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December 23, 2013

Via Electronic Filing

Ms. Betty McCauly
Administration/Docketing
Ohio Power Siting Board
180 East Broad Street, 11th Floor
Columbus, Ohio 43215-3793

Re: 6011 Greenwich Windpark, LLC.
Case No. 13-990-EL-BGN

Dear Ms. McCauly:

Attached please find five hard copies of an Application in the above referenced matter which was electronically filed today. In addition we have provided the Staff of the Ohio Power Siting Board ("Board") with ten disks containing the Application and one disk containing GIS information. Pursuant to Ohio Administrative Code Rule 4906-5-03(A)(3), the applicant makes the following declarations:

Name of Applicant: 6011 Greenwich Windpark, LLC.
c/o Windlab Developments USA, Ltd
927 Wing Street
Plymouth, MI 48170

Name/Location of Proposed Facility: Greenwich Windpark, a 60 MW wind farm
Greenwich Township
Huron County

Authorized Representative Technical: Monica Jensen
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Notarized Statement: See Attached Affidavit of Monica Jensen on behalf of 6011 Greenwich Windpark, LLC

Sincerely on behalf of
6011 GrREENWICH WINDPARK, LLC

Sally W. Bloomfield

Sally W. Bloomfield

Enclosure

BEFORE
THE OHIO POWER SITING BOARD

In the Matter of the Application of the **6011 GREENWICH WINDPARK, LLC** for a Certificate to Site Wind-Powered Electric Generation Facilities in Huron County, Ohio	))))	Case No. 13-990-EL-BGN

AFFIDAVIT OF MONICA JENSEN, 6011 GREENWICH WINDPARK, LLC

STATE OF MICHIGAN :
: ss.
COUNTY OF Wayne :

I, Monica Jensen, 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 upon my personal knowledge:

1. I am the Vice President, Development of Windlab Developments USA, Ltd, the sole member of 6011 Greenwich Windpark, LLC. and am authorized to execute this affidavit.

2. I have reviewed the 6011 Greenwich Windpark, LLC Application to the Ohio Power Siting Board for a Certificate of Environmental Compatibility and Public Need in the above referenced case.

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.

Monica Jensen

Sworn to before and signed in my presence this 19th day of December, 2013.

Notary Public

[SEAL]

BREON T MORIARTY
Notary Public, State of Michigan
County of Livingston
My Commission Expires June 21, 2019
Acting in the County of Wayne

6855205v1

APPLICATION

TO

THE OHIO POWER SITING BOARD

FOR A

CERTIFICATE OF ENVIRONMENTAL COMPATIBILITY & PUBLIC NEED

Submitted By

6011 GREENWICH WINDPARK, LLC
Township of Greenwich,
Huron County, Ohio

Case No. 13-990-EL-BGN

December 23, 2013

Applicant and Prepared by: 6011 Greenwich Windpark, LLC,
a subsidiary of Windlab Developments USA, LTD
927 Wing Street
Plymouth, MI 48170
Contact: Monica Jensen, Regional Manager
Telephone: 734-335-6219

BEFORE THE OHIO POWER SITING BOARD

Application of a Certificate of Environmental Compatibility and Public Need
Greenwich Wind Farm

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Exhibit Z. Huron County Road Agreement (DRAFT)

Exhibit AA. Ohio University System Internship Agreement (DRAFT)

Exhibit BB. CSX Railroad Permit Template

GLOSSARY

List acronyms and abbreviations used in the Application, for example:

AEP	American Electric Power
ASML	Above Mean Sea Level
ASTM	American Society for Testing and Materials
BBA	Ohio Breeding Bird Atlas
BBS	North American Breeding Bird Survey
dBA	Decibels, A-weighted
DPL	Dayton Power and Light
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Administration
GIS	Geographic Information System
gpm	Gallons Per Minute
Hz	Hertz
kV	Kilovolt
kW	Kilowatt
MW	Megawatts
MWh	Megawatt hours
NAAQS	National Ambient Air Quality Standards
NAIP	National Agricultural Imagery Program
NLCD	National Land Cover Dataset
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic
NTIA	National Telecommunications and Information Administration
NWI	National Wetlands Inventory
O&M	Operations and Maintenance
OAC	Ohio Administrative Code
ODNR	Ohio Department of Natural Resources
ODOT	Ohio Department of Transportation

OPSB	Ohio Power Siting Board
ORAM	Ohio Rapid Assessment Method
PJM	PJM Interconnection, LLC - Integrated System Operator (ISO)
RPM	Revolutions Per Minute
SPCC	Spill Prevention Control and Countermeasure Plan
SWP3	Stormwater Pollution Prevention Plan
SWPA	Source Water Protection Area
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VIA	Visual Impact Assessment
WDUSA	Windlab Developments USA, LTD

4906-17-02 Project Summary and Facility Overview

(A) PROJECT SUMMARY AND OVERVIEW OF THE PROPOSED PROJECT

6011 Greenwich Windpark, LLC (hereafter referred to as the "Applicant"), a wholly owned subsidiary of Windlab Developments USA, Ltd., is proposing to construct the Greenwich Wind Farm, a wind-powered electric generation facility located in Huron County (hereafter referred to as 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 compliance with Section 4906.06 of the Ohio Revised Code (Revised Code) and in accordance with Chapter 4906-17 of the Ohio Administrative Code (OAC), Application Filing Requirements for Wind-Powered Electric Generation Facilities. The Application has been prepared by the Applicant.

The Applicant is proposing to construct the wind-powered electric generation facility in Huron County, which would consist of up to 25 wind turbine generators, along with access roads, underground electric collection cables, an interconnection substation, one laydown yard for construction staging, an operations and maintenance (O&M) facility, and up to two meteorological towers. The energy generated at that Facility will deliver power to a single point of interconnection on the Greenwich to South Greenwich 69 kV Transmission Line owned and operated by AEP (American Electric Power).

(1) General Purpose of the Facility

The general purpose of the Facility is to produce wind-powered electricity that will deliver clean, renewable electricity to the Ohio bulk power transmission system to serve the needs of electric utilities and their customers. The electricity generated by the Facility will be transferred to the transmission grid operated by PJM Interconnection, LLC (PJM) for sale at wholesale or under a power purchase agreement.

(2) Facility Description

The Project Area is located within approximately 4,650 acres of leased private farm and agricultural land in Greenwich Township. The Facility consists of up to 25 wind turbine generators, each with a nameplate capacity rating of 2.4 MW, and the total generating capacity of the Facility will be 60 MW. The Facility is expected to operate with an average annual gross capacity factor of 40% generating a total of approximately 210 GWh/yr of electricity each year. Figure 05-4 depicts the proposed Facility. A detailed description of the Facility, including each Facility component, can be found in Section 4906-17-03(A) of this Application.

(3) Site Selection Process

The initial selection of possible sites for development of wind power facilities is focused on wind resource and proximity to electric transmission lines. If a potential project area appears to have a valid wind resource and available transmission, the project is then screened for sensitive wildlife areas, population density and zoning regulations. If the area continues to appear favorable, discussions with local landowners ensue to gauge interest or opposition. During this process, areas within the potential project are identified to install temporary wind measuring equipment. The Greenwich site was identified in the fall of 2009 and initial landowner meetings began in spring of 2010. A 60-meter meteorological tower was installed in May of 2010 to begin assessing the wind resource on the site.

The Applicant's selection of the Project Area and decision to continue development of the Facility were based on the details described below.

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

- Adequate access to the transmission grid – the proposed line for interconnection transects the Project Area with more than one location available for a new interconnection substation (see Exhibits C and D).
- An early community meeting (Spring 2010) was well received and long term lease agreements were executed with agreeable landowners. An additional public meeting was held December 2011 to update the community on progress, as well as, discuss and answer general construction questions. Community relations have been positive.
- Site accessibility – the Project Area is served by an existing network of public roads and railroad infrastructure (see Exhibit E).
- Appropriate geotechnical conditions – significant geotechnical constraints for the planned construction of the Facility are not anticipated (see Exhibit F).
- Limited population/residential development – the Project Area and the surrounding communities have a low population density as compared to statewide estimates (see Exhibit G).
- Compatible land use – the Project Area is predominantly rural agricultural, which is compatible with the proposed Facility.
- Limited sensitive ecological resources – the proposed Facility is not expected to result in significant adverse impacts to ecological resources (see Exhibit H, I, J, K, U, and W).
- Cultural Resources – the proposed Facility is not expected to impact any identified existing cultural resources (see Exhibit L.)

Additional information about the site selection process for the Project Area can be found in Section 4906-17-04 of this Application.

(4) Principal Environmental and Socioeconomic Considerations

A socioeconomic analysis was prepared (Exhibit G) to evaluate the area within a five-mile radius of the proposed Facility. The survey analyzed the following socioeconomic considerations: demographics, economic impact of the Facility,

benefits to local communities, and potential regional impacts. Ecological studies of the Project Area include wetlands and surface water delineations, evaluation of habitat for threatened and endangered species, and various bird and bat surveys. Impacts to historic and archaeological resources were evaluated in a cultural impact study. Each of these reports is discussed in detail in Section 4906-17-08 of this Application. A brief summary of the major environmental and socioeconomic considerations is provided below.

(a) *Land Use impacts*

The Facility is located in Huron County, in the township of Greenwich. The land is made up of flat and rolling terrain consisting of croplands, farmsteads, meadows, and large woodlots. The county contains approximately 317,517 land acres, of which 80 percent is farmland. Residential development within and around the Facility consists almost entirely of single-family homesteads along rural roads. Approximately 4,650 acres have been leased from twenty-six landowners that will comprise the construction area; in addition, landowners adjacent to participating landowners are able to be partial participants on a neighboring monetary agreement. The Facility will be compatible with the current agricultural purposes and future anticipated farming practices. Most construction impacts will be temporary in nature, and confined to the properties of participating landowners. Only very minor changes in land use within the Project Area are anticipated as a result of Facility operation. The presence of the turbines bases, substation, and other ancillary structures will result in the cumulative conversion of approximately 28 acres of land from its current use to built facilities (0.6% of the 4,650 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 minimally interfere with on-going land use (i.e., farming activities).

(b) *Economic Impact*

The proposed Facility will have a positive impact on the local economy by generating new tax revenues, new full time employment positions and a swell in revenues to the local service industry businesses during Construction. During the entire 8-month construction phase, approximately 100 employees will be working on the project directly. Although Facility construction will require some workers with specialized skills, the Applicant will employ local labor to the extent practicable. Operations and maintenance of the proposed wind farm will create approximately 3-4 full-time jobs directly supported by the Project. Local wages and salaries for all wind park employees are conservatively estimated at $215,000 cumulatively per year. In addition to the jobs created and wages paid to the windpark force, the Facility will have a direct economic benefit from the first round of buying/selling, which includes the purchase of goods from local sources (such as fuel), the spending of income earned by workers, annual labor revenues, and the income effect of taxes. These direct effects will result in additional induced economic benefits in other sectors.

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 Huron County, Greenwich Township and the South Central Local School District. It is important to note that the proposed Facility will make few, if any, demands on local government services. Therefore, payments made to local taxing jurisdictions will be net positive gains and represent an important economic benefit to the local area. In addition, annual lease payments will be provided to local landowners participating in the Facility.

(c) *Ecological Impact*

Over the past three years, a concentrated effort to coordination with state and federal agencies to help avoid and minimize impacts to ecological communities, streams, and wetlands. Based on the Facility layout presented herein and the assumed area of disturbance associated with various construction activities described in Section 4906-17-05(B)(1), a total of approximately 241 acres will be cleared of vegetation. Of those, approximately 213 acres will be temporarily impacted and restored following construction, while approximately 28 acres will be used long term to support the Facility. Facility components are overwhelmingly located in agricultural lands: only approximately 12.7 acres of forestland will be impacted.

A Surface Waters and Ecological Communities Report (Exhibit H) was prepared by Ecology & Environment, Inc. (E & E). To identify and evaluate potential surface water impacts, a desktop surface water evaluation was conducted of the area that may be affected by the Facility. A total of 8 primary perennial streams, with 15 associated intermittent and ephemeral tributaries were identified and delineated during this investigation. No streams will be impacted by construction of the turbines. For all identified stream crossing points, effective construction techniques will be used to avoid and minimize stream impacts. The vast majority of these impacts will be temporary in nature. Additional information about streams and impact avoidance measures are provided in Section 4906-17-08(B) and Exhibit H of this Application. This report also describes the ecological communities adjacent to the Facility, and describes the approach that will be used by the Applicant to comply with applicable environmental rules and regulations.

A Wetland Delineation Report (Exhibit W) was prepared by Windlab Developments USA Ltd. To identify and evaluate potential wetlands water impacts, a wetland evaluation was conducted in the area that may be

affected by the Facility. A total of 11 wetlands were identified and delineated during this investigation. It is anticipated that unavoidable impacts to wetlands due to Project construction will be minimal. The construction of access roads, collection lines, and crane paths will result in a total potential temporary wetland impact of approximately 0.5 acres. The permanent impact from access roads to wetlands is only expected to be approximately 0.1 acres. Furthermore, wetland impacts will be negligible at turbine locations. Additional information about wetlands and impact avoidance measures are provided in Section 4906-17-08(B) and Exhibits H & W of this Application.

In addition, Stantec performed numerous bird and bat surveys. Pre-construction assessments began in summer 2011 when Stantec conducted bat mist-netting surveys (Exhibit K). To further characterize birds and bat activity, Stantec conducted acoustic bat, diurnal raptor, passerine migration, raptor nest searches, bald eagle monitoring, and owl playback surveys throughout the fall of 2011 and spring, summer and fall of 2012 (Exhibits I and J). The work plans for these studies were developed based on feedback with the ODNR on May 21, 2011 and March 26, 2012 and the U.S. Fish and Wildlife Service (USFWS) on February 2, 2012 (Exhibit V). The Applicant subsequently met with ODNR and USFWS on March 19, 2013 to receive any comments on the surveys as they related to the Greenwich Wind Project, and will continue to work with the ODNR and USFWS to appropriately address any wildlife concerns.

The Project Area is within the range of one federally-listed species, Indiana bat (endangered), one candidate species for federal listing, Eastern Massasauga rattlesnake, and one federal species of concern, bald eagle. Facility-related impacts to other federally-listed species are not anticipated. In addition, potential habitat exists in the Project Area for 9 state-listed plants species and 6 state-listed animal species (ODNR,

2013b). Other state-listed species may occur in the Project Area incidentally or as transients. During the 2011 and 2012 Stantec studies, field surveys for these species were conducted. No threatened or endangered species were found during the surveys, and therefore, Facility-related impacts to state-listed species are not anticipated (Stantec, 2011a, 2011b, 2012c, 2012d, 2013e). See Section 4906-17-08(B)(1)(e) of this Application for additional discussion of federally and state-listed species in the Project Area.

Construction-related impacts to wildlife are anticipated to be minimal, but could include incidental injury and mortality to slow moving animals due to construction activity and vehicular movement, construction-related silt and sedimentation impacts on aquatic organisms, habitat disturbance/loss associated with clearing and earth-moving activities. Operational impacts to wildlife are expected to be limited to possible displacement of wildlife due to the presence of the wind turbines. These potential impacts is discussed in further detail in Section 4906-17-08(B) of this Application, along with mitigation measures to minimize such impacts to the extent possible.

(d) *Cultural Impacts*

Data on cultural and archaeological resources was collected and compiled into a Report on the Cultural Impact of the proposed Facility (Exhibit L). The purpose of the records 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 records review for the 5-mile (8-kilometer) radius study area identified 5 historic properties listed in the NRHP; 5 individual properties previously determined eligible (DOE) for listing in the NRHP; one historic district; 103

previously identified historic structures recorded in the OHI; 83 archeological sites recorded in the OAI; 12 previously inventoried historic bridges (1 listed on the Ohio Bridge Historic Inventory); and 37 cemeteries recorded by the OGS. Properties listed on the NRHP are located in the Village of New London, the Village of Shiloh, Greenwich Township and Ruggles Township. There are no National Historic Landmarks within the study area.

Because construction and/or operation of the Facility will not physically alter any registered landmarks, potential impacts to NRHP-listed and NRHP-eligible structures are limited to indirect visual effects. Some of the proposed turbines will likely be visible from portions of the Village of Greenwich and the Village of New London, particularly from properties on the outskirts of each municipality that are not screened by other buildings. However, for many sensitive sites within the study area, including National Register-listed historic sites and others that occur in the Village of Greenwich and the various villages, field review suggests that the Facility will either not be visible or will be significantly screened by the foreground vegetation and structures.

Based on the siting of the Facility in upland areas and design criteria that minimized ground-disturbing activities to the extent possible, construction and operation of the proposed Facility is expected to have a low risk of impacting archaeological resources. However, the Applicant recognizes that the Project Area has not been systematically surveyed for cultural resources. Therefore, although not required under OAC Chapter 4906-17, the Applicant intends to conduct a Phase I cultural resource reconnaissance survey and a Phase I Historic Structure Inventory to further assess the effects of the proposed Facility on unregistered cultural resources, if any. Archeological resources identified during the Phase I investigation will be documented and avoided. Additional information

about impacts to cultural resources is presented on Section 4906-17-08(D)(2) and Exhibit L.

(e) *Environmental Impacts*

Wind turbines generate electricity without releasing pollutants into the atmosphere. The proposed Facility will produce approximately 210 GWh of emission-free electricity annually (assuming a nameplate capacity of 60 MW, operating at an annual average gross capacity factor of 40%). Power delivered to the grid from this Facility will directly offset the generation of energy at existing conventional power plants. Anticipated emission displacements for the Facility, based on emissions rates for electricity used in Ohio, are presented in Table 02-1 below.

Table 02-1. Estimated Annual Emission Displacements from the Facility

Pollutant	Estimated Annual Dispacement in Tons (194,500 MWh)
CO2 (carbon dioxide)	175,731
NOX (nitrogen oxides)	671
SO2 (sulfur dioxide)	1546
Mercury Compounds	1955
Lead Compounds	2760

Source: Abraxas Energy, 2013.

Construction activities will be dispersed over a large area, resulting in relatively low level of soil disturbance. Soil disturbance from Facility construction will be a small fraction of the acreage of soil routinely exposed through plowing and other agricultural activities within the area. Additionally, impact minimization and avoidance measures described in Section 4906-17-07(C)(2)(c) will be utilized to further reduce potential impacts to receiving water bodies. Facility operation will not involve the discharge of 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 through 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.

Facility construction will generate some limited solid waste, primarily packaging materials, construction scrap, and general refuse. This material will be collected from turbine sites and other Facility work area, and consolidated in dumpsters. A private contractor will empty the dumpsters on an as-needed basis and dispose of the refuse at a licensed solid waste disposal facility. Operation of the Facility will not result in significant generation of debris or solid waste. The O&M building will generate solid wastes comparable to a typical small business office and will likely utilize local solid waste disposal services.

(5) Project Schedule

Acquisition of land and land rights began in 2010 and continued through 2011. A public information meeting was held on May 22, 2013 at South Central High School in Greenwich to facilitate public interaction with the Applicant and expert consultants, and included information on visual/aesthetics, ecological studies, and wind turbine technology. Pre-Application meetings with OPSB staff were conducted in April 2012. This Certificate Application was officially submitted in December 2013. Construction is anticipated to begin in mid-2015 and run through late 2015, at which point the facility will be placed into service. Additional information about the Project Schedule can be found in Section 4906-17-03(B)(1) of this Application. Refer to Figure 03-1 for a bar chart of the anticipated Project Schedule.

4906-17-03 Project Description and Schedule

(A) PROPOSED FACILITY DESCRIPTION

The Applicant is proposing to develop, construct, own, and operate a wind-powered electric generation facility. The energy generated at the Facility will connect to the existing 69 kV Transmission Line owned by AEP. The Facility presented herein consists of up to 25 wind turbine generators, each with a nameplate capacity rating of 2.4 MW, and a total generating capacity of up to 60 MW. The Facility is expected to operate with an average annual gross capacity factor of 40%, generating a total of approximately 210 GWh of electricity each year.

(1) Project Description

The descriptions provided below apply to the proposed Project Area, as defined in OAC Section 4906-17-01(B)(1). No alternative Project Areas are proposed. In Case No. 08-1024-EL-ORD, Opinion and Order, October 28, 2008, p.21 at Finding 56, the OPSB determined that an applicant is not required to provide alternative sites for a proposed wind farm.

(a) *Types of Turbines*

As depicted in Exhibit M, each wind turbine consists of three major components: the tower, the nacelle, and the rotor. The nacelle sits atop the tower, and the rotor hub is mounted to the front of the nacelle. "Hub height" is the height of the center of the rotor, while the total turbine height is the height of the entire turbine, as measured from the tower base to the tip of the highest blade when rotated to the highest position. The turbine model that has been determined to be most suitable for this site is Nordex N117 (2.4MW). Table 03-1 presents the dimensions in feet and meters for this model.

Table 03-1. Approximate Turbine Dimensions

	Nordex N117
Hub Height	298.5 feet (91 meters)
Rotor Diameter	383.8 feet (117 meters)
Total Height	490.5 feet (149.5) meters

This model represents the turbine evaluated and selected at the time of this Application. Additional turbine detail is provided below in Section 4906-17-03(A)(2) of this Application. As previously mentioned, the Facility evaluated in this Application consists of up to 25 wind turbine generators. The total generating capacity will be up to 60 MW.

Preliminary analysis indicates that the turbines will have an annual gross capacity factor of 40%. Accounting for the total generating capacity of 60 MW, anticipated operating times, and turbine capacity factors, the Facility will generate between approximately 210 GWh of electricity each year. It is expected that the Applicant will develop, construct, own, and operate the Facility.

(b) *Land Area Requirements*

The Facility is located in Huron County, within Greenwich Township. The Facility is located within approximately 4,650 acres of lease private land. However, the Facility footprint will occupy a much smaller area. Table 03-2 presents the estimated footprint of each Facility component for the Project, based on the Applicant's experience with the construction and operation of other wind farm facilities. The construction impacts presented throughout this Application were calculated using these assumptions.

Table 03-2. Impact Assumptions

Facility Components	Typical Area of Vegetation Clearing	Area of Total Soil Distrubance (temporary and permanent)	Area of Permanent (fill/structure) Disturbance
Wind Turbines and Workspaces	150' radius per turbine	150' radius per turbine	0.2 acre (pedestal plus crane pad & gravel skirt)
Access Roads	40' wide per linear foot of road	40' wide per linear foot of road	20' wide per linear foot of road
Buried Electrical Collection Cable	60' wide per linear foot of cable	60' wide per linear foot of cable	none
O&M Building (and associated storage yard)	3 acres	3 acres	3 acres
Laydown Yard	9.5 acres	9.5 acres	none
Substation	3 acres	3 acres	3 acres
Meteorological Towers	1 acre	0.03 acre	0.00002 acre

Approximately 241 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 28 acres of built facilities, or approximately 0.6% of the total leased land.

(2) Description of Major Equipment

As previously indicated, the Facility evaluated herein consists of up to 25 wind turbines. In addition to the turbines, the Facility will include approximately 9.1 miles of access roads, approximately 13.9 miles of buried 34.5 kV electrical

collection cable, a Project substation, one temporary laydown yard for construction staging, an O&M building, and up to two meteorological towers. Additional information about each of these Facility components is presented below.

Wind Turbines

For the purposes of this Application, the Applicant has evaluated and selected the Nordex N117 turbine for the Facility. Included in Exhibit M are details of the Nordex N117. Each wind turbine results in an operational footprint of approximately 0.2 acre(s) (see Table 03-2 above), and consists of three major components: the tower sections, the nacelle, and the rotor with blades. The hub height will be 298.5 feet (91 meters). The nacelle sits atop the tower, and the rotor hub is mounted to the front of the nacelle. The rotor diameter will be 383.8 feet (117 meters). The total turbine height (i.e., the height at the highest blade tip position) will be 490.5 feet (149.5) meters. Descriptions of each of the turbine components are provided below and illustrated in Exhibit M.

Tower: The tubular towers used for megawatt-scale turbines are 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 have the benefit of reducing visibility from ground vantage points, which are generally viewed against the background of sky.

Nacelle: The main mechanical components of the wind turbine are housed in the nacelle. As depicted in Exhibit M, these components include the drive train, gearbox, and generator. The nacelle is housed in a steel reinforced fiberglass shell that protects internal machinery from the environment 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 single, medium intensity aviation warning light. These lights are anticipated to be flashing red strobes (L-864) that operate at night only. 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: A rotor assembly is mounted to the nacelle to operate upwind of the tower. Each rotor consists of three (3) composite blades that will be 191.9 feet (58.5 meters) in length, with a maximum rotor diameter of 383.8 feet (117 meters). 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. The wind turbines will begin generating energy at wind speeds of 3 meters per second (m/s) [6.7 miles per hour (mpg)], and cut out when wind speeds reach approximately 20 m/s [44.7 (mph)]. Rotor speed will be in the range of 14 to 16 revolutions per minute (RPM).

Access Roads

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 05-4. The total length of private access roads required to service all proposed wind turbine locations is approximately 9.1 miles. The turbine access roads will be gravel-surfaced and typically 16 feet in finished width, but no wider than 20 feet in width.

Electrical System

PJM completed a Generation Interconnection System Impact Study (SIS), to determine a plan, with approximate cost and construction time estimates, to connect the generation interconnection to the PJM network (see Exhibit C). PJM

also completed a Feasibility Study, to access the reliability impact for a new generator interconnecting to the PJM system as a capacity resource (see Exhibit D). The proposed Facility will have an electrical system consisting of two parts: (1) system of 34.5 kV shielded and insulted cables that will collect power from each wind turbine and (2) a project collector substation ("Project substation") with a step-up transformer. Each of these electrical system components is described below.

Collector System: The wind turbine transformer will raise the voltage of electricity produced by the turbine generator up to the 34.5 kV voltage level of the 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 36 inches below the surface. Exhibit N illustrates typical underground collection system trench and cabling during construction. The located of the proposed collection system is depicted on Figure 05-4. This 34.5 kV collection system will connect the individual turbines to the Project substation. The total length of the buried 34.5 kV collector lines carrying electricity to the Project substation will be approximately 13.9 miles, buried on private owned land leased by the Applicant, and to a lesser extent, in public road right-of-ways.

Project Substation: The proposed substation is currently identified as a new 69 kV single breaker interconnection switching station. Current discussions with AEP and PJM include a possible future conversion to operate in a ring bus configuration with at least 3 breakers to accommodate a possible future transmission infrastructure improvement to a 138 kV circuit. Current design and location details have not yet been finalized; however, estimated size of impact is no greater than 3 acres. Discussions with landowner for land purchase, lease and right-of-way are currently underway. Planned location of the substation is just west of State Route 13 on Plymouth East Road, adjacent to the existing Greenwich to South Greenwich 69 kV line as identified in the interconnection request. The substation will be enclosed by a chain link fence and accessed

from Plymouth East Road by a new gravel-surfaced road approximately 0.1 mile in length.

Laydown Yards

It is currently anticipated that Facility construction will require the development of one temporary laydown yard for construction staging. This laydown area, to be located on leased private land, is currently being negotiated with a leased landowner. Refer to Figure 05-4 for proposed location. The total area of the laydown yard will not exceed 10 acres. The property location identified was selected based on its flat topography, central proximity to the overall project area and easily locatable location. In addition, the entrance and exit to the laydown area will be onto a township road as to limit county road merging impairments to traffic. The laydown area will be used for the general contractor's construction trailers, electrical components and construction support machinery and vehicles. The area will be secured. Parking lighting of the temporary laydown yard may be installed as needed.

Operations and Maintenance Facility

An O&M building and associated storage yard will be required to house operations personnel, equipment and materials, and to provide operations staff parking. The Applicant's first preference would be to identify an existing structure in the vicinity of the Facility to be purchased or leased and refurbished for O&M activities. If a new building is needed, it is not expected to exceed 6,000 square feet or permanently disturb an area of greater than 3 acres, and will be designed to resemble an agricultural building similar to those found throughout the area (see Exhibit N, which provides photographic examples of O&M buildings and a typical schematic).

Meteorological Towers

Up to two 80-meter (262 foot) 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 05-4; all of these sites are located in cultivated agricultural land. See Exhibit N for a photo of a typical permanent meteorological tower.

(3) Description of New Transmission Lines

No new overhead transmission lines will be built for the proposed Facility. A line tap is planned for interconnection. In addition, no modifications to the existing Willard – South Greenwich 69 kV transmission line are anticipated.

(B) DETAILED PROJECT SCHEDULE

(1) Project Schedule

Refer to Figure 03-1 for a bar chart of the anticipated Project Schedule.

(a) *Land Acquisitions and Land Rights*

Acquisition of land and land rights began in February 2010 and continued through June 2011.

(b) *Wildlife Studies/Surveys*

Wildlife surveys/studies were conducted from 2010 through 2013.

(c) *OPSB Application Preparation*

Preparation of the Application occurred during the spring, summer and fall of 2013, with data and analyses added as various studies were completed. A public information meeting was held on May 22, 2013.

(d) *OPSB Application for Certificate Submittal*

This Application was officially submitted in December 2013.

(e) *Issuance of the OPSB Certificate*

It is anticipated that the Certificate will be issued in the third quarter of 2014.

(f) *Preparation of Final Design*

It is expected that final designs and detailed construction drawings will be completed between August 2014 and January 2015.

(g) *Facility Construction*

Construction is anticipated to begin in the second quarter of 2015 and be completed with 4-6 months.

(h) *Placement of Facility in Service*

The Facility will be placed in service upon completion of construction, anticipated for the fourth quarter of 2015.

(2) Impact of Critical Delays

Critical Delays may have material, adverse effects on Facility financing, which include limiting the Applicant's ability to procure turbines, obtain other Facility components, and capture tax credits within any given year. Such delays may push the in-service date back. In addition, delays that result in a project not being able to capture tax credits can amount to millions of dollars; this can adversely impact the ability to finance the entire project. If the delay were to occur in the permitting stage, the losses would be associated with the time value of money resulting from a delay in the timing of revenue payments or delay in commencement of commercial operations. Holding costs to maintain viability of the project grow exponentially (i.e., landowner payments, staffing, additional work needed to cure delays). Depending on the type and length of delay, projects can incur additional project costs in the range of $5,000 to $50,000 per month. If the delay were to occur during construction, the costs would include lost construction days and the expense associated with idle crews and equipment. These delay

damages are detailed in the construction contract and can vary greatly from project to project and type of delay (i.e. weather, component delivery, etc). If delivery of energy or commercial operation date is not met, there can be additional damage payments payable to the energy purchaser. Delays during construction can range from $1 million to upwards of $10's of millions per month depending on finalized construction and power contracts.

4906-17-04 Project Area Analyses

Given the unique nature and constraints associated with the siting of wind-powered electric generation facilities, the Applicant has not provided a fully developed project area site selection study that includes all practicable project sites. The Applicant has requested a waiver of the requirement to provide an extensive site selection study, which can be found in Exhibit A.

In Case No. 08-1024-EL-ORD, Opinion and Order, October 28, 2008, p.21 at Finding 56, the OPSB determined that an applicant is not required to provide alternative sites for a proposed wind farm. Although alternative sites were not proposed, the Applicant has provided information in this section regarding the general site selection process for the Facility, along with associated siting constraints and requirements.

(A) PROJECT AREA SITE SELECTION

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. These factors include: the convergence of sufficient wind resources, sufficient transmission capacity, compatible land uses and interested landowners willing to lease their land. This section describes the project purpose and the general site selection process, along with associated siting constraints and requirements.

(1) Project Purpose

A principal impetus for clean renewable energy in Ohio comes from the Alternative Energy Portfolio Standard (AEPS), signed into law by Governor Strickland on May 1, 2008 (substitute Senate Bill 221). The law mandates that by 2025, at least 25% of all electricity sold in the state come from alternative energy resources. At least half of that standard, or 12.5% of electricity sold, must be generated by renewable resources, and at least half of this renewable energy must be generated in-state. Wind resource is extremely limited in Ohio; there are only a handful of project sites with the wind resource necessary to support a

utility scale project. In order for Ohio utilities to meet the requirements for renewable energy mandated by the Ohio legislature, all viable Ohio wind sites must be considered as potential wind energy project sites. Each specific criterion set forth in OAC Rule 4906-17-04 may not apply even though the site is an appropriate one for a wind energy project.

(a) *Description and Rational for Selecting Study 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 wind resource map (see Exhibit B) suggests a suitable wind resource in south-east Huron County. Adequate access to the bulk power transmission system is an important siting criterion, as the system must be able to accommodate the interconnection, and accept and transmit power from the Facility. As depicted on the wind resource map in Exhibit B, existing bulk transmission lines occur in the Huron County study area.

Land use in Huron County is primarily agricultural and characterized by open spaces suitable for hosting a wind power project, complying with factors address in rule 4906-17-08(C)(1). Initial site visits to the area provided visual verification that the study area is dominated by agricultural use, and the land would be compatible with wind project development.

Proximity to major transportation routes is another feature of the study area that provided rationale for selection as a potential site for the Facility. Located approximately 65 miles west-southwest of Cleveland, the study area is in close proximity to I-71 to the south and I-80/90 to the north.

These major roads provide accessibility for the transportation of turbine parts, construction equipment, and staff.

(b) *Maps of Project Area/Evaluated Sites*

A map of the Project Area is included as Figure 05-4. In addition, a statewide wind resource map, which is typical of the type of data used in initial screening evaluations, is included in Exhibit B.

(c) *List and Describe all Qualitative and Quantitative Siting Criteria*

Unlike state or municipal entities, private developers do not have the power of condemnation or eminent domain. Consequently, 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. Moreover, private landowner agreements strictly limit the use of land to a wind energy project, and as such, do not allow for siting of other alternative energy production facilities (e.g., solar, hydro, biomass, or fossil fuel). Accordingly, other power generation technologies are not reasonable alternatives that warrant consideration in this Application.

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, which are presented below:

- Adequate wind resource – the Applicant determine through an initial screening process utilizing a statewide wind resource map (see Exhibit B), and subsequent on-site measurements, that the Project Area has an adequate wind resource.
- Adequate access to the bulk power transmission system – 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 interconnect request filed with PJM. See Section 4906-17-05(D) of this Application for additional detail.

- Willing land lease participants and host communities – the Applicant obtained private lease agreements, which constitute contiguous area of land necessary to support the Facility. See Section 4906-17-06(A) of this Application for additional detail. In addition, the Applicant has engaged local and state stakeholders and the local community to educate and share information. A well-attended public information meeting was held at the South Central High School in Greenwich near the Project Area on May 22, 2013 to share information and gather feedback. See Section 4906-17-08(E)(1) 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 05-1 and see Exhibit E).
- Appropriate geotechnical conditions – the Applicant determined that significant geotechnical constraints for the planned construction of the Facility are not anticipated (see Exhibit F).
- Limited population/residential development – the Project Area and the surrounding communities have a low population density as compared to statewide estimates. See Section 4906-17-08(A)(1) and Exhibit G of this Application for additional detail.
- Compatible land use – the Project Area is predominately rural agricultural, which is compatible with the proposed Facility (see Figure 08-2).

- Limited sensitive ecological resources – the proposed Facility is not expected to result in significant adverse impact to ecological resources (see Exhibits H, I, J, K, U, and W).
- Cultural Resources – the proposed Facility is not expected to interfere with any identified existing cultural resources (Exhibit L).

In addition to the above-listed siting criteria, the Applicant utilized supplementary internal siting classification methods that are employed for all Windlab Systems Pty Ltd. global wind projects. Windlab Systems has developed wind generation projects in South Africa, Australia, and Canada. Once the Applicant determined that the Project Area was suitable for development of a wind power facility, various constraints were identified and evaluated in order to appropriately micro-site the Facility components. Micro-siting efforts are discussed in detail below.

(d) *Relevant Factors in the Site Selection Process*

As noted above, the selection of possible sites for development of wind power facilities is constrained. Particularly, projects must be located in areas with 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 setback, land use, and environmental restrictions imposed by local, state and federal laws. Once a project area has been selected (macro-siting), there is some ability to alter turbine and other component locations on the properties that are participating in the project (micro-siting) within the confines of the private agreements that the Applicant has obtained. The mico-siting of project components within a given project site is governed by site-specific factors, including land use constraints, noise constraints, wind resource constraints, shadow flicker constraints, wetland and stream constraints, agricultural constraints, and landowner considerations. Each of these

constraints, as used in selecting the Project area, is discussed in additional detail below.

Land Use Constraints

A graphic study of turbine siting constraints for the Facility is included as Figure 04-1, as required by OAC Rule 4906-17-04(A)(2). Suitable areas for Facility development are restricted by setbacks from right-of-ways, non-participating parcels, and residences. Illustrative as it is, this graphic cannot show all the site-specific constraints and considerations, such as wetlands and surface waters, landowner preferences, turbine engineering factors (e.g., minimum separation distances to avoid wake loss), shadow flicker and acoustic 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 so as to minimize environmental impacts to the maximum extent practicable, 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 was quite complex. This type of evaluation is necessary to optimize the turbine layout and assess 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 course of 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 in order to minimize impacts to active agricultural lands. These efforts included filed-specific investigations in order to place turbines and access roads along field edges, and minimizing temporary disturbance and permanent loss of active agricultural land to maximum extent practicable. 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 4906-17-08(F) of this Application.

Noise Constraints

No existing national, state, county, or local laws specifically limit wind turbine noise levels in the Project Area. However, in Certificates granted to previously approved wind projects in the State of Ohio, the OPSB has imposed conditions addressing Project-related noise levels in areas surrounding proposed facilities. The standard which has evolved requires that turbine noise levels do not exceed the ambient L90 by more than 5 dBA, non-cumulative, under any operating conditions. In order to satisfy this standard, the Applicant conducted field studies to measure both day-time and night-time ambient noise levels within the proposed Project Area. These measured ambient noise levels were then implemented as voluntary Project design goals, driving selection of individual turbines sites

to minimize noise impacts. For additional information on noise, see Section 4906-17-08(A)(2) 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. No existing national, state, county, or local standards regulate frequency or duration of shadow flicker from wind turbines in the Project Area. However, international guidelines from Europe and Australia have suggested 30 hours of shadow flicker per year as the threshold of significant impact, or the point at which shadow flicker is commonly perceived as annoyance (DECC, 2011). Furthermore, the OPSB has used 30 annual hours of shadow flicker as a threshold of acceptability in reviewing and approving other commercial wind power projects in Ohio. 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 4906-17-08(A)(6) of this Application.

Wetland and Stream 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 United States, including wetlands. As described by the EPA (http: www.epa.gov/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 other words, an Applicant must show that is has, to the extent practicable:

- Taken steps to avoid wetland impacts,
- Minimized potential impacts on wetlands, and
- Provided compensation for any remaining unavoidable impacts.

In order to maximize wetland avoidance, 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. Based on these efforts, no wetlands will be directly impacted by turbine locations. The construction of access roads, collection lines, and crane paths will result in a total potential temporary wetland impact of approximately 0.5 acres. The permanent impact from access roads to wetlands is only expected to be approximately 0.1 acres (E & E, 2013). For all identified stream crossing points, effective construction techniques will be used to avoid and minimize stream impacts to the extent practicable. The vast majority of stream impacts will be temporary in nature. For additional information on estimated wetland and stream impacts, see Section 4906-17-08(B)(2) and Exhibit H & W 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.

(e) *Process for Determining Sites*

Based on the criteria listed in OAC Rule 4906-17-04(A)(1)(c), 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 a suitable wind resource, access to the bulk power transmission system, sufficiently low population density, positive feedback from landowners and township officials, highly compatible land-use characteristics, and few environmentally sensitive areas.

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.

(2) Constraint Map

A constraint map of the Project Area showing setbacks, public roads, right-of-ways, streams, and wetlands is included as Figure 04-1.

(B) SUMMARY TABLE OF EVALUATED SITES

A comprehensive project area site selection study comparing various project area sites is not feasible, primarily because of the intense land acquisition requirement and pre-construction assessments needed for a utility scale wind project. To obtain viable project area sites, these extensive and cost pre-certification tasks would have to be completed for each alternative. Is it simply not practicable to procure land contracts, perform environmental and engineering studies, enter into and progress through multiple interconnection permit processes, and proceed with community outreach and education campaigns for multiple project area sites. In fact, because of the need for wind energy development in the state as dictated by the Alternative Energy Portfolio Standard (SB 221), truly viable alternative sites would be considered as options to be developed in addition to, rather than in place of, the proposed Facility. In Case No. 08-1024-EL-ORD, Opinion and Order, October 28, 2008, p.21 at Finding 56, the OPSB determined that an applicant is not required to provide alternative sites for a proposed wind farm. Therefore, a project area site summary table is not applicable and not

included herein. The Applicant has requested a waiver of the requirement to provide an extensive site selection study, which can be found in Exhibit A.

(C) OPTION TO PROVIDE THE SELECTION STUDY

No additional site selection study was prepared by the Applicant, and therefore is not provided within the current Application. The Applicant has requested a waiver of the requirement to provide an extensive site selection study, which can be found in Exhibit A.

(A) PROJECT AREA SITE

The following sub-sections provide information on the location, major features, and the topographic, geologic, and hydrogeologic suitability of the proposed Project Area site. No alternative project area sites were considered for this Facility.

(1) Geography and Topography

Figure 05-1 depicts the geography and topography of the Project Area, and the surrounding area within a 5-mile radius. This mapping was developed from the following United States Geological Survey (USGS) 7.5 minute, 1:24,000 topographic quadrangles: Ashland North, Clarksburg, Greenwich, New London, Norwalk, Nova, Olivesburg, and Shiloh. Among other information, Figure 05-1 shows the following features:

(a) *The proposed Facility.*

(b) *Major population centers and geographic boundaries.*

(c) *Major transportation routes and utility corridors.*

(d) *Bodies of water which may be directly affected by the proposed Facility.*

(e) *Topographic contours.*

(f) *Major institutions, parks, and recreational areas.*

(g) *Residential, commercial, and industrial buildings and installations.*

(h) *Air transportation facilities, existing or proposed.*

(2) Aerial Photograph

Figure 05-2 depicts the location of the proposed Facility in relation to surface features within a one-mile radius. This mapping was developed using 2011 aerial photographs from the National Agricultural Imagery Program (NAIP).

(3) Site Mapping/Existing Features Map

Figure 05-3 depicts the proposed Facility and existing features at a 1:12,000 scale, using 2011 NAIP aerial imagery for the base mapping. Among other information, Figure 05-3 shows the following features:

(a) *Topographic Contours*

(b) *Existing Vegetative Cover*

(c) *Land Use and Classifications*

(d) *Individual Structures and Installations*

(e) *Surface Waters*

(f) *Water and Gas Wells*

Vegetative cover that may be removed during construction is not included in this Figure/Map. The Applicant has requested a waiver of the requirement to provide a map of the vegetative cover, and instead allow a general narrative of the vegetative cover that may be disturbed during construction. This requested waiver can be found in Exhibit A.

Also refer to Section 4906-17-08(B)(2)(a), where impacts to ecological communities are discussed and quantified, based on the typical area of vegetation clearing assumptions presented in Table 03-2.

(4) Geology and Seismology

Windlab Systems Pty Ltd. (2013a) prepared a desktop review of available hydrogeological and geotechnical information in the vicinity of the Project Area, which is attached hereto as Exhibit F. The following figures in Exhibit F show geological features in the vicinity of the Project Area: Figure 2 (bedrock topography), Figure 3 (cross-sectional views), and Figure 4 (geophysical features). Other figures in Exhibit F illustrate information pertaining to hydrology and groundwater, and will be discussed in Section 4906-17-05(A)(5). As part of final Facility design, a geotechnical engineer will identify test boring locations and conduct geotechnical surveys. The test boring locations will be provided upon

ignition of that work (see Attachment B in Exhibit F for more information.) The Applicant has requested a waiver of the requirement to map proposed test boring locations, which can be found in Exhibit A.

The data in Exhibit F was compiled by Windlab Systems Pty Ltd. through a desktop review and literature search of existing and readily available documents related to the surface and subsurface soils, agricultural resources, geologic/bedrock conditions, surface water flows, and groundwater resources in the Project Area. This information was reviewed to develop a generalized understanding of the suitability of the soils within the Project Area for grading, compaction, and drainage for the Project Area. Sources consulted include the Federal Emergency Management Administration (FEMA); the United States Geological Survey (USGS); the United States Department of Agriculture (USDA) Soil Conservation Service Soil Survey of Huron County; the Ohio Environmental Protection Agency (Ohio EPA); the Ohio Department of Agriculture (ODA); and the Ohio Department of Natural Resources (ODNR).

(a) *Site Geology*

Existing Conditions

As presented in Exhibit F, the Project Area lies within the Galion Glaciated Low Plateau section of the Central Lowland Physiographic Province. The Galion Glaciated Low Plateau is a rolling upland transitional area between the gently rolling till plains and hilly glaciated Allegheny plateau. The Galion Glaciated Low Plateau is mantled with thin to thick drift covering bedrock. Moderate relief is present in the district (100 feet) with ground elevations between 800-1400 feet above mean sea level (msl) (ODGS, 1998). As shown in Figure 1, surface elevations of the Study area range from 950 feet above msl in the northern section of the study area to 1180 feet above msl in the southernmost part of the study area.

The majority of glacial deposits within the Study Area consist of clayey till in the form of end moraines, which generally occur as hummocky ridges higher than the adjacent terrain in the southern half of the study area and

ground moraines, in the northern half, which are flat to gently undulating (Pavey et. Al., 1999). Surficial glacial materials within the district are of Late Wisconsinan-age (ODGS, 1998).

Bedrock underlying the project area is primarily shale and is present in the three units which form the bedrock surface in Greenwich Township. The oldest unit is the Berea Sandstone and Bedford Shale undivided of Upper Devonian and Lower Mississippian age, this unit makes up a portion of a buried pre-glacial valley east of the project area. The Berea Sandstone and Bedford Shale undivided unit is overlain by Sunbury Shale of Lower Mississippian age. Sunbury Shale makes up a significant portion of a buried pre-glacial valley west of the project area. Sunbury shale is very thinly laminated and carbon rich. The overlying Cuyahoga Formation consists of thin to massive bedding of shale with inter-bedded sandstone, siltstone, and conglomerate. The Cuyahoga Formation is the youngest bedrock, of Lower Mississippian age and forms the bedrock surface of the project area, and significant portion of the buried pre-glacial valleys to the east and west of the project area (See Exhibit F).

The depth of bedrock documented in the vicinity of the Project Area ranges from 21 to 123 feet (Hartzell, 1986). Information obtained from the ODNR Division of Geological Survey indicates that there are no known or probable karst formations areas within the Study Area. The nearest probable karst formation is in the northwestern corner of Huron County.

An assessment of geologic structural and seismic information determined that there are no fault zones located beneath the general vicinity of the Project Area. The nearest fault zone is the Crawford faults located approximately 20 miles to the southwest. The closest recorded earthquake was reported to have originated in nearby south-central Champaign County in 1843 and was a 3.5 magnitude. The epicenter of the highest magnitude earthquake (5.4) recorded in Ohio to date occurred

in 1937 near Anna, approximately 30 miles northwest of the Facility (Hansen, 2009).

Site Suitability

Based on their desktop assessment of the region, Windlab (2013a) 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 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 and substation.

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 F for additional information.

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 F, 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 substation locations. The borings will extend to the proposed depth or competent bedrock, whichever is encountered first.

(b) *Soil Suitability*

Existing Conditions

The USDA Soil Conservation Service Soil Survey for Huron County was reviewed 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 Bennington and Cardington silt loams. The soil survey information indicates that the Bennington silt loams are poorly drained, have low to moderately high capacity of transmit water (0.06-0.20 inches/hour), with the depth to water table being 12 to 30 inches. The Cardington silt loams are moderately well drained, have low to moderately high capacity to transmit water (0.06-0.60 inch/hour), with the depth to water table being 18 to 36 inches. The soil surveys also indicate that the soils do not frequently flood or pond surface water runoff. See Exhibit F for additional information.

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 water toward existing or proposed drainage swales. Surface water will be properly controlled and drained away from the work area. 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, the soils on-site should be suitable for grading, compaction, and drainage when each site is prepared as discussed in Attachment B of Exhibit F.

(5) Hydrology and Wind

(a) *Water Budgets*

The Proposed Facility will not use or discharge sufficient quantities of water during construction or facility operations. The proposed Facility will not directly affect water quantities and/or flow rates within any body of water. Therefore, no water resources are likely to be directly affected by the Proposed Facility. In addition, changes in storm water runoff volumes that may be result from the Project will be insignificant, as the Project is not expected to appreciably increase the quantity of impervious surfaces in the Project area. There will be some water usage associated with dust suppression and the operation of the cement batch plant during construction; however, the volume used for these operations will be negligible when considering the overall water budget available.

On average approximately 35 inches of precipitation falls within the Project area every year. The groundwater recharge rate is approximately 5 inches per year and the natural groundwater discharge rate of the aquifer to surrounding water bodies is approximately 4 inches per year (Dumouchelle et al., 2002). The amount of water usage that will result due to the Project construction and operation will be negligible. All appropriate permits will be obtained if groundwater extraction is required for construction or operation of the Project. As indicated in the preliminary desktop geotechnical report (see Exhibit F), areas of shallow groundwater may be encountered during construction of Generation Facility components, such as turbine foundation and substation foundations. However, based on the preliminary geotechnical information gathered, only a small percentage of turbines may require groundwater extraction or dewatering during excavation. In these occurrences the groundwater will be properly managed and controlled using best management practices. The volume of water that potentially may be extracted from the subgrade during construction is assumed to be minimal compared to the available

resources in the area; therefore, it is anticipated that the Project will have no effect on the recharge or discharge of the groundwater aquifer.

No existing surface water gauging stations are available within the Project area. However, a USGS water stage recorder station is located within the Project area basin. It is located along the Vermilion River at Vermilion, Ohio, Station 04199500, and is approximately 28 miles in proximity to the Project area. Based on the historical data collected at this monitoring point, the 10-year mean flow is recorded as 311.74 cubic feet per second (cfs) and the critical surface flow (lowest 7-day flow in ten years) is recorded as 4.82 cfs (USGS, 2013). The drainage area for this water body is approximately 262 square miles (mi^2), which is much larger than the drainage areas for the remaining water bodies identified in the Project area. Therefore, the mean and critical flows in the other surface water bodies adjacent to the Project area are anticipated to be much less. The anticipated amount of storm water runoff generated during construction and operation of the Generation Facility will not significantly contribute of the overall flow of the water bodies.

The depth of the water table in the vicinity of the Project Area varies and site-specific geotechnical investigations/borings will be performed prior to the final design of the Project to identify depth to groundwater at each turbine location. The preliminary geotechnical desktop review indicated that the bedrock depths documented in the water well drilling logs in the vicinity of the project area range from 21 to 123 feet. The construction and operation of the Proposed Facility will not use or discharge significant enough quantities of water to effect groundwater table levels. Additionally, it is anticipated that subgrade components of the Project, such as turbine foundations or substation foundations, will not impact the aquifer migration as at most locations the footings should be above the water table.

(b) *Floods and High Winds*

Floods

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, this 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, 2013g).

Information on floodplains in the vicinity of the Project Area was obtained from the ODNR and FEMA, as part of the Groundwater Hydrogeology Desktop Review Summary Report prepared by Windlab (2013a) and attached hereto as Exhibit F. Flooding is unlikely to impact the proposed turbine locations, as there is no 100-year floodplain located within the proposed Project Area. As show in Figure 1 in Exhibit F, the area predominately along the Vermilion River (located mostly to the north and west of the Project Area) is designated as a 100-year floodplain. However, no portion of any recorded floodplain lies with 1,711 feet of a proposed turbine site (Windlab, 2013a).

High Winds

The wind turbines proposed for the Facility are rated to withstand wind speeds 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 International Electrotechnical Commission (IEC), a world-recognized body for standards development. The Nordex N-117 2.4 MW turbines proposed for the site are certified according to the IEC for Class IIIA winds. Accordingly, Class IIIA-qualified turbines are specified to withstand winds to 83.9 mph at hub height for an extreme 10-minute average wind speed (once per 50 years), also known as the Reference Wind Speed (IEC, 2005). It is important to note that these IEC standards represent minimum design values and do not indicate a point of certain failure.

In addition, the Project was designed with automatic braking systems that utilize feathering and brakes to prevent uncontrolled rotation, over-speeding, and excessive pressure on the tower structure, rotor blades, and WTG components, as described in Section 4906-17-05(C)(2), during periods of high winds. Finally, to ensure public safety, setbacks that meet the OPSB requirements from residences as well as minimum setbacks from other structures, property lines, roads, and utility lines have been incorporated into the Project to provide additional protection in the unlikely event of a structural failure due to wind forces.

(c) *Maps/Aquifers*

The principal groundwater source within the vicinity of the Project Area is the Mississippian sandstone and sandy shale bedrock aquifers. Water wells installed yield less than 10 gallons per minute (gpm) (Hartzell, 1986). Unconsolidated aquifers overlying the Mississippian bedrock aquifer in the vicinity of the project area are shown in Figure 5. The map shows that wells may be developed in the unconsolidated deposits throughout the Project Area. The Galion End Moraine and Galion Ground Moraine

Aquifers occupy the largest portions of the Project Area, and are capable of producing 5-25 gpm. The Mohican Complex Aquifer located in the southern portion of Greenwich Township is capable of producing 5-25 gpm. The Galion Thin Upland Aquifer is located in the northeastern portion of the Project Area produces less than 5 gpm. Refer to Figure 5 in Exhibit F for a map of existing aquifers which may be directly impacted by the proposed Facility. Based on Windlab's review, it does not appear that construction, including blasting if required, will have a significant adverse effect on groundwater quality or yield.

The Project Area lies within a rural portion of Huron County. There are no urban areas in close proximity to the project area that are large enough to extend municipal water service out into rural areas. As a result, property owners utilize private wells to supply potable water. The wells locations depicted on Figure 5 in Exhibit F were compiled from information provided by ODNR and the Ohio EPA. Due to the number of private wells specific information associated with the wells has not been reviewed, nor have there been any attempts to differentiate between wells installed in unconsolidated aquifers or installed within the underlying bedrock.

Several larger reservoirs are located outside, but within close proximity of the Project area (within 0.5 miles). The Greenwich Reservoir is the most notable. It is located just south of the Village of Greenwich, approximately 0.5 miles to the west of the Project boundary. The New London Upground Reservoir is the largest body of water within one mile of the Project area; this is a 210-acre impoundment located approximately one mile to the northeast of the Project area (E & E, 2013).

(B) LAYOUT AND CONSTRUCTION

(1) Project Area Site Activities

The order of information below does not strictly comply with the order of information contained in OAC Rule 4906-17-05(B)(1), but rather is presented to

facilitate understanding of the activities associated with the proposed wind energy facility. All sub-sections required under OAC Rule 4906-17-05 (B)(1) are included, but not in the prescribed sequence. Additional sub-sections are included for (e) foundation excavation, (f) turbine erection, (g) buried collection system installation, and (h) overhead collection system installation. Project area site alternatives are not addressed because the site alternative analysis was not performed. Applicant is seeking a waiver from the site selection alternative analysis, as described in Exhibit A.

(a) *Test Borings*

The Applicant has requested a waiver of the requirement to provide the location of test borings" pursuant to Rule 4906-17-05(A)(4). The Applicant has proposed to defer providing the location of the test borings until after the certificate issues and the final turbine sites have been established. After the geotechnical engineer has reviewed all available desktop information, they will determine the number of borings to be drilled for at turbine locations. In addition, borings will be taken at the proposed substation locations. The borings will extend to the proposed depth or competent bedrock, whichever is encountered first. Split-barrel sampling of soil will be performed in accordance with American Society for Testing and Materials (ASTM) D1586 for each boring in increments of 2.5 feet to the depth of 10 feet, and at 5-foot intervals below 10 feet to the depth of the borings. In all the borings, Standard Penetration Test (SPT) data will be developed and representative samples preserved. Water observations in the boreholes will be recorded during (and at the completion of) drilling. A truck-mounted drill rig will be used to perform the borings, unless unfavorable weather conditions make the site inaccessible, in which case an ATV-mounted drill rig will be used. All borings will be backfilled at the completion of drilling with bentonite chips and drill cuttings (Windlab, 2013a).

A laboratory testing program will be established by the geotechnical engineer based on the observations made during the drilling activities and experience. All samples will be classified in the laboratory based on the visual-manual examination (ASTM D 2488) Soil Classification System and the laboratory test results. Formal boring logs will be prepared using the field logs and the laboratory classifications. For a limited number of samples considered to be representative of the foundation materials encountered by the borings across the Project Area, laboratory testing will include moisture content, particle-size analyses, and Atterberg limits. Unconfined compression and consolidation tests will be performed if low strength and/or highly compressible cohesive soils are encountered, as deemed necessary by the geotechnical engineer. All laboratory testing will be performed in accordance with ASTM or other specified standards. A report will be prepared documenting the findings of the borings and laboratory testing, along with recommendations on construction considerations and foundation designs.

(b) *Removal of Vegetation*

Facility construction will be initiated by clearing (as necessary) all tower sites, access roads, and interconnect routes. As described in Table 03-2, it is assumed that up to a 150-foot radius will be cleared around each tower. During construction, access road installation and use could result in temporary soil disturbance of a maximum width of 40 feet. A temporary corridor of up to 60 feet wide may 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 3 acres will be cleared for the substation and a total of approximately 9.5 acres for the laydown yard. Section 4906-17-08(B)(2)(a) of this Application quantifies anticipated temporary and permanent impacts from construction activities,

including vegetation removal, to ecological communities in the Project Area.

The Applicant has requested a waiver of the requirement to provide a map of the vegetative cover, and instead allow a general narrative of the vegetative cover that may be disturbed during construction. This requested waiver can be found in Exhibit A.

(c) *Grading and Drainage*

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 of use of adjacent properties, right-of-way, 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 such as silt fence, hay bales, filter socks, and/or temporary siltation basins will be installed and maintained throughout site development. Catch basins may be installed to allow sedimentation to fall out before the run-off enters the streams, and swales and/or ditches may be installed to divert sediment laden water away from streams and into areas with property sediment control measures. 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. 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 4906-17-07(C).

(d) *Access Roads*

Wherever feasible, existing roads and farm drives will be upgraded for use as Facility access roads, in order 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. 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 geo-textile 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 typical finished access road will be no greater than 20 feet in width with occasional wider pull-offs to accommodate passing vehicles, and earthen shoulders on either side to accommodate crane traffic. Maximum permanent road width will be 20 feet. Appropriately sized culverts will be placed at stream crossings in accordance with state and federal permit requirements. In other locations, culverts may also 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 temporary soil disturbance of a maximum width of 40 feet. In agricultural areas, topsoil will be stripped and wind-rowed along that 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 pre-construction contours. Typical access road details and photos of access road construction are included in Exhibit N.

(e) *Foundation Excavation*

Once the access roads are complete for a particular group of turbine sites, the respective turbine foundation construction will commence on that completed access road section. Foundation construction occurs in several stages, as dictated by type of foundation to be used. These stages could include hole excavation, outer form setting, rebar and bolt cage assembly, casting and finishing of the concrete, removal of forms, backfilling and compacting, and site restoration. Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of excavated areas required to install foundations.

Initial activity at each tower site will involve removing vegetative cover as necessary and grading topsoil within a 150-foot radius (300-foot diameter) workspace around each tower (this workspace can be adjusted to avoid sensitive ecological resources). In agricultural land, the topsoil within a 150-foot radius of each tower will be stripped and stockpiled. An excavator will then be used to dig a foundation hold. 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 bedrock is not rippable, it will be excavated by pneumatic jacking, hydraulic fracturing, or blasting. At this time, blasting is not anticipated to occur at the proposed Project site. However, in the unlikely event blasting

is necessary the Applicant will submit a blasting plan and obtain any necessary permits. As indicated in Section 4906-17-05(A)(4)(a) and Exhibit F of this Application, blasting is not expected to be necessary (Windlab, 2013a). 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.

Upon completion of the detailed geotechnical exploration, suitable foundation systems will be designed. Two possible types are currently under consideration: spread footing foundations and rock anchored pile-supported foundations. 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 18-foot diameter pedestal that typically extends 6 to 8 inches above grade and is surrounded by a 6-foot gravel skirt. At the base of each tower, an area of approximately 80 feet by 40 feet will be developed as a level, permanent crane pad.

(f) *Turbine Erection*

Beyond the tower, nacelle, and rotor blades, other smaller wind turbine components include hubs (center portion of the rotor assembly), 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 yard. 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 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, place the nacelle on top of the tower, and following ground assembly, place the rotor onto the nacelle (see construction photos in Exhibit N). The erection crane(s) will move from one tower to another along Project access roads or temporary crane paths.

(g) *Buried Collection System Installation*

The total length of the buried 34.5 kV collector lines carrying electricity from the turbines to the substation will be approximately 13.9 miles. As mentioned previously, electrical collection routes will generally parallel Facility access roads, but will also follow field edges and cut directly across fields in some places. The proposed layout of the collection system is illustrated on Figure 05-4, and photos of typical underground cable trenches can be found in Exhibit N. Where buried cable is 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. Any drainage tiles damaged during construction will immediately be identified, documented, and repaired. It is anticipated that a local drain tile contractor will be involved with repair activities.

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 sidecast area immediately adjacent to the

trench. Direct burial installs the cable between 36 inches and 48 inches deep.

Installation of collection lines in an open trench will be used in areas where the previously described direct methods are not practical. Areas appropriate for open trench installation will be determine at 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 maximum of 48 inches deep. The overall temporary footprint of vegetation and soil disturbance may be a maximum of 60 feet 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 spoil material will occur immediately 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 in surface condition. Restoration of these areas will be completed through seeding and mulching of al exposed soils, or by other appropriate farming methods in active agricultural fields.

(h) *Overhead Collection System Installation*

As indicated in Section 4906-17-03(A)(2), it is currently anticipated that no overhead collection system will be installed at the proposed Project Site.

(i) *Removal and Disposal of Debris*

Project 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 Project work areas, and disposed of in dumpsters located

at the laydown yard. A private contractor will empty the dumpsters on an as-needed basis, and dispose of the refuse at a licensed solid water disposal facility.

(j) *Post-construction Reclamation*

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 pre-construction contours to the extent possible. Exposed soils at restored turbine sites, laydown sites, and along Project access roads, will be stabilized by seeding, mulching, and/or agricultural planting. Reclamation/restoration activities will be in accordance with the Ohio NPDES permits described in Section 4907-17-07(C) of this Application.

(2) Layout

The proposed layout of all Facility components is illustrated on Figure 05-4. Prepared at a 1:12,000 scale using 2011 NAIP aerial imagery as the base mapping, Figure 05-4 includes the following information:

(a) *Wind-Powered Electric Generation Turbines*

(b) *Transformers and Collection Lines*

Transformers will be located within the confines of the Facility substation, with smaller pad-mount transformers located at each turbine, either inside the tower or near the base. The Facility substation and turbine sites are depicted on Figure 05-4, along with electrical collection lines.

(c) *Construction Laydown yard*

(d) *Transmission Lines*

As described in Section 4906-17-03(A)(3), the Applicant will not be building any new transmission lines for the Facility. Therefore, none are depicted on Figure 05-4.

(e) *Substation*

(f) *Transportation Facilities and Access Roads*

(g) *Security Facilities*

As described in Section 4906-17-03(A)(2) of this Application, the substations will be enclosed by chain link fencing. Gates may be constructed along access roads to turbines, at the discretion of the landowner. No additional security features are proposed; therefore, none are depicted on Figure 05-4.

(h) *Grade Elevations*

The Applicant has requested a waiver of this requirement (see Exhibit A), as grade elevations around the pedestals will not be available until construction.

(i) *Other Pertinent Installations*

Met Tower: Two potential sites for up to two permanent meteorological towers are depicted in Figure 05-4.

(3) Structures

(a) *Estimated Overall Dimensions*

Each wind turbine consists of three major components: the tower, the nacelle, and the rotor. The hub height of the Nordex N117 will be 298.5 feet (91 meters); the rotor diameter will be 383.8 feet (117 meters); and the total turbine height (i.e., the height at the highest blade tip position) will be 490.5 feet (149.5) meters.

The O&M facility is not anticipated to exceed 6,000 square feet or permanently disturb an area of greater than 3 acres. An existing structure located within or near the Project Area would be the first preferred facility to house O&M staff, equipment, and parts. When compared to constructing a new facility, this would have the advantage of reducing environmental impacts, and could also decrease the vacancy rate of commercial buildings in the area. A new building would only be constructed if a suitable existing structure cannot be located within or near the Project. A typical O&M building schematic and example photos are provided in Exhibit N.

The proposed substation total area will be no greater than 3 acres in size and enclosed by a chain link fence. Current design of the proposed substation is currently identified as a new 69 kV single breaker interconnection switching station. Current discussions with AEP and PJM include a possible future conversion to operate in a ring bus configuration with at least 3 breakers to accommodate a possible future transmission infrastructure improvement to a 138 kV circuit.

The permanent meteorological tower(s) will be free-standing and 80 meters (262 feet) tall. The foundations will be approximately 24 feet by 24 feet in size and 5-6 feet deep. The 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.

(b) *Construction Materials*

All materials and construction practices used will meet or exceed safe and reliable engineering and design standards. The turbines will be installed on a concrete foundation surrounded by a gravel skirt. The turbine towers are conical steel structures manufactured in multiple sections, depending on the final turbine model selected. The rotor shaft is forged from heat-

treated steel, and the rotor blades are manufactured from high quality fiberglass reinforced plastic. The O&M building, if newly constructed, will consist of standard construction materials for agricultural buildings that currently exist through the region.

(c) *Color and Texture of Facing Surfaces*

The turbine towers are tubular steel structures manufactured in multiple sections. In accordance with FAA aeronautical studies of the Facility, the towers will be painted white to make the structure visible to aircraft (viewing against the ground), while decreasing visibility from ground vantage points.

The O&M building may utilize existing structures. If a new structure is required, it will be designed to resemble agricultural buildings similar in style to those found throughout the region. Please see Exhibit N for additional information.

(d) *Photographic Interpretation or Artist's Pictorial Sketches*

Windlab Developments USA, Ltd. (Windlab, 2013e) prepared a Visual Impact Assessment (VIA) for the proposed Facility (see Exhibit Q). The purpose of this VIA was 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, and
- assess the visual impacts associated with the proposed action.

The procedures used for this study are consistent with the policies, procedures, and guidelines contained in established visual impact

assessment methodologies. The results and conclusions presented in the VIA (Exhibit Q) are briefly summarized below:

Viewshed analysis and field verification indicate that the Facility has the potential to be visible from a number of sites within five miles of the Facility. However, field review indicates that in many areas a significant number of the turbines will be at least partially and/or mostly screened by trees, existing vegetation, topography, and other structures. For many sensitive sites within the study area, including National Register-listed historic sites and others that occur in the surrounding villages and townships, field review suggest that the Facility may not be visible or will be significantly screened by foreground vegetation and structures.

Figures 1-10 in Appendix A of Exhibit Q provide realistic photographic simulations of the complete Facility from ten selected viewpoints located within five miles of the Project Area. The photographic simulations are presented alongside the original photos of the existing condition, so as to allow direct comparison of “before” and “after” views of the Project Area, identical in every respect except for the turbines shown in the simulated views.

Evaluation of the simulations of the proposed Facility indicate that overall impact on scenic quality is variable and dependent on the distance from the viewer to the nearest turbine, the presence or lack of screening afforded by foreground vegetation and topography, and the number of turbines visible. Minimal to moderate contrast was noted for viewpoints located more than 2.0 miles from the Facility, particularly where existing vertical elements (such as utility poles, trees, and agricultural buildings) reduces the turbines, line and scale contrast with the landscape. More appreciable contrast was noted where foreground and near mid-ground views of turbines (i.e., 1.0 mile or less) are available. At these distances the Facility’s strong scale and line contrast with existing landscape features was noted. However, in most cases the Facility appears

compatible with the working agricultural landscape that makes up the majority of the visual study area. Based on experience with currently operating wind power projects elsewhere, public reaction to the Facility is likely to be generally positive, but highly variable based on proximity to the turbines, the affected landscape, and personal attitude of the viewer regarding wind power (Windlab, 2013e). Although wind power projects are man-made facilities, what they represent may be seen as a positive addition to the landscape.

(e) *Unusual Features*

No unusual features are expected, as all Facility components are consistent with typical wind energy facilities.

(4) Plans for Construction

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

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

Please see Section 4901-17-05(B)(1) of this Application for additional detail.

(5) Future Plans

The Facility presented herein includes up to 25 turbines with the capacity to generate up to 60 MW of emissions-free electricity that will be collected to an electric substation in Greenwich Township, Huron County. This point of interconnection has a maximum capacity of 60 MW. Therefore, as the interconnection capacity will be fully utilized by the Proposed Facility, the Applicant has no future plans to construct additional turbines in the vicinity of the Project Area.

(C) EQUIPMENT

(1) Wind Powered Generation Equipment

As previously indicated, the Facility evaluated herein consists of up to 25 wind turbines. In addition to the turbines, the Facility will include approximately 9.1 miles of access roads, approximately 13.9 miles of buried 34.5 kV electrical collection cable, a substation, and an Operations and Maintenance building. Each of these components is described in further detail in Section 4906-17-03(A)(2). In addition, information about the turbines and electrical system is presented below, and photos can be found in Exhibit N.

<u>Wind Turbines</u>

The Applicant has evaluated and selected the Nordex N117 for the proposed Facility. Included in Exhibit M are details of the Nordex N117. Each wind turbine results in an operational footprint of approximately 0.2 acre (see Table 03-2), and consists of three major components: the tower sections, the nacelle, and the rotor with blades. The hub height will be 298.5 feet (91 meters). The nacelle sits atop the tower, and the rotor hub is mounted to the front of the nacelle. The rotor diameter will be 383.8 feet (117 meters). The total turbine height (i.e., the height at the highest blade tip position) will be 490.5 feet (149.5) meters. Descriptions of each of the turbine components are provided below and illustrated in Exhibit M.

Tower: The tubular towers used for megawatt-scale turbines are 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 have the benefit of reducing visibility from ground vantage points, which are generally viewed against the background of sky.

Nacelle: The main mechanical components of the wind turbine are housed in the nacelle. As depicted in Exhibit M, these components include the drive train, gearbox, and generator. The nacelle is housed in a steel reinforced fiberglass shell that protects internal machinery from the environment 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 single, medium intensity aviation warning light. 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: A rotor assembly is mounted to the nacelle to operate upwind of the tower. Each rotor consists of three (3) composite blades that will be 191.9 feet (58.5 meters) in length, with a maximum rotor diameter of 383.8 feet (117 meters). 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. The wind turbines will begin generating energy at wind speeds of 3 meters per second (m/s) [6.7 miles per hour (mpg)], and cut out when wind speeds reach

approximately 20 m/s [44.7 (mph)]. Rotor speed will be in the range of 14 to 16 RPM.

Electrical System

A General Interconnection Feasibility Study was prepared by PJM Interconnection (PJM, 2012) to determine the means of connecting the Project to the PJM network (see Exhibit D). Primary and secondary interconnection sites were provided to assess interconnection feasibility and estimated cost estimates. PJM Interconnection (PJM, 2013) also completed a Generation Interconnection System Impact Study, to determine a plan, with approximate cost and construction time estimates, to connect the generation interconnection to the AEP network (see Exhibit C). The proposed Facility with an electrical system that consists of two parts: (1) a system of 34.5 kV shielded and insulated cables that will collect power from each wind turbine, and (2) a substation that will transfer power from the 34.5 kV collector cables to existing transmission lines and the regional power grid. Each component is described below.

Collector System: The wind turbine transformer will raise the voltage of electricity produced by the turbine generator up to the 34.5 kV voltage level of the collection system. The electric power from the transformer will be transmitted via underground lines, which will terminate at the substation. At the substation a step up transformer will be used to raise the voltage from 34.5 kV to 69 kV, whereby the energy can be interconnected to the 69 kV line for regional use.

The insulated and shielded underground collection lines will be encased in conduit and buried to a minimum depth of 48 inches. In addition to the power lines, the conduit will also collect a fiber optic network cable (SCADA system-supervisory control and data acquisition) that allows for continuous communications with each turbine. It is planned all collector system infrastructure will be bored under state road crossings and it is not anticipated overhead lines will be necessary outside of the substation area.

Underground Trenching: Exhibit N illustrates typical underground collection system trench and cabling during construction. The located of the proposed underground collection system is depicted on Figure 05-4. This 34.5 kV collection system will connect the individual turbines to the Facility substation. The total length of the new buried 34.5 kV collector lines carrying electricity to the Facility substation will be approximately 13.9 miles.

Project Substation: The proposed substation is currently identified as a new 69 kV single breaker interconnection switching station. Current discussions with AEP and PJM include a possible future conversion to operate in a ring bus configuration with at least 3 breakers to accommodate a possible future transmission infrastructure improvement to a 138 kV circuit. Current design and location details have not yet been finalized; however, estimated size of impact is no greater than 3 acres. Discussions with landowner for land purchase, lease and right-of-way are currently underway. Planned location of the substation is just west of State Route 13 on Plymouth East Road, adjacent to the existing Greenwich to South Greenwich 69 kV line as identified in the interconnection request. The Facility substation will step up voltage from 34.5 kV to 69 kV to allow connection with the existing 69 kV transmission line. The Project substation will be enclosed by a chain link fence and accessed from Plymouth East Road by a gravel-surfaced driveway. See Exhibit N for photos of a typical substation.

(2) Safety Equipment

Emergency Response

The near proximity of the Village of Greenwich to the project site allow for emergency planning and response coordination with the Village of Greenwich and North Central EMS. All turbines are located less than 4.5 miles from emergency responders. Coordination efforts have begun with both the Greenwich Fire Department and NorthCentral EMS. Emergency procedures and site safety manuals are in draft form and continue to be refined.

The Village of Greenwich fire house and equipment is located in downtown Greenwich; the all volunteer squad is comprised of 22 firefighters. North Central EMS has separate facilities in downtown Greenwich that are staffed by 7 to 8 emergency medical technicians, advanced emergency medical technicians and paramedics. The Greenwich fire department and North Central EMS work in concert together to provide emergency services to the Greenwich community. Every emergency vehicle is equipped with advanced life support equipment that provides mobile intensive care for critically ill and injured patients. In addition, North Central EMS is partnered with Mercy St. Vincent Medical Center to support Life Flight, located in Milan Ohio, 22 miles from the project area. This close proximity offers incredibly short flight times for critically injured patients. Currently, in-service emergency training is anticipated to begin prior to commencement of construction. Multiple training dates for both firefighters and EMS staff will assure all responders have adequate situational training specific to wind energy facilities.

(a) *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. However, the risk of construction-related injury will be minimized through daily safety meetings, regular safety training, and the use of appropriate safety equipment.

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, ATV, or snowmobile). The latter could result in collision with stockpiled materials (soil, rebar, turbine components), as well as falls into open excavations.

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.

Measures to prevent unauthorized site entry and unsafe practices will be implemented during Facility construction and operation. During the construction phase, temporary, highly visible, plastic mesh fencing will be erected around equipment and spare part storage yards, staging areas, and other potential construction hazards. The temporary fencing will be supplemented by signs cautioning the public of potential dangers, and providing 24-hour emergency numbers, operator contact information, and instructions for emergency personnel.

The turbines will be equipped with lockable outside tower doors that restrict unauthorized access into the turbine tower, to the control panel and nacelle access ladder. Permanent fencing will also be installed around the storage areas for replacement parts adjacent to the O&M building, substation, and switchyard. As with temporary fencing, signs marked "Private No Trespassing" will also be posted on permanent chain-link fencing to warn the public of potential dangers and provide 24-hour emergency numbers, operator contact information, and instructions for emergency personnel.

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 generation 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. This, in combination with the elevated location of the nacelle and the enclosed space of the tower interior makes response to a fire or other emergency difficult, and

beyond the capabilities of most local fire departments and emergency service providers. 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 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 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

Lightning protection systems were first added to rotor blades in the mid-1990s, and are now a standard component of modern 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.

Fire Safety

In the unlikely event that a wind turbine were 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 ignite 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 Project substation.

Generally, any emergency/fire situation at a wind turbine site or substation that are beyond the capabilities of the local service providers will be the responsibility of the Facility's owner/operator. Construction and maintenance personnel 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.). In addition, local fire and EMS service providers (Village of Greenwich Firefighters and NorthCentral EMS) will be trained in how to respond to emergency/fire situations that could occur at the Greenwich Windpark. Currently, in-service emergency training is anticipated to begin prior to commencement of construction. Multiple training dates for both firefighters and EMS staff with assure all responders have adequate situational training specific to wind energy facilities. In addition, safety meetings will be held with emergency service personnel on an on-going basis. 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 the above-mentioned local rescue workers in training for the emergency procedures specific to the turbine model used for the Facility.

Ice Shedding Protection

The turbines proposed for the Facility utilize ice detection equipment. For example, systems 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 automatically shut down itself.

(b) *Reliability of the Equipment*

Equipment reliability is an important criterion in turbine selection. As described in Section 4906-17-03(A), the turbine model that has been determined to be most suitable for this site and is anticipated to be installed is the Nordex N117. 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 automatically shut down the turbines in the event of excess blade vibrations or when wind speeds exceed maximum values. This equipment is regularly maintained on a preventative maintenance schedule to ensure continued operation.

(c) *Turbine Manufacturer's Safety Standards.*

Exhibit R consists of the manual considered representative of those to be used at the proposed Facility. This manual addresses safety measures specific to operations and maintenance employees, such as first aid, protection against falls, and personal protective equipment. Greenwich Windpark will provide Staff with the appropriate safety manual once the turbine model is secured for the Facility.

(3) Any Other Major Equipment

Other major equipment associated with the proposed Facility includes an electrical substation. As described in Section 4906-17-03(A)(2); the planned substation is located near the intersection of State Route 13 and Plymouth East Road in Greenwich Township, adjacent to the existing Greenwich – South Greenwich 69 kV transmission line. The Facility substation will step up voltage from 34.5 kV to 69 kV to allow connection with the existing 69 kV transmission line.

Substation construction will begin with clearing the site and stockpiling topsoil for later use in site restoration. The site will be graded, and a laydown area for construction trailers, equipment, materials, and parking will be prepared. Concrete foundations for major equipment and structural supports will be poured, followed by the installation of various conduits, cable trenches, and grounding grid conductors. The final steps involve laying down crushed stone across the stations, erecting a chain link perimeter fence, connecting the high voltage links, and testing the control systems.

(D) REGIONAL ELECTRIC POWER SYSTEMS

All sub-sections required under Section 4906-17-05(D) are included, along with an additional sub-section for service agreements.

(1) Interconnection Queue

(a) *Name of the Queue*

PJM Interconnection Queue; AEP 69 kV circuit (Willard – South Greenwich)

(b) *Web Link of the Queue*

http://www.pjm.com/planning/generation-interconnection/generation-queue-active.aspx

(c) *Queue Number*

X3-023

(d) *Queue Date*

August 29, 2011

(2) System Studies

PJM prepared a Feasibility Study (2012), which is attached hereto as Exhibit D.

PJM also completed a System Impact Study (2013), attached as Exhibit C.

(a) *Feasibility Study*

The PJM Feasibility Study evaluated two possible interconnection points for a 60 MW project. The primary point of interconnection is a new 69 kV 3-breaker ring bus station to the Greenwich-south Greenwich 69 kV line. A secondary point of interconnection at the Howard 138 kV substation via a single 138 kV breaker was also evaluated.

The feasibility study (see Exhibit D) evaluated compliance with reliability criteria for summer peak conditions in 2015. Study results described potential overloads for which the Facility may be responsible for all or partial upgrades. In order to connect to the primary point selected the Project will be required to provide the necessary facilities from their collector station to connect to the Greenwich-South Greenwich 69 kV line. Protection schemes at the remote ends of the line at Greenwich and S Greenwich will need to be modified and 69 kV metering will need to be installed. The work required to connect the Project includes: 1) installation of new 3-breaker 69 kV interconnection substation laid out in a breaker and on-half arrangement, including associated disconnect switches, bus work, SCADA and 69 kV revenue metering, 2) modification of relay at Greenwich station, 3) modification of relay at South Greenwich substation.

(b) *System Impact Study*

PJM Interconnection issued the System Impact Study (SIS) Report in November 2013 (see Exhibit C). This report evaluated PJM Project #X3-023, a 60 MW (7.8 MW capacity) wind generating facility. The Point of Interconnection (POI) is located approximately 15 miles east of the existing Willard 69 kV station.

The proposed generating facility is to be tapped between the Greenwich and South Greenwich stations on the Willard – South Greenwich 69 kV line. The generating facility will be separated from the tapping point by a circuit breaker. PJM requested a provision be made to expand the facilities at the Point of interconnection in the future. In addition, the Willard 69 kV station configuration must be modified to operate as a ring bus and PJM requested the substation footprint be expanded to a dimension of 200 feet by 200 feet. Furthermore, a transfer trip relaying scheme will be required between Willard and South Greenwich and protection relays in the surrounding area will need to be reset to accommodate the addition of the new project. The point of interconnection is also to include 69 kV metering, SCADA, and associated equipment.

The Applicant will engineer and field test the transfer trip relay package to assure compliance and reliability. The collection system portion of the substation will consist of one main step up transformer (low side voltage 34.5 kV / high side voltage 69 kV) and a 34.5 kV collector system. Each turbine will have its own 34.5-.660 kV 2.75 MVA transformer.

AEP has accepted the Impact Study results of PJM. The Queue Project #X3-023 was studied as a 60.0 MW (Capacity 7.8 MW) injection connected between the Greenwich and South Greenwich 69 kV stations in the AEP area. Project #X3-023 was evaluated for compliance with reliability criteria for summer peak conditions in 2015.

Potential network impacts:

No problems were identified for:

- Generator Deliverability (Single or N-1 contingencies for the Capacity portion only of the interconnection),
- Light Load Analysis (however, loading issues on the radial feed toward Willard, identified at full Energy output at peak load, may be slightly worse at lower customer load levels)
- Multiple Facility Contingency (Double Circuit Tower Line, Line with Failed Breaker and Bus Fault contingencies for the full energy output)
- Short Circuit
- Contribution to Previously Identified Overloads (This project contributes to the contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)
- Steady-State Voltage Requirements
- Contribution to Previously Identified System Reinforcements (Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may be allocated partial cost responsibility which will be calculated by PJM.)

Impacts to Stability and Reactive Power Requirement will be determined in the Facilities Study.

PJM also studied the delivery of the energy portion of this interconnection request. New System Reinforcements (Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation):

- Eight of the most severely overloaded conditions were identified. Problems identified may result in operational restrictions to the

project. AEP & First Energy are working together to come up with a solution to mitigate current overloaded lines. In all cases, Greenwich may choose to upgrade the equipment and/or add SCADA (utilizing either a carrier or fiber optic option) to manage exposure to curtailment in real time.

- Greenwich may choose to pursue a Merchant Transmission Request, which will study all overload conditions associated with the overloaded element(s) identified.

4906-17-06 Financial Data

(A) OWNERSHIP

The Applicant will construct all structures and equipment associated with the Facility, and the Applicant will own and operate all such structures. AEP will retain ownership of the existing Willard – South Greenwich 69 kV circuit and continue to maintain and operate this line.

As depicted on Figure 05-4, where the collection lines cross the roads, limited portions of the buried 34.5 kV electrical collection lines will be horizontal directional drilled across public road right-of-ways. The proposed Facility will not change the ownership status of such right-of-ways. 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 will not change the ownership status of private lands within the Project Area, with the possible exception of land that may be purchased for the interconnect substation and O&M facilities, for which the Applicant may either lease or purchase an existing building and associated land.

The Applicant (6011 Greenwich Windpark, LLC) is a wholly owned subsidiary of Windlab Developments USA, Ltd. ("Windlab"). Windlab Developments USA, Ltd. is the North American subsidiary of Windlab Systems Pty Ltd ("Windlab"). Windlab, headquartered in Canberra, Australia, was established in 2003 as a spin out from Australia's premier scientific research institute, the CSIRO (Commonwealth Scientific and Industrial Research Organization). Windlab owns and utilizes a suite of world-leading atmospheric modeling and wind energy prospecting tools to identify and efficiently deliver wind farm sites throughout the world. By identifying and developing project sites from early stages, Windlab seeks to manage the inherent risks of project development.

The Windlab global project portfolio development includes: Canada 445 MW, USA 475 MW, South Africa 3,723 MW and Australia 1,870 MW. In addition, Windlab continues to

grow and expand in emerging markets and frequently provides consulting services to wind developers and countries pursing renewable expansion.

(B) CAPITAL AND INTANGIBLE COSTS

(1) Capital and Intangible Cost Estimates

The total estimated capital and intangible costs of proposed Facility are approximately $117,706,000 ($1,961/kW). These costs are broken out in Table 06-1 below.

Table 06-1. Estimated Capital and Intangible Costs

Description	Cost ($'000)
Capital Costs	
Turbine	$80,393
Balance of Plant (Erection, civil, electrical)	$23,143
Other	$8,128
Total Capital Costs	$111,664
Intangible costs	
Development & Management	$2,200
Insurance	$642
Legal & Other	$5,400
Total Intangible Costs	$8,242
Total	$124,906
Cost per KW	$1,998

As described in Section 4906-17-04, the Applicant has not proposed alternative project areas. Therefore, no cost comparison between alternatives is available.

(2) Total Cost Comparison

Project costs compiled by the U.S. Department of Energy indicate the installation cost (per KW) of wind power projects has steadily declined since 2009/2010.

The majority of this “installed price” reduction is due to turbine pricing, as turbine costs represent the single largest price component of wind projects. Technology advancements, such as larger MW generating size and rotor swept area, have helped lower the price point. These technology advancements have boosted capacity factors, which have financially supported this cost decrease. In addition, economy of scale becomes evident, particularly among the large-sized project range. The U.S. Department of Energy indicates pricing for wind projects of less than 5 MW ranges from $1,750/KW to almost $5,000/KW (approximate average $2,600/KW). Conversely, pricing for wind projects over 200 MW ranges from $1,500/KW to just under $2,500/KW (approximate average $1,950/KW). In addition, pricing trends in various regions are impacted by permitting and development costs (Wiser & Bolinger, 2012). The Greenwich total project cost of under $2,000KW is very competitive across all size of project and regional cost differences.

(3) Tabulation of Present Worth and Annualized Capital Costs

Capital costs will include development costs, construction design and planning, equipment costs, and construction costs. These costs will be incurred within a year or two of the start of construction. Therefore, a present worth analysis is essentially the same as the costs presented in Section 4906-17-06 (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 Costs

For the first two years of commercial operation, total staffing costs are conservatively estimated to be $215,000 per year. Maintenance costs could range between $1,320,464 and $1,923,082 per year. These figures exclude any other ongoing expenses related to environmental monitoring, property taxes, land royalties, reverse power, and insurance costs.

(2) Operation and Maintenance Total Cost Comparison

Operations and maintenance costs are a significant component of the overall cost of wind projects, but can vary widely between facilities. The Berkeley National Laboratory has compiled limited O&M cost data for 138 installed wind power project in the United States, totally 9,022 MW of capacity, with commercial operation dates of 1982 through 2011. On average, facilities installed more recently have incurred lower O&M costs. Specifically, capacity-weighted average 2000-2012 O&M costs for projects constructed in the 1980s equal $34/MWh. The 2000-2012 O&M costs dropped to $23/MWh for projects installed in the 1990s, and to $10/MWh for projects installed in the 2000s. This drop in O&M costs is likely due to a combination of factors. It has been suggested that projects installed more recently, with larger turbines and more sophisticated designs, may experience lower overall O&M costs on a per-MWh basis when compared to older turbine models. In addition, operational protocols have been refined as installation and operations experience has been gained over more than a decade of wind power development (Wiser & Bolinger, 2012).

The O&M costs for the Facility are estimated to be approximately $18.42 MWh, depending on the maturity of the project in a given year of its life cycle. 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 the Berkeley National Laboratory, as described above. The O&M costs for the Facility will range from approximately $18.00 to $20.84 per MWh in years 1 through 6 of operation, and approximately $15.00 to $18.00 per MWh in years 6 through 30 of operation.

(3) Present Worth and Annualized Capital Costs

The annual operation and maintenance costs itemized in Section 4906-17-06(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 operation and maintenance costs, using an inflation rate of 2.2% and arbitrary 1.32% discount rate, is between $6,828,773 million and $7,547,592 million. As alternative project areas and facilities were not considered in this Certificate Application, the operation and maintenance cost information in this section is limited to the Facility.

(D) DELAYS

Due to the complexity of preparing a modern wind energy facility for permitting, construction, financing, off-takes, etc., impacts of any delay can vary widely. Critical delays may have material, adverse effects on Facility financing, which include limiting the Applicant's ability to procure turbines, obtain other Facility components, and capture tax credits within any given year. Delays that result in a project not being able to capture tax credits can amount to millions of dollars; this can adversely impact the ability to finance the entire project. If the delay were to occur in the permitting stage, the losses would be associated with the time value of money resulting from a delay in the timing of revenue payments or delay in commencement of commercial operations. Holding costs to maintain viability of the project grow exponentially (landowner payments, staffing, additional work needed to cure delays). Depending on the type and length of delay, projects can incur additional project costs in the range of $5,000 to $50,000 per month. If the delay were to occur during construction, the costs would include lost construction days and the expense associated with idle crews and equipment. These delay damages are detailed in the construction contract and can vary greatly from project to project and type of delay (i.e. weather, component delivery, etc). If delivery of energy or commercial operation date is not met, there can be additional damage payments payable to the energy purchaser. Delays during construction can range from $1 million to upwards of $10's of millions per month depending on finalized construction and power contracts.

4906-17-07 Environmental Data

(A) GENERAL

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.

(B) AIR

(1) Preconstruction

(a) *Ambient Air Quality*

The State of Ohio Environmental Protection Agency (Ohio EPA) Division of Air Pollution Control publishes air quality data for the State of Ohio annually. The most recent report summary of air quality data available for the state is the *Division of Air Pollution Control 2012 Annual Report* (Ohio EPA, 2012). Included in this report are a summary of 2012 air quality data, a discussion of toxics monitoring projects, and trend studies for selected pollutants. While no air monitoring sites are located in Huron County, monitoring stations for pollutants were located in one of the seven adjacent counties. Pollutants monitored in neighboring counties include both particulate matter and ozone in Lorain County. No violations of National Ambient Air Quality Standards (NAAQS) were reported in the vicinity of the Project Area (Ohio EPA, 2012).

Air emissions in the general areas are related primarily to farm operations, vehicular travel, and manufacturing. Vehicles traveling area roads and farm equipment produce exhaust emissions, along with dust from unpaved road surfaces. In addition, routine odors are associated with certain farming practices (e.g., manure-spreading). The largest source of manufacturing emissions in the vicinity of the Project Area originate from the Shelby Municipal Light Plant in Richland County, AK Steel Corporation – Mansfield Operations in Richland County, and Huron Lime, Inc. in Erie

County, located approximately 19, 21, and 30 miles from the Facility respectively.

(b) *Air Quality Standards and Limitations*

In accordance with Section 111 of the Clean Air Act Extension of 1970, the 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, New Source Performance Standards do not apply to the Proposed Facility.

The Clean Air Act, as amended by the Clean Air Act amendments of 1990, requires the EPA to set NAAQSs (40 CFR part 50) for pollutants considered harmful to public health and the environment. The 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, ozone, and sulfur dioxide. As described above, no air quality monitoring takes place in Huron County; however, monitoring does occur in one of the seven adjacent counties. No violations of NAAQSs were reported in the vicinity of the Project Area (Ohio EPA, 2013).

All new sources of air emissions in Ohio are required to obtain a Permit to Install (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 EPA, the Acid Rain Program was established by the Clean Air Act amendments of 1990 to reduce emission of sulfur dioxide and mono-oxygen oxides 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 NAAQS. The proposed Facility will not be a major source of any pollutants. Therefore, PSD does not apply.

(c) *List of Required Air Pollution Permits*

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

(d) *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 Ohio Revised Code Chapter 3704, may be applicable. The Applicant will control fugitive dust through the use of several practices, as described below in Section 4906-17-07(B)(2).

(2) Construction

Best management practices will be utilized and implemented to minimize the amount of dust generated by construction activities. These operations will be temporary and distributed throughout the Project area and, therefore, will not result in significant impacts on air quality.

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. If necessary, temporary paving (e.g., oil and stone) could be used to stabilize dusty surfaces in certain locations (e.g., the laydown yard). However, oil and stone dust suppression methods will not be applied within or immediately adjacent to sensitive areas, such as streams or wetlands. Any unanticipated construction-related dust problems will be identified and immediately reported to the construction manager and contractor.

(C) WATER

The Project area is located within Hydrologic Unit Code (HUC) 12 - South Branch Vermilion River watershed and HUC-10 New London Upground Reservoir – Vermillion River watershed. The western two-thirds of the Project area drains into the South Branch Vermilion River drainage basic (HUC-12), while the eastern third of the Project area drains to the New London Upground Reservoir-Vermilion River drainage basin (HUC-210). Both of these sub-basins are within the larger Southwestern Branch Vermilion River watershed, a component of the Huron-Vermilion drainage basin (HUC-8) (USGS, 2013a). This entire region of northern Ohio is encompassed within the Lake Erie watershed.

Within the Project area there are eight primary perennial streams, with 15 associated intermittent and ephemeral tributaries, and eight ponds, as defined by USGS National Hydrography Dataset (NHD) (USGS, 2013a). All Streams within the Project area are generally small and all are unnamed tributaries to the Southwest Branch Vermilion and Vermilion Rivers. The impounded water bodies within the project area are small farm ponds. These are located in both the northern and southern Project area extent, with the largest measuring approximately 4.5 acres. Several larger reservoirs are located outside the Project area. The Greenwich Reservoir is located on the south side of

Greenwich Township, approximately 1/2 mile from the western Project area boundary. The largest water body, New London Upground Reservoir, is a 210-acre impoundment approximately one mile to the northeast of the Project area.

(1) Preconstruction

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

- The Ohio National Pollutant Discharge Elimination System (NPDES) construction storm water general permit, Ohio EPA Permit No OHC000004
- An individual permit or nationwide permit under Section 404 of the Clean Water Act, (if necessary as determined after final engineering).
- A Water Quality Certification Section 401 from the Ohio EPA (if necessary as determined after final engineering)
- An Ohio Isolated Wetland Permit (if necessary as determined after final engineering)
- An Ohio Permit to Install on-site sewage treatment or septic containment facilities for operations and maintenance building waste.

(2) Construction

(a) *Permits*

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 required permitting. The Notice of Intent (NOI) and associated fee for the Construction Activities General Permit will be filed at least 21 days prior to commencement of construction activities.

The Applicant has sited Project facilities to minimize stream and wetland impacts by placing turbine pads, O & M building, substation, and construction laydown area away from wetland and water surface features. Any impacts to wetland and surface waters will be due to construction of access roads, collection lines and crane paths. Current layout design

indicates total potential permanent wetland impacts are expected to be approximately 0.1 acre. Once final engineering is completed, permit requirements for the following agencies will be coordinated and completed: Army Corps of Engineers (USACE) (Section 404) and Ohio EPA (Section 401-Water Quality Certification and Isolated Wetland Permit).

The review period for applicable permits is dependent on the type of permit that will be required. State wetland permitting can take up to 30 days (starting from the date the Ohio EPA confirms application is complete by notification letter). It is anticipated a general Section 404 permit from USACE Section 404 permit can be received in considerable less time than an individual Section 404 permit, which is estimated at 90 days.

Permits required for waste water at the O&M building will be filed at time of final design work. All state requirements, satisfying the commercial facilities statute, will be adhered to by Project.

(b) *Aquatic Discharges*

The proposed Facility will not result in wide-scale conversion of land to built/impervious surfaces. Tower bases, crane pads, access roads, O&M facilities, and the substation in total will add approximately 28 acres of impervious surface to the approximately 4,650 acres of leased land (i.e., conversion of approximately 0.6%). Consequently, no significant changes to the rate, make-up, or volume of stormwater 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. Blasting activities potentially may impact

localized groundwater levels through seismic vibrations or fracture bedrock, however, the turbine setback from residences helps to ensure that private wells would not likely be damaged or suffer reduced well yields. As private wells are typically located near residences, the Project 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. As this permanent project foot print is 28 acres over 4,650 acres it is unlikely the Project will have an 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 minor 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 Plans*

As described above, groundwater is not expected to be encountered during construction, 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 ground water. 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. The exact location of private water supply wells within the Project Area will be determined and clearly marked to avoid potential damage. 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 or 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 described in 4906-13-06(C)(1)(a), Facility construction will require a NPDES permit (construction storm water general permit), Ohio EPA Permit No. OHC000004. In addition, a Storm Water Pollution Protection Plan (SWP3) (OHC00003) checklist for construction activities must be filed prior to the NPDES Construction Activities General Permit (required at least 21 days prior to 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 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. 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 Ohio EPA Division of Emergency and Remedial Response and Federal regulations.

As described in Section 4906-17-08(F)(2)(b), topsoil removal and de-compaction will be conducted in agricultural areas (which constitute the majority of the Facility footprint), where soil restoration is necessary to accommodate future agricultural uses. 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.

Impacts to wetlands and surface waters will be avoided and/or minimized by utilizing existing or narrow crossing locations whenever possible. Upgrading existing crossings that are either under-maintained or

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. Special crossing techniques, equipment restrictions, herbicide use restrictions, and erosion and sediment control measures will 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 additional information on avoidance and minimization measures to protect wetlands and surface water, see Section 4906-17-08(B)(2)(c).

These 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 4906-17-07(C)(2)(b) and the mitigation measures discussed above in Section 4906-17-07(C)(2)(c), changes to the flow patterns and erosion are not anticipated.

(3) Operation

(a) *Quantitative Flow Diagram*

The O&M facilities will generate sewage and wastewater comparable to a typical small business office. These 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 on-site sewage treatment under OAC Chapter 3745-42. No other Facility components will discharge measurable quantities of wastewater. Therefore, flow diagram information is not applicable.

(b) *Conservation Practices*

The Applicant will follow OEPA BMPs for stormwater pollution prevention, stormwater management, and erosion and sedimentation control. Once operational, the O&M facilities will use water at a rate comparable to a typical small business office. No other Facility components will use measurable quantities of water. Because water consumption during operations will be minimal, implementation of water conservation measures is not expected to provide a significant reduction in water usage. Therefore, water conservation practices are not applicable.

The US Department of Energy, 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 60 MW wind farm such as the proposed Facility, will conserve approximately 116 million gallons of water annually because wind-powered electric generation facilities do not use/consume water as do conventional thermal power plants such as coal (NREL, 2006).

(D) SOLID WASTE

(1) Preconstruction

(a) *Debris and 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 To Deal with Waste*

No waste removal is necessary or planned prior to construction.

(2) Construction

(a) *Debris and Solid Waste Generated*

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) *Storage and Disposal Methods*

Construction waste will be collected from turbine sites and other Facility work areas, and disposed of in dumpsters located at the laydown yard. A private contractor will empty the dumpsters on an as needed basis, and dispose of the refuse at a licensed solid waste disposal facility.

(3) Operation

(a) *Solid Waste Generated*

For the most part, Facility operation will not result in significant generation of debris or solid waste. Waste generated from the O&M facilities 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) *Treatment, Transport, and Disposal*

The O&M facilities will utilize local contracted 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.

4906-17-08 Social and Ecological Data

(A) HEALTH AND SAFETY

(1) Demographic Characteristics

Existing and projected population estimated presented herein are based upon the socioeconomic analysis prepared by Windlab Systems (see Exhibit G). The proposed Facility is located in rural Huron County, approximately 85 miles southeast of Toledo and approximately 65 miles southwest of Cleveland. It is expected that economic activity created by the project will reach beyond Huron County into surrounding rural counties, as well as nearby population centers. Therefore, for the purposes of assessing the economic impacts of the proposed Facility, the "local economy" is defined as the Ohio Counties of Huron, Erie, Lorain, Ashland, Richland, Crawford, Seneca, and Sandusky (Windlab, 2013b). Table 08-1 below summaries the population statistics of the local economy.

Table 08-1. Population Statistics of the Local Economy

County	1990	2000	2010	% Change 1990-2010
Huron County	56,240	59,487	59,626	6.00%
Erie County	76,779	79,551	77,079	0.40%
Lorain County	271,126	284,664	301,356	11.20%
Ashland County	47,507	52,523	53,139	11.90%
Richland County	126,137	128,852	124,475	-1.20%
Crawford County	47,870	46,966	43,784	-8.50%
Seneca County	59,733	58,683	56,745	-5.00%
Sandusky County	61,963	61,792	60,944	-1.60%
Local Economy Total	**747,355**	**772,518**	**777,148**	**4.00%**

Source: U.S. Census Bureau, 2013a.

Additional communities that occur within five miles of the proposed Facility include the Villages of Greenwich, New London, and Shiloh; and the Townships of Greenwich, Fitchville, New London, Ripley, and Fairfield (Huron County), Butler and Blooming Grove (Richland), and Ruggles (Ashland). Table 08-2 provides the population of each incorporated community and township that occurs within five miles of the proposed Facility, based on data from the U.S. Census Bureau. Table 08-2 also provides estimated population projections for these communities.

Table 08-2. Population Projections for Communities within 5 Miles of the Facility

Incorporated Municipalities	2000	2010	2012 (Estimate)	2017 (Estimate)	2020 (Estimate)	% Change 2012-2022
Greenwich Village (Huron Co.)	1,525	1,476	1,463	1,440	1,416	-3.20%
New London Village (Huron Co.)	2,696	2,461	2,434	2,328	2,222	-8.70%
Shiloh Village (Richland Co.)	721	649	637	605	573	-10.00%
Total Population	**4,942**	**4,586**	**4,534**	**4,373**	**4,211**	**-7.1%**
Townships	**2000**	**2010**	**2012 (Estimate)**	**2017 (Estimate)**	**2020 (Estimate)**	**% Change 2012-2022**
Greenwich (Huron Co.)	954	1,044	1,044	1,093	1,142	9.40%
Fitchville (Huron Co.)	1,012	1,056	1,048	1,071	1,093	4.30%
New London (Huron Co.)	3,440	3,268	3,234	3,121	3,072	-5.00%
Ripley (Huron Co.)	943	1,024	1,016	1,060	1,103	8.60%
Fairfield (Huron Co.)	1,284	1,218	1,204	1,173	1,143	-5.10%
Ruggles (Ashland Co.)	857	905	904	929	955	5.60%
Butler (Richland Co.)	1,386	1,205	1,187	1,109	1,032	-13.10%
Blooming Grove (Richland Co.)	1,157	1,204	1,186	1,210	1,235	4.10%
Total Population	**11,033**	**10,924**	**10,823**	**10,766**	**10,775**	**-0.40%**

Source: U.S. Census Bureau, 2013a.

The estimated population density in Huron County is 121 persons per square mile, compared to 282 persons per square mile statewide (US Census Bureau, 2013a.)

(2) Noise

Acentech Incorporated (Acentech) was retained by the Applicant to evaluate potential noise impacts from the proposed Facility (see Exhibit O). The study consisted of two principal phases: (1) background sound level survey and (2) a computer modeling analysis of future turbine sound levels. The field survey of existing sound levels at the site was performed to determine how much natural masking noise there might be – as a function of wind speed – at the nearest residences to the project. The relevance of this is that high levels of background noise due to wind-induced natural sounds (such as tree rustle) act to reduce the audibility of the wind farm, while low levels of natural noise would permit operational noise from the turbines to be more readily perceptible. For a broadband noise source such as a wind farm, the audibility and potential impact of the new noise 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 noise is the natural sound generated by the wind itself. The sound from a wind turbine can often be masked by wind noise at downwind receivers because the frequency spectrum from wind is very similar to the frequency spectrum from a wind turbine. In general, wind turbines only operate and produce noise when the wind exceeds a minimum cut-in speed of roughly 3 m/s at hub height. Turbine sound levels increase with wind speed up to about 6 or 7 m/s, when the sound produced generally reaches a maximum and no longer increases because the rotor has reached a predetermined maximum rotational speed. Consequently, at moderate to high wind speeds – when turbine sound levels are most significant – the level of natural masking noise is normally also relatively high due to tree or grass rustle thus reducing the perceptibility of the turbine noise.

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 noise from the Facility at locations representative of potentially sensitive receptors close to project turbines. The meters continuously recorded a number of statistical parameters in 10 minute increments, such as the average (Leq), minimum (Lmin), maximum (Lmax), and residual (L90) sound levels. Of these, Leq and L90 levels are the most meaningful. The Leq is literally the average sound level over each measurement interval. This measure can be influenced and elevated by sporadic, short-duration noise events, such as cars passing by, and is therefore often unrepresentative of the quietest periods between these events. The L90 statistical sound level is commonly used to conservatively quantify background sound levels. The L90, or residual sound level, is the sound level exceeded during 90% of the measurement interval (i.e., it is louder than the L90 level most [90%] of the time). This measure has the quality of filtering out relatively loud, sporadic, short-duration noise events thereby capturing the quiet lulls between such events. It is this consistently present, near-minimum "background" level that forms a conservative basis for evaluating the audibility of a new source.

A total of 6 background sound level measurement positions were adopted for the survey (see Figure 3 in Exhibit O). These positions were selected to be representative of the acoustic environments experienced at noise sensitive receptors near the proposed future turbine locations and to cover the study area in a fairly uniform manner. Each location is at or near a typical home in the area. In some cases, the monitor was set back from the nearest road about the same distance as typical residences on that road to replicate the exposure to local traffic noise. In other cases, the monitor was set up behind the house or at a location much further from the nearest road.

Rion NL-31 & NL-32 continuous sound level meters were used for the study. A windscreen was fitted on each microphone in order to reduce the potential

influence of local wind-induced noise on the measured data without significantly attenuating the actual ambient sounds. The windscreens used for this ambient sound survey, which are constructed of open-cell polyurethane foam, were engineered and supplied by the acoustic instrumentation vendors Bruel & Kjaer and Rion. The sound level monitors were field calibrated just prior to and directly following the measurements. In addition, the monitors had been laboratory calibrated within 12 months prior to the measurements. The survey period lasted one week beginning on June 5 and ending on June 17, 2013. Each microphone was typically positioned a similar distance (e.g., about 50 ft to 150 ft. and greater) from the major local sound sources (e.g., road and rail traffic) as the homes in the area. The field team also observed sound sources, which included at times local and distant road and rail traffic, birds, wind in trees and brush, distant jet aircraft, and farm equipment (Acentech, 2013).

The overall average nighttime Leq sound for the six measurement positions was 46 dBA, and the daytime average was 51 dBA. These average Leq sound levels can be attributed to: (1) the frequent operation of farming and agricultural equipment throughout the study area; (2) multiple large-scale livestock operations (swine and chickens) located within the study area; and (3) the frequency of railcars traveling along the rail line immediately north of the proposed Project Site. The nighttime and daytime sound levels as a function of wind speed are summarized below in Table 08-3.

Table 08-3. Mean Leq and L90 Sound Levels as a Function of Wind Speed

Wind Speed at 10 m, m/s	3	4	5	6	7	8	9
Mean Nighttime L90, dBA	33	34	39	43	43	43	43
Mean Nighttime Leq, dBA	52	54	54	56	56	56	56
Mean Daytime L90, dBA	40	41	42	43	43	43	43
Mean Daytime Leq, dBA	55	55	57	56	56	56	56

Source: Acentech, 2013.

(a) *Construction Noise Levels*

Noise from construction activities associated with the Facility is likely to temporarily constitute a moderate unavoidable impact at some of the homes in the vicinity of the Project Area. The sound levels resulting from construction activities will vary significantly depending on several factors such as the type and age of equipment, the specific equipment manufacture 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, preparation of the site for crane-lifting, and wind turbine assembly and commissioning.

In general, the maximum potential noise impact at any single residence might be analogous to a few days to a few weeks of repair or repaving work occurring on a nearby road or to the sound of machinery operating on a nearby farm. More commonly (at houses that are some distance away), the sounds from project construction are likely to be faintly perceived as the far off noise of diesel-powered earthmoving equipment characterized by such things as irregular engine revs, back up alarms, gravel dumping, and the clanking of metal tracks. The use of explosives and the need to drive piles are not anticipated for this project. In the

unlikely event that a need for dynamiting or pile driving arises during construction, such activities would occur intermittently and only for limited periods of time. Furthermore, the location of such activities, if needed, would not be widespread within the Project Area (i.e., would most likely be confined to limited areas) (Acentech, 2013).

Construction of the Facility is anticipated to consist of several principal activities:

- Site clearing: The initial phase includes establishing temporary site offices, workshops, stores, and other on-site facilities. Installation of erosion and sedimentation control measures, as well as the preparation of initial haulage routes.
- Excavation: This phase includes the excavation and formation of access roads, preparation of the laydown yard, and excavation for the concrete turbine foundations.
- Foundation work: This phase consists of construction of the reinforced concrete turbine foundations and installation of the electrical interconnection network. As indicated in Exhibit F, blasting for foundation work is not anticipated to occur.
- Wind Turbine installation: Delivery of the turbine components, followed by their installation and commissioning.
- Restoration: Once construction is complete, temporarily disturbed areas will be restored and returned to their approximate pre-construction contours. Exposed soils will be stabilized by seeding, mulching, and/or agricultural planting.

Typical on-site equipment likely to be used to construct the proposed Facility will include trucks, cranes, dozers, excavators, trenchers, graders, and batch plants. Representative average near (1,470 feet) and far (1 mile) noise levels associated with construction are summarized in Table 08-4. Typical noise levels are as reported in the Power Plant Construction

Noise Guide. It should be noted that the reference used for equipment sound levels is quite old, dating back to 1977, and that the levels in it are roughly 5 dBA higher than the values that can be found in more recent references, such as from the Federal Highway Administration for modern construction equipment (USDOT, 2006). These older, higher values have been deliberately used purely to be conservative. The expected construction noise levels at the nearest property boundary will be variable and are expected to be within the ranges found in Table 08-4.

Table 08-4. Construction Equipment Sound Levels by Phase

Equipment Description	Est. Sound Level at 1,470 ft per Phase, dBA	Est. Sound Level at 5,280 ft per Phase, dBA
Preparation & Foundation		
Blasting	62**	43**
Pile Driving	61**	42**
Dozer	51	32
Excavator	52	33
Trencher	52	33
Grader	50	31
Roller	47	28
Trucks	46	27
Batch Plant	43	24
Erection & Installation		
Trucks	46	27
Cranes	52	33
Test & Commission		
Trucks	46	27

Note: **Estimated values for blasting and pile driving are maximum (Lmax) sound levels, not Leq.
Source: Acentech, 2013.

The values in this table generally indicate that, depending on the particular activity, sounds from construction equipment are likely to be at least intermittently audible at distances of up to about 1 mile. At the very worst, however, sound levels ranging from 43 to 62 dBA might temporarily occur over several weeks at residential structures located nearest (1,460 feet) to turbine construction sites. A majority of the construction activities associated with the proposed project will be conducted during daylight hours. At times over the planned construction schedule, the construction activities will be audible to nearby residents. Any construction at the facility in the evening and nighttime is expected to be limited to relatively quiet activities and to be less noticeable than in the daytime. In addition, construction sound that may be heard off-site will vary from hour-to-hour and day-to-day in accordance with the equipment in use and the operations being performed at the site. Since the construction activity at the site will be temporary, will occur mostly in the daytime hours, and will produce sounds that are already familiar to the community, including sounds from farming activity, and home and other mid-size building construction, its overall noise impact on the community beyond 1,000 ft. of the nearest turbine is not expected to be significant (Acentech, 2013).

Based on the requirements of OAC Section 4906-17-08(C)(1)(c)(ii) and the dimensions of the proposed turbines, setbacks from residences must be at least 1,312 feet/400 meters (based on the longest rotor blades under consideration for the Facility). All turbine locations comply with and exceed these setbacks. However, there may be some cases where access road construction or trenching operations occur closer to homes, which could result in higher sound levels if this work occurs very close to residences. In such cases, every effort will be made to give affected residents advanced notice about when this kind of work will be occurring and how long it is expected to last.

Sounds generated by construction activities are typically exempt from state and local noise oversight provided that they occur within weekday, daytime periods as may be specified under local zoning or legal codes. All reasonable efforts will be made to minimize the impact of noise resulting from construction activities. When construction scheduling is finalized, construction personnel will notify the community as necessary of expected Facility construction commencement and duration to help minimize the effects of construction noise. In addition, the location of stationary equipment and the siting of the proposed construction laydown yard have been carefully selected to be as far removed from existing noise sensitive areas as is practical. Due to the setbacks involved and the limited duration of the activities, construction noise should not pose undue quality of life concerns (Acentech, 2013).

(i) Dynamiting Activities

Dynamiting activities as part of foundation excavation is unlikely to be necessary for the Project and therefore will not result in noise impacts. However, should blasting become necessary, the Applicant will provide a blasting plan that will be designed by a licensed blasting company. Charges and delays will be set such that Bureau of Mines standards for vibration and airblast overpressure will be met.

(ii) Operation of Earth Moving Equipment

Table 8-4 provides noise levels of various earthmoving equipment, including excavators, bulldozers, and trenchers. The operation of this equipment could range in sound level from 51 dBA to 52 dBA at a distance of 1,470 feet and 33 dBA at a distance of one mile. The noise resulting from these operations will occur infrequently and over a short duration at each location. Such levels, at a close distance, would not generally be considered acceptable on a

permanent basis, but as a temporary, daytime occurrence, and with the setbacks implemented by the Applicant, operation of earth moving equipment should not pose undue quality of life concerns for residents in the Project area.

(iii) Driving of Piles

Pile driving activities as part of foundation excavation could range in sound level from 61 dBA at a distance of 1, 470 feet and 42 dBA at a distance of one mile. Such levels, at a close distance, would not generally be considered acceptable on a permanent basis, but as a temporary, daytime occurrence, and with the setbacks implemented by the Applicant, operation of pile driving equipment should not pose undue quality of life concerns for residents in the Project area.

(iv) Erection of Structures

The erection of turbines will require the use of cranes, dump trucks and concrete trucks, and tractor trailers to deliver equipment. The predicted sounds levels for this equipment range from 46 dBA to 52 dBA at 1,470 feet and 27 to 33 dBA at 1 mile. The noise resulting from these operations will occur infrequently and over a short duration at each location. Such levels would not generally be considered acceptable on a permanent basis, but as a temporary, daytime occurrence, and with the setbacks implemented by the Applicant, erection of structures should not pose undue quality of life concerns for residents in the Project area.

(v) Truck Traffic

Increased traffic will be generated throughout the construction period with personnel, equipment, and materials deliveries. The volume, vehicle type, and roadways utilized will be dependent on

the construction activities taking place or scheduled to occur. Construction traffic will consist of standard construction equipment including dump trucks, concrete trucks, semi-trailers, and pick-up trucks, as well as specialized hauling trucks for delivery of turbine components. Although final transportation routing will be developed in consultation with the Huron County Engineer, component delivery traffic is currently assumed to enter the Project Area through use of U. S Route 224. The specialized hauling trucks will use over-size/over-weight trucks to bring the components from the manufacturer to the Project Area (refer to Exhibit E route evaluation study). Noise from the very small amount of daily vehicular traffic to and from the current site of construction should be negligible in magnitude relative to normal traffic levels and temporary in duration at any given location.

Truck traffic, including tractor trailers, dump trucks, and concrete trucks, will be necessary during construction of the Project in order to transport materials and equipment throughout the Project area. It is estimated that sound levels from these activities will range from 46 dBA at 1,460 feet to 27 dBA at one mile. The noise resulting from these operations will occur infrequently and over a short duration at each location. Such truck traffic levels should not pose undue quality of life concerns for residents in the Project area.

(vi) Installation of Equipment

As addressed above in Erection of Structures (section iv), installation of the equipment for the Project will primarily be related to the use of liftcranes. The noise resulting from these operations will occur infrequently and over a short duration at each location. Such installation of equipment levels should not pose undue quality of life concerns for residents in the Project area.

(b) *Operational Noise Levels*

In order to assess the impact of sound that will result from operation of the Project, Acentech conducted field surveys to establish the ambient sound levels in the Project area and then utilized Cadna A acoustical modeling software to predict the sound levels that will result from operation of the Project at nearby residences.

(i) Ambient Sound Levels

Acentech conducted field sampling surveys at six different monitoring stations located throughout the Project area in order to establish the background (Leq) sound levels within the Project area. Background sound monitoring in the Project area indicated that the average daytime Leq for the area is 51 dBA while the average nighttime Leq is 46 dBA. These average Leq sound levels can be attributed to: (1) the frequent operation of farming and agricultural equipment throughout the study area; (2) multiple large-scale livestock operations (swine and chickens) located within the study area; and (3) the frequency of railcars traveling along the rail line immediately north of the proposed Project Site. While there are no existing township, state, or federal laws or regulations that limit noise levels applicable to the Project, nor is there a generally accepted nuisance level, the OPSB has indicated that it will evaluate noise levels associated with each application on a case by case basis, focusing on evaluating impacts of 5 dBA over ambient sound levels (Leq).

Following the establishment of the ambient sound levels in the Project area, Acentech modeled the predicted sound levels resulting turbine operation, during both daytime and nighttime hours, using Cadna A acoustical modeling software. This software is an internationally accepted acoustical model used by many other

noise control professionals in the United States and abroad. The model follows methods specified by the International Standards Organization in their ISO 9613-1 standards, “Acoustics- Attenuation of sound during propagation outdoors, Part 1: Calculation of the absorption of sound by the atmosphere, and ISO 9613-2 standards, "Acoustics - Attenuation of sound during propagation outdoors, Part 2: General Method of Calculation." The model takes into account for spreading losses, atmospheric attenuation, ground effects, terrain, and other barrier shielding (Acentech, 2013).

(ii) Turbine Sound Levels

When operating, the primary source of noise will be from the wind turbines, which produce low level broad band sound that varies with wind speed, and from the substation. For this analysis, Acentech modeled the sound of the proposed 25 turbine layout of the Nordex N117 model turbines and one substation main transformer. Noise from the wind turbines is primarily aerodynamic sound created by wind flowing over the moving wind turbine blades; mechanical noise is minimized by design features.

Nordex has performed field testing of this unit in accordance with IEC Standard 61400-11 to quantify the apparent sound power level of the total noise emissions from the wind turbine. The maximum sound power level emission for the Nordex N117 wind turbine with a 91 meter hub height is 105 dBA, which occurs when wind speeds are nominally 7 m/sec and greater when measured at the standard 10 meter height. Table 6 of Exhibit O shows the overall A-weighted sound power level emissions for the N117 turbine across its range of operating wind speeds and Table 7 of Exhibit O lists the A-weighted octave band sound power levels associated with the maximum sound output condition (7 m/s and greater wind speed).

Each turbine was modeled to be a point source located at the actual proposed turbine hub height, 91 meters above local ground elevation. For a very basic case with no atmospheric absorption or ground effects and with the wind turbine modeled as a point source, the resulting estimated sound level would be 55 dBA at 400 ft from a single turbine hub; and since sound diminishes ideally by 6 dB for every doubling of distance from a point source, the calculated level would reduce to 49 dBA at 800 ft from the turbine hub. As shown in Figure 27 of Exhibit O, the typical maximum sound level is expected to be 44 dBA or less. This is well below the average daytime (51 dbA) and nighttime (46 dBA) long-term Leq sound levels that were identified around the Project area.

Based on these sound modeling results, operation of the Nordex N117 turbine is not expected to exceed the OPSB sound level limit precedent of 5dBA over ambient sound levels.

(iii) Model Results

The overall results from the model are shown in Figure 26 in Exhibit O, which illustrates the estimated cumulative sound levels from all of the proposed wind turbines under maximum output conditions, i.e., with wind speeds at or above 7 m/s at the standard 10 meter height. In addition to sound contours, the Figure 26 map shows locations of the 25 proposed turbines, the project boundary, the one-mile project buffer boundary, and the 906 non-participating residences located within approximately the one-mile boundary.

The sound model allows extraction of expected maximum sound levels at every residence in the project area. Figure 27 in Exhibit O is a scatter plot that displays the estimated sound levels during moderate to high wind conditions (7 m/s and greater at 10 m height) at all non-participating residences vs. their respective

distances from the nearest turbine hub. Note that the levels represent the sound of the entire project and that more than just the one nearest turbine may contribute significantly to the overall sound levels at a specific receptor. As shown in Figure 27 and also in Table 8 of Exhibit O, the typical maximum sound level is expected to be 44 dBA or less at all non-participating residences. Therefore, it is expected that routine wind farm operations will typically produce sound levels that are similar to or lower than the measured community daytime (51 dBA) and nighttime (46 dBA) average ambient sound levels (Acentech, 2013).

(iv) Low Frequency Noise

Low frequency sound energy is generally considered to be in the 20 – 200 Hz range, whereas infrasound is defined as sound energy that is lower in frequency than 20 Hz, which is the typical lower limit of human hearing. A common measure of low frequency noise is the C-weighted sound level (dBC).

According to ANSI Standard B133.8, a threshold level of 75 to 80 dBC is given as the approximate on-set point for complaints and the perception of vibrations due to airborne sound. Sound pressure levels were also modeled to account for low-frequency sound that will result from turbine operation.

As shown in Table 8 Exhibit O, the dBC levels produced under maximum rotational operating conditions are below 66 dBC and are comparable to the ambient long-term average C-weighted sound levels measured in the area. These results signify that there will be no adverse impact of any kind related to low frequency noise from the Facility (Acentech, 2013.)

(v) Substation Noise

Sound emissions will result from the operation of the transformers as part of the substation. The Project will include the use of a 36.5 to 138 kV step-up transformer. Noise associated with the transformers includes a pure tone or "hum" which results from vibrations caused by expansion and contraction or the transformer core. During periods of high ambient noise levels these noises would be inaudible. Additional noise emissions may also result from other infrastructure within the substation, such as cooling fans, top changers, and auxiliary noise from other mechanical components. The operational noise from the step-up transformer at the substation was included in the noise modeling for the turbine sound described above.

Additionally, no structures are located within 590 feet of the Project substation. It is anticipated that noise from the substation will not have any impacts as the substation is setback far enough from the nearest residences to provide sufficient protection from any noise that would result from the operation of substations. The sound contributions from the substation are included in the turbine sound modeling described above.

(vi) Traffic and Transportation

Transportation noise during Facility construction is addressed above in Section 4906-17-08(2)(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 the Project substation. Such maintenance/service visits will usually involve one or two pick-up

trucks. Therefore, significant impacts from traffic noise are not anticipated.

(c) *Location of Noise-Sensitive Areas Within One-Mile of Facility*

The predicted operation sound contour plots in Figure 26 of Exhibit O depict residential structures within one mile of the proposed Facility. There are no libraries, nursing homes, or hospitals located within one mile of the proposed turbines. However, the local Mennonite School is 0.6 miles from the nearest turbine and the Greenwich United Methodist Church is located 1.0 mile from the nearest turbine. In addition, one recreational area (a local park) is located within one mile of the proposed facility. There are approximately 906 non-participating residential structures located within about one mile of the turbines.

The Project does not anticipate major impacts at these locations as all sensitive receptors are either outside the Project area or are already mitigated by residential setback requirements of 400 meters (1,312.34 feet). Facility sound levels will be less than 45 dBA at all of the noise sensitive areas listed above. Therefore, adverse impact to noise-sensitive areas from Facility related sound is not anticipated. See Section 4906-17-08(D)(5) of this Application for additional information on impacts to recreational areas.

(d) *Mitigation of Noise Emissions During Construction and Operation*

Over the last decade, the wind industry has invested heavily in reducing turbine noise through improvements in turbine technology, engineering, and insulation. According to a 2006 report prepared by the Renewable Energy Research Laboratory, sound levels emitted by wind turbines have decreased as technology has advanced. Improvements in blade airfoil efficiency have resulted in more wind energy being converted into rotational energy, and less into acoustic energy. Vibration dampening and improved mechanical design have also significantly reduced noise from

mechanical sources. Furthermore, aerodynamic sound generation is very sensitive to speed at the blade tips. Modern variable speed wind turbines, like those proposed for the Facility, rotate at slower speeds in low winds, increasing in higher winds. This results in quieter operation in low winds when compared to older, constant speed wind turbines (Rogers et al., 2006). These findings are consistent with a recent U.S. Department of Energy Report (2008), which found "advances in engineering and insulation ensure that modern turbines are relatively quiet; concerns about sound are primarily associated with older technology, such as the turbines of the 1980s, which were considerably louder."

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

- Site infrastructure away from residences. Turbines have been sited at least 1,312 feet (400 meters) from all potentially inhabitable residential dwellings (participating and non-participating) and sensitive noise receptors in the Project area reducing the amount of construction activity near these receptors.
- Implementing best management practices for sound abatement during construction, including use of appropriate mufflers, proper vehicle maintenance, adherence of all local speed limits, and limiting hours of construction to normal working hours, unless there is a compelling reason to work beyond those hours.
- Nighttime construction work that does occur will generally be limited to relatively quiet activities, such as welding and installing equipment, cabling, and instrumentation.
- Notifying landowners of certain construction sound impacts in advance, e.g., if blasting become necessary (as indicated in Exhibit F, blasting is unlikely to occur).

During operation of the Facility, the following turbine and substation minimization and mitigation Procedures will be implemented:

- Site infrastructure away from residences and sensitive receptors. All turbines and the substation have been sited 1,312 feet (400 meters) and 590 feet (179 meters), respectively from all potentially inhabitable residential dwellings and sensitive noise receptors in the Project.

In addition, if adverse noise impacts are identified from wind turbine operations, a reasonable complaint resolution procedure will be implemented to ensure than any complaints regarding construction or operational sound are adequately investigated and resolved.

(3) Water

Windlab Systems (2013a) conducted a desktop review of available hydrogeology and geotechnical information for the proposed Facility, attached as Exhibit F. As described in Section 4906-17-05(A)(5) of this Application, information was summarized from available on-line databases and/or documents produced by the following federal, state, and local agencies: the FEMA; the USGS; the USDA Soil Conservation Service Soil Survey of Huron County; the Ohio EPA; the ODA and the ODNR.

The Project Area lies within a rural areas, where municipal water is generally unavailable. Therefore, residents rely upon private wells for their drinking water, as well as for agricultural uses such as watering livestock and irrigating crops. As described in Section 4906-17-05(A)(5)(c) of this Application, the only SWPA within the vicinity of the Project Area is the SWPA associated with the Village of Greenwich. Construction of the proposed Facility will not constitute an activity that would be restricted within either a surface water or groundwater SWPA. The primary sources of groundwater in the Project Area are sandstone and sandy shale bedrock aquifers. Figure 5 in Exhibit F depicts aquifers, along with well locations compiled from information provided by ODNR and the Ohio EPA. It

should be noted that Windlab (2013a) has not reviewed specific information such as depth, boring logs, or construction associated with any of the wells depicted on Figure 5, nor has there been any attempt to differentiate whether the private wells were installed in unconsolidated aquifers or installed within the underlying bedrock.

As described in Section 4906-17-8(C)(1)(c)(ii) of this Application, the Ohio Revised Code Section 4906.20(B)(2) specifies a setback from residential structures of 1,125 feet in horizontal distance from the turbine's nearest blade when extended at 90 degrees. All turbine locations comply with this setback, as the Applicant has utilized setback distances of 400 meters from residences (1,312.34 feet) and 164.2 meters (538.71 feet) from property lines. Although the exact location of each potable use well cannot be determined with the information obtained to date, it is assumed that the potable wells are located in close proximity to each property owners' residence. Due to the distance between residences and construction activities at proposed turbine sites, this setback will protect wells 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 (Windlab, 2013a).

(4) Ice Throw

Ice shedding refers to the phenomena that can occur when ice accumulates on rotor blades, and subsequently breaks free and falls to the ground. Under certain weather conditions, ice may build up on the rotor blades and/or sensors, slowing the rotational speed, and potentially creating an imbalance in the weights of the individual blades. Field observations and studies of ice shedding indicate that most ice shedding occurs as air temperatures rise and the ice on the rotor blades begins to thaw. Therefore, the tendency is for ice fragments to drop off the rotors and land near the base of the turbine. Although less common, ice can potentially be "thrown" when ice begins to melt and stationary turbine blades begin to rotate again (although turbines usually do not restart until the ice has largely melted and fallen straight down near the base).

Research generally indicates that the risk of being struck from ice shedding is low if turbines are set back from residences and roadways. The distance traveled by a piece of ice depends on a number of factors, including: rotor azimuth, rotor speed, position of the blade when the ice break occurs, location of the ice on the blade when the break occurs, size, weight and shape of the ice, and wind speed. Smaller ice fragments produce less aerodynamic drag and thus increase the potential throwing distance. Large and long ice fragments experience more drag and will hit the ground closer to the turbine. The risk of ice landing at a specific location is found to drop dramatically as the distance from the turbine increases.

The effects of ice accumulation can be sensed by the turbine's computer controls and typically result in the turbine being shut down until the ice melts. The turbines proposed for the Facility utilize such ice detection equipment. For example, systems will 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. As ice builds up on the blades of an operating wind turbine, it can lead to vibration, caused by both the mass of the ice and the aerodynamic imbalances. Modern commercial turbines are equipped with vibration monitors, which shut the machine down when vibrations exceed a pre-set level. 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.

Windlab Systems Pty Ltd (Windlab, 2013g) carried out an assessment of the risk of ice fragments being shed from wind turbines for the proposed Facility. These results are presented in Exhibit X. The modeling results of the analysis indicate that the typical distance range of ice throw from the turbine center is approximately 190m (623 feet), with a maximum throw distance of 260m (855 ft). In accordance with Ohio Revised Code Section 4906.20(B)(2) – which specifies a setback from residential structures of 1,125 feet – there are no dwellings, homes, roads or public areas located within the maximum throw area of any

proposed turbine location, the probability of a building or person being struck by an ice throw projectile appears negligible.

Furthermore, in an effort to fully evaluate the potential impacts from ice throw, each turbine location was assessed on two criteria: 1) nearest property boundary adjoining to participating landowners, 2) nearest property boundary adjoining a non-participating landowner. The nearest adjacent property boundary to each proposed turbine location is presented in Exhibit X, Table 4-2.

As show in Exhibit X, Table 4-2, proposed turbine locations 11 and 25 are located within 164 meters of a property boundary adjoining a non-participating landowner. However, the distance from turbines 11 and 25 to the nearest non-participating dwelling are 702 meters and 685 meters respectively. Proposed turbine locations 6 and 13 are located nearest to a property boundary adjoining a participating landowner at a distance of less than 1 meter. However, at each of these proposed locations, the same participating landowner owns both the parcel where the proposed turbine is to be located and the adjoining land parcel. In addition, as these distances are calculated to property boundaries, rather than to residential dwellings, there appears to be no eminent threat.

The risk of ice throw striking a fixed dwelling will be minimized by Project setback distances, which will be 400 meters from residences (1,312.34 feet). These Facility setback distances will adequately protect the general public from potential falling ice. In addition, unauthorized public access to the site will be limited. The operations and maintenance staff, who work in close proximity to the turbines, may experience some risk of blade ice shed if they are beneath a turbine when icing conditions exist. To minimize this risk, wind farm personnel will be properly trained to recognize the potential for ice shed and to follow specific protocols when such conditions exist. In addition, local fire and EMS service providers (Village of Greenwich Firefighters and NorthCentral EMS) will be trained in how to respond to emergency/ice throw situations that could occur at the Greenwich Windpark. Currently, in-service emergency training is

anticipated to begin prior to commencement of construction. Multiple training dates for both firefighters and EMS staff with assure all responders have adequate situational training specific to the Greenwich Windpark energy facilities. In addition, safety meetings will be held with emergency service personnel on an on-going basis.

Based upon the results of studies and field observations at other wind power projects, modern turbine technological controls, the Facility's siting criteria, limited public access to the turbine sites, and the fact that there has been no reported injury caused by ice being "thrown" from an operating wind turbine, it is not anticipated that the Facility will result in any measurable risks to the health or safety of the general public due to ice shedding. However, risks of impacts due to ice throw will be further minimized by safety features incorporated into the design of the turbines, constant monitoring of operations, and warning signs located along property lines and turbine access roads (Windlab, 2013g).

(5) Blade Shear

Another potential public safety concern is the possibility of a rotor blade dropping or being thrown from the nacelle. While rare, such incidents can be dangerous. The cause of a thrown blade varies depending on conditions and tower type. Past occurrences of these incidents have generally been the result of design defects during manufacturing, improper installation, poor maintenance, control system malfunction, or lightning strikes. The distance a blade piece can be thrown from a turbine depends on its mass, shape, speed at the time it breaks from the machine, the orientation of the blade at the time of the throw, and the prevailing wind speed. Evidence suggests that the most common cause of blade failure is human error in interfacing with control systems. Turbine manufacturers have reduced this risk by limiting human adjustments that can be made in the field. Technological improvements and mandatory safety standards during turbine design, manufacturing, and installation have significantly reduced the instances of blade throw. The reduction in 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.

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 proposed for this Facility are of the highest level and meet all applicable federal, state, and/or local codes. In the design phase, state and local laws require that licensed professional engineers review and approve the structural elements of the turbines. State-of-the-art braking systems, pitch controls, sensors, and speed controls on wind turbines have greatly reduced the risk of blade throw. The wind turbines proposed 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. In addition, the turbines will automatically shut down at wind speeds over the manufacturer's threshold of 20m/s (44.7 mph) for the Nordex N117. As described above, the turbines will also cease operation if significant vibrations or rotor blade stress is sensed by the monitoring systems. See Exhibit M for additional information on the monitoring systems. See Section 4906-17-05(A)(5)(b) of this Application for additional information regarding structural integrity as it relates to wind speeds.

Publicly available information on wind turbine blade throw due to rotor failures is severely limited. In 2007, Garrad Hassan was contracted by the Canadian Wind Energy Association (CanWEA) to provide a literature review of such events. Their report indicated that full or partial rotor failures leading to blade throw events are extremely rare. Most information came from a Dutch Handbook which covers turbine operation from Denmark and Germany during the years 1980-2001. Maximum reported throw distances were reported to be 150m for an entire blade, and 500m for a blade fragment.

The distance from each proposed turbine location to the nearest participating and non-participating landowner property boundary is presented in Exhibit X, Table 4-2. Proposed turbine locations 11 and 25 are located within 164 meters of a property boundary adjoining a non-participating landowner. However, the distance from turbines 11 and 25 to the nearest non-participating dwelling are 702 meters and 685 meters respectively. Both the property boundary and dwelling distances of non-participating landowners exceed the maximum reported throw distances of 150m (entire blade) and 500m (blade fragment). Proposed turbine locations 6 and 13 are located nearest to a property boundary adjoining a participating landowner at a distance of less than one meter. However, at each of these proposed locations, the same participating landowner owns both the parcel where the proposed turbine is to be located and the adjoining land parcel. Participating landowners will not be at a significantly greater risk of blade throw, as the 1,312 feet (400 meters) self-imposed minimum Project setback of any occupied dwelling exceeds the maximum throw distance of 492 feet (150 meters).

As shown in Exhibit X, Table 4-2, the potential impact at neighboring property boundaries is negligible. The Project setback distances between turbine sites and permanent residences (minimum of 400 meters/1,312.34 feet) and property lines (164.2 meters/538.71 feet) are intended to protect the public from the already minimal risk of blade throw. The Facility will utilize fencing, signage, and public outreach efforts to discourage unauthorized access to the Project Area site. While the operations staff working in and around the turbines may be at risk, the staff will be properly trained to recognize the potential for blade throw and to follow specific protocols when such conditions exist.

In the event of a blade thrown incident, the Applicant will have site specific safety procedures in place. These procedures will include: emergency shutdown procedures; post-event site security measures; immediate notification of the event to state and local officials; and the implementation of manufacturer specific safety precautions. In addition, the Applicant will conduct annual training for

company personnel, as well as local first responders on the procedures to be implemented in the event of such an incident.

(6) Shadow Flicker

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 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 10 rotor diameters (maximum of 1,170 meters [3,838 feet] for this Facility), shadow flicker effects are essentially undetectable (DECC, 2011). This is because shadow flicker intensity diminishes as the distance between receptors and turbines increases.

There is some public concern that flickering light can have negative health effects, such as triggering seizures in people with epilepsy. According to the British Epilepsy Association (2007), approximately 5% of individuals with epilepsy have sensitivity to light. Most people with photosensitive epilepsy are sensitive to flickering around 16-25 hertz (Hz, or flashes per second), although some people may be sensitive to rates as low as 3 Hz and as high as 60Hz. Modern wind turbines are usually built to operate at a frequency of 1 Hz or less. There is no evidence that operating turbines at this frequency can trigger seizures (British Epilepsy Association, 2012).

Although setback distances of 1,300 feet (400 meters) established by the Applicant for siting turbines will significantly reduce shadow flicker impacts to homes within the Study Area, some limited impact will occur. With respect to regulatory thresholds, no national, state, county, or local standards exist for allowable frequency or duration of shadow flicker from wind turbines at the proposed Facility site. However, standards developed by some states and countries provide guidance in this regard. The Ohio Power Siting Board has

used 30 annual hours of shadow flicker as a threshold of acceptability in reviewing and approving commercial wind power projects. International guidelines from Europe have suggested 30 hours of shadow flicker per year as the threshold of significant impact, or the point at which shadow flicker is commonly perceived as an annoyance (DECC, 2011). Accordingly, a threshold of 30 shadow flicker hours per year was applied to the analysis of the proposed Greenwich Wind Farm to identify any potentially significant impacts on area residences.

Windlab Systems Pty Ltd (2013d) conducted a shadow flicker analysis for the Facility, attached hereto as Exhibit P. The study evaluated the Nordex N117 2.4 turbine with respect to shadow flicker. To calculate potential shadow flicker impacts, Windlab utilized a computer modeling software package based on the following data:

- Proposed turbine coordinates
- Elevations (AMSL) of proposed turbine locations;
- Shadow receptor/structure coordinates
- Turbine specifications (height, rotor diameter, cut-in wind speeds, etc.)
- Joint wind speed and direction frequency distribution
- Monthly sunshine probabilities
- Annual wind rose data

The model calculation includes the cumulative sum of shadow hours for all 25 proposed turbine sites. This omni-directional approach reports total shadow flicker results at a receptor, regardless of the presence or orientation of windows and doors at the receptor 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 the model is defined as a one dimensional point, located two meters above ground level; the actual dimensions of the house are not taken into consideration. A total of 298 structures within 1,170 meters (10 rotor diameters) of the nearest wind turbine were identified and analyzed. Worst case scenarios were evaluated

in the model. The worst case analysis accounted for turbine operation hours and wind characteristics, as well as local sunshine probabilities during the calculations. However, these results did not factor for blocking or shading effects from terrain, vegetation or building structures. Furthermore, the model "double counts" flicker duration in instances where two or more turbines are simultaneously causing flicker to occur at one receptor point. As a result, the predicted duration of flicker provided under this model are considered conservative (over-estimated) of the degree of shadow flicker that is expected to occur once the Project is constructed (Windlab, 2013d).

Based on the shadow-flicker analysis, a total of seven residential structures are predicted to exceed the 30-hour annual threshold. Of these seven homes, three only slightly exceed the 30-hour threshold (by less than 5 hours annually); all three are non-participating residential structures. Results of the shadow flicker analysis are summarized below in Table 08-5.

Table 08-5. Structures Exceeding 30 Hours of Shadow Flicker Per Year

Structure ID #	Project Status	Predicted Shadow Flicker [hr/yr]	Turbines Contributing Shadow Flicker
272	Participating	63	17, 18, 20, 21
39	Non-Participating	42.6	19, 21, 22
273	Participating	41.4	1, 6
277	Non-Participating	41	11, 13
241	Non-Participating	34.7	15
38	Non-Participating	34	19, 21 ,22
37	Non-Participating	31.1	19, 21, 22

Source: Windlab Systems Pty Ltd, 2013d.

Although shadow flicker at these seven structures exceeds the normal 30-hour per year threshold, as noted above, these calculations do not take into account

site-specific conditions. Therefore, the above stated results are expected to be an over-prediction of the actual impacts that will occur, and the actual number of cumulative hours for each receptor would be lower than estimated. To more accurately gauge the realistic amount of shadow flicker a particular receptor will receive, the following steps were undertaken to refine the shadow flicker analysis of the Greenwich Wind Farm:

1. Site reconnaissance was performed on March 26, 2013 and July 19, 2013 at each of the residential receptors predicted to receive greater than 30 hours of shadow flicker per year under the worst case analysis. Photographs were taken to document any obstacles that may block a receptor from receiving shadow flicker.
2. The photos were then compared to a geometrically corrected aerial view photograph of the site to determine the actual location of each obstacle with respect to nearby receptors and the wind turbines.
3. Obstacles were analyzed to extrapolate how they may mitigate the impact of shadow flicker on the surrounding receptors.

As shown in Figures 4-1 through 4-41 in Exhibit P, consideration of site-specific conditions appears to reduce anticipated shadow flicker for three of the analyzed structures. Of the remaining four homes that remain in excess of the threshold, two are landowners participating in the project who are receiving monetary compensation; two are non-participating structures.

If necessary, shadow flicker minimization measures, including screening such as vegetative planting or window treatments and/or curtailment of operation during select times, will be utilized so that no non-participating receptors are exposed to more than 30 hours of shadow flicker annually.

OAC Rule 4906-17-08(A)(6) requires the Applicant to “evaluate and describe the potential impact from shadow flicker at adjacent residential structures and primary roads…” With respect to primary roads, Figure A-3 in Exhibit P,

Appendix 4 utilizes data generated during the initial conservative analysis without obstacles, and depicts the expected shadow flicker at all areas (including roads) in the vicinity of the proposed Facility. However, the model results presented in Exhibit P assume a stationary object, which remains fixed 24 hours per day, 365 days per year. Therefore, as primary road users are mobile, typically traveling in motorized vehicles at a relatively high rate of speed, any Facility-related flicker experienced would be a fraction of that experienced by a stationary object. Furthermore, most vehicle operators and passengers are already accustomed to shadow flicker experienced while driving, as shadows cast from nearby objects (e.g., trees, roadside/overhead signage, etc.) will "flicker" across the windows of a moving vehicle (Windlab, 2013d).

(B) ECOLOGICAL IMPACT

(1) Project Site Information

In support of the preparation of this Application, environmental consultants from various firms have made numerous site visits to the Project Area, with extensive on-site ecological surveys conducted during multiple growing seasons. Ecology and Environment, Inc. (E&E) prepared a desktop Surface Waters and Ecological Communities Report (attached hereto as Exhibit H), the purpose of which was to provide a surface water delineation of Facility locations including turbines, access roads, and electrical interconnect lines and to describe the ecological communities adjacent to the Facility, and to describe the approach that will be used by the Applicant to comply with applicable environmental rules and regulations. Windlab Developments USA Ltd. prepared a Wetland Delineation Report (attached hereto as Exhibit W), the purpose of which was to provide a wetland delineation of Facility locations including turbines, access roads, and electrical interconnect lines, and to describe the approach that will be used by the Applicant to comply with applicable environmental rules and regulations.

In addition, Stantec performed numerous bird and bat surveys in the vicinity of and within the Project Area. Pre-construction assessments began in 2011 when

Stantec conducted nocturnal radar, raptor migration, and bat acoustic surveys. To further characterize bird and bat activity, Stantec conducted bat mist-netting, acoustic bat, diurnal raptor, breeding bird, passerine migration, and owl playback surveys in 2011 and 2012. The protocols for these studies were developed based on best management practices, extensive coordination with the ODNR and the U.S. Fish and Wildlife Service (USFWS) and were refined based on meetings with the ODNR and the USFWS. The results of the bird and bat surveys conducted by Stantec are attached as follows:

- Summer 2011 Indiana bat survey and inventory of bat species;
- Fall 2011 diurnal bird/raptor migration survey;
- Fall 2011 passerine migration survey;
- Winter 2012 owl surveys;
- 2012 raptor nest searches;
- 2012 bald eagle nest monitoring and summer activity monitoring;
- 2012 bat acoustic monitoring;
- Spring 2012 diurnal bird/raptor migration survey; and
- Spring 2012 passerine migration survey.

(a) *Facility Mapping*

Figure 08-1 shows the Facility and lands within a 0.5-mile radius of the proposed Facility. This mapping was developed from 2011 NAIP aerial imagery. Among other information, Figure 08-1 shows the following features:

(i) The proposed Project area boundary

(ii) Undeveloped or abandoned land such as wood lots, wetlands, or vacant fields.

(iii) Recreational areas, including parks, wildlife areas, nature preserves, and other conservation areas.

(b) *Vegetative Survey*

E & E (2013) assessed the ecological communities present within the Project area and surrounding 0.5 mile radius, and compiled a catalog of species for these communities. The desktop review was conducted utilizing spatial data from the United States Environmental Protection Agency (EPA), National Land Cover Database (NLCD) 2006 dataset, and the United States Geological Survey (USGS) National Gap Analysis Program (GAP). In addition, topographic maps, aerial photography, and available National Wetland Inventory (NWI) and Ohio Wetland Inventory (OWI) data were used to support this effort. The natural areas (i.e., wood lots, wetlands, and vacant fields) within the boundary of the Project area and the 0.5-mile buffer were used to categorize the ecological environment.

<u>Vegetation Identified:</u> As defined by the USGS GAP Analysis program, the forests occurring within this area are classified as eastern Northern American cool temperate forest and are almost entirely composed of four major types including: (1) central mesophytic hardwood forest, (2) central oak-hardwood and pine forest, (3) northern mesic hardwood and conifer forest, and (4) northern and central swamp forest. The central mesophytic hardwood forest type is the most dominant forest macrogroup, representing approximately 14% (1,753 acres) of the total land cover in the Project area and surrounding 0.5 mile buffer and is represented by North-Central Interior Beech-Maple Forest community. Central oak-

hardwood pine forest type comprises roughly 3% (416 acres) of the Project area land cover and surrounding 0.5 mile buffer and is characterized by both North-Central Interior Dry-Mesic Oak Forest and Woodland and Northeastern Interior Dry-Mesic Oak Forest communities. Northern mesic hardwood and conifer forest type also comprises approximately 3% (349 acres) of the habitat in the Project area and 0.5 mile buffer, and is represented by an Appalachian Hemlock-Hardwood Forest community. Northern and central swamp forest represent only roughly 0.5% (76 acres) of the total land cover of the Project area and surrounding 0.5 mile buffer. This forest type is represented by the North-Central Interior Wet Flatwood forest community and North-Central Interior and Appalachian Rich Swamp. These dominant forest communities, which represent the natural community and habitat present within the Project area and surrounding 0.5 mile buffer area, are discussed in more detail below.

The North-Central Interior Beach-Maple Forest community type comprises approximately 14.2% of the area within 0.50 mile of the Facility boundary. North-Central Interior Beach-Maple Forests are typically found on flat to rolling uplands with rich loam soils formed from glacial till, rich loam soils produce prime farming conditions and as a result this forest size has been reduced by agricultural conversion. North-Central Interior Dry-Mesic Oak Forest and Woodland community type comprises approximately 2.6% of the area within 0.5 mile of the Facility boundary. This community type is found on gently rolling terrain near floodplains with a dense shrub layer. Northeastern Interior Dry-Mesic Oak Forest comprises approximately 0.8% of the area within 0.5 mile of the Facility boundary. Northeastern Interior Dry-Mesic Oak Forest is dominated by oak species, located on low to mid elevations of flat to rolling topography. Appalachian Hemlock-Hardwood Forest occurs on low to mid slopes and valley bottoms with an intermediate moisture regime, and comprises approximately 2.8% of the

area within 0.5 mile of the facility boundary. North-Central Interior and Appalachian Rich Swamp comprise of approximately 0.4% of the area within 0.5 mile of the facility boundary. This community type is a hardwood or mixed ecosystem located within a swamp area, the understory is a diverse combination of species. North-Central Interior Wet Flatwood is a hardwood forest of upland and wetland flora occurring in poorly drained depressions. This community type comprises approximately 0.2% of the area within 0.5 mile of the facility boundary.

Cultivated cropland, pasture and hayfields, open water, and developed open-space represent approximately 78% of the study area evaluated by E&E. Forested communities collectively representing 21% of the total land cover of this area. The remaining 1% of the land cover is composed of Allegheny-Cumberland Dry Oak Forest and Woodland-Hardwood, Ruderal forest, Central Interior and Appalachian Floodplain, Riparian, and Shrub-Herbaceous Wetland systems and Central Appalachian Pine-Oak Rocky Woodland. They are found in very small pockets, often less than 0.5 acres in size. All of these systems, with the exception of Central Appalachian Pine-Oak Rocky Woodland and Allegheny-Cumberland Dry Oak Forest and Woodland – Hardwood are associated with wetland ecosystems. In general these wetland communities are found along riparian corridors and in small and isolated depressions and pockets throughout the Project area.

Vegetation Impacted: Most land disturbance during construction of the Project will be to cultivated cropland; approximately 177.3 acres, or 84%, of the 212.2 acre temporary disturbance from construction of the Project will be to cultivated agricultural land. Of the temporary cultivated cropland land impact, only 24.9 acres of cultivated agricultural land will be permanently impacted by the Project. The permanent impact results from areas which will be converted for the foundations of turbine pads, access

roads, the operations and maintenance (O&M) building, and the Project substation (E & E, 2013).

The remaining impacts during construction will be to pasture and hayfields, forested communities, and developed areas. The clearing of forestland and pasture and hayfields communities has been minimized to the greatest extent practical in the development of the design of the Project. Construction will result in a localized temporary reduction in the amount of 11 acres of forested land. Specifically, approximately 6.2 acres of North-Central Interior Beech-Maple forest; 3.5 acres of Appalachian Hemlock-Hardwood Forest; 0.8 acres of North-Central Interior Dry-Mesic Oak Forest and Woodland; 0.4 acres of Northeastern Interior Dry-Mesic Oak Forest; and 0.1 acres of Central Appalachian Pine-Oak Rocky Woodland will be impacted from the construction of the Project. Nearly all of the forested impacts will be allowed to regenerate or will be replanted after construction, as only 1.6 acres of permanent forested impact are anticipated. The reduction in the amount of forested habitat as a result of the Project is minor in comparison with the overall acreage of forestland located in the Project area.

Approximately 18.1 acres of pasture and hayfield will be temporarily impacted from the construction of the Project, while only 0.6 acres will be permanently impacted. Wetlands delineated within the Project area will be temporarily impacted by the construction of the Project. The construction of access roads, collection lines, and crane paths will result in a total potential temporary wetland impact of approximately 0.5 acres. The permanent impact from access roads to wetlands is only expected to be approximately 0.1 acres (E & E, 2013).

(c) *Animal Life Survey*

Based upon a project boundary map submitted to the Ohio Department of Natural Resources on May 20, 2011, ODNR prepared a list of

recommended environmental surveys to the Applicant in their letter dated May 21, 2011 (refer to Exhibit V). Subsequently, the Applicant revised and resubmitted the project boundary map on March 16, 2012; ODNR revised their survey recommendations, which were outlined in their letter dated March 26, 2012 (see Exhibit V). In accordance with the ODNR recommendations for conducting wildlife surveys, Windlab retained Stantec to conduct numerous avian and bat studies throughout the Project Area and surrounding area (see Exhibits I, J, and K). Animal resources in the vicinity of the Project Area were also identified through analysis of existing data sources. These various sources of information have been synthesized and are presented below for birds and mammals.

Birds

This section summarizes available information regarding avian use of the Project Area and surrounding areas, based on review of existing data and studies conducted on-site.

Breeding Birds: The Ohio Department of Natural Resources requires that breeding bird surveys be conducted for all sites, with the actual number of survey points being calculated on twice the maximum number of turbines proposed for the site. However, because agricultural land is not considered to be suitable nesting habitat for most species of birds, turbines places within these types of habitat are exempt of this recommendation. As illustrated by the proposed turbine layout (Figure 05-4), all twenty-five proposed wind turbine generators are located in agricultural land; therefore, it is anticipated that ODNR will waive this requirement. Nevertheless, extensive bird migration and species activity studies were conducted by Stantec in 2011 and 2012. Results of both the passerine migration and diurnal bird migration studies are discussed in detail below.

Passerine Migration: The Passerine Migration Survey was conducted to provide an indication of the amount of migratory songbird activity that occurs within the Project Area during spring and fall migrations. This survey was used to characterize the spring and fall songbird migration and to identify any federally or state listed species within the Project Area. The survey targets songbirds actively using the Project area as migratory stopover habitat during the spring and fall migratory seasons.

The fall surveys were conducted between August 18, 2011 and November 11, 2011 and included eight survey points, based on consultation with ODNR. In the spring of 2012, the number of survey points was increased from four (which was initially established with ODNR) to five to account for the size of the southwestern wood lot in the Project Area. The spring migratory surveys were conducted between April 27, 2012 and May 25, 2012. A figure depicting the survey points and their distribution throughout the Project area is provided in the 2012 Avian Survey Report, Appendix B of Exhibit J.

The passerine migration survey consisted of a point-count style survey to characterize the usage of the Project Area by passerine birds during migration. Survey points were determined based on habitat type, distribution throughout the Project Area, and field reconnaissance. Forest/Ag, Forest/Fallow, Forest/Wet, and interior habitats were surveyed as a means of best representing the different habitat types present within the Project Area. The selection of survey points reflects the diversity of habitat within the Project Area, not necessarily the habitat types that will predominately be affected by the construction and operation of the Project. As a result, the avian surveys may over-represent the abundance and diversity of birds using the agricultural areas that will comprise approximately 62.8% of the impacted area. Survey points were established along state and county roadsides. Observers trained visual and auditory bird identification documented all species seen and heard

within a 10-minute listening period at each of the points. Surveys were conducted from dawn to 10:00AM.

Fall 2011

A total of 1,157 birds, representing 11 species, were observed at the eight survey points during the fall 2011 migratory season. The Ring-Billed Gull (*Larus delawarensis*), American Robin (*Turdus migratorius*), Blue Jay (*Cyanocitta cristata*), and Red-Winged Blackbird (*Agelaius phoeniceus*) were the most commonly observed species. There were no state or federally listed endangered or threatened species observed during the 2011 fall migration point count surveys. However, six Dark-eyed Junco (state threatened) were observed incidentally between point-counts. Two species of concern were documented during surveys; one Northern Bobwhite was heard, and one Sharp-shinned hawk was heard. Surveys also documented three species of special interest; Brown Creeper, Golden-crowned Kinglet, and Winter Wren.

Spring 2012

During the spring 2012 migratory season, a total of 675 birds, representing 61 different species, were counted at the 5 survey points within the Project Area. The American Goldfinch (*Carduelis tristis*), Northern Cardinal (*Cardinalis cardinalis*), Brown-headed Cowbird (*Molothrus ater*), Tufted Titmouse (*Baeolophus bicolor*), Wood Thrush (*Hylocichla mustelina*), and Black-capped Chickadee (*Poecile atricapillus*) were the most commonly observed species, comprising 36% of all birds seen. There were no state or federally listed endangered or threatened species observed during the 2012 spring migration point count surveys. However, one state species of concern, a yellow-bellied sapsucker was documented during surveys. Surveys also documented one state species of special interest, a single purple finch. Three additional state species of special interest were documented as incidental observations: hermit thrush, blackburnian warbler, and least flycatcher.

The results of the spring and fall passerine migratory surveys indicate that the species observed in the Project Area during migration are not surprising, nor do any present a major concern. All documented species are generally common and regionally abundant, and are representative of the habitats in which they were observed.

Diurnal Bird Migration: Diurnal migration surveys were conducted during the fall of 2011 and spring of 2012 in order to provide an indication of the amount of raptor and waterfowl migratory activity that occurs within the Project Area during spring and fall migrations and to identify any federally or state listed species within the Project Area.

Diurnal bird surveys were conducted from three points in the fall of 2011, and eight survey locations in the spring of 2012. Daylong (9:00 a.m. to 4:00 p.m.) surveys were conducted three days per week, during seasonally favorable weather for avian migration during the fall 2011 study period. Surveys occurred three days per week for one hour at each site starting at 9:00am from the eight points in spring 2012. Observers scanned the sky and surrounding landscape for raptors and waterfowl. Detailed notes, including location and flight path, flight height, activity of the bird, and weather conditions were recorded for each bird observation.

Fall 2011

The fall 2011 diurnal surveys were conducted three days a week between September 7, 2011 and October 25, 2011. A total of 3,526 individual non-raptor birds were observed during the study period. Non-raptors included seven species. The most common species recorded included Ring-billed Gull (33 percent), American Crow (32 percent), and Canada goose (28.67 percent). No federally-listed threatened or endangered species were observed during fall 2011 diurnal surveys in the Project Area.

Spring 2012

The spring 2012 diurnal surveys were conducted three days per week between March 21, 2012 and April 26, 2012. A total of 288 individual non-raptor birds were observed during the study period. Non-raptors totaled nine species. The most common species recorded included the American crow (59 percent) and Canada goose (22 percent). No federally-listed threatened or endangered species were observed during spring 2012 diurnal surveys in the Project Area.

Both the Fall 2011 and Spring 2012 diurnal bird/raptor surveys focused largely on raptors, but other larger diurnal birds were recorded as well. Raptor observations and results are discussed in detail in the following raptor section.

Migrating Raptors: The Facility is located in the north-central portion of the state in the Till Plains Physiographic Region. Elevations in this area range between 177 and 367 meters (m) above sea level. The geologic strata of the Till Plains consist of two similar bedrock formations from the Devonian period. The Lower and Upper Devonian-age rock are generally fragmented sedimentary rocks that are mainly limestone and dolomite with some shale and sandstone (Ohio Division of Geological Survey 1998). The typography surrounding the Facility does not contain any outstanding features that typically concentrate raptors. This is most likely the result of there being only one primary habitat type (cultivated agricultural land) in the Project Area and an almost complete absence of large bodies of water. Stantec conducted diurnal raptor migration surveys during 2011 and 2012 to characterize raptor activity in the vicinity of the Project Area, and to document the level and timing of species activity, diversity, and abundance of the raptor community within the Project area.

Due to the size and breadth of the Project Area, fall 2011 raptor surveys were conducted from three site points within the study area; two located in

the southern portion of the Project area and one located in the northeast corner of the Project area. The observation sites were open and active agricultural lands that offered good view points to the north, south, east and west. The observer scanned the sky continuously from the observation point using binoculars, spotting scope, and/or naked eye. Observations were recorded into data sheets. Detailed notes on each observation were recorded.

In 2011, raptor surveys were conducted on 24 days between September 7 and October 25, 2011, for a total of 168 hours. A total of 87 raptors, representing seven different species were observed during these surveys yielding an overall observation rate of 0.62 birds/hour. Red-tail hawk (N=51) was the most commonly observed species during the on-site raptor migration survey, and accounted for 59% of the observed raptors. American Kestrel was the second most commonly observed species (N=13), accounting for 15% of total observations. Other species observed at low densities include: bald eagle, Cooper's hawk, merlin, sharp-shinned hawk, and northern harrier. Northern Harrier is listed as endangered in the State of Ohio, while the Bald Eagle is listed as threatened and Sharp-shinned hawk is listed as species of concern. No federally-listed threatened or endangered species were observed during the Fall 2011 diurnal bird/raptor migration surveys within the Project area (Stantec, 2012c). Turkey vulture (*Cathartes aura*) observations were separated from raptor observations for purposes of analysis due to the disproportionate number observed. A total of 3,088 individual Turkey Vultures were observed during the survey period.

Flight height of bird observations in relation to proposed turbine height was summarized in two ways. The total number of raptors and the number of each species of raptor flying at three altitude levels was summarized. Finally, numbers of birds traveling in each direction was calculated and graphically represented. Throughout the fall 2011 survey

season, flight height of raptors was visually estimated in three categories: 0-40 m, 40-180 m, and greater than 180 m. Four raptor species were observed flying in the rotor-swept area (40-180 m). These species included Bald Eagle (n=4), Cooper's Hawk (n=2), Red-tailed Hawk (n=13), and Sharp-shinned Hawk (n=1). Flight direction of raptors observed was noted during field observations. Raptors observed in the study area were generally moving in a southerly or south westerly direction. Throughout the survey season, flight height of vultures observed was noted during field observations. Fifty-two percent of Turkey Vultures (n=1601) were observed flying in the rotor-swept area (40-180 m). Flight direction of vultures observed was noted during field observations. Vulture flight heights varied more than those of raptors at the Project Area. In general most vultures were moving in a southern direction.

The southern direction observed during fall 2011 surveys may indicate that some raptors were migrating to warmer climates. Many of the raptors observed in fall were Turkey Vultures, which tend to have varied flight directions. Vultures tend to have a wandering flight and may have detected food in the other directions and, therefore, traveled to feed. In comparison, raptor flight directions showed strong southern movement. During the fall 2011 survey period, fewer raptors were observed in the rotor-swept zone than below it, though some individuals were observed flying above the rotor zone. For Turkey Vultures, the majority of observations were within the rotor zone (Stantec, 2011b).

Initially, during the 2012 surveys, one raptor migration survey point was to be established within the Project Area. However, after the identification of a bald eagle nest less than one mile northeast of the Project Area boundary, USFWS and ODNR recommended that eight survey sites be monitored. Eight survey sites were established. The observer scanned the sky continuously from the observation point using binoculars, spotting

scope, and/or naked eye. Observations were recorded into data sheets. Detailed notes on each observation were recorded.

In 2012, raptor surveys were conducted on 17 days (136 hours) between March 21 and April 26. A total of 135 raptors, representing seven different species were observed in the spring surveys yielding, an overall observation rate of 0.99 birds/hour. The Red-tail hawk (N=96, 71%) was the most commonly observed species during the spring migration survey. American Kestrel was the second most commonly observed raptor species (N=13), accounting for 10% of total observations in the spring. Other species observed at low densities in 2012 include: bald eagle, Cooper's hawk, northern harrier, red-shouldered hawk, and the sharp-shinned hawk. Northern Harrier is listed as endangered in the State of Ohio, while the Sharp-shinned hawk is listed as a species of concern. No federally-listed endangered or threatened species were observed during the spring 2012 surveys within the Project area (Stantec, 2012c). Turkey Vulture (*Cathartes aura*) observations were separated from raptor observations for purposes of analysis due to the disproportionate number observed. A total of 1,013 individual Turkey Vultures were observed during the survey period.

Flight height of bird observations in relation to proposed turbine height was summarized in two ways. The total number of raptors and the number of each species of raptor flying at three altitude levels was summarized. Finally, numbers of birds traveling in each direction was calculated and graphically represented. Throughout the spring survey season, flight height of raptors was visually estimated in three categories: 0-40 m, 40-180 m, and greater than 180 m. Four raptor species were observed flying in the rotor-swept area (40-180 m). These species included bald eagle (n=2), Cooper's Hawk (n=4), red-tailed hawk (n=13), and sharp-shinned hawk (n=75).

Flight direction of raptors observed was noted during field observations. Raptors observed in the study area were generally moving in a westerly or north-easterly direction. Throughout the survey season, flight height of vultures observed was noted during field observations. Seventy-two percent of Turkey Vultures (n=728) were observed flying in the rotor-swept area (40-180 m). Flight direction of vultures observed was noted during field observations. Vulture flight heights varied more than those of raptors within the study area. In general most vultures were moving in north-westerly direction.

The northern direction observed during spring 2012 surveys may indicate that some raptors were migrating to their summer breeding grounds. Many of the raptors observed in spring were turkey vultures, which tend to have varied flight directions. Due to the addition of five points to the previous year's three points (to cover bald eagle survey requirements), many of the vulture observations are likely individuals previously observed at other surveys points in a given day. Vultures tend to have a wandering flight pattern and may have detected food in the other directions and, therefore, traveled to feed. In comparison, the raptor only flight directions showed average northern movement. During the spring survey period, more raptors were observed in the rotor-swept zone than below it, though some individuals were observed flying above the rotor-swept zone. For Turkey Vultures, the majority of observations were also within the rotor-swept zone (Stantec, 2012c).

Raptor Nest Searches & Nest Monitoring: Raptor nest surveys were conducted on March 13, 14, and 15, 2012 within the Project Area and a 1-mile buffer of the Project Area. The raptor survey included a windshield survey using binoculars, spotting scopes, and other resources in order to view into woodlots within the Project Area. The raptor nest searches were conducted within those leaseholder properties (within the Project Area) where access was granted and was conducted from publicly accessible

roads within the 1-mile vicinity of the Project Area. No state or federally listed raptor nests were observed within the Project area; there are no known protected nesting raptors within the Project area. One bald eagle nest was identified outside the northeastern Project boundary. A more detailed discussion regarding bald eagles and nest monitoring is presented in the paragraphs below.

Bald Eagle Nest Monitoring: On March 13, 2012 a bald eagle nest was located outside of the Project area, but within one mile of the northeastern project boundary. Local residents indicated that the nest was originally established in 2011. Upon identification of the nest, WindLab and Stantec notified both USFWS and ODNR of its presence. Both the ODNR and USFWS requested that nest monitoring be conducted to get a better understanding of the activity patterns of both the adults and fledglings and how they interact inside the project boundaries.

Nest and activity monitoring methods were developed and approved in coordination with ODNR and USFWS. As recommended by ODNR's March 26, 2012 letter of effort, the eagle's nest was monitored twice weekly for four hours each day in effort to establish patterns of use within the Project Area. Surveys were conducted visually or with the aid of binoculars from the opposite side of the small lake from the nest tree. When adults would leave the nest the surveyor would attempt to follow their flight path via roadway.

In an effort to estimate the Project risk to eagles, surveys were also conducted to document spatial and temporal use of the Project Area. Eight survey locations were established throughout the Project Area. These points were monitored twice monthly from May to September 2012 to assess usage of the Project Area during summer months. Surveys were conducted for an hour at each location daily. Nest monitoring began on April 6, 2012 and was conducted for a total of 18 days from April 6 to

June 5. A minimum of 72 hours were spent directly monitoring the bald eagle nest; however, additional uncounted hours were spent attempting to follow adults as well as periodic “checks” of the nest during other project survey efforts.

One eagle (presumed female based on relative time spent on nest) spent the majority of time near the nest. This eagle rarely left the nest and was presumed to be incubating eggs until the last hatched or brooding young. It was not until April 12, 2012 that this bird was observed leaving the vicinity of the nest. During this time, the second adult (presumed male) was rarely observed at the nest location. When this eagle returned it was often observed bringing fish to the nest. When the eagles left the nest site, either individually or together, they were most often observed flying north and east from the nest.

The breeding pair of eagles successfully hatched two chicks. The chicks were first directly observed on April 12. On April 27, the eaglets’ down feathers appeared to be gone and one of the juveniles was standing in the nest with wings raised. By May 2, the juveniles appeared to be nearly half the size of an adult and were observed exercising their wings often. On May 29, the juveniles were seen perching on the rim of the nest. The two juveniles were not observed fledging the nest. Local residents indicated that they had seen both in other trees near the nest. On April 8 and 27, a bald eagle sub-adult (i.e. after hatch year bird) was observed at the nest site. On the first occasion, the sub-adult flew into the vicinity of the lake, circled three times and perched throughout the rest of the monitoring event. On the second occasion, a sub-adult was seen circling over the nest site with both adult eagles. The three eagles circled together from 90 – 120 m in height for 45 minutes before the sub-adult and one adult departed to the east-northeast. It is likely, but not certain, that this bird was the same bird observed previously. There were two documented observations of the nesting eagles entering the Project Area. The first

observation was on May 2 when the nesting pair entered the northeast corner of the Project Area. Both eagles left the nest site at approximately the same time and flew directly south making a few low-level circles (approximately 10 – 15 m above ground) before settling on the railroad tracks just east of the intersection with Alpha Road. After feeding for a time on an opossum (*Diadelphis virginiana*) carcass, the eagles returned directly north to the nest site.

Based on observations and reports of bald eagles foraging at New London Reservoir and the observations of large fish prey delivery observed at the nest, it appears that the majority of the breeding pair's diet comes from larger aquatic habitats. This is consistent with Buehler's (2000) assertion that ideal nesting sites often occur within two km of ample water/fish resources. There are no large water features within the Project Area. Small yard ponds and drainage ditches limit the amount of food availability for raising young. This is the most obvious reason for the observations of these nesting eagles foraging on fish from New London Reservoir. It is expected that these eagles foraged along larger portions of rivers and other large water sources outside of the Project Area (Stantec, 2012c).

Bald Eagles: Low numbers of migrating eagles were observed during pre-construction surveys. A total of five bald eagle observations were recorded during the fall 2011 raptor migration survey period. Single sightings occurred on September 8, October 20 and October 22. Two Bald Eagles were observed on October 23 at point 1. Observations of Bald Eagles for which age could be determined were: 3 adults, 1 SA-III and 1 juvenile. Only one Bald Eagle observation occurred outside of the Project Area. Observations of four Bald Eagles within the Project Area noted three flew at heights between 40 and 180 m, with the fourth flying below 40 m. Four of the five observations of Bald Eagles were suspected to be actively migrating. No federally-listed threatened or endangered species were observed during the Fall 2011 diurnal bird/raptor migration

surveys within the Project Area (Stantec, 2011b). A total of two bald eagles were observed in the Project Area during the spring and summer 2012 surveys. No adult bald eagles were observed, only sub-adults. No federally-listed endangered or threatened species were observed during the 2012 surveys within the Project Area (Stantec, 2012c).

In Ohio, spring migration occurs between late February and mid-April, with peak migration occurring between February 20 and March 20, and a second peak during May (Peterjohn, 1987). The bald eagle observations during the spring 2012 Diurnal Bird/Raptor Migration Survey fell within the known migration dates, and very near to the peak. Bald Eagles observed during this spring survey were sub-adults or juveniles and were likely migrants based on migration times and their pre-breeding maturity status (i.e. not having achieved adult plumage).

Given that observations indicated that the adults primarily used large reservoirs to the northeast of the project area and rarely entered the Project Area, there is low potential for harm to breeding or nesting eagles as a result of the Project. Should new information regarding eagle use of the Project Area become available, the Applicant will work with USFWS and ODNR to determine if potential risk exists (Stantec, 2012c).

Recent post-construction monitoring studies at wind facilities (other than the Altamont Pass Wind Resource Area, CA) indicate that mortalities of eagles are very low. The Applicant has designed the project to avoid or minimize impacts to eagles. Collector lines will be buried where feasible, which will minimize the potential risk of electrocution and collision to eagles and other birds. Above-ground collector lines will be equipped with insulated and shielded wire to avoid electrocution of eagles and other birds. Measures will be implemented to avoid and reduce scavenging opportunities for raptors and eagles around the turbine locations.

Owls: In accordance with ODNR protocols, owl playback surveys were conducted once for each potentially occurring species for a total of three surveys; one survey for great horned owls (*Bubo virginianus*), one for barred owls (*Strix varia*), and one for the Eastern screech owls (*Otus asio*). Per ODNR guidelines, playback surveys were required at 4 locations within the study area (one point per 100 hectare forest block). Owl-play back surveys were conducted and occurred on January 30, 2012 for great-horned owl; February 28, 2012 for barred owl; and March 14, 2012 for eastern screech owl. Surveys were recorded as north and south survey locations. Survey date and start times were recorded. Weather conditions were also recorded for each location.

There were few responses to the playback calls of target species during surveys. The only response, not obtained during target month, was the great horned owl. No other species of owl were heard or observed during the survey period. Survey results indicate that there is likely a great horned owl nest somewhere in the vicinity of the North woodlot survey location. However, no nests were observed or located during survey efforts in either the North or South woodlots or while walking to the survey location. This species is very common throughout Ohio and in agricultural landscapes (Peterjohn, 2001). The presence of great horned owls in the vicinity of the Project Area is likely the reason why no barred owls were heard or observed at either survey location. Peterjohn (2001) states that barred owls are unable to compete with great horned owls for both nesting sites and territory. The absence of the eastern screech owl is likely due to limited nest cavity locations. While the North woodlot had a variety of aged trees with a generally open subcanopy, few cavities were observed. The South woodlot was younger and denser. Few trees larger than 25 centimeters (cm) were observed and no cavities were observed during owl playback surveys or previous year 2011 surveys (Stantec, 2012c).

Mammals

This section summarizes available information regarding mammal use of the Project Area and surrounding areas, based on review of existing data, studies conducted on-site and recommended ODNR wildlife surveys.

Bats: To characterize and document bat activity in the vicinity of the Project Area, Stantec conducted filed surveys during the summer of 2011, and in the spring, summer, and fall of 2012. The spring and fall surveys were designed to document migratory bat activity patterns in the vicinity of the Project Area, while the summer survey was designed to document bat activity in the vicinity of the Project Area during the maternity season. Bat echolocation calls were recorded through the use of 2 stationary Ananbat acoustic detectors. Although the habitat surrounding the sample sites was mostly open agricultural fields adjacent to small pockets of hardwood forest, stands of tree line were generally within 160 meters.

Bat Acoustical Survey

Bat call sequences were individually marked and categorized by species group, or "guild" based on visual comparison to reference calls. Qualitative visual comparison of recorded call sequences of sufficient length to reference libraries of bat calls allows for relatively accurate identification of bat species (O'Farrell et al. 1999, O'Farrell and Gannon 1999). Call sequences were classified to species whenever possible, based on criteria developed from review of reference calls collected by Chris Corben, the developer of the Anabat system, as well as other bat researchers. However, due to similarity of call signatures between several species, all classified calls have been categorized into five guilds reflecting the bat community in the region of the Project Area and are as follows:

- **Myotis (MYSP)** – All bats of the genus *Myotis*. While there are some general characteristics believed to be distinctive for several of the species in this genus, these characteristics do not occur consistently

enough for any one species to be relied upon at all times when using Anabat recordings. To be conservative, Stantec (2011a) did not attempt to differentiate among species within this genus.

- **Eastern red bat/tri-colored bat2 (RBTB)** – Eastern red bats and tri-colored bats. These two species produce calls distinctive to each species. However, significant overlap in the call pulse shape, frequency range, and slope can occur. Evening bats are rare in Ohio and only are found in the mid and southern part of the state. Though unlikely, if evening bat calls were recorded, the calls were categorized as RBTB due to the similarity between their call characteristics and those of eastern red bats.

- **Big brown bat/silver-haired bat (BBSH)** – Big brown and silver-haired bats. These species' call signatures are often difficult to distinguish and have therefore been included as one guild in this report.

- **Hoary bat (HB)** – Hoary bats. Calls of hoary bats can usually be distinguished from those of big brown and silver-haired bats by minimum frequency extending below 20 kHz or by calls varying widely in minimum frequency across a sequence.

- **Unknown (UNKN)** – All call sequences with less than five calls, or poor quality sequences (those with indistinct call characteristics or overwhelming background static). These sequences were further identified as either "high frequency unknown" (HFUN) for sequences with a minimum frequency above 30 to 35 kilohertz (kHz), or "low frequency unknown" (LFUN) for sequences with a minimum frequency below 30 to 35 kHz. For this area, HFUN most likely represents eastern red bats, tri-colored bats and *Myotis* species since these species typically produce ultrasound sequences of more than 30 kHz.

Big-eared bats are rare in Ohio and documented from the southern part of the state. Though unlikely, if big-eared bat calls were recorded, the calls were either identified to species or categorized as HFUN as they typically produce ultrasound sequences of more than 30 kHz. Big brown, silver-haired and hoary bats would be the species in this area typically producing ultrasound sequences of less than 30 kHz (LFUN).

This method of guild identification represents a conservative approach to bat call identification. Since some species sometimes produce calls unique only to that species, all calls were identified to the lowest possible taxonomic level before being grouped into the listed guilds (Stantec, 2011a).

The 2012 survey was conducted from March 14 to November 15. Detectors operated successfully for the entire survey period, with valid data collected by each detector for 100 percent of 247 sampled nights (494 detector-nights). To understand the seasonal difference in activity levels, species composition, and use of the Project Area, results were reported separately for the spring migratory, summer residency, and fall migration periods. For the purpose of the report, the spring season was March 14 through May 31, summer season was June 1 through July 31, and fall season was August 1 through November 15.

During the sampling period, a total of 2,553 bat call sequences were detected and recorded resulting in a combined detection rate of 2.4 calls/detector-night in spring, a combined detection rate of 11.4 calls/detector-night in summer, and a combined detection rate of 3.8 calls/detector-night in fall.

Of the calls that could be identified to species or guild in the 2012 survey, in spring, the greatest number of calls were identified as calls from the low frequency unknown (LFUN) guild (n=91; 24%) and the BBSH guild (n=89;

23%). In summer, the greatest number of calls were identified as LFUN (n=372; 27%). Of those calls that could be identified to species or guild, calls from hoary bats (HB) contained the highest number of call sequences (n=253; 18%) identified to species. In fall, the greatest number of calls were identified as high frequency unknown (HFUN) (n=273; 35%) and the BBSH guild (n=153; 40%). Bat sequences identifiable to species were recorded for big brown bat, silver-haired bat, hoary bat, myotis species, red bat, and tri-colored bat (Stantec, 2012d).

Bat Mist Netting Survey

During the summer of 2011, Stantec (2011a) conducted a bat mist-netting survey to further characterize activity of bats in the vicinity of the proposed Facility. Mist-netting surveys were completed between June 15 and July 31, 2011. One hundred and two bats representing five species were captured at 15 mist-net sites distributed over the Project study area.

Bats were identified to species using a combination of morphological characteristics: ear and tragus, calcar, pelage, size/weight, length of right forearm, and overall appearance of the animal. The species, sex, reproductive condition, age, weight, length of right forearm, and time and location, and net site of capture were recorded for all bats. Age (adult or juvenile) of bats was determined by examining ephiphyseal-diaphyseal fusion (calcification) of long bones in the wing. Weight was measured to 0.1 grams using a Pesola spring scale. Length of the right forearm of each bat was measured to the nearest 1.0 mm using a dial caliper or ruler. The reproductive condition of captured bats was classified as non-descended male, descended male, non-reproductive female, pregnant female (based on gentle abdominal palpation), lactating female, or post-lactating female.

The 15 mist net sites surveyed fell into two categories: upland forest fragments (n=12, 80%) and riparian/impoundment (n=3, 20%; Table 2).

Upland mist net sites were generally surrounded by agricultural fields while the riparian areas generally consisted of a collection ditch in which the fields drained. One pond, mist net site 14 (MS14) was netted within the Project Area. Mist net sites were spread throughout the Project Area where landowner permissions were granted (Exhibit K, Appendix A – Figure 1). All forested areas were scouted thoroughly; however, most provided little in the way of travel corridors (e.g., trails, roads, interior openings) in which net sites could be established. As such, many net sites focused on potential entrance and exit points to the woodlots.

All species captured are common to central Ohio and no federally endangered bats were captured during mist netting surveys. Bats were captured at all 15 mist net sites. Two species were relatively abundant: big brown bat (n=52, 51%) and northern bat (n=25, 25%). These two species represented 75 percent of all bat captures (n=77; see Table 3). The remaining 25 percent was distributed among little brown bat (n=15, 15%), eastern red bat (n=8, 8%), and tri-colored bat (n=2, 2%).

Sixty percent of all species captured were female, while 40 percent were male. Surveys were conducted during mid to late June and therefore no juveniles had become volant. Forty-six percent of captures were lactating females and 11 percent were pregnant. No post-lactating females were captured thus further indicating that young of the year were not yet volant. Three female bats (1 big brown and 2 northern bats) were found not to be reproductive (not pregnant, lactating, or post lactating) during field efforts. This condition is not uncommon as either mating was unsuccessful prior to hibernation or other environmental/ physical conditions may have caused the fetus to abort (Stantec, 2011a).

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, Ohio Division of Wildlife data, and ODNR data. Based on this information, along with documented species ranges, it is estimated that approximately 18 reptile and amphibian species could occur within Huron County. This species include: eastern American toad, Fowler's toad, Blanchard's cricket frog, gray tree frog, northern spring peeper, western chorus frog, American bullfrog, northern green frog, northern leopard frog, wood frog, mudpuppy, spotted salamander, small-mouth salamander, northern dusky salamander, redback salamander, two-lined salamander, Butler's garter snake and eastern rat snake (Davis, 2013; Lipps, 2013). These species are generally common and widely distributed throughout Ohio.

Field review with the USFWS determined that the Project Area contains low potential suitable habitat for the eastern massasauga, a candidate species for federal listing (Stantec, 2013e). For additional information about this rare snake, and other state- and federally-listed species that occur in Huron County, see Section 4906-17-08(B)(1)(e) of this Application.

(d) *Summary of Ecological Studies*

Ecological studies of the Project Area include the Ecology and Environment, Windlab, and Stantec studies described above. Environmental scientists from Ecology and Environment assessed and delineated streams within the Project Area. In addition, E&E provided a summary of the vegetation and ecological communities within 0.5 mile of the Facility boundary (see Exhibit H). Certified wetland delineation staff from Windlab assessed and delineated wetlands within the Project Area (see Exhibit W). Stantec conducted on-site bat mist-netting surveys throughout the summer of 2011 (see Exhibit K), and conducted on-site visual, radar, and acoustic monitoring studies of bat migration during the spring, summer and fall of 2012 (see Exhibit I). In addition, Stantec conducted various on-site avian studies during the fall of 2011 and spring

of 2012, including diurnal raptor migration, raptor nest searches, bald eagle monitoring, owl play back surveys, and passerine migration surveys (see Exhibit J). Stantec also conducted a desktop assessment and field review to determine habitat suitability within the Project Area for the Eastern Massasauga (see Exhibit U).

Vegetation Survey Summary

In summary, the vegetation survey conducted by E & E (2013) assessed the ecological communities present within the Project area and surrounding 0.5 mile radius, and compiled a catalog of species for these communities. In addition, E & E quantified the anticipated vegetation impacts (both temporary and permanent) from construction and operation of the Project.

Wetland Delineation Summary

The wetland delineation identified a total of 11 wetlands; 10 Ohio Category 1 wetlands, one Ohio Modified Category 2 wetlands within the proposed Project Area. The surface water delineation identified a total of 8 primary perennial streams, with 15 associated intermittent and ephemeral tributaries within the proposed Project Area. Wetlands and surface waters delineated within the Project area will be temporarily impacted by the construction of the Project. The turbine pads, O&M building, construction laydown and concrete batch plant area, and Project substation have been sited to avoid wetland resources, but linear components such as access roads, collection lines, and crane pathways will encroach into wetlands to a limited extent. The construction of access roads, collection lines, and crane paths will result in a total potential temporary wetland impact of approximately 0.5 acres. The permanent impact from access roads to wetlands is anticipated to be approximately 0.1 acres. The Applicant will coordinate with USACE to design the Project such that construction impacts are minimized (e.g. use timber mats for wetlands crossed by crane paths) and if applicable, the necessary permits for wetland impacts

are obtained. See Section 4906-17-08(B)(2)(a) below for additional detail about streams and wetlands in the Project Area.

Avian Survey Summary

Generally, the bird communities utilizing the Project Area, including passerine, raptor, and owl do not have strict habitat requirements and will use wide-ranging habitat types to forage. The Project Area lacks large bodies of water, large wetland complexes, and/or natural grasslands that would offer habitat to attract a wider diversity of niche specific avian species. Forested areas comprise approximately 19% of the land cover in the Project Area and are generally found in smaller blocks (less than 100 acres) and are highly fragmented by cultivated land. As such, many of the forested areas do not provide quality habitat for many sensitive forest dwelling species. Most of the Project Area is active agricultural land (63%) that offers limited habitat diversity or habitat quality. The results of the surveys reflect this, with the majority of the birds observed being common species adapted to managed landscapes. The Project Area also does not contain habitat that would attract large numbers of migrating birds, nor is it located in a major migratory path. The migratory survey results also reflect this with relatively low bird counts compared to sites along Lake Erie where birds are funneled along the lake shore during migration.

Raptor Migration Summary

Stantec (2011b, 2012c) conducted diurnal raptor migration surveys during 2011 and 2012 to characterize raptor activity at the Project Site, and to document species-specific flight and behavioral patterns in the area. In 2011, raptor surveys were conducted on 24 days between September 7 and October 25, 2011, for a total of 168 hours. Turkey Vulture (N=3,088) was the most commonly observed species during the on-site raptor migration survey. Red-tailed hawk was the second most commonly observed species (N=51). In 2012, raptor surveys were conducted on 17

days (136 hours) between March 21 and April 26. Turkey vulture (N=1,013) was the most commonly observed species during the spring survey. Red-tailed hawk was the second most commonly observed species (N=96). No federally-listed endangered or threatened species were observed during the 2011 and 2012 surveys within the Project Area (Stantec, 2012c). See Section 4906-17-08(B)(1)(c) above for additional detail about migrating raptors and raptor nest search.

Owl Playback Survey

Three Owl Playback surveys were conducted during the winter of 2012. Each survey was targeted for a different owl species and was scheduled during the respective breeding season for each species. For each survey, one playback sample point was established in each of the three forested blocks, greater than 100 hectares, within the Project Area. Great Horned Owl surveys were conducted on January 30, 2012. A single Great Horned Owl was heard responding to the playing of a Barred Owl call on March 14, 2012; however, no nests were observed during the January survey period. Barred Owls were surveyed on February 28, 2012. No barred owls were detected during the Barred Owl playback survey. Eastern Screech-Owls were surveyed on March 14, 2012. No Eastern Screech-Owls were detected during this survey.

Acoustical Survey Summary

To characterize bat activity in the vicinity of the Project Area, Stantec (2012d) conducted acoustic monitoring from March through November 2012 which encompasses the spring migration, summer residency, and fall migration periods for bats. The survey was designed to sample and document the level and timing of bat activity in spring, summer, and fall at two heights within the meteorological (met) tower located within the Project area. During the spring sample period, 387 bat call sequences were detected and recorded between March 14 and May 31. In spring, the greatest number of calls were identified as calls from the low

frequency unknown (LFUN) guild (24% of all sequence calls), followed by the species within in the BBSH guild (23% of all call sequences). During the summer sample period, 1,393 bat call sequences were detected and recorded between June 1 and July 31, 2012. Of the 3 survey periods (spring, summer, and fall), activity levels were generally highest in summer. During summer, the greatest number of calls were identified as LFUN (27% of all sequence calls). Of those calls that could be identified to species or guild, calls from hoary bats (HB) contained the highest number of call sequences (18%) identified to species. During the fall sample period, 773 bat call sequences were detected and recorded between August 1 and November 15. In fall, the greatest number of calls were identified as calls from the BBSH guild (40% of all sequence calls), followed by the species within the high frequency unknown (HFUN) guild (35% of all sequence calls).

Summer Mist Netting Summary

To further characterize bat activity in the vicinity of the proposed Facility, Stantec (2011a) conducted a bat mist-netting survey in the summer of 2011. The goal of the survey was to document all bat species occurring within the project area with specific focus placed on attempting to identify the occurrence of the federally endangered Indiana bat. Summer mist net surveys followed methodologies outlined by the USFWS's "Indiana Bat Draft Recovery Plan: First Revision," dated April 2007, as well as the protocol for mist-netting outlined in the ODNR Cooperative Agreement document "On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocol for Commercial Wind." A total of 102 bats, representing five species, were captured during summer mist net surveys. Bats were captured at all 15 mist net sites. No federally endangered bats were captured during mist netting surveys. Two species were relatively abundant: big brown bat (n=52, 51%) and northern bat (n=25, 25%). These two species represented 75 percent of all bat captures (N=77). The

remaining 25 percent was distributed among little brown bat (n=15, 15%), eastern red bat (n-8, 8%), and tri-colored bat (n=2, 2%). The complement of species captured during summer mist netting (5 species) and number of total bats captured (102 individuals) was typical for the geographic location and type of habitat sampled. Although it is not possible to determine with absolute certainty the absence of the Indiana bat, the lack of Indiana bat captures at mist net site locations suggests their probable absence during the summer reproductive season in the Project Area. These results suggest that the project is not likely to adversely affect the Indiana bat during the summer maternity period. See Section 4906-17-08(B)(1)(c) above for additional information about bats in the vicinity of the Project Area. Anticipated impacts to ecological resources are presented below in Sections 4907-17-08(B)(2) and 4907-17-08(B)(3) of this Application.

(e) *Major Species List*

Major species are defined as species of commercial or recreational value, and species designated as endangered or threatened in accordance with the U.S. and Ohio threatened and endangered species lists. Commercial species consist of those trapped or hunted for fur, while recreational species consist of those hunted as game.

Online databases were used to search for commercially and recreationally important species within the Project area and within the vicinity of the Project boundary. Vegetative community types identified during the vegetation surveys were compared with species specific habitat requirements from the ODNR to determine the suitability of the habitats occurring in the Project area for each identified species (ODNR, 2013b).

<u>Commercial Species</u>

The ODNR (2013c, 2013f) regulates the hunting and trapping of the following furbearers in Huron County:

- Muskrat (*Ondatra zibethicus*): 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 (*Procyon lotor*): Raccoon 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.

- Red Fox (*Vulpes vulpes*): 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 (*Urocyon cinereoargenteus*): Less common in Ohio than the red fox, gray fox prefer forested and shrub-land habitats, avoiding open areas. Although the Project Area is predominantly open agricultural land, this species could occur in low numbers in area woodlots and shrub-land.

- Coyote (*Canis latrans*): Once extirpated in Ohio, coyotes are now common statewide, occupying a wide variety of habitats, including forests, cropland, and developed land. Coyotes are likely to occur in the vicinity of the Project Area.

- Mink (*Mustela vison*): This semi-aquatic weasel has a statewide distribution, and favors forested wetlands with abundant cover. A small number of this species may occur in the vicinity of the Project Area.

- Opossum (*Didelphis virginiana*): 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 (*Mephitis mephitis*): 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 (*Mustela frenata*): 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.

- Beaver (*Castor canadensis*): Beaver are common statewide, inhabiting and modifying permanent sources of water of almost any type, particularly low gradient streams and small lakes or ponds with outlets. This species is likely to occur in the vicinity of the Project Area.

- River Otter: A program to reintroduce the river otter in Ohio was begun in 1986. Since then, river otters have been sighted in nearly two-thirds of Ohio's counties and young otters or family groups have been seen throughout eastern Ohio. However, river otters are infrequent and very rare in northwestern Ohio; hunting of river otters is prohibited in Huron County.

<u>Recreational Species</u>

The ODNR (2013c, 2013f) regulates the hunting of the following species in Huron County:

- White-tailed deer (*Odocoileus virginianus*): Deer are common statewide, occupying a wide variety of habitats, including forests, shrub-land, cropland, and developed land. This species are likely to occur within the vicinity of the Project Area.

- Gray, red, and fox squirrels: The fox squirrel (*Sciurus niger*) is primarily an inhabitant of open woodlands, while the gray squirrel (*Sciurus carolinensis*) and the red squirrel (*Tamiasurius hudsonicus*) 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 rabbit (*Sylvilagus floridanus*): Cottontails are widespread and 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 (*Marmota monax*): Woodchuck are common statewide, occupying a wide variety of habitats, including pastures, grasslands, and open woodlands. This species is likely to occur in the vicinity of the Project Area.

- Ring-necked pheasant (*Phasianus colchicus*): 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 is likely to occur in the vicinity of the Project Area.

- Northern bobwhite pheasant *(Colinus virginianus)*: The northern bobwhite occurs across the state of Ohio, and prefers to inhabit open fields bordered by forests. This species has been documented in the vicinity of the Project Area by Stantec and was observed during fieldwork on-site (Stantec 2011b, 2012c).

- Wild turkey (*Meleagris gallopavo*): 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 can live successfully in areas with little forest cover. Hunting of wild turkeys is prohibited in Huron County (ODNR, 2013f). This species has been documented in the vicinity of the Project Area by Stantec and was observed during fieldwork on-site (Stantec 2011b, 2012c).

- Mourning dove (*Zenaida macroura*): Mourning doves are common statewide, occupying a wide variety of habitats, including cropland, shrub-land, and developed land. This species has been documented in the vicinity of the Project Area by Stantec and was observed during fieldwork on-site (Stantec 2011b, 2012c).

- American crow (*Corvus brachyrhyncos*): 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 by Stantec and was observed during fieldwork on-site (Stantec 2011b, 2012c).

- Wild boar (*Sus scrofa*): Wild boar are not native to Ohio, but have established breeding populations in several locations, occupying a wide variety of habitats, including forests, cropland, and shrub-land. Distribution maps from the ODNR (2013a) indicate that feral swine have not been recorded in the vicinity of the Project Area.

- Waterfowl: The following waterfowl game species have been recorded in the vicinity of the Project Area: Canada goose (*Branta canadensis*) and wood duck (*Aix sponsa*).

Federally-Listed Species

No federally-listed species were observed in the Project Area. Review of the United States Department of the Interior's federally listed species by Ohio counties list (USFWS, 2013) indicates that the Project Area is within

the range of one federally-listed, one candidate species, and one species of concern: Indiana bat (endangered), eastern massasauga (candidate), and bald eagle (species of concern). This wind development project commenced in 2010; throughout the course of this project, these three species were further identified by the USFW and ODNR for the Applicant to evaluate (Exhibit V).

- Indiana bat (*Myotis sodalis*): The Indiana bat is a migratory bat that hibernates in caves and mines in the winter. In spring, reproductive females emerge from their hibernation location and migrate, forming maternity colonies in wooded areas to bear and raise their young. Trees (dead, dying, or healthy) with exfoliating or defoliating bark, or trees containing cracks or crevices, provide suitable summer roosts. Indiana bats require a mosaic of habitats for feeding, preferring to forage along streams/rivers and above water-bodies, but also utilizing upland forests, clearings with successional old field vegetation, the borders of croplands, wooded fencerows, and pastures (USFWS, 2007).

  The USFWS Ohio Field Office considers all 88 counties of Ohio to lie within the range of the Indiana bat. Most records of reproductive Indiana bats are from the western portion of the state; however, summer (non-reproductive) occurrences are more widely distributed (USFWS, 2007). The known summer distribution (i.e. records exist) of the Indiana bat in Ohio does not include Huron County. However, recent survey efforts in the region have resulted in new records for neighboring Seneca and Crawford counties, which have land uses and forest distribution similar to those found in the project area (USFWS, 2007). Based upon normal geographical range, nine species of bat may occur in Ohio; however, 11 have been documented (Brack et al. 2010).

As noted above in the Summer Mist Netting Summary (Section 4906-17-08(B)(1)(d), the goal of bat mist-netting survey that took place in the summer of 2011 was to document all bat species occurring within the project area, with specific focus placed on attempting to identify the occurrence of the federally endangered Indiana bat. No federally endangered bats were captured during mist netting surveys. Although it is not possible to determine with absolute certainty the absence of the Indiana bat, the lack of Indiana bat captures at mist net site locations suggests their probable absence during the summer reproductive season in the Project Area. These results suggest that the project is not likely to adversely affect the Indiana bat during the summer maternity period (Stantec, 2011a). See Section 4906-17-08(B)(1)(c) above for additional details of the bat acoustic monitoring and mist-netting survey.

- Eastern massasauga (*Sistrurus catenatus catenatus*): This rare rattlesnake has declined drastically since the mid-1970s rangewide, and now occurs in primarily in disjunct, isolated populations. Massasaugas are found in a variety of habitats, including bogs, fens, marshes, upland old fields, prairies, sedge meadows and wet grasslands adjacent to bottomland forest, but tend to avoid heavily wooded areas (Wright 1941; Reinert and Kodrich 1982; Seigel, 1986; Weatherhead and Prior 1992; Ernst and Ernst 2003). Massasaugas prefer moderate to large, open canopy wetland habitats with adjacent open upland or wet/mesic grassland that is used for foraging (Ernst and Ernst 2003). The adjacent uplands typically have little to no agriculture present. Hibernation locations typically include crayfish burrows, mammal burrows, or old root systems. According to the ODNR (2012c), eastern massasauga was historically known from over 30 Ohio counties, but extensive farming has drastically reduced both numbers and habitat. A field review was conducted by a qualified

Stantec biologist on June 17-19, 2012. All wetlands identified on NWI maps or identified in the field were investigated to provide a description of the wetland, surrounding land use, and a description of adjacent grassland (if present). After completion of the desktop assessment and field reconnaissance, a determination of habitat suitability was made for each wetland. For purposes of this habitat assessment, suitable massasauga habitat was defined as either: highly suitable, moderately suitable, low potential or unsuitable.

It was determined that overall the Greenwich project area has low potential to support a population of eastern massasauga rattlesnakes (see Exhibit U). Only two wetlands (NWI 45 and NWI 54) were rated as low to moderately suitable, largely based on the combined sized of the two wetlands (22.3 acres). Although the size and vegetative characteristics of these wetlands suggest that they may have the potential to support a small population of the snakes, this potential is likely further limited by the surrounding land use (i.e., row crops), the presence of an active county road through the middle of the wetland, and mowing that occurs in the adjacent upland grassland and the scrub-shrub border (Stantec, 2013e).

In order to avoid potential impacts to the eastern massasagua, a presence/absence survey may be conducted at the site. The survey would be conducted by a USFWS- and ODNR-approved eastern massasauga surveyor. If no eastern massasauga is detected, no further avoidance and minimization measures will be necessary. If presence is detected, or if a survey is not conducted, presence will be assumed and USFWS- and ODNR approved avoidance and minimization measures will be implemented. See Exhibit U for additional detail about the eastern massasauga survey.

- Bald eagle (*Haliaeetus leucocephalus*): Although they are no longer protected by the federal Endangered Species Act, Bald Eagles are still listed as a species of concern and are protected by the Bald and Golden Eagle Protection Act. Bald Eagles have been reported in the vicinity of the Project area. Five bald eagle observations were made during the fall 2011 wildlife survey period. Single sightings occurred on September 8, October 20 and October 22. Two Bald Eagles were observed on October 23 at the same location. Observations of Bald Eagles for which age could be determined were: 3 adults, 1 SA-III and 1 juvenile. One Bald Eagle observation occurred outside of the Project area. Observations of four Bald Eagles within the Project area noted three flew at heights between 40 and 180 m, with the fourth flying below 40 m. Four of the five observations of Bald Eagles were suspected to be actively migrating (see Exhibit J for additional information).

  As noted above in Section 4906-17-08(B)(1)(c), one bald eagle nest was located just outside the northeastern Project boundary. This nest was monitored for several months to establish foraging patterns. Observation indicated that the adults primarily used large reservoirs to the northeast of the project area and rarely entered the Project area. No bald eagles were observed in the Project area during summer surveys.

To date, the U.S. Fish and Wildlife Service has proposed listing the northern long-eared bat as endangered under the Endangered Species Act (Federal Register, 2013). The Service will make a final decision on listing the species in October 2014. If a final decision is made to list the northern long-eared bat, the species will be protected from take – harming, harassing, killing – and federal agencies will work to conserve the bat and its habitat as they fund, authorize or carry out activities. In addition, a recovery plan will be developed for the species. It is currently

anticipated that the northern long-eared bat will be federally-listed as an endangered species in October 2014. At such time, the Applicant will work with USFW and ODNR to determine suitable operational protocols that meet USFW regulations and best practices.

State-Listed Species

A preliminary evaluation of available online databases for the ODNR Division of Natural Areas and Preserves Natural Heritage Program (NHP) identified 9 state-listed plant species and 6 state-listed animal species occurring in Huron County (ODNR, 2013b). Table 08-6 is a summary of the state-listed species occurring in Huron County with potential habitat within the Project Area. General habitat requirements and Ohio state status for each species is also included.

Table 08-6. Protected Species with Potential Habitat within the Project Area

Plant Species			
Scientific Name	**Common Name**	**General Habitat**	**Ohio Status**
Acorus americanus	American Sweet-flag	streams/banks/marshes	P
Carex lupuliformis	False Hop Sedge	variety	P
Corallorhiza maculata	Spotted Coral-root	moist/shaded/forests	P
Luzula bulbosa	Southern Woodrush	day clearings/fields	T
Plagiothecium latebricola	Lurking Leskea	swamps/marshes	T
Rosa blanda	Smooth Rose	dry to mesic prairies	P
Sagittaria platyphylla	Elliptic-leaved Arrowhead	static streams/ponds	X
Triphora trianthophora	Three-birds Orchid	forests	P
Ulmus thomasii	Rock Elm	variety	P
Animal Species			
Scientific Name	**Common Name**	**General Habitat**	**Ohio Status**
Gallinago delicata	Wilson's Snipe	marshes/meadows	SI
Ixobrychus exilis	Least Bittern	dense marshes	T
Lasmigona compressa	Creek Heelsplitter	streams/rivers	SC
Rallus limicola	Virginia Rail	dense marshes/swaps/wetlands	SC
Sistrurus catenatus	Eastern Massasauga	variety	E
Uniomerus tetralasmus	Pondhorn	ponds/creeks/streams	T

Source: Ohio Division of Wildlife, 2013b.

In order to better identify potential impacts from the Project on federally and state-listed species, the Applicant has been in direct contact with the USFWS and ODNR. In 2010, the Applicant received notification from

ODNR's Division of Natural Areas (see Exhibit V) that the Division had no record of rare or endangered species in the 6011 Greenwich Windpark project area. Furthermore, the correspondence noted no presence of dedicated state nature preserves, scenic rivers, unique ecological sites, geologic features, animal assemblages, state parks, state forests or site wildlife areas with the project site or a one mile radius. To further assure compliance with protected species regulations, the Applicant sent consultation letters on May 20, 2011 and March 16, 2012, to ODNR requesting information regarding any major species occurring within the Project area. ODNR indicated that the project area fell within regions of the state that DOW had identified as needing moderate monitoring efforts and recommended several survey studies. The Applicant complied with the ONDR and USFWS and completed the recommended monitoring surveys. Copies of the agency correspondence letters and responses may be found in Exhibit V.

(2) Construction

(a) *Impact of Construction*

Potential ecological impacts 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 yard and temporary workspaces around the turbine sites; and the construction of the substation and O&M building. Impacts to agriculture, forested and wetland communities are discussed below.

Most land disturbance during construction of the Project will be to agricultural land; approximately 195.8 acres, or 92%, of the 213.3 acre temporary disturbance from construction of the Project will be to agricultural land. Of the temporary agricultural land impact, only 25.7 acres of agricultural land will be permanently impacted by the Project. The permanent impact results from areas which will be converted for the

foundations of turbine pads, access roads, the operations and maintenance (O&M) building, and the Project substation.

The remaining impacts during construction will be to forested communities, developed areas, and minimal wetlands. The clearing of forestland and pasture and hayfields communities has been minimized to the greatest extent practical in the development of the design of the Project. Construction will result in a localized temporary reduction in the amount of 11 acres of forested land. Nearly all of the forested impacts will be allowed to regenerate or will be replanted after construction, as only 1.6 acres of permanent forested impact are anticipated. The reduction in the amount of forested habitat as a result of the Project is minor in comparison with the overall acreage of forestland located in the Project area.

Wetlands delineated within the Project area will be temporarily impacted by the construction of the Project. The construction of access roads, collection lines, and crane paths will result in a total potential temporary wetland impact of approximately 0.5 acres. The permanent impact from access roads to wetlands is only expected to be approximately 0.1 acres. Table 08-7 quantifies impacts to ecological communities, based on the typical area of vegetation clearing column presented in Table 03-2.

Table 08-7. Impact to Ecological Communities

Community	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Forestland	12.7	11.1	1.6
Residential/Developed	6.9	5.9	1.0
Agricultural	221.5	195.8	25.7
Wetlands	0.6	0.5	0.1
TOTAL	**241.7**	**213.3**	**28.4**

Source: Ecology & Environmental, 2013.

Agricultural lands have been included in the Table 08-9 to fully account for all anticipated impacts. Please refer to Table 08-16 for a more detailed breakdown of impacts to various types of agricultural lands (i.e., pasture vs. cultivated crops, etc.). Impacts to natural communities have been avoided to the extent possible. Of the 28.4 acres of permanent disturbance, 25.7 acres occur within agricultural lands, 1.0 acre occurs within residential, 1.6 acres occur within forestland, and 0.1 acre occurs within in wetlands. Native vegetation or agricultural crops will be reestablished during restoration of the 195.8 acres of agricultural land, 11.2 acres of forestland, and .05 acre of wetlands temporarily disturbed as a result of construction activities.

Wetlands & Surface Water Habitats

All of the proposed wind turbines are located in currently or recently active agricultural fields. Therefore, direct and indirect impacts to wetlands and surface waters in the vicinity of turbine workspaces will be negligible. The greatest potential for direct and/or indirect impacts to surface water and wetlands will be in the construction of turbine access roads and installation of electrical line interconnections among the turbine arrays (Windlab, 2013f; E & E, 2013).

Metro Consulting Associates (MCA) conducted a preliminary wetland desktop screening analysis of the Project Area (Appendix D, Exhibit W) and surrounding areas. This desktop study was used as a guideline to determine if potential wetland locations, watercourses, or bodies of water regulated by the U.S. Army Corps of Engineers (USAEC) and/or Ohio Environmental Protection Agency (Ohio EPA) are present in the project area and to delineate their boundaries. Windlab Developments USA Ltd., using the MCA delineation as a guide, conducted an on-site wetland delineation in September 2013 to determine and evaluate potential wetland areas that may be affected by the Facility.

Windlab's (2013f) wetland field delineation activities were performed in accordance with methods outlined in the 1987 US Army Corps of Engineers (USACE) Wetland Delineation Manual, the 2009 Midwest Regional Supplement to the 1987 Manual and subsequent regulatory guidance issued by the USACE and Ohio EPA. Windlab located the wetland edges in the field using these procedures, subsequent USACE memoranda and regulatory guidance, and basic principles of plant community ecology. Plant communities within the facility were characterized using the three-criterion wetland delineation approach. After characterizing the vegetation, hydrology, and soils of a plant stand type and becoming familiar with the soil, vegetation, and/or hydrologic cues that indicated wetland edge, the wetland edge was flagged with periodic collection of additional soil of hydrologic data to refine the edge. Wetland boundaries were mapped in the field using a portable mapping-grade GPS unit to capture the locations of each flag. Wetland delineation data sheets appear in Appendix B of Exhibit W.

A quantitative assessment of wetland value was then conducted using the Ohio Rapid Assessment Method for Wetlands (ORAM) Version 5.0, and the wetlands were assigned into the appropriate category, as defined by the Ohio Water Quality Standards Antidegradation Policy for Wetlands (OAC Section 3745-1-54). There are three possible Ohio Wetland Antidegradation categories to 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 attaining higher value. Most wetlands in Ohio are expected to fall into this category. The designation '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 may be large, diverse, represent rare plant community types, contain rare, threatened or endangered species, or any combination of these several other factors. The designation 'Category 3' is assigned to wetlands whose ORAM scores fall between 65 and 100.

The delineation identified a total of 11 wetlands; 10 Ohio Category 1 wetlands and one Ohio Modified Category 2 wetland. No Ohio Category 3 wetlands were identified. Of the 11 wetlands delineated, 10 were found to be non-isolated and under the Clean Water Act jurisdiction of federal and state government (Windlab, 2013f). Delineated wetlands are mapped in Figure(s) 1 – 10 of Appendix E in Exhibit W, which also contains detailed descriptions of each wetland, including information on dominant vegetation, soils, and hydrology. Characteristics of delineated wetlands in the vicinity of the Project Area are summarized in Table 08-8 below.

Table 08-8. Delineated Wetlands in the Project Area

Wetland ID	Figure Number	Sample points	NWI Community Type	Wetland Size (ac)	ORAM Category	ORAM Score	Isolation Status
A	1	1,2,3	None	~0.82	1	15	Non-Isolated
B	2	4	None	~0.12	1	12	Non-Isolated
C	2	5,6,7,8,9	PSS1/EM1A	~0.93	1	13	Non-Isolated
D	1	10,11	None	~.60	1	14	Non-Isolated
E	1	30,31	None	~0.56	1	12	Non-Isolated
F	1	28,29	PFO1C	~1.49	1 or 2 'Grey Zone'	33	Non-Isolated
G	4	14,15,16,17,18	None	~1.04	1	12	Non-Isolated
H	5	24,25,26,27	None	~0.56	1	12	Non-Isolated
I	5	19	None	~0.04	1	11	Non-Isolated
J	3	12,13	PSS1/EM1A	~0.51	1	12	Non-Isolated
K	5	20,21,22,23	None	~1.21	1	26	Non-Isolated

Source: Windlab Systems Pty Ltd, 2013w.

Wetlands delineated within the Project area will be temporarily impacted by the construction of the Project. The turbine pads, O&M building, construction laydown and concrete batch plant area, and Project substation have been sited to avoid wetland resources, but linear components such as access roads, collection lines, and crane pathways will encroach into wetlands to a limited extent. The construction of access roads, collection lines, and crane paths will result in a total potential temporary wetland impact of approximately 0.5 acres. The permanent impact from access roads to wetlands is only expected to be

approximately 0.1 acres. The Applicant will coordinate with USACE to design the Project such that construction impacts are minimized (e.g. use timber mats for wetlands crossed by crane paths) and if applicable, the necessary permits for wetland impacts are obtained. In addition, Applicant will coordinate with the U.S. Army Corps of Engineers and the Ohio Environmental Protection Agency to obtain the necessary permits to permanently impact wetlands. Additional information on proposed mitigation measures can be found in Section 4906-17-08(B)(2)(c) of this Application.

Ecology and Environment, Inc. (E & E, 2013) conducted a desktop surface water evaluation to delineate and evaluate potential surface water areas that may be affected by the Facility. The surface water evaluation consisted of two stages: (1) an initial determination to identify the absence or potential presence of surface waters within the Project Area and (2) a preliminary determination where stream crossings may occur.

The surface water delineation identified a total of 8 primary perennial streams, with 15 associated intermittent and ephemeral tributaries, and eight ponds, as defined by USGS National Hydrography Dataset (NHD) (USGS, 2013a). All streams within the Project area are generally small and all are unnamed tributaries to the Southwest Branch Vermilion and Vermilion Rivers. The majority of the southern and western Project area drains in a northwesterly direction through these small, unnamed headwater streams into the Southwest Branch Vermilion River. The northeastern extent of the Project area drains in a northeasterly direction through these unnamed systems into the Vermilion River. The impounded waterbodies within the Project area are small farm ponds. These are located in both the northern and southern Project area extent, with the largest measuring approximately 4.5 acres. Several larger reservoirs are located outside, but in close proximity of the Project area (within 0.5 miles). The Greenwich Reservoir is the most notable, and is located just

south of the Village of Greenwich, approximately 0.5 miles to the west of the Project boundary. The New London Upground Reservoir is the largest waterbody within one mile of the Project area; this is a 210-acre impoundment located approximately one mile to the northeast of the Project area (E & E, 2013). Identified streams are mapped in Figure 1 of Appendix A in Exhibit H.

Once the initial determination to identify the absence or presence of surface waters was completed, streams with the potential to be impacted by Facility activities were mapped. USGS NHD geospatial data was combined with the Project infrastructure layout to determine where crossings may occur. At each crossing, aerial photography was then used to determine the width of the stream crossing and thus the stream impact. These NHD data contain features such as lakes, ponds, streams, rivers, canals, dams, and stream gages, and are designed to be used as for general mapping and analyses of surface water systems (USGS, 2013a). Each stream reach is assigned a NHD code, which acts an identifier, describing the basin and sub-basin the stream reach is located in.

Depending upon when the NHD data was generated and land use of the interest area, NHD data may not accurately reflect the current conditions of the waterway. The NHD data for highly modified areas such as agricultural land, which have typically been altered through the installation of drain tile, stream channelization, and undergone topographic contour modifications, can be slightly inaccurate as a result of these activities. Therefore, to more accurately assess the water resources within the Project area, NHD data was overlaid atop high-resolution aerial photography to perform a desktop level assessment of the surface waters within the Project construction impact areas. The condition of the stream reaches were assessed to determine if the stream reach had a defined bed and bank (definition of a stream), was a perennial, intermittent, or ephemeral stream; and to measure the wetted width of the stream, when

applicable. Through this assessment supporting data regarding the surface waters within the Project area and the Project's potential impacts to them could be generated.

A review of USGS NHD water resources identified a total of 45 crossings of NHD stream reaches by linear Project facilities. Through an analysis of high-resolution aerial photography, the majority of NHD streams within the impact areas of the Project were determined to lack defined stream bed and banks or were devoid of water. Therefore, it was determined that surface waters would not be impacted as a result of construction at these NHD identified crossings. Streams classified as being potentially jurisdictional waters of the U.S. include streams that appear to be relatively permanent waterway (RPW) and are hydrologically connected tributaries to traditional navigable waters (TNWs). Table 2 of Exhibit H provides details on the stream reaches crossed by the access roads, collection lines, and crane pathways.

A total of five streams, comprising an estimated 133 linear feet of streams, will be crossed by the crane pathways, the collection line system, and access roads. Of the 133 linear feet of streams impacted by Project infrastructure, 53 linear feet will be impacted permanently as a result of the construction of new access roads. The remaining 80 linear feet will be temporarily impacted from the construction of crane pathways (estimated 34 and 22 feet) and access roads (estimated 24 feet) (E & E, 2013).

The NHD streams determined to be impacted by the construction of the Project do not fall into the category of being TNW, but do appear to have hydrological connectivity to TNW, and therefore, may be determined to by waters of the U.S., and fall under the jurisdiction of the USACE, CWA Section 404 and RHA Section 10 regulations (E & E, 2013). Following a finalized Project layout with engineering plans for stream crossings,

Windlab will consult with the USACE to determine whether construction minimization measures can be implemented to reduce impacts further.

For all identified stream crossing, effective techniques are available and will be used to avoid or minimize stream impacts. For example, existing stream crossing will be used for access roads whenever possible. These existing crossings may need to be temporarily strengthened via placement of a steel plate to allow crossing by heavy equipment (e.g., cranes) and turbine components. After construction, the steel plate will be removed, and maintenance vehicles will use the existing crossing without modification. Where access road crossings will require in-water work, culverted crossings will be utilized. Culverted crossings will be permitted through the USACE Nationwide Permit program. These culverted access road crossings will utilize techniques and structures that do not disturb ground that is within the delineated edge of the stream. Further measures to minimize impact to the extent practicable will be utilized, such as installation of crossings where there is no flowing water and with no excavation equipment located in flowing waters for ephemeral and intermittent stream crossings.

In instances where collection lines cross streams, Windlab will utilize boring or horizontal directional drilling (HDD) underneath the streams, to avoid disturbances to the bed or banks. If during final design of the Project it is determined that the collection lines cannot be installed via boring or HDD, the Applicant will coordinate with USACE to obtain the necessary permits. Impacts will be further minimized through the implementation of a Storm Water Pollution Prevention Plan (SWPPP) to prevent erosion and sedimentation into nearby waterbodies under Ohio EPA's National Pollutant Discharge Elimination System (NPDES) General Permit for Construction Activities. Erosion control structures will be utilized to prevent an off-site migration of soil and to minimize impacts to fish and aquatic species. Silt fencing will be installed along the

construction ROW in all areas adjacent to wetlands, in accordance with the SWPPP. Best Management Practices (BMPs) will be utilized during construction to prevent excess stormwater runoff from the construction areas. Further, areas temporarily disturbed during construction will be restored to pre-construction conditions as soon as possible in order to further minimize the impact of construction. Additional information on proposed mitigation measures can be found in Section 4906-17-08(B)(2)(c) of this Application.

The Facility is located entirely on lease private land. Therefore, no construction-related impacts will occur at recreational areas, parks, wildlife areas, nature preserves, or other conservation areas as identified in OAC Rule 4906-17-08(B)(1)(a)(iii).

(b) *Impact of Construction on Major Species*

Siting Facility components away from sensitive habitats, such as forestland, streams and wetlands, will minimize impacts to wildlife. Construction-related impacts to wildlife are anticipated to be limited to incidental injury and mortality due to construction activity and vehicular movement, construction-related silt and sedimentation impacts on aquatic organisms, habitat disturbance/loss associated with clearing and earth-moving activities, forest fragmentation, and displacement of wildlife due to increased noise and human activities. Each of these potential impacts is described below. 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.

<u>Incidental Injury & Mortality</u>

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, and which currently (and historically) experiences frequent agricultural-related disturbances, such impacts are anticipated to be very minor.

Siltation & 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, a general permit for storm-water discharges associated with construction activity, 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 a limited number of wildlife species. In addition, these areas are already subject to periodic disturbance in the form of mowing, plowing, harvesting, etc. However, hayfields and pastureland do provide habitat for open country/grassland avian species, and will be disturbed by Facility construction. Forested communities will experience less construction-related disturbance. Based on the current Facility layout, approximately 177.3 acres of agriculture, 18.1 acres of

hayfields and pasturelands, and 11.1 acres of forest habitat will be temporarily impacted by Facility construction.

Forest Fragmentation

Nearly all of the forested impacts will be allowed to regenerate or will be replaced after construction, as the proposed facility will result in permanent loss of approximately 1.6 acres of forest habitat. 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 the proposed Facility.

Disturbance/Displacement

Some wildlife displacement will also occur to the 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 disturbed and/or displaced by Facility construction.

(c) *Mitigation of Short and Long-term Construction Impacts*

Various procedures will be used to reduce impacts during Facility construction, including impact minimization measures, site restoration, and mitigation. Each of these procedures is described in detail below:

Impact Minimization Measures

Mitigation measures to avoid or minimize impacts to vegetation will include identifying/delineating sensitive areas (such as wetlands) where no 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 re-vegetate these areas, except in active agricultural fields.

To avoid or minimize Facility-related impacts on surface waters and wetlands, preliminary and final Facility design is guided by the following criteria during the siting of wind turbines and related infrastructure:

- Large built components of the Facility, including wind turbine generators, the laydown yard, the O&M building, and the 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 whenever possible, and by utilizing existing crossings and narrow crossing locations to the extent practicable. Where necessary, new culverts will be installed/utilized for access roads crossing streams.
- Buried electric interconnect lines will avoid crossing wetlands, will cross streams at existing or previously disturbed locations, and will utilize installation techniques (such as boring or horizontal directional drilling) 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 surface waters are required, the Applicant will employ best management practices associated with applicable streamside activities. Specific

mitigation measures for protecting wetlands and surface water resources will include designating no equipment access areas and restricted activity areas, employing low impact stream crossing techniques, developing and implementing a sediment and siltation control plan and a storm water pollution prevention plan, and implementing spill prevention, containment and countermeasure controls. 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. However, in order to provide further protection to wetlands and surface waters, restricted activities within this buffer zone will include:

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

Low Impact Stream Crossing Techniques: The Applicant will adhere to any permit special 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.

Storm Water Pollution Prevention Plan (SWP3): To avoid and minimize impacts to aquatic resources resulting from construction-related siltation and sedimentation, an approved SWP3 will be implemented. To protect surface waters, wetlands, and groundwater, silt fencing, hay bales and other sediment and erosion control measures will be installed and maintained throughout Facility development. The location of these features will be indicated on construction drawings and reviewed by the contractor prior to construction.

Spill Prevention, Containment, and Countermeasure (SPCC): SPCC measures will be implemented to prevent the release of hazardous substances into the environment. These measures will not allow refueling of construction equipment within 100 feet of any stream or wetland, and all contractors will be required to keep materials on hand to control and contain a petroleum spill. These materials will include a shovel, tank patch kit, and oil-absorbent materials. Any spills will be reported in accordance with ODNR regulations. Contractors will be responsible for ensuring responsible action on the part of construction personnel.

Site Restoration

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

- The 150-foot radius turbine workspaces will be reduced to a permanent footprint of 0.2 acre (40-foot by 80-foot gravel crane pad, 18-foot diameter turbine pedestal, and a 6-foot wide gravel skirt around the tower base).

- 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 interconnect 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 stockpiled 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.

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

Mitigation Measures

6011 Greenwich Windpark LLC has made a strenuous effort to avoid federally regulated surface water impacts from discharge of fill material via rerouting access roads, repositioning turbines, and other approaches, and is exploring methods for crossing streams during construction that do not involve any impacts to streams, including using large steel plates as temporary spans. These avoidance efforts notwithstanding, a limited amount of permanent and temporary surface water impact from discharge of fill material is unavoidable during construction of this project. It appears that all proposed surface water impacts can be covered under a Clean Water Act Section 404 general permit (e.g., the Nationwide Permit program) and that individual Section 404 and 401 permits will not be necessary. If required by the USACE and Ohio EPA during the permitting process, the Applicant will undertake a suitable compensatory mitigation

project to mitigate for unavoidable permanent stream impacts associated with the Facility. Any necessary compensatory mitigation would be developed in consultation with the USACE and Ohio EPA during the permitting process.

(3) Operation

(a) *Estimate the Impact of Operation on Areas*

Approximately 28 acres of the total project area (0.6% of the 4,650 acres leased) are anticipated to experience permanent impacts from the facility. Most of the permanent land disturbance due to operation of the Facility will be to cultivated cropland. It is anticipated that approximately 24.9 acres of agricultural land will be permanently impacted by the Project. While construction will result in a temporary reduction in the amount of 11 acres of forested land; nearly all of the forested impacts will be allowed to regenerate or will be replanted after construction, as only 1.6 acres of permanent forested impact are anticipated. Approximately 18.1 acres of pasture and hayfield will be temporarily impacted from the construction of the Project, while only 0.6 acres will be permanently impacted. The construction of access roads, collection lines, and crane paths will result in a total potential temporary wetland impact of approximately 0.5 acres; however, the permanent impact to wetlands is only expected to be approximately 0.1 acres.

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 OAC Rule 4906-17-08(B)(1)(a). However, Facility visibility will extend beyond the boundaries of leased private land. There is one identified recreational area located within one mile of the proposed Facility. This site is briefly described below, along with a brief assessment of potential impacts from the

proposed Facility. See Section 4906-17-08(d)(5) of this Application for additional detail on recreational areas.

- **Greenwich Reservoir Park** is located within the Village of Greenwich, along Reservoir Drive, located 1.13 miles from the nearest turbine. Turbines may likely be visible throughout the property, with the number of turbines visible ranging from 0 to 4, depending on location (Windlab, 2013e). The modeled operation Facility sound levels at Greenwich Park indicate sound levels will be equal to or less than 35 dBA (Acentech, 2013). As Greenwich Reservoir Lake Park is located at a distance of greater than 10 rotor diameters from the nearest turbine, no portion of the park should be impacted by shadow flicker (Windlab, 2013d).

As indicated in Exhibit Q, the visual impact of the wind turbines from a given location is highly variable based on the number of turbines visible, viewer sensitivity/acceptance, and/or existing land use characteristics. The greatest impact typically occurs when numerous turbines are visible and where those turbines are close to the viewer (i.e., less than 1.0 mile). These conditions tend to heighten the Facility's contrast with existing elements of the landscape in terms of line, form, and especially scale. Visual impact can also be significant where the turbines appear incongruous or out of place in a certain landscape setting, or where aesthetic quality and/or viewer sensitivity are high. However, the analysis presented in the Visual Impact Assessment (Exhibit Q) does not indicate a significant adverse impact (Windlab, 2013e). See Section 4906-17-05(B)(3)(d) of this Application for more information about the visual impacts of the proposed Facility.

(b) *Estimate the Impact of Operation on Major Species*

Siting Facility components away from sensitive habitats, such as forestland, streams and wetlands, will minimize impacts to wildlife.

Construction-related impacts to wildlife are anticipated to be limited to incidental injury and mortality due to construction activity and vehicular movement, construction-related silt and sedimentation impacts on aquatic organisms, habitat disturbance/loss associated with clearing and earth-moving activities, forest fragmentation, and displacement of wildlife due to increased noise and human activities. Each of these potential impacts is described below. 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.

Major Species

No federally-listed threatened or endangered wildlife species or vegetation or plant communities were identified within the Project Area through consultation with the USFWS and ODNR, or during the field survey efforts. Therefore, no impacts on threatened and endangered species or communities are expected as a result of operation of the Proposed Facility.

Operation and maintenance of the Proposed Facility may slightly increase vehicle traffic within recreationally and commercially important species habitat areas. However, use of the access roads will be infrequent and consistent with current use levels throughout the area. Further, access road and collection line right-of-ways may provide corridors for movement of some species and additional edge habitat for foraging. While the operation of the Facility may slightly increase traffic and human presence in areas where only minimal disturbance occurs, most species would be expected to avoid direct interaction with humans.

Incidental Injury & 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, and which currently (and historically) experiences frequent agricultural-related disturbances, such impacts are anticipated to be very minor.

Siltation & 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 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 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 constructed in agricultural lands, which generally provide limited habitat for wildlife. In addition, these areas are already subject to periodic disturbance in the form of plowing, harvesting, mowing, etc. Hayfields and pastureland do provide habitat for open county/grassland avian species. However, the agricultural lands in the Project Area are dominated by fields of tilled crops. Natural communities will experience very little construction-related disturbance.

Forest Fragmentation

Nearly all of the forested impacts will be allowed to regenerate or will be replaced after construction, as the proposed facility will result in permanent loss of approximately 1.6 acres of forest habitat. 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 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 the proposed Facility is located in agricultural land, species utilizing those habitats are the only ones likely to be disturbed and/or displaced by Facility construction.

(c) *Mitigation of Impacts*

Various procedures will be used to reduce impacts during Facility construction, including impact minimization measures, site restoration, and mitigation. Each of these procedures is described in detail below:

Impact Minimization Measures

Mitigation measures to avoid or minimize impacts to vegetation will include identifying and/or delineating sensitive areas (such as wetlands) where no 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 re-vegetate these areas, except in active agricultural fields or to otherwise meet the desires of the landowner.

To avoid or minimize Facility-related impacts on surface waters and wetlands, preliminary and final Facility design is 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, O&M building, and the substation are sited to completely avoid wetlands and surface waters.

- The number and overall impacts due to access road crossings were minimized by outing around wetlands and streams whenever possible, and by utilizing existing crossings and narrow crossing locations to the extent practicable. Where necessary, new culverts will be installed/utilized for access roads crossing streams.

- Buried electric interconnect lines will avoid crossing wetlands, 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 surface waters are required, the Applicant will employ best management practices associated with applicable streamside activities. Specific mitigation measures for protecting wetlands and surface water resources will include designating no equipment access areas and restricted activity areas, employing low impact stream crossing techniques, developing and implementing a sediment and siltation control plan and a storm water

pollution prevention plan, and implementing spill prevention, containment and countermeasure controls. 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 deposition of slash
- No accumulation of construction debris
- No application of herbicide
- No degradation of stream banks
- No equipment washing or refueling and
- No storage of any petroleum or chemical material

Low Impact Stream Crossing Techniques: The Applicant will adhere to any permit special 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.

Low Impact Wetland Crossing Techniques: When constructing roads or installing buried interconnect, routing around wetland edges, utilizing previously-disturbed areas, and crossing the narrowest portion of a

wetland will be the preferred crossing options. Where permanent roadways are installed and impoundment of water is possible, suitably sized culverts will be installed to maintain the natural water levels/flows on each side of the road.

Storm Water Pollution Prevention Plan (SWP3): To avoid and minimize impacts to aquatic resources resulting from construction-related siltation and sedimentation, an approved SWP3 will be implemented. To protect surface waters, wetlands, and groundwater, silt fencing, hay bales and other sediment and erosion control measures will be installed and maintained throughout Facility development. The location of these features will be indicated on construction drawings and reviewed by the contractor prior to construction.

Site Restoration

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

- The 150-foot radius turbine workspaces will be reduced to a permanent footprint of 0.2 acre (40-foot by 80-foot gravel crane pad, 18-foot diameter turbine pedestal, and a 6-foot wide gravel skirt around the tower base).

- 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 interconnect 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 stockpiled 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.

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

Mitigation Measures

6011 Greenwich Windpark LLC has made a strenuous effort to avoid federally regulated surface water impacts from discharge of fill material via rerouting access roads, repositioning turbines, and other approaches, and is exploring methods for crossing streams during construction that do not involve any impacts to streams, including using large steel plates as temporary spans, culverts, and underground boring or horizontal directional drilling. These avoidance efforts notwithstanding, a limited amount of permanent and temporary surface water impact from discharge of fill material may occur during construction of this project. It appears that any probable surface water impacts would be covered under a Clean Water Section 404 general permit (i.e., the Nationwide Permit program). If required by the USACE and Ohio EPA during the permitting process, the Applicant will undertake a suitable compensatory mitigation project to mitigate for unavoidable permanent stream impacts associated with the Facility. Any necessary compensatory mitigation would be developed in consultation with the USACE and Ohio EPA during the permitting process.

Inspection and Maintenance Measures

With respect to short-term and long-term inspection and maintenance activities, such activities that are relatively minor (e.g., routine inspection of various components) will be carried out through use of the Facility infrastructure/access roads that are established during construction. Major repairs that require large equipment (i.e., a crane) can typically be trucked directly to the respective crane pad established during construction at the base of each turbine, and permanent access roads are generally wide enough to accommodate this activity.

(d) *Post-Construction Monitoring of Wildlife Impacts*

The Applicant will work with ODNR and USFWS on an on-going basis to minimize impacts to wildlife. Impacts to most species of wildlife found within the Project area will not occur or be significant as a result of the operation of the proposed wind farm; therefore, only monitoring of those species that potentially could be affected will be conducted. The duration and scope of this type of post-construction monitoring will be finalized after all field surveys are complete and through further consultation with ODNR and USFWS.

(C) ECONOMICS, LAND USE AND COMMUNITY DEVELOPMENT

Agricultural uses are the predominant land use as measured by percent area of each township and county within 5 miles of the Facility. The township that will host the Facility is dominated by agriculture. The predominance of agricultural use emphasizes the rural character of this region, and contributes to this part of Ohio being an ideal location for a potential wind energy facility. Wind energy development is compatible with this rural agricultural land use. Relatively little land is impacted for wind facilities, while the surrounding land can remain for agricultural use.

(1) Land Uses

(a) *Land Use Map*

Land uses within the five-mile study area of the Facility are shown on Figure 08-2. The land use mapping was developed from 1981 Huron County, 1982 Ashland County, and 1987 Richland County ODNR/Land Use/Land Cover data.

(b) *Residential Structures*

Twenty-seven residential structures are located within the Greenwich Windpark project area. Upon review of aerial photography, county plat maps, and county property records, it has been determined that 159 residential structures are located within 1,000 feet of the boundary of the proposed facility. No residential structures are located within 100 feet of the boundary of the proposed facility.

(c) *Wind Turbine Structure Locations*

Proposed turbines are sited in locations consistent with setbacks from roads, rail lines, electric and natural gas lines, property lines, and residential structures. These setbacks are described in further detail below. While not specified in the OPSB rules, the Applicant has complied with new Staff guidelines regarding setbacks to roadways, railroad lines, and electric and natural gas transmission lines.

Setbacks to Roads

All turbines have been sited at least 1,023.62 feet from busy state roads and federal highways, compliant with the setback minimum equal to 150 percent of the sum of the hub height and rotor diameter. This is based on the Nordex N117 2.4 MW turbine with a 58.5 meter blade on a 91 meter tower.

Setbacks to Railroad Lines, Electric and Natural Gas Transmission Lines

All turbines have been sited at least 539.5 feet from railroad lines and electric and natural gas transmission lines, compliant with the minimum setback of 1.1 times structure height. This is based on the Nordex N117 2.4 MW turbine with a 58.5 meter blade on a 91 meter tower.

(i) Distance from base to property line

With the exception of 16 proposed turbine sites, all other turbines have been sited at least 539.5 feet from the nearest uncontrolled property boundary, compliant with the minimum setback of 1.1 times structure height. This is based on the Nordex N117 2.4 MW turbine with a 58.5 meter blade on a 91 meter tower. The Applicant's land lease agreement allows for turbine placement within the minimum setbacks set forth by OPSB. For 16 proposed turbine locations (numbers 1, 3, 4, 5, 6, 7, 9, 10, 12, 13, 14, 15, 17, 21, 22, and 25), the minimum setback of 1.1 times structure height to the nearest adjacent property boundary is penetrated. The adjacent landowners to each of these turbines have parcels under lease with the Applicant. The Applicant is currently in the process of executing a waiver of the minimum setback with each of these landowners.

All other turbine locations adhere to the minimum setbacks set forth by OPSB.

(ii) Distance from blade to property line

At the time of this Application, all turbines have been sited at least 1,125 feet from the nearest habitable residential structure.

One additional residential structure (while not inhabited) is currently under construction on property owned by a participating landowner. Turbine 9 is 1,117.5 feet from this structure. The location of this residential structure was determined by the participating landowner after wind ground lease agreements were executed and with full knowledge of the infrastructure that will be installed. The Applicant is currently in the process of executing a waiver of the minimum setback with this landowner.

(iii) Waiver of minimum setback

The Applicant's land lease agreement allows for turbine placement within the minimum setbacks set forth by OPSB.

For 16 proposed turbine locations (numbers 1, 3, 4, 5, 6, 7, 9, 10, 12, 13, 14, 15, 17, 21, 22, and 25), the minimum setback of 1.1 times structure height to the nearest adjacent property boundary is penetrated. The adjacent landowners to each of these turbines have parcels under lease with the Applicant. The Applicant is currently in the process of executing a waiver of the minimum setback with each of these landowners.

For the one residential structure that is currently under construction, the minimum setback of 1,125 feet from the nearest habitable residential structure is penetrated. The Applicant is currently in the process of executing a waiver of the minimum setback with this participating landowner.

(d) *Impact of Proposed Facility*

Agriculture is the predominant land use in the vicinity of the Project Area. Table 08-9 summarizes land use impacts, based on the typical area of vegetation clearing column presented in Table 03-2. As measured by percent of total area, agricultural land occupies 92% of the total impacts.

The predominantly agricultural land use in and around the Project Area demonstrates the rural character of the region. The land is made up of flat and rolling terrain consisting primarily of croplands, farmsteads, meadows, and forests. Residential development within and around the Facility consists almost entirely of single-family homesteads along rural roads.

Table 08-9. Land Use Impacts

Land Use	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Forestland	12.7	11.1	1.6
Residential/Developed	6.9	5.9	1.0
Pasture and Cropland	220.9	195.4	25.5
Farmstead Lands	0.6	0.4	0.2
Wetlands	0.6	0.5	0.1
Total	**241.7**	**213.3**	**28.4**

Source: Ecology & Environmental, 2013.

Construction and operation of the proposed Facility will not result in any impacts to the following land uses: orchards and groves, urban, manufacturing and commercial, mining, recreational, transport, utilities, or water and wetlands. Construction of the proposed Facility will involve the leasing of private land, collectively comprising approximately 4,650 acres. This land is currently being used primarily for agricultural purposes. While both temporary impacts 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 4906-17-08(F)(2)(b) of this Application, Greenwich Wind Farm LLC 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.

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 turbines bases, substations, and other ancillary structures will result in the cumulative permanent conversion of approximately 28 acres of land from its current use to built facilities (approximately 0.6% of the 4,650 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).

(e) *Identification of Structures to 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 proposed Facility.

(f) *Plans for Future Use*

As previously indicated, comprehensive plans for Huron County indicates that current rural land uses are the preferred use for future development. A common goal among the comprehensive plan is to utilize agricultural land in order to encourage economic diversity and to promote the conservation of high quality farm land. The proposed Facility is compatible with the land uses and zoning policies of the municipalities within five miles of the Project site.

(g) *Concurrent or Secondary Uses*

The Applicant has no plans for concurrent or secondary uses of the site. However, because 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.

(2) Economics

Information provided in this section was obtained from *Assessing the Economic Impacts of Greenwich Wind Farm*, a report prepared by Windlab Systems (see Exhibit G). In the evaluation of economic impacts, Windlab used the Job and Economic Development Impact Wind Model (JEDI), specifically designed to assess economic impacts of wind-powered electric generation facilities. The model was developed in 2002 for the National Renewable Energy Laboratory, under the auspices of the U.S. Department of Energy's "Wind Powering America" project. Originally developed with state-specific parameters, subsequent refinements make it possible to analyze impacts on regional and county level economies. Using this information, an input-output model with data specific to Ohio and the local economy was used to estimate the economic impacts of the proposed Facility. The model evaluates both the construction phase of the project, and the ongoing operations and maintenance phase of the project.

In order to further evaluate and verify the output figures generated by the JEDI model, the Applicant consulted with a third-party independent constructor familiar with the construction and operation of wind energy generating facilities, as well as ran further financial operating models in-house. After completing this second stage of verification, the Applicant revised the JEDI output numbers. Therefore, the figures presented below (while different from the JEDI output numbers in Exhibit G) provide a more accurate estimate of anticipated construction and operating figures.

(a) *Estimated Payroll*

Construction of the proposed Facility will take approximately four to six months. The size of the construction crew will vary based on weather conditions and the stage of construction; therefore, all workers will not be on site at the same time. Over the construction period, there are generally three phases. The first and last phases typically call for smaller construction crews, while the peak phase of construction requires a full complement of employees working on-site. The Applicant's policy is to maximize the number of local workers, subject to the nature of the construction process. It is expected that a substantial portion of all construction workers will be hired from within Ohio, including managers, technicians, and administrative staff. The remaining workers, those who have specialized skills at constructing wind farms, will likely come from other locations. Construction of the proposed Facility will employ a total work force of approximately 100 employees over the course of the 4 to 6-month construction period. Total construction payroll is anticipated to total $8 million.

Once operational, the Facility is expected to employ 3-4 full-time workers. These positions will consist of an operations manager/supervisor, operations and maintenance technicians, parts/logistics personnel, and a customer service representative. Total annual payroll for all of the Facility's full-time employees is estimated to be approximately $215,000 per year.

(b) *Estimated Employment*

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. It is expected that approximately 50 % of all construction workers will be hired from within Ohio, including managers, technicians, and administrative staff. The remaining workers, those who

have specialized skills at constructing wind farms, will likely come from other locations. Construction of the proposed Facility will employ a total work force of approximately 100 employees over a four to six month period. 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 households and local businesses.

Once the Facility is operational, wages and salaries from new jobs will continue to add to the local economy. Operations and maintenance of the proposed wind farm will create approximately 3-4 new full-time jobs directly supporting operation of the Facility.

(c) *Estimated Tax Revenue*

The proposed Facility will have a significant positive impact on the local tax base, including the local school district and other taxing districts that service the area where the proposed wind farm is to be located. Taxing districts within the Project Area include Huron County, Greenwich Township, Village of Greenwich, and the South Central School District.

Ohio Revised Code Section 5727.75 exempts qualified energy projects, including wind farms, from real and personal property taxation if certain conditions are met. Instead, owners and lessees of such projects are required to make annual payments in lieu of taxes. In order to qualify for the property tax exemption – and be certified by the Ohio Department of Development as a qualified energy project – several criteria/requirements must be met:

- **Application Submittal:** The facility owner or a lessee must submit an application to the Ohio Power Siting Board for a certificate under

Section 4906.20 of the Revised Code on or before December 31, 2015. This Application was officially submitted in December 2013.

- **Construction:** Construction or installation of the energy facility must begin on or after January 1, 2009, and before January 1, 2016. At this time, it is anticipated that facility construction will begin in the second quarter of 2015.

- **County Approval:** The board of county commissioners of the host county must also adopt a resolution approving the wind farm as a qualified energy project. As an alternative to approving the individual project, the board of county commissioners may adopt a resolution declaring the county to be an alternative energy zone and declaring all applications submitted to the Director of the Ohio Department of Development to be approved by the board. At this time, Huron County is not designated as an alternative energy zone. Furthermore, while the Huron County Board of Commissioners have not adopted a resolution approving the Facility, the Applicant is in the process of finalizing other statue requirements (see below) and anticipates that the Huron County Board of Commissioners will approve the proposed wind farm as a qualified energy project in the near future.

In order to be approved by the local county commissioners, the statue also requires facilities to:

1) Meet certain jobs-creation criteria. At this time, it is expected that approximately 50% of all construction workers will be hired from within Ohio, including managers, technicians, and administrative staff.

2) Provide for local road repairs. The Applicant is working with the Huron County Engineer to develop a road use agreement that will ensure any potential damage to public roads is repaired. As part of

the agreement, a road bond, or other similar surety, will be established to provide adequate funds to repair any construction/operation road damage that may occur. A Road Use Agreement is currently being reviewed by the Huron County Engineer and their attorneys. Refer to Exhibit Z for a copy of the proposed draft Road Use Agreement.

3) Provide training and equipment to local responders. The Applicant is working with the Village of Greenwich Fire Department and North Central EMS to develop an emergency response plan. Greenwich Fire and North Central EMS personnel will be trained to respond to emergency/fire situations that could occur at the wind farm facility. Currently, in-service emergency training is anticipated to begin prior to commencement of construction. Multiple training dates for both firefighters and EMS staff with assure all responders have adequate situational training specific to wind energy facilities.

4) Establish a partnership with a member of Ohio university system. In accordance with Ohio Revised Code Section 3345.011, the Applicant has agreed to establish a Renewable Energy Internship Program with Stark State College. Refer to Exhibit AA for a copy of the internship agreement. Exhibit AA has verbally been agreed upon and is in the process of being executed.

If exempted, the qualified energy project must make an annual payment in lieu of taxes. The amount of the annual service payment depends on the ratio of Ohio-domiciled full-time equivalent employees to total full-time equivalent employees during construction or installation during the preceding tax year. The base payment ranges from $6,000 and $8,000 per MW of nameplate capacity. In addition, the county may also require that an additional tax exempt payment be made to be allocated to the

county's general fund. However, in accordance with the Ohio Revised Code, the total annual payment cannot exceed $9,000 per megawatt.

The Applicant anticipates that it will pay real and personal property taxes at the maximum rate of $9,000 per MW of nameplate capacity per year during the life of the project. Assuming an aggregate nameplate capacity of 60 MW, the increase in local tax revenues will be $540,000 for the Facility. These funds would be paid directly to Huron County to distribute appropriately. Based on a review of the 2013 tax rates for the applicable jurisdiction where turbines would be located, the estimated average percentage distribution of the annual base payments in lieu of taxes are estimated to be as follows: approximately 2.1 % to Huron County, approximately 6.4% for Greenwich Township, and approximately 36.9% for the South Central School District.

(d) *Estimated 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 expenditures 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 the jobs created during construction and the wages paid to the work force, the Facility will have a direct economic benefit from the first round of buying and selling, which includes the purchase of goods from local sources (such as fuel), the spending of income earned by workers, annual labor revenues, and the income effect of taxes. These direct effects will result in additional, subsequent rounds of buying and selling in other sectors. In addition, local governments will see net gains in revenue for a period of up to 20 years, and participating landowners will receive revenue from lease payments (Windlab Systems, 2013b).

Annual lease payments will be provided to local landowners participating in the Facility. The lease payments are a direct financial benefit to all participating landowners, and will enhance the ability of those in the agricultural industry to continue farming. Like other local expenditures, the lease payments will also enhance the ability of participating landowners to purchase additional goods and services. To the extent that these purchases are made locally, they will have a broader positive effect on the local economy.

(3) Impact on 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 would be hired to the extent possible. Hiring non-resident workers would occur only when local residents with the required skills were no 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 an increase in traffic on roads leading to the site, due to deliveries of equipment and materials during construction.

(4) Impact on Regional Development

(a) *Description of Regional Development Effects*

Housing

The population of townships within five miles of the proposed Facility is projected to decrease from 10,823 in 2012 to approximately 10,775 by 2022. This modest population decline is projected to create pockets of both growth and loss throughout the area within five miles of the Project site. The eight Ohio townships are projected to experience a net loss in population of approximately 48 by 2022. Given conservative population decline estimates, an average housing vacancy rate of four percent within the region, and a local unemployment rate of seven percent, it is unlikely that demand for housing will significantly increase due to the construction or operation of the proposed Facility. While the project will result in a substantial increase in temporary jobs during the construction phase of the project, these jobs are short term in nature and will not have an impact on demand for new housing development over the long term. Permanent jobs created as a result of the Facility are more limited in number, and will not have an appreciable effect on housing demand within the region (Windlab Systems, 2013b).

Commercial and Industrial Development

The construction and operation of the proposed Facility will have a positive impact on commercial and industrial development in Huron County, as well as throughout north-central Ohio and the entire State. The positive impacts on commercial activity are described above in Section 4906-17-08(C)(2). In terms of industrial development, wind power projects typically require a substantial number of inputs from outside the local area, as is the case with the proposed Facility. However, there is

substantial growth potential in Ohio for renewable energy production and the manufacturing sectors that support it, according to a 2004 report by the Renewable Energy Policy Project (REPP) entitled "Wind Turbine Development: Location of Manufacturing Activity." Job creation in the manufacturing sector will include those companies already involved in wind infrastructure production.

The REPP report assessed the location of manufacturing activity related to wind turbine development, and determined the number of potential employees at existing companies capable of manufacturing turbine parts. Based on that review, Ohio ranked second in the nation (behind California) in the number of employees at companies with the potential for wind farm infrastructure manufacturing. Currently, manufacturers in Ohio are already producing wind turbine components that include blade extenders, brakes, cooling systems, gear boxes, pitch drives, power electronics, rotor blades, tower flange, bolts, and yaw drives. The REPP report estimates that existing firms in Ohio with the technical potential to become involved in wind turbine development have approximately 80,500 employees, and that these companies have the potential to expand by an adding approximately 11,500 new jobs (Sterzinger and Svercek, 2004).

While difficult to gauge the proposed Facility's exact impact on job creation and investment, the REPP analysis suggests that every 1,000 MW of wind power developed creates a potential for 3,000 jobs in manufacturing (Sterzinger and Svercek, 2004). If this formula were applied to the 60 MW Facility, approximately 180 manufacturing jobs would be created or maintained to produce the turbine components. Because Ohio already has wind turbine manufacturing infrastructure in place, the state is poised to benefit from such job creation.

Transportation System

Due to the rural nature of the Project Area and surrounding areas, public transportation is not widely available and residents must rely heavily on automobile travel. This is accomplished through a network of interstate, U.S, and state highways, as well as county, and township roads. This existing roadway network provides access to the Toledo, Cleveland, and Columbus metropolitan areas, as well as to nearby smaller communities including Freemont, Findley, and Akron.

There are two interstate highways serving the greater region: I-80/90, which connects Toledo to Cleveland, and I-71, which connects Columbus to Cleveland. The Project Area is also served by U.S. Routes 225 and 250, and State Route 13. Given the limited population and the existence of alternate routes around the proposed project site, temporary road closures during construction are not expected to create any significant adverse impacts on the vehicular transportation network.

There are numerous airports located within a two hour drive of the proposed wind farm. Cleveland Hopkins International Airport is the largest of the primary airports in the region. The airport is owned and operated by the city of Cleveland and is the largest airport in the state of Ohio. The other major airport in the area is the Toledo Express Airport, located 10 miles west of Toledo. There are also many smaller municipal or private airfields in proximity to the Project Area, used primarily for recreational purposes. Neither the construction nor operation of the proposed facility is expected to have any significant impact on these airports or the existing air travel network.

The FAA and ODOT conducted aeronautical studies of a proposed preliminary turbine layout under the provisions of Title 49 of the U.S. Code, Section 44718, and applicable Title 14 of the Code of Federal Regulations, Part 77 and Ohio Revised Code Section 4561.32 respectively. These aeronautical studies concluded that the turbines in

the preliminary layout do not exceed obstruction standards and will not be a hazard to air navigation. A Determination of No Hazard has been issued by the FAA for all of the 25 proposed turbine locations (see Exhibit S). All turbines will be marked and/or lit in accordance with FAA Advisory Circular 70/7460-1 K Change 2, Obstruction Marking and Lighting - Chapters 4, 12 & 13 (Turbines). Given the preliminary FAA determinations of no hazard to air navigation, neither construction nor operation of the proposed Facility is expected to create any adverse impacts on these airports or the existing air travel network.

One existing Sunoco pipeline is located in the vicinity of the proposed wind farm. This underground pipeline is of considerable age and not currently in operation; however, it is anticipated that this pipeline may be utilized in the future. Neither the construction nor operation of the proposed Facility is expected to create any significant adverse impacts on the existing pipeline network. The Applicant has discussed easement crossing requirements for all facilities with Sunoco Pipeline owner/operator. Once final design of project is complete, the Applicant will work with Sunoco to finalize an easement crossing agreement. Pipeline crossing requirements will be adhered to. It is anticipated that Applicant will utilize horizontal directional drilling (HDD) for collection systems beneath the pipeline easement. Any above-ground interface for access roads and crane paths will be done in accordance with Sunoco policy and final easement agreement.

One CSX rail line is located in the vicinity of the proposed wind farm. This provides the area with freight access to and from various regional locations. Neither the construction nor operation of the proposed Facility is expected to create any significant adverse impacts on the existing railroad network. In order to submit an application for a Facility Encroachment Permit, CSX requires a finalized project design and engineered drawings. Once design of project is completed, Applicant will

submit final project design and engineered drawings, along with Facility Encroachment Permit application, to CSX. Rail line crossing requirements will be adhered to. It is anticipated that collection systems will be horizontally drilled beneath the rail line easement. As CSX policy does not allow infrastructure (cranes or otherwise) to cross above-ground rail track, it is anticipated that any aboveground interface will require a crane breakdown to cross this area. Refer to Exhibit BB for a copy of the CSX Railroad Permit Application template.

(b) *Regional Plan Compatibility*

As previously indicated in Section 4906-17-08(C)(1)(f) of this Application, comprehensive plans for Huron, Richland, and Ashland Counties indicate that current rural land uses are the preferred use for future development. A common goal among the comprehensive plans it to utilize agricultural land in order to encourage economic diversity and to promote the conservation of high quality farm land. The proposed Facility aligns with the goals of the comprehensive plans and will be compatible with the land uses and zoning policies of the municipalities within five miles of the Project Area (Windlab Systems, 2013b).

(D) CULTURAL IMPACT

Data on cultural and archaeological resources was collected by Lawhon & Associates, Inc. (Lawhon et al.) and compiled into a report on the cultural impact of the proposed Facility, attached hereto as Exhibit L.

(1) Landmarks of Cultural Significance and Recreational Areas (map)

Figure 08-2 depicts registered landmarks of historic, religious, archaeological, scenic, natural, or other cultural significance within 5 miles of the proposed Facility in a 1:24,000 scale. For a more comprehensive and in-depth view of these areas, refer to Figures 1-28 in Appendix A of Exhibit L.

Lawhon & Associates staff conducted a cultural resources records review (Lawhon et al., 2013) through online resources from the Ohio Historic Preservation Office (OHPO). The records review examined a study area consisting of a 5-mile (8-kilometer) radius around the proposed Facility, consistent with OPSB guidelines. 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 historic sites, such as cemeteries, buildings, structures, objects, and districts. The literature review included the following records available from the OHPO:

- Cultural Resource Management Reports
- Ohio Archaeological Inventory (OAI)
- Ohio Historic Inventory (OHI)
- National Register of Historic Places (NRHP)
- Determination of Eligibility Files (DOE)
- National Historic Landmarks (NHL) List
- Ohio Genealogical Society (OGS) Cemetery Files
- Ohio Historic Bridge Inventory (OHPO & ODOT)
- Mills Archaeological Atlas of Ohio

The records review identified that five NRHP-listed properties have been recorded within 5 miles of the proposed Facility: the Silas Ferrell House, Mead Zimmerman House, Charles Crittenden House, Henry Crittenden House, and Gregory House. The Silas Ferrell House, OHI#RIC0078502, is located within the Village of Shiloh in Richland County. The Mead Zimmerman House, OHI#HUR0033609, is located in Greenwich Township in Huron County. The Crittenden Farm – including both the Charles Crittenden House, OHI#ASD0001401, and the Henry Crittenden House, OHI#ASD0005201, is located in Ruggles Township in Ashland County. The Gregory House, OHI#HUR0013607, is located in the Village of New London in Huron County. None of these sites is within the direct Area of Potential Effects (APE), herein

defined as the area of permanent or temporary ground disturbance associated with the Proposed Facility. The Mead Zimmerman house is located within or adjacent to the lands leased for the Facility, with the closest turbine approximately 0.36 miles to the southwest. However, no impacts are anticipated to the Mead-Zimmerman House (Lawhon et al, 2013).

The records review also identified the following cultural resources within the 5-mile study area: 5 individual properties previously determined eligible (DOE) for listing in the NRHP; one historic district; 103 previously identified historic structures recorded in the OHI; 83 archeological sites recorded in the OAI; 1 previously inventoried historic bridge recorded in the OHOP; and 37 cemeteries recorded by the OGS. Tables 1-8 in Exhibit L contain a complete listing of all identified cultural resources located within the 5-mile study area. There are no National Historic Landmarks located within the 5-mile study area.

Of the 83 OAI-listed archaeological sites in the study area, one (33HU03010, historic) is located within or adjacent to the lands leased for the Facility. A recommendation was previously made that this site is not considered eligible for listing in the National Register of Historic Places, and that no further work is required. Of the 1 historic district, 5 DOE sites, 37 OGS-listed cemeteries, and 1 OHOP historic bridge located within the 5-mile study area, none are located within the lands leases or adjacent to the Proposed Facility (Lawhon et al, 2013). Additional information about these resources can be found in Exhibit L.

(2) Estimated Impact on Landmarks

The cultural resources records review identified relatively few previously recorded cultural resources in the immediate vicinity of the proposed Facility. As described above, these include 1 archaeological site, 1 historic structure and no historic bridges or cemeteries. All Facility components have been sited to avoid these previously identified cultural resources. Based on the results of the records review, the proposed Facility will not have direct impacts on known

cultural resources within the study area. Therefore, no specific mitigation plans have been developed at this time.

The literature review indicated that much of the study area has not been systematically surveyed for the presence of cultural resources. Based on the prehistoric context of the area, unidentified prehistoric archaeological sites may be located in or near the lands leased for the Facility, and may represent a range of site types and time periods. Unidentified archaeological sites may occur along slight topographic features and ridges. Prehistoric site types that could be located within the lands leased for the Facility range from isolated artifacts reflective of a single episode in the past, to small short-term occupations, resources extraction, or other activity specific sites, or large occupation sites, and can range in date from the Paleoindian period to the Protohistoric period. Any unidentified historic archaeological sites located within the lands leased for the Facility are likely to be related to agricultural and/or rural domestic activity associated with the historic development of Huron County. Some common site types that may be represented include farmsteads or other residential sites, churches, cemeteries, schools, or historic dump and debris discard areas.

Because construction and/or operation of the Facility will not physically alter any registered landmarks, potential impacts to NRHP-listed and NRHP-eligible structures are limited to indirect visual effects. In each case, the potential effect of the proposed Facility would be a change in the visual setting associated with the property. The vast majority of historic structures listed in the OHI within the study area are located in village settings, including the Village of Greenwich, Greenwich Township, Village of New London and the Village of Shiloh. The Visual Impact Assessment prepared for the Project (Windlab, 2013e) included preparation of a viewshed model and field review of existing conditions throughout the study area. The field review indicated that some of the proposed turbines will likely be visible from portions of the Village of Greenwich, Greenwich Township and the Village of New London, particularly from properties on the outskirts of the township and village(s) that are not screened by other buildings.

The field review confirmed a lack of visibility from most portions of the township and village(s) due to the screening effects of intervening structures and/or vegetation (street and yard trees).

Although much of the study area was surveyed for the Greenwich Wind Farm, the Applicant recognizes that portions of the study area have not been systematically surveyed for the presence of cultural resources. Therefore, the Applicant intends to conduct a target Phase I archaeological reconnaissance survey and a Phase I historic structure inventory to assess the potential effects of the proposed Facility on cultural resource prior to construction. If any archeological sites are identified within the lands leased for the Facility during the Phase I investigation, the Applicant intends to document and avoid those sites. If avoidance is not possible, a Phase II investigation will take place to assess the significance of any site for which the review agencies determine the NRH status cannot be determined on the basis of the Phase I survey date. The results and conclusions of the targeted Phase I archaeological reconnaissance and Phase I historic structure inventory will be presented in a complete report of investigations to be provided at a future date following completion of the fieldwork.

(3) Consideration/Definition of Landmarks

Landmarks considered for the purposes of the two preceding sections include those districts, site, buildings, structures, and objects that are recognized by, registered with, or identified as eligible for registration by the national registry of natural landmarks, the Ohio Historical Society, or the Ohio Department of Natural Resources.

(4) Mapping Landmarks – Recreational Areas Within Five Miles

Although scenic and recreational resources of national or statewide significance are limited, the 5-mile radius area does include regional and local recreational sites. Existing recreational areas within a five-mile radius of the proposed Facility are listed below in Table 08-10.

Table 08-10. Recreational Areas Within a Five-Mile Radius of the Facility

Recreational Area	Location	Distance from Nearest Turbine
Greenwich Reservior Park	Village of Greenwich, Huron County	1.13 miles
Crall Woods	Ruggles Township, Ashland County	1.6 miles
Millstone Hills Golf Course	Village of New London, Huron County	2.4 miles
Freedom Valley Campground	Fitchville Township, Huron County	2.2 miles
New London Recreation Park	Village of New London, Huron County	3.0 miles
New London Upground Reservoir	Village of New London, Huron County	2.9 miles
Fowler Woods Nature Preserve	Butler Township, Richland County	1.6 miles

Source: Lawhon et al., 2013.

(5) Impact on Recreational Areas Within One Mile

As listed in Table 08-10, there is one recreational area located within a one-mile radius of the proposed Facility, including one local park. This recreational site is described below, along with an assessment of potential impacts from the proposed Facility.

Greenwich Reservoir Park is a community-owned park in the Village of Greenwich, Ohio. Greenwich Reservoir is on a tributary of the Southwest Branch Vermilion River and is used for recreation purposes. Construction of the reservoir was completed in 1921 and the park opened in 1956. The facilities include two picnic shelters to accommodate 250 people, approximately 20 picnic tables, grills, some playground equipment, a grass basketball court, a few horseshoe courts, and privies. Fishing is permitted in the Reservoir Lake. Two

lighted baseball diamonds exist for baseball and softball. Electric power and drinking water are available to area. An additional 22 acres of land adjacent to the existing park was purchased and developed with money from a new one-mill tax levy approved by the voters in November 1965. The park includes 40 acres of land and the 10 acre lake (Village of Greenwich, 2013). The Greenwich Reservoir Dam is of earthen construction. Its height is 19.9 feet with a length of 700 feet. Maximum discharge is 1106 cubic feet per second. It drains an area of 1.4 square miles (FindLakes.com, 2013).

A. *Proximity to population centers.* The Greenwich Reservoir Park is located within the village limits of Greenwich in Huron County, Ohio. The population of the Village of Greenwich was 1,476 in 2010.

B. *Uniqueness.* The Greenwich Reservoir Park is a city park with a reservoir which provides fishing, a nature center, and a campground. From desktop review, it is not known if this area provides any uniqueness. However, it does provide wildlife habitat and recreational activities associated with natural resources and wildlife.

C. *Topography.* The Greenwich Reservoir Park is located at approximately 1050 feet above sea level. The Reservoir Lake is located at 1042 feet above sea level.

D. *Vegetation.* Vegetation at the Greenwich Reservoir Park is primarily mowed grass lawn beside the recreational areas, such as the baseball diamonds. Trees are located throughout the project area and area likely decorative throughout the park.

E. *Hydrology.* According the Basin Characteristic Report (USGS, 2013b), the Greenwich Reservoir's area is 1.42 square miles. The mean annual precipitation at basin centroid is 36.2 inches. The streamflow variability index at the outlet is 0.619.

F. *Wildlife*. The Greenwich Reservoir is used recreationally for fishing. From desktop review, it is not known if this area provides any unique wildlife habitat.

G. *Estimate of the Impacts of the Proposed Facilities.* The proposed facilities should not impact the Greenwich Reservoir Park. The closest project impact is an access road, located approximately 0.9 mile southeast of the park.

As shown in Appendix A of Exhibit Q, turbines may be visible from open areas within the park, with the number of turbines visible ranging from 0 to 4, depending on location. It is unlikely the turbines will be visible from the dense tree lot area located on the south end of the park. In addition, intermittent trees located along the eastern edge of the park should provide some screening of the nearest 4 turbines. The Visual Impact Assessment prepared for the proposed Facility includes photo-documentation and field review of the potential visibility of the project from this recreational resource within the study area (see Appendix A of Exhibit Q).

As depicted in Figure 26 in Exhibit O, operating Facility sound levels along Reservoir Park will always be less than or equal to 35 dBA, even under high winds and anomalous meteorological conditions (Acentech, 2013).

As illustrated on Figure A-3, in Appendix A of Exhibit P, Greenwich Reservoir Park will receive no measurable shadow flicker impacts from the proposed Facility (Windlab, 2013d).

(6) Visual Impacts and Mitigation Measures

Mitigation options are limited, given the nature of the Project and its siting criteria (tall structures located in open fields). The VIA for the proposed Facility includes consideration of a variety of mitigation options including: screening, relocation, camouflage, reducing turbine height, reducing the number of turbines, considering alternate technologies, use of non-specular materials, use of

minimum amounts of lighting allowable by FAA, maintenance, and offsets. Other measures that will reduce or mitigate visual impact have been incorporated into the Project design. These include that all turbines will have uniform design, speed, height and rotor diameter; the white color of the turbines generally blends well with the sky at the horizon, and eliminates the need for daytime FAA warning lights; the Project operations and maintenance building (although not yet designed) will reflect the vernacular architecture of the area (i.e., resemble an agricultural structure); and, the placement of any advertising devices on the turbines will be prohibited.

As described in Section 4906-17-08(D)(2) of this Application, no adverse visual impacts to archaeological or historical landmarks are anticipated from construction and operation of the Facility, and no specific mitigation measures are proposed at this time. However, much of the Greenwich study area has not been systematically surveyed for cultural resources. The Applicant will initiate a Phase I cultural reconnaissance survey, including archaeological reconnaissance to assess the direct effects of the proposed Facility, and a historic structure inventory and assessment survey to assess the indirect effects of the proposed Facility. The Phase I survey is anticipated to occur in the spring/summer/fall of 2014. A complete report of investigations for the Phase I survey will be provided to OPSB staff prior to the commencement of construction of the Facility.

(E) PUBLIC RESPONSIBILITY

(1) Public Information Program

The Applicant has and 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, participation at community open houses; through the company's 800 telephone number; and through the company website.

An early informational meeting with potential landowners was held in spring 2010; the meeting was well received and long-term lease agreements were executed with agreeable landowners. An additional public meeting was held December 2011 to update the community on progress, as well as, discuss and answer general construction questions. The Applicant also hosted a community open house at South Central High School in Greenwich Township on May 22, 2013 to provide information about wind energy and the proposed Facility. Community members had the opportunity to visit a series of wind information stations and speak with wind industry experts. Information stations include wind turbine technology and construction, environmental bat studies, ecological studies, company information and, general wind information.

The Applicant maintains an informational telephone number (800-776-3461) for the Facility. This toll-free number provides a dedicated telephone line for project landowners, concerned parties, and the general public to reach Applicant. Callers may ask questions about the project, voice concerns, and request information.

The Applicant maintains an informational website for the Facility (located at www.greenwichwindpark.com). This website provides project information, along with news releases and general information about wind power resources and the benefits of wind power. This website will be continuously updated with new information throughout the planning and review process. In addition, Windlab staff will continue to be available to interact with the community and public officials during the construction and operation phases of the Project.

(2) Liability Insurance

The Applicant will effect 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, at a minimum, insure against claims of

$1,000,000 per occurrence and $2,000,000 in the aggregate. In addition, Applicant shall effect 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, at a minimum, insure against claims of $10,000,000 per occurrence and $10,000,000 in the aggregate.

(3) Evaluation of Interference with Radio and Television

To evaluate the potential for the Facility to impact existing telecommunications, Comsearch was contracted to conduct analyses of off-air television, cable and satellite sites, Doppler radar paths, AM/FM broadcast station operations, licensed microwave paths, land mobile (cellular phone) service, and emergency phone service in the vicinity of the Project Area (see Exhibit T). Potential impacts to each of these resources are described below.

Off-Air Television Analysis: Off-air television stations transmit broadcast signals from terrestrially located facilities that can be received directly by a television receive or house-mounted antenna. The television reception analysis identified all off-air television stations with a 150-kilometer (93.2- mile) radius of an area of interested encompassing the proposed Facility, as illustrated in Figure 2 of the Off-Air-TV Reception Analysis report in Exhibit T. The results of the study indicate that there are 138 off-air television stations within 150 kilometers, including stations broadcast from Ohio, Michigan, and Ontario, Canada. However, the television stations most likely to produce off-air coverage to Huron County residents in the vicinity of the Project Area are those located at a distance of 75 kilometers (46.6 miles) or less.

Of the 27 licensed and operating television stations identified within 75 kilometers of the area of interest, 13 are full-power stations and 14 are either low-power digital stations or translators. The selection of off-air television available to the local communities is considered good, since there are an adequate number of full-power digital channels available. Translators and other low-power stations

typically have a limited range, and programming is often limited, as well. Since the turbines are located beyond the coverage area of all 14 low-power stations and translators, there will be no impact to these stations (Comsearch, 2013f).

There are numerous full-power stations located around the Greenwich project area. WGGN-TV is just outside the project's area-of-interest and within 2.9 kilometers of the closest wind turbine. The station's antenna is on a tower at a height of 297.8 meters above ground level. At this height the station's signal will not pass through any of the wind turbine blades. Because of this, the overall coverage of the station should be unaffected by the wind turbines even though the station antenna is close to the wind turbines. The residences close to the station, including those in and around the project, will receive a signal so strong that the attenuation caused by the wind turbines should not prevent satisfactory reception of the station's programming.

For the stations which are located further away from the project area, there may be difficulty receiving stations for residences that are on the opposite side of the project area. Because the television stations are located in a diverse manner around the Greenwich project area, no single community or area should be deprived of all its sources of off-air programming. However, it is possible that one or more stations will no longer be available to some communities when the project is completed. This is due to the fact that most of the stations are located at a significant distance from the project area, with the exception of WGGN-TV, which means the received signals are weak to begin with. The wind turbines could attenuate the television signal further and it might cause the signal level to fall below the level that can produce acceptable reception. However, it is not anticipated that any community will lose all of its off-air broadcast stations after the project's wind turbines are installed. It is also expected that cable, where it is available, and direct broadcast satellite service (DBS) are utilized extensively in the communities in and around the project area. Both cable service and direct broadcast satellite service should be unaffected by the presence of the wind turbine facility.

If Facility operation results in impacts to existing off-air television coverage, the Applicant will address each reported concern individually. One option of remediation may be to offer cable television hookups or direct broadcast satellite reception systems to those residents who can demonstrate that their off-air TV reception has been disrupted by the presence of the wind turbines, after they are installed. Please see section below regarding Cable and Satellite for additional information.

Cable and Satellite Analysis: Comsearch (2013b) was retained to evaluate the potential for impacts to cable and satellite sites identified within or near the Project area. A head-end facility is the core of a cable television system. The facility handles many types of functions including reception and processing of broadcast or "off-air" television signals and reception, decryption and modulation of satellite programming for distribution to cable TV subscribers. Wind turbines may affect cable head-end facilities that are receiving wireless off-air television and satellite signals. In addition, wind turbines may attenuate the signal transmitted and received in satellite uplinks and receive earth stations. Cable and satellite data was derived from a several sources including the FCC's cable and international bureau databases, as well as the operators themselves. Comsearch identified the physical system IDs (PSIDs), community units, and cable operators in the area of interest. In general, each unique PSID corresponds to a principal head-end facility with multiple community units served by that facility, also referred to as a cable plant. (For a summary of the cable systems near the Project area, see Exhibit T, Table 1). In addition to the PSIDs which are area-based, Comsearch also identified and plotted site-based FCC-licensed head-end facilities and satellite earth stations. The data was imported into GIS software and the structures mapped in relation to the wind energy area of interest (see Exhibit T, Figure1).

In planning wind turbine locations within the Project area, a conservative approach would dictate to avoid siting turbines in close proximity to satellite structures, thus avoiding any possible impact to the communications services.

Since all of the satellite sites identified near the Greenwich wind project are well outside the Project area, no impact to their services is anticipated. There is a possibility that cable facilities located near the Project area may have off-air television reception antennas on their premises (if they are not using fiber or satellite as their method of off-air television reception). For these facilities, it is possible that the television stations that are being transmitted from east and northeast of the project (primarily from Cleveland and Akron) may experience signal obstruction by the wind turbines (if turbines are directly located between the television transmitter and the receiver antenna at the head-end site). This could result in degradation of the television signal being received at the head-end site. If Facility operation results in any degradation to a head-end facility's off-air television reception due to a wind turbine, the Applicant will address each reported concern individually. One option of remediation may be advising cable providers to use an alternate method of reception, such as fiber, satellite or that they receive the obstructed television signal from a different head-end location.

Doppler Radar: Comsearch (2013c) was also contracted to assess the impact of the Greenwich wind facility on the operation of Doppler weather Radar systems owned and operated by television stations and commercial interests within 250 kilometers of the proposed wind energy project. As shown on Table 1 in the Doppler Radar Study in Exhibit T, Comsearch identified twenty-one television stations and commercial Doppler radar systems located within 250 kilometers of the project area.

In order to determine the potential impact of the turbines on the Doppler radar systems in the area, Comsearch calculated whether the wind turbines are located in line-of-sight of the radar systems. If turbines are located in line-of-sight of the radar systems' transmitted signals, turbines have the potential to block radar coverage and produce false targets. (See Table 3, Doppler Radar Study, Exhibit T for calculations to determine line-of site). As shown in Table 3 in the Doppler Radar Study (Exhibit T), Comsearch determined that three of the

twenty-one radar systems could have a potential line-of-sight condition with the wind turbines.

To further analyze the line-of-sight conditions for these three Doppler radar systems, terrain path profiles were undertaken by Comsearch to determine the actual conditions of the path that exists between the three radar sites and the wind turbines. The closest planned wind turbine to each of the radar systems was used for this analysis. (See Figures 4, 5, and 6, Doppler Radar Study, Exhibit T for path profiles). Based on Comsearch's calculations, path profiles, and analysis performed in the project area, they concluded that two of the twenty-one Radar systems in the area could potentially be impacted by the planned wind turbines.

As an operational mitigation, the clutter sectors caused by the wind turbines can be mapped and provided to the radar operators so that they are aware of the potential for lost coverage and false targets in the wind facility area. Another useful mitigation would be to provide a switchable blanking capability in the sectors where the radar antennas would have line-of-sight conditions to the wind turbines. The blanking capability shuts the radar transmitter off at those azimuths so that clutter and false targets will not appear on the radar displays. The operators, at their discretion, could use the blanking if it enhanced the data collection they were striving to obtain. If possible, the affected radar systems could be relocated so that their operation would not be degraded by the wind turbines (Comsearch, 2013c).

AM/FM Analysis: Comsearch (2013a) indentified six AM stations within 30 kilometers (18.6 miles) of the Project. Potential problems with AM broadcast coverage can occur when stations with directive antennas are located within 3.2 kilometers (2 miles) of turbines or when stations with non-directive antennas are located within 0.8 kilometers (0.5 mile). As shown in Figure 1 in the Analysis of AM and FM Radio Report in Exhibit T, all AM stations are located outside the Project Area, with the closest station located approximately 20.3 kilometers (12.6

miles) from the nearest proposed turbine site. Therefore, no degradation of AM broadcast coverage is anticipated (Comsearch, 2013a).

In addition, Comsearch determined that there are records for twenty-one licensed and operational FM stations within 30 kilometers (18.6 miles) of the Project. [There are twenty-eight database records for FM stations within 30 kilometers; however, seven of these are low-power or translator stations that operate with limited range.] For FM stations, a separation distance of 4 kilometers (2.5 miles) is recommended so that the stations can maintain normal operation and coverage. As shown on Figure 2 in the Analysis of AM and FM Broadcast Station Operations report in Exhibit T, all FM stations are located outside the Project Area. However, there is one station (NEW) with an application for a construction permit in the project area-of-interest. The FCC application is from 2003 and it may not ever be built. The station will be owned by the Mansfield Christian School and its transmit power is only 120 watts. The height of the antenna center line is to be 24 meters which means the coverage of the station should be unaffected by the wind turbines since the signal radiated from the antenna will be below the bottom tip height of the wind turbine blades. If this station becomes operational its coverage should not reduced by the presence of the wind turbines (Comsearch, 2013).

Licensed Microwave Report: Microwave telecommunication systems are wireless point-to-point links that communicate between two antennas and require clear line-of-sight conditions between each antenna. As shown on Figure 2 in the Licensed Microwave Report in Exhibit T, Comsearch (2013e) identified four microwave paths in the vicinity of the Project Area. 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. Comsearch calculated a Worse Case Fresnel Zone (WCFZ) for each of the microwave paths identified. Based upon the calculated WCFZ and subsequent analysis, it was determined that none of the turbines conflict with microwave paths. Therefore,

no degradation of microwave telecommunications is anticipated (Comsearch, 2013e).

Land Mobile (Cellular) and Emergency Services Report: Comsearch (2013d) investigated the potential impact of wind turbines on mobile (cellular) telephone operations in and around the Project Area, and the results of their investigation can be found within the Land Mobile and Emergency Services Report in Exhibit T. This analysis evaluated the registered frequencies for the following types of first responder entities: police, fire, emergency medical services, emergency management, hospitals, public works, transportation and other state, county and municipal agencies. Additionally, all industrial and business land mobile radio (LMR) systems and commercial E911 operators within the proposed wind energy facility boundaries were included.

Land mobile and emergency services incumbent data was derived from the FCC's Universal Licensing System (ULS) and the FCC's Public Safety and Homeland Security bureau. Twenty-one site based licenses, twenty-five area wide licenses and seven E911 wireless operators were identified near the Project Area. The closest site based license is 360 meters to a turbine location, which is well above the conservative 77.5 meter recommended buffer to avoid interference. The first responder, industrial/business land mobile sites, area wide public safety and commercial E911 communications are typically unaffected by the presence of wind turbines and do not represent any significant harmful effect to these services in the Greenwich wind energy project area. Although each of these services operates in different frequency ranges and provides different types of service including voice, video and data applications, there is a commonality among these different networks in regard to the impact of wind turbines on their service. Each of these networks is designed to operate reliably in a non-line-of-site (NLOS) environment. Many land mobile systems are designed with multiple base transmitter stations covering a large geographic area with overlap between adjacent transmitter sites in order to provide handoff between cells, and any signal blockage caused by the wind turbines does not

materially degrade the reception because the end user is likely receiving signals from multiple transmitter locations. Additionally, the frequencies of operation for these services have characteristics that allow the signal to propagate through wind turbines. To avoid any possible impact to the communication services all turbines are located well beyond the recommended 77.5 meter FCC setback for electrical device (Comsearch, 2013d).

As a result, very little, if any, change in their coverage should occur when the wind turbines are installed. Therefore, it is anticipated that no cellular telephone service will be impacted by the proposed Facility (Comsearch, 2013d).

(4) Evaluation of Interference with Military Radar Systems

Windlab sent 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 Federal Aviation Administration. 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 radar systems, this conflict would be identified during IRAC review.

The notification letter was sent to NTIA on March 23, 2010. A response letter from NTIA was received on June 3, 2010 (see Exhibit T). No concerns regarding blockage of communication systems were identified.

(5) Evaluation of Impact to Roads and Bridges

The Applicant has been working in coordination with the Huron County Engineer to develop a road use agreement 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 Huron County Engineer's Office to provide adequate funds to repair any damage to public roads. Currently, a draft Road Use Agreement is being reviewed by the Huron County Engineer and their attorneys. Applicant is currently awaiting comments. A copy of the current proposed draft road use agreement is attached to this Application as Exhibit Z.

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. Metro Consulting Associates (MCA) prepared a Route Evaluation Study for the Facility (see Exhibit E) to identify probable equipment delivery routes; identify preliminary constraints that would require roadway improvements; describe required state permits; and describe the types of road impact that are typical for the development of a wind turbine facility (MCA, 2013b).

The size and types of vehicles needed to deliver the turbine equipment depend on the Facility location, and the model and manufacturer of the turbine being hauled. Turbine components and associated vehicles can be classified as follows:

- *Blade Sections:* Blades are transported on trailers with one to three blades per vehicle. Blades typically control the length of the design vehicle, and the radii of the curves that can be navigated along the travel route to the site. Specialized transport vehicles are designed with articulating (manual or self-steering) rear axles to allow maneuverability through curves.
- *Tower Sections:* Towers are typically transported in four to six sections depending on the supplier. Although towers do not generally control design vehicle length but may control design vehicle height and/or width.
- *Nacelle and Hub:* The turbine nacelle, hub, and related elements are typically the heaviest components transported. Generally, the nacelle and

hub are transported separately, and the nacelle is the heaviest component.

- *Escort Vehicles:* Light trucks with signs and banners that travel immediately in front or behind oversized loads to provide warning to motorists of the oversized vehicle.

Transportation of turbine components and associated construction material involves numerous conventional and specialized transportation vehicles. Conventional trucks will carry stone, gravel, and miscellaneous construction equipment. Cranes will be used for assembly of wind towers, and will be transported to the site in sections, requiring numerous trips. Concrete trucks will deliver materials for the turbine foundations. Because they are the largest component, delivering the turbine blades will present the greatest logistical challenge. To accommodate the turbine blades, a worst-case design vehicle was developed for this evaluation, with a 187-foot trailer and total length of 206 feet.

Exact component origination will be determined at a later date. Once the point of origin has been finalized, a more thorough evaluation of the selected delivery route(s) will be conducted to determine infrastructure needs, identify specific impacts, and recommend specific mitigation strategies. In addition, conditions of existing infrastructure will be quantitatively and qualitatively documented to establish a record of existing conditions. The detailed routing study will be used to meet the requirements of the State, County, and Local Governments that will be impacted by construction of the proposed Facility.

Interstate 71 and U.S. Route 224 will be the primary roads used to access the Project Area vicinity. Therefore, the probable equipment delivery routes analyzed originate at interchanges from these highways. Delivery vehicles using U.S. Route 224 will approach the Project Area from the east. This roadway is 22 feet wide, is surfaced with asphalt in good condition, and has a variable speed limit between 35 and 55 miles per hour (mph). Delivery vehicles using Interstate 71 will approach from the south and north, depending on component origination,

and will access the Project Area from the east via U.S. Route 224. Interstate 71 is surfaced with asphalt in good condition, and has a speed limit of 70 mph. Possible constraining points were investigated in the field, and existing conditions were photo-documented. The path of the worst-case design vehicle was evaluated along each of the potential travel routes to identify conceptual intersection and sharp curve improvements that may be required. Figures 1-9 in Appendix D of Exhibit E show conceptual widening improvement areas for potential constraints identified for the Project construction and delivery route (MCA, 2013b).

Because they are the largest component, delivering the turbine blades will present the greatest logistical challenge. Component height is also restrictive, since clearance under overhead bridges cannot be modified without substantial cost implications. An experienced transportation provider will be used for the delivery of materials and turbine elements. Low-profile flatbed or open-bottom (Schnabel) truck trailers may be utilized to offset overhead clearance limitations. Multi-axle trailers may be utilized to distribute oversized loads to acceptable levels, as stipulated by state special hauling permits. Special hauling permits are required when loads exceed legal dimensions or weights. Table 08-11 summarizes these maximum legal dimensions for State of Ohio highways, along with the approximate dimensions for Facility delivery vehicles. Transportation of the blades, nacelles, and tower sections will require Special Hauling Permits for criteria that exceed state highway limits. Each individual vehicle must receive a separate Special Hauling Permit from the ODOT Central Office. The specifications of the Special Hauling Permit depend on the characteristics of the vehicle, its cargo, and the duration of the delivery schedule. Nacelles can weigh up to 200,000 pounds, and when combined with the transport vehicle, the total weight can exceed 380,000 pounds. 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.

Table 08-11. State Highway Limits and Dimensions of Facility Components

Vehicle Characteristics	State Highway Limit	Approximate Dimension of Component to be Transported, Inclusive of Vehicle		
		Blade	Nacelle	Tower Sections
Width of Vehicle, Inclusive of Load	8.5 feet	12.2 feet	11.5 feet	14.0 feet
Height of Vehicle, Inclusive of Load	13.5 feet	14.5 feet	14.5 feet	15.0 feet
Length of Vehicle, Inclusive of Load	75 feet	206 feet	132 feet	158 feet
Total Weight of Vehicle, with 3 more more axles	80,000 lbs	94,000 lbs	224,000 lbs	232,000 lbs

Source: Metro Consulting Associates, 2013b.

The roadways to be used for delivering Facility equipment and materials will be video-documented prior to the commencement of construction to establish existing conditions. Upon completion of the Facility, the Applicant will return all roadways to their pre-construction conditions. Pavement or structures damaged during construction will be replaced. The process of documenting roadway conditions and restoring impacted roads will be performed in conjunction with state and local permitting.

To the extent that public roads will be utilized and potentially damaged from construction-related traffic, the Applicant will work with the Huron County Engineer to ensure that such damage is repaired. 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.

(6) Plan for 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 not upgraded, or if the turbines are non-operational for an extended period of time (such that there is no expectation of their returning

to operation), they will be decommissioned. The Applicant's plan for de-commissioning of the site (Exhibit Y) is comprised of two primary components: removal of Facility improvements and financial assurance. Each of these components is described in additional detail below. The Applicant's decommissioning plan complies with item 26 of the OPSB Post-Certificate Requirements. Refer to Exhibit Y for a complete discussion of the Applicant's decommissioning plan for the Project Area.

Removal of Facility Improvements

At the termination of the lease, or if at any time during the lease period no electricity has been generated for a continuous period of 12 months, the Applicant will dismantle and remove Facility improvements and all other physical material pertaining to the facility owned or installed by 6011 Greenwich Windpark, LLC. All physical material pertaining to the wind energy facility to a depth of 36 inches will be removed. Any underground infrastructure installed to a greater depth may remain in place. Turbine foundations will be excavated to a depth sufficient to remove all anchor bolts, rebar, conduits, cable, and concrete to a depth of 60 inches below grade. 6011 Greenwich Windpark, LLC will re-grade disturbed areas, restoring slopes and contours to their original grade, to the extent possible. Upon request of the landowner, Greenwich Windpark may consider allowing access roads, buildings, structures, or other improvements to remain in place. However, Greenwich Windpark is 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. Refer to Exhibit Y of this Application for additional discussion of removal of Facility components/improvements for the Project Area.

Financial Assurance

6011 Greenwich Windpark, LLC will post and maintain funds, a surety bond, or similar financial assurance in an amount equal to the per-turbine Decommissioning Costs multiplied by the sum of the number of turbines constructed. The funds, surety bond, or financial assurance total amount will

reflect the aggregate of the Decommissioning Costs for all turbines constructed. The Applicant will retain an independent, registered Professional Engineer, licensed to practice engineering in the state of Ohio to estimate the total cost of decommissioning in current dollars. This estimate shall be conducted every five years. The Applicant will maintain such funds or assurance throughout the remainder of the applicable term and will adjust the amount of assurance, if necessary, to offset any increase or decrease in the Decommissioning Costs. Refer to Exhibit Y of this Application for additional discussion of financial assurance for the Project Area.

(F) AGRICULTURAL DISTRICT IMPACT

(1) Agricultural District Mapping

Agricultural land use is a significant component of the Project Area. Figure 08-3 depicts agricultural land and agricultural district land within the Project Area.

(2) Impact Assessment on Agricultural Land

Significant impacts to agricultural land have been avoided through careful Facility design, which deliberately 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 08-12 quantifies impacts to agricultural land uses, based on the typical area of vegetation clearing column presented in Table 03-2.

Table 08-12. Impacts to Agricultural Land

Agricultural Land	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Confined Feeding Operations	0	0	0
Cultivated Lands	202.2	177.3	24.9
Farmstead	0.6	0.4	0.2
Pasturelands	18.7	18.1	0.6
Total	**221.5**	**195.8**	**25.7**

Source: ODNR, 1981.

Construction and operation of the proposed Facility will not result in any impacts to managed woodlots, orchards, nurseries, or agricultural related structures.

(i) Field operations

As shown above in Table 08-16, construction of Facility access roads, buried interconnects, wind turbines, and other accessory structures will collectively temporarily disturb a total of 195.8 acres of agricultural lands. Although most of these impacts will be temporary, approximately 25.7 acres of agricultural lands will be converted to built facilities. Access road construction through agricultural fields may include stripping of up to a 40-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 20 feet or less. In locations where buried cable crosses agricultural fields, construction equipment may disturb a width of up to 60 feet of soil. However, this will represent a temporary

disturbance only, and as the cable will be buried at depth of 36 to 48 inches, will not have a long-term impact on farming practices (e.g., plowing). Topsoil within a 150-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 0.2 acre, which includes the turbine pedestal, crane pad, and gravel skirt. The remaining work area will be restored to agricultural use.

Along with these direct impacts to agricultural land, movement 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.

(b) *Proposed Mitigation Procedures*

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 (wherever possible), so as to minimize adverse impacts on agricultural land and farming operations. Permanent access road width is limited to 20 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 yard, and other temporary and permanent support facilities have been located outside of active agricultural fields were 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:

<u>Access Roads Specifications</u>

- 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 20 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). Stockpiled topsoil shall be left on the property from which it was removed.
- 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. If drainage or other issues preclude a level surface, the road will be elevated no more than six inches above the surrounding field. 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 required when rutting occurs to an extent that it interrupts natural cross drainage of the area traversed, or prevents 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 the access roads, designated work areas at the tower sites, and/or designated parking and the material laydown

yard. 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 yard 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. All existing fences and gates will be maintained or relocated as necessary to prevent livestock access to the work area and/or escape from fenced enclosures. Following construction, any relocated 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 whenever possible. If this material is determined to be unsuitable as backfill, select granular fill (e.g., bank run gravel) will be utilized in its place. No rock backfill will be used in the top 24 inches in active agricultural fields.

<u>Foundation Specifications</u>

- Concrete trucks will be restricted to designated access roads and crane pads at all times.

- Excess concrete shall be disposed of offsite, unless otherwise approved by 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 agricultural areas in locations approved by the landowner.
- In active pasture areas, foundation 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 cranes will be restricted to designated access roads and work pads at the structure sites. 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 geo-textile 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 yard.
- 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 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.
- 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 if 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.

(3) Viability Assessment

The impact of Facility construction and operation/maintenance is qualified above in Table 08-12, which addresses impacts to the following agricultural land uses:

- Confined Feeding Operations,
- Cultivated Lands,
- Farmstead,
- Pasturelands

The Facility will not physically impact any agriculturally 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. 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.

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