lines are described above in Section 4906-4-03(B)(2).

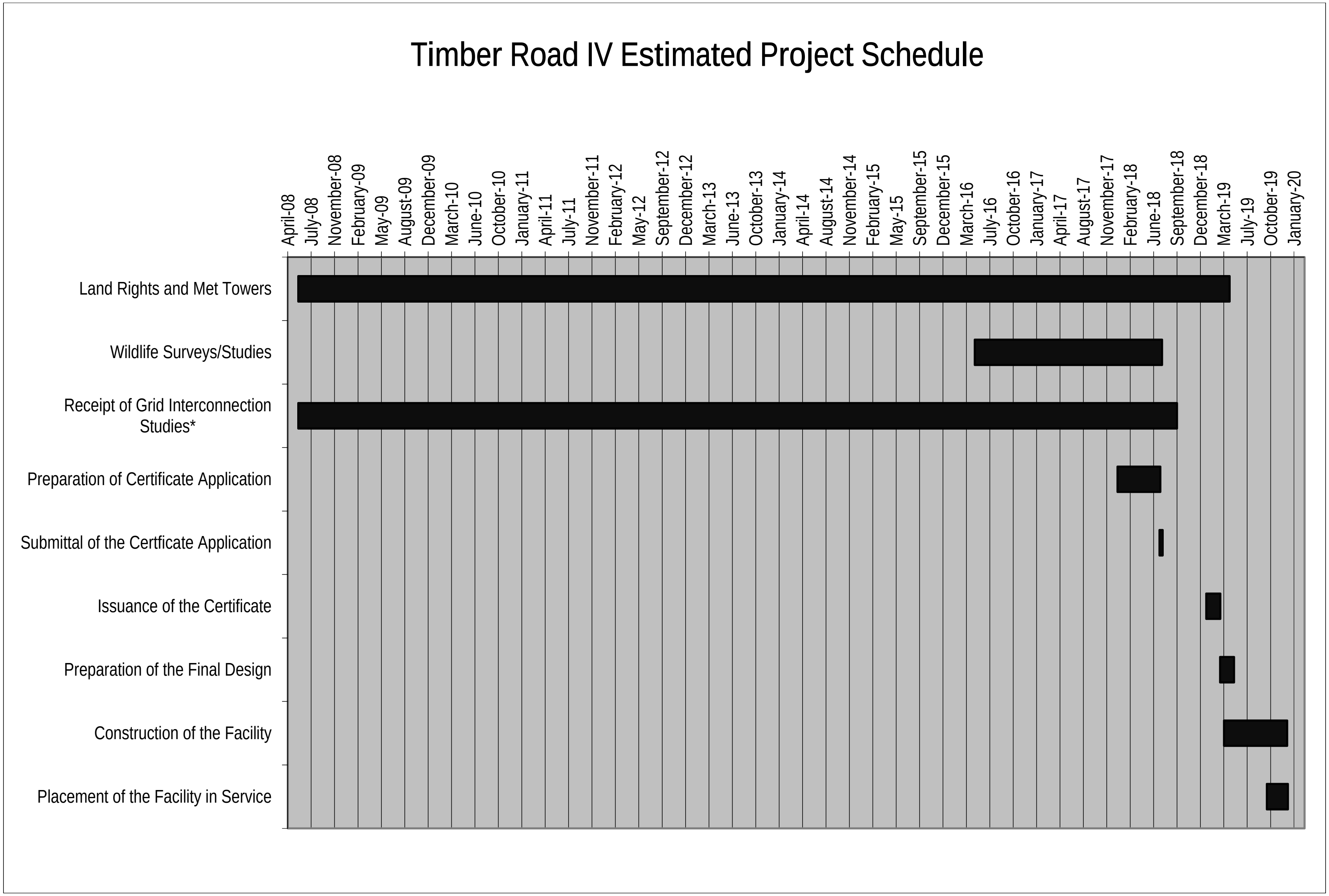
Facility construction will generate some solid waste, primarily plastic, wood, cardboard, and metal packing/packaging materials, construction scrap, and general refuse. This material will be collected from turbine sites and other Facility work areas, and disposed of in dumpsters located at the laydown yards. A private contractor will empty the dumpsters on an as-needed basis, and dispose of the refuse at a licensed solid waste disposal facility.

Once construction is complete, temporarily disturbed areas will be restored (including removal of excess road material, de-compaction, and rock removal in agricultural areas) and returned to their approximate preconstruction contours. Exposed soils at restored turbine sites and along Facility access roads will be stabilized by seeding, mulching, and/or agricultural planting.

(3) Impact of Critical Delays

Critical delays may have material, adverse effects on Facility financing, including the Applicant's ability to procure turbines and other Facility components. Such delays may push the in-service date back. In addition, considerable costs would be incurred if the delays prevented the Facility from meeting deadlines for federal incentive programs such as the Production Tax Credit. This could ultimately interfere with the Applicant's ability to build the Facility, and provide emissions-free, renewable energy to the people of Ohio in accordance with Senate Bill 221, which mandates that at least 12.5% of the electricity sold in Ohio must be generated from renewable resources by 2027.

The Applicant plans to enter into a power purchase agreement (PPA) with an off taker to purchase the energy from the Paulding Wind Farm IV facility. In the event of a critical delay, the Applicant would experience a heightened financial risk or a higher risk of termination of the project.



*See Section 4906-4-05 for additional detail regarding grid interconnection studies and milestones

4906-4-04 PROJECT AREA SELECTION AND SITE DESIGN

The selection of appropriate sites for a wind-powered electric generation facility is constrained by numerous factors that are essential considerations for the Facility to operate in a technically and economically viable manner. Given the unique nature and constraints associated with the siting of wind-powered electric generation facilities and in accordance with the OPSB's determination in Case No. 08-1024-EL-ORD, Opinion and Order, October 28, 2008, p. 21 at Finding 56, the Applicant has not provided alternative sites for the proposed wind farm.

(A) PROJECT AREA SELECTION

This section describes the general site selection process (macro-siting), along with associated siting constraints and requirements.

(1) Description and Rationale for Selecting Project Area

Availability/quality of wind resource and proximity to the bulk power transmission system are the initial screening criteria evaluated in the site selection process for any wind power project. The Applicant's initial evaluation was based on publicly available data, such as the Wind Resource of Ohio map (AWS, 2007), along with site visits and capacity analysis for nearby transmission lines.

The Applicant has studied the wind resource in Ohio for over ten years, and build three operating wind farm facilities in Ohio (two in Paulding County). The data collected for the Paulding Wind Farm IV LLC Project area as well as data from the surrounding operating sites combined with available transmission and a supportive communities provides evidence to support that the Paulding Wind Farm IV LLC is located in an area that is suitable for a wind farm facility.

Land use in Paulding County is largely agricultural and characterized by open spaces suitable for hosting a wind energy project. Initial site visits to the area provided visual verification that the study area is dominated by agricultural use, and that the land use would be compatible with wind project development. Land use is discussed in Section 4906-4-08(C) and agriculture is discussed in detail in Section 4906-4-08(E).

Proximity to major transportation routes is another feature of the area that provided rationale for selection as a potential site for the Facility. Located approximately 30 miles east of Fort Wayne, Indiana, the Project Area is in close proximity to I-69/I-469 to the west, US-24 to the north, US-30 to the south, and US-127 to the east. These major roads provide accessibility for the transportation of turbine components, construction equipment, and staff.

(2) Map of Study Area

A map of the Project Area is included as Figure 04-1. In addition, a statewide wind resource map, which is typical of the type of data used in initial screening evaluations, is included in Exhibit A.

(3) List and Description of all Qualitative and Quantitative Siting Criteria

The Applicant does not have the unfettered ability to locate projects in any area or on any parcel of land. Facilities can only be sited on private property where the landowner has agreed to allow such construction.

Siting criteria used for the selection of a particular area (i.e., macro-siting) to host a viable wind power project, such as the Facility proposed herein, include a number of factors/requirements. All siting criteria listed below are equally important, essential, and strongly considered when siting a wind farm. The siting criteria are presented below:

<u>Viable commercial wind resources</u> - The Applicant determined through an initial screening process utilizing a statewide wind resource map (see Exhibit A), and subsequent on-site measurements, that the Project Area has a viable wind resource.

<u>Adequate access to the bulk power transmission system</u> - The Applicant determined that the existing transmission infrastructure was adequately accessible from the standpoints of proximity and ability of the system to accommodate the interconnection, as well as the ability to accept and transmit the power from the Facility at a reasonable cost. This determination was made through an initial internal preliminary assessment and subsequent interconnection request filed with PJM Interconnection LLC (PJM). See Section 4906-4-05(B) of this Application for additional detail.

<u>Compatible land use</u> - The Project Area is predominately rural agriculture, which is compatible with the proposed Facility. See Section 4906-4-08(E) and Figure 08-5 of this Application for additional detail.

<u>Limited sensitive ecological resources</u> - The proposed Facility is not expected to result in significant adverse impact to ecological resources (see Section 4906-4-08(B) and Exhibits L, M, N, O, P, Q, R, S and T of this Application).

<u>Willing land lease participants and host communities</u> – The Applicant plans to obtain all private lease agreements, which constitutes contiguous areas of land necessary to support the Facility. See

Section 4906-4-06(A) of this Application for additional detail. In addition, the Applicant made significant efforts to engage local and state stakeholders and the local community to educate and share information. A public information meeting was held at the Black Swamp Nature Center in Paulding Township within the Project Area on April 4, 2018 to share information and gather feedback. See Section 4906-4-06(F)(i) of this Application for additional detail on public interaction.

Site accessibility – The Project Area is served by an existing network of public roads, which will facilitate component delivery, construction, and operation and maintenance activities (see Figure 03-2 and see Exhibit F).

Appropriate geotechnical conditions - The Applicant determined that significant geotechnical constraints for the planned construction of the Facility are not anticipated. See Sections 4906-4-08(A)(4) and 4906-4-08(A)(5) of this Application for additional information.

Limited population/residential development – The Project Area and the surrounding communities have a low population density as compared to statewide estimates. Areas with limited residential development generally have more available space for siting wind turbines once constraints related to setbacks, sound levels, and shadow flicker are taken into account. See Section 4906-4-08(C)(4) and Exhibit H of this Application for additional detail on demographics in the vicinity of the Project Area. For additional information on sound, see Section 4906-4-08(A)(3), 4906-4-09(F), and Exhibits I and J of this Application. For additional information on shadow flicker, see Section 4906-4-08(A)(9), 4906-4-09(E), and Exhibit K of this Application.

Cultural Resources - The proposed Facility is not expected to interfere with any identified existing cultural resources (see section 4906-4-08(D) and Exhibit U).

Once the Applicant deemed the Project Area suitable for development of a wind power facility, various siting factors and constraints were identified and evaluated in order to appropriately design the Facility layout and micro-site the Facility components.

(4) Description of Process by Which Siting Criteria Were Used

As previously mentioned, the process for locating sites for wind power facilities is met with constraints. Specifically, development locations must have adequate wind resource proximate to electric transmission lines with unused capacity sufficient to accept energy from the facility, and situated in locations that can accommodate setbacks, land use, and environmental restrictions imposed by local, state and federal laws.

(5) Description of Project Area Selected for Evaluation

Based on the criteria listed in OAC Rule 4906-4-04(A)(3), the Project Area site selection analysis concluded that the site presented herein meets all the factors necessary to support a viable wind energy facility. The proposed site possesses some of the best terrestrial wind resource in the state, manageable access to the bulk power transmission system, sufficiently low population density, positive feedback from landowners and town officials, highly compatible land-use characteristics, and few environmental sensitivities.

Once it was determined that the Project site was adequate, the Applicant then worked with various consultants to conduct detailed assessments, which identified and defined the siting factors and constraints described above. Through the use of geographic information system (GIS) tools and consultant assessments, the Applicant performed numerous iterations to determine the proposed Facility layout as presented and described in this Application.

(B) FACILITY LAYOUT DESIGN PROCESS

Once the Project site was selected and the macro-siting was determined, the Facility layout and site design process began. This section describes the design process used by the Applicant from inception of the process to the final engineering design submitted prior to construction.

(1) Constraint Map

A constraint map of the Project Area showing setbacks, public roads, utility corridors, streams, public ROWs, and wetlands is included as Figure 04-2.

(2) Criteria Used to Determine Site Layout

The selection of possible sites for development the Facility and the determination of the Facility's layout and design are based on certain criteria. Particularly, throughout the entire process of site selection, as discussed above, the Applicant took into consideration criteria including, but not limited to: the preferences of the landowners; whether the location has adequate wind resource that is proximate to electric transmission lines with unused capacity sufficient to accept energy from the Facility; and whether the location can accommodate setbacks, land use, and environmental restrictions imposed by local, state, and federal laws. Once the macro-siting of the Project was completed and the site selected, these criteria continue to be taken into consideration in the ultimate determination of the site layout and design, right up to the presentation of the final engineering drawings to the OPSB staff, which occurs just prior to construction. This Application sets forth the proposed locations where the Facility's components will be located within the study corridor of the Project site. These locations, while not necessarily exact coordinates, may be subject to unsubstantial and minor engineering revisions (micro-siting) prior to construction. Any such micro-siting will: only occur if it is necessitated by one of the many criteria described in this Application, including, but not limited to: state laws and regulations; land use constraints; only occur within the environmental study corridor previously evaluated for environmental resources by the Applicant; be compatible with landowner preferences and in compliance with the agreements the Applicant has with property owners. All micro-siting will be presented at the preconstruction meeting with OPSB with proof of landowner signed lease agreements, all necessary participation agreements, and that the change is within the environmental study corridors. Many of the constraints and criteria used in determining the Project layout and design are discussed in additional detail below.

Land Use Constraints

Land use in the Project Area is predominately agricultural resulting in undisrupted development and operation to current agricultural practices. A graphic study of turbine siting constraints for the Facility is included as Figure 04-2, as required by OAC Rule 4906-4-04(B)(1). Suitable areas for Facility development are restricted by setbacks from ROWs, non-participating parcels, and residences. Illustrative as it is, this graphic cannot show all the site-specific constraints and considerations, such as minimizing tree clearing and impacts to wetlands and surface waters, landowner preferences, turbine engineering factors (e.g., minimum separation distances to avoid wake loss), shadow flicker assessments, access road engineering requirements, and minimizing impacts to agricultural lands, all of which further limit micro-siting alternatives within the participating parcels.

In addition to investigating the layout within the constraints discussed above, numerous expert analyses and field studies have been conducted to assure that the individual turbines are sited to minimize environmental impacts as much as possible, while still allowing for a successful project. The pertinent studies and analyses are attached hereto as Exhibits and discussed in various sections of the Application.

Wind Resource Constraints

The wind resource assessment of the proposed Facility site optimizes turbine layout and assesses the energy yield estimation within the context of the existing, site-specific constraints. One objective of micro-siting is to locate wind turbines in the highest energy yield positions with the lowest shadowing and wake loss influence between these turbines. During the wind analysis, micro-scale modeling tools were utilized to develop the energy yield assessment for the layout proposed herein, which is a result of a comprehensive management of the local constraints with the goal of achieving high energy yield. Inputs to the modeling tools include wind data from on-site meteorological towers and high-resolution terrain/roughness/land cover data from a digital elevation model.

Agricultural Constraints

Agricultural land is the dominant resource within the Project Area. Therefore, the Applicant has designed the Facility footprint to minimize impacts to active agricultural land. Impact minimization efforts include placing turbines and access roads along field edges and minimizing temporary disturbance and permanent loss of active agricultural land as much as possible. The Facility will not physically impact any agriculture-related structures and, aside from temporary disturbance during construction activities, is largely compatible with farming practices. Furthermore, the Facility will not result in a change in land use and will promote the long-term economic viability of the affected farms by supplementing the income of participating farmers. For additional information on agricultural land, see Section 4906-4-08(E) of this Application.

Sound Constraints

As established in OAC Rule 4906-4-09(F)(2), the Facility will adhere to sound level regulations during construction and operation. Construction activities will be limited to daytime operating hours as described in Section 4906-4-09(F)(1), and the Facility will be operated so that the Facility sound contribution does not result in an increase in sound levels as described in Section 4906-4-09(F)(2). In the event the sound level requirement cannot be met, the Applicant will seek to enter into a participation agreement or waiver of the sound requirement with the owner of the sensitive receptor, as defined in OAC Rule 4906-4-09(F)(1). For additional information on sound, see Sections 4906-4-08(A)(3) and 4906-4-09(F), and Exhibits I and J of this Application.

Shadow Flicker Constraints

Shadow flicker from wind turbines can occur when moving turbine blades pass in front of the sun, creating alternating changes in light intensity or shadows. These flickering shadows can cause an interruption in sunlight when cast on nearby residences. OAC Rule 4906-4-09(H) limits shadow flicker at any non-participating sensitive receptor within 1,000 meters of any turbine to 30 hours per year. In the event the shadow flicker requirement cannot be met, the Applicant will seek to enter into a participation agreement or waiver of the shadow flicker requirement with the owner of the sensitive receptor, as defined in OAC Rule 4906-4-09(H). Accordingly, a threshold of 30 hours of shadow flicker per year was used for evaluation of potential impact from the Facility. For additional information on shadow flicker, see Section 4906-4-08(A)(9), Section 4906-4-09(H), and Exhibit K of this Application.

Wetland Constraints

Federal and state law discourages development in wetlands/streams and advocates that such impacts be avoided or minimized. Section 404 of the Clean Water Act established a program to regulate the discharge of dredged or fill material into waters of the U.S., including wetlands. As described by the U.S. Environmental Protection Agency (US EPA) (http://www.epa.gov/owow/wetlands/pdf/ reg_authority.pdf), the basic premise of the program is that no discharge of dredged or fill material may be permitted if: (1) a practicable alternative exists that is less damaging to the aquatic environment, or (2) the nation's waters would be significantly degraded.

In order to maximize wetland avoidance, desktop evaluations were done to identify and avoid potential surface waters during initial Facility design. In addition, on-site investigations were conducted to establish the locations of streams and wetlands, and Facility components were sited in an effort to avoid impacts to these resources to the maximum extent practicable. As described in Section 4906-4-08(B)(1) of this Application, there will be no impacts to wetlands as a result of construction or operation of the Facility. For all identified stream and wetland crossing points, effective construction techniques will be used to avoid and minimize impacts. As a result, the vast majority of stream impacts will be temporary in nature. For additional information on estimated wetland and stream impacts, see Section 4906-4-08(B) and Exhibits M of this Application.

Landowner Considerations

The Applicant has and will continue to meet with various participating landowners to review the Facility footprint on their respective parcel(s). Among other things, these meetings often involve field analysis to ensure that Facility components avoid site features of importance to the landowner, or to ensure adequate separation distances from such site features. Where Facility components are proposed to cross active agricultural fields, attempts will be made to determine the location of any subsurface drainage tiles through consultation with the landowner and subsurface drainage tiles will be avoided or repaired, if necessary.

(2) Description of Number and Type of Comments Received

The Applicant held a public open house at the Black Swamp Nature Center in Paulding County, Ohio April 4th, 2018. A total of 96 people attended the meeting. The public open house had several information tables including experts to help address questions the public had about the Facility; including an environmental/wildlife, shadow flicker, visual simulation, acoustic, and a Facility layout table. A majority of the people who attended the meeting were in support of the project. Most of the comments came from landowners who asked questions or requested minor changes to the location of Facility equipment. Several landowners requested more wind turbines to be sited on their property and a good deal of time was spent explaining setbacks and other restrictions for siting wind turbines in Ohio. The Applicants development and engineer teams obtained over twenty recommendations for changes to the Facility layout during the public meeting. Both teams worked together for six weeks in collaboration with the landowners to confirm the collection, access roads, and turbine locations minimized negative impacts to drain tile and current farming operations. The Facility layout was updated as well as the environmental survey corridor in order to submit a Facility layout that incorporated feedback received from the public open house.

About three homeowners had concerns regarding the transportation routes being near their homes. The Applicant reviewed the transportation plan and followed up with the landowners letting them all know that the transportation route will be about a half mile south of their homes. All three were glad to hear that they were not going to experience construction traffic directly in front of their homes.

The Applicant received on anonymous written comment about health concerns related to wind turbines. There are no known health impacts of wind turbines. The Applicant has additional information that can be shared addressing health concerns for anyone who seeks it. One attendee at the meeting had a concern about shadow flicker. The Applicant will share the results of the shadow flicker study with members of the community who wish to understand the potential for shadow flicker. The Applicant will work with individuals who may receive more shadow flicker than is statutorily allowed to either reduce the shadow flicker impacts at their residence, provide compensation, or address the concern in a manner that is satisfactory to the impacted homeowner.

4906-4-05 ELECTRIC GRID INTERCONNECTION

(A) CONNECTION TO THE REGIONAL ELECTRIC GRID

The proposed Facility will deliver electricity to the grid using one POI at the existing Logtown 138 kV switching station.

(B) INTERCONNECTION INFORMATION

(1) Interconnection Queues

The Applicant is utilizing two PJM queue positions to build the Facility. The first queue position, T131, is for 150 MWs. The ISA/ICSA for T131 was executed on February 18, 2016. The operating Paulding Wind Farm III facility is utilizing 100.8 MWs of T131. The remaining 49.2 MWs of capacity of T131 will be utilized by the Paulding Wind Farm IV facility. The second queue position, AC1-173, which is for 75.9 MWs, will be utilized by the Paulding Wind Farm IV facility.

(a) *Name of Queue*

The name of the first queue position is Lincoln-Sterling 138kV.

(i) Web Link of Queue

The weblink of the queue is http://www.pjm.com/pub/planning/project-queues/feas_docs/t131_fea.pdf.

(ii) Queue Number

The PJM queue number is T-131.

(iii) Queue Date

The queue date is January 9, 2008.

(b) *Name of Queue*

The name of the second queue position is Logtown 138kV

(i) Web Link of Queue

The weblink of the queue is https://www.pjm.com/pub/planning/project-queues/feas_docs/ac1173_fea.pdf.

(ii) Queue Number

The PJM queue number is AC1-173.

(iii) Queue Date

The queue date is October 31, 2016.

(2) System Studies

(a) *Feasibility Study*

T-131 – The Feasibility Study, issued by PJM in 2008, analyzed a 150 MW generating capability to be injected into the Lincoln-Sterling 138 kV circuit (Exhibit B). This study evaluated compliance with reliability criteria for summer peak conditions in 2011, assessing both network and local impacts. Potential network impacts evaluated include generator deliverability, multiple facility contingency, short circuit, contribution to previously identified overloads, new system reinforcements, and contribution to previously identified system reinforcements. Potential local impacts evaluated include normal system, single contingency, and short circuit analysis.

The Feasibility Study also considered additional interconnection requests in the area that could affect T131's interconnection (i.e., PJM Queue R49 and PJM Queue S73). PJM Queue R49 was evaluated as a 150 MW wind generation facility to connect to the Haviland-Milan 138 kV circuit, while Queue S73 was evaluated as a 200 MW wind generation facility to connect to both the Lincoln-Sterling 138 kV circuit and the Haviland-Milan 138 kV circuit. Queue R49 represents the operating Paulding Wind Farm II LLC facility, which currently utilizes 99.825 MW of capacity. Queue S73 was later withdrawn, as discussed in the Facilities Study for Queue T131.

PJM evaluated two scenarios for capacity impacts. No problems were identified for the first scenario which identifies R49, S73, and T131 operating at 20% capacity. The second scenario evaluated option one or two with R49 and S73 during peak summer 2011 conditions. No network problems were found regarding the normal system or the short circuit analysis.

AC1-173 – PJM issued the Feasibility Study in April 2017 (Exhibit B). The queue project AC1-173 was evaluated as a 75.9 MW (capacity 9.9 MW) injection at the Logtown 138 kV substation. The study evaluated for compliance with applicable reliability planning criteria for summer peak conditions in 2020. Potential network impacts evaluated include generator deliverability, multiple facility contingency, steady-state voltage requirements, short circuit, and system reinforcements. No problems or new system reinforcements were identified.

(b) *System Impact Study*

T-131 – PJM issued the System Impact Study in June 2009, followed by a revised Impact Study in October 2015 (Exhibit C). The report evaluated Queue T-131 as a 150 MW connection to the AEP Ohio Transmission Company, Inc. (AEP) Lincoln-Sterling 138 kV circuit between Lincoln and North Delphos station via a new in-line switching station. This new switchyard was constructed to interconnect the Paulding Wind Farm III facility and is currently operating. PJM evaluated Queue T131 network impacts for compliance with reliability criteria for peak summer conditions in 2013. No network problems were found regarding generator deliverability, multiple facility contingency, short circuit, stability contribution to previously identified overloads, new system reinforcements, and contribution to previously identified system reinforcements.

AC1-173 – PJM issued the System Impact Study in May 2018 (Exhibit C). The report evaluated Queue AC1-173 as a 75.9 MW injection into the T-131/Logtown 138 kV substation. It was evaluated for compliance with applicable reliability planning criteria for peak summer conditions in 2020. No network problems were found for generator deliverability, multiple facility contingency, and contributions to previously identified overloads, stead-state voltage requirements, short circuit, or stability analysis.

(c) *Facilities Study*

T-131 – PJM issued a Facilities Study in February 2018 (Exhibit D). The Facilities Study identified the three amendments to the previously issued interconnection studies. First, the S73 queue request has been withdrawn, resulting in a change in the transmission configuration in the local area. Second, the Applicant requested use of a different site for the interconnection. While the new location is not a significant change electrically, it required a complete retool of the Facilities Study. Finally, network upgrades at the Lincoln, North Delphos, and Sterling previously included in the T131 scope have largely been absorbed by approved baseline upgrades. To minimize risk of failing to complete the baseline upgrades on time, while meeting the requested backfeed and commercial operations date (COD) for T131, additional equipment will be required at the T131 interconnection station, to be removed after the baseline upgrades are in service.

According to the Facilities Study, network upgrades are required for two stations: both the Lincoln 138 kV and Sterling 138 kV stations require modified relay settings.

AC1-173 – The Applicant has requested that PJM and AEP allow the Applicant to skip the Facilities Study and go straight to executing the ISA/ICSA. This request has been granted by PJM and AEP since no significant system upgrades are necessary to connect to the grid. It is expected that Paulding Wind Farm IV LLC, PJM, and AEP will execute the ISA/ICSA for AC1-173 in the third quarter of 2018 to advance construction and facilitate a fourth quarter of 2019 in-service date.

(d) *Interconnection Service Agreement/Interconnection Construction Service Agreement*

T131 – PJM, AEP Ohio Transmission Company, Inc. (AEP), and Paulding Wind Farm III LLC executed an ISA and ICSA for 150 MW on February 18, 2016 (Exhibit E). The operating Paulding Wind Farm III facility is utilizing 100.8 MWs of T131. The remaining 49.2 MWs of capacity of T131 will be utilized by Paulding Wind Farm IV LLC. Currently, the remaining 49.2 MWs of capacity of T131 has been in suspension since January 2017. The Applicant is working with PJM and AEP to bifurcate the T131 ISA/ICSA such that the remaining 49.2 MWs to be built by Paulding Wind Farm IV LLC will be placed into its own separate ISA/ICSA and be taken out of suspension in order to advance construction and facilitate a fourth quarter of 2019 in-service date.

4906-4-06 ECONOMIC IMPACT AND PUBLIC INTERACTION

(A) OWNERSHIP

The Applicant will construct all structures associated with the Facility, and the Applicant plans to own and operate all associated structures. The construction equipment used to build the Facility will be rented or owned by a contractor obtained by the Applicant. As depicted on Figure 03-2, limited portions of the buried 34.5 kV electrical collection lines will be located within public road ROWs where the collection lines cross roads from one participating parcel to another. The proposed Facility will not change the ownership status of such ROWs. All other components of the Facility will be located entirely on privately-owned land, and voluntary lease agreements between the Applicant and private landowners will accommodate the Facility. The proposed Facility and associated lease agreements are not expected to change the ownership status of private lands within the Project Area, with the possible exception of land that may be purchased for the Facility collection substation, for which the Applicant may either lease land or purchase associated land.

(B) CAPITAL AND INTANGIBLE COSTS

(1) Estimated Capital and Intangible Costs by Alternative

The total estimated capital and intangible costs of the Facility could range between approximately $[redacted] and $[redacted] ($[redacted]/kW$ – $[redacted]/kW) depending on the turbine model and installed capacity selected. These costs are broken out in Table 06-1 below, assuming a cost value in the approximate middle of the estimated range.

Table 06-1. Estimated Capital and Intangible Costs

Description	Cost
Tangible Costs	
Turbine (including transportation and installation)	$[redacted]
Civil and Electrical Work	$[redacted]
Other	[redacted]
Total Tangible Costs	$[redacted]
Intangible Costs	
Development/Management	[redacted]
Insurance	[redacted]
Legal/Other	$[redacted]
Total Intangible Costs	$[redacted]
Total	$[redacted]
Cost per kW	$[redacted]

As described in Section 4906-4-04, the Applicant has not proposed alternative project areas. Therefore, no cost comparison between alternatives is available.

(2) Cost Comparison with Similar Facilities

Installed project costs compiled by the U.S. Department of Energy National Renewable Energy Laboratory (NREL) in August 2017 indicate that the capital costs of the Facility are in line with recent industry trends. The NREL compilation shows that capacity-weighted average installed costs in 2011 averaged roughly $1,590 per kilowatt (kW). This represents a decrease of $780/kW or 33% from the apparent peak in average costs of installed projects in 2009 and 2010. Early indications from a limited sample of projects under construction (anticipating completion in 2016) during report preparation suggest no material change in capacity-weighted average installed costs in 2017 (Wiser & Bolinger, 2017).

By way of further comparison, the costs of wind energy facilities recently completed by affiliates of the Applicant in Ohio and Indiana averaged around [redacted] per kW. These costs are not substantially different from the average cost estimated for the Facility.

(3) Present Worth and Annualized Capital Costs

Capital costs will include development costs, construction design and planning, equipment costs, and construction costs. The costs will be incurred within a year or two after the start of construction. Therefore, a present worth analysis is essentially the same as the costs presented in Section 4906-4-06(B)(1) of this Application. As alternative project areas and facilities were not considered in this Application, the capital cost information in this section is limited to the proposed Facility.

(C) OPERATION AND MAINTENANCE EXPENSES

(1) Estimated Annual Operation and Maintenance Expenses

For the first two years of commercial operation, staffing is estimated to be $[redacted] per year and maintenance could range between $[redacted] and $[redacted] per year.

(2) Operation and Maintenance Cost Comparisons

O&M costs are a significant component of the overall cost of wind projects, but can vary widely between facilities. The Berkeley National Laboratory has compiled O&M cost data for 159 installed wind power projects in the U.S., totaling 13,120 MW of capacity, with commercial operation dates of 1982 through 2015. On average, facilities installed more recently have incurred lower O&M costs. Capacity-weighted average O&M costs for projects constructed in the 1980s are approximately $69/kW per year. The O&M costs dropped from $69/kW per year in the 1980s to $57/kW per year for projects installed in the 1990s, to $28/kW per year for projects installed in the 2000s, and to $27/kW per year for projects installed since 2010. It has been suggested that the larger, more sophisticated designs used at modern wind energy facilities may experience lower overall O&M costs on a per-MWh basis when compared to older turbine models (Wiser & Bolinger, 2017).

The O&M costs for the Facility are estimated to be approximately $[redacted]/kW per year, depending on the maturity of the project in a given year of its life cycle, totaling $[redacted] over its 30-year lifetime. These estimated O&M costs exclude any other ongoing expenses related to environmental monitoring, property taxes, land royalties, reverse power, and insurance. These costs will be consistent with the average costs compiled by NREL, as described above. The O&M costs for the Facility will be similar to O&M costs at other operating facilities in Ohio that are operated by affiliates of the Applicant, for which modelled costs range from approximately $[redacted]/kW per year in 2025 to [redacted]/kW in 2040.

(3) Present Worth and Annualized Operation and Maintenance

The annual O&M costs itemized in Section 4906-4-06(C)(1) will be subject to real and inflationary increases. Therefore, these costs are expected to increase with inflation after the first two years. The Net Present Value of the O&M costs, using an inflation rate of 2% and arbitrary 10% discount rate, is between $[redacted] and $[redacted] As alternative project areas and facilities were not considered in this Application, the O&M cost information in this section is limited to the Facility.

(D) COST OF DELAYS

The monthly delay costs would depend on various factors. If the delay were to occur during construction, the costs would include lost construction days and the costs associated with idle crews and equipment. This is estimated to be $[redacted] to $[redacted]per month. There could also be penalties associated with failing to meet a delivery deadline under a potential Power Purchase Agreement. In addition, significant losses would be incurred if the delays prevented the Facility from meeting deadlines to qualify for the existing federal Investment Tax Credit. Prorating these delay costs monthly would not be meaningful, as the lost opportunity is triggered at a single deadline and does not accrue over time.

(E) ECONOMIC IMPACT OF THE PROJECT

Information provided in this section was informed by the Socioeconomic Report, prepared by EDR (see Exhibit H). The proposed Paulding Wind Farm IV Facility is anticipated to have local and statewide economic benefits. Wind power development, like other commercial development projects, can expand the local, regional, and statewide economies through both direct and indirect means. Income generated from direct employment during the construction and operation phases of the wind farm is used to purchase local goods and services, creating a ripple effect throughout the state. The economic development impacts of the Facility include onsite jobs and earnings, economic output from these onsite earnings, local revenue/supply chain jobs and earnings, economic output from these local revenue/supply chain earnings, induced jobs and earnings, and economic output from these induced jobs and earnings (see Part IV of Exhibit H for a description of impacts and indicators).

(1) Construction and Operation Payroll

It is anticipated that construction and operation of the proposed Facility will directly generate employment of an estimated 215 construction and operation positions for Ohio residents. It is estimated that the annual earnings for the construction jobs will be approximately $11.1 million. Facility construction labor wages for similar construction positions within the Toledo region range from an average of $18.64 per hour for construction laborers, $31.11 for electricians, and $45.85 for construction managers (Bureau of Labor Statistics, 2017). Local, regional, and statewide employment during the construction phase will primarily benefit those in the construction trades, including equipment operators, truck drivers, laborers, and electricians. Facility construction will also require workers with specialized skills, such as crane operators, turbine assemblers, specialized excavators, and high voltage electrical workers. It is anticipated that many of the highly-specialized workers will come from outside the area and will remain only for the duration of construction.

The operation and maintenance of the proposed Facility is estimated to generate annual earnings of approximately $0.5 million. These jobs are anticipated to be comprised of project management, technician, and administrative personnel. Wage rates are projected to be consistent with statewide averages which are estimated to be $18.86 per hour for payroll and timekeeping clerks, $25.55 per hour for industrial engineering technicians, and, $51.21 for industrial production managers (Bureau of Labor Statistics, 2017).

(2) Construction and Operation Employment

Demand for new jobs associated with the Facility will be created during both the construction period and the years following construction, in which the Facility is in operation. The money injected into the statewide economy through the creation of these jobs will have long-term, positive impacts on individuals and businesses in Ohio as it ripples through the economy.

Jobs that will be created by the proposed Facility will include workers who will be directly employed to construct and subsequently operate and maintain the wind farm (approximately 215 in total, including 7 jobs during operation). In addition, other jobs will be created that play a supportive role. The increased wealth from jobs and spending will have a ripple effect in the local economy, thereby creating the need for additional jobs in the area, as the wages of the locally-based workers go toward the support of household and local businesses.

Turbine manufacturing and supply chain industries could in turn generate an additional 327 jobs across the State of Ohio over the course of Facility construction. In addition, Facility construction could induce demand for 135 jobs statewide through the spending of additional household income. The total impact of potentially 670 new jobs could result in up to $37.4 million of earnings, assuming a 2019 construction schedule and wage rates consistent with statewide averages. Operations and maintenance should also generate new jobs in other sectors of the economy through supply chain impacts and the expenditure of new and/or increased household earnings. Increased employment demand throughout the supply chain is estimated to result in approximately eight jobs with annual earnings of approximately $0.5 million. In addition, it is estimated that nine jobs with associated annual earnings of $0.4 million will be induced through the increased household spending associated with Facility operations. In total, while in operation, this Facility is estimated to generate demand for 22 jobs per year with annual earnings of approximately $1.4 million. Total economic output could also increase by an estimated $4.2 million as a result of Facility operations and maintenance.

(3) Local Tax Revenues

The proposed Facility will have a significant positive impact on the local tax base, including local school districts and other taxing districts that service the area where the proposed wind farm is to be located. Taxing districts within the Project Area include five municipalities (Benton, Blue Creek, Crane, Harrison, and Paulding Townships) in Paulding County, along with three school districts (Wayne Trace Local School District, Antwerp Local School District, and Paulding Exempted Village School District).

The amount of the annual service payment depends on the ratio of Ohio-domiciled full-time equivalent (FTE) employees to total FTE employees during construction or installation. The base payment ranges from $6,000 to $8,000 per MW of nameplate capacity. The county could also require that an additional service payment be made to the county's treasurer. However, in accordance with ORC Section 5727.75, the total annual payment cannot exceed $9,000 per MW.

The Applicant anticipates that it will pay real and personal property taxes between the minimum and maximum rate set under ORC Section 5727.75; between $6,000 to $9,000 per MW of nameplate capacity per year during the life of the Project. Assuming an aggregate nameplate capacity of 125.1 MW, the increase in local tax revenues will be between $750,600 and $1.125 million annually for the Facility. It is important to note that the proposed Facility will make few, if any, demands on local government services. Therefore, payments made to local governments will be net positive gains and represent and important economic benefit to the local area.

(4) Economic Impact on Local Commercial and Industrial Activities

Wind power development can expand the local economy through ripple effects. Ripple effects stem from subsequent expenditures for goods and services made by first-round income from the development. A direct effect or impact arises from the first round of buying and selling. Direct effects include the purchase of inputs from local sources, the spending of income earned by workers, annual labor revenues, and the income effect of taxes. These direct effects can be used to identify additional, subsequent rounds of buying and selling for other sectors and to identify the effect of spending by local households. The indirect effect or impact is the increase in sales of other industry sectors in the region, which include further round-by-round sales. The induced effect or impact is the expenditure generated by increased household income resulting from direct and indirect effects. The total effect or impact is the sum of the direct, indirect, and induced effects.

The proposed Facility will have a beneficial impact on the local economy. In addition to jobs and earnings, the construction of the Facility is expected to have a positive impact on economic output, a measurement of the value of goods and services produced and sold by backward-linked industries. Economic output provides a general measurement of the amount of profit earned by manufacturers, retailers, and service providers connected to a given project. The value of economic output associated with Facility construction is estimated to be $98.7 million. Between workers' additional household income and industries' increased production, the impacts associated with the Facility are likely to be experienced throughout many different sectors of the statewide economy.

(F) PUBLIC RESPONSIBILITY

(1) Public Interaction

The Applicant has been working in Paulding County for nine years, developing constructing, and operating two wind farm facilities. The Applicant takes great pride in taking care of the community, by construction and operating the wind farm according to the permits and lease agreement commitments made with the landowners and the State of Ohio. With the Applicant's excellent track record with constructing and operating wind farms in the surrounding area, the community leaders and landowners desire for the Applicant to build more wind in Paulding County. The Applicant will continue to make general information about wind power and specific information about the proposed Facility available to community members, elected officials, the media, and local civic organizations. Information has been shared through, among other activities, a public meeting on April 4, 2018 in Paulding County.

The Applicant maintains an informational website for the Facility (https://www.edprnorthamerica.com/). This site provides Facility information, along with news releases and general information about wind power resources and the benefits of wind power.

A complaint resolution procedure will be implemented to ensure that any complaints regarding Facility construction or operation are adequately investigated and resolved. A toll-free number will be set up to receive and formally document all complaints, which will then be investigated by onsite Facility staff. This complaint resolution process will be formalized with OPSB Staff before construction begins. At least seven days prior to the start of construction, the Applicant will mail a notice to affected property owners and tenants summarizing the upcoming construction activities, details of the Complaint Resolution Plan, and other sources of information about the Facility. A draft Complaint Resolution Plan is attached hereto as Exhibit V.

(2) Liability Insurance

The Applicant will acquire and maintain throughout the term of the Facility, at its sole cost, insurance against claims and liability for personal injury, death, and property damage arising from operation of the Facility. The insurance policy or policies will insure the Applicant to the extent of their interests. The limits of the insurance policy described will insure against claims of $1,000,000 per occurrence and $2,000,000 in the aggregate. In addition, Applicant shall acquire and maintain throughout the construction and operation period, at its sole cost, Umbrella Coverage against claims and liability for personal injury, death, and property damage arising from the operation of the Facility. The limits of the excess liability insurance will insure against claims of $10,000,000 per occurrence and $10,000,000 in the aggregate.

The Applicant will work with the Paulding County Engineer to develop a road use agreement (or a similar document) that will ensure any potential damage to public roads from construction-related traffic is repaired. As part of the agreement, the Applicant will complete a detailed engineering report prior to construction to estimate the capacity of the existing roads. Furthermore, a road bond, or other similar surety, will be established through the Engineer's Office to provide adequate funds to repair any damage to public roads.

(3) Roads and Bridges

ORC Section 5727.75 requires the Applicant to repair and restore roads, bridges, and culverts that become damaged by the Facility and requires posting of a bond in favor of the County Commissioners to ensure funding for such work. The statute also empowers the County Engineer to require the Applicant to enter into an agreement regarding roadway use, commonly referred to as a Road Use Agreement (RUA). It is expected that the Pauling County Engineer will require a RUA, which will contractually bind the Applicant to its statutory roadway protection responsibilities.

At this point, the Applicant has made the following determinations with respect to roadway improvements and protection, which shall form the basis of the RUA or the Applicant's operations if a RUA is not required.

State and local roads in the vicinity of the Project Area will experience increased traffic during Facility construction due to the delivery of materials and equipment. Information provided in this section was obtained primarily from the Transportation Study prepared by Fisher Associates, P.E., L.S., P.C. (Fisher), attached hereto as Exhibit F. The study identifies a primary route to the Project Area, evaluates the existing local roadway conditions, describes the anticipated impacts from construction vehicles and equipment delivery, and identifies mitigation measures to address identified impacts. Specific to constraints, the Transportation Study identifies roadway limitations for load, pavement width, pavement condition, height, grades, intersection radii, and sharp curve radii. The evaluation also identifies locations where improvements to the road are likely needed to accommodate the size of the delivery and construction vehicles and are depicted in Exhibit F. This study will be submitted to the Paulding County Engineer.

Construction/Delivery Vehicles: To deliver the turbine components, concrete, gravel, equipment, and construction workers to each turbine site during the construction of the Facility, the roads will experience increased truck traffic. Standard construction traffic will consist of gravel/dump trucks, concrete trucks, excavation equipment, conventional semi-trailers, transport/tool vehicles, and employee vehicles. These standard construction vehicles should not require physical modifications to the roadways to accommodate their presence.

Delivery of the wind turbine components will utilize Over-Size/Over-Weight (OS/OW) trucks to bring the components from the manufacturer to the study area. The OS/OW trucks are special hauling vehicles with unique lengths, widths, heights, and weights depending on the component being transported.

The transportation provider (i.e., hauling contractor) delivering the turbine components will further evaluate all primary, secondary, and tertiary roadways prior to construction as part of the Special Hauling Permit processor pursuant to any RUAs. A Special Hauling Permit is required for vehicles and/or loads that exceed the legal maximum dimensions or weights specified by Special Hauling Permit Section of the Ohio Department of Transportation (ODOT). Transportation of the blades, nacelles, and tower sections will require Special Hauling Permits for criteria that exceed state highway limits. Each overweight or oversized vehicle must receive a separate Special Hauling Permit from ODOT for hauling across State Routes and from those counties, townships, and municipalities whose roadways will be affected, as set forth in ORC Section 4513.34. Oftentimes township officials will "piggyback" their Special Hauling Permits with those issued by the County Engineer. The specifications of the Special Hauling Permit depend on the characteristics of the vehicle, its cargo, and the duration of the delivery schedule. If any vehicle exceeds 120,000 pounds, 14 feet wide, or 14.5 feet in height, a permit via the "super load" process will be required. See Section 4906-4-06(F)(4) below for further discussion on transportation permits.

Delivery Route: A final delivery route has not yet been finalized; however, for the purposes of the Transportation Study, it is assumed the proposed delivery route to the Project Area begins from two locations. The first location is from Interstate 24 and south onto State Route 49 where it disperses through the area of the Facility north of the railroad. The second location is from Interstate 30 and north onto State Route 49 where it disperses through the area of the Facility south of the railroad. Exhibit 6 of the Transportation Study includes a map of the preliminary delivery route.

All intersections being used by the OS/OW trucks will need improvements to accommodate the OS/OW vehicles. Exhibit 6 of the Transportation Study details the improvements necessary to accommodate the OS/OW vehicles. With regard to bridge impacts, Fisher obtained information regarding bridge structure type and history from Paulding County and the ODOT Bridge Management System bridge inspection reports inventory. There are no "posted" bridge crossings along the specified route. A bridge or is "posted" if it does not meet ODOT's loading/inspection requirements. It was assumed that any culvert with less than 2 feet of cover may be susceptible to damage during construction activities. These locations will be further analyzed during final engineering to determine if improvements are necessary prior to construction.

During the Transportation Study, Fisher investigated the roads for height limitations, such as bridges and utility lines. There are no overhead bridges or structures that will prevent truck movement within the Project Area. Overhead wires are located throughout the Project Area and will need to be temporarily raised to accommodate construction traffic. The Applicant will coordinate and obtain permits from the utility companies in order to adjust the utility lines crossing the roadways. The actual heights and proposed modifications will be included in the route survey for the Special Hauling Permits from the state.

Impacts and Mitigation: During construction activities, local traffic may experience minor delays due to slow moving vehicles and increased construction related traffic. As the existing traffic volumes are low, local traffic flow should not be significantly impacted by standard construction traffic or during OS/OW load transport. Most of the impacts will be to transportation infrastructure due to roadway improvements for oversize vehicles. Intersection radii will generally need to be improved to 200 feet. Overhead utility lines will need to be raised in some areas to accommodate over-height vehicles. Culvert reinforcement projects are also likely along main delivery routes for heavy vehicles. All such improvements will be first approved by the relevant public authority and identified in any RUAs or Final Transportation Routing Plan.

There are locations along the identified routes where component delivery vehicles and construction traffic will cross into opposing lanes of traffic. Escort vehicles, flag persons, and/or temporary traffic signals may be used to allow the safe passage of the OS/OW vehicles.

Prior to construction, the selected transportation provider will obtain all necessary permits from ODOT and the Paulding County Engineer and any affected townships (see Section 4906-4-06(F)(4) below for further discussion on transportation permits). All public upgrades that may be required to accommodate construction vehicles will be identified as part of the Final Transportation Routing Plan, or any RUAs, based on the routes selected. The following mitigation techniques may be utilized to avoid or minimize transportation-related impacts and/or to provide long-term improvement to the local road system:

<u>Insufficient Roadway Conditions</u>

- Repair roadways if damaged by construction traffic using the appropriate treatment to reestablish the preconstruction surface conditions.

<u>Insufficient Roadway Geometry</u>

- Constructing appropriate turning radii at intersections where construction traffic is anticipated. This includes clearing and grubbing of existing vegetation, relocating traffic signs, fences, and utility poles, grading of the terrain to accommodate the improvement, extension of existing drainage pipes and/or culverts, reestablishment of ditch line if necessary, and construction of a suitable roadway surface to carry the construction traffic based on the existing geotechnical data.

Insufficient Cover Over Drainage Structures

- Additional cover over pipes
- Reinforce pipes with bracing
- Use bridge jumpers to clear pipes
- Use bridge plates to distribute vehicle loading
- Replace pipes prior to construction
- Replace pipes during construction

Insufficient Vertical Clearance

- Temporarily raise overhead utility lines

Upon completion of the Facility, the Applicant will return all roadways to their preconstruction conditions (i.e., the condition of the roadway will be the same or better than it was prior to construction). The process of documenting roadway conditions and restoring impacted roads after construction will be performed in conjunction with local permitting and any RUAs. In addition, ODOT may review all bridges to be used for construction during the Special Hauling Permit application process.

Based on information collected during the Transportation Study field investigation, delivery vehicle assumptions, and information available from ODOT, sufficient infrastructure exists via primary roads to transport the turbine components to the Project Area. A number of intersection radii improvements will be required (see Exhibit 6 of the Transportation Study). A transportation provider experienced with oversized loads will be engaged to provide a Final Transportation Routing Plan including all primary, secondary, and tertiary roads. The plan will be performed in conjunction with the special hauling permit process for ODOT and the county and any township authorities, as well as any RUAs, as discussed in Section 4906-4-06(F)(4) below. Construction plans will be prepared for any roadway or intersection improvements in accordance with any RUAs or the Final Transportation Routing Plan. All temporary improvements will be restored to their preconstruction condition following completion of construction. All work will be coordinated and approved by the appropriate public authority prior to construction.

(4) Transportation Permits

Prior to construction, the selected transportation provider will obtain all necessary permits from ODOT and the Paulding County Engineer. It is anticipated that permits will be required for oversized loads, new access points, improving existing roadways, and crossing highways with buried electrical interconnects. To the extent that public roads will be utilized and potentially damaged from construction-related traffic, the Applicant will work with the Paulding County Engineer to ensure that such damage is repaired. Furthermore, a road bond, or other similar surety, will be established through the Engineer's Offices to provide adequate funds to repair any damage to public roads. The RUA will outline the financial terms and methods for the Applicant to provide adequate funds.

ODOT special hauling permits are required when loads exceed legal dimensions or weights. Transportation of the blades, nacelles, tower sections, and cranes will require special hauling permits for a variety of criteria. Each vehicle must receive an individual special hauling permit from ODOT, as the specifications of the permit depend on the characteristics of the vehicle, its cargo, and duration of the delivery schedule. If any vehicle exceeds 120,000 pounds, 14 feet wide, or 14.5 feet in height, a permit via the "super load" process is required.

(5) Decommissioning

Megawatt-scale wind turbine generators typically have a life expectancy of 20 to 25 years. The current trend in the wind energy industry has been to replace or "re-power" older wind energy projects by upgrading older equipment with more efficient turbines. However, if the turbines are non-operational for a period of 12 continuous months, or determined to be in a state of disrepair, the wind farm, or individual turbines will be decommissioned.

At the end of the useful life of the Facility, the Applicant will dismantle and remove Facility improvements and other above-ground property owned or installed by EDPR and transport it off site. Below-ground structures, such as turbine foundations/footings and buried interconnect lines, will be removed to a minimum depth of 36 inches and transported off site. Any underground infrastructure installed to a greater depth will remain in place. The Applicant will re-grade disturbed areas, restoring slopes and contours to their original grade, to the extent possible. Upon request of the landowner, the Applicant may consider allowing roads, foundations, buildings, structures, or other improvements to remain in place. However, the Applicant will not be obligated to leave any components or improvements and will only consider such action so long as it does not violate any permits or legal requirements.

The Applicant will provide a final decommissioning plan to the OPSB and Paulding County Engineer at least 30 days prior to the preconstruction conference. Additional details regarding decommissioning of the Facility are described in Section 4906-4-09(I).

4906-4-07 COMPLIANCE WITH AIR, WATER, SOLID WASTE, AND AVIATION REGULATIONS

(A) PURPOSE

This section provides environmental data regarding air, water, and solid waste in terms of current site conditions, potential impacts of the proposed Facility, and any proposed mitigation measures. The Applicant will comply with regulations for air and water pollution, solid and hazardous wastes, and aviation.

(B) AIR

(1) Preconstruction

(a) *Ambient Air Quality*

The Ohio EPA Division of Air Pollution Control publishes air quality data for the state of Ohio annually. The most recent summary of air quality data available for the state is the *Division of Air Pollution Control 2016 Annual Report* (Ohio EPA, 2018a). Included in this report are a summary of 2016 air quality data, a discussion of toxics monitoring projects, and trend studies for selected pollutants. No air monitoring sites exist in Paulding County, or in adjacent Defiance, Putnam, or Van Wert Counties. Allen County is the closest monitoring station and tracks sulfur dioxide (SO_2), particulate matter less than 2.5 microns in diameter ($PM_{2.5}$), and ozone (O_3). SO_2 in Allen County is low compared to other monitoring stations in Ohio, while $PM_{2.5}$ and O_3 values were moderate compared to other monitoring stations in Ohio. There were no violations of National Ambient Air Quality Standards (NAAQSs) reported at any monitoring station in the vicinity of the Project Area (Ohio EPA, 2018a). As described previously, there are no alternative areas for the Facility.

Air emissions in the area are related primarily to farm operations, vehicular travel, and manufacturing. Vehicles traveling area roads and operating farm equipment produce exhaust emissions, along with dust from unpaved road surfaces and exposed agricultural soils. In addition, routine odors are associated with certain farming practices (e.g., manure-spreading). The greatest sources of manufacturing emissions near the Project Area in Paulding County originate from two Gerken Materials Inc. plants in Paulding County, one approximately 4.5 miles east and the other approximately 11 miles northeast; Lafarge North America located approximately three miles northeast of the proposed Facility; AL-CO Products Inc. located approximately two miles east of the proposed Facility; and Systech Environmental Corporation located approximately three miles northeast of the proposed Facility (Ohio EPA, 2018b)

(b) *Air Pollution Control Equipment*

Wind turbines generate electricity without releasing pollutants into the atmosphere. Therefore, air pollution control equipment is not required for the proposed Facility.

(c) *Air Quality Standards and Limitations*

In accordance with Section 111 of the Clean Air Act Extension of 1970, the US EPA established New Source Performance Standards (NSPSs) to regulate emissions of air pollutants from new stationary sources. The OAC regulations do not contain any NSPS regulations for the Project Area beyond those promulgated at the federal level. These standards apply to a variety of facilities including landfills, boilers, cement plants, and electric generating units fired by fossil fuels. Because wind turbines generate electricity without releasing pollutants into the atmosphere, NSPSs do not apply to the proposed Facility.

The Clean Air Act, as amended by the Clean Air Act amendments of 1990, requires the US EPA to set NAAQSs (40 CFR part 50) for pollutants considered harmful to public health and the environment. The US EPA Office of Air Quality Planning and Standards has set NAAQSs for six principal pollutants, which are called "criteria" pollutants and include carbon monoxide, lead, nitrogen dioxide, particulate matter, O_3, and SO_2. As described above, no air quality monitoring occurs in Paulding County; however, monitoring occurs in Allen County. No violations of NAAQSs were reported in the vicinity of the Project Area (Ohio EPA, 2018).

All new sources of air emissions in Ohio are required to obtain a PTI for Title V facilities, or a Permit to Install and Operate (PTIO) for non-Title V facilities. Because wind turbines generate electricity without releasing pollutants into the atmosphere, the proposed Facility will not require a PTI or PTIO.

Administered by the US EPA, the Acid Rain Program was established by the Clean Air Act Amendments of 1990 to reduce emission of SO_2 and nitrous oxide (N_2O) through regulatory and market-based approaches. Because wind turbines generate electricity without releasing pollutants into the atmosphere, the proposed Facility will not require an acid rain permit.

Prevention of Significant Deterioration (PSD) applies to new major sources of pollutants, and/or major modifications at existing sources for pollutants where the source is located in an area in attainment or unclassifiable with the NAAQSs. The proposed Facility will not be a major source of any pollutants. Therefore, PSD does not apply.

(d) *List of Required Air Pollution Permits*

Wind turbines generate electricity without releasing pollutants into the atmosphere. Therefore, it is not anticipated that the Applicant will need any air pollution permits for the proposed Facility. However, if during final design it is determined that air pollution permits are needed, the Applicant will obtain all appropriate permits.

(e) *Air Quality Map*

As per OAC Rule 4906-4-07(B)(1)(e), this requirement does not apply to wind farms.

(f) *Compliance with Permits and Standards*

As indicated above, wind turbines generate electricity without releasing pollutants into the atmosphere. Therefore, no air pollution permits are required. However, fugitive dust rules adopted pursuant to the requirements of ORC Chapter 3704 may be applicable. The Applicant will control fugitive dust using several practices, as described below in Section 4906-4-07(B)(2).

(2) Plans to Control Air Quality During Site Clearing and Construction

Best management practices will be utilized and implemented to minimize the amount of dust generated by construction activities. All construction vehicles will be maintained in good working condition to minimize emissions from construction-related activities. In addition, the extent of exposed/disturbed areas on the site at any one time will be minimized and restored/stabilized as soon as possible. Water or a dust suppressant such as calcium carbonate will be used to suppress dust on unpaved roads (public roads, as well as Facility access roads) as needed throughout the duration of construction activities. Any unanticipated construction-related dust problems will be identified and immediately reported to the construction manager and contractor.

(3) Plans to Control Air Quality During Facility Operation

As per OAC Rule 4906-4-07(B)(3), this requirement does not apply to wind farms.

(C) WATER

(1) Preconstruction

(a) *List of Required Permits to Install and Operate the Facility*

Prior to the start of construction, the Applicant will obtain the following permits:

- The Ohio NPDES construction storm water general permit, Ohio EPA Permit No. OHC000004
- A nationwide permit under Section 404 of the Clean Water Act, (if necessary as determined after final engineering).
- A Water Quality Certification from the Ohio EPA (as determined after final engineering)
- An Ohio Isolated Wetland Permit (as determined after final engineering)

(b) *Water Quality Map*

The Facility will not discharge water or waste into streams or water bodies, nor will Facility operation require the use of water for cooling or any other activities. Furthermore, the Facility will add only small areas of impervious surface, which will be dispersed throughout the Project Area, and will have a negligible effect on surface water runoff and groundwater recharge. Therefore, measurable impacts on the quality of surrounding water resources are not anticipated. Since there are no bodies of water likely to be affected by the proposed Facility, this section is not applicable.

(c) *Description of Water Monitoring and Gauging Stations*

As described above in Section 4906-4-07(C)(1)(b), there are no bodies of water likely to be affected by the proposed Facility. Therefore, this section is not applicable.

(d) *Existing Water Quality of Receiving Stream*

The Facility will not discharge water or waste into streams or water bodies. Therefore, there will be no receiving streams and this section is not applicable.

(e) *Permit Application Data*

The Facility will not discharge any water. Therefore, this section is not applicable.

(2) Construction

(a) *Water Quality Map*

As described above in Section 4906-4-07(C)(1)(b), measurable impacts on the quality of surrounding water resources are not anticipated. Since there are no bodies of water likely to be affected by the proposed Facility, this section is not applicable.

(b) *Quantity/Quality of Construction Runoff*

The proposed Facility will not result in wide-scale conversion of land to impervious surfaces. Tower bases, crane pads, access roads, and the substation in total will add approximately 54.2 acres of impervious surface to the approximately 12,819 acres of leased land (i.e., conversion of approximately 0.4%). Consequently, no significant changes to the rate, make-up, or volume of storm water runoff are anticipated.

Construction of the proposed Facility could result in certain localized impacts to groundwater. Installation of turbine foundations has the greatest potential for such impacts. Based on the preliminary turbine design information, shallow foundations may be able to support the turbines. Due to the anticipated depth of bedrock in the area, blasting is not anticipated for construction. When required, blasting can generate seismic vibrations, fracture bedrock, and potentially impact localized groundwater levels. However, the turbine setback from residences helps to ensure that private wells will not likely be damaged or suffer reduced well yields, since private wells are typically located within 100 feet of residences. Therefore, construction is not anticipated to physically damage private wells or affect well yields.

In addition to potential impacts to groundwater due to turbine foundation installation, minor impacts could result from other Facility activities. Soil compaction from the use of construction equipment could limit the efficiency of surface water infiltration to groundwater. When soils are compressed, the pore spaces within the soil are decreased, which reduces water percolation. Construction of access roads will result in minor increases in storm water runoff that otherwise would have infiltrated into the ground at the road locations. However, areas so affected will be a miniscule percentage (0.2%) of the ground surface within the approximately 12,819 acres of leased land, and will not have a noticeable impact on groundwater recharge.

A final potential impact to groundwater is the possible introduction of pollutants to groundwater from accidental discharge of petroleum or other chemicals during construction. Such discharges could occur in the form of leaks from fuel and hydraulic systems, or as more substantial spills that could occur during refueling of vehicles or due to mechanical failures and other accidents. As described below, a Spill Prevention, Control, and Countermeasure (SPCC) Plan will be prepared that outlines procedures to be implemented to prevent the release of hazardous substances into the environment. In the event of a release, the SPCC Plan discusses how to contain and respond to the release.

(c) *Mitigation*

As described above, groundwater is not expected to be encountered, even if blasting is required. However, the construction process could potentially impact groundwater, should excavation or blasting occur below the water table or alter fractures in the rock that carry groundwater. Although it is not anticipated, any blasting necessary for construction of wind turbine foundations will be designed with appropriate charge weights and delays to localize bedrock fracturing to the proposed foundation area, thus minimizing the already unlikely chance of impacting water levels in residential wells. Should groundwater be encountered during excavation, water removal shall be conducted in accordance with the following best management practices:

- A sump pit shall be used to trap and filter water for pumping to a suitable discharge point.
- Clean pumped water shall be discharged to a vegetated and stabilized area (or to an appropriately sized level spreader or riprap energy dissipater) to prevent scouring of the receiving area.
- Sediment-laden water shall be pumped through a filter bag or into a sediment trapping device prior to discharge.
- No discharges shall occur directly to a receiving water body.

As mentioned in Section 4906-4-07(C)(1)(a), the Facility will require a NPDES Construction Storm Water General Permit (OHC000004) from the Ohio EPA. This permit is required for all construction sites disturbing 1.0 or more acres of ground. To obtain this permit, the Applicant will develop an SWP3, and file a Notice of Intent (NOI) letter with the Ohio EPA at least 21 days prior to the commencement of construction activities.

The SWP3 will address all minimum components of the NPDES permits and conform to the specifications of the Rainwater and Land Development manual, which describes Ohio's standards for storm water management, land development, and urban stream protection. The SWP3 will identify potential sources of pollution that may reasonably be expected to affect the quality of storm water discharges associated with construction activities. If applicable, the SWP3 will clearly identify all activities that will be authorized under Section 401 of the Clean Water Act and be subject to an anti-degradation review. The SWP3 will also describe and ensure the implementation of best management practices that reduce pollutants in storm water discharges during construction.

In addition to the SWP3, a SPCC Plan will be prepared that outlines procedures to be implemented to prevent the release of hazardous substances into the environment. This plan will not allow refueling of construction equipment within 100 feet of any stream or wetland, and contractors will be required to keep materials on hand to control and contain a petroleum spill, including a shovel, tank patch kit, and oil-absorbent materials. Any spills will be reported in accordance with federal and Ohio EPA Division of Emergency and Remedial Response regulations.

As described below in Section 4906-4-08(E)(2)(c), topsoil removal and de-compaction will occur in agricultural areas, which constitute the majority of the Facility footprint. These practices will also mitigate any potential impacts that soil compaction could have on infiltration of rain and snowmelt, thereby further reducing any potential impact to groundwater recharge. The construction footprint will be minimized by defining/delineating the work area in the field prior to construction and adhering to work area limits during construction. These measures will limit potential impacts of soil compression on normal infiltration rates.

On-site investigations were conducted to establish the locations of streams and wetlands, and Facility components were sited to avoid impacts to these resources to the maximum extent practicable. Impacts to surface waters will be minimized by utilizing existing or narrow crossing locations whenever possible and using arched bridges or other low-impact crossing methods. Upgrading existing crossings that are under-maintained/undersized will have a long-term beneficial effect on water quality, as it will help to keep farm equipment and other vehicles out of surface waters. Equipment restrictions, herbicide use restrictions, and erosion and sediment control measures will also be utilized to reduce adverse impacts to water quality, surface water hydrology, and aquatic organisms. In addition, vegetation clearing along stream banks and in wetland areas will be kept to an absolute minimum. For more information on mitigation measures to protect wetlands and surface water see Section 4906-4-08(B)(2)(b).

These mitigation measures will ensure that impacts to groundwater, surface waters, and wetlands are avoided or minimized to the maximum extent practicable during Facility construction.

(d) *Changes in Flow Patterns and Erosion*

As a result of the limited impacts discussed in Section 4906-4-07(C)(2)(b) and the mitigation measures discussed above in Section 4906-4-07(C)(2)(c), changes to flow patterns are not anticipated.

(e) *Equipment for Control of Effluents*

Facility operation will not involve the discharge of effluents into streams or water bodies. Therefore, this section is not applicable.

(3) Operation

(a) *Water Quality Map*

As described above in Section 4906-4-07(C)(1)(b), measurable impacts on the quality of surrounding water resources are not anticipated. Since there are no bodies of water likely to be affected by the proposed Facility, this section is not applicable.

(b) *Water Pollution Control Equipment and Treatment Processes*

The Facility will not require any water pollution control equipment or treatment processes. As such, this section is not applicable.

(c) *NPDES Permit Schedule*

As mentioned above, Facility construction will require an Ohio NPDES construction storm water general permit, Ohio EPA Permit No. OHC000004. The Applicant anticipates full and complete compliance with this permit. The NOI and associated fee for the Construction Activities General Permit will be filed at least 21 days prior to commencement of construction activities.

(d) *Quantitative Flow Diagram*

As explained in the following sub-sections, flow diagram information is not applicable to the proposed Facility.

(i) Sewage

The proposed Facility will use an existing O&M facility, which was previously permitted and constructed for the Paulding Wind Farm II facility. The O&M facility will generate sewage and wastewater comparable to a typical small business office. These waterborne wastes are disposed of through use of a septic system. No other Facility components will discharge measurable quantities of wastewater.

(ii) Blow-down

This section is not applicable, as wind turbines do not utilize blow-down equipment.

(iii) Chemical and Additive Processing

The proposed Facility will not require the use of chemical and/or additive processing. As such, this section is not applicable.

(iv) Wastewater Processing

Aside from the sewage generated at the O&M facility, discussed above in Section 4906-4-07(C)(3)(d)(i), the Facility will not process or generate wastewater. Therefore, this section is not applicable.

(v) Run-off and Leachates

The Facility is not expected to generate any run-off or leachates. Therefore, this section is not applicable.

(vi) Oil/water Separators

This section is not applicable because the Facility will not utilize any oil/water separators.

(vii) Run-off from Soil and Other Surfaces

Following completion of construction, temporarily impacted areas will be stabilized and restored to their preconstruction condition. Facility operation will not result in further soil disturbance, aside from occasional repair activities. Therefore, this section is not applicable.

(e) *Water Conservation Practices*

The O&M facility will use water at a rate comparable to a typical small business office. No other Facility components will use measurable quantities of water. Therefore, water conservation practices are not applicable.

The U.S. DOE, Office of Energy Efficiency and Renewable Energy issued a report detailing the water conservation benefits of wind energy as compared to thermoelectric power. According to this report, a 125 MW wind farm such as the proposed Facility will conserve approximately 197 million gallons of water annually because wind-powered electric generation facilities do not consume water as do conventional thermal power plants such as coal (NREL, 2006).

(D) SOLID WASTE

(1) Preconstruction

(a) *Nature and Amount of Solid Waste*

The Applicant is not aware of any debris or solid waste within the Project Area that would require removal for Facility development.

(b) *Plans for Waste Removal*

No waste removal is necessary or planned.

(2) Construction

(a) *Nature and Amounts of Construction Waste*

Facility construction will generate some solid waste, primarily plastic, wood, cardboard and metal packing/packaging materials, construction scrap, and general refuse. The amount of construction waste will be minimal.

(b) *Methods for Storage and Disposal of Construction Waste*

Construction waste will be collected from turbine sites and other Facility work areas, and disposed of in dumpsters located at the laydown yards. A private contractor will empty the dumpsters on an as-needed basis and dispose of the refuse at a licensed solid waste disposal facility. Waste materials will be recycled when possible. Used oil, used antifreeze, and universal waste will be handled, managed, and disposed of in accordance with federal, state, and local regulations.

(3) Operation

(a) *Nature and Amounts of Waste*

For the most part, Facility operation will not result in significant generation of debris or solid waste. Waste generated from the O&M facility could include wood, cardboard, metal packing/packaging materials, used oil, general refuse, universal waste, and used antifreeze. The O&M facility offices will generate solid wastes comparable to a typical small business office.

(b) *Methods for Storage and Disposal of Waste*

The O&M facility will utilize local solid waste disposal and recycling services. Used oil, used antifreeze and universal waste will be handled, managed, and disposed of in accordance with federal, state and local regulations.

(4) Licenses and Permits

Facility operation will not require acquisition of waste generation, storage, treatment, transportation, and/or disposal licenses or permits.

(E) COMPLIANCE WITH AVIATION REGULATIONS

(1) Aviation Facilities List and Map

There are no known public airports or helicopter pads within 5 miles of the Project Area. However, there are three private airports within 5 miles of the Project Area:

- Basting Airport is approximately 4.2 miles west of the Project Area,
- Buehler Airport is approximately 1.8 mile east of the Project Area, and
- Steinman Airport is approximately 4.2 miles west of the Project Area.

Figure 07-1 shows the private airports within 5 miles of the Project Area.

(2) FAA Filing Status and Potential Conflicts

The FAA is the authority in the U.S. government responsible for regulating all aspects of civil aviation, including issuing determinations on petitions for objects that penetrate the nation's airspace. The FAA conducts aeronautical studies for new structures that will exceed 200 feet in height under the provisions of Title 49 of the U.S. Code, Section 44718, and applicable Title 14 of the Code of Federal Regulations (CFR) 77. The FAA can issue two types of determinations, one that identifies a hazard and another that identifies no hazard.

The Applicant submitted completed Notices of Proposed Construction, Form 7460-1, to the FAA in February 2018. Upon receipt of these forms, the FAA obstruction group automatically notifies the ODOT Office of Aviation. The FAA and ODOT Office of Aviation will evaluate the proposed turbines and determine whether they are in compliance with the standards set forth in 14 CFR 77 and the ORC. It is anticipated that the proposed turbines will not exceed obstruction standards and will not be a hazard to air navigation.

Turbines will be marked and/or lit in accordance with FAA Advisory Circular 70/7460-1 K Change 2, Obstruction Marking and Lighting. Because no turbine will be constructed until the respective Determination of No Hazard has been issued, neither construction nor operation of the proposed Facility is expected to create any adverse impacts on the existing air travel network.

4906-4-08 HEALTH AND SAFETY, LAND USE, AND ECOLOGICAL INFORMATION

(A) HEALTH AND SAFETY

(1) Equipment Safety and Reliability

(a) *Major Public Safety Equipment*

Public safety concerns associated with Facility construction include: (1) the movement of large construction vehicles, equipment, and materials; (2) falling overhead objects; (3) falls into open excavations; and (4) electrocution. These issues are most relevant to construction personnel who will be working in close proximity to construction equipment and materials and exposed to construction related hazards on a daily basis. The risk of construction-related injury will be minimized through daily safety meetings, regular safety training, and the use of appropriate safety equipment. The Applicant has a rigorous safety program and is actively engaged with onsite personnel throughout construction. In addition, the Applicant only contracts with contractors who have a demonstrated safety record and who provide onsite safety managers who monitor safety and training on a daily basis.

The general public could also be exposed to construction-related hazards due to the passage of large construction equipment on area roads and unauthorized access to the work site [on foot, by motor vehicle, all-terrain vehicle (ATV), or snowmobile]. The latter could result in collision with stockpiled materials (soil, rebar, turbine components), as well as falls into open excavations. To ensure that local first responders are aware of these potential issues, the Applicant will meet with the local emergency service personnel (fire, police, and emergency medical services [EMS]) to review and discuss the planned construction process. However, because construction activities will adhere to industry safety standards and will occur primarily on private land well removed from adjacent roads and residences, exposure of the general public to construction-related risks/hazard is expected to be very limited. The Applicant takes great care to develop a transportation plan in consultation with local officials and to monitor all traffic on a daily basis to make sure that risks are greatly reduced. Additionally, the Applicant's contractor will send a daily email to all local officials, school bus drivers and members of the community that specifically informs interested parties about where work or the transportation of equipment will be occurring on public roads.

Wind turbines, due to their height, physical dimensions, and complexity, have the potential to present response difficulties to local emergency service providers and fire departments. Although the turbines contain relatively few flammable components, the presence of electrical generating equipment and electrical cables, along with various oils (lubricating, cooling, and hydraulic) does create the potential for fire or a medical emergency within the tower or the nacelle. The Applicant actively assists with the training of local emergency responders and puts into place protocols for handling emergency situations. The Applicant and wind turbine provider have several trained full time personnel who can properly and safely perform rescue operations. The presence of high voltage electrical equipment also presents potential safety risks to local responders. All turbines and electrical equipment will be installed according to National Fire Protection Association (NFPA) 70E code standards prior to being brought on line. This, along with implementation of built-in safety systems, minimizes the chance of fire occurring in the turbines or electrical stations. However, fire at these facilities could result from a lightning strike, short circuit or mechanical failure/malfunction. Any of these occurrences at a turbine would be sensed by the System Control and Data Acquisition (SCADA) system and reported to the Facility control center. Under these conditions, the turbines would automatically shut down and Facility maintenance personnel would respond as appropriate.

Lightning protection systems were first added to rotor blades in the mid-1990s, are now a standard component of modern turbines, and will be included on all turbines. These systems rely on lightning receptors and diverter strips in the blades that provide a path for the lightning strike to follow to the grounded tower. Lightning is effectively and safely intercepted at several receptor points including the outermost blade tip and the blade root surface, and transmitted to the wind turbine’s lightning conductive system. The turbines' blade monitoring system provides documentation of all critical lightning events. If a problem is detected, the turbine will shut down automatically, or at a minimum, be inspected to assure that damage has not occurred.

In the unlikely event that a wind turbine was to catch fire, it would typically be allowed to burn itself out while maintenance and fire personnel maintain a safety area around the turbine to protect against the potential for spot ground fires that might start due to sparks or falling material. Power to the circuit of the Facility with the turbine fire is also disconnected. An effective method for extinguishing a turbine fire from the ground does not exist, and the events generally do not last long enough to warrant attempts to extinguish the fire from the air. However, since the public does not have access to the private land on which the turbines are located, risk to public safety during a fire event is essentially non-existent. In addition, transformers at the substation are equipped with a fire suppression system. This system will quickly extinguish any fires that occur at the Facility substation.

Generally, any emergency/fire situations at a wind turbine site or substation that are beyond the capabilities of the local service providers will be the responsibility of the Facility owner/operator. Construction and maintenance personnel (and properly trained and equipped regional responders) will be trained and will have the equipment to deal with emergency situations that may occur at the Facility site (e.g., tower rescue, working in confined spaces, high voltage, etc.). Consequently, such an incident would generally not expose local emergency service providers or the general public to any public health or safety risk. The Applicant will include local rescue workers in regular joint training for the emergency procedures specific to the turbine model used for the Facility. This would provide additional trained rescue personnel in the unlikely case of injury or other accident occurring in the turbines.

The turbines proposed for the Facility will utilize appropriate ice detection equipment that would cause turbines to enter into a pause or stop mode until the ice conditions disappear. The Applicant has committed to using this measure in Section 4906-4-09(E)(1)(c) of this Application. For example, systems currently in place monitor the temperature and conditions on the detection unit. If ice starts to form on this unit, it will send a command to the turbine to shut down. Most modern wind turbines also monitor the wind speed to power output ratio. If ice accumulates on the blades, this ratio becomes too high and the turbine will stop itself.

(b) *Equipment Reliability*

Equipment reliability is an important criterion in turbine selection. As described in Section 4906-4-03(B), turbine models that have been determined to be suitable for this site include the Siemens Gamesa 126, 132, and 145, Vestas 136and 150, and Acciona 132 and 140. These turbines are independently certified as meeting international design standards by independent product safety certification organizations such as Germanischer Lloyd and Underwriters Laboratories. These certifications require that the wind turbines have a design life of at least 20 years for the specified wind regime. The wind regime considers factors such as weather extremes, average wind speed, wind gusts, and turbulence intensity. In addition to stringent design standards, turbines are equipped with monitoring equipment that will shut down the turbines in the event of excessive blade vibrations or when wind speeds exceed maximum values. This equipment is regularly maintained on a preventative maintenance schedule to ensure continued operation. Once the turbine model that will be used for the Project is chosen, in accordance with OAC Rule 4906-4-09(G)(3), the Applicant will submit a certificate of design and compliance from the equipment manufacturer(s) from and underwriter laboratory.

(c) *Generation Equipment Manufacturer's Safety Standards*

Exhibit W consists of manufacturer's safety manuals for the wind turbines proposed to be used at the proposed Facility. These manuals address safety measures specific to operations and maintenance employees, such as first aid, protection against falls, and personal protective equipment. A copy of the safety manual for the final turbine model selected will be kept in the Facility's O&M building as described in Section 4906-4-09(A)(2)(a) of this Application.

(d) *Measures to Restrict Public Access*

The public does not have access to the private land on which the Facility is located; hence, the public would encounter the proposed Facility only by trespassing. There will be signs at the intersection of public roads and access roads identifying the turbine(s) served by the access road and prohibiting unauthorized entry. If a fence already exists, then a gate will be installed; otherwise, access roads will not have gated entrances. The Project substation will be enclosed by a chain link fence. The doors at the base of the turbines are locked to prevent unauthorized access to the interior of the turbines.

(e) *Fire Protection, Safety, and Medical Emergency Plans*

All Facility employees and contractors will be required to adhere to a Health and Safety Plan (HSP) and an Emergency Action Plan (EAP). Preliminary versions of these documents are attached as Exhibit X. The final HSP and EAP will be developed with consultation from all necessary local emergency services, including medical facilities. To ensure that local first responders are aware of potential issues, the Applicant will consult with the local emergency service personnel (fire, police, and EMS) to review and discuss the planned construction process. The Applicant will include local rescue workers in regular joint training for the emergency procedures specific to the turbine model used for the Facility. In addition to training, the Applicant typically will equip fire and emergency responders with proper equipment to enable them to respond to emergency situations.

(2) Probable Impacts due to Failures of Pollution Control Equipment

Wind farms are not required to address this section. However, the Applicant notes that, wind turbines generate electricity without combusting fuel or releasing pollutants into the atmosphere.

(3) Sound

Tetra Tech was retained by the Applicant to evaluate potential sound impacts from the proposed Facility (see Exhibit I). The study consists of two principal phases: (1) a background sound level survey; and (2) a computer modeling analysis of future turbine sound levels. The report also includes a primer on the science of sound, an overview of relevant standards and precedents that apply to the proposed Facility, and an evaluation of construction sound impacts. Additional information regarding sound levels at the proposed Facility is described in Section 4906-4-09(F) of this Application.

The purpose of the background sound level survey was to determine what minimum environmental sound levels are consistently present and available to mask or obscure potential sound from the Facility at locations representative of potentially sensitive receptors close to proposed turbines. The background sound level survey was performed to determine how much existing natural masking sound there might be at the nearest property lines and residences to the Facility. The relevance of this is that high levels of background sound, such as insects or the rustling of leaves on trees or corn stalks, act to reduce the audibility of the wind farm, while low levels of natural sound would permit operational sound from the turbines to be more readily perceptible. For a broadband sound source such as a wind farm, the audibility and potential impact of the new sound source is a function of how much, if at all, it exceeds the pre-existing background sound level.

An additional factor that is important in establishing the minimum background sound level available to mask potential wind turbine sound is the natural sound generated by the wind itself. Wind turbine sound is negligible when the rotor is at rest, it increases as the rotor tip speed increases, and is generally constant once rated power output and maximum rotational speed are achieved. Under this condition, the turbine maximum sound power level will be reached at approximately 6 m/s. As wind speeds increase, the background ambient sound level will generally increase as well, resulting in acoustic masking effects. Consequently, during periods of elevated wind speeds when higher wind turbine sound emissions occur, the sound produced by a wind turbine operating at maximum rotational speed may be largely or fully masked due to wind generated sound in foliage or vegetation, such as rustling leaves or grass.

Sound levels are presented on a logarithmic scale to account for the large pressure response range of the human ear, and are expressed in units of decibels (dB). Broadband sound includes sound energy summed across the frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum is often completed to determine tonal characteristics. The unit of frequency is Hertz (Hz), which corresponds to the rate in cycles per second that sound pressure waves are generated. Typically, a sound frequency analysis examines 11 octave (or 33 1/3 octave) bands ranging from 20 Hz (low) to 20,000 Hz (high). This range encompasses the entire human audible frequency range. Since the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system. Sound exposure in acoustic assessments is commonly measured and calculated as A-weighted dB (dBA).

Low frequency and tonal noise are often considered in the acoustic assessment of wind farms; however, neither phenomenon is typically an issue for modern wind energy facilities. The frequency range of 20 to 200 Hz is typically defined as low frequency noise. Extensive studies have shown that low frequency sound produced by modern wind turbines is generally below the threshold of human perception at standard setback distances. Acoustic energy concentrated in a narrow frequency range is defined as tonal. Modern wind turbines, such as the ones being analyzed for Timber Road IV, normally produce a broad spectrum of sound energy without such significant frequency concentrations.

Long-term sound level monitoring was carried out at the site from February 20 through February 14, 2018 at four different locations spread across the proposed Project Area. The microphones and windscreens were tripod-mounted at an approximate height of 1.5 to 1.7 meters (4.9 to 5.6 feet). Sound level data was collected using Larson Davis Model 831 sound level meters. The sound level meters logged A-weighted equivalent sound levels in 10-minute intervals.

The analyzers were programmed to sample and store A-weighted and octave band sound level data, including equivalent (Leq). The Leq is the average sound level over each measurement interval. Since Leq describes the average pressure, loud and infrequent sound has a greater effect on the resulting level than quieter and more frequent noises. Because it tends to weight the higher sound levels and is representative of sound that takes place over time, the Leq is the most commonly used descriptor in noise standards and regulations.

The overall average nighttime Leq sound for the four measurement positions (at wind speeds of 6 m/s) was 42 dBA, and the daytime average was 39 dBA[2]. In all cases the nighttime Leq levels are less than or equal to the daytime Leq levels, which is typical. Observations during equipment deployment indicate that the locations were relatively quiet with agricultural activities and sporadic noise from animals or roadways contributing to ambient sound level. The results show a generally homogenous ambient acoustic environment throughout the Project Area with limited variation in measured sound levels. The nighttime and daytime sound are summarized below in Table 08-1.

[2] At the critical design wind speed of 6 m/s (Tetra Tech, 2018).

Table 08-1. Sound Monitoring Summary

Monitoring Location	Time Period	Sound Level, Leq (dBA)									
		Wind Speed (m/s)									
		3	4	5	6	7	8	9	10	11	12
1	Day	43	44	44	44	45	45	46	46	47	48
	Night	39	39	39	40	41	41	42	43	44	46
2	Day	43	44	46	47	49	50	51	52	53	54
	Night	39	39	40	40	41	42	43	44	45	46
3	Day	43	44	46	47	49	51	54	56	59	62
	Night	34	35	35	36	37	38	39	40	41	43
4	Day	36	37	38	39	40	42	43	45	47	49
	Night	31	32	33	34	35	37	39	41	43	46
Project Area	Day	40	41	41	42	43	44	45	47	48	50
	Night	38	38	39	39	40	42	43	45	46	48

(a) *Construction Sound Levels at the Nearest Property Boundary*

Sound from construction activities associated with the Facility is likely to cause short-term but unavoidable impact at some of the homes in the vicinity of the Project Area. The sound levels resulting from construction activities vary significantly depending on several factors such as the type and age of equipment, the specific manufacturer and model, the operations being performed, and the overall condition of the equipment and exhaust system mufflers. The development of the Facility will involve construction to establish access roads, excavate and form wind turbine foundations, prepare the site for crane-lifting, and assemble and commission the wind turbines.

Construction of the Facility is anticipated to consist of the following five phases:

- Site clearing: The initial site mobilization phase includes the establishment of a temporary construction staging area that will contain temporary construction trailers, an area for the delivery and storage of equipment and parking. Installation of erosion and sedimentation control measures will be completed, as well as the preparation of initial haulage routes. Pre-construction public road work typically occurs during this first phase of construction.
- Excavation: During this phase excavation for private access roads and foundations will commence.
- Foundation work: Construction of the reinforced concrete turbine foundations would take place in addition to the installation of the underground internal collection system.
- Wind turbine installation: Delivery of the turbine components would occur followed by their installation and commissioning.

- Restoration: After certain temporary features are no longer needed for construction or delivery of wind turbine components, or other equipment restoration of these improvements will commence.

As required by OAC Rule 4906-4-08(A)(3)(a)(i) through (vi), the individual pieces of equipment likely to be used for each of these phases and sound levels at 50 feet (near) and 2,000 feet (far) are summarized below in Table 08-2. The expected construction sound levels at the nearest property boundary will be variable, given the varying distances between the turbine sites and property lines. As currently sited, the distance between proposed turbines and the nearest non-participating property line range from 700 feet to 3,430 feet. Construction sound levels at property lines are expected to be within or lower than the range of sound levels presented in Table 08-2.

Table 08-2. Estimated Sound Levels from Various Construction Equipment

Equipment	Estimated Sound Pressure Level at 50 feet (dBA)	Estimated Sound Pressure Level at 2,000 feet (dBA)
Crane	85	53
Forklift	80	48
Backhoe	80	48
Grader	85	53
Man Basket	85	53
Dozer	83-88	51-56
Loader	83-88	51-56
Scissor Lift	85	53
Truck	84	52
Welder	73	41
Compressor	80	48
Concrete Pump	77	45

The values in Table 08-2 generally indicate that sound levels ranging from 73 to 88 dBA might temporarily occur at property boundaries, which is within the Occupational Safety and Health Administration (OSHA) permissible daily sound exposure limits for eight hours per day (29 Code of Federal Regulations §1910.95). Such levels would not generally be considered desirable on a permanent basis or outside of normal daytime working hours, but as temporary, daytime occurrence, construction sound of this magnitude may well go unnoticed by many in the vicinity of the Project Area. This is especially true in agricultural areas, where the sounds of tractors, trucks, and other agricultural machinery are commonplace.

Construction activities, and subsequently sound associated with construction sound, shall be limited to the hours of 7:00 AM to 7:00 PM, or until dusk when sunset occurs after 7:00 PM. Impact pile driving, hoe ram, and blasting operations, if required, shall be limited to the hours between 10:00 AM to 5:00 PM, Monday through Friday. See Section 4906-4-09(F)(1) for additional detail regarding limits on construction activities. All reasonable efforts will be made to minimize the impact of sound resulting from construction activities. As the design of the Facility progresses and construction scheduling is finalized, the construction engineer will notify the community via public notice (or an alternative method) of the expected construction commencement and duration to help minimize the effects of construction sound. In addition, the location of stationary equipment and the siting of potential construction laydown areas have been carefully selected to be as far removed from existing sound sensitive areas as is practical.

Construction activity will generate traffic having potential sound effects, such as trucks travelling to and from the site on public roads. At the early stage of the construction phase, equipment and materials, such as hydraulic excavators and associated spreading and compacting equipment needed to form access roads and foundation platforms for each turbine will be delivered to the site. Once the access roads are constructed, equipment for lifting the towers and turbine components will arrive. Traffic sound is categorized into two categories: 1) the sound that will occur during the initial temporary traffic movements related to turbine delivery, haulage of components, and remaining construction; and 2) maintenance and ongoing traffic from staff and contractors, which is expected to be minor.

(b) *Operational Sound Levels at the Nearest Property Boundary*

(i) Operational noise from generation equipment

OAC Rule 4906-4-09(F)(2) requires that the Facility shall be operated so that the Facility sound contribution does not result in sound levels at any non-participating receptor within one mile of the project boundary that exceed the Project Area ambient nighttime average sound level by 5 dBA. Daytime operation (7:00 Am to 10:00 PM), the Facility may operate at the greater of: the Project Area ambient nighttime Leq plus 5 dBA, or the validly measured ambient Leq plus 5 dBA at the location of the sensitive receptor. Since the measured average nighttime Leq sound in the Project Area was 39 dBA, it is anticipated that that OPSB would impose a threshold of 44 dBA for Facility sound at non-participating residences.

Wind turbine manufacturers report wind turbine sound power data at integer wind speeds referenced to the effective huh height, ranging from cut-in to full-rated power per International Electrotechnical Commission (IEC) standard *IEC 61400-11:2006 Wind Turbine Generator Systems – Part 11:Acoustic Sound Measurement Techniques*.

These standards provide sound power emission levels from a turbine, by wind speed and frequency. They also provide a confidence interval. Since the specific make and model of turbine to be installed in the Project Area has not yet been determined, the sound characteristics of all turbines under consideration were reviewed. Sound propagation modeling was performed for the Acciona AW132-3.3 MW turbine model at all 54 turbine locations. This turbine model was selected for sound propagation modeling because it was found to result in the greatest number of potential sound impacts at sensitive receptors, and therefore, it represents the most conservative analysis. The Acciona AW132-3.3 MW was modeled at an 84-meter hub height.

In addition to the wind turbines, the Facility will also include a new collection substation with a 55/73/92 MVA transformer. Substation transformer data were provided by the Applicant. Substations have switching, protection, and control equipment and typically one or more transformers, which generate the sound generally described as a low humming. There are three main sound sources associated with a transformer: core noise, load noise and noise generated by the operation of the cooling equipment. The core vibrational noise is the principal noise source and does not vary significantly with electrical load. Transformers are designed and catalogued by MVA ratings. Just as horsepower ratings designate the power capacity of an electric motor, a transformer's MVA rating indicates its maximum power output capacity. The National Electrical Manufacturers Association (NEMA) published NEMA Standards TR1-1993 (R2000), which establish the maximum noise level allowed for transformers, voltage regulators, and shunt reactors based on the equipment's method of cooling its dielectric fluid (air-cooled vs. oil-cooled) and the electric power rating. Transformer sound source levels for the collection substation were derived based on a 55/73/92 MVA rating and a maximum NEMA rating of 88 dBA.

Modeling for the project was completed using the International Standards Organization (ISO) 9613-2 standard, "Acoustics – Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation." The ISO standard states, *"This part of ISO 9613 specifies an engineering method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level … under meteorological conditions favorable to propagation from sources of known sound emissions. These conditions are for downwind propagation … or, equivalently, propagation under a well-developed moderate ground-based temperature inversion, such as commonly occurs at night."*

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 ISO standard was implemented in the Cadna A acoustical modeling software. Made by DataKustik GmbH, Cadna A is an internationally accepted acoustical model, used by many other sound control professionals in the United States and abroad. Standard modeling methodology takes into account moderate nighttime inversions or moderate downwind conditions. In the study conducted by Tetra Tech, sound propagation was modeled in accordance with ISO 9613-2 with spectral ground attenuation, mixed ground (G=0.5) and foliage was not modeled. These model parameters have been shown to yield conservative results for wind turbine sound. Acoustic modeling was completed for Facility operation with the above-listed parameters at the critical design wind speed. The critical design wind speed is defined as the operational condition when the greatest differential occurs between the pre-construction background sound level and the wind turbine sound power level at the corresponding given wind speed. For the Acciona AW132-3.3 MW turbine, the critical design speed occurs at the reference wind speed of 6 m/s. In addition, the sound energy contribution from the collection substation was included in the acoustic modeling analysis.

The analysis evaluated the predicted operating sound level at 408 discrete receivers at residences and other sensitive locations. A receiver is a point above the ground at which the computer model calculates a sound level. The coordinates for each receiver are provided in Appendix A of Exhibit I.

Initial modeling showed that sound levels could exceed the Facility's 44 dBA sound limit at 97 receptors. However, demonstration of compliance with the sound limit is not required at 39 of those receptors since they have participation agreements signed with the Applicant. The remaining 58 receptors are non-participating residences. However, this analysis assumed that all 54 turbine locations would be built, when in reality, no more than 37 turbines will be built. Upon final Facility design, the Applicant will update the modeling to ensure that no sound-sensitive receptors will be over the Facility's 44 dBA sound limit. See Section 4906-4-09(F)(2) for additional detail regarding the Facility's sound contribution.

Transformers the size of the one proposed for the collection substation can present a noise concern if the separation distance is less than a few hundred feet between the transformers and the sensitive receptors. The proposed transformer location is approximately 1,788 feet (545 meters) from the nearest sensitive receptor and poses little concern from a sound perspective.

In addition to analyzing the Facility sound impacts in isolation, Tetra Tech modeled the proposed Facility in conjunction with adjacent operational wind farms, including Paulding Wind Farm II, Paulding Wind Farm III, Blue Creek Wind Farm, and Northwest Ohio Wind Farm (Exhibit J). Due to the proximity of these wind energy facilities, sound emissions from their respective wind turbines could contribute to sound levels and sensitive receptors within the Project Area.

Cumulative acoustic modeling was completed assuming all wind turbines were operating continuously and concurrently. Figure 1 of Exhibit J shows broadband operations sound levels at wind speeds corresponding to wind turbine operation at the critical design wind speed (6 m/s). The modeling results indicated that there are 140 potential exceedances of the 44 dBA sound level limit. However, 69 of the 140 receptors are participants of the wind farm project. The remaining 71 receptors are non-participants that are predicted to experience a sound level over 44 dBA. Results of the cumulative analysis at each receptor can be found in Table 8 of Exhibit J.

(ii) Processing equipment

There is no processing equipment associated with this Facility. Therefore, this section is not applicable.

(iii) Associated road traffic

Transportation sound during Facility construction is addressed above in Section 4906-4-08(3)(a). Once operational, the proposed Facility will not significantly contribute to traffic on local roads. Post-construction traffic will be associated with operations personnel traveling to and from the O&M building and wind turbine sites. Routine maintenance will typically be required on a quarterly basis at each wind turbine, as well as at the collection substation. These service visits will usually involve one or two pick-up trucks. Therefore, significant impacts from traffic sound are not anticipated.

(c) *Location of Sound-Sensitive Areas within One-Mile of the Facility*

The predicted sound contour plots in Figure 4-1 of Exhibit I depict noise sensitive areas (i.e., occupied buildings) within one mile of the proposed Facility. There are no schools, churches, libraries, nursing homes, or hospitals within one mile of the proposed turbines.

(d) *Mitigation of Sound Emissions during Construction and Operation*

Over the last decade, the wind industry has invested heavily in reducing turbine sound through improvements in turbine technology, engineering, and insulation. Due to the improved design of wind turbine mechanical components and the use of improved noise dampening materials within the nacelle, including elastomeric elements supporting the generator and gearbox, mechanical noise emissions have been minimized. Sound reduction elements designed as a part of the wind turbines include impact noise insulation of the gearbox and generator, sound reduced gearbox, sound reduced nacelle, and rotor blades designed to minimize noise generation (Tetra Tech, 2018).

Although residential sound impacts are anticipated to be minor, additional mitigation measures will include the following:

- Implementing best management practices for sound abatement during construction, including use of appropriate mufflers, proper vehicle maintenance, and limiting hours of construction to hours required by OAC Rule 4906-4-09(F).
- Notifying landowners of certain construction sound impacts in advance, e.g., if blasting becomes necessary.
- The highest possible sound levels produced by the proposed wind turbine models were used for modeling, when the turbine will not actually produce such high levels during many operating conditions (i.e., sound levels will often be lower than those presented herein, which represent the worst-case scenario).
- While 54 turbine locations were modeled, the Applicant anticipates that only 37 turbines will be built, which will reduce sound levels at many locations than those modeled and presented herein. However, upon final Facility design, the Facility will be modeled to determine if the Facility will result in sound levels above the 44 dBA limit at any non-participating receptor. As necessary to keep Facility-related sound levels below the anticipated 44 dBA limit, a subset of the turbines will be operated in one of several low sound modes during nighttime hours.

In addition, if adverse sound impacts are identified from wind turbine operations, a reasonable complaint resolution procedure will be implemented to ensure that any complaints regarding construction or operational sound are adequately investigated and resolved. A hotline will be setup to receive and formally document all sound complaints, which will then be investigated by onsite Facility staff. A draft Complaint Resolution Plan is attached hereto as Exhibit V.

Construction of the Facility will be limited to daytime hours as described in Section 4906-4-08(A)(3)(a) and in greater detail in Section 4906-4-09(F)(1) of this Application.

(e) *Preconstruction Background Sound Study*

A preconstruction sound analysis of the Project Area is was conducted (Exhibit I) and included measurements taken under both day and nighttime conditions.

(4) Water Impacts

The information provided in this section and below in response to the requirements of OAC Rule 4906-4-08(A)(5) is largely based on two reports prepared by Hull & Associates, Inc. (Hull) in support of the Paulding Wind Farm I and Paulding Wind Farm III certificate applications. The 2009 Groundwater Hydrogeology Desktop Review Summary Report was submitted to the OPSB as Exhibit G to the certificate application for Paulding Wind Farm I in Case No. 09-980-EL-BGN, and the 2010 Groundwater Hydrogeology Desktop Review Summary Report was submitted as Exhibit G to the certificate application for Paulding Wind Farm II in Case No. 10-369-EL-BGN. These reports summarized information from available on-line databases and/or documents produced by the following federal, state, and local agencies: the Federal Emergency Management Administration (FEMA); the USGS; the USDA Soil Conservation Service Soil Survey of Paulding County; the ODOT District 1 and the Office of Geotechnical Engineering; the Paulding County Engineer and Health Department; the Ohio EPA; the Ohio Department of Agriculture (ODA); the Ohio Department of Natural Resources (ODNR); and the Ohio State University Agricultural Extension Office.

(a) *Impacts to Public and Private Water Supplies from Construction and Operation*

Due to the rural nature of the Project Area, municipal water is generally unavailable, and residents rely upon private wells for their drinking water, as well as for agricultural uses such as watering livestock and irrigating crops. The principal groundwater source within the Project Area is a carbonate bedrock aquifer, which includes limestone and dolomite. Groundwater yields of up to 500 gallons per minute (gpm) have reportedly been obtained at depths greater than 300 feet. Agricultural and domestic supplies of about 10 to 15 gpm can reportedly be developed at depths of less than 90 feet. Wells are often completed at shallower depths in an attempt to obtain sulfur-free water. The Lake Maumee Lacustrine aquifer overlies the bedrock aquifer across the Project Area. The Maumee Lacustrine aquifer reportedly yields between 5 and 25 gpm. Alluvial deposits along Fla Rrock Creek are included in the Auglaize River alluvial aquifer, which is capable of producing between 5 and 25 gpm (Hull, 2009, 2010).

Several source water protection areas (SWPAs) are located within Paulding County. Construction of the proposed Facility will not constitute an activity that would be restricted within either a surface water or groundwater SWPA, as further discussed below in Section 4906-4-08(A)(4)(d). Based on the reported depth to groundwater throughout the Project Area, it does not appear that construction, including blasting if required, will have a significant adverse effect on groundwater quality or yield (Hull, 2009, 2010).

Due to the distance between residences and construction activities at proposed turbine sites, the wells will be protected from any significant negative impact. Therefore, no impact to public or private water supplies is anticipated from the construction or operation of the proposed Facility.

(b) *Impacts to Public and Private Water Supplies from Pollution Control Equipment Failures*

Wind turbines generate electricity without combusting fuel or releasing pollutants into the atmosphere. Therefore, this section is not applicable.

(c) *Water Resources Map*

Though existing aquifers, water wells, and drinking water source protection areas are not anticipated to be directly affected by the proposed Facility, Figure 08-1 depicts these water resources in the vicinity of the Project Area. The water resources mapping was developed from publicly available data from the ODNR and Ohio EPA.

(d) *Compliance with Local Water Source Protection Plans*

Ohio's Source Water Assessment and Protection Program, also known as "Wellhead Protection" and "Drinking Water Source Protection," assists communities with protecting their sources of drinking water (streams, rivers, lakes, reservoirs, and aquifers) from contamination. SWPAs as defined and approved by Ohio EPA for the protection of drinking water sources were also evaluated during the Groundwater Hydrogeological and Geotechnical Desktop Document Review Summary Reports (Hull, 2009, 2010). Environmental regulatory programs within the Ohio EPA, as well as other regulatory agencies such as the Ohio Bureau of Underground Storage Regulations, have adopted regulations that restrict specific activities within SWPAs. These activities include concentrated animal feeding operations, sanitary, industrial or residual waste landfills, land application of biosolids, and voluntary brownfield cleanups. The restrictions typically apply to SWPAs relying on groundwater as their drinking water source.

There are no designated groundwater SWPAs within the Project Area. However, the proposed Facility is located within the watersheds for several inland SWPAs, specifically Paulding Village, Napoleon City, Bowling Green City, and Campbell Soup Supply. This designation applies to the portion of the drainage area upstream from the water system intake.

- The Paulding Village Inland SWPA encompasses Flat Rock Creek, which serves as the surface water source for the community public water system. Flat Rock Creek is approximately 34 miles in length with a drainage area of 195 square miles, and it flows into the Auglaize River. The water system intake is located approximately 14 miles from the mouth, and the protection area covers approximately 167 square miles (Ohio EPA, 2003a). The proposed Facility includes 19 turbines located within the Paulding Village Inland SWPA.
- The Napoleon City SWPA encompasses the Maumee River, which serves as the surface water source for the community public water system. The Maumee River is approximately 105.4 miles in length with a drainage area of 6,570 square miles, and flows into Lake Erie via Maumee Bay. The City of Napoleon water system intake is located approximately 47 miles from the mouth, respectively, and the protection area covers approximately 5,617 square miles (Ohio EPA, 2003b). All 54 proposed turbine locations lie within the Napoleon City Inland SWPA, as does the entirety of Paulding County and several other nearby counties.
- The Campbell Soup Supply Company SWPA encompasses the Maumee River, which serves as the surface water source for a community public water system and also provides the water used in food production. The Campbell Soup Supply Company's two water system intakes are located approximately 46 and 47 miles from the mouth, respectively, and the protection area covers approximately 5,623 square miles (Ohio EPA, 2003c). All 54 proposed turbine locations lie within the Campbell Soup Supply Company Inland SWPA, as does the entirety of Paulding County and several other nearby counties.
- The City of Bowling Green Inland SWPA encompasses the Maumee River, which serves as the surface water source for the community public water system. The Bowling Green water system intake is located approximately 23 miles from the mouth, and the protection area covers approximately 6,280 square miles (Ohio EPA, 2003d). All 54 proposed turbine locations lie within the City of Bowling Green Inland SWPA, as does the entirety of Paulding County and several other nearby counties.

Limited portions of the Facility also lie within the Corridor Management Zone (CMZ) for the Paulding Village Inland SWPA. The CMZ is the area of focus for protective efforts, and extends ten miles upstream of the intake, 1,000 feet laterally from each side of Flat Rock Creek, and 500 feet laterally from each bank of any tributaries. Potential contaminant sources within the CMZ include an septic system discharges, a wastewater treatment plant, above ground storage tanks, cemeteries, an airport, an inactive landfill, and water treatment plants (Ohio EPA, 2003a). The proposed Facility includes three turbine sites located within the Paulding Village CMZ.

Hull (2009, 2010) reviewed the range of programs which have adopted rules related to SWPAs, and concluded that construction of the proposed Facility will not constitute an activity that would be restricted within either a surface water or groundwater SWPA.

(e) *Prospects of Floods in the Area*

A floodplain is flat land adjacent to a stream or river that experiences occasional or periodic flooding. For regulatory purposes, the floodplain is divided into two areas, based on water velocity: the floodway; and the flood fringe. The floodway includes the channel and the portion of the adjacent floodplain required to pass the 100-year flood without increasing flood heights. Typically, this is the most hazardous portion of the floodplain where the fastest flow of water occurs. Due to the high degree of hazard, most floodplain regulations require that proposed floodway developments do not block the free flow of flood water, as this could dangerously increase that water's depth and velocity. The flood fringe is the remaining portion of the floodplain, outside of the floodway, that usually contains slow-moving or standing water. Development in the fringe will not normally interfere as much with the flow of water. Therefore, floodplain regulations for the flood fringe typically allow development to occur but require protection from floodwaters through flood proofing so that water cannot enter the structure (ODNR, 2018a).

The entire Project Area lies within the Maumee River Drainage Basin. In general, surface water flow is toward the east-northeast, and water bodies include several small streams, ditches, and ponds. Flat Rock Creek is the largest stream within the Project Area, and flows from the southwest to northeast across the central portion of the Project Area. Named tributaries of Flat Rock Creek that flow through the Project Area include Wildcat Creek and Big Run. Blue Creek flows through the very southern extent of the Project Area, south of all proposed turbine sites and associated facilities. The southeastern portion of the Project Area includes several unnamed tributaries to Blue Creek, which like Flat Rock Creek, drains into the Auglaize River approximately 10 miles northeast of the Project Area.

Information on floodplains in the vicinity of the Project Area was obtained from the ODNR and FEMA, as part of the Groundwater Hydrogeological and Geotechnical Desktop Document Review Summary Reports prepared by Hull (2009, 2010) and in the course of preparing this Application. Areas designated as 100-year floodplains are present in the Project Area along Flat Rock Creek, Wildcat Creek, and Blue Creek. There are no turbines or other Facility components proposed within designated 100-year floodplains.

(5) Geological Features Map

Figure 08-2 depicts the geologic features of the proposed Project Area, as well as topographic contours, existing gas and oil wells, and injection wells.

(a) *Geologic Suitability*

<u>Existing Conditions</u>

The Project Area lies entirely within the glaciated Maumee Lake Plains Region, in the Huron-Erie Lake Plains Section of the Central Lowland Physiographic Province. The Region is characterized as a flat-lying Ice-Age lake basin containing beach ridges, bars, dunes, deltas, and clay flats, with approximate elevations ranging from 570 to 800 feet above mean sea level (AMSL). Historically, the Maumee Lake Plain Region contained the Great Black Swamp, a vast regional wetland that formed during Wisconsin glaciation. Until the late 19th century when it was drained, the Black Swamp consisted of extensive swamps and marshes, with some higher dry ground interspersed. Low physiographic relief (less than 5 feet) is generally present throughout the Region, except for slight dissection by modern streams (Ohio Division of Geological Survey, 1998; Hull, 2009; 2010).

The area was passed over by both the Illinoian and Wisconsinan glaciers, and the surface topography of the region is the result of ice-deposited ground moraine, which was planed by waves in glacial lakes following deposition, resulting in a relatively flat surficial topography. The deposits have a rather uniform distribution, with the depth to bedrock varying from 25 to 55 feet in the Project Area. Relatively small patches of lacustrine sand, silt, or clay are present on the surface in many areas. Alluvial deposits have also been noted along the flood plain of Flat Rock Creek, which flows from southwest to northeast across the Project Area (Hull, 2009, 2010).

The uppermost bedrock within the majority of the Project Area is the undivided Ten Mile Creek Dolomite and Silica Formation of Middle Devonian age, comprised primarily of dolomite, limestone, and shale (Slucher et al., 2006). Based on the inferred bedrock topography within the Project Area, the depth to bedrock appears to vary between approximate depths of 25 and 50 feet (Hull, 2009, 2010). Information obtained from the Ohio Division of Geological Survey (1999) indicates that there are no known or probable karst areas within the Project Area.

An assessment of geologic structural and seismic information determined that no structural features or earthquake epicenters underlie the Project Area (Ohio Division of Geological Survey, 2012). The nearest known structural feature is the Fort Wayne Rift, located more than five miles south of the Project Area boundary. Other faults and fault systems in the region include the Anna-Champaign Fault, situated about 20 miles south-southeast of the Project Area boundary, and the Bowling Green Fault System, located about 50 miles east of the Project Area boundary. The closest recorded earthquake was reported to have originated in north-central Mercer County, approximately 20 miles south-southeast of the Project Area boundary. The epicenter of the highest magnitude earthquake (5.4) recorded in Ohio to date occurred in 1937 near Anna, approximately 49 miles southeast of the Project Area boundary (Hansen, 2012). A review of data from the Indiana Geologic Survey did not indicate the presence of any earthquake epicenters in the vicinity of the Project Area (Kirby, 2006).

Site Suitability

Based on their experience with earthwork in the region, Hull (2009, 2010) indicates that conventional, shallow foundations may be able to support the turbines. However, this assumption will need to be confirmed by a detailed geotechnical exploration and evaluation at each turbine site. If it is determined that shallow foundations are not suitable for structural support, extended type foundation systems (such as driven H-piles or auger cast piles) may be necessary to bear in suitable material or on bedrock. Additionally, other suitable foundation types may be utilized according to their compatibility with the geotechnical parameters of the specific turbine site.

The geotechnical engineer, or a designated representative, will examine foundation designs and compatibility with the supporting soils, and approve the work prior to placement of foundation components. See Exhibit G and Section 4906-4-08(A)(5)(c) below for additional information.

Hull contacted the Paulding County Engineer’s Office regarding its knowledge and experience of previous construction projects, subsurface conditions, and maintenance history within the Project Area, and to ask about permits that may be necessary for construction. Mr. Travis McGarvey and Mr. Chad Moore of the Paulding County Engineer’s office indicated that, based on their experience and the general description of the proposed Facility provided by Hull, significant geotechnical constraints for the planned construction are not anticipated. Mr. McGarvey and Mr. Moore both confirmed that only typical construction permits are expected to be necessary (Hull, 2009, 2010).

Due to the anticipated depth of bedrock in the Project Area, bedrock blasting will probably not be necessary. Initial geotechnical investigation and test borings will be conducted prior to construction to confirm/refine the information presented in Exhibit G and Section 4906-4-08(A)(5)(c), and to facilitate final foundation design and engineering. The locations of test borings will be at appropriate turbine sites, as determined necessary by the geotechnical engineer. In addition, borings will be taken at the proposed collection substation location. The borings will extend to the proposed depth or competent bedrock, whichever is encountered first (Hull, 2009, 2010).

(b) *Soil Suitability*

Existing Conditions

The USDA Soil Conservation Service Soil Survey for Paulding County was reviewed by Hull (2009, 2010) and EDR to obtain existing data for the Project Area. Soil surveys furnish surface soil maps and provide general descriptions and potentials of the soil to support specific uses, and can be used to compare the suitability of large areas for general land uses. Surface soils in the Project Area are comprised mostly of Hoytville silty clay, Latty silty clay, and Paulding clay. The soil survey information suggests the Hoytville and Latty silty clays are poorly drained, have a low to extremely low capacity to transmit water (0.01 to 0.20 inch/hour), with the depth to water table being 0 to 12 inches below surface. The Paulding clays are very poorly drained, have a low to extremely low capacity to transmit water (0.01 to 0.20 inch/hour), with the depth to water table being 0 to 6 inches below surface. The soil surveys indicate that, although they frequently pond surface water runoff, the Hoytville and Latty silty clays and Paulding clays do not frequently flood (USDA NRCS, 2006).

Site Suitability

To maintain soil stability during construction, adequate surface water run-off drainage will be established and properly controlled at each proposed construction site to minimize any increase in the moisture content of the subgrade material. Positive drainage of each construction site will be created by gently sloping the surface toward drainage swales. It should be noted that sub-grade soils are subject to shrinking and swelling due to variation in seasonal moisture contents, and consideration should be given during constructability reviews to determine how best to deal with potential moisture fluctuations. Based on a review of the soil survey information and Hull's experience with earthwork in the area, the soils on-site should be suitable for grading, compaction, and drainage when each site is appropriately prepared.

Site Restoration

Construction will involve topsoil stripping and grubbing of stumps, as necessary. Stripped topsoil will be stockpiled along the road corridor for use in site restoration. Following removal of topsoil, subsoil will be graded, compacted, and surfaced with gravel or crushed stone (depth to be determined on a case-by-case basis), and a geotextile fabric or grid will be installed beneath the road surface if necessary, to provide additional support. In agricultural areas, all topsoil within the work area will be stripped and segregated from excavated subsoil.

Once construction is complete, the soil will be restored. Exposed subsoils will be de-compacted with a deep ripper or heavy-duty chisel plow to a minimum depth of 18 inches. Following de-compaction of the subsoil, the surface of the subsoil will be picked over to remove all rocks four inches in size or larger. Following rock picking, stockpiled topsoil will be returned to all disturbed agricultural areas. The topsoil will be re-graded to match original depth and contours to the extent possible. The surface of the re-graded topsoil will be disked, and any rocks over four inches in size will be removed from the soil surface. Restored topsoil will be stabilized with seeding and/or mulching, unless other arrangements have been made with the landowner. All access roads will be re-graded as necessary to create a smooth travel surface, allow crossing by farm equipment, and prevent interruption of surface drainage. Temporary water bars and culverts will be removed if they are no longer necessary.

Additional information regarding site restoration is described in Section 4906-4-09(A)(4) of this Application.

(c) *Plans for Test Borings*

Terracon Consultants, Inc. (Terracon) prepared a Geotechnical Work Plan for the proposed Facility, which is attached as Exhibit G. This report consists of a work plan describing the planned test borings to be conducted prior to Facility construction, along with the subsurface exploration procedures to be used, the field and laboratory testing to be performed, and the geotechnical engineering report to be prepared. The report also includes preliminary earthwork recommendations. Terracon plans to conduct test borings at each proposed wind turbine location, as well as at the locations of proposed transmission tower structures, meteorological towers, and substation. In addition, test borings will be performed at selected access road locations, and in public road areas that will be subjected to the construction traffic. The borings will be conducted with a track-mounted Diedrich D-50 rotary drill rig using continuous flight hollow stem augers, owned and operated by Ohio Testbor.

Continuous soil sampling will typically be performed from a depth of about 1 foot to 11 feet below the existing site grades. At greater depths, soil sampling will be performed at approximate 5-foot intervals to the terminal depth of the test borings. Soil sampling will be performed using split-barrel soil sampling procedures, wherein a standard 2-inch outer diameter split-barrel sampling spoon is driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon the last 12 inches of a normal 18-inch penetration is recorded as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. When split-barrel refusal is encountered in bedrock, the number of inches of penetration into the rock for 50 hammer blows will be recorded. In addition to conducting split-barrel sampling, thin-walled (Shelby) tube samples will be obtained if medium stiff or softer cohesive formations are obtained. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge is pushed hydraulically into the soil to obtain a relatively undisturbed sample.

Groundwater levels will be observed and recorded while drilling and at the completion of each boring. To better establish longer-term groundwater information, temporary piezometers are installed at each turbine location. The temporary piezometers generally extended to a depth of about 15 feet and consisted of 10 feet of slotted well screen at the bottom and 10 feet of solid riser pipe above the well screen. Sand will be used to backfill the annular space between the well screen and the bore hole. Above the sand pack, bentonite chips will be used as backfill up to the ground surface to prevent surface water infiltration. Terracon intends to measure the water level within the piezometers monthly over a period of six months.

The sampling depths, penetration distances, and other sampling information will be recorded on the field boring logs. The samples will be placed in appropriate containers and taken to Terracon's soil laboratory for testing and classification by a geotechnical engineer. Field boring logs will be prepared as part of the drilling operations. The field logs will include visual classifications of the materials encountered during drilling and interpretation of the subsurface conditions between samples. Additional field tests to be performed at a subset of test borings include seismic refraction testing and electrical earth resistivity. Field thermal conductivity sampling will also be performed to evaluate underground collection cabling and falling weight deflectometer testing will be performed along designed paved roadways to evaluate the condition of the proposed delivery routes. Each of these tests is described in Exhibit G.

The laboratory testing program will include examination of soil samples by an engineer. All laboratory testing will be performed in accordance with American Society for Testing and Materials (ASTM) or other specified standards. Based on the material's texture and plasticity, Terracon will describe and classify the soil samples in accordance with the Unified Soil Classification System. Final boring logs will be prepared that will include both field observations and results of the laboratory tests. A report will be prepared documenting the findings of the borings and laboratory testing, including subsurface soil properties, static water levels, rock quality descriptions, percent recovery, and depth and description of bedrock contact. This report will be provided to OPSB Staff prior to commencement of Facility construction.

Additional information regarding test borings is described in Section 4906-4-09(A)(2) of this Application.

(6) Prospects of High Winds in the Area

The wind turbines proposed for the Facility are rated to withstand wind speeds well in excess of those likely to occur in the Project Area. International standards for wind turbines are developed by working groups of Technical Committee-88 of the IEC, a world-recognized body for standards development. All turbines under consideration for the Facility are designed to meet the standards of the IEC-61400 series and are rated to specific IEC wind classes. The Acciona 132 and Vestas 150 are certified for class IIIb winds; the Vestas 136 and Siemens Gamesa 126 are certified for class IIIa winds; the Siemens Gamesa 132 and 145 are certified for class IIa winds, and the Acciona 140 is designed for class IIIb. IEC IIIa and IIIb provides that the structure is designed to withstand average wind speeds of 7.5 m/s (17 mph) and extreme 10-minute average wind speeds of 37.5 m/s (84 mph). IEC IIa provides that the structure is designed to withstand average wind speeds of 8.5 m/s (19 mph) and extreme 10-minute average speeds of 42.5 m/s (95 mph). It is important to note that these IEC standards represent minimum design values.

(7) Blade Shear

A potential public safety concern with wind power projects is the possibility of a wind turbine tower collapsing or a rotor blade dropping or being thrown from the nacelle. While extremely rare, such incidents have occurred; however, to the best of the Applicant's knowledge, no member of the public has ever been injured as a result of these incidents because appropriate setbacks have proved to be sufficient to protect area homes and public roads.

The reasons for a tower collapse or blade throw vary depending on conditions and tower type. The main causes of blade and tower failure are a control system failure leading to an over speed situation, a lightning strike, or a manufacturing defect in the blade. Technological improvements and mandatory safety standards during turbine design, manufacturing, and installation reduce the instances of blade throw. The reduction in the potential for blade failures coincides with the widespread introduction of wind turbine design certification and type approval. The certification bodies perform quality control audits of the blade manufacturing facilities and perform strength testing of construction materials. These audits typically involve a dynamic test that simulates the life loading and stress on the rotor blade (Garrad Hassan, 2010).

Modern utility-scale turbines are certified according to international engineering standards. These include ratings for withstanding different levels of hurricane-strength winds and other criteria (ASCE & AWEA, 2011). The engineering standards of the wind turbines ultimately used for this Facility will meet all applicable engineering standards. State of the art braking systems, pitch controls, sensors, and speed controls on wind turbines have greatly reduced the potential for blade throw. The wind turbines to be used for the Facility will be equipped with two fully independent braking systems that allow the rotor to be brought to a halt under all foreseeable conditions and a pitch control system. In addition, the turbines will automatically shut down at wind speeds over the manufacturer's threshold (i.e., 25 m/s [56 mph]), in the event of uncontrolled rotation, excessive blade vibrations, stress, or pressure on the tower structure, rotor blades, and turbine components. For all of these reasons, the risk of blade throw is minimal. In addition, as described in Section 4906-4-08(A)(1), the public does not have access to the private land on which the Facility is located. There will be signs at the intersection of public roads and access roads identifying the turbines, prohibiting unauthorized entry, and warning the public of danger.

Although the risk of blade throw is minimal, the Applicant will have procedures in place in the event of a blade throw incident. These procedures will include emergency shutdown procedures, post event site security measures, immediate notification of state and local officials, and the implementation of turbine manufacturer specific blade throw safety procedures, if any. In addition, the Applicant will conduct annual training for operating staff as well as local first responders on the procedures to be implemented in the event of a blade throw incident.

Given the low risk of tower collapse and blade throw, the potential impact is negligible. The Facility's setbacks from permanent residences and adjacent property lines will more than adequately protect the public from tower collapse and blade throw. The Facility setbacks consist of a minimum of 1,371 feet between turbine sites and adjacent property lines. As currently sited, the distance between proposed turbines and the nearest non-participating residential structure ranges from 1,514 to 4,349 feet, and averages 2,281 feet. The distance between proposed turbines and the nearest non-participating property line ranges from 700 feet to

3,430 feet, and averages 1,566 feet, and the distance between turbines and public roads ranges from 590 feet to 2,376 feet and averages 1,247 feet. Section 4906-4-09(G) describes the measures the Applicant has committed to in order to minimize the risk from blade shear.

(8) Ice Throw

Ice throw refers to the release of an ice fragment from a rotating turbine blade. Its occurrence is the product of ice accretion on the blades and the appropriate conditions to allow release from the blade. Ice accumulation from icing on a turbine blade occurs in two primary ways, precipitation icing and in-cloud icing. Precipitation icing forms as liquid precipitation comes into contact with a turbine blade. During a narrow temperature range, precipitation icing may result from wet snow, though this generally occurs on structures at a standstill. In contrast, freezing rain can affect rotating blades, demonstrates a high rate of adhesion, and results in an ice with a high density. In-cloud icing forms as supercooled water droplets deposit onto the blade surface. A wider range of accretion and density result from this process, influenced by the thermodynamics at the surface (Battisti, 2015).

When ice fragments are released from the blade their trajectory is influenced by the wind strength and direction, along with the mass and size of the fragments, amongst other factors (Battisti, 2015). Limited data on the impact of these individual factors exist; however, a limited number of observational studies have been undertaken to quantify ice throw behavior. In a 2-year study in the Swiss Alps, Cattin et. al. (2007) collected 121 fragments in the area surrounding a turbine with a rotor diameter of 40 meters, with a maximum weight of 1.8 kilogram and a maximum throwing distance of 92 meters. Forty percent of the ice found was recovered within 20 meters of the turbine base and over 95% of the fragments were less than 500 grams (g). A Swedish study carried out from 2014 to 2016 collected 421 ice fragments, of which 336 have a recorded mass. Fifty percent of these 336 fragments were less than 500 g and 85% less than 1 kilogram. A maximum throwing distance of 142 meters was recorded for a 0.10-kilogram ice fragment at a wind speed of 8.4 m/s (Poyry, 2017).

EDR performed an ice throw analysis to evaluate the probability of ice throw impact at the nearest property boundary and public road. The methodology, as detailed in the ice throw analysis (Exhibit Y), included identifying conditions under which ice throw could occur, analyzing trends in local wind conditions, and modeling the trajectory of released ice fragments. Further, the probabilities of impact across an (x, y) grid surrounding each turbine was calculated. A localized regression model was applied to the results to determine probability contours around each turbine.

Ohio, in general, experiences a humid continental climate with hot humid summers and cold winters. While ice forms on turbine blades in two primary ways, as discussed above, there are minimal studies on the accretion of ice on turbine blades, and to the author's knowledge none in Ohio. However, beyond Ohio there are records of the occurrence of ice accretion on turbine blades due to freezing rain. This method is thought to be the most common method of ice accretion in nearby Southern Ontario and is more likely to impact low-lying lands such as those of the Project Area (Biswas et. al., 2012 and Tammelin, 1998). Chagnon & Karl (2003) considered historic trends in freezing rain between 1948 and 2000 for the continental U.S. and found an average of five freezing rain days a year in Northwestern Ohio. Five days per year is considered a moderate level of icing event occurrence within the existing body of ice throw literature (Morgan 1998). Chagnon & Karl (2003) also found the earliest occurrence of freezing rain in the area to be November and the latest occurrence in April. This six-month range, between November and April, is taken as the time frame during which ice throw could occur. In addition to the accretion of ice on the turbine blades, conditions must exist for ice fragments to release from the blades. A simplified method has been developed in the literature from observations of ice accretion and ice throw at existing turbines (Battisti, 2015). One study estimated the rate of ice accretion at 75 kilograms/day (Battisti, 2015). Using the assumption that all of the ice breaks off in 1-kilogram fragments, it would result in 75 throws per day. To provide a conservative assessment, the number of 100 throws per day was used. Additional detail is provided in Exhibit Y.

The Applicant operates a Sonic Detection and Ranging (SODAR) unit which measures wind speed and direction up to 200 m above ground. From the SODAR unit, wind speed and direction between November and April over a 2-year period between 2009 and 2011 were analyzed for trends. Between November and April, winds dominate from the west-southwest, primarily at 5 m/s to 7.5 m/s.

A ballistic model described in Biswas et. al. (2012), is used to model the three-dimensional trajectory of ice fragments released from turbine blades. The turbine considered for the study, the Vestas 150 – 4.2 MW turbine, was selected from a list of potential turbine models under consideration for the site, for its long blade length and height. The Vestas 150 – 4.2 MW turbine has a hub height of 105 meters and a blade diameter of 150 meters. In addition to turbine dimensions, and precipitation and wind data, other input parameters included, air density, drag coefficient, Von Karman constant, gravitational acceleration, ice fragment mass, roughness length, and ice fragment frontal area.

The results of the study yielded an annual probability "impact" (i.e., the location where a given fragment of ice is modeled to land) for every 1 m^2 in a 29-hectare grid with a turbine at the center. For ease of interpretation and visualization the results were fit with a local regression model (LOESS) which identifies trends in the probabilities, generating impact probability contours around a turbine. As localized topography was not included, and the model input data is considered consistent across the project site, the impact probability contours are the same for each proposed turbine.

Impact probabilities in impacts/m^2/year for a 1 kg ice fragment are shown in Figure 4 of Exhibit Y. Northeast of the turbine the 1% impact contour approaches a maximum distance of 60 meters (197 feet) as measured diagonally from the turbine base. In contrast, this distance is 49 meters (161 feet) to the south direction, and 56 meters (184 feet) to the west. The minimum distance between a proposed turbine and the nearest public road is 590 feet and the distance between a proposed turbine and the nearest non-participating property is 700 feet. These distances greatly exceed the distance of the 1% impact contour (Figures 5 and 6 of Exhibit Y).

In summary, the analysis presented here finds that for a 1 kilogram fragment of ice an impact probability of 1% does not extend beyond the length of the turbine blade modeled. Further, the analysis determines the probabilities at the nearest public road and nearest non-participating property boundary to be 0.2% and 0.02%, respectively. This meets the requirements set by OAC Rule 4906-4-09(E)(3). While uncertainty exists in the rate of ice accretion and release during icing events given the limited available data on field observations presented in the literature, reasonable assumptions were made in this analysis which are consistent with the methodologies presented in multiple sources. Using multiple moderate assumptions generates conservative impact probabilities which likely overestimate the modeled impacts.

(9) Shadow Flicker

Shadow flicker refers to the moving shadows that an operating wind turbine casts at times of the day when the turbine rotor is between the sun and a receptor’s position. These flickering shadows can cause an annoyance when cast on nearby residences (receptors). The spatial relationship between a wind turbine and a receptor, along with weather characteristics such as wind direction and sunshine probability, are key factors related to shadow-flicker impacts. At distances beyond roughly 10 rotor diameters (approximately 1,500 meters based on the Vestas 150-4.2 turbine model used in this case) shadow-flicker effects are generally considered negligible (BERR, 2009; DECC, 2011; DOER, 2011). This is because shadow flicker intensity diminishes as the distance between receptors and turbines increases.

Although shadow flicker has been alleged to cause or contribute to health effects, blade pass frequencies for modern commercial scale wind turbines are very low. According to the Epilepsy Society (2012), approximately five percent of individuals with epilepsy have sensitivity to light. Most people with photosensitive epilepsy are sensitive to flickering around 16-25 Hz (Hertz or Hz = 1 flash per second), although some people may be sensitive to rates as low as 3 Hz and as high as 60 Hz. Modern wind turbines (including the proposed General Electric GE 3.6-137) typically operate at a frequency of 1 Hz or less, and there is no evidence that wind turbines can trigger seizures (British Epilepsy Association, 2007; Ellenbogen et al., 2012; NHMRC, 2010; DECC, 2011). The primary concern with shadow flicker is the annoyance it can cause for adjacent homeowners.

Although setback distances for turbines will significantly reduce shadow flicker impacts to homes, some impact may still occur. OAC Rule 4906-4-09(H)(1) requires that, "*The Facility shall be designed to avoid unreasonable adverse shadow flicker effect at any non-participating sensitive receptor within one thousand meters of any turbine. At a minimum, the facility shall be operated so that shadow flicker levels do not exceed thirty hours per year at any such receptor."* The OPSB has used this threshold of acceptability (i.e., 30 annual hours of shadow flicker) in certifying all commercial wind power projects to date in Ohio (OPSB, 2011a, 2011b, 2012, 2013, 2014). Accordingly, a threshold of 30 shadow flicker hours per year was applied to the analysis of the proposed Facility to identify any potentially significant impacts on residences.

EDR conducted a shadow flicker analysis for the Facility, attached hereto as Exhibit K. The study evaluates the Vestas 150-4.2 turbine, which has the largest rotor diameter of the turbines under consideration and, therefore, represents a worst-case analysis with respect to shadow flicker. The shadow flicker analysis for the proposed Facility used *WindPRO 3.1.633* software and associated Shadow module. *WindPRO* is a widely accepted modeling software package developed specifically for the design and evaluation of wind power projects. Input variables and assumptions used for shadow flicker modeling calculations for the proposed Facility include:

- The latitude and longitude coordinates of 54 proposed wind turbine sites (provided by the Applicant).
- The latitude and longitude coordinates for 358 potential receptors located in the 10-rotor diameter (1,500 meters) Study Area (provided by the Applicant).
- USGS 1:24,000 topographic mapping and USGS 10-meter resolution digital elevation model (DEM) data.
- The rotor diameter (150 meters) and hub height (105 meters) for the Vestas 150-4.2 turbine.
- Annual wind rose data (provided by the Applicant), which is depicted in Attachment A of Exhibit K (to determine the approximate directional frequency of rotor orientation throughout the year).
- To account for the occurrence of cloudy conditions, the average monthly percent of available sunshine for the nearest National Oceanic and Atmospheric Administration (NOAA) weather station

with a similar latitude (Fort Wayne, Indiana) was used. Data was obtained from NOAA's "Comparative Climatic Data for the United States through 2015" (see Attachment A of Exhibit K) (http://www.ncdc.noaa.gov).

- No allowance was made for wind being below or above generation speeds. Blades are assumed to be moving during all daylight hours when the sun's elevation is more than 3 degrees above the horizon. Shadow flicker is generally considered imperceptible when the sun is less than 3 degrees above the horizon (due to the scattering effect of the atmosphere on low angle sunlight) (States Committee for Pollution Control, 2002).
- The possible screening effect of all existing trees and buildings adjacent to the receptors was not taken into consideration in the modeling. In addition, the number and/or orientation of windows in residential structures were not considered in the analysis.

The model calculations include the cumulative sum of shadow hours for all Facility turbines. This omni-directional approach reports total shadow flicker results at a receptor regardless of the presence or orientation of windows at that particular residence (i.e., it assumes shadows from all directions can be perceived at a residence, which may or may not be true). A receptor in this "greenhouse" model is defined as a one square meter area located one meter above ground; actual house dimensions are not taken into consideration.

Because the shadow flicker analysis conducted for the proposed Facility was based on the conservative assumptions that: 1) 54 turbines will be built; 2) the turbines are in continuous operation during daylight hours; and 3) shadow flicker can be perceived at a receptor structure regardless of the presence or orientation of windows or the screening effects of all surrounding trees and buildings, the analysis presented herein is a conservative projection of the shadow-flicker effects at ground level.

Figure 3 in Exhibit K illustrates the results of the shadow flicker analysis. A summary of the projected shadow flicker at each of the 358 receptors located with 1,500 meters of a proposed turbine site is presented below:

- 139 (39%) of the receptors are not expected to experience any shadow flicker,
- 1 (0%) of the receptors may be affected 0-1 hour/year,
- 72 (20%) of the receptors may be affected 1-10 hours/year,
- 57 (16%) of the receptors may be affected 10-20 hours/year,
- 31 (9%) of the receptors may be affected 20-30 hours/year,
- 58 (16%) of the receptors may be affected for more than 30 hours/year.

Of the 58 receptors predicted to receive more than 30 hours of shadow flicker per year, 22 are located on participating parcels, while 36 are currently non-participants. The details regarding anticipated shadow flicker at the 36 non-participating receptors are summarized below in Table 08-3.

Table 08-3. Daily Effect to Non-Participating Receptors Predicted to Exceed 30 Hours of Shadow Flicker

Receptor ID	Predicted Annual Shadow Flicker (hh:mm)	Turbines Contributing to Shadow Flicker	Approximate Times of Day Receptor Potentially Affected by Flicker[1]
294	30:48	53, 61, 61a	4:15 PM – 4:30 PM 7:45 PM – 9:00 PM
55	32:08	7, 17, 47	6:45 AM – 7:30 AM 4:00 PM –5:15 PM
281	32:45	86	3:45 PM – 6:00 PM
51	33:14	7, 17, 47	6:45 AM – 7:30 AM 4:15 PM – 5:15 PM
25	33:34	15, 16	7:45 AM – 10:00 AM
191	33:59	80	6:30 AM – 7:30 AM
54	34:06	7, 17, 47	6:30 AM – 7:15 AM 4:00 PM – 5:30 PM
70	34:14	9, 10, 10A, 87	7:15 AM – 9:30 AM 3:45 PM – 4:30 PM
52	35:40	7, 17, 47	6:45 AM – 7:30 AM 4:00 PM – 5:00 PM 8:00 PM – 9:00 PM
53	36:13	7, 17, 47	6:30 AM – 7:30 AM 4:00 PM – 5:15 PM 8:00 PM – 9:00 PM
318	36:51	71, 72	8:45 AM – 9:30 AM 3:15 PM – 4:45 PM
160	37:20	58, 60	5:00 PM – 6:45 PM 7:00 PM – 8:30 PM
238	37:29	16, 17	6:30 PM – 8:00 PM 8:30 PM – 9:00 PM
239	37:37	16, 17	6:45 PM – 8:00 PM 8:30 PM – 9:00 PM
291	37:41	73, 74	5:00 PM – 7:15 PM 7:45 PM – 8:45 PM
379	38:34	58, 60	8:45 AM – 9:45 AM 3:15 PM – 5:30 PM
161	39:08	58, 60	5:45 PM – 7:15 PM 7:30 PM – 8:45 PM
285	42:53	66, 72, 73, 84	7:00 AM – 10:00 AM 8:15 PM – 9:00 PM
149	42:59	52b, 57, 78a,	7:30 PM – 10:15 PM
159	43:21	52b, 57, 58, 60	4:30 PM – 7:30 PM 8:00 PM – 9:00 PM
85	43:46	10, 19, 87	7:00 AM – 8:00 AM 5:00 PM – 7:15 PM 7:30 PM – 8:30 PM

Receptor ID	Predicted Annual Shadow Flicker (hh:mm)	Turbines Contributing to Shadow Flicker	Approximate Times of Day Receptor Potentially Affected by Flicker[1]
316	44:31	71, 72	8:30 AM – 9:45 AM 4:00 PM – 6:30 PM
104	45:27	44	7:15 PM – 8:45 PM
78	45:36	9, 10, 10a	6:30 AM – 7:15 AM 7:30 AM – 8:30 AM 5:45 PM – 7:30 PM
315	49:51	71, 72	8:15 AM – 9:45 AM 4:15 PM – 6:45 PM
138	49:53	76, 77	7:15 PM – 8:45 PM
314	57:59	71, 72	8:00 AM – 10:00 AM 4:45 PM – 7:15 PM
64	59:13	10a, 42. 90	6:30 AM – 7:30 AM 8:00 AM – 9:30 AM 8:00 PM – 9:00 PM
151	60:15	78	6:45 AM – 8:15 AM
150	60:16	78	6:45 AM – 8:30 AM
313	62:46	71, 72	7:45 AM – 10:00 AM 5:30 PM – 7:30 PM
311	64:32	71, 72	7:45 AM – 10:00 AM 6:15 PM – 7:30 PM
79	68:45	9, 10, 10a, 87	6:30 AM – 7:15 AM 7:30 AM – 8:30 AM 4:45 PM – 7:00 PM
312	70:12	71, 72	7:30 AM – 10:00 AM 6:15 PM – 7:45 PM
310	81:27	71, 72	7:30 AM – 10:00 AM 6:30 PM – 8:00 PM
287	130:00	73, 74, 84	6:45 AM – 9:00 AM 7:00 AM – 8:30 AM

[1]The times of day presented in Table 08-3 represent the range of times during which each structure could potentially experience shadow flicker throughout the year; however, no structures will experience shadow flicker every day during all those hours. See Attachment B of Exhibit K for detailed calendars that illustrate the specific times of year and day that each structure may experience shadow flicker.

Although shadow flicker at these receptors exceeds the 30-hour per year threshold, these calculations do not take into account the actual location and orientation of windows, or the screening effects associated with existing, site-specific conditions such as vegetation and/or buildings. This analysis also assumes turbine rotors are continuously in motion during daylight hours, which will not necessarily be the case (i.e., the blades do not spin below the cut-in speed of 3 m/s [6.7 mph]). In addition, many of the modeled shadow-flicker hours are expected to be low intensity because they would occur during the early morning or late afternoon when the sun is low in the sky. As the sun sinks below the horizon, more of its light is scattered by the atmosphere, which has the effect of dampening its brightness and, therefore, reducing its ability to cast dark shadows (EMD, 2013).

Furthermore, to provide a worst-case scenario results, this analysis evaluated the potential impact of 54 Vestas 150 turbines, when in fact the number of turbines that the Applicant plans to build will be no greater than 37. The Vestas 150 turbine was used in this analysis because it has the largest rotor diameter of any turbine model under consideration and would therefore produce the greatest amount of shadow flicker. The actual shadow flicker to be produced will be dependent on the turbine model selected, the number of turbines constructed, and the turbine sites selected for the Facility.

As required by OAC Rule 4906-4-09(H), the Facility will be operated so that shadow flicker levels do not exceed 30 hours per year at any non-participating receptor within 1,000 meters of any turbine. A preconstruction shadow flicker analysis will be conducted to determine the actual shadow flicker effects based on the final turbine model selected, and the associated turbine sites. In addition, if adverse shadow flicker impacts are identified from wind turbine operations, a reasonable complaint resolution procedure will be implemented to ensure that any complaints regarding shadow flicker are adequately investigated and resolved. A draft Complaint Resolution Plan is attached hereto as Exhibit V.

(10) Radio and Television Reception

To evaluate the potential for the Facility to impact existing telecommunication signals, Comsearch was contracted to conduct analyses of off-air television reception and AM/FM broadcast station operations in the vicinity of the Project Area (see Exhibit Z and AA). Potential impacts to each of these resources are described below.

Off-Air Television Analysis: Off-air stations are television broadcasts that transmit signals that can be received directly by a television receiver or house-mounted antenna. The television reception analysis identified all off-air television stations within a 150-kilometer (93.2-mile) radius of an area of interest encompassing the proposed Facility, as illustrated in Figure 2 of the Off-Air TV Analysis report in Exhibit Z. The results of the study indicate that there are a total of 113 off-air television stations within 150 kilometers. However, the television stations most likely to produce off-air coverage to residents in the vicinity of the Project Area are those located at a distance of 100 kilometers (62.1 miles) or less.

There are a total of 57 database records for stations within approximately 100 kilometers of the Facility. Of these stations, only 27 are currently licensed and operating, 14 of which are low-power digital stations or translators. Translator stations are low-power stations that receive signals from distant broadcasters and re-transmit the signal to a local audience. These stations serve local audiences and have limited range, which is a function of their transmit power and the height of their transmit antenna. The remaining 13 operational stations broadcast at full power.

Ten of the 13 full-power digital stations, two low-power digital station (W26DH-D and WEIJ-LD), and one translator station (WDFM-LP) may have their reception disrupted in and around the proposed Facility. These stations are listed below in Table 08-4. The areas primarily affected would include TV service locations within 10 kilometers (6.2 miles) of the Facility that have clear line-of-sight to a proposed wind turbine but not to the respective station.

Table 08-4. Licensed Off-Air TV Stations Subject to Degradation

ID	Call Sign	Channel	Distance to Nearest Turbine (km)	Distance to Nearest Turbine (miles)
5	WDFM-LP	26	17.2	10.7
27	WINM	12	33.1	20.6
29	W26DH-D	26	35.4	22.0
31	WANE-TV	31	40.3	25.0
32	WISE-TV	18	40.6	25.2
33	WPTA	24	40.6	25.2
34	WEIJ-LD	38	41.2	25.6
35	WFWA	40	41.2	25.6
36	WFFT-TV	36	41.4	25.7
38	WTLW	44	49.8	30.9
40	WLIO	8	54.3	33.7
53	WBGU-TV	27	60.3	37.5
56	WLMB	5	83.6	51.9

Source: Comsearch, 2018a.

Communities and homes in these locations may have degraded reception of these stations after the wind turbines are installed, due to signal scattering that can occur when TV signals are reflected by the rotating wind turbine blades and mast. In the event that interference is observed in any of the TV service areas, it is recommended that a high-gain directional antenna 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 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 (2018a). Residents that experience degraded off-air television service after installation of the Facility can issue a formal complaint with Applicant. A hotline will be setup to receive and formally document all complaints, which will then be investigated by onsite Facility staff. The complaint resolution process will be developed with OPSB Staff before construction begins.

AM/FM Analysis: Comsearch identified five database records for AM stations within 30 kilometers (18.6 miles) of the proposed Facility. Potential problems with AM broadcast coverage can occur when stations with directional antennas are located within the lesser of 10 wavelengths or 3 kilometers (1.9 miles) of turbines, or when stations with non-directional antennas are located within one wavelength. As shown on Figure 1 in the Analysis of AM and FM Radio Report in Exhibit AA, all AM stations are located well outside the Project Area, with the closest station located approximately 18.7 kilometers (11.6) miles from the nearest proposed turbine site. Therefore, no degradation of AM broadcast coverage is anticipated (Comsearch, 2018b).

In addition, Comsearch determined that there are 13 database records for FM stations within 30 kilometers (18.6 miles) of the proposed Facility. While all of these stations are currently licensed and operating, seven are low-power or translator stations that broadcast with limited range. The coverage of FM stations is generally not susceptible to interference caused by wind turbines, especially when large objects, such as wind turbines, are sited in the far field region of the radiating FM antenna in order to avoid the risk of distorting the antenna's radiation pattern. As shown on Figure 2 in the Analysis of AM and FM Broadcast Station Operations report in Exhibit AA, the closest operational FM station to the Facility is more than 2.5 kilometers (1.6 miles) from the nearest turbine. At this distance there should be no degradation of FM broadcast coverage (Comsearch, 2018b).

(11) Radar Interference

Comsearch was also contracted to send written notification of the proposed Facility to the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. Upon receipt of notification, the NTIA provides plans for the proposed Facility to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC), which include the Department of Defense, the Department of Education, the Department of Justice, and the FAA. The NTIA then identifies any Facility-related concerns detected by the IRAC during the review period. If the Facility had the potential to interfere with military or civilian radar systems, this conflict would be identified during IRAC review.

The notification letter was sent to NTIA on March 22, 2018. A response letter from NTIA was received on May 29, 2018 (see Exhibit BB). No concerns regarding blockage of communication systems were identified.

(12) Navigable Airspace Interference

The FAA is the authority in the United States government responsible for regulating all aspects of civil aviation, including issuing determinations on petitions for objects that penetrate the nation's airspace. The FAA conducts aeronautical studies for new structures that will exceed 200 feet in height under the provisions of Title 49 of the U.S. Code, Section 44718, and applicable Title 14 of the CFR, part 77 and ORC 4561.32. The FAA can issue two types of determinations, one that identifies a hazard and another that identifies no hazard.

The Applicant submitted completed Notices of Proposed Construction, Form 7460-1 in February 2018. Upon receipt of these forms, the FAA obstruction group automatically notifies the ODOT Office of Aviation, thereby fulfilling the state permit application requirements as set forth in OAC Section 5501:1. The FAA and ODOT Office of Aviation will evaluate the proposed turbines and determine whether they are in compliance with the standards set forth in 14 CFR Part 77 and the ORC. The Applicant notified owners/operators of nearby airports of the proposed Facility location, turbine dimensions, and anticipated timeframe for Facility construction. The notification letters to the airport owners are included in Exhibit DD.

Turbines will be marked and/or lit in accordance with FAA Advisory Circular 70/7460-1 K Change 2, Obstruction Marking and Lighting. Because no turbine will be constructed until the respective Determination of No Hazard has been issued, neither construction nor operation of the proposed Facility is expected to create any adverse impacts on the existing air travel network.

(13) Communication Interference

Microwave telecommunication systems are 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. These systems are wireless point-to-point links that communicate between two antennas and require clear line-of-sight conditions between each antenna. To assure an uninterrupted line of communications, a microwave link should be clear, not only along the axis between the center point of each antenna, but also within a mathematical distance around the center axis known as the Fresnel Zone. Microwave bands that may be affected by the installation of wind turbine facilities operate over a wide frequency range (900 MHz – 23 GHz).

Comsearch identified 45 microwave paths in the vicinity of the Project Area. These paths are listed in Table 1 and illustrated in Figure 2 in the Licensed Microwave Report (see Exhibit EE). Comsearch verified the location of each tower location, then calculated a Worse Case Fresnel Zone for each microwave path. Based upon the dimensions of the largest turbine under consideration, Comsearch (2018c) determined that none of the proposed turbine sites would obstruct any microwave paths.

(B) ECOLOGICAL IMPACT

(1) Ecological Resources in the Project Area

In support of the preparation of this Application, environmental consultants from various firms have made numerous site visits to the Project Area and completed extensive on-site ecological surveys during multiple growing seasons. Cardno ENTRIX (Cardno) prepared a Surface Water Delineation Report, attached hereto as Exhibit M. The purpose of this report was to provide a stream and wetland delineation of Facility locations including turbines, access roads, and electrical interconnect lines; to map and characterize vegetative communities; and to screen for potential occurrence of rare, threatened, and endangered plant and animal species.

In addition, numerous wildlife surveys were completed in the vicinity of and within the Project Area by Western EcoSystems Technology, Inc. (WEST). WEST conducted an avian use survey for a period of one year from March 2016 to February 2017 within an area including Paulding Wind Farm II facility, Paulding Wind Farm III facility, and the northern half of the Project Area. WEST conducted an additional avian use survey focusing on the Project Area for a period of one year from November 2016 through October 2017 to assess current use of the Project Area by eagles and other bird species. Raptor nest surveys were completed by WEST in Spring 2017 and Spring 2018 to identify raptor nests in the vicinity of the Project Area. WEST also conducted bat acoustic surveys during the spring, summer, and fall of 2017 and spring of 2018 to assess bat use and phenology in the Project Area. WEST also completed bat mist-netting surveys in July 2017 to determine presence or probably absence of Indiana and northern long-eared bats within the Project Area during the summer maternity season. Finally, WEST completed an assessment of the proposed Facility for potential impact to mussel habitat. Survey methodologies were based on the ODNR's *On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio* and recommendations from ODNR and U.S. Fish and Wildlife Service (USFWS). The wildlife surveys completed for the Facility are attached hereto as follows:

- Paulding Wind Farm II, III, and IV Avian Use Survey (Exhibit N)
- Paulding Wind Farm IV Avian Use Survey (Exhibit O)
- Raptor Nest Survey (Exhibit P)
- Bat Studies Technical Memorandum (Exhibit Q)
- Bat Acoustic Survey (Exhibit R)
- Bat Mist-Net Survey (Exhibit S)

These field surveys are described below in Section 4906-4-08(B)(1)(b) and (d).

(a) *Open Spaces and Facility Map*

Figure 08-3 shows the proposed Facility and lands within a 0.5-mile radius of the Project Area. This mapping was developed from ESRI ArcGIS Online "World Topographic Map" map service. Among other information, Figure 08-3 shows the following features:

(i) The proposed Facility and Project Area boundary
(ii) Undeveloped or abandoned land such as wood lots or vacant tracts of land subject to past or present surface mining activities
(iii) Wildlife areas, nature preserves, and other conservation areas
(iv) Surface bodies of water
(v) Highly erodible soils and steep slopes

No wildlife areas, nature preserves, or conservation areas were located within a 0.5-mile radius of the Project Area. As such, there are none shown on Figure 08-3.

(b) *Field Survey and Map of Vegetative Communities and Surface Waters within 100 Feet of Construction*

Cardno completed a habitat assessment and wetland and waterbody delineation surveys (Exhibits L and M) of the proposed Facility and surrounding areas. For the habitat assessment, Cardno utilized GIS to screen for and classify potential environmental resources. Sources of the desktop reference material included but were not limited to the USDA Natural Resources Conservation Service (NRCS) Soil Survey for Paulding County, historic aerial photographs and farmed wetland maps from the USDA Farm Service Agency (FSA), National Wetland Inventory (NWI) maps, Ohio Wetland Inventory (OHI) maps, USGS topographic maps, the USGS National Hydrography Dataset (NHD), and recent aerial photographs. Cardno completed wetland and waterbody delineation surveys during winter 2017 and spring 2018 to determine the extent and jurisdiction of wetlands and waterbodies in the area to be disturbed by Facility construction. The field surveys evaluated a 100-foot corridor around all proposed Facility components (Project Corridor). The data obtained during the desktop review was found to be generally consistent with the results of the survey.

Vegetative Communities

The dominant ecological communities in the wetland survey area are agricultural (crops), with lesser amounts of developed/open space (residences/yards), and forestland. Each of these communities is described below:

Agricultural fields within the Project Corridor consist of primarily of soy beans and corn. The cultivated areas within the Project Corridor are expected to occupy the same general area from year to year, with the potential for the type of crop to change seasonally. During the winter months, fields may be planted in a cover crop such as winter wheat (*Triticum aestivum*) to control erosion and restore soil nutrients. The Project Corridor consists of agricultural fields that are currently active or recently fallowed. Many of the crop areas and roadsides had man-made or modified ditches which helped maintain field drainage for agricultural operations. In between many of the fields, as well as along many roadsides, there were also grassy swales (consisting of *Festuca* and fescue grasses) that helped to direct stormwater runoff away from the crop area. In intermittent and ephemeral ditches, the channels were often vegetated with reed canary grass (*Phalaris arundinacea*) and narrow-leaf cattail (*Typha angustifolia*) indicating the presence of water during portions of the year. Some ditches, which rarely received any runoff except during severe storm events, lacked vegetation in the channel or had a mix of grasses (*Festuca* and fescue).

Disturbed/developed lands are found in low densities throughout the Project Corridor. These areas are characterized by the presence of buildings, parking lots, paved and unpaved roads, and lawns/landscaped areas. Vegetation in these areas is generally either lacking or highly managed including ornamental plantings and managed lawns of tall fescue (*Festuca arundinacea*). In areas that are not intensely managed, weedy herbaceous species such as dandelion (*Taraxacum officinale*), thistle (*Cirsium vulgare*), ragweed (*Ambrosia artemesiifolia*), clover (*Trifolium* sp.), and common purslane (*Portulaca oleracea*) may develop.

Forestland within the Project Corridor is limited to isolated woodlots between crop areas and along roads. The windrows consisted of narrow forested strips between cultivated areas, and likely served as property boundaries historically. Windrows typically ranged in depth from 30 to 60 feet, with the wider windrows occasionally containing man-made ditches which served to improve drainage along the adjoining cultivated areas. Woodlots within the Project Corridor were often much deeper, but surrounded by cultivated areas along at least two sides. Larger woodlots are likely utilized for hunting opportunities.

Both the windrows and woodlots have a dominance of weedy vegetation along the edges including pokeweed (*Phylotacca americana*), blackberry (*Rubus* sp.), and poison ivy (Toxicodendron radicans). Mature trees along windrows and inside of the woodlots include: maples (Acer sp.), oaks (*Quercus* sp.), American elm (*Ulmus americana*), American beech (*Fagus grandifolia*), and shagbark hickories (*Carya ovata*). Though shagbark hickories can be used as roosting habitat for many bat species, the Cardno field teams did not observe any bats during surveys; however, surveys were completed during daylight hours when bats are generally inactive.

The habitats surveyed during field efforts appeared to lack significant or obvious evidence of rare, threatened, or endangered species due to the high level of habitat fragmentation and degradation. The delineated waterbodies could potentially provide habitat, but they had significantly reduced quality due to the surrounding land use and were unlikely to be suitable for most species (i.e., high sediment loading during storms, fertilizer in runoff). During field surveys, minimal wildlife use was observed in the Project corridor and no rare, threatened, or endangered species were observed.

Wetland and Stream Delineations

Wetland and stream delineations were completed throughout the Project Corridor in accordance with the 1987 USACE *Corps of Engineers Wetlands Delineation Manual* (USACE, 1987) and the applicable regional supplements; *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region (Version 2.0)* (USACE, 2012). The wetland delineations consisted of field jurisdictional determinations and documentation of regulated waters using USACE criteria. All stream features were documented for their general dimensional, substrate, morphology, and flow regimen characteristics where possible. Potentially regulated waters were mapped with sub-meter accuracy Global Positioning System (GPS) equipment. Data points were recorded at each suspected wetland, within the wetland, and in an adjacent upland area.

After the field delineations were complete, the identified wetlands were scored using the Ohio EPA's Ohio Rapid Assessment Method for Wetlands (ORAM). The ORAM wetland functional assessment was developed to determine the ecological "quality" and level of function of a particular wetland in order to meet requirements under Section 401 of the Clean Water Act (CWA). Wetlands are scored on the basis of hydrology, upland buffer, habitat alteration, special wetland communities, and vegetation communities. Each of these subject areas is further divided into sub-categories under ORAM v5.0, resulting in a score that describes the wetland using a range from 0 (low quality and high disturbance) to 100 (high quality and low disturbance). Based on these scores, there are three possible categories into which wetlands may be assigned:

- Category 1 – Lowest value category. Wetlands in this category are generally limited to small, low-diversity wetlands and wetlands with a predominance of non-native invasive species. The designation 'Category 1' is assigned to wetlands whose ORAM scores fall between 0 and 29.9. Wetlands whose ORAM scores fall between 30 and 34.9 fall in a scoring 'gray area' and additional testing is needed to determine whether they belong in Category 1 or the next higher category.
- Category 2 – Middle value category. Wetlands in this category are of moderate diversity but do not contain rare, threatened or endangered species. They are generally degraded but are capable of restoring some of the lost functionality and attaining a higher value. Most wetlands in Ohio are expected to fall into this category. The designation of 'Modified' is assigned to wetlands whose ORAM scores fall within the lower end (ORAM = 35-44.9) of the scoring range that defines Category 2 (ORAM = 35-59.9). Wetlands whose ORAM scores fall between 60 and 64.9 in a scoring 'gray area', and additional testing is needed to determine whether they belong in Category 2 or the next higher Category.
- Category 3 – Highest value category. Wetlands in this category have high levels of diversity, a high proportion of native species, and/or high functional values. The designation 'Category 3' is assigned to wetlands whose ORAM scores fall between 65 and 100.

A total of six wetlands were delineated during field surveys, for a total of 3.03[3] acres within the Project Corridor. Five of the six wetlands were considered palustrine forested (PFO) wetlands and the sixth was identified as a palustrine emergent (PEM) wetland, due to the lack of woody vegetation. Five of the wetlands scored as Modified Category 2, indicating that the habitat had been modified but still had some ecological value and utilization. The remaining wetland was a Category 2. The wetlands typically occurred in isolated woodlots that were surrounded by active agricultural fields and lacked connections to other waterbodies.

Only one of the wetlands is considered jurisdictional due to a potential hydrologic connection to a Waters of the U.S. (WOTUS). The remaining five wetlands are isolated and under the sole jurisdiction of the Ohio Isolated Wetland Permitting Program. Delineated wetlands are mapped in Figure 08-4, which illustrates all delineated resources and vegetative communities within 100 feet of Facility components at

[3] Wetland acreages reported are representative of the portion of the wetland located within the Project Corridor only; wetlands may extend beyond the portion of the Project Area subject to disturbance from Facility construction.

a 1:12,000 scale. Additional information on the wetland delineation, including a more zoomed in view of each delineated feature is available in Exhibit M.

Cardno (2018) evaluated streams and ditches with potential to be impacted using the Ohio Headwater Habitat Evaluation Index (HHEI) and/or the Ohio Qualitative Habitat Evaluation Index (QHEI) scoring method, as applicable. Both methods yield a numerical score for the section of streams evaluated, which Cardo used to estimate the probable existing aquatic life use of each stream. Jurisdictional streams were identified as those waters that had an Ordinary High Water Mark (OHWM), a defined channel, and an open water feature, such as surface water or at least a non-vegetated area through the channel that indicated periodic flowing water. Channels that parallel the roadway, do not have an identifiable OHWM, are dominated by upland vegetation, and do not represent a relocation of a natural channel are not considered jurisdictional.

All streams delineated in the field were assessed using the HHEI as outlined in the Field Evaluation Manual for Ohio's Primary Headwater Habitat Streams Review. The HHEI is used to determine the status of smaller streams as one of three classes of primary headwater habitats (PHWH). The method scores streams on a range of 0 to 100 based on physical characteristics. Scores less than 30 indicate a Class I PHWH (ephemeral streams); scores 30 to 70 indicate a Class II PHWH (intermittent, interstitial or perennial, warm water streams); scores greater than 50 can be either Class II or Class III depending on their conditions; and Scores 70 or greater indicate a Class III PHWH (perennial, cool water streams).

Additional assessments were performed on streams which were identified as potentially having a drainage area of greater than one square mile (259 ha) and with predominant pools having maximum pool depths over 40 centimeters using the Ohio EPA's QHEI. The QHEI assessment examines a number of stream characteristics and yields a score ranging from 0 to 100. A score of 60 typically indicates a stream has the physical characteristics needed to support diverse macroinvertebrate and fish populations and attain the warmwater habitat (WWH) designation. Scores of 32 to 60 may be indicative of a modified warmwater habitat, meaning a WWH that has been disturbed but could potentially recover. Scores less than 32 typically indicate a limited resource water (LRW). Scores that are greater than 75 are indicative of a possible exceptional warmwater habitat (EWH).

A total of 57 waterbodies were delineated in the Survey Area, all of which were identified as ditches. Twenty-five of the linear waterbodies were identified as Class I according to the HHEI scoring matrix, with the remaining 32 scoring as Class II. None of the features scored high enough on the HHEI to be considered class III waterbodies. Four of the Class I waterbodies are anticipated to be jurisdictional features due to their potential connection to WOTUS as tributaries or due to identification as NHD features. All of these features have a very low chance of being potential habitat for rare, threatened, or endangered species, but have a defined bed, bank, and OHWM. Thirty of the delineated Class II waterbodies are anticipated to be jurisdictional features due to their potential connection to a WOTUS. Although many were considered to be moderate quality, it is unlikely that these streams and ditches will be suitable habitat for any RTE species. Additional information on the delineated waterbodies can be found in Exhibit M.

(c) *Literature Review of Plant and Animal Life within 0.25 Mile of Construction*

This section provides the results of a literature survey of the plant and animal life within at least one-fourth mile of the Project Area boundary. The literature survey is broken out into two sections: (i) for plant; and (ii) for animals.

(i) Aquatic and Terrestrial Plants

The review of plant resources within 0.25 mile of the Project Area boundary focuses on species of commercial or recreational value, and species designated as endangered or threatened. This information was compiled through review and analysis of existing data sources, including Natureserve, USDA Plants, and ODNR Natural Heritage Databases.

<u>Species of Commercial or Recreational Value</u>

Agricultural impacts, including impacts to crops and other commodity plants, are addressed in Section 4906-4-08(E). Aside from crops, there are no other plant species of commercial or recreational value identified as occurring in the Project Area.

<u>Threatened and Endangered Plant Species</u>

Based on ODNR records for state-listed species, there are two endangered species and three threatened plant species known to occur in Paulding County (ODNR, 2016a). The status and generalized habitat requirements for each of these species are summarized below in Table 08-5.

Table 08-5. Threatened and Endangered Plant Species in Paulding County

Scientific Name	Common Name	General Habitat	Ohio Status[1]
Carex crus-corvi	Raven-foot sedge	Swampy woods	T
Cuscuta cuspidata	Cuspidate dodder	Openings along creeks and streams	E
Iris brevicaulis	Leafy blue flag	Shaded or semi-shaded wet areas	T
Rorippa aquatica	Lakecress	Sunny shores of ponds and slow moving streams	T
Vernonia fasciculata	Prairie ironweed	Sunny wet areas	E

Source: ODNR, 2016a
[1] E = Endangered, T = Threatened

As shown in Table 08-5, the majority of state-listed plant species that are found in Paulding County occur in wetland habitats, which are uncommon within the Project Area and have been avoided during Facility siting to the extent practicable.

(ii) Aquatic and Terrestrial Animals

Animal resources with 0.25 mile of the Project Area boundary were identified through review and analysis of existing data sources, including the North American Breeding Bird Survey, the Audubon Christmas Bird Count, the Hawk Migration Association of North America, the American Society of Mammalogists, the Ohio Frog and Toad Calling Survey, the Ohio Salamander Monitoring Program, the National Amphibian Atlas, and ODNR field guides. These various sources of information have been synthesized and are presented below for birds, mammals, reptiles/amphibians, aquatic species, commercial species, and recreational species. Each of these discussions identifies potential presence of species designated as endangered or threatened in accordance with the U.S. and Ohio threatened and endangered species list. See Section 4906-4-08(B)(1)(d) for a discussion of field surveys conducted on-site.

<u>Birds</u>

Breeding Birds: The North American Breeding Bird Survey (BBS), overseen by the Patuxent Wildlife Research Center of the USGS, in a long-term, large-scale, international avian monitoring program that tracks the status and trends of North American bird populations. Each survey route is 24.5 miles long, with 3-minute point counts conducted at 0.5-mile intervals. During the point counts, every bird seen or heard within a 0.25-mile radius is recorded. The Berne Survey Route is southwest of the Project Area, approximately 5.6 miles from the closest turbine. Data on breeding birds was collected on this route during 49 of the 51 years between 1966 and 2017. There have been 90 species recorded on this route since 1966, the most commonly observed of which include house sparrow (*Passer domesticus)*, European starling (*Sturnus vulgaris*), red-winged blackbird (*Agelaius phoeniceus*), American robin (*Turdus migratorius*), common grackle (*Quiscalus quiscula*), song sparrow (*Melospiza melodia*), horned lark (*Eremophila alpestris*), mourning dove (*Zenaida macroura*), vesper sparrow (*Pooecetes gramineus*), indigo bunting (*Passerina cyanea*), chipping sparrow (*Spizella passerina*), and killdeer (*Charadrius vociferus)*. Two state-listed endangered species (northern harrier [*Circus cyanues*] and upland sandpiper [*Bartramia longicauda*]) and three state-listed species of concern (bobolink [*Dolichonyx oryzivorous*], northern bobwhite [*Colinus virginianus*], and black-billed cuckoo [*Coccyzus erythropthalmus*]) were observed during these surveys. These state-listed species have generally been detected in very low numbers. The boblink and northern bobwhite were identified in moderate numbers in the 1970s, 1980s, and 1990s, but since 2010 no bobolinks and only five northern bobwhites have been observed. Two northern harriers were observed (in 1983 and 1987), and none have been detected since. Similarly, only 3 upland sandpipers (two in 1977 and one in 1982) were observed, and two black-billed cuckoos (1982 and 1987). No federally-listed endangered or threatened species were observed (Pardieck, et al., 2017; ODNR, 2017).

Wintering Birds: Data from the Audubon's Christmas Bird County (CBC) provides an overview of the birds that inhabit the region during the early winter. Counts take place on a single day during a three-week period around Christmas, when birdwatchers comb a 15-mile (24 km) diameter circle in order to count the number of bird species and individuals observed. The Black Swamp count circle is centered approximately 13 miles east of the Project Area. The numbering of wintering birds observed in this count circle ranged between 40 and 56 species per year over the last 10 years, with a total of 85 different species recorded. The most common wintering bird species observed were European starling, Canada goose (*Branta canadensis*), house sparrow, horned lark, mallard (*Anas platyrhynchos*), lapland longspur (*Calcarius lapponicus*), mourning dove, American tree sparrow (*Spizelloides arborea*), dark-eyed junco (*Junco hyemalis*), rock pigeon (*Columbia livia*), and snow bunting (*Plectrophenax nivalis*). The following state-listed avian species were documented over the past 10 years of the Black Swamp CBC: northern harrier (endangered); sandhill crane (*Grus canadensis*; threatened); and sharp-shinned hawk (*Accipiter striatus*; species of concern); no federally-listed endangered or threatened species were recorded (National Audubon Society, 2017; ODNR, 2017).

Migratory Birds: The Hawk Migration Association of North America (HMANA) collects hawk count data from almost 200 affiliated raptor monitoring sites throughout the United States, Canada, and Mexico. There is one hawk watch site in Ohio in Conneaut in Ashtabula County. However, the closest hawk watch site is the Detroit River Hawk Watch in Michigan (approximately 100 miles northeast of the Project Area; HMANA, 2018). Data from the Detroit River Hawk Watch was reviewed, but due to the distance to the Project Area and the marked differences in landform, these sites were not considered representative of conditions for migrating raptors in the vicinity of the proposed Facility. See Section 4906-4-08(B)(1)(d) below for a description of site-specific surveys that were completed to evaluate the passerine migration and raptor migration through the Project Area.

Mammals

The occurrence of mammalian species was documented through evaluation of species range and available habitat, including data from the American Society of Mammalogists, NatureServe, and ODNR field guides. This effort suggests that approximately 46 species of mammal could occur in the area, including white-tailed deer (*Odocoileus virginianus*), eastern cottontail rabbit (*Sylvilagus floridanus*), eastern chipmunk (*Tamias striatus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), raccoon (*Procyon lotor*), Virginia opossum (*Didelphis virginiana*), woodchuck (*Marmota monax*), eastern gray squirrel (*Sciurus carolinensis*), eastern fox squirrel (*Sciurus niger*), striped skunk (*Mephitis mephitis*), American beaver (*Castor canadensis*), common muskrat (*Ondatra zibethicus*), American mink (*Mustela vison*), long-tailed weasel (*Mustel frenata),* big brown bat *(Eptesicus fuscus*), little brown bat (*Myotis lucifugus*), Indiana bat (*Myotis sodalist*), northern long-eared bat (*Myotis septentrionalis*), eastern red bat (*Lasiurus borealis*), tri-colored bat (*Perimyotis subflavus*), hoary bat (*Lasiurus cinereus*), evening bat (*Nycticeius humeralis*), and a variety of small mammals such as mice, moles, voles, and shrews. Most of the mammal species likely to occur in the area are common and widely distributed throughout Ohio. However, Indiana bat is both state- and federally-listed as endangered, and the northern long-eared bat is both state- and federally-listed as threatened (ODNR, 2017). Neither of these species were identified in recent bat surveys in the Project Area. See 4906-4-08(B)(1)(c)(ii) for further discussion of on-site surveys. Several other mammal species of concern could also occur in the area, including the star-nosed mole (*Condylura cistata*), North American deermouse (*Peromyscus maniculatus*), and woodland vole (*Microtus pinetorum*), and gray fox (*Urocyon cinereoargenteus*) (ASM, 2018; NatureServe, 2017; ODNR, 2017).

Amphibians and Reptiles

Reptile and amphibian presence in the vicinity of the Project Area was determined through review of the Ohio Frog and Toad Calling Survey, the Ohio Salamander Monitoring Program, the National Amphibian Atlas, and ODNR data. Based on this information, along with documented species ranges, it is estimated that approximately 29 reptile and amphibian species could occur within 0.25-mile of Facility construction. These species include, but are not limited to, Eastern American toad (*Bufo americanus*), Blanchard's cricket frog (*Acris crepitans*), northern spring peeper (*Pseudacris crucifer*), western chorus frog (*Pseudacris triseriata*), gray treefrog (*Hyla versicolor*), American bullfrog (*Rana catesbeiana*), northern green frog (*Rana clamitans*), snapping turtle (*Clelydra serpentina*), midland painted turtle (*Chrysemys picta*), eastern garter snake (*Thamnophis sirtalis*), common water snake (*Nerodia sipedon*), and eastern milksnake (*Lampropeltis triangulum*) (Davis & Lipps, 2018; ODNR, 2008, 2012a, 2016c; USGS, 2014). Most of the amphibian and reptile species likely to occur in the area are generally common and widely distributed throughout Ohio.

Aquatic Species

The potential occurrence of aquatic species in the vicinity of the Project Area was determined through review of the Ohio Aquatic Gap Analysis Program and ODNR data. Based on this information, it is estimated that approximately 72 fish species, 40 mollusk species, and 6 crayfish species could occur in the area (Covert et al., 2007). Fish species likely to occur within the Facility boundary include bigeye chub (*Notropis amblops*), black bullhead (*Ameiurus melas*), blacknose dace (*Rhinichthys atratulus*), blackside darter (*Percina maculata*), bluntnose minnow (*Pimephales notatus*), bluegill (*Lepomis macrochirus*), brown bullhead (*Ictalurus nebulosus*), common shiner (*Luxilus cornutus*), central mudminnow (*Umbra limi*), central stoneroller (*Campostoma anomalum*), creek chub (*Semotilus atromaculatus*), fathead minnow (*Pimephales promelas*), fantail darter (*Etheostoma flabellare*), golden shiner (*Notemigonus crysoleucas*), grass pickerel (*Esox americanus*), green sunfish (*Lepomis cyanellus*), greenside darter (*Etheostoma blennioides*), Johnny darter (*Etheostoma nigrum*), largemouth bass (*Micropterus salmoides*), northern hogsucker (*Hypentelium nigricans*), pumpkinseed (*Lepomis gibbosus*), redfin shiner (*Lythrurus umbratilis*), rock bass (*Ambloplites rupestris*), sand shiner (*Notropis stramineus*), silverjaw minnow (*Notropis buccatus*), spotfin shiner (*Cyprinella spiloptera*), striped shiner (*Luxilus chrysocephalus*), white sucker (*Catostomus commersoni*), and yellow bullhead (*Ameiurus natalis*).

Mollusk species likely to occur within the Facility boundary include creek heelsplitter (*Lasmigona compressa*), cylindrical papershell (*Anodontiodes ferussacianus*), fatmucket (*Lampsilis radiata*), giant floater (*Pyganodon grandis*), long fingernail clam (*Musculium transversum*), slippershell mussel (*Alasmidonta viridis*), striated fingernail claim (*Sphaerium striatinum*), and threehorn wartyback (*Obliquaria reflexa*).

Crayfish species likely to occur within the Facility boundary include big water crayfish (*Cambarus robustus*), devil crayfish (*Cambarus diogenes*), paintedhand mudbug (*Cambarus polychromatus*) papershell crayfish (*Orconectes immunis*), rusty crayfish (*Orconectes rusticus*), and white river crayfish (*Procambarus acutus*).

These aquatic species are generally common and widely distributed throughout Ohio. However, the following state-listed species are thought to occur in watersheds in the vicinity of the Project Area: the endangered clubshell (*Pleurobema clava*), rabbitsfoot (*Quadrula cylindrical*), rayed bean (*Villosa fabalis*), and washboard (*Megalonaias nervosa*); and the threatened black sandshell (*Ligumia recta*), fawnsfoot (*Truncilla donaciformis*), and threehorned wartyback (*Obliquaria reflexa*); and the creek heelsplitter, deertoe (*Truncilla truncate*), elktoe (*Alasmidonta marginata*), kidneyshell (*Ptychobranchus fasciolar*), purple wartyback (*Cyclonaias tuberculate*), round pigtoe (*Pleurobema plenum*), salamander mussel (*Simpsonaias ambigua*), and wavyrayed lampmussel (*Lampsilis fasciola*) (species of concern) (Covert et al., 2007, ODNR 2017). The rayed bean and clubshell mussels are also federally-listed as endangered. An evaluation of potential mussel habitat and the need for site-specific surveys is discussed in Section 4906-4-08(B)(1)(e) of this Application.

Commercial Species

Commercial species consist of those trapped or hunted for fur. The ODNR regulates the hunting and trapping of the following furbearers in Paulding County: Common muskrat, raccoon, red fox, gray fox, coyote, American mink, Virginia opossum, striped skunk, long-tailed weasel, and American beaver (ODNR, 2016d). Each of these species is briefly described below, based on habitat and distribution data published by the ODNR (2012b, 2016a) and the American Society of Mammalogists (ASM, 2018).

- Common muskrat: Muskrat are abundant throughout Ohio, and prefer habitats with slow-moving water, such as creeks and wetlands. This species is likely to occur in the vicinity of the Project Area.
- Raccoon: Raccoon are common statewide, occupying a wide variety of habitats near water, including forests, cropland, and developed land. This species is likely to occur in the vicinity of the Project Area.
- Red fox: Red fox are common statewide, occupying a wide variety of habitats, including forests, cropland, and developed land. This species is likely to occur in the vicinity of the Project Area.

- Gray fox: Less common in Ohio than the red fox, gray fox prefer forested and shrubland habitats, avoiding open areas. Although the Project Area is predominantly open agricultural land, this species could occur in low numbers in area woodlots and shrubland.
- Coyote: Once extirpated in Ohio, coyotes are now common statewide, occupying a wide variety of habitats, including forests, cropland, shrubland, and developed land. This species is likely to occur in the vicinity of the Project Area.
- American mink: This semi-aquatic weasel has a statewide distribution and favors forested wetlands with abundant cover. Although the Project Area is predominantly open agricultural land, this species could occur in low numbers in the area woodlands.
- Virginia opossum: Opossum are common statewide, occupying a wide variety of habitats, including forests, cropland, and developed land. This species is likely to occur in the vicinity of the Project Area.
- Striped skunk: Skunk are common statewide, occupying a wide variety of habitats, including forests, cropland, and developed lands. This species is likely to occur in the vicinity of the Project Area.
- Long-tailed weasel: Found in a wide variety of habitats (including forests, cropland, and shrubland), this species is Ohio’s most common weasel, and is likely to occur in the vicinity of the Project Area.
- American beaver: Beaver are common statewide, inhabiting and modifying permanent sources of water of almost any type, particularly low gradient streams and small lakes/ponds with outlets. This species has potential to inhabit the Project Area, but is less likely than in other areas of Ohio.

<u>Recreational Species</u>

Recreational species consist of those hunted as game. The ODNR regulates the hunting of the following species in Paulding County: white-tailed deer, gray squirrel, red squirrel (*Tamiasciurus hudsonicus*), fox squirrel, cottontail rabbit, woodchuck, wild turkey (*Meleagris gallopavo*), ring-necked pheasant (*Phasianus colchicus*), American crow, mourning dove, and various waterfowl (ODNR, 2016d). Each of these species are briefly described below, based on habitat and distribution data published by the ODNR (2012b, 2013, 2016c), American Society of Mammalogists (ASM, 2018), USGS Breeding Bird Survey (Pardiek et al., 2017), and Christmas Bird Count (National Audubon Society, 2017).

- White-tailed deer: Deer are common statewide, occupying a wide variety of habitats, including forests, shrubland, cropland, and developed land. This species is likely to occur in the vicinity of the Project Area.
- Gray, red, and fox squirrels: The fox squirrel is primarily an inhabitant of open woodlands, while the gray squirrel and the red squirrel prefer more extensive forested areas. However, all three species have adapted well to landscaped suburban areas and are often found around structures. These tree squirrels occur throughout Ohio and are likely to occur in the vicinity of the Project Area.

- Eastern cottontail: Cottontails are abundant statewide. The species prefers open areas bordered by brush and open woodlands and have adapted well to developed areas. This species is likely to occur in the vicinity of the Project Area.
- Woodchuck: Woodchuck are common statewide, occupying a variety of habitats, including pastures, grasslands, and open woodlands. This species is likely to occur in the vicinity of the Project Area.
- Wild turkey: Once extirpated in Ohio, this species has re-established populations statewide, and is especially common in the southern and eastern parts of the state. Wild turkey is an adaptable species that prefers mature forest habitats, but live successfully in areas with as little as 15% forest cover. This species has been documented in the vicinity of the Project Area in the Audubon CBC.
- Ring-necked pheasant: Although not native to North America, the pheasant is naturalized in northern and western Ohio, and occupies open habitats such as agricultural landscapes and old fields. This species has been documented in the vicinity of the Project Area in the USGS BBS and the Audubon CBC.
- American crow: Crow are common statewide, occupying a wide variety of habitats, including forests, cropland, shrubland, and developed land. This species has been documented in the vicinity of the Project Area in the USGS BBS and the Audubon CBC.
- Mourning dove: Mourning doves are common statewide, occupying a wide variety of habitats, including cropland, shrubland, and developed land. This species was documented in the USGS BBS and the Audubon CBC.
- Waterfowl: The following waterfowl game species have been recorded in the vicinity of the Project Area in the USGS BBS and/or the Audubon CBC: Canada goose, mallard, American black duck (*Anas rubripes*), ruddy duck (*Oxyura jamaicensis*), and wood duck (*Aix sponsa*).

(d) *Results of Field Surveys for Plan and Animal Life Identified in Literature Review*

The literature review discussed in Section 4906-4-08(B)(1)(c) identified plant and animals likely to occur in the vicinity of the Project Area, based on previously published data. This review largely identified common species, but also indicated that some endangered, threatened, and special concern species could occur in the area. A series of site-specific field surveys were subsequently completed to further evaluate the plants and animals found on-site. The site-specific wildlife studies focused on birds and bats, which are more vulnerable to operational impacts from wind energy facilities than flightless wildlife species, and on endangered and threatened species likely to occur within the Project Area. The site-specific vegetation studies focused on identifying plant communities/habitats, and on delineating sensitive features such as wetlands and streams. Numerous avian and bat studies were completed throughout the Project Area and surrounding area between 2016 and 2018 by WEST (see Exhibits N, O, P, Q, R, and S). These surveys were designed and completed in accordance with ODNR's *On-Shore Bird and*

Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind Energy Facilities in Ohio (2009), as well as USFWS and ODNR recommendations.

<u>Paulding Wind Farm II, III, and IV Avian Use Survey</u>

WEST conducted an avian use survey between March 4, 2016 to February 16, 2017 from 24 observation points at the Paulding Wind Farms II and III, as well within the northern area of the proposed Facility. The main objective of the study was to determine the seasonal and spatial use of the site by eagles. The survey also recorded uses of sensitive species (i.e. state- of federally-listed) and other large birds. Survey methods were designed in accordance with USFWS and ODNR recommendations. Surveys were conducted monthly at the 24 observation points, yielding a total of 288 survey hours.

A total of 3,129 observations were recorded, representing 23 unique species. The most abundant species observed was the rock pigeon with 1,592 individuals, followed by the killdeer with 483 individuals. Of the raptor family, the red-tailed hawk (*Buteo jamaicensis)* was the most observed species with a total of 43 individuals, followed by the American kestrel (*Falco sparverius*) with 36 individuals. Fall and winter experienced the greatest use compared to spring and summer.

A total of six bald eagles (*Haliaeetus leucocephalus*) were observed in the study area over the 288 hours of surveys, and were only observed in the winter months. Flight height of the observed bird species was recorded as part of the survey. The purpose of this was to determine how often species fly within the rotor-swept height (RSH) which ranges between 25 meters to 150 meters. Bald eagles were observed having an average flight height of 50 meters, and 100% were observed in the RSH. Large corvids and waterbirds were also observed flying within the RSH, comprising approximately 88.4% and 72.7% of observations, respectively.

Three state-listed species were observed in the study area, the northern harrier (endangered), sharp-shinned hawk (species of special concern), and bobolink (species of special concern). A total of 25 observations of the northern harrier were made, as well as 2 observations of a sharp-shinned hawk and 1 observation of a bobolink. Federally-listed species were not observed in the study area.

<u>Paulding Wind Farm IV Avian Use Survey</u>

WEST conducted an avian survey from November 2, 2016 to October 30, 2017 from 30 observation points to assess use and risk by eagles and sensitive species including the sandhill cranes during migration. The secondary objective was to record use of other large birds at the Facility. A total of 360 survey hours over 12 visits were conducted. All four seasons were equally represented with 90 hours of surveys. Sandhill crane surveys were also conducted during the sandhill crane migration period (November 1 through December 15, 2016). Survey timing and methods were based on recommended protocol developed by the ODNR.

A total of 4,969 observations were recorded, representing 21 different species. Overall, the most commonly observed species included the Canada goose (1,969 observations), rock pigeon (935 observations), killdeer (722 observations), and the turkey vulture (*Cathartes aura*; 327 observations). The most common raptors recorded the red-tailed hawk (76 observations of 84 individuals) and the northern harrier (64 observations of 64 individuals). Avian use varied seasonally. Doves and pigeons were the most commonly observed group in the spring, shorebirds were most commonly observed group in the summer and fall, and waterfowl was the most commonly observed group in the winter months.

Flight heights were recorded based on bird type and averaged yielding a single mean flight height. The osprey and 'other raptors' both had the highest flight height, averaging 100 meters. The next highest flight height was recorded for bald eagles with a mean height of 58.55 meters. Heights between 25 and 150 meters fall within the RSH, increasing the potential threat for collision with a wind turbine.

A total number of 13 bald eagles were observed in the study area. Of the observed eagles, three were identified as juvenile, three as subadult, six as adult, and one unknown age. Eagle observations were recorded for each of the season. Eagle use of the study area was greater in the fall than the other three seasons. Four state-listed sensitive species were identified, including the endangered sandhill crane (37 observations), endangered northern harrier (64 observations), endangered upland sandpiper (1 observation), and the sedge wren (1 observation), which is listed as species of concern. No federally-listed species were identified in the study area.

<u>Raptor Nest Survey</u>

WEST completed raptor nest surveys in Spring 2017 and Spring 2018 (Exhibit P) to investigate nesting activities in the study area. The first year of surveys were conducted within a 2-mile buffer of a smaller turbine layout, and within 3 miles of the Maumee River and Flat Rock Creek. The study involved driving along public roads and stopping within view of suitable habitat to search for nest structures using binoculars and spotting scopes. In 2018, all forested areas within 2 miles of turbine locations were searched for raptor and eagle nests by helicopter. In addition, areas of potentially suitable eagle nesting habitat were searched for eagle nests within 2 to 10 miles of turbine locations. Surveys were conducted on March 22-24, and March 27, 2017 and March 12-14, 2018 prior to leaf out conditions. In addition, a follow-up visit was completed on April 24, 2018 to determine if the unoccupied potential eagle nests found during the survey were inactive.

Sixteen nests were identified during the 2017 survey. Four of the identified nests were bald eagle nests, three of which were deemed active and one inactive (WEST, 2017). Ten red-tailed hawk nests were observed in the study area, all of which appeared active. Two nests observed in the study area were classified as 'unknown *Buteo* or owl' nests. The unknown nests were believed to be constructed by red-tailed hawks given their abundant presence and the size of the nests; however, the nests could also be used by other raptor species such as Cooper's hawk or great horned owl. The study area did not contain suitable nesting habitat for the state-listed northern harrier.

Five active bald eagle nests and two unoccupied potential bald eagle nests were recorded during 2018 surveys. Three of the nests were previously known and the other four (three active and one occupied) were discovered during 2018 surveys (WEST, 2018a). Three of the active nests occurred along the Maumee River and two active nests occurred along Flat Rock Creek. Both of the unoccupied nests were in fair condition, deemed to be large enough to accommodate eagles and were located near one another along the Maumee River. The follow-up visit to these eagle nests did not yield any eagle activity and the nests were determined to be inactive. Eagle nests occurred within 0.7 to 6.8 miles of proposed turbine locations. No nests of federally or state-listed species were detected during surveys. Fourteen active and occupied red-tailed hawk nests, two great horned owl (*Bubo virginianus)* nests, and seven unoccupied raptor nests were observed within 2 miles of the proposed turbine locations. As with the 2017 surveys, the study area did not contain suitable nesting habitat for the state-listed northern harrier.

<u>Bat Acoustic Survey</u>

WEST conducted bat acoustic surveys from May 4 to November 16, 2017 and March 14 through May 31, 2018 (Exhibit R) to characterize seasonal bat activity within the Project Area. Additional acoustic surveys are ongoing and are discussed below and in a memo provided by WEST (Exhibit Q). Survey timing and methods were based on, and exceeded recommended protocol developed by the ODNR. Between May 4 and July 15, 2017, bat activity was monitored using one AnaBat™ SD2 detectors suspended 1 meter (3 feet) above the ground prior to the construction of a met tower. Once the met tower was constructed on July 15, 2017, three AnaBat™ SD2 detectors were suspended from the tower at different heights to capture information about bat species flying at variable altitudes: one at 5 meters (16 feet), one at 45 meters (145 feet) and, one at 80 meters (263 feet) above ground level (henceforth referred to as the

Ground, Low, and High detectors, respectively). Detectors were programmed to begin recording 30 minutes before sunset and stop recording 30 minutes after sunrise. Each detector was manually checked by trained technicians weekly during the survey period. Acoustic surveys are ongoing and will continue until July 15, 2018 in order to complete one year of surveys with detectors placed near the ground and raised near the rotor swept area, as per ODNR recommendations.

A total of 1,636 bat call sequences were recorded during 642 detector nights in 2017 and 2018 and analyzed by acoustic bat experts. Call sequences were sorted into two main groups: high-frequency and low frequency bats. High frequency bats with the potential to occur within the Project Area include: eastern red bat, little brown bat, northern long-eared bat, Indiana bat, evening bat, tri-colored bat, and Seminole bat (*Lasiurus seminolus*). Low frequency bats with the potential to occur within the Project Area include: big brown bat, hoary bat, and silver-haired bat (*Lasionycteris noctivagans*).

The majority of calls (54.9%, 898 calls) were identified as silver-haired bats or big brown/silver-haired bats, followed by eastern red bats (18.4%, 301 calls) and hoary bats (9.7%, 158 calls). Nineteen unknown high-frequency bat calls were recorded, but the quality of these calls was too low to determine species or species group. Approximately 90% of the total call sequences recorded were categorized by species or species group. No calls of federally-listed bat species were positively identified during the survey. Indiana bats are known to occur in Paulding County; however, no calls were identified as *Myotis* species.

The number of call sequences represented the number of bat passes per detector-night, also known as the index of bat activity (IA) in the Project Area. A bat pass represents a sequence of at least two echolocation calls produced by an individual bat with a pause no greater than one second in between the calls. Average bat activity per night were calculated by dividing the total number of passes by the number of detector-nights at the different detector heights (IA= # passes ÷ # detector nights). Bat activity was classified by high-frequency and low-frequency bats, as well as seasonality (WEST, 2018b). In 2017, the detector units recorded a combined mean 3.23 bat passes per detector-night. Bat activity was higher at the ground detector (IA=5.61) when compared to either raised detector (Low detector IA=2.36, high detector IA=1.72). In 2018 the detector units recorded a combined mean of 0.44 bat passes per detector night. The near ground detector recorded an average of 0.64 bat passes per detector-night, the 45-meter detector recorded an average of 0.26 bat passes per detector-night, and the 80-meter detector recorded an average bat passes of 0.41 per detector-night. The two years are different because 2017 encompasses spring and summer (March 16 to July 31) and fall (August 1 to November 15), which are seasons of higher bat activity, and 2018 surveys encompassed only spring (March 15 to May 15) and a small fraction of summer. A final report including all 2018 data will be provided to OPSB after surveys have been completed.

Bat Mist-Net Survey

WEST completed a bat mist-netting survey during the summer of 2017 to assess the presence, or probable absence, of federally-listed Indiana and northern long-eared bat species in the Project Area during summer maternity season. Surveys followed guidelines recommended by the USFWS and ODNR and were conducted under WEST's ODNR Scientific Collection Permit (no. 18-30) (Exhibit S). One site consisting of nine nets was monitored over two non-consecutive nights on July 17 and 19, 2017. Mist-netting began at sunset and continued for a minimum of five hours and checked every ten minutes. Photo-documentation was taken for each species of bat captured. A total of 26 bats were captured and identified as one species: big brown bat. The number of captures each night were similar, with 14 bats caught on July 17, 2017 and 12 caught on July 19, 2017. No northern long-eared bats or Indiana bats were captured by mist-netting surveys.

(e) *Summary of Additional Ecological Impact Studies*

Mussel Assessment

One state- and federally-listed endangered mussel species, clubshell, has been recorded within Paulding County. Additionally, there are county records of six mussel species that are listed as species of special concern by the ODNR (elktoe [*Alasmidonta marginata*], purple wartyback [*Cyclonaias tuberculata*], creek heelsplitter [*Lasmigona compressa*], round pigtoe [*Pluerobema sintoxia*], kidneyshell [*Ptychobranchus fasciolaris*], and deertoe [*Truncilla truncata*]). WEST also recorded the presence of state threatened species, pondhorn (*Uniomerus tetralasmus*) when conducting surveys within the county in May 2016. WEST assessed the proposed Project Area to identify any areas of potential instream impact and determine if a field assessment should be conducted in areas of potential instream impacts (Exhibit T).

The methods for the assessment were based on the Ohio Mussel Survey Protocol (OMSP) (ODNR, 2016b). Locations where streams within the Project Area may have instream impacts were assessed for mussel habitat using USFWS National Wetland Inventory (NWI) mapping and aerial photography. The OMSP calls for in-stream surveys of streams with a watershed greater than 10 square miles or within streams listed in Appendix A of the OMSP (ODNR, 2016b).

Based on NWI mapping and aerial imagery, 17 stream locations were determined to contain water over multiple years and were investigated further as potential mussel habitat. Of the 17 locations, the stream with the largest watershed drained an area of 6.1 square miles and watersheds of all other streams being impacted were less than 5 square miles and none were listed within the OMSP. Potential mussel habitat is limited within the Project Area, and the potential impact areas assessed were either ephemeral/intermittent ditches or had a watershed of less than 10 square miles. As such, none of the streams in the area represented suitable mussel habitat.

(2) Construction Impacts

(a) *Estimation of Impact of Construction on Undeveloped Areas, Plants, and Animals*

Since the Facility is located entirely on leased private land, there will be no construction-related impacts to recreational areas, parks, wildlife areas, nature preserves, or other conservation areas. Potential impacts to undeveloped areas, plants, and animals may occur during construction as a result of the installation of turbines, access roads, and electrical interconnects; the upgrade of local public roads or intersections; the development and use of the laydown yards and temporary workspaces around the turbine sites; and the construction of the substation. Anticipated impacts to these resources are discussed below.

Impacts to Plants

Construction activities that will result in impacts to vegetation include site preparation, earth-moving, and excavation/backfilling activities associated with construction/installation of the laydown yards, access roads, foundations, and buried electrical interconnect. These activities will result in the cutting and clearing of vegetation, the removal of stumps and root systems, and increased exposure/disturbance of soil. Along with direct loss of (and damage to) vegetation, these impacts can result in a loss of wildlife food and cover, increased soil erosion and sedimentation, increased risk of colonization by non-native invasive species, and disruption of normal nutrient cycling; however, it is not anticipated that any plant species occurring the Project Area will be extirpated or significantly reduced in abundance as a result of construction activities.

Impacts to Wildlife Species

Construction-related impacts to wildlife are anticipated to very limited but could include incidental injury and mortality due to vegetation clearing and vehicular movement, potential silt and sedimentation impacts to aquatic organisms, habitat disturbance/loss associated with clearing and earth-moving activities. Based on the studies conducted to date, none of the construction-related impacts will be significant enough to affect local populations of any resident or migratory wildlife species. Each of these potential impacts are described below.

Incidental Injury and Mortality: Incidental injury and mortality should be limited to sedentary/slow moving species such as small mammals, reptiles, and amphibians that are unable to move out of the area being disturbed by construction. If construction occurs during the nesting season, wildlife subject to mortality could also include the eggs and young offspring of nesting birds, as well as immature mammalian species that are not yet fully mobile. More mobile species and mature individuals should be able to vacate areas that are being disturbed. Furthermore, because most Facility components are sited in active agricultural land that provides limited wildlife habitat, which currently (and historically) experiences frequent agricultural-related disturbances, such impacts are anticipated to be minor.

Siltation and Sedimentation: Earth-moving activities associated with Facility construction have the potential to cause siltation and sedimentation impacts down slope of the area of disturbance. Facility components will be sited away from wetlands and streams to the extent practicable. To prevent adverse effects to water quality and aquatic habitat during construction, runoff will be managed under an NPDES construction storm water permit and the associated SWP3. An erosion and sediment control plan will be developed prior to construction that will use appropriate runoff diversion and collection devices. Also, because the majority of Facility components are being sited in active agricultural land, soil disturbance/exposure due to Facility construction will generally occur in areas already subject to regular plowing, tilling, harvesting, etc.

Habitat Loss: The majority of the Facility will be built in or adjacent to agricultural land, which generally provides habitat for only a limited suite of wildlife species. In addition, most of these areas are already subject to periodic disturbance in the form of mowing, plowing, harvesting, etc. Scrub-shrub and forested communities have largely been avoided and will experience less construction-related disturbance. Based on the current Facility layout, less than 1.0 acre of forest and no scrub-shrub habitat will be directly impacted by Facility construction (see Table 08-6). Although no Indiana bats or northern long-eared bats were found during summer presence/probable absence surveys, if tree clearing is necessary, it will not be conducted from April 1 through September 30 when roosting bats may be present.

Forest Fragmentation: The proposed Facility will result in the permanent conversion of less than 0.5 acre of forest to successional communities. In addition, the forested habitat being impacted by the Facility generally occurs at the edge of relatively small blocks or woodlots. This being the case, it is not anticipated that any forests will be significantly fragmented by construction of the proposed Facility.

Disturbance/Displacement: Some wildlife displacement will also occur due to increased noise and human activity as a result of Facility construction. The significance of this impact will vary by species and the seasonal timing of construction activities. Because most of the Facility occurs in agricultural land, species utilizing those habitats are most likely to be temporarily disturbed/displaced by Facility construction.

Impacts to Upland Habitats

Table 08-6 quantifies impacts to ecological communities, including undeveloped areas, based on the limits of vegetative clearing and soil disturbance provided by Fisher.

Table 08-6. Impacts to Ecological Communities

Community[1]	Permanent Impacts	Soil Disturbance (acres)		Vegetation Disturbance (acres)	
		Temporary	Total[2]	Temporary[3]	Total
Agricultural	54.0	367.6	421.6	461.0	515.0
Urban	0.0	0.0	0.0	0.1	0.1
Forestland	0.0	0.4	0.4	0.9	0.9
Total	**54.0**	**368.0**	**422.0**	**462.0**	**516.0**

[1] Ecological community types were obtained from Land Use/Land Cover shapefiles for Paulding County (ODNR, 1994) and were verified and updated using recent aerial imagery.
[2] Total soil disturbance was calculated by adding the temporary soil disturbance to the permanent impacts.
[3] Temporary vegetation disturbance was calculated by subtracting permanent impacts from total vegetation disturbance.

Although they don't represent undeveloped lands, agricultural and urban lands have been included Table 08-6 above to fully account for all anticipated impacts. Please refer to Table 08-17 for a more detailed breakdown of impacts to various types of agricultural lands (i.e., pasture vs. cultivated croplands, etc.).

Impacts to natural communities have been avoided to the extent possible. All of the 54.0 acres of permanent disturbance will occur within agricultural land. While the table above does indicate that there will be impacts to forestland, the Applicant will not clear any trees in the Project Area. Native vegetation or agricultural crops will be reestablished during restoration of the 461.0 acres of agricultural land and 0.1 acre of urban land.

Impacts to Wetland and Surface Water Habitats

The proposed Facility has been designed to avoid impacting wetlands and surface waters, to the extent practicable, and to minimize such impacts where avoidance is not possible. All large permanent components (i.e., the turbines, substation, and met towers) have been sited in upland areas, currently or recently used for agricultural production. Therefore, no direct temporary or permanent impacts to wetlands or waterbodies will result from construction of these components, and the potential for indirect impacts to wetlands and surface waters in the vicinity of these components will be negligible as a result of required SWP3 best management practices (BMPs).

The construction of access roads and the installation of electrical line interconnections among the turbine arrays presents the greatest potential for direct and/or indirect impacts to surface water and wetlands. Through an iterative design process, all Facility components were successfully sited to avoid impacts to wetlands.

As indicated above, construction, operation, and maintenance of Facility access roads will not impact any wetlands. However, there will be both temporary and permanent impacts to waterbodies as a result of access road installation. Based on the current layout design, up to 17 miles of new, permanent gravel roads will be installed. There will be no temporary or permanent impacts to delineated stream reaches due to access roads or collection lines. However, construction of the Project access roads is expected to require up to 18 ditch crossings, which will collectively result in a total of 2,577 linear feet or 0.39 acre of temporary impact and 524 linear feet or 0.08 acre of permanent impact. Each ditch crossing will utilize a standard culvert with rock fill to create stable road crossing. The Applicant will design these crossing to allow adequate flow during storm conditions, and not affect the flow of water within the Project Area. The addition of culverts will be done in coordination between the Applicant's engineers and the Paulding County Engineer.

There will be no temporary or permanent impacts to waterbodies as a result of collection line installation. Collection line installation will involve crossing a total of 48 ditches, some of which are crossed multiple times. All collection line crossings will be completed via HDD, resulting in no temporary or permanent impacts to the waterbodies.

Anticipated waterbody impacts are summarized below in Table 08-7. Additional information about each waterbody impact can be found in Appendix D of Exhibit M.

Table 08-7. Waterbody Impact

Waterbody ID	Flow Regime	PHWH Class	Anticipated Jurisdictional (Yes/No)	Access Road Crossing Method	Access Roads				Number of Collection Line Crossings	Collection Line Crossing Method	Collection Line			
					Temporary Impact		Permanent Impact				Temporary Impact		Permanent Impact	
					square feet	acres	square feet	acres			square feet	acres	square feet	acres
WB-134	Intermittent	II	Yes	Culvert	1,357	0.03	543	0.01	1	HDD	0	0	0	0
WB-107	Intermittent	II	Yes	Culvert	745	0.02	0	0.00	3	HDD	0	0	0	0
WB-008	Intermittent	II	Yes	Culvert	1,521	0.03	0	0.00	1	HDD	0	0	0	0
WB-106	Intermittent	II	Yes	Culvert	3,789	0.09	178	0.00	1	HDD	0	0	0	0
WB-139	Ephemeral	I	No	Culvert	458	0.01	139	0.00	1	HDD	0	0	0	0
WB-104	Intermittent	I	Yes	Culvert	314	0.01	10	0.00	1	HDD	0	0	0	0
WB-103	Intermittent	I	Yes	Culvert	640	0.01	110	0.00	2	HDD	0	0	0	0
WB-001	Ephemeral	I	No	Culvert	148	0.00	0	0.00	-	-	-	-	-	-
WB-211	Ephemeral	I	No	Culvert	159	0.00	0	0.00	-	-	-	-	-	-
WB-119	Ephemeral	I	No	Culvert	2,191	0.05	770	0.02	3	HDD	0	0	0	0
WB-147	Ephemeral	I	No	Culvert	70	0.00	11	0.00	-	-	-	-	-	-
WB-100	Intermittent	II	Yes	Culvert	1,262	0.03	324	0.01	-	-	-	-	-	-
WB-006	Intermittent	II	Yes	Culvert	1,412	0.03	486	0.01	-	-	-	-	-	-
WB-120	Ephemeral	I	No	Culvert	525	0.01	103	0.00	2	HDD	0	0	0	0
WB-137	Intermittent	II	Yes	Culvert	1,681	0.04	551	0.01	1	HDD	0	0	0	0
WB-129	Intermittent	II	Yes	Culvert	1,133	0.03	261	0.01	1	HDD	0	0	0	0
WB-143	Ephemeral	I	No	Culvert	0	0.00	119	0.00	-	-	-	-	-	-
WB-145	Intermittent	II	Yes	Culvert	0	0.00	283	0.01	-	-	-	-	-	-
WB-200	Intermittent	II	Yes	-	0	0	0	0	2	HDD	0	0	0	0
WB-201	Ephemeral	I	No	-	0	0	0	0	1	HDD	0	0	0	0
WB-005	Intermittent	I	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-003	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-304	Ephemeral	II	No	-	0	0	0	0	1	HDD	0	0	0	0
WB-004	Intermittent	II	No	-	0	0	0	0	1	HDD	0	0	0	0

Waterbody ID	Flow Regime	PHWH Class	Anticipated Jurisdictional (Yes/No)	Access Road Crossing Method	Access Roads				Number of Collection Line Crossings	Collection Line Crossing Method	Collection Line			
					Temporary Impact		Permanent Impact				Temporary Impact		Permanent Impact	
					square feet	acres	square feet	acres			square feet	acres	square feet	acres
WB-009	Intermittent	II	Yes	-	0	0	0	0	2	HDD	0	0	0	0
WB-010	Ephemeral	I	No	-	0	0	0	0	1	HDD	0	0	0	0
WB-100	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-105	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-116	Ephemeral	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-121	Ephemeral	I	No	-	0	0	0	0	1	HDD	0	0	0	0
WB-122	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-130	Intermittent	II	Yes	-	0	0	0	0	2	HDD	0	0	0	0
WB-131	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-142	Intermittent	II	Yes	-	0	0	0	0	2	HDD	0	0	0	0
WB-145	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-150	Intermittent	II	No	-	0	0	0	0	1	HDD	0	0	0	0
WB-154	Ephemeral	I	No	-	0	0	0	0	1	HDD	0	0	0	0
WB-205	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-207	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-209	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-210	Perennial	II	Yes	-	0	0	0	0	2	HDD	0	0	0	0
WB-214	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-213	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-215	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-216	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
WB-301	Ephemeral	I	No	-	0	0	0	0	1	HDD	0	0	0	0
WB-313	Ephemeral	I	No	-	0	0	0	0	1	HDD	0	0	0	0
WB-203	Intermittent	II	Yes	-	0	0	0	0	1	HDD	0	0	0	0
Total					17,405	0.39	3,888	0.08	--	--	0	0	0	0

(b) *Description of Short-term and Long-term Mitigation Procedures*

To minimize Facility-related impacts on surface waters and wetlands, preliminary and final Facility designs were guided by the following criteria during the siting of wind turbines and related infrastructure.

- Large built components of the Facility, including wind turbine generators, meteorological towers, and the new collection substation are sited to completely avoid wetlands and surface waters.
- The number and overall impacts due to access road crossings were minimized by routing around wetlands and streams wherever possible, and by utilizing existing crossings and narrow crossing locations to the extent practicable.
- Buried electric interconnect lines will avoid crossing wetlands where possible, will cross streams at existing or previously disturbed locations to the extent practicable, and will utilize installation techniques that minimize construction-related impacts to surface waters.

Other on-site environmental or logistical constraints, such as stands of mature forest, landowner concerns, and other current land use, may make further avoidance of streams unfeasible. Where crossings of wetlands or surface waters are required, the Applicant will employ applicable best management practices. Specific mitigation procedures for protecting wetlands, surface water resources, vegetation, and major species and their habitats are described below.

(i) Site restoration and stabilization of disturbed soils

Following completion of construction, temporarily impacted areas will be restored to their preconstruction condition. Restoration activities are anticipated to include the following:

- The 263-foot radius turbine work spaces will be reduced to a permanent footprint of 0.2 acre (including the pedestal and crane pad).
- Pre-construction contours and soil/substrate conditions will be established in all disturbed areas, to the extent practicable.
- Disturbed stream banks will be stabilized per the conditions of any formal state-issued permit.
- Buried electrical collection routes will be restored to pre-construction contours (as necessary) and allowed to regenerate naturally.
- Restoration of disturbed agricultural fields will be accomplished by de-compacting the soil, removing rocks, and re-spreading topsoil.
- Disturbed soils throughout the Project Area will be re-seeded with an annual cover crop to stabilize exposed soils and control sedimentation and erosion. Seeding outside of active agricultural fields will be restricted to native seed mixes, unless otherwise requested by the landowner.

- All temporary gravel and other construction staging area and access road materials will be removed after the completion of construction activities, as weather permits.
- All construction debris and contaminated soil will be promptly removed and disposed of in accordance with the Ohio EPA regulations. Gravel and other construction material will not be disposed of by spreading such material on agricultural land.

These actions will assure that, as much as possible, the site is returned to its preconstruction condition and that long-term impacts are minimized.

(ii) Frac out contingency plan

Facility construction will include the use of trenchless excavation methods known as HDD. This widely used technique accomplishes the installation of buried utilities with minimal impact, by routing the utility under a sensitive feature (such as a stream, river, or wetland). HDD operations have the potential to inadvertently release drilling fluids into the surface environment from pressurization of the drill hole beyond the containment capability of the overburden soil material or through fractured bedrock into the surrounding rock (frac out). The HDD procedure uses a bentonite slurry, a fine clay material, as a drilling lubricant. Although bentonite is non-toxic and non-hazardous, it has the potential to adversely impact aquatic species if released into waterbodies. Seepage of drilling fluid is most likely to occur near the bore entry and exit points where the drill head is shallow. Frac-outs can occur, however, in any location along a directional route.

The HDD Frac-Out Contingency Plan, included as Exhibit EE, sets forth procedures to avoid, minimize, and remediate potential environmental impacts resulting from and inadvertent return of drilling fluids during HDD operations. Measures to be deployed as part of the contingency plan include site inspection, proper training of the contractor and construction personnel, development of response procedures, provision of containment materials, and implementation of appropriate clean up procedures. For more information, see Exhibit EE.

(iii) Methods to demarcate surface waters and wetlands during construction

The boundaries of jurisdictional streams and wetlands within and immediately adjacent to the construction limits of disturbance will be demarcated with highly visible fluffing, staking, or fencing prior to construction. These sensitive areas will also be depicted on construction drawings. All contractors and subcontractors working on-site will be provided with training to understand the significance of the types of flagging used, and the importance of staying within defined limits of work areas, especially in and adjacent to marked sensitive resource areas such as wetlands.

(iv) Inspection procedures for erosion control measures

Erosion and sediment control measures will be inspected by a third party duly qualified individual contracted by the Applicant at Applicant's expense throughout the period of construction to assure that they are functioning properly until completion of all restoration work. Disturbed areas and areas used for storage of materials that are exposed to precipitation shall be inspected for evidence of or the potential for pollutants entering the drainage system. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site vehicle tracking. Inspections will be conducted at least once every seven calendar days, and within 24 hours after any storm event with 0.5 inch or greater of rain. This inspection frequency may be reduced to once every month if the entire site is temporarily stabilized and runoff is unlikely due to weather conditions (e.g., site is covered with snow, ice, or the ground is frozen).

Following each inspection, the qualified inspector will complete and sign a checklist/inspection report. At a minimum, the inspection report shall include:

- the inspection date;
- names, titles, and qualifications of personnel making the inspection;
- weather information for the period since the last inspection (or since commencement of construction activity if the first inspection) including a best estimate of the beginning of each storm event, duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether any discharges occurred;
- weather information and a description of any discharges occurring at the time of the inspection;
- locations of any BMPs that need to be maintained; and
- any corrective actions recommended.

For three years following the submittal of a notice of termination form, the Applicant will maintain a record summarizing the results of the SWP3 inspections described above, including the names(s) and qualifications of personnel making the inspection, the date(s) of the inspection, major observations relating to the implementation of the SWP3, and a signed certification as to whether the Facility is in compliance with the SWP3.

(v) Measures to protect vegetation

Mitigation measures to avoid or minimize impacts to vegetation will include identifying/delineating sensitive areas (such as wetlands) where not disturbance or vehicular activities will be allowed, limiting areas of disturbance to the smallest size practicable, siting Facility components in previously disturbed areas (e.g., existing farm lanes), educating the construction workforce on respecting and adhering to the physical boundaries of off-limit areas, employing best management practices during construction, and maintaining a clean work area within the designated construction sites. Following construction activities, temporarily disturbed areas will be seeded (and stabilized with mulch and/or straw if necessary) to reestablish vegetative cover in these areas. Native species will be allowed to revegetate these areas, except in active agricultural fields or to otherwise meet the desires of the landowner.

(vi) Options for clearing methods and disposing of brush

Facility construction will require clearing or disturbance of approximately 516 acres of vegetation (see Table 08-6). Almost all of this disturbance (more than 99%) will occur in agricultural lands. Facility construction and operation will not require the clearing of any trees. Brush and vegetation cleared from the work area will be buried, chipped, or otherwise disposed of as directed by the landowner and as allowed under federal, state and local regulations.

(vii) Avoidance measures for state- or federally-listed and protected species and their habitats

To minimize impacts to wildlife species and their habitats, Facility components have been sited away from sensitive habitats, such as forestland, streams and wetlands, to the extent practicable. As a result, construction-related impacts to wildlife are anticipated to be very limited. The following avoidance measures will further reduce construction impacts to major species and their habitats:

- To avoid impacts to roosting bats, any necessary tree clearing will be completed between October 1 and May 31.
- To prevent adverse effects to aquatic species and their habitats during construction, runoff will be managed under a NPDES construction storm water permit and the associated SWP3. An erosion and sediment control plan will be developed prior to construction that will use appropriate runoff diversion and collection devices.
- Turbines were sited at least 0.5-mile from Flat Rock Creek to avoid impacts to potentially sensitive habitat.

Most of the state-listed plant species found in Paulding County occur in wetland habitats, which are uncommon within the Project Area, and as indicated above, have been avoided during Facility siting to the extent practicable. The Applicant has made a strenuous effort to avoid federally regulated surface water impacts. Avoidance efforts notwithstanding, a limited amount of minor permanent and temporary surface water impact from discharge of fill material is unavoidable during construction of the Facility.

To protect surface waters, wetlands, groundwater, and storm water quality, erosion and sediment control measures will be installed and maintained throughout site development. Such measures could include silt fence, hay bales, and/or temporary siltation basins. The location of these features will be detailed on the construction drawings, approved by the Ohio EPA as part of the NPDES review, and reviewed by the contractor prior to construction. As described above, a duly qualified individual will also inspect these features throughout the period of construction to assure that they are functioning properly until completion of all restoration work (final grading and seeding).

Specific mitigation measures for protecting wetlands and surface water resources will include designating no equipment access areas and restricted activity areas and employing low impact stream crossing techniques. Each of these mitigation measures is described below.

No Equipment Access Areas: Except where crossed by permitted access roads, wetlands and surface waters will be designated "No Equipment Access," thus prohibiting the use of motorized equipment in these areas.

Restricted Activity Areas: A buffer zone of 50 feet, referred to as a "Restricted Activity Area," will be established wherever Facility construction traverses, or comes in proximity to, wetlands and surface waters. The 50-foot buffer zones will be depicted on construction drawings. Construction vehicles will be allowed in this zone, if necessary; however, in order to provide further protection to wetlands and surface waters, restricted activities within this buffer zone will include:

- No deposit of slash
- No accumulation of construction debris
- No application of herbicide
- No degradation of stream banks
- No equipment washing or refueling
- No storage of any petroleum or chemical material

Low Impact Stream Crossing Techniques: Where crossings of surface waters are required, best management practices associated with applicable streamside activities will be implemented. The Applicant will adhere to any permit conditions pertaining to low impact stream crossing techniques, including seasonal restrictions and/or alternative stream crossing methods, such as temporary bridging and installation of crossings "in the dry." Open-bottomed or elliptical culverts may be utilized on certain streams to minimize loss of aquatic habitat and restriction of fish passage. Utilizing these techniques should avoid or minimize any adverse impacts on fish and other aquatic organisms.

Additional detail regarding the Applicant's commitment to wildlife protection is discussed in Section 4906-4-09(D).

(3) Operation Impacts

(a) *Estimation of Impact of Operation on Undeveloped Areas, Plants, and Animals*

Aside from minor disturbance associated with routine maintenance and occasional repair activities, no other disturbance to plants, vegetative communities, wetlands, or surface waters are anticipated as a result of Facility operation. As previously indicated, the Facility is located entirely on leased private land. Therefore, the built Facility will not result in physical disturbance/impacts to recreational areas, parks, wildlife areas, nature preserves, or other conservation areas as identified in Section 4906-4-08(B)(1)(a). However, Facility visibility will extend beyond the boundaries of leased private land. Such impacts are discussed in detail below in Sections 4906-4-08(D)(3) and (4).

Operational impacts to wildlife are expected to be limited to possible displacement of wildlife due to the presence of the wind turbines, and some level of avian and bat mortality as a result of collisions with the wind turbines. Each of these potential impacts is described below.

<u>Disturbance/Displacement</u>

Habitat alteration and disturbance resulting from the operation of turbines and other wind farm infrastructure has the potential to make a site unsuitable or less suitable for some species of wildlife. As mentioned above, the footprint of turbine pads, roads, and other Facility infrastructure represents a very small percentage of the site following construction. Therefore, overall land use is relatively unchanged by wind power development. However, due to the presence of tall structures and increased human activity, the amount of wildlife habitat indirectly affected by a wind power project can extend beyond the functional Facility footprint. Some wildlife may become habituated to the presence of wind turbines over time; however, the rate and degree of habituation is currently unknown because few studies have evaluated this effect.

Results from the Buffalo Ridge Wind Power Project in Minnesota (Leddy et al., 1999), the Stateline wind energy facility in Oregon and Washington (Erickson et al., 2004), the Combine Hills wind energy facility in Oregon (Young et al., 2006), the Noble Wethersfield Windpark in western New York (Kerlinger & Guarnaccia, 2010), and three wind energy facilities in North and South Dakota (Johnson & Shaffer, 2012; Shaffer & Buhl, 2016) suggest that impacts of wind-energy facilities on grassland nesting passerines vary somewhat between species and sites and are generally minor. For example:

- At the Buffalo Ridge facility, overall bird density was lower within 262 feet (80 meters) of wind turbines, but at distances of 590 feet (180 meters) from the turbines, bird density did not differ from grasslands with no turbines (Leddy et al., 1999).
- At the Stateline facility, horned lark and savannah sparrow showed increased usage post-construction, while grasshopper sparrow (*Ammodramus savannarum*) and western meadowlark (*Sturnella neglecta*) showed decreased use within 50 meters (164 feet) of turbine strings; areas further away from turbines did not exhibit reduced bird use (Erickson et al., 2004).
- At the facility in New York State, bobolink showed an effect of turbine displacement following construction, with significantly fewer bobolinks within 246 feet (75 meters) of turbines situated in hayfields, but savannah sparrows did not show a significant difference in abundance based on distance from turbines (Kerlinger & Guarnaccia, 2010).
- At the three facilities in the Dakotas, grasshopper sparrow showed displacement effects in the areas adjacent to turbines, but western meadowlarks did not (Johnson & Shaffer, 2012). Most of the nine grassland bird species studied showed some displacement at least one of the three facilities, although vesper sparrow and killdeer did not (Shaffer & Buhl, 2016).

Leddy at al. (1999) specifically recommended that wind turbines be placed within cropland to reduce displacement impacts to grassland passerines. Given that all 54 of the turbine sites proposed for the Facility are located within cultivated croplands as opposed to grasslands, birds using these areas are generally common and accustomed to disturbance. Therefore, displacement effects to grassland birds are not expected.

The potential impacts of the Facility on waterfowl, including foraging Canada geese, should not be significant, even though migrating waterfowl can be expected to forage in the farm fields in the vicinity of the Project Area. This conclusion is based on the results of a study conducted by the Iowa Cooperative Fish and Wildlife Research Unit at the Top of Iowa Wind Farm located in Worth County, Iowa. Due to its proximity to three state-owned Wildlife Management Areas, the Top of Iowa Wind Farm experiences very high use by waterfowl (over 1.5 million duck and goose use-days per year). Observations at that site revealed that the wind turbines did not affect the use of the fields by Canada geese or other species of waterfowl (Koford et al., 2005). At the Buffalo Ridge wind-energy facility in Minnesota, the abundance of several bird types, including shorebirds and waterfowl, were found to be significantly lower at survey plots with turbines than at reference plots without turbines. However, the report concluded that the area of reduced use was limited primarily to within 328 feet (100 meters) of the turbines (Johnson et al., 2000). Based on these study results, and observations at other wind power projects, the proposed Facility is not anticipated to have a significant, long-term displacement effect on resident or migrating waterfowl.

Forest and forest edge birds should not be significantly disturbed because there is so little of this habitat in the vicinity of the Project Area. In addition, as described in Section 4906-4-08(B)(1)(d), field surveys indicated that there was a lack of nesting northern harriers in the Project Area.

Landowners and recreational users are often concerned over the potential displacement effect of wind turbines on game species such as deer and wild turkey. While habituation may not be immediate, species such as deer and wild turkey generally adapt quickly to the presence of man-made features in their habitat, as evidenced by the abundance of these species in suburban settings. Specific to wind turbines, EDR personnel observed deer and wild turkey foraging at the base of wind turbines that had just been erected a few months before at multiple wind energy facilities, including the Maple Ridge Wind Farm in Lewis County, New York; the Hardscrabble Wind Power Project in Herkimer County, New York; and the Hoosac Wind Power Project in Berkshire County, Massachusetts. Significant displacement of game species from a wind power site has not been reported.

Avian Collision Mortality

Collision with wind turbines is a documented source of avian fatality, with levels varying by bird species, season, and region. A 2014 study reviewed data from a total of 116 studies at 70 wind energy facilities across the U.S. and Canada, representing over 100,000 turbine searches demonstrated low levels of collision fatality at most projects. Small passerines (i.e., songbirds) were the most common among bird fatalities caused by collision with turbines at wind energy facilities, comprising an estimated 62.5% of all bird fatalities. By region, the eastern and prairie avifaunal biomes generally have higher fatality rates than those northern forests and various western biomes (Erickson et al., 2014), but these are well below levels that would be likely to adversely affect any particular species' population.

Collision risk to resident waterbirds (waterfowl, long-legged waders, shorebirds, rails, etc.) in the Project Area is likely to be minimal. There are small wetlands in the vicinity of the Project Area, so some waterbirds may be present; however, research has demonstrated that very few waterfowl, waterbirds, or shorebirds collide with wind turbines or other tall structures. Shorebirds are extremely rare on the lists of birds killed at wind power projects (Erickson et al., 2001). Risk of collision to waterfowl and other waterbirds during migration is also likely to be minimal, because these birds typically migrate at high altitudes, and because this group of birds has not demonstrated a propensity to collide with wind turbines or communication towers. The Canada geese that forage on nearby agricultural fields may experience a slightly higher level of risk due to abundance; however, Canada geese have never demonstrated susceptibility to colliding with turbines. A study at the Top of Iowa Wind Power Project site revealed no fatalities to waterfowl despite documented use in proximity to turbines (Koford et al., 2005). Therefore, waterbirds are not likely to be at significant risk of colliding with wind turbines in the Project Area.

Similarly, raptor mortality from collision with turbines has also been low at most operating wind power projects outside of California (Whitfield & Madders, 2006; Chamberlain et al., 2006; Kerns & Kerlinger, 2004; Gruver et al., 2009; Derby et al., 2007; Jain, 2005). As described in Section 4906-4-08(B)(1)(d) of this Application, raptor use of the Project Area was evaluated during 2017 and 2018. Even where concentrated hawk migration does occur around wind energy sites, evidence suggests that risk to migrating raptors is not great, and not likely to be biologically significant. Reports from Tarifa, Spain, where raptor migration is highly concentrated, strongly suggest that migrating raptors rarely collide with turbines (DeLucas et al., 2004). Based on post-construction monitoring studies at other operating wind energy facilities, the raptor species most likely to be impacted are resident birds that forage in open country, such as red-tailed hawk, as opposed to migrating raptors that pass through the area. These species are common and widespread throughout their ranges; therefore, the low impacts expected by the Facility are not likely to affect local or regional populations.

As these studies illustrate, bird collisions are relatively infrequent events at wind farms. Only occasional raptor, waterfowl, or shorebird fatalities have been documented. In the Midwestern and Eastern U.S., night migrating songbirds have accounted for a majority of the fatalities at wind turbines. In general, the documented level of fatalities has not been large in comparison with the source populations of these species and has been minor when compared to other potential sources of avian mortality (see Table 08-

8 below). When scavenging and observer efficiency are factored in, studies of avian mortality suggest that wind turbines account for 1-9 avian fatalities per turbine per year (Erickson et al., 2001; Jain et al., 2007).

There currently is no predictive model available to quantify expected avian collision mortality as a result of wind power project operation. Therefore, risk assessments must be based on pre-construction indices and indicators of risk (e.g., avian use surveys), along with empirical data from operating facilities (e.g., avian mortality surveys). Because preconstruction surveys revealed no indicators of elevated risk (e.g., unusually high numbers, habitat that would act as an ecological magnet, or abundance of rare species), collision risk to birds in the Project Area is likely to be consistent with other wind sites in the Mid-Western United States.

Table 08-8 summarizes estimated annual avian mortality from anthropogenic causes, including wind turbines. The cumulative level of avian fatalities from wind turbines is quite minor when compared to other anthropogenic sources of mortality. Other sources of avian mortality that each greatly exceed that caused by wind turbines include collision with buildings, collision with power lines, predation by domestic cats, collision with vehicles, use of agricultural pesticides, collision with communication towers, and poisoning in oil pits (USFWS, 2002; NRC, 2007; Erickson et al., 2005, 2014).

Table 08-8. Estimated Annual Avian Mortality from Anthropogenic Causes

Mortality Source	Estimated Annual Mortality	Citation
Collisions with Buildings	1 – 1,000 million	Klem, 1990 Bracey et al., 2016
Collisions with Power Lines	130 – 174 million	Erickson et al., 2005 USFWS, 2002
Predation by Domestic Cats	100 million	Coleman & Temple, 1996
Automobiles	57 – 80 million	Banks, 1979 Hodson & Snow, 1965
Pesticides	72 million	USFWS, 2002
Communication Towers	4 - 50 million	USFWS, 2002
Oil Pits	1.5 – 2 million	USFWS, 2002
Wind Turbines	368,000	Erickson et al., 2014

Bat Collision Mortality

As with avian risk, there are currently no predictive models available to quantify expected bat collision mortality as a result of wind energy facility operation, and risk assessments must be based on pre-construction indices and indicators of risk (e.g., acoustic surveys), along with empirical mortality data from operating facilities. Because the Project Area reveals no indicators of elevated risk (e.g., landscape position), collision risk to bats in the Project Area is likely to be consistent with other wind energy projects in agricultural landscapes in the mid-west.

Most bat fatalities occur during relatively low-wind conditions during bat migration periods (Arnett et al., 2008). Studies have shown that altering blade angles to either stop or slow rotor movement in low wind speeds (i.e., feathering) below the manufacturer's cut-in speed (3 m/s) is expected to reduce overall bat mortality by a minimum of 35 % (Good et al., 2012; Young et al., 2011; Baerwald et al., 2009). Arnett et al. (2011) found that nightly reductions in bat fatality ranged from 44 to 93% when turbine cut-in speed was raised from 3.5 m/s to either 5.0 m/s (11.2 mph) or 6.5 m/s (14.5 mph). The resulting economic loss was less than 1% of the total annual energy output for the facility (Arnett et al., 2011). Similarly, Good et al. (2011) reported an approximate 50% reduction in overall bat fatalities when turbine cut-in speed was raised from 3.5 m/s to 5.0 m/s and approximately 78% fewer fatalities when cut-in speed was raised form 3.5 m/s to 6.5 m/s.

Based on known fatalities at nearby wind farms, there is some risk of impact to Indiana and northern long-eared bats during the spring and fall migration seasons. The Applicant has contracted WEST to assist in the development of a Habitat Conservation Plan (HCP) in order to obtain an Incidental Take Permit (ITP) to cover potential take of Indiana bats and northern-long eared bats during spring and fall migration as a result of operation of the Facility. The HCP is being developed in coordination with the United Stated Fish and Wildlife Service (USFWS) and will detail steps that will be taken by the Applicant to minimize and mitigate take of Indiana and northern long-eared bats. The Applicant will obtain a *Technical Assistance Letter for Avoidance of Indiana and Northern Long-eared Bat Take* (TAL) for the Facility from USFWS and will implement operational measures to avoid take of Indiana and northern long eared bats until the ITP is obtained. The Applicant expects that the operational measures included in the TAL will be an increased cut-in speed for all turbines of 6.9 meters/second from ½ hour before sunset to ½ hour after sunrise between March 15 and May 15 and between August 1 and October 15. Additionally, all turbines will be feathered below manufacturer's cut-in speed during the summer season, May 16 through July 31. The operational measures to be included in the ITP are not known at this time, but at a minimum, all turbines will be feathered below manufacturer's cut-in speed during the spring, summer, and fall seasons (April 1 through October 1). The operational measures implemented both during the TAL and the ITP will not only protect Indiana and northern long-eared bats but also all bats. As discussed above, operational measures implemented under the TAL and ITP are expected to reduce bat fatalities at least 35% and up to more than 78%.

(b) *Procedures to Avoid/Minimize/Mitigate Short-term and Long-term Operational Impacts*

Aside from minor disturbance associated with routine maintenance and occasional repair activities, no other disturbance to plants, vegetative communities, wetlands, or streams are anticipated as a result of Facility operation. Since no significant operational impacts to these resources are anticipated, no mitigation measures are proposed.

The anticipated short-term and long-term operational impacts of the Facility on wildlife are expected to be minor. The Facility has been designed to minimize bird and bat collision mortality. The following measures will minimize impacts to state and federally protected bats as well as other wildlife species:

- The turbines will be placed much further apart than in older wind farms where high rates of avian mortality have been documented, such as those in California.
- Turbines will be placed in agricultural fields to the extent practicable, avoiding wooded areas that provide habitat for bats. The Applicant does not anticipate any tree clearing, but if tree clearing is necessary, it will not be conducted from April 1 through September 30 when roosting bats may be present.
- Towers will be tubular structures (rather than lattice), which prevent perching and nesting by birds.
- Lighting of turbines and other infrastructure will be minimized to the extent allowed by the FAA and will follow specific design guidelines to reduce collision risk (e.g., using flashing lights with the longest permissible off cycle).
- The Applicant will avoid impacts to Indiana and northern long-eared bats by implementing measures specified in the TAL until an ITP is obtained (see above). Operational measures implemented under the TAL and ITP are expected to reduce bat fatalities at least 35% and up to more than 78%.

(c) *Post-Construction Monitoring Plans*

A post-construction avian and bat fatality monitoring program will be implemented. Although this study will not directly mitigate Facility-specific impacts, it will help to advance understanding of avian and bat collision impacts and inform response plans if necessary. Experts have indicated that, although the impact of wind power projects on wildlife has been studied more intensively than comparable infrastructure, such as communication towers, important research gaps remain. Those gaps result primarily from the limited number of post-construction monitoring studies that have been completed and made publicly available.

The Applicant will implement post-construction monitoring protocols to evaluate bird and bat impacts in Accordance with ODNR and USFWS guidelines.

(C) LAND USE AND COMMUNITY DEVELOPMENT

(1) Land Use

(a) *Land Use Map*

Land uses within the 1-mile study area of the Facility are shown on Figure 08-5. The land use mapping was developed from the Paulding County Auditor's land use data associated with parcel data. Among other information, Figure 08-5 shows the following features:

(i) The proposed Facility
(ii) Land use
(iii) Structures
(iv) Incorporated areas and population centers

(b) *Structures Table*

(i) Distance between structures/property lines and the nearest turbine (for structures within 1,500 feet)

There is one structure within 1,500 feet of a proposed turbine site. Table 08-9 presents the distance to the nearest turbine.

Table 08-9. Structures Within 1,500 Feet of a Wind Turbine

Distance to Turbine (feet)	Closest Wind Turbine
1,460	TRIV-82

There are 236 property lines within 1,500 feet of a wind turbine. Table 08-10 identifies the distance from property lines to the nearest wind turbine and the nearest turbine to the property line.

Table 08-10. Property Lines Within 1,500 Feet of a Wind Turbine

Distance to Turbine (feet)	Closest Wind Turbine
15	TRIV-60
56	TRIV-62

Distance to Turbine (feet)	Closest Wind Turbine
1,028	TRIV-10
1,034	TRIV-71

Distance to Turbine (feet)	Closest Wind Turbine
59	TRIV-49
59	TRIV-10
78	TRIV-56
82	TRIV-48
91	TRIV-10
95	TRIV-87
96	TRIV-55
113	TRIV-73
113	TRIV-76
120	TRIV-82
123	TRIV-50
130	TRIV-59
132	TRIV-77
153	TRIV-14
166	TRIV-50
168	TRIV-53
186	TRIV-80
202	TRIV-42
202	TRIV-59
207	TRIV-50
210	TRIV-53
219	TRIV-61
243	TRIV-78
255	TRIV-86
275	TRIV-44
278	TRIV-46
282	TRIV-74
283	TRIV-47
284	TRIV-57
304	TRIV-48
305	TRIV-57
316	TRIV-48
318	TRIV-51
323	TRIV-74
333	TRIV-71

Distance to Turbine (feet)	Closest Wind Turbine
1,042	TRIV-15
1,046	TRIV-47
1,055	TRIV-49
1,056	TRIV-44
1,064	TRIV-47
1,067	TRIV-86
1,068	TRIV-52
1,079	TRIV-53
1,092	TRIV-10
1,093	TRIV-09
1,119	TRIV-55
1,143	TRIV-78
1,171	TRIV-63
1,175	TRIV-50
1,177	TRIV-42
1,179	TRIV-14
1,194	TRIV-14
1,194	TRIV-58
1,202	TRIV-55
1,202	TRIV-72
1,206	TRIV-55
1,216	TRIV-44
1,220	TRIV-27
1,221	TRIV-72
1,224	TRIV-76
1,230	TRIV-74
1,238	TRIV-10
1,240	TRIV-47
1,240	TRIV-63
1,249	TRIV-48
1,253	TRIV-61
1,253	TRIV-15
1,260	TRIV-66
1,261	TRIV-82
1,266	TRIV-52

Distance to Turbine (feet)	Closest Wind Turbine
340	TRIV-66
342	TRIV-78
347	TRIV-42
349	TRIV-51
393	TRIV-44
404	TRIV-42
439	TRIV-52
447	TRIV-78
452	TRIV-71
461	TRIV-76
464	TRIV-41
485	TRIV-80
485	TRIV-53
505	TRIV-87
507	TRIV-09
510	TRIV-52
524	TRIV-56
553	TRIV-86
564	TRIV-73
584	TRIV-63
617	TRIV-44
624	TRIV-53
637	TRIV-54
640	TRIV-74
642	TRIV-58
644	TRIV-46
647	TRIV-19
649	TRIV-78
652	TRIV-52
654	TRIV-57
656	TRIV-49
668	TRIV-08
672	TRIV-19
675	TRIV-19
677	TRIV-58

Distance to Turbine (feet)	Closest Wind Turbine
1,269	TRIV-72
1,270	TRIV-90
1,273	TRIV-61
1,275	TRIV-61
1,287	TRIV-44
1,295	TRIV-42
1,297	TRIV-61
1,305	TRIV-76
1,306	TRIV-46
1,311	TRIV-86
1,313	TRIV-84
1,316	TRIV-78
1,318	TRIV-86
1,319	TRIV-74
1,320	TRIV-90
1,321	TRIV-14
1,327	TRIV-08
1,331	TRIV-46
1,332	TRIV-15
1,346	TRIV-71
1,354	TRIV-47
1,356	TRIV-84
1,357	TRIV-84
1,358	TRIV-76
1,361	TRIV-54
1,361	TRIV-09
1,370	TRIV-52
1,373	TRIV-72
1,379	TRIV-44
1,381	TRIV-78
1,383	TRIV-56
1,384	TRIV-61
1,385	TRIV-56
1,386	TRIV-61
1,388	TRIV-49

Distance to Turbine (feet)	Closest Wind Turbine
678	TRIV-44
692	TRIV-09
700	TRIV-46
703	TRIV-49
710	TRIV-49
713	TRIV-09
714	TRIV-53
718	TRIV-27
718	TRIV-15
722	TRIV-41
726	TRIV-87
727	TRIV-44
731	TRIV-41
736	TRIV-14
745	TRIV-10
766	TRIV-78
771	TRIV-15
774	TRIV-86
782	TRIV-71
788	TRIV-82
791	TRIV-07
798	TRIV-07
829	TRIV-48
831	TRIV-08
837	TRIV-09
844	TRIV-66
853	TRIV-80
854	TRIV-09
871	TRIV-71
882	TRIV-52
884	TRIV-47
892	TRIV-61
892	TRIV-78
901	TRIV-45
920	TRIV-59

Distance to Turbine (feet)	Closest Wind Turbine
1,396	TRIV-73
1,397	TRIV-62
1,398	TRIV-78
1,402	TRIV-71
1,403	TRIV-77
1,408	TRIV-56
1,408	TRIV-55
1,410	TRIV-84
1,411	TRIV-71
1,412	TRIV-10
1,413	TRIV-84
1,414	TRIV-46
1,416	TRIV-27
1,417	TRIV-27
1,417	TRIV-27
1,418	TRIV-14
1,419	TRIV-54
1,423	TRIV-62
1,426	TRIV-55
1,428	TRIV-45
1,429	TRIV-76
1,429	TRIV-55
1,430	TRIV-55
1,433	TRIV-44
1,441	TRIV-66
1,442	TRIV-09
1,444	TRIV-50
1,449	TRIV-71
1,449	TRIV-71
1,450	TRIV-76
1,453	TRIV-50
1,455	TRIV-62
1,457	TRIV-71
1,468	TRIV-41
1,474	TRIV-07

Distance to Turbine (feet)	Closest Wind Turbine
929	TRIV-72
929	TRIV-19
936	TRIV-66
947	TRIV-19
949	TRIV-57
971	TRIV-71
984	TRIV-42
986	TRIV-71
992	TRIV-80
1,002	TRIV-42
1,015	TRIV-66

Distance to Turbine (feet)	Closest Wind Turbine
1,474	TRIV-90
1,476	TRIV-71
1,478	TRIV-58
1,479	TRIV-74
1,480	TRIV-71
1,480	TRIV-56
1,480	TRIV-66
1,485	TRIV-14
1,489	TRIV-72
1,494	TRIV-55
1,499	TRIV-71

(ii) Distance between structures/property lines and associated facility

There are 25 structures within 250 feet of an associated facility (i.e., a collection line, access road, laydown yard, or the collection substation). Of these, three structures are within 250 feet of two different associated facilities. For each occurrence of an associated facility within 250 feet of a structure, Table 08-11 presents the distance to the nearest component and the type of the closest Facility component.

Table 08-11. Structures Within 250 Feet of an Associated Facility

Distance to Facility Component (feet)	Closest Facility Component
79	Laydown Yard
103	Collection Line
113	Collection Line
116	Access Road
124	Collection Line
126	Collection Line
130	Collection Line
133	Collection Line
140	Collection Line
147	Collection Line
151	Collection Line
158	Collection Line
162	Collection Line

Distance to Facility Component (feet)	Closest Facility Component
169	Access Road
172	Collection Line
175	Collection Line
189	Access Road
195	Access Road
196	Collection Line
216	Access Road
217	Collection Line
224	Collection Line
229	Collection Line
230	Collection Line
242	Collection Line

In addition to structures, 163 parcel boundaries were identified within 250 feet of an associated facility (i.e., a collection line, access road, laydown yard, O&M facility, or the collection substation). For each occurrence of an associated facility within 250 feet of a structure, Table 08-12 presents the distance to the Facility component and the type of Facility component.

Table 08-12. Property Lines Within 250 Feet of an Associated Facility

Distance to Project Component (Feet)	Closest Facility Component
0	Access Road
1	Access Road
4	Access Road
4	Collection Line
5	Access Road
6	Access Road
6	Access Road
6	Access Road
7	Access Road
7	Collection Line
8	Collection Line
8	Collection Line
9	Access Road
10	Collection Line

Distance to Project Component (Feet)	Closest Facility Component
11	Access Road
11	Access Road
11	Collection Line
11	Collection Line
12	Access Road
12	Access Road
13	Collection Line
14	Access Road
14	Collection Line
14	Collection Line
14	Collection Line
14	Collection Line
15	Collection Line
15	Collection Line
17	Access Road
17	Access Road
17	Collection Substation
18	Access Road
18	Access Road
18	Collection Line
18	Collection Line
19	Collection Line
20	Access Road
20	Collection Line
20	Collection Line
21	Access Road
21	Collection Line
21	Collection Line
22	Access Road
22	Access Road
22	Collection Line
23	Access Road
23	Access Road
23	Access Road

Distance to Project Component (Feet)	Closest Facility Component
23	Access Road
23	Access Road
23	Collection Line
24	Access Road
25	Access Road
25	Access Road
25	Collection Line
28	Collection Line
29	Access Road
29	Collection Substation
30	Access Road
30	Collection Line
30	Collection Line
31	Access Road
31	Collection Line
32	Access Road
32	Collection Line
33	Collection Line
34	Access Road
34	Access Road
34	Access Road
34	Collection Line
35	Collection Line
35	Collection Line
36	Collection Line
36	Collection Line
36	Collection Line
37	Access Road
37	Collection Line
37	Collection Line
38	Collection Line
39	Access Road
39	Access Road
39	Collection Line

Distance to Project Component (Feet)	Closest Facility Component
39	Collection Line
40	Collection Line
40	Collection Line
41	Collection Line
41	Collection Line
41	Collection Line
41	Collection Line
43	Access Road
43	Collection Line
44	Access Road
44	Access Road
44	Collection Line
45	Access Road
46	Access Road
46	Collection Line
46	Collection Line
48	Access Road
49	Collection Line
49	Collection Line
49	Collection Line
50	Collection Line
50	Collection Line
51	Collection Line
52	Collection Line
52	Collection Line
52	Collection Line
52	Collection Line
53	Access Road
53	Access Road
53	Collection Line
53	Collection Line
53	Collection Line
54	Access Road
57	Collection Line

Distance to Project Component (Feet)	Closest Facility Component
57	Collection Line
58	Access Road
58	Met Tower
59	Collection Line
60	Collection Line
62	Access Road
65	Access Road
66	Access Road
67	Collection Line
69	Collection Line
69	Collection Line
69	Collection Line
69	Collection Line
72	Access Road
72	Collection Line
78	Collection Line
79	Collection Line
86	Collection Line
91	Collection Line
92	Collection Line
93	Collection Line
94	Collection Line
95	Access Road
99	Collection Line
102	Collection Line
103	Access Road
110	Access Road
110	Collection Line
118	Access Road
133	Access Road
147	Collection Line
158	Access Road
165	Access Road
167	Access Road

Distance to Project Component (Feet)	Closest Facility Component
169	Access Road
178	Access Road
179	Access Road
180	Collection Line
189	Access Road
198	Collection Line
219	Met Tower
224	Access Road
229	Access Road
235	Access Road
237	Access Road
248	Access Road
249	Met Tower

(iii) Status of the property for each structure

The Applicant continues to meet with property owners and is in the process of obtaining the necessary leases and waivers. The Application commits to comply with all statutory and regulatory setbacks and will provide OPSB with an updated lease status list for each structure and property as it relates to the turbine and associated facility locations in the near future.

(c) *Land Use Impacts*

Table 08-13 presents the total, temporary, and permanent land use impacts on the land uses illustrated in Figure 08-5, in total for each land use type, and by Facility component. Facility-related impacts to land use were calculated based on the limits of disturbance (temporary and permanent) and vegetative clearing provided by Fisher and the land use codes for each parcel, found in the parcel shapefiles for Paulding County. Table 03-1 details the approximate impacts that were used by Fisher to create the limits of disturbance and clearing. The parcel shapefiles were clipped to the limits of disturbance shapefiles, resulting in the total land use that will be impacted by each Facility component. The separate areas of impact for each Facility component were added together, resulting in the temporary, permanent, and total areas of impact associated with each component and for each land use type.

Table 08-13. Land Use Impacts

Land Use[1]	Total Vegetation Disturbance (acres)	Temporary Soil Disturbance (acres)	Permanent Loss (acres)
Agricultural (100)	501.2[3]	360.4	52.9
Wind Turbines and Workspaces	*256.8*	*233.7*	*17.9*
Access Roads	*84.7*[4]	*48.4*	*32.8*
Buried Collection Lines	*133.7*[4]	*61.3*	*0.0*
Laydown Yards	*17.0*	*17.0*	*0.0*
Collection Substation	*2.0*	*0.0*	*2.0*
Meteorological Towers[5]	*7.0*	*0.0*	*0.2*
Residential (500)	1.7[3]	1.0	0.0
Wind Turbines and Workspaces	*0.0*	*0.0*	*0.0*
Access Roads	*0.2*	*0.2*	*0.0*
Buried Collection Lines	*1.2*	*0.5*	*0.0*
Laydown Yards	*0.3*	*0.3*	*0.0*
Collection Substation	*0.0*	*0.0*	*0.0*
Meteorological Towers[5]	*0.0*	*0.0*	*0.0*
Unknown	13.1[3]	8.8	1.3
Wind Turbines and Workspaces	*5.0*	*4.6*	*0.3*
Access Roads	*3.0*	*1.6*	*1.0*
Buried Collection Lines	*4.6*[4]	*2.1*	*0.0*
Laydown Yards	*0.5*	*0.5*	*0.0*
Collection Substation	*0.0*	*0.0*	*0.0*
Meteorological Towers	*0.0*	*0.0*	*0.0*
Total	516.0[2]	370.2[2]	54.2[2]

[1] From land use codes associated with parcels, provided by the Paulding County Auditor
[2] The value for total vegetation disturbance (516.0 acres) is consistent with impacts presented in Table 08-6. Permanent loss is 0.2 acre greater than presented in Table 08-6 and temporary disturbance is 2.2 acres greater than presented in Table 08-6. These inconsistencies are minor and a result of rounding.
[3] This breakdown of impact acreages differs slightly from those presented in Table 08-6 because the data were derived from different sources. Land uses were derived from property tax codes, which are assigned by parcel, while ecological communities were derived from ODNR data, which are not assigned by parcel. For example, the 1.7 acres of residential (urban in ecological communities) impact is greater than presented in the ecological communities because the whole parcel is considered residential even though it may contain some forested areas. Please note that the impact acreages are essentially consistent regardless of data sources.
[4] Totals of impact from individual components would be higher except that some clearing associated with these components is also located within the footprint of clearing for another Facility component (e.g., meteorological towers, turbines).
[5] The acreage impacts as a result of clearing and disturbance associated with meteorological towers is a total from the six locations under consideration for the Facility. This represents an over-representation of impacts since only up to three meteorological towers will be constructed.

Only very minor changes in land use are anticipated within the Project Area as a result of Facility operation, and no changes are predicted outside the Project Area. The presence of the turbine bases, the collection substation, and other ancillary structures will result in the cumulative conversion of approximately 54.2 acres of land from its current use to build facilities (less than 1% of the 20,372 acres of leased land). During Facility operation, additional impacts over the years on land use should be infrequent and minimal. Aside from occasional maintenance and repair activities, Facility operation will not interfere with on-going land use (i.e., farming activities).

More than 97% of the total clearing impacts from Facility construction and operation will occur in land used for agriculture (based on land use codes). While both temporary and permanent impacts to land use could occur, these changes will affect a tiny percentage of leased lands, and the Facility will be compatible with the agricultural land uses that dominate the Project Area. The transportation and use of construction equipment and material could impact growing crops, fences and gates, subsurface drainage systems (tile lines), and/or temporarily block farmers' access to agricultural fields. However, construction impacts will be temporary in nature, and confined to the properties of participating landowners. As described in Section 4906-4-08(E)(2)(b), the Applicant has developed construction specifications for construction activities occurring partially or wholly on privately owned agricultural land. These specifications, along with special siting considerations will minimize impacts to agricultural land uses in the Project Area.

(d) *Structures That Will Be Removed or Relocated*

The Applicant does not anticipate the removal or relocation of any existing structure as a result of construction or operation of the Facility.

(2) Parcel Status Map

Figure 08-6 illustrates the proposed Facility, habitable residences, and parcel boundaries of all parcels within a half-mile of the Project Area. This map also shows the setbacks from property lines, pipelines, and major roads.

(a) *Setback to Wind Farm Property Line*

As per OAC Rule 4906-4-08(C)(2)(a), the distance from a wind turbine base to the property line of the wind farm property shall be at least 1.1 times the total height of the turbine structure as measured from its tower's base (excluding the subsurface foundation) to the tip of a blade at its highest point. As shown in Table 03-2, the maximum total height of the tallest model under consideration for the Facility is 591 feet. Therefore, absent a waiver, the setback to the wind farm property line for the proposed Facility would be 650.1 feet (591 feet x 1.1).

(b) *Setback to Property Line of Nearest Adjacent Property, including State or Federal Highway*

As per OAC Rule 4906-4-08(C)(2)(b), the wind turbine must be at least 1,125 feet in horizontal distance from the tip of the turbine's nearest blade at 90 degrees to the property line of the nearest adjacent property, including a state or federal highway, at the time of certification application. As shown in Table 03-2, the maximum blade length for the turbine models under consideration for the Facility is 246 feet. Therefore, absent a waiver, the setback to the property line of the nearest adjacent property would be 1,371 feet (246 feet + 1,125 feet). Also, the setback to a state or federal highway is 1,371 feet (246 feet + 1,125 feet).

(c) *Setback to Electric Transmission Line, Gas Pipeline, Gas Distribution Line, Hazardous Liquid Pipeline*

As per Rule OAC 4906-4-08(C)(2)(c), the distance from a wind turbine base to any electric transmission line, gas pipeline, gas distribution line, hazardous liquid(s) pipeline, or public road shall be at least 1.1 times the total height of the turbine structure as measured from its tower's base (excluding subsurface foundations) to the tip of the blade at its highest point. As shown in Table 03-2, the maximum total height of the tallest model under consideration for the Facility is 591 feet. Therefore, setback to these facilities and roads for the proposed Facility is 650.1 feet (591 feet x 1.1).

(d) *Setback Waivers*

The Applicant understands that minimum setbacks from property lines and residences may be waived pursuant to ORC 4906.20 and the procedures set forth in OAC Rule 4906-4-08(C)(3). The Applicant is in the process of working with property owners to obtain the necessary waivers and understands that it will only be able to construct turbines that either meet the statutory setback requirement or have the requisite setback waivers.

(3) Setback Waiver

While not all waivers have been obtained, as stated previously, the Applicant understands that the setbacks described above will apply in all cases except those in which all owner(s) of property adjacent to the wind farm property waive application of the setback to that property. The requirements of the waivers are described below.

(a) *Content of Waiver*

The waivers entered into by the Applicant will meet the following requirements set forth in OAC Rule 4906-4-08(C)(3)(a):

(i) Be in writing

(ii) Provide a brief description of the Facility

(iii) Notify the applicable property owner(s) of the statutory minimum setback requirements

(iv) Describe the adjacent property subject to the waiver through a legal description

(v) Describe how the adjacent property is subject to the statutory minimum setback requirements

(vi) Advise all subsequent purchasers of the adjacent property subject to the waiver that the waiver of the minimum setback requirements shall run with the land

(b) *Required Signature*

In accordance with OAC Rule 4906-4-08(C)(3)(b), all setback waivers entered into by the Applicant will be signed by the Applicant and the applicable property owner(s), indicating consent to construction activities without compliance with the minimum setback requirements.

(c) *Recordation of Waiver*

In accordance with OAC Rule 4906-4-08(C)(3)(c) all setback waivers entered into by the Applicant will be recorded.

(4) Land Use Plans

(a) *Formally Adopted Plans for Future Use of Site and Surrounding Lands*

Several of the municipalities within the five-mile study area have adopted comprehensive land use plans and/or economic development plans. Each of these are summarized below:

- <u>Maumee Valley Planning Organization (MVPO) Comprehensive Economic Development Strategy (CEDS):</u> In late 2012 the MVPO, with financial support from the U.S. Economic Development Authority, finalized a CEDS for Defiance, Fulton, Henry, Paulding, and Williams Counties. This CEDS represents a prioritized action plan that strategizes steps to achieve economic development goals. These goals aim to increase employment growth and investment, improve the efficiency and effectiveness of economic development efforts, enhance and promote quality of life assets, ensure that the current and future workforce needs of businesses are met, and ensure that the current and future infrastructure needs of the region are met. This strategy is in the process of being updated and is expected to be completed in September of 2018 (MVPO, 2012).

- Paulding County Community Development Plan: The Paulding County Vision Board, comprised of representatives from the County, Villages and Townships, is currently in the process of developing a Community Development Plan that will describe the history, current conditions, and future vision for the County. Upon doing so, it is intended to develop a road map for making that vision a reality. Draft goals presented by the Paulding County Visioning Board in May 2018 include sidewalk improvements, road repair, addressing drug problems, sewer and water, upkeep of properties and downtown areas, increasing local industry, improving reliability of internet and cell phone coverage (Paulding County Development Plan, 2018).

- Village of Antwerp Comprehensive Plan: In 2014, the Village of Antwerp adopted a Comprehensive Plan that provides an overview of the community, changes and trends throughout the years, an overview of existing land use, and a vision and strategy for future development. That vision features four critical elements: 1) redeveloping areas near US-24 and SR-4; 2) revitalizing the downtown area; 3) becoming more walkable and bike-able; and 4) expanding recreational/pedestrian/cycling amenities (Village of Antwerp, 2014).

- Allen County (Indiana) Comprehensive Plan

  In 2007, the "Plan-it Allen!" Comprehensive Plan was developed under the guidance of the Comprehensive Committee of Allen County and Fort Wayne to serve as a guide for community decision making in Allen County, Indiana. This joint land use and development plan creates a path towards community inclusivity, economic development, protection and enhancement of natural resources, and preservation and revitalization of communities (Allen County and the City of Fort Wayne, 2007).

- Allen County (Indiana) Strategic Plan: Update: The Allen County Strategic Plan was initially drafted in 2009, then updated in 2010 and 2011, to reflect changes in goals and implementation strategies. The primary goals include the improvement of community services, development and growth of the local economy, collaborative government, development of a well-informed community, and implementation of conservation techniques (Allen County, 2011).

(b) *Applicant's Plans for Concurrent or Secondary Uses of the Site*

The Applicant has no plans for concurrent or secondary uses of the site. Facility components will be located on portions of leased land with existing rural residential or agricultural uses. Wind power projects are compatible with agricultural practices, and because this Facility has been sited and designed to maximize such compatibility, existing land uses will continue concurrently with Facility operation.

(c) *Impact on Regional Development*

The regional economy surrounding the Facility is shaped in large part by the agricultural industries of Paulding, Defiance, and Van Wert Counties, as well as regional metropolitan areas of northwestern Ohio. Paulding County is primarily agricultural in nature. The regional context for the development of this Facility is discussed in further detail below, concentrating on five primary components: housing, commercial and industrial development, schools, transportation, and other public services and facilities. In addition, the compatibility of the proposed Facility with regional developmental goals and plans is reviewed.

<u>Housing</u>

As with all sectors of the economy, the housing market throughout the region has felt the impact of population loss. Owner-occupied vacancy rates in Paulding County (2.4%) and Van Wert County (3.5%) are slightly higher than the Ohio statewide average (1.9%), while the rate for Defiance County (1.0%) is slightly lower. The average rate of owner-occupied vacancies in Allen County (Indiana) (1.6%) falls slightly below the statewide average in Indiana (2%). The rental vacancy rate in Allen County (Indiana) (8.2%), Defiance County (6.2%), Paulding County (7.0%), and Van Wert County (7.3%) is slightly higher than the statewide Ohio and Indiana averages (6.0% and 7.6%, respectively).

Defiance, Paulding, and Van Wert Counties feature a median monthly gross rent level of $669, $619, $653, respectively, all of which is below the statewide average of $743/month. Similarly, the median monthly gross rent level in Allen County ($691) is lower that the Indiana statewide average of $758/month. Each county in the Study Area has a lower percentage of households whose rent accounts for more than 35% of their household income, compared to their respective statewide values. In addition, the median housing values of Defiance, Paulding, Van Wert, and Allen Counties are below the statewide averages of both Ohio ($131,900) and Indiana ($126,500).

It is estimated that 3,595 housing units within Defiance, Paulding, and Van Wert Counties, and 13,042 within Allen County are currently vacant. Given these figures, in addition to the population projections discussed in Section 4906-4-08(C)(4)(e) below, it is not expected that the development of the Facility will have a significant impact on the regional housing market. While the Facility development may not represent a widespread boom for rental property owners, it is worth noting that the availability of vacant rental housing also indicates that the Facility should not have a destabilizing effect on current renters.

Commercial and Industrial Development

The diversification of Ohio's energy portfolio will have significant and positive economic impacts beyond a reduced dependence on coal imported from outside of the state. The Environment Ohio Research & Policy Center estimated that if the State of Ohio increased wind power production to 20% of the state's total energy portfolio by 2020, such development would create 3,100 permanent, full-time positions within the state, and result in cumulative wages totaling $3.7 billion. This same analysis estimated that such a commitment would result in an increase in gross state product of approximately $8.2 billion by 2020 (Environment Ohio, 2007).

These impacts are principally due to the impact of wind energy development on the manufacturing sector. The State of Ohio is uniquely positioned to take advantage of advanced manufacturing opportunities for the development and distribution of wind power technology, according to the Renewable Energy Policy Project's (2004) report, "Wind Turbine Development: Location of Manufacturing Activity." This analysis estimates that if the U.S. were to invest $50 billion into 50,000 MW of new wind power production, Ohio manufacturers could stand to create 11,688 jobs in wind turbine and related manufacturing, accounting for 1.95% of the total investment; by way of comparison, the American Wind Energy Association (AWEA) estimates that the State of Ohio alone has enough wind resources to generate nearly 359 MW at 80 meter hub height and 110,439 MW at 110 meter hub height of onshore wind energy (AWEA, 2015).

The Environmental Law & Policy Center (ELPC) estimated that the State of Ohio is currently home to 106 wind power supply chain businesses, providing 1,000 to 2,000 jobs throughout the state (ELPC, 2011). Wind energy technology manufacturing opportunities include rotors, controls, drive trains, generators, and towers. Several of these manufacturers and other wind power-related businesses are located in the Greater Cleveland Region (AWEA, 2015).

Specific short- and long-term economic impacts of this Facility on commercial and industrial development throughout the region are described in further detail in Section 4906-4-06(E)(4) of this Application.

Schools

The proposed Facility will have a significant positive impact on the local tax base, including local school districts that serve the area where the wind farm is to be located. However, aside from increased tax revenue for the local school districts, no significant impact on schools or school facilities is anticipated. The Facility is not expected to have significant growth-inducing effects on the surrounding locales. Local employees would be hired to the extent possible. In the event that non-resident workers are hired, it is expected that they would commute or stay in regional transient housing or motels and would not bring families that might require additional school facilities.

Transportation System Development

The region surrounding the Facility features numerous Interstates, U.S., and State highways, as well as county and local roadway networks, in addition to freight rail lines and small airports. These facilities are described here in further detail. The main transportation routes to the Facility are U.S. Route 24 to the north and U.S. route 49 to the south. U.S. Route 127 to the east runs adjacent to the Facility. vState Routes 111, 114 and 613 (east and west) and State Route 49 (north and south), provide direct access into the Facility. vThese and other primary routes facilitate transportation between the Facility and the surrounding metropolitan areas.

Workers coming to and from the site will most likely enter via State Route 49 and 613 from U.S. Route 24 and 49. Construction traffic bound for the substation will likely use State Route 49 as the primary route. The proposed Facility is not expected to cause any substantial disruption to major transportation corridors serving the five-mile study area.

Freight rail lines connect several of the municipalities throughout the five-mile study area. CSX and Norfolk Southern operate the majority of Ohio's freight rail system, although smaller operators such as Grand Trunk Western Railway also operate in the area. Study area municipalities connected to freight rail lines include the Townships of Carryall, Crane, Emerald, Harrison, Jackson, Paulding, Tully, and Union, and the Villages of Antwerp, Broughton, Cecil, Latty, and Payne. The rail system may be used for the transportation of a very small number of turbine component and equipment suppliers, but the Applicant does not anticipate making any modifications to the system.

The Project Area is also in proximity to the Defiance Memorial Airport, the Van Wert County Airport, the Williams County Airport, and the Ruhe's Airport. Construction and operation of the Facility will be designed according to FAA standards and are not expected to result in any adverse impacts to the regional air transportation network. The Applicant has filed a Form 7460-1 with the FAA to confirm the turbines will not cause any adverse impacts to the existing air travel network.

Other Public Services and Facilities

The Facility is not expected to have significant growth-inducing effects on the surrounding locales. Therefore, no significant impact on local public services and facilities is expected. Workers will commute to the work site on a daily basis. Local employees will be hired to the extent possible. Hiring of non-resident workers would occur when local residents with the required skills were not available or competitive. It is expected that non-resident workers would commute or stay in regional transient housing or motels, and not require new housing, and would not bring families that might require family healthcare or additional school facilities. The principal impact on public services in the site locale would be a temporary increase in traffic on roads leading to the Project Area, due to deliveries of equipment and materials during construction.

(d) *Regional Plan Compatibility*

As discussed in Section 4906-4-08(C)(4)(a), several of the municipalities within the five-mile study area have adopted comprehensive land use plans and/or economic development plans. Compatibility with each of these plans is discussed below.

- Maumee Valley Planning Organization Comprehensive Economic Development Strategy: Wind energy, along with its supply chain manufacturers were mentioned in the plan as substantial investors and growing components of the regional economy. In addition, construction and operation of the Facility will provide local jobs, ensure that infrastructure needs of the region are met.

- Paulding County Community Development Plan:
  Wind energy is not mentioned specifically in the draft plan. However, the Facility will increase employment growth and investment, and natural resources can be advertised as an asset of the county to increase the number of employment options.

- Village of Antwerp Comprehensive Plan:
  The proposed Facility provides economic activity within the village, which in turn, will provide additional revenues to assist in implementing this vision.

- Village of Antwerp Comprehensive Plan (Indiana):
  The proposed Facility provides economic activity within the village, which in turn, will provide additional revenues to assist in implementing this vision.

- Allen County Comprehensive Plan
  The plan does not specifically reference wind energy; however, it does emphasize the use of renewable energy as a method for improving air quality and aiding environmental stewardship. Another primary goal is the enhancement of community appearance, specifically to ensure new

development is complementary to existing local character. Whether or not a wind facility negatively impacts local character is subjective, to some extent. Some people may feel the Facility will impact local character, which would represent an inconsistency.

- Allen County Strategic Plan: Update:

  Wind energy is referenced within the plan as a potential indicator of improvement towards the goal of implementation of conservation techniques. Allen County strives to increase knowledge, awareness, and implementation of conservation programs and techniques.

The Facility is located in an area that is largely rural in nature with a majority of impacts from the Facility construction and operation occurring on land used for agriculture. The economic benefits of the turbines for local agriculturalists, as well as their overall compatibility with farming practices, will support and aid in the preservation of local farming operations. Furthermore, the jobs and economic development created by Facility may help to create and retain existing local employment opportunities. Therefore, the development of this Facility is compatible with the goals and strategies of existing local and regional plans.

(e) *Current and Projected Population Data*

Census data reveals that the communities within the five-mile study area have experienced a varied history of small population growth and decline over the past two decades. Table 08-14 presents the population trends for the State of Ohio and counties within five miles of the Project Area, including percent change in population numbers from 2010 to 2016, population density, and ten-year population projections. Indiana and Ohio showed a notable increase in population, 8.4% and 2.1%, respectively. All three counties in Ohio (Paulding, Defiance, and Van Wert) showed a decrease in population from 2000 to 2016. Defiance County only decreased by -2.6%, while Paulding and Van Wert County decreased by -6.1% and -3.9%, respectively, during the same time frame.

Table 08-14: County Population Trends and Densities

County	2000 Pop.	2010 Pop.	2016 Pop.	% Change 2000-2016	Est. 2026 Pop.	% Change 2016-2026	Population Density (people per square mile)
Defiance County	39,500	39,037	38,488	-2.6%	37,872	-1.6%	93.5
Paulding County	20,293	19,614	19,057	-6.1%	18,332	-3.8%	45.8
Van Wert County	29,659	28,744	28,501	-3.9%	27,806	-2.4%	69.7

County	2000 Pop.	2010 Pop.	2016 Pop.	% Change 2000-2016	Est. 2026 Pop.	% Change 2016-2026	Population Density (people per square mile)
Allen County (IN)	331,849	355,329	365,565	10.2%	338,961	6.4%	563.5
State of Ohio	11,353,140	11,536,504	11,586,941	2.1%	11,736,076	1.3%	284.2
State of Indiana	6,080,485	6,483,802	6,589,578	8.4%	6,938,826	5.3%	185.1

Source: U.S. Census Bureau, 2000 and 2010 Decennial Census, Census Reporter, and American Community Survey 5-Year Estimates 2012-2016. Projections derived from each municipality's respective 2000-2016 growth rates.

Table 08-15 presents population estimates for 2016, population projections for 2026, and population densities for each community within five miles of the Project Area. A majority of the local municipalities demonstrate a general decrease in population from 2000 to 2016. Notable exceptions include small municipalities, such as the Village of Haviland, which experienced a population increase of 25% over the same time span (Table 08-15). Allen County, Indiana also experienced a notable growth in population by 10.2% from 2000 to 2016.

Table 08-15: Municipal Population Trends and Densities

Jurisdiction within 5-Miles Radius of Facility	2000 Pop.	2010 Pop.	2016 Pop.	% Change 2000-2016	Est. 2026 Pop.	% Change 2016-2026	Population Density (people per square mile)
Benton Township	1,035	1,046	879	-15.1%	796	-9.4%	24.1
Blue Creek Township	804	781	828	3.0%	843	1.9%	22.8
Carryall Township	3,046	2,980	2,899	-4.8%	2,812	-3.0%	81
Crane Township	1,530	1,420	1,418	-7.3%	1,353	-4.6%	39.2
Emerald Township	824	789	641	-22.2%	552	-13.9%	19.6
Harrison Township	1,566	1,459	1,482	-5.4%	1,432	-3.4%	41.1
Hoaglin Township	605	662	408	-32.6%	325	-20.4%	12.7
Jackson Township	1,886	1,795	1,842	-2.3%	1,815	-1.5%	50.1
Jackson Township, IN	489	504	366	-25.2%	308	-15.8%	14.4
Latty Township	1,026	1,017	973	-5.2%	942	-3.2%	26.7
Maumee Township, IN	2,619	2,620	2,692	2.8%	2,739	1.7%	102.1
Monroe Township, IN	1,963	1,927	1,741	-11.3%	1,824	-7.1%	70.4

Jurisdiction within 5-Miles Radius of Facility	2000 Pop.	2010 Pop.	2016 Pop.	% Change 2000-2016	Est. 2026 Pop.	% Change 2016-2026	Population Density (people per square mile)
Paulding Township	4,008	4,022	3,908	-2.5%	3,847	-1.6%	108.2
Scipio Township, IN	414	414	527	2.7%	536	1.7%	39.9
Tully Township	2,119	2,054	1,903	-10.2%	1,782	-6.4%	52.7
Union Township	1,009	942	816	-19.1%	718	-12.0%	22.4
Village of Antwerp	1,740	1,736	1,522	-12.5%	1,403	-7.8%	1,142.5
Village of Broughton	166	120	108	-34.9%	84	-21.8%	497.3
Village of Cecil	216	188	179	-17.1%	160	-10.7%	122.5
Village of Convoy	1,110	1,085	1,169	5.3%	1,208	3.3%	2,083.5
Village of Haviland	180	215	225	25.0%	260	15.6%	572.2
Village of Latty	200	193	165	-17.5%	147	-10.9%	614
Village of Paulding	3,595	3,605	3,615	0.6%	3,628	0.3%	1,529.4
Village of Payne	1,166	1,194	1,167	0.1%	1,168	0.1%	1,719.8
Village of Scott	322	286	319	-0.9%	317	-0.6%	393.3
City of Woodburn, IN	1,579	1,520	1,481	-6.2%	1,423	-3.9%	1,591.1
Total[4]	35,217	34,574	33,273	-5.5%	32,108	-3.5%	--

Source: U.S. Census Bureau, 2000 and 2010 Decennial Census, Census Reporter, and American Community Survey 5-Year Estimates 2012-2016. Projections derived from each municipality's respective 2000-2016 growth rates.

Although construction employment related to the construction of the Facility will be substantial, this employment is relatively short term and is not expected to result in the permanent relocation of construction workers to the area; therefore, the Facility is not anticipated to generate significant population growth within the five-mile study area. The number of potential short- and long-term employment opportunities associated with the construction and operation of the Facility is discussed in further detail above in Section 4906-4-06(E)(2).

[4] Totals calculated by formula, may reflect rounding errors.

(D) CULTURAL AND ARCHAEOLOGICAL RESOURCES

(1) Landmarks of Cultural Significance Map

Figure 08-7 depicts formally adopted land and water recreation areas, recreational trails, scenic rivers, scenic routes or byways, and registered landmarks of historic, religious, archaeological, scenic, natural, or other cultural significance within 10 miles of the Project Area.

EDR conducted a cultural resources records review (Exhibit U) through online resources from the Ohio Historic Preservation Office (OHPO). The purpose of this review was to identify known cultural resources in the vicinity of the Facility so that impacts to these resources can be minimized. Cultural resources include archaeological and historical sites, such as cemeteries, buildings, structures, objects, and districts. The literature included the following records:

- National Register of Historic Places (NRHP)
- NRHP Determination of Eligibility (DOE) properties
- National Historic Landmarks (NHL) List
- Ohio Historic Preservation Office (OHPO) previous Phase I, II, and III cultural resources surveys
- Ohio Historic Inventory (OHI)
- Ohio Department of Transportation (ODOT)
- Historic Bridge Inventory
- Ohio Archaeological Inventory (OAI)
- Ohio Genealogical Society (OGS) cemetery files
- Mills *Archaeological Atlas of Ohio* (1914)

The records review for the 10-mile study area identified five NRHP-listed properties (none within the Project Area); seven properties determined eligible for listing in the NRHP; 527 previously identified historic structures recorded in the OHI; 399 archaeological sites recorded in the OAI; and 76 cemeteries recorded by the OGS. Appendix B of Exhibit U contains a complete list of NRHP-listed properties within 10 miles of the Project Area. A list of properties within 10 miles of the Project Area previously determined eligible for listing on the NRHP can be found in Exhibit C in Exhibit U. Additional information on all cultural resources can be found in Exhibit U.

Because the 10-mile study area extends into the State of Indiana, the EDR cultural resources records review included a review of records from Indiana Department of Natural Resources Division of Historic Preservation and Archaeology (DHPA), including the Indiana Historic Sites and Structures Inventory (IHSSI). The records review identified 238 historic structures located within the Study Area. These resources are located between 2.5 and 9.5 miles from the Project Area.

(2) Impact to Landmarks and Mitigation Plans

EDR concluded that there will be no direct impacts to known cultural resources within the 10-mile study area from construction or operation of the proposed Facility, and no specific mitigation measures are proposed at this time. However, the impacts to previously recorded and hereto unidentified archaeological resources are currently unknown.

The proposed Facility has the potential to cause indirect (visual) impacts to aboveground and recreational resources within the 10-mile study area. However, the rural nature and population density of the area, as well as the general lack of major thoroughfares, limits the number of viewers potentially impacted by the Facility. A complete visual impact analysis has been completed for the proposed Facility and is discussed below in Section 4906-4-08(D)(4).

(3) Impact to Recreational Areas and Mitigation Plans

Existing recreational areas within a 10-mile radius of the Project Area are depicted on Figure 08-7 and listed in Table 08-16 below. Recreational areas were identified through ODNR Lands and Facilities online mapping (2018b), ESRI StreetMap North America (2008), and ESRI ArcGIS Online map services.

Table 08-16. Recreational Areas within a 10-mile Radius of the Facility

Recreational Area	Location	Distance from Nearest Turbine
Maumee State Scenic and Recreational River	Delaware, Carryall, Crane, and Emerald Townships, Paulding County Ohio and Monroe Township, Allen County, Indiana	2.2
Ohio Lincoln Highway Historic Byway, Indiana Lincoln Highway Historic Byway	Benton, Tully, Union, Pleasant, and Ridge Townships, Paulding County, Ohio, and Monroe Township, Allen County, Indiana	3.5
North Country Trail	Brown Township, Paulding County, Ohio	9.9
Buckeye Trail	Brown Township, Paulding County, Ohio	10.0
Forest Woods Nature Preserve	Crane Township, Paulding County, Ohio	3.8
Blue Cast Springs Nature Preserve	Maumee and Springfield Townships, Allen County, Indiana	8.3
Steam Saw Mill Site (Maumee River Overlook)	Maumee and Springfield Townships, Allen County, Indiana	9.2

As listed in Table 08-16 above, seven state-designated recreation areas that occur within 10 miles of the proposed Facility. Each of these recreational sites is described below, along with an assessment of potential impact from the proposed Facility.

The Maumee River is a state-designated scenic river located 2.2 miles at its closest point to a turbine. The Maumee River was designated an Ohio scenic river in 1974. The scenic portion of the Maumee River originates at the Ohio-Indiana state line and extends 43 miles, west of Defiance. The recreational portion from Defiance to Perrysburg is 53 miles long. The historic and cultural heritage of this section is of major state and national significance. The river historically constituted one of the chief modes of transportation. Miami Indians lived along the river and the Maumee River has played a role in Ohio's history (ODNR, 2018c). The water surface is a minimum of 10-15 feet below the adjacent land, with portions being much lower. The banks on both sides of the river have a belt of thick vegetation that further encloses the river and screens views of the surrounding landscape. Consequently, views outward in any direction from the water's surface are very limited and in all cases at least partially screened. If there is a portion of the river that does allow for views toward the proposed Facility the view would be tightly framed, partially screened, and at a background distance. The visual impact analysis (VIA) (see Exhibit FF) further discusses visual impacts to visually sensitive resources and mitigation of such impacts. Facility sound levels along the Maumee River will always be less than 44 dBA Leq, even under high winds and anomalous meteorological conditions (Tetra Tech, 2018). There will be no shadow flicker along the Maumee River (EDR, 2018a).

The Lincoln Highway in Ohio combines history that predates Ohio's statehood with how the U.S. changed and grew with the advent of automobile travel from 1913 onward. The byway is located at its closest point 3.5 miles from proposed turbines and is approximately 241 miles and traverses the state in an east-west direction (America's Scenic Byways, 2018). Facility visibility from the byway will be available along the majority of the portion that is within the study area. Study Area Roadside vegetation consists of low growing grasses with adjacent agricultural fields. Mature roadside vegetation or hedgerows are not common and therefore open views are available in all directions. While traversing the visual study area the dominant features of the landscape are the vast agricultural fields and the existing wind turbines. In views to the north of the byway, existing turbines currently encompass the foreground, midground and background views. The proposed turbines will occupy the background distance zone and will not change the visual character of the resource. The visual impact analysis (VIA) (see Exhibit FF) further discusses visual impacts to visually sensitive resources and mitigation of such impacts. Facility sound levels along the byway will always be less than 44 dBA Leq, even under high winds and anomalous meteorological conditions (Tetra Tech, 2018). There will be no shadow flicker along the byway (EDR, 2018a).

The Buckeye Trail is an approximately 1,440-mile trail that loops around the State of Ohio. At its closest point it is approximately 10 miles to the closest proposed turbine. First envisioned in the late 1950's as a trail from the Ohio River to Lake Erie, the Buckeye Trail evolved into a large loop, branching both north and east from Cincinnati. The separate legs rejoin in the Cuyahoga Valley National Park near Cleveland, and complete the trip to Lake Erie (Buckeye Trail, 2018). The North Country National Scenic Trail is the longest in the National Trails System, stretching 4,600 miles over 7 states from the middle of North Dakota to the Vermont border of New York. The Trail traverses through a National Grassland, 10 National Forests, more than 150 federal, state and local public lands; near three of the Great Lakes; past countless farmlands; through large cityscapes; over many rivers; and through the famed Adirondacks (North Country Trail Association, 2018). The North County trail passes within 9.5 miles at its closest point to a turbine. The Buckeye Trail and North Country Trail pass through a 10 miles radius of the Project Area. Consequently, field review confirmed potential turbine visibility from portions of both these trails. Visual simulations presented in the visual impact analysis (Exhibit FF) represent the range of potential views that will be available from either trail network. The visual impact analysis (VIA) (see Exhibit FF) further discusses visual impacts to visually sensitive resources and mitigation of such impacts. Facility sound levels along the trails will always be less than 44 dBA Leq, even under high winds and anomalous meteorological conditions (Tetra Tech, 2018). There will be no shadow flicker along the trails (EDR, 2018a).

At 346 acres, Forrest Woods Nature Preserve is the largest owned nature preserve of the Black Swamp Conservancy. It is home to more than 30 rare, threatened and endangered species of plants and animals. The property is open to the public by permit only (Black Swamp Conservancy, 2018). At its closest point, it is approximately 3.8 miles from a proposed turbine. Field review of the Black Swamp Conservancy's Forrest Woods Nature Preserve was conducted by traveling the perimeter roads, (C-73, C-230, & T-192) and observing the landscape conditions. By obtaining a permit, access to the site allows a visitor to experience one of the finest remnants of the historic Great Black Swamp. The site is heavily wooded, and open outward views are rare. Where they do occur, vegetation along the adjacent Maumee River Corridor will also add additional screening. The visual impact analysis (VIA) (see Exhibit FF) further discusses visual impacts to visually sensitive resources and mitigation of such impacts. Facility sound levels at the preserve will always be less than 44 dBA Leq, even under high winds and anomalous meteorological conditions (Tetra Tech, 2018). There will be no shadow flicker at the preservice (EDR, 2018a).

Blue Cast Springs Nature Preserve protects over 3,000 feet of the Maumee River back and is the site of a natural spring once thought to have healthful properties. Bluffs over 30-feet high offer vistas of the Maumee

River and one of its islands. Native Americans likely used these bluffs to overlook the river's canoe traffic. A number of ravines running through the upland forest feed into the river (Acres Land Trust, 2018a). The preserve is located approximately 8.3 miles from the nearest proposed turbine and was visited and photographed as part of the field review. The only portion of the preserve with potential views of the proposed Facility is the parking area and immediate connector trails. As is the case with the Forrest Woods Nature Preserve, Blue Cast Springs also focusses on interior views, with open outward views blocked by the mature vegetation. The proposed turbines will have no effect on the internal views of either of these two preserves and consequently their overall scenic quality and viewer enjoyment will remain unaffected. The visual impact analysis (VIA) (see Exhibit FF) further discusses visual impacts to visually sensitive resources and mitigation of such impacts. Facility sound levels at the preserve will always be less than 44 dBA Leq, even under high winds and anomalous meteorological conditions (Tetra Tech, 2018). There will be no shadow flicker at the preserve (EDR, 2018a).

Located 9.1 miles away from the nearest proposed turbine, the Maumee River Overlook, or Steam Saw Mill site, is a high forested embankment overlooking the Maumee River. A water-powered sawmill was once located nearby on an outcrop of rocks in the river. Lumber from the mill was used in the Wabash & Erie Canal, which ran along the south border of the preserve (Acres Land Trust, 2018b). Views of the river are available along the 0.9-mile overlook trail, but long-distance views are primarily shielded by forested vegetation along the river. The visual impact analysis (VIA) (see Exhibit FF) further discusses visual impacts to visually sensitive resources and mitigation of such impacts. Facility sound levels at the preserve will always be less than 44 dBA Leq, even under high winds and anomalous meteorological conditions (Tetra Tech, 2018). There will be no shadow flicker at the overlook (EDR, 2018a).

(4) Visual Impact

EDR prepared a Visual Impact Analysis (VIA) for the proposed Facility (see Exhibit FF). The purpose of the VIA is to:

- Describe the appearance of the visible components of the proposed Facility.
- Define the visual character of the Facility study area.
- Inventory and evaluate existing visual resources and viewer groups.
- Evaluate potential Facility visibility within the study area.
- Identify key views for visual assessment.
- Assess the visual impacts associated with the proposed Facility.

The VIA was prepared by, and with oversight from, a professional with experience in developing visual impact assessments. It is also consistent with the policies, procedures, and guidelines contained in established visual impact assessment methodologies.

The visual study area for the Facility was defined as the area within a 10-mile radius of each of the proposed wind turbines. The 10-mile study area encompasses approximately 608 square miles. The largest portion, 502 square miles, is located in Ohio and consists of the following municipalities: 1) Defiance, Paulding, and Van Wert Counties, 2) Auglaize, Benton, Blue Creek, Brown, Carryall, Crane, Delaware, Emerald, Hoaglin, Harrison, Hicksville, Jackson, Latty, Mark, Paulding, Pleasant, Ridge, Tully, Union, and Washington Townships, 3) the Villages of Antwerp, Broughton, Cecil, Convoy, Grover Hill, Haviland, Hicksville, Latty, Melrose, Paulding, Payne, Scott, & Sherwood, and 4) the City of Van Wert. A smaller portion of the study area, 106 square miles, is located in Indiana and includes 1) Adams, Allen, and De Kalb Counties, 2) Jackson, Jefferson, Madison, Maumee, Milan, Monroe, Newville, Scipio, Springfield, and Union Townships, 3) the Town of Monroeville and 4) the City of Woodburn. The location and extent of the visual study area is illustrated in Figure 3 in Exhibit FF.

(a) *Project Visibility and Viewshed Analysis*

An analysis of Facility visibility was undertaken to identify those locations within the visual study area where there is potential for the proposed wind turbines to be seen from ground-level vantage points. This analysis included identifying potentially visible areas on viewshed maps and verifying visibility in the field. The methodology employed for each of these assessment techniques is described in Exhibit FF. Results are summarized below, with additional detail to be found in Exhibit FF.

<u>Viewshed Analyses</u>

The bare-earth Digital Elevation Model (DEM) viewshed analysis indicates that areas where there is no possibility of seeing the Facility are extremely limited, consisting of a few topographic depressions, such as quarries and portions of river/stream valleys. Based on the screening effect of topography alone, none of the visually sensitive sites within the visual study area are indicated as being completely screened from view of the proposed wind turbines; however, 98 of the 222 inventoried resources will experience partial screening by intervening topography.

Factoring vegetation and structures into the viewshed analysis, through use of the lidar/NLCD-derived Digital Surface Model (DSM), provides a more accurate reflection of what the actual extent of Facility visibility is likely to be (see Figure 5 in Exhibit FF). The blade tip viewshed analysis indicates that approximately 78.6% of the study area will have potential views of some portion of a wind turbine. Visibility will be eliminated in small areas throughout the study area where blocks of forest vegetation occur along forested stream corridors. In general, areas of screened views increase in size with distance from the Facility and are most wide-spread north of the Maumee River. Sizable areas of no or limited turbine visibility include the Maumee River, Flat Rock Creek, and the Villages of Hicksville, Antwerp, Paulding, Payne, Convoy, Haviland, Grover Hill, and the center of the Village of Scott (not the agricultural outskirts). The DSM viewshed analysis indicates that views of the proposed Project will be fully screened from 37 of the inventoried visually sensitive resources within the 10-mile radius study area. Based on the DWM viewshed, 13 of the 222 inventoried visually sensitive resources are indicated as having unobstructed open views of the Facility from their full geographic extent, only four of which occur within Ohio. These four resources include Vinegar Farm Plot Cemetery, Miser/Mizer Plot Cemetery, Angrove-Blaine Cemetery, and McClure-Dowler Cemetery. The remaining 172 identified resources are indicated as having at least partially screened views, depending on the exact location of the viewer within the resource's mapped boundary.

The results of the FAA warning light viewshed analysis are very similar to those of the blade tip analysis, except that it illustrates that the Facility's potential nighttime visibility covers a somewhat smaller geographic area. Considering the screening of topography, vegetation, and structures, potential nighttime turbine visibility is indicated within 72.0% of the visual study area.

Field Verification

The field review suggested that portions of the Facility will be visible throughout most of the study area due to the flat topography and the abundance of open agricultural land. The field review confirmed a general lack of open views toward the Facility from developed areas with an abundance of structures and street/yard trees, particularly in the Cities of Van Wert, Ohio and Woodburn, Indiana, the Town of Monroeville, Indiana and the Ohio Villages of Antwerp, Convoy, Hicksville, and Paulding. Consequently, views of the Facility from the majority of residences and historic sites within these residential areas are anticipated to be fully or partially screened. In general, only on the outskirts of these developed areas, where open fields adjoined residential areas, were open views available in the direction of the Facility. Views of Facility turbines will be most available from the more rural/agricultural portions of the study area. Some screening will be provided by wood lots, hedgerows, farm buildings, rural residences and yard trees. Long distance views are likely to be unavailable where homes and roads are surrounded by vegetation, as the lack of topography allows the foreground and midground vegetation to screen the view.

Field review also confirmed that the Facility will be visible from most of the transportation corridors in the study area.

The majority of sensitive sites is found within the cities and villages in the study area. Field review of these confirmed that visibility from the majority will be partially to fully screened, because of the surrounding built environment. More discussion of Facility visibility from sensitive sites is presented in Exhibit FF, which also includes, in Appendix B, a comprehensive summary of potential visibility from land and water recreation areas, recreational trails, scenic rivers, scenic routes or byways, and registered landmarks of historic, religious, archaeological, scenic, natural, or other cultural significance within 10 miles of a proposed turbine site.

(b) *Description of Scenic Quality of Existing Landscape*

As previously discussed, land use within the 10-mile radius visual study area is dominated by agricultural land, farms, and rural and suburban residential development. Farms in the area are typically large, with soybeans and corn being the primary agricultural crops grown. Rural residential development occurs at a very low density throughout the agricultural portions of the study area. Villages occur as relatively small pockets of development within a primarily rural/agricultural landscape. Higher density residential and commercial development is concentrated in the Cities of Van Wert, Ohio and Woodburn, Indiana, the Town of Monroeville (Indiana), and the Ohio villages of Paulding, Hicksville, Antwerp, and Convoy. The city and villages are generally characterized by a grain elevator and associated silos, a train depot, and adjacent main street business district surrounded by traditional residential neighborhoods, with some commercial frontage development along the outskirts. Some suburban residential and commercial development occurs around the periphery of the city and villages in the study area. Commercial/industrial uses within the study area also occur on the outskirts of the city and villages, and along certain portions of state and county highways in the area.

Vegetation in the study area is dominated by active agricultural land (crop fields), followed by developed/open space (residences/yards), and some deciduous forest areas (woodlots). Many of the fields and are bordered by ditches and narrow waste areas characterized by unmoved herbaceous woody vegetation. Forestland is limited to isolated woodlots between crop areas and along roads. The majority of the water features within the study area are small streams and ponds that occur on private land, and therefore receive very limited recreational use. These water bodies are also not major visual components of the landscape, and typically can only be seen at, or in proximity to, public road crossings.

The definition of landscape types found in the study area provides a useful framework for the analysis of available visual resources and viewer circumstances. These landscape types, referred to in the VIA as Landscape Similarity Zones (LSZs), are defined based on the similarity of landscape features such as landform, vegetation, water, and land use patterns, as well as characteristics that affect visual sensitivity, such as the availability of open views, scenic quality and user activity. Within the 10-mile radius visual study area, six major LSZs were defined:

- Rural Residential/Agricultural Zone,
- City/Village Zone,
- Suburban Residential Zone, and
- Transportation Corridor Zone.

The Rural Residential/Agricultural LSZ is the dominant landscape type that occurs throughout the study area and is visually recognizable by its working landscape characteristics. The landscape in this zone is characterized by uniformly level topography with a mix of farms and associated crop fields, rural residences, hedgerows, small woodlots, and occasional water features. The dominant land use is crop farming (primarily soybeans and corn), along with small amounts of pasture. Due to the presence of open fields, views within this LSZ are more open and longer in distance than those available in other zones within the study area. These views typically include a level foreground field, with woodland vegetation in the background, and, in places, crossing or framing the view. Views in the Rural Residential/Agricultural LSZ include widely scattered homes, barns and silos, with working farm equipment occasionally seen in the fields. Scenic quality generally ranges from low to moderate depending on the variety and arrangement of landscape features in the view. Due to the abundance of open fields, and the proposed location of turbines exclusively within this zone, open foreground (0-0.5 mile), midground (0.5-3.5 miles), and background (>3.5 miles) views of the proposed Facility will be available from many areas within the Rural Residential/Agricultural LSZ.

Additional information about the Rural Residential/Agricultural LSZ and descriptions of the other less common LSZs, including representative photos of each LSZ, can be found in Exhibit FF.

(c) *Landscape Alterations and Impact on Scenic Quality of the Landscape*

The VIA indicates that the proposed Facility's overall contrast with the visual/aesthetic character of the study area will also be variable. Insignificant to moderate contrast was noted for viewpoints where one or more of the following occurs: existing turbines are present, existing vegetation provides at least partial screening, or distance reduces the turbines' perceived line and scale contrast with the landscape. More substantial contrast was noted where unscreened foreground and near midground views of turbines are now available where currently no turbines are visible, or where the proposed Facility increases perceived turbine density and visual clutter increases perceived turbine density and visual clutter. In most settings, addition of the proposed Facility will not alter the landscape character, scenic quality, or activities of various user groups. However, the visibility and visual impact of the wind turbines will be variable, based on landscape setting, the extent of natural screening, and distance of the viewer from the Facility. As described above, scenic quality in the study area generally ranges from low to moderate, depending on the variety and arrangement of landscape features in the view.

Based upon the nighttime photos/observations of existing wind power projects within the study area, the red flashing lights on the turbines could result in a potential nighttime visual impact. The actual significance of this impact from a given viewpoint will depend on how many proposed turbines are visible, how many existing turbines and other sources of lighting are present in the view, the extent of screening provided by structures and trees, and nighttime viewer activity/sensitivity. The proposed Facility will add additionally visual clutter to open areas where existing turbines are already present in the view. The additional visual clutter may result from the viewer experiencing a blinking red line across the horizon versus individual structures, or a more erratic blinking pattern due to the presence of multiple wind farms and the passage of turbine blades in front of the flashing lights. However, it should be noted that nighttime visibility/visual impact will be limited in cities, villages, hamlets, and along highways where existing lights already compromise dark skies and compete for viewer attention.

The low to medium scenic quality within the working agricultural landscape that makes up the majority of the visual study area serves to limit the Facility's visual impact. There are no National Parks, National Forests, National Wildlife Refuges, National Natural Landmarks, federally designated scenic rivers or trails, State Nature Preserves, State Parks, or State Forests within the visual study area.

In addition, as part of the VIA, the potential cumulative visual impacts of the proposed Facility along with other wind energy projects currently operating in the surrounding region were considered. Cumulative impacts are two or more individual visual effects which, when taken together, are significant or that compound or increase other similar visual effects. The VIA addresses the potential cumulative visual impacts that may arise from interactions between the proposed Facility and the currently operating wind Paulding Wind Farms I and III, the Blue Creek Wind Farm, and the Northwest Ohio Wind Project. These facilities are located approximately 0.7 mile, 1 mile, and 0.7 mile from the nearest point of the Facility, respectively. The visibility and visual effect of wind turbines within the study area will vary based on viewing distance, viewer orientation, and the number of turbines visible, as well as the potential screening effects of vegetation and structures.

If turbines from the existing Paulding, Blue Creek, or Northwest Ohio Wind Farms are visible from a vantage point within the Project Area, they will typically be viewed as background features in any view that includes the proposed turbines in the foreground or midground. The reverse will be true when the proposed Facility is viewed from sites within or adjacent to any of the existing wind farms. From longer distances, the multiple wind farms may appear to be a single larger facility.

The zones where cumulative project visibility is most likely to occur are the Rural Residential/Agricultural and the Transportation Corridor LSZs. Due to the abundance of open agricultural land, the Rural Residential/Agricultural LSZ offers the greatest opportunity to see numerous turbines from multiple projects. The increased density of turbines in these views will increase visual impact from some locations. The increased density of turbines in these views will increase visual impact from some locations. However, many of turbines (existing and/or proposed) will be viewed at significant distances, which reduces their visual impact, and areas where such views are available generally have few visually sensitive resources and a limited number of viewers. Within the Transportation Corridor LSZ, turbines from multiple projects will be visible at a variety of distances and directions as travelers pass through the study area on the major highways. However, because the viewers are moving at a high rate of speed, the duration of their views and their perception of increased turbine density will be limited. In addition, the travelers that will be experiencing these views generally have limited sensitivity to visual change within the landscape.

Consequently, although there may be locations where occurrence of the existing and proposed wind projects will have a noticeable cumulative visual effect, these instances will be relatively rare, and generally will not affect a significant number of viewers on sites that are particularly sensitive to visual change. Thus, the addition of the proposed turbines to a working agricultural landscape where these features already exist is not expected to have a significant adverse cumulative visual impact.

(d) *Visual Impacts to Landmarks of Cultural Significance*

The DSM viewshed analysis indicates that views of the Facility will be fully screened from 37 of the inventoried visually sensitive resources. These include four NRHP-listed resources, six NRHP-eligible resources, four state historic markers, and 23 other locally significant resources (see Appendix B of Exhibit FF). Only 13 of the inventoried visually sensitive resources are indicated as having fully unobstructed views of the Facility, and only four of which are in Ohio and are cemeteries, and the remaining 172 identified resources are indicated as having a combination of open and screened views, depending on the exact location of the viewer within the resources mapped boundary.

(e) *Photographic Simulations*

To illustrate anticipated visual changes associated with the proposed Facility, photographic simulations of the completed Facility from 10 selected viewpoints were used to evaluate Facility visibility, appearance, and contrast with the existing landscape. The visual simulations are included as Appendix D of Exhibit FF. Review of these images, along with photos of the existing view, allowed for comparison of the aesthetic character of each view with and without the proposed Facility in place. Exhibit FF includes a detailed discussion of each simulation. Evaluation by an EDR aesthetics expert indicates that the Facility's overall contrast with the visual/aesthetic character of the area will range from insignificant to appreciable.

Contrast was noted for some viewpoints evaluated as part of the VIA. However, contrast is insignificant to moderate, particularly where existing vegetation provides at least partial screening, or where existing vertical elements (such as trees and utility poles) in the foreground or mid-ground reduces the turbines' perceived line and scale contrast with the landscape. Moderate to appreciable contrast was noted where foreground and near mid-ground views of turbines are available, especially from agricultural areas. Under these circumstances, the Facility's strong scale and line contrast with existing landscape features, and with viewer activity was noted. However, contrast was substantially reduced when views of the turbines were more distant or screened. In addition, due to the existing turbines in the Project Area, the newly proposed turbines will often not be the dominant structures within view.

In addition to the visual simulations, EDR also produced visual renderings of the proposed Facility from 10 viewpoint locations. It should be noted that these renderings are provided as informational illustrations only and additional qualitative analysis associated with these renderings is not provided in Exhibit FF. The methodology used to create these renderings is described below.

In order to determine the number and location of viewpoints used for the proposed project renderings, EDR performed a GIS analysis by creating a 3-square mile grid which was placed over the proposed turbine array. Additionally, roads were added to the GIS analysis to ensure that the selected viewpoints would be from public vantage points. To the extent possible, the viewpoints were chosen at the intersection of two roads to increase location recognition. With the 3-square mile grid overlaid on the

Project area, it was determined that 10 separate grid cells encompassed some portion of the Project area. Consequently, 10 viewpoints were chosen for the creation of Facility renderings (as required by OAC Rule 4906-4-09(C)(6)). These are in Table 2 and illustrated in the mapping provided in Appendix F of Exhibit FF.

Once the geographic locations of the viewpoints were determined, EDR used the 2006 OSIP Digital lidar data for Paulding County to build a georeferenced 3D point cloud model of the vegetation and structures throughout the entire Project Area in 3D Studio Max®. Additionally, the lidar data were used to create a 3D topographic model of existing site topography within 5 square miles of each selected viewpoint. This is generally the extent of ground plane visibility when considering the screening effect of vegetation, structures, and curvature of the earth. To account for the color of the trees and the ground plane, EDR used georeferenced aerial photography to assign a color value to the coincident points in the point cloud (for vegetation and structures) or grid cell (for the ground plane). With the existing environment modeled, EDR then incorporated a 3D model of the proposed Facility and the four existing wind farms adjacent to the Facility. Details for the existing wind farms' turbine models were obtained from the respective project websites. The elevation for each turbine was determined by the lidar data. With the turbines in place, EDR created four cameras at each viewpoint location. All cameras represent a lens setting of exactly 50 millimeters and each camera was set to point either north, east, south, or west, in order to cover multiple vantagepoints, as required by the OPSB regulations. It should be noted that ground level cameras placed in the lidar model can result in excessive foreground distraction, so the cameras were places up to 15 feet above ground level to minimize this effect. With the cameras in place, EDR assigned geometric values to the lidar point cloud to make the points visible to the camera. The geometric values that were applied to the points appear as circles in the viewpoint renderings when proximate to the viewer. However, these circles represent actual screening elements found in the Project area, such as portions of trees, utility poles, houses, barns, or other built structures. In order to differentiate between the existing and proposed turbines, existing turbines were assigned a dark grey color. This is only intended to clearly distinguish the proposed Project from the existing turbines, and should not be misinterpreted as the actual turbine color.

Once the turbines and cameras were placed and adjusted, a lighting system was created to represent high contrast for optional wind turbine visibility. The environmental conditions represented are perfectly clear and free of any atmospheric haze. The skies were programmed to be cloudless and blue, providing a high contrast background. The resulting renderings assume high visibility viewing conditions from each of the four view directions from 10 viewing locations. The resulting Facility renderings are provided in Appendix F of Exhibit FF, along with the mapped viewpoint locations and technical specifications.

(f) *Impact Minimization Measures*

Mitigation options are limited, given the nature of the Facility and its siting criteria (i.e., tall structures typically located in open fields). The VIA evaluates various impact minimization measures, as summarized below:

<u>Project Area Location</u>

Locating the proposed Facility in an area with existing wind farms can be seen as a form of mitigation. Because the proposed Facility fills a gap within the existing projects and does not overly extend the combined visual effect area, it limits additional effected resources, and takes advantage of lower user and landscape sensitivity. From a few viewpoints the co-location could be seen as adding additional elements to an already visually cluttered scene, however in most cases, the proposed turbines will be perceived as part of the existing wind farms, and compatible with these facilities in line, color, form, and scale.

<u>Lighting</u>

Turbine lighting will adhere to FAA regulations. Medium intensity red flashing lights will be used at night rather than white strobes or steady burning red lights

<u>Turbine Layout</u>

Because of the number of individual turbines proposed, their location in open agricultural fields, the variety of viewpoints from which they may be visible, and the presence of existing wind farms, additional turbine relocation will generally not significantly alter visual impact. Where visible from sensitive resources within the study area, (e.g., local parks, and heavily used roadways), relocation of individual machines would have little effect on overall visual impact. Throughout the study area, available views of the Facility include different turbines at different distances from the viewer. Therefore, turbine relocation would generally not be effective in mitigating visual impacts.

<u>Visual Screening</u>

Views of the proposed turbines from cities and villages, where the majority of the residents and sensitive historic sites are located, are typically well screened by intervening structures and trees. Midground and background views in the more rural portions of the study area, including views from sensitive sites, are generally at least partially screened by hedgerows and woodlots. However, due do the height of individual turbines and the geographic extent of the proposed Facility, screening of individual foreground turbines with earthen berms, fences, or planted vegetation will generally not be effective in reducing Project visibility or visual impact.

Facility Coloration

The white color of wind turbines as mandated by the FAA to eliminate the need for day time lighting minimizes contrast with the sky under most conditions, especially when viewed at distance against the horizon. Consequently, use of this color is an appropriate means of limiting visual impact. The size and movement of the wind turbine blades prevents more extensive camouflage from being a viable mitigation alternative (i.e., they cannot be made to look like anything else). Neilson (1996) notes that efforts to camouflage or hide wind farms generally fail, while Stanton (1996) feels that such efforts are inappropriate. She believes that wind turbine siting "is about honestly portraying a form in direct relation to its function and our culture; by compromising this relationship, a negative image of attempted camouflage can occur."

Maintenance

The turbines and turbine sites will be maintained to ensure that they are operating efficiently. Research and anecdotal reports indicate that viewers find wind turbines more appealing when the rotors are turning (Stanton, 1996, Pasqualetti et al., 2002).

Offsets

Correction of an existing aesthetic problem within the viewshed is a viable mitigation strategy for wind power projects that result in significant adverse visual impact. The Applicant anticipates entering into an agreement with OHPO to enhance and restore resource(s) in the visual study area. This could include projects such as maintaining cemeteries, restoring historic buildings, etc. and will be determined in consultation with OHPO.

(E) AGRICULTURAL DISTRICT IMPACTS

(1) Agricultural Land and Agricultural District Land Map

Agricultural land use is the dominant land use in the Project Area. Figure 08-8 depicts agricultural land, agricultural district land, and land eligible for Current Agricultural Use Value (CAUV) program within the Project Area.

(2) Potential Impacts and Proposed Mitigation

Significant impacts to agricultural land have been avoided through careful Facility design, which deliberatively sited Facility components along field edges/hedgerows to the extent practicable. Each wind turbine location, along with the locations for associated infrastructure, was individually inspected during field efforts by the Applicant and/or its consultants.

(a) *Acreage Impacted*

Table 08-17 quantifies impacts to agricultural land uses, based on the limits of clearing and disturbance shapefiles provided by Fisher.

Table 08-17. Impacts to Agricultural Land Use

Agricultural Land Use[1]	Total Vegetation Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Cash Grain or General Farm (101 or 111)	501.2	360.4	52.9
Wind Turbines and Workspaces	*256.8*	*233.7*	*17.9*
Access Roads[3]	*84.7*	*48.4*	*32.8*
Buried Electrical Collection Cable[3]	*133.7*	*61.3*	*0.0*
Laydown Yards	*17.0*	*17.0*	*0.0*
Collection Substation	*2.0*	*0.0*	*2.0*
Meteorological Towers[4]	*7.0*	*0.0*	*0.2*
Total	501.2[2]	360.4[2]	52.9[2]

[1] Agricultural district data obtained from Paulding County Auditors.
[2] Only one type of agricultural land was present within the limits of clearing and limits of disturbance for the Facility. As such, these impacts are consistent with the agriculture impacts presented in Table 08-6. The breakdown of impact acreages differs somewhat from those presented in Table 08-6 because table 08-6 includes non-agricultural communities, such as forestland and urban, which are not included here.
[3] Totals of impact from individual components would be higher except that some clearing associated with these components is also located within the footprint of clearing for another Facility component (e.g., meteorological towers, turbines).
[4] The acreage impacts as a result of clearing and disturbance associated with meteorological towers is a total from the six locations under consideration for the Facility. This represents an over-representation of impacts since only up to three meteorological towers will be constructed.

Table 08-18 quantifies impacts to agricultural district land, based on the limits of clearing and disturbance shapefiles provided by Fisher.

Table 08-18. Impacts to Agricultural District Land

Agricultural District Land[1]	Total Vegetation Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Wind Turbines and Workspaces	*5.0*	*4.6*	*0.3*
Access Roads[3]	*2.8*	*1.6*	*1.3*
Buried Electrical Collection Cable[3]	*5.3*	*2.3*	*0.0*
Laydown Yards	*0.0*	*0.0*	*0.0*
Collection Substation	*0.0*	*0.0*	*0.0*
Meteorological Towers[2]	*3.5*	*0.0*	*0.1*
Total	16.6[4]	8.5[4]	1.7[4]

[1] Agricultural district data obtained from Paulding County Auditors.

[2] The acreage impacts as a result of clearing and disturbance associated with meteorological towers is a total from the six locations under consideration for the Facility. This represents an over-representation of impacts since only up to three meteorological towers will be constructed.

[3] Totals of impact from individual components would be higher except that some clearing associated with these components is also located within the footprint of clearing for another Facility component (e.g., meteorological towers, turbines).

[4]This breakdown of impact acreages differs from those presented elsewhere in this Application because this table only includes impacts from Facility components located within designated Agricultural District Land.

For property tax purposes, farmland devoted exclusively to commercial agriculture may be valued according to its current use rather than at its "highest and best" potential use. This provision of Ohio law is known as the CAUV program. By permitting values to be set well below true market values, the CAUV normally results in a substantially lower tax bill for working farmers. To qualify for the CAUV, the land must meet one of the following requirements during the three years preceding an application for the CAUV; ten or more acres must be devoted exclusively to commercial agricultural use; or if under ten acres are devoted exclusively to commercial agricultural use, the farm must produce an average yearly gross income of at least $2,500. In Paulding County, in order to be in an Agricultural District, the parcel must also be enrolled in the CAUV program. Therefore, the impacts to Agricultural Districts presented above also represent the impacts to CAUV land.

(b) *Impacts on Agricultural Facilities and Practices*

(i) Field operations

As shown above in Table 08-17, construction of Facility access roads, buried interconnects, wind turbines, and other accessory structures will collectively disturb a total of 501.2 acres of agricultural lands. Although most of these impacts will be temporary, approximately 52.9 acres of agricultural lands will be converted to built facilities. Access road construction through agricultural fields will include stripping a 36-foot width of topsoil and placing it in windrows along the access road to prevent construction vehicles from driving over undisturbed soil and adjacent fields. Following turbine construction, access road widths will be reduced to 16 feet or less. In locations where buried cable crosses agricultural fields, construction equipment may disturb soil in a corridor up to an average of 10 feet wide. However, this will represent a temporary disturbance only, and as the cable will be buried at a minimum depth of 48 inches, will not have a long-term impact on farming practices (e.g., plowing). Topsoil within a 263-foot radius of each tower will first be stripped and stockpiled. A backhoe will then be used to excavate a foundation hole. Excavated subsoil and rock will be segregated from topsoil during this process. Following construction, the footprint of each turbine will be reduced to approximately 0.3 acre, which includes the turbine pedestal and gravel crane pad. The remaining work area will be restored to agricultural use.

Along with these direct impacts to agricultural land, movement of equipment of equipment and material during Facility construction could result in damage to growing crops, damage to fences and gates, and/or temporary blockage of farmers' access to agricultural fields. However, as described in the following section, wind turbines and associated facilities have been located so as to minimize loss of active agricultural land and interference with agricultural operations. Such impacts are not anticipated during Facility operation and maintenance, but landowners will be compensated for any impacts that do occur.

(ii) Irrigation

Irrigation systems are not in widespread use in the Project Area. Potential interference to irrigation operations is very limited and coordination with affected landowners will alleviate potential for significant long-term disruption.

(iii) Field drainage systems

Facility construction could result in damage to subsurface drainage systems (tile lines). Avoidance of damage to drainage systems will be incorporated in Facility design, and mitigation measures will be implemented as outlined below.

(iv) Structures used for agricultural operations

The Facility will not physically impact any agriculturally related structures.

(v) Viability as agricultural district land

Aside from temporary disturbance during construction activities, the Facility is largely compatible with farming practices. Furthermore, the Facility will not result in a change in land use and will promote the long-term economic viability of the affected farms by supplementing the income of participating farmers. The presence of wind turbines will help preserve agricultural land and avoid conversion of that land to other developmental land uses, such as seasonal or permanent high-density residences.

(c) *Proposed Mitigation Procedures*

(i) Avoidance/minimization of damage to field tile drainage systems

Where Facility components are proposed to cross active agricultural fields, an attempt will be made to determine the location of any subsurface drainage tiles through consultation with the landowner and/or review of public records.

(ii) Timely repair of damaged field tile systems

Any drainage tiles damaged during construction will immediately be identified, documented, and repaired. It is anticipated that a local drain tile contractor or the farmer tending the land will be involved in repair activities.

(iii) Topsoil segregation, decompaction, and restoration

Mitigation measures to protect and restore agricultural soils have been incorporated into the siting of Facility components. For example, wind turbines and other structures have been located along field edges, so as to minimize adverse impacts on agricultural land and farming operations. Permanent access road width is limited to 16 feet or less. Where possible, access roads follow hedgerows and field edges to minimize loss of agricultural land. To the extent practicable, existing fields have been kept intact, rather than broken up into smaller, irregularly shaped fields that are more difficult to farm. Parking areas, the laydown yards, and other temporary and permanent support facilities have been located outside of active agricultural fields where possible. Known surface and subsurface drainage features (i.e., ditches, diversions, tile lines) have been avoided.

Additional measures to reduce impacts to agricultural land will be undertaken during Facility construction, operation, and maintenance. These mitigation measures include:

Access Roads Specifications

- Vehicular access to the tower sites will be minimized until permanent access roads have been constructed.
- Roads will be constructed only in locations shown on the construction drawings.
- The boundaries of all work areas will be identified with snow fence, stockpiled topsoil, or other temporary barrier. No vehicles or equipment will be allowed outside the work areas.
- All permanent access roads across agricultural fields will be the minimum width necessary to accommodate construction traffic (i.e., no wider than 16 feet).
- Project schedule permitting, roads across agricultural fields will not be constructed during saturated conditions when their development would damage agricultural soils.
- When constructing access roads on active agricultural land, all topsoil will be stripped from the entire work area and stockpiled in windrows along the road, or in designated temporary storage areas. Temporarily stockpiled topsoil shall be segregated from other excavated material (rock and/or subsoil).
- When stockpiling topsoil in windrows along roads, surface water drainage from the road or adjacent agricultural fields will not be blocked.
- When constructing access roads through active agricultural land, the final road surface will be leveled with the adjacent field surface. During restoration, topsoil will be used to create a smooth transition between the road surface and surrounding agricultural land, so as not to impede crossing by farm equipment.
- Where necessary, culverts or water bars will be installed to assure uninterrupted natural surface water drainage patterns. Such culverts or water bars will be installed in a manner that prevents concentration of water runoff and soil erosion.
- Access roads will be maintained throughout construction so as to allow continued use/crossing by farm machinery. Maintenance will be performed to repair rutting so as to avoid interrupting natural cross drainage of the area of preventing use or crossing of the road by the landowner.
- To prevent damage to adjacent agricultural land, all vehicle traffic and parking will be confined to access roads, designated work areas at the tower sites, and/or designated parking and material laydown yards. Any necessary pull-offs and parking areas will be developed outside of active agricultural fields. If this is not possible, all topsoil shall be stripped from agricultural areas used for vehicle and equipment traffic and parking, and such areas will be restored at the end of construction.

Laydown Yard Specifications

- Temporary construction parking, laydown, and storage areas on active agricultural land will be developed by removing all topsoil from areas that will receive vehicular traffic. Topsoil will be stockpiled adjacent to the laydown yards in windrows or piles on the same property from which it was removed.
- Storage of construction materials on undisturbed ground will only be permitted if their placement and removal can be accomplished without driving over the undisturbed areas.
- Upon completion of construction, any gravel and/or geotextile mats will be removed, and the soils will be de-compacted and restored as described below in the restoration specifications.

Excavation/Backfill Specifications

- The boundaries of all rights-of-way and work areas will be identified with snow fence or other temporary barrier. No vehicles or equipment shall be allowed outside the work area.
- All agricultural areas to be disturbed by excavation shall first be stripped of topsoil. Topsoil stripping must be undertaken on the full area to be disturbed by excavation, grading, or piling of excavated subsoil/rock.
- Stripped topsoil will be segregated from subsoil and stockpiled in temporary storage areas on the property from which it was removed.
- All areas to be disturbed by excavation and backfilling will be enclosed within silt fencing or other temporary barrier to define the allowable limits of disturbance. No vehicular activity will be allowed outside the defined work area.
- Excavated subsoil and rock shall not be stockpiled or spoiled on active agricultural land outside the work area.
- Excess excavated subsoil and rock that is not suitable for backfill will be removed from the site. On-site disposal will only occur outside of active agricultural land with permission from the landowner.
- Open excavation areas in active pastureland will be temporarily fenced to protect livestock access to the work area and/or escape from fenced enclosures. Following construction, any related fencing will be restored to “like new” condition in its original location (or as otherwise agreed upon with the landowner).
- Any water pumped from open excavations shall be directed into temporary sediment traps prior to discharge. Pumping will be done in a manner that minimizes adverse effects on agricultural crops and operations.

- Buried electric lines in active agricultural fields will be at least three feet deep, unless bedrock is encountered prior to reaching this depth. If bedrock is encountered, the buried lines will be placed completely below the bedrock surface.
- Backfill will utilize excavated subsoil and rock wherever possible. If this material is determined to be unsuitable as backfill, select granular fills (e.g., bank run gravel) will be utilized it its place. No rock backfill will be used in the top 24 inches in active agricultural fields.

Foundation Specifications

- Concrete trucks will be restricted to designated access roads and crane pads at all times.
- Excess concrete shall be disposed on off-site, unless otherwise approved by the landowner. Under no circumstances shall it be buried or left on the surface in active agricultural areas.
- Concrete trucks will be washed in foundation holes, or outside of active agricultural areas in locations approved by the landowner.
- In active pasture areas, foundations treated with concrete curing compound or sealer shall be temporarily fenced to prevent access by livestock.

Turbine Erection Specifications

- Any grading to accommodate crane pads and material laydown at the turbine sites will be confined to the designated work area around each foundation.
- Topsoil will be stripped from crane pad locations and work areas around foundations and stockpiled in areas designated on the construction drawings.
- Erection crane set-up and break-down activities will not occur outside these areas in active agricultural land.
- Crane paths across active agricultural land will be improved to the extent necessary to protect agricultural soils. If conditions allow (i.e., soils are hard and dry) the crane may drive across the ground without stripping of topsoil. If leveling of the ground is required, such leveling will be kept to a minimum, and topsoil will not be mixed with subsoil. If significant rutting or soil disturbance could occur, temporary roads will be developed to accommodate crane passage.
- Development of temporary roads, if necessary, across agricultural land will involve stripping and stockpiling of topsoil and may involve placement of gravel over a geotextile mat. Following use by the crane, any gravel and matting will be removed, and soils restored in accordance with the restoration specifications described below.
- The contractor will immediately pick up and dispose of any pieces of wire, bolts, staples, or other small metallic objects that fall to the ground in active pastureland.

Restoration Specifications

- Following completion of construction, excess gravel/fill will be removed from along access roads and crane paths, around towers, and the laydown yards.
- Exposed subsoils will be de-compacted with a deep ripper or heavy-duty chisel plow to a minimum depth of 18 inches. Soil de-compaction shall be paid for by the Applicant.
- Following de-compaction of the subsoil, the surface of the subsoil will be picked over to remove all rocks 4 inches in size or larger. Following rock picking, stockpiled topsoil will be returned to all disturbed agricultural areas. The topsoil will be re-graded to match original depth and contours to the extent possible.
- The surface of the re-graded topsoil will be disked, and any rocks over 4 inches in size will be removed from the soils surface. Restored topsoil will be stabilized with seeding and/or mulching, unless other arrangements have been made with the landowner.
- De-compaction of crane paths over otherwise undisturbed agricultural land will be accomplished using a deep ripper or heavy chisel plow as needed.
- All access roads will be re-graded as necessary to create a smooth travel surface, allow crossing by farm equipment, and prevent interruption of surface drainage. Temporary water bars and culverts shall be removed inf they are no longer necessary.
- Restored agricultural areas will be stabilized with seed and/or mulch. In areas to remain in hay production, an appropriate seed mix will be selected in consultation with the landowner. If future crop type is undetermined at the time of restoration, the site shall be seeded with annual rye or similar cover crop, or as agreed to with the landowner. If restoration occurs outside of the growing season, restored areas will be stabilized by mulching with hay or straw.
- Any surface or subsurface drainage features, fences, or gates damaged during construction shall be repaired or replaced as necessary.
- All construction debris will be removed and disposed of off-site at the completion of restoration.
- The Applicant will review restored agricultural land with the landowner during the following growing season to identify and correct any facility-related problems that may not have been apparent immediately following restoration.

4906-4-09 REGULATIONS ASSOCIATED WITH WIND FARMS

The Applicant commits to comply with the regulations established by the OPSB as set forth below.

(A) CONSTRUCTION, LOCATION, USE, MAINTENANCE, AND CHANGE

(1) Adherence to Other Regulations

The Applicant will construct and operate the Facility in accordance with all applicable federal, state, and local requirements including all applicable safety, construction, environmental, electrical, communications, and FAA requirements.

(2) Construction, Operations, and Maintenance Safety

The Applicant will ensure utilization of equipment and construction practices align with those set forth in this Application.

(a) *Equipment Safety*

(i) Manufacturer's Safety Manual

The Applicant will comply with the current manufacturer's safety manuals, unless such safety manual conflicts with OAC Rule 4906-4-08(C)(2).

(ii) Displaying Manufacturer's Safety Manual

The Applicant will maintain a copy of the manufacturer's safety manual in the Facility's O&M building located at 9630 State Route 49 Payne, Ohio 45880.

(b) *Geologic Features*

(i) Geotechnical exploration

At least 60 days prior to the preconstruction conference, the Applicant will provide a fully detailed geotechnical exploration and evaluation to confirm that there are no issues to preclude development of the Facility.

(ii) Boring results

The geotechnical report will include borings at each turbine location to provide subsurface soil properties, static water level, rock quality description, percent recovery, and depth and description of the bedrock contact. Recommendations for final design and construction of each wind turbine foundation, as well as the final location of the collection substation will be included in the geotechnical report.

(iii) Borehole closures

The Applicant will fill all boreholes. Abandoned boreholes will comply with state and local regulations.

(iv) Copies of boring logs

The Applicant will provide copies of all geotechnical boring logs to OPSB staff and ODNR Division of Geological Survey staff prior to construction.

(c) *Blasting*

As indicated in Section 4906-4-08(A)(5)(a) of this Application, blasting is not anticipated. However, if site-specific conditions warrant blasting, the Applicant will provide OPSB staff with a blasting plan at least 30 days prior to blasting.

(i) Blasting plan

If site-specific conditions warrant blasting, the Applicant will submit the following information as part of its blasting plan:

a. Blasting company contact information

The Applicant will provide the name, address, and telephone number of the drilling and blasting company.

b. Blasting plan

A detailed blasting plan for dry and/or wet holes for a typical shot. The blasting plan will address blasting times, blasting signs, warnings, access control, control of adverse effects, and blast records.

c. Liability plan

A plan for liability protection and complaint resolution.

(ii) Required licenses and permits

The Applicant does not anticipate requiring the use of explosives. However, prior to the use of explosives, the Applicant or explosive contractor will obtain all required licenses and permits. The Applicant will submit a copy of the license or permit to OPSB staff within seven days of obtaining it from local authority.

(iii) Seismographs

If blasting is needed, the blasting contractor will use two blasting seismographs that measure ground vibration and air blast for each blast. One seismograph will be placed beside the nearest dwelling, or at least at the nearest accessible property line to the dwelling, and the other placed at the discretion of the blasting contractor.

(iv) Notification

If blasting is needed, at least 30 days prior to the initiation of blasting operations, the Applicant will notify, in writing, all residents or owners of dwellings or other structures within 1,000 feet of the blasting site. The Applicant or explosive contractor will offer and conduct a pre-blast survey of each dwelling or structure within 1,000 feet of each blasting site, unless waived by the resident or property owner. The survey will be completed and submitted to OPSB at least 10 days before blasting begins.

(3) Location

The Facility will be installed at Paulding Wind Farm IV LLC's proposed site as presented in this Application. The Facility will comply with requirements outlined in OAC Rule 4906-4-08(C)(2). Please refer to Section 4906-4-08 of this Application for additional details.

(4) Maintenance and Use

(a) *Maintenance*

The Applicant will maintain the Facility equipment in good condition. Maintenance activities will include, but will not be limited to, painting, structural repairs, and security measures.

(b) *Construction and Maintenance Access Plan*

Prior to commencement of construction, the Applicant will provide a construction and maintenance access plan based on the final plans for the Facility, access roads, and types of equipment to be used. The plan will:

(i) Consider the location of sensitive resources, as identified by ODNR, and explain how impacts to all sensitive resources will be avoided or minimized during construction, operation, and maintenance.

(ii) Include locations of erosion control measures.

(iii) Provide specific details on all wetland, streams, and/or ditches to be impacted by the Facility, including those where construction or maintenance vehicles and/or Facility components such as access roads cannot avoid crossing the waterbody. If crossing a waterbody cannot be avoided, the plan will specifically discuss the proposed crossing methodology for each wetland and stream crossing, as well as post-construction site restoration.

(iv) Include the measures to be used for restoring the area around all temporary access points, and a description of any long-term stabilization required along permanent access routes.

(c) *Vegetation Management Plan*

The Applicant will submit a vegetation management plan prior to the commencement of construction. The plan will:

(i) Identify all areas of proposed vegetation clearing for the Project, specifying the extent of the clearing, and describing how such clearing work will be done so as to minimize removal of woody vegetation.

(ii) Describe how trees and shrubs around structures, along access routes, at construction staging areas, during maintenance operations, and in proximity to any other Project facilities will be protected from damage. Priority will be given to protecting mature trees throughout the Project Area, and all woody vegetation in wetlands and riparian areas, both during construction and during subsequent operation and maintenance of all facilities; low-growing trees and shrubs in particular will be protected wherever possible within the proposed ROWs.

(iii) Explore various options for the disposal of downed trees, brush, and other vegetation during initial clearing activities for the Facility and recommend methods that minimize the movement of heavy equipment and other vehicles within the ROW that would otherwise be required for removing all trees and other woody debris off site.

(d) *Herbicide Use*

For both construction and future ROW maintenance, the Applicant will limit, to the greatest extent possible, the use of herbicide in proximity to surface waters, including wetlands along the ROW. Individual treatment of tall-growing woody plant species is preferred, while general, widespread use of herbicides during initial clearing or future ROW maintenance should only be used where no other options exist, and with prior approval from the Ohio EPA. Prior to commencement of construction, the Applicant will describe the planned herbicide use for all areas in or near any surface waters during initial Facility construction and future ROW maintenance.

(e) *Post-construction Site Restoration*

The Applicant's post-construction site restoration plan and stabilization of disturbed soils, will include the following:

(i) Temporary Project component

The Applicant will remove all temporary gravel and other construction staging area and access road materials after the completion of construction activities, as weather permits, unless otherwise directed by the landowner.

(ii) Construction material disposal

The Applicant will not dispose of gravel or any other construction material during or following construction of the Facility by spreading such material on agricultural land. All construction debris and all contaminated soils will be promptly removed and properly disposed of in accordance with Ohio EPA regulations.

(5) Change, Reconstruction, Alteration, or Enlargement

(a) *Amendments*

If necessary, any amendment to the Facility's Certificate will be provided to OPSB as an amendment application.

(b) *Modifications*

The Applicant understands that, unless otherwise ordered by the OPSB or administrative law judge, modification(s) shall not be considered amendments under this rule if such modification(s) would be minimal in nature, and would be adequately addressed by the conditions of the Certificate.

(c) *Modification Review*

The Applicant understands that:

(i) The Applicant may seek review of a proposed modification(s) sought under OAC Rule 4906-4-09(A)(5)(b) by filing the proposed modification(s) in this case and providing written notification of such filing to OPSB staff and all landowners immediately adjacent to the site of the proposed modification(s).

(ii) The notification shall reference, and include a copy of OAC Rule 4906-4-09(A)(5).

(iii) In the filing, the Applicant is to present its rationale as to why it is seeking the proposed modification(s) and must demonstrate that the proposed modification(s) satisfies OAC Rule 4906-4-09(A)(5)(b).

(iv) OPSB staff or any interested person may file objections to the Applicant's proposal within 21 days. If no objections are filed within the 21-day period, the Applicant may proceed with the proposed modification(s). If objections are filed within the 21-day period, OPSB staff may subsequently docket its recommendation on the matter.

(v) The OPSB will process proposed modification(s) under the suspension process set forth for accelerated applications as outlined in OAC Rule 4906-6-09.

(B) EROSION CONTROL

Within its procedures for inspection and repair of erosion control measures, the Applicant will employ the following erosion and sedimentation control measures, construction methods, and best management practices when working near environmentally-sensitive areas or when in close proximity to any watercourse:

(1) Seeding Disturbed Areas

During construction, the Applicant will seed all disturbed soil, except within actively cultivated agricultural fields, within seven days of final grading. Denuded areas, including spoils piles, will be seeded and stabilized in accordance with the Facility's approved SWP3, if such areas will be undisturbed for more than 21 days. Re-seeding will be conducted in accordance with the Facility's approved SWP3 as necessary until sufficient vegetation in all areas has been established.

(2) Inspection of Erosion Control Measures

The Applicant will inspect and repair all erosion control measures after each rainfall event where one-half inch, or greater, of rain falls over a 24-hour period. Such efforts will continue until permanent vegetative cover is established on disturbed areas.

(3) Marking Watercourses

The Applicant will delineate all watercourses, including wetlands, by fencing, flagging, or other prominent means.

(4) Watercourse Avoidance

The Applicant will avoid the entry of construction equipment into watercourses, including wetlands, except at specific locations where construction has been approved.

(5) Protection of Sensitive Areas

The Applicant will not store, stockpile, or dispose of equipment or material in the watercourses or wetlands.

(6) Location of Structures

The Applicant will locate structures outside of identified watercourses, including wetlands, except at specific locations where construction has been approved.

(7) Stormwater Runoff

The Applicant will direct stormwater from fill slopes and other exposed surfaces to the greatest extent possible, and direct instead to appropriate catchment structures, sediment ponds etc., using diversion berms, temporary ditches, check dams, or similar measures.

(C) AESTHETICS AND RECREATIONAL LAND USE

(1) Vandalism

In the event of vandalism on the Facility, the Applicant will immediately remove or abate the damage to preserve the aesthetics of the Project to pre-vandalism condition.

(2) Signage

No commercial signage or advertisements will be placed on any turbine, tower, or related infrastructure, except for reasonable identification of the manufacturer component or the operator of the Facility.

(3) FAA Lighting

The structures that require lighting by the FAA, including construction equipment, will be lit with the minimum lighting required by the FAA. Lighting of other parts of the wind farm, such as associated structures and access roads, will be limited to that required for safety and operational purposes, and shall be reasonably shielded from adjacent properties.

(4) Structure Surfaces

The visible surfaces of wind farm structures will be a non-reflective, matte finished, non-obtrusive, and neutral color such as white, off-white, gray, or beige.

(5) Impact Avoidance Plan

The Applicant will provide a plan to avoid adverse impacts of the Facility on landmarks (which refer to those districts, sites, buildings, structures, and objects that are recognized by, registered with, or identified as eligible for registration by the national registry of natural landmarks, the state historic preservation office, or ODNR) in the surrounding area. If avoidance measures are not feasible, the Applicant will describe why impacts cannot be avoided and provide an evaluation of the impact of the Facility on the preservation and continued meaningfulness of registered or potentially eligible landmarks of historic, religious, archaeological, scenic, natural, or other cultural significance and describe plans to mitigate any adverse impact. The mitigation plan will contain measures to be taken should previously-unidentified archaeological deposits or artifacts be discovered during construction.

(6) Photographic Simulations

Appendix F of the VIA (Exhibit FF) contains artist's pictorial sketches (visual renderings) of the Facility from 10 viewpoint locations (at least one vantage point in each area of three square miles within the Project Area), showing views to the north, south, east, and west. The photographic simulations or artist's pictorial sketches incorporated the environmental and atmospheric conditions under which the Facility would be most visible. Additional detail on the renderings can be found in Exhibit FF.

(D) WILDLIFE PROTECTION

(1) Coordination with USFWS and ODNR

The Applicant will coordinate with the USFWS, ODNR, and OPSB staff to determine if actions are necessary to avoid or minimize impacts to state- or federally-listed and protected species or other species which may be impacted. The Applicant will provide coordination letters received from USFWS and ODNR. If USFWS, ODNR, or OPSB staff identify any recommendations for avoidance or minimization of impacts to specific species, the Applicant will describe how it will address such recommendations.

(2) Presence of Threatened or Endangered Species

The Applicant will contact OPSB staff within 24 hours if a state or federally-listed species are encountered during construction activities. Construction activities that could adversely impact the identified plants or animals will be halted until appropriate action is agreed upon by the Applicant, OPSB staff, and applicable administrative agencies.

(3) Habitat Avoidance

The Applicant will avoid construction in federal- or state-listed and protected species' habitats during seasonally-restricted dates, or at restricted habitat types, as provided by ODNR and USFWS, unless coordination efforts with ODNR and USFWS allows a different course of action.

(4) Post-Construction Avian and Bat Monitoring Plan

The Applicant will submit a post-construction monitoring plan for avian and bat species to OPSB. Though not anticipated, if significant mortality occurs to birds or bats during operation of the Facility, the Applicant will develop a mitigation plan.

(5) Turbine Curtailment

At least 60 days prior to the first turbine becoming operational, the Applicant will provide OPSB with a description of its plans for maintaining the turbine blades in a stationary, or nearly stationary, stance during low wind speed conditions at night during bird and bat migratory seasons.

(6) Adverse Impact to Listed Species

Construction activities are not anticipated to negatively impact state- or federally-listed species; however, if construction activities result in significant adverse impact to state- or federally-listed and protected species, the Applicant will develop a mitigation plan or adaptive management strategy.

(E) ICE THROW

(1) Ice Throw Analysis

An ice throw analysis has been prepared for the Facility (see Exhibit Y). The analysis includes the probability of ice throw impacts at the nearest property boundary and public road.

(2) Impact Minimization

The Applicant's plans to minimize the potential impacts of ice throw include:

(a) Restricting public access to the Facility with appropriately placed signs and other necessary measures,

(b) Instructing workers on the potential hazards of ice conditions on wind turbines, and

(c) Installing and utilizing an ice warning system to include and ice detector installed on the roof of the nacelle, ice detection software, warranted by the manufacturer to detect ice, for the wind turbine controller, or an ice sensor alarm that triggers an automatic shutdown.

(3) Ice Throw Safety

The Applicant understands that, in addition to the use of the safety measures enumerated in Section 4906-4-09(E)(2) of this Application, the potential impact from ice throw shall be presumptively deemed to satisfy safety considerations if the probability of one kilogram of ice landing beyond the statutory property line setback for each turbine location is less than one percent per year. The ice throw analysis (Exhibit Y) indicates that the ice throw impact will have a probability of less than 1% per year at the statutory property line setback. This analysis is described in detail in Section 4906-4-08(A)(8) of this Application.

(F) SOUND

(1) Construction Hours

General construction activities will take place between 7:00 a.m. and 7:00 p.m., or until dusk during times when the sun sets later than 7:00 p.m. Impact pile driving, hoe ramming, and blasting operations will only occur between 10:00 a.m. and 5:00 p.m. Monday through Friday. The Applicant understands that construction activities that do not involve sound increases above ambient levels at sensitive receptors (i.e., occupied buildings) are permitted outside of daylight hours, when necessary. The Applicant will notify property owners and affected tenants within the meaning of OAC Rule 4906-3-03(B)(2) of upcoming construction activities including potential for nighttime construction activities.

(2) Construction Sound Limits

The Facility will be operated so that it does not result in sound levels at any non-participating (non-participating, as used in this context, refers to a property for which the owner has not signed a waiver or otherwise agreed to be subject to a higher sound level) sensitive receptors (i.e., occupied building) within 1 mile of the Project boundary that exceed the Project Area ambient nighttime average sound level (Leq) by five A-weighted decibels (dBA). The Applicant understands that, during daytime operation only (7:00 a.m. to 10:00 p.m.), the Facility may operate at the greater of: the Project Area ambient nighttime Leq plus 5 dBA; or the validly measured ambient Leq plus 5 dBA at the location of the sensitive receptor. After commencement of commercial operation, the Applicant will conduct further review of the impact and possible mitigation of all Project-related sound complaints through its complaint resolution process.

(G) BLADE SHEAR

The Applicant will provide plans to minimize potential impacts from blade shear, including restricting public access to the Facility with properly placed warning signs or other necessary measures, and instructing workers on the potential hazards.

(1) Turbine Equipment

To minimize the possibility of blade shear, the Applicant will equip all wind turbine generators with the following:

(a) *Braking system*

Two independent braking systems, which may include aerodynamic overspeed controls and mechanical brakes operated in a fail-safe mode, but shall not include stall regulation.

(b) *Pitch control system*

A pitch control system.

(c) *Lightning protection system*

A lighting protection system.

(d) *Turbine shutoffs*

Turbine shutoffs in the event of excessive wind speeds, uncontrolled rotation, excessive blade vibration, stress, or pressure on the tower structures, rotor blades, and turbine components.

(2) Safety Feature Bypass

Bypass or override of wind turbine safety features or equipment will be prohibited.

(3) Industry Standards

Design of the wind turbine generators will conform to industry standards, as effective at the time of this Application, including: the American National Standards Institute (ANSI); the International Electrotechnical Commission (IEC); or other equivalent industry standard. The Applicant will submit certificates of design and compliance obtained by the equipment manufacturers from underwriter laboratories, det Norske veritas, Germanischer Lloyd wind energies, or other similar certifying organization. Once the turbine model that will be used for the Project is chosen, the Applicant will submit a certificate of design and compliance from the equipment manufacturer(s) from and underwriter laboratory.

(H) SHADOW FLICKER

(1) Avoidance

The Facility will be designed to avoid unreasonable adverse shadow flicker effect at any non-participating (non-participating, as used in this context, refers to a property for which the owner has not signed a waiver or otherwise agreed to be subject to a higher shadow flicker level) sensitive receptor (i.e., occupied building) within 1,000 meters of any turbine. At a minimum, the Facility will be operated so that shadow flicker levels do not exceed 30 hours per year at any such receptor.

(2) Shadow Flicker Complaints

Following the commencement of Facility operation, the Applicant will conduct further review of the impact and possible mitigation of all Project-related shadow flicker complaints through its complaint resolution process.

(I) DECOMMISSIONING AND REMOVAL

(1) Decommissioning Plan

The Applicant will provide the final decommissioning plan to the OPSB and Paulding County Engineer at least 30 days prior to the preconstruction conference. The decommissioning plan will:

(a) Indicate the intended future land use of the land following reclamation.

(b) Describe the engineering techniques and main equipment to be used in decommissioning and reclamation; a surface water drainage plan and any proposed impacts that would occur to surface and ground water resources and wetlands; and a plan for backfilling, soil stabilization, compacting, and grading.

(c) Provide a detailed timetable for the accomplishment of each major step in the decommissioning process, including the steps to be taken to comply with applicable air, water, and solid waste laws and regulations and any applicable health and safety standards in effect as of the date of submittal.

(2) Revised Decommissioning Plan

The Applicant will file a revised decommissioning plan to the OPSB and Paulding County Engineer every five years following the commencement of construction. The revised plan will include advancements in engineering techniques and reclamation equipment and standards. The revised plan will be applied to each five-year decommissioning cost estimate.

(3) Completion of Decommissioning

The Applicant will, at its expense, complete decommissioning of the Facility, or individual wind turbines, within the 12-month period following the end of the useful life of the Facility or individual wind turbines. The Applicant understands that: if no electricity is generated for a continuous period of 12 months, or if the OPSB deems the Facility or turbine to be in a state of disrepair warranting decommissioning, the wind farm or individual wind turbines will be presumed to have reached the end of its useful life; the OPSB may extend the useful life period for the wind farm or individual turbines for good cause as shown by the Applicant; and the OPSB may require decommissioning of individual wind turbines due to health, safety, wildlife impact, or other concerns that prevent the turbine from operating within the terms of the certificate.

(4) Structure Removal

Decommissioning activities will include: the removal and transportation of wind turbines and towers off site; the removal of buildings, cabling, electrical components, access roads, and other associated facilities, unless otherwise mutually agreed upon between the Facility owner and/or Facility operator, and the landowner; all physical material pertaining to the Facility and associated equipment will be removed to a depth of at least 36 inches below soil surface and transported off site; the disturbed area will be restored to the same physical its condition that existed before construction of the Facility; and damaged field tile systems shall be repaired as soon as practicable using a qualified field tile repair contractor approved by the property owner in advance, at the Applicant's expense, after receiving the landowner's approval.

(5) Recyclable Materials

During decommissioning, all recyclable material, salvaged and non-salvaged, shall be recycled to the furthest extent practicable. Non-recyclable waste material will be disposed of in accordance with state and federal laws.

(6) Electrical Infrastructure

The Facility owner and/or Facility operator will not remove any improvements made to the electrical if doing so would disrupt the electric grid, unless otherwise approved by the applicable regional transmission organization and interconnection utility.

(7) Cost of Decommissioning

At least 7 days prior to the preconstruction conference, the Applicant will to retain an independent, Ohio state-licensed engineer to estimate the total cost of decommissioning, in current dollars, without regard to the salvage value of equipment. The estimate will be converted into a per-turbine basis calculated as the total cost of decommissioning of all facilities divided by the number of turbines in the most recent Facility engineering drawings. This estimate will be conducted every 5 years and will include:

(a) An identification and analysis of the activities necessary to implement the most recently approved decommissioning plan, including, but not limited to, physical construction and demolition costs assuming good industry practice and based on publication or guidelines approved by OPSB staff.

(b) The cost to perform each activity.

(c) An amount to cover contingency costs, not to exceed 10% of the estimated reclamation cost.

(8) Decommissioning Bond

The Applicant, Facility owner, and/or Facility operator will post and maintain a performance bond equal to the per-turbine decommissioning cost multiplied by the sum of the number of turbines constructed and under construction (a turbine is considered to be under construction at the commencement of excavation for the turbine foundation). The form of the performance bond will be mutually agreed upon by OPSB and the Applicant, Facility owner, and/or the Facility operator. The performance bond will ensure the faithful performance of all requirements and reclamation conditions of the most recently filed and approved decommissioning and reclamation plan. At least 30 days prior to the preconstruction conference, the Applicant, Facility owner, and/or the Facility operator will provide an estimated timeline for the posting of decommissioning funds based on the construction schedule for each turbine. Prior to commencement of construction, the Applicant, Facility owner, and/or the Facility operator will provide a statement from the holder of the performance bond demonstrating that adequate funds have been posted for the scheduled construction. Once the performance bond is provided, the Applicant, the Facility owner and/or Facility operator will maintain such funds or assurance throughout the remainder of the applicable term. The Applicant, Facility owner, and/or the Facility operator will obtain a new performance bond every 5 years with an updated decommissioning cost estimate from its engineer and revised decommissioning plan.

(9) Damage to Public Roads

The Facility owner and/or Facility operator will repair damages to government-maintained (public) roads and bridges caused by decommissioning activity. Damages will be repaired promptly to their pre-decommissioning state by the Facility owner and/or Facility operator under the guidance of the appropriate regulatory agency. Additionally, the Applicant will provide financial assurance to the County that it will restore the public roads and bridges it uses to their pre-decommissioning condition. These terns will be defined in a RUA between the Applicant and the Paulding County engineers prior to construction. The RUA will include the following:

(a) A pre-decommissioning survey of the condition of public roads and bridges conducted within a reasonable time prior to decommissioning activities.

(b) A post-decommissioning survey of the condition of public roads and bridges conducted within a reasonable time after decommissioning activities.

(c) An objective standard of repair that obligates the Facility owner and/or Facility operator to restore public roads and bridges to the same condition, or better, than they were prior to decommissioning.

(d) A timetable for posting the decommissioning road and bridge bond prior to the use or transport of heavy equipment on public roads and bridges.

(10) Performance Bond

The Applicant understands that the performance bond will be released by the holder of the bond when the Facility owner and/or Facility operator has demonstrated, and the OPSB concurs, that decommissioning has been satisfactorily completed, or upon written approval of the OPSB, in order to implement the decommissioning plan.

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