4906-17-08 Social and Ecological Data

(A) HEALTH AND SAFETY

(1) Demographic Characteristics

The Project area boundary is located in Paulding and Van Wert Counties, Ohio, within the Townships of Benton, Blue Creek, Hoaglin, Latty, Tully, and Union. The Project area consists primarily of agricultural land situated amongst the communities of Van Wert, Scott, Cavett, Haviland, and Convoy. Additional communities that exist within five miles of the Project area boundary include three townships in Paulding County (Harrison, Jackson, and Paulding); five townships in Van Wert County (Harrison, Jackson, Pleasant, Ridge, and Washington); the City of Van Wert; four villages in Paulding County (Broughton, Grover Hill, Latty, and Payne); and the Village of Convoy in Van Wert County.

Table 8-1 provides the population of each county, township, city, and village within five miles of the Project area boundary. The information presented in this table is based on the 1990 and 2000 census, as well as 2008 and 2020 population estimates from the Ohio Department of Development (ODOD), Policy Research and Strategic Planning Office and the U.S. Census Bureau (USCB). Projected 2020 population data is only available at the state and county levels; therefore, the Applicant has estimated data for townships, cities, and villages based on the percentage average annual rate of change provided by the ODOD.

TABLE 8-1
Populations of Communities within 5 Miles of the Facility

Governmental Unit	1990 Census Population [1, a]	2000 Census Population [b]	2008 Population Estimate [b]	2020 Population Projection [2, c]
Paulding County	20,488	20,293	19,096	19,430
Benton Township	--	1,035	983	912
Village of Payne (pt.)	1,244 (total)	341	329	301
Blue Creek Township	--	804	786	758

TABLE 8-1
Populations of Communities within 5 Miles of the Facility

Governmental Unit	1990 Census Population [1, a]	2000 Census Population [b]	2008 Population Estimate [b]	2020 Population Projection [2, c]
Village of Haviland	210	180	165	140
Village of Scott	339 (total)	118	112	104
Harrison Township	--	1,566	1,481	1,357
Village of Payne	1,244 (total)	825	823	754
Jackson Township	--	1,886	1,769	1,599
Village of Broughton	151	166	153	135
Latty Township	--	1,026	1,025	1,025
Village of Grover Hill	518	412	368	311
Paulding Township	--	4,008	3,741	3,382
Village of Latty	205	200	184	162
Washington Township	--	789	771	706
Van Wert County	30,464	29,659	28,748	28,970
Harrison Township	--	1,085	1,060	1,022
Hoaglin Township	--	605	651	721
Pleasant Township	--	11,120	10,594	9,831
City of Van Wert (pt.)	10,891	8,887 (10,690 total)	8,500 (10,211 total)	7,684 (9,231 total)
Ridge Township	--	3,114	3,058	2,985
City of Van Wert (pt.)	10,891	1,803 (10,690 total)	1,711 (10,211 total)	1,567 (9,231 total)
Tully Township	--	2,119	2,060	1,986
Village of Convoy	1,200	1,110	1,050	962
Union Township	--	1,009	1,028	1,053
Village of Scott (pt.)	339 (total)	204	198	189
Washington Township	--	5,228	5,062	4,819

Notes:

1 Through correspondence with the ODOD, it was determined that this data is not available at the township level (Larrick, 2009).

2 For all townships, cities, and villages, the Applicant calculated this estimated value using the percent average annual rate of change provided for each governmental unit by the ODOD.

Sources:

a ODOD, 2009a & USCB, 2009a

b ODOD, 2009b

c ODOD, 2009c

As shown in the table above, with the exception of the Village of Broughton and Union Township, each county, township, city, and village that occurs within five miles of the Project area boundary has experienced a decline in population from 1990 to 2008. Most of the townships, cities, and villages anticipate continued declines in population from 2008 to 2020. Projected populations for Paulding and Van Wert Counties and Hoaglin and Union Townships portray small increases.

The estimated population density for the year 2000 in Paulding County was 48.8 persons per square mile (ppsm), while Van Wert County was 72.3 ppsm. In comparison, the state of Ohio was 277.3 ppsm during the same year (USCB, 2009b).

(2) Noise

Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. There are several ways to measure noise, depending on the source of the noise, the receiver, and the reason for the noise measurement. Table 8-2 summarizes the technical noise terms used in this section. In addition, an introduction to acoustics and technical vocabulary is included in Appendix T, Noise Analysis of Blue Creek Wind Farm Project.

TABLE 8-2
Definitions of Acoustical Terms

Term	Definitions
Ambient noise level	The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
Decibel (dB)	A unit describing the amplitude of noise, equal to 20 times the logarithm to the base 10 of the ratio of the measured pressure to the reference pressure, this is 20 micropascals.
A-weighted noise pressure level (dBA)	The noise pressure level in decibels as measured on a noise level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the noise in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise. All noise levels in this report are A-weighted.

Source: Beranek, 1988

(a) Construction Noise Levels

The noise levels would vary during the construction period, depending on the phase of construction and number and locations of operating construction equipment. The Applicant does not expect construction activities to be constant at any individual location throughout the entire construction period. Therefore, some locations may experience a few weeks of significant activity that would then progress to a different portion of the Facility area. Although the turbines are located more than 1,200 feet from residential structures, construction of roads, and other Facility components will be located at closer distances.

The *Roadway Construction Noise Model (RCNM) User's Guide* is one of the most comprehensive ever developed in the U.S. (Federal Highway Administration, 2006). Equipment noise levels from Table 1 in the *RCNM User's Guide* are shown below in Table 8-3. All listed noise levels are maximum A-weighted noise pressure levels at a reference distance of 50 feet. The acoustical usage factor is the fraction of time that the equipment generates noise at the maximum level.

TABLE 8-3
RCNM Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (%)	Specified L_{max} @ 50 ft (dBA)	Actual Measured L_{max} @ 50 ft (dBA)	No. of Actual Data Samples (Count)
All Other Equipment > 5 HP	50	85	-- N/A --	0
Auger Drill Rig	20	85	84	36
Backhoe	40	80	78	372
Bar Bender	20	80	-- N/A --	0
Blasting	-- N/A --	94	-- N/A --	0
Boring Jack Power Unit	50	80	83	1
Chain Saw	20	85	84	46
Clam Shovel (dropping)	20	93	87	4
Compactor (ground)	20	80	83	57
Compressor (air)	40	80	78	18
Concrete Batch Plant	15	83	-- N/A --	0

TABLE 8-3
RCNM Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (%)	Specified L_{max} @ 50 ft (dBA)	Actual Measured L_{max} @ 50 ft (dBA)	No. of Actual Data Samples (Count)
Concrete Mixer Truck	40	85	79	40
Concrete Pump Truck	20	82	81	30
Concrete Saw	20	90	90	55
Crane	16	85	81	405
Dozer	40	85	82	55
Drill Rig Truck	20	84	79	22
Drum Mixer	50	80	80	1
Dump Truck	40	84	76	31
Excavator	40	85	81	170
Flat Bed Truck	40	84	74	4
Front End Loader	40	80	79	96
Generator	50	82	81	19
Generator (<25KVA, VMS signs)	50	70	73	74
Gradall	40	85	83	70
Grader	40	85	-- N/A --	0
Grapple (on backhoe)	40	85	87	1
Horizontal Boring Hydraulic Jack	25	80	82	6
Hydra Break Ram	10	90	-- N/A --	0
Impact Pile Driver	20	95	101	11
Jackhammer	20	85	89	133
Man Lift	20	85	75	23
Mounted Impact Hammer (hoe ram)	20	90	90	212
Pavement Scarafier	20	85	90	2
Paver	50	85	77	9
Pickup Truck	40	55	75	1
Pneumatic Tools	50	85	85	90
Pumps	50	77	81	17
Refrigerator Unit	100	82	73	3
Rivet Buster/chipping gun	20	85	79	19

TABLE 8-3
RCNM Construction Equipment Noise Levels

Equipment Description	Acoustical Usage Factor (%)	Specified L_{max} @ 50 ft (dBA)	Actual Measured L_{max} @ 50 ft (dBA)	No. of Actual Data Samples (Count)
Rock Drill	20	85	81	3
Roller	20	85	80	16
Sand Blasting (Single Nozzle)	20	85	96	9
Scraper	40	85	84	12
Shears (on backhoe)	40	85	96	5
Slurry Plant	100	78	78	1
Slurry Trenching Machine	50	82	80	75
Soil Mix Drill Rig	50	80	-- N/A --	0
Tractor	40	84	-- N/A --	0
Vacuum Excavator (Vac-truck)	40	85	85	149
Vacuum Street Sweeper	10	80	82	19
Ventilation Fan	100	85	79	13
Vibrating Hopper	50	85	87	1
Vibratory Concrete Mixer	20	80	80	1
Vibratory Pile Driver	20	95	101	44
Warning Horn	5	85	83	12
Welder / Torch	40	73	74	5

Source: Federal Highway Administration, 2006
L_{max} = maximum noise level

A review of Table 8-3 indicates that the loudest equipment generally emits noise in the range of 80 to 90 dBA at a distance of 50 feet. The closest and loudest equipment dominates noise at any specific receptor. As noted above, the types and numbers of construction equipment near any specific receptor location would vary over time. The Applicant based the construction noise estimates on conservative assumptions of multiple pieces of loud equipment operating in close proximity to each other. The Applicant believes this to be a realistic scenario.

Additional assumptions include the following:

- One piece of equipment generating a reference noise level of 85 dBA (at a distance of 50 feet with a 40 percent usage factor) located 50 feet from the point of reception;
- Two pieces of equipment generating reference 85 dBA noise levels located at an additional 50 feet farther away (100 feet from point of reception); and
- Two more pieces of equipment generating reference 85 dBA noise levels located 100 feet farther away (150 feet from point of reception).

Table 8-4 presents construction equipment noise levels at various distances, based on the above assumptions. This extrapolation is conservative as it only considers geometric spreading and does not account for atmospheric absorption.

TABLE 8-4
Construction Equipment Noise Levels versus Distance

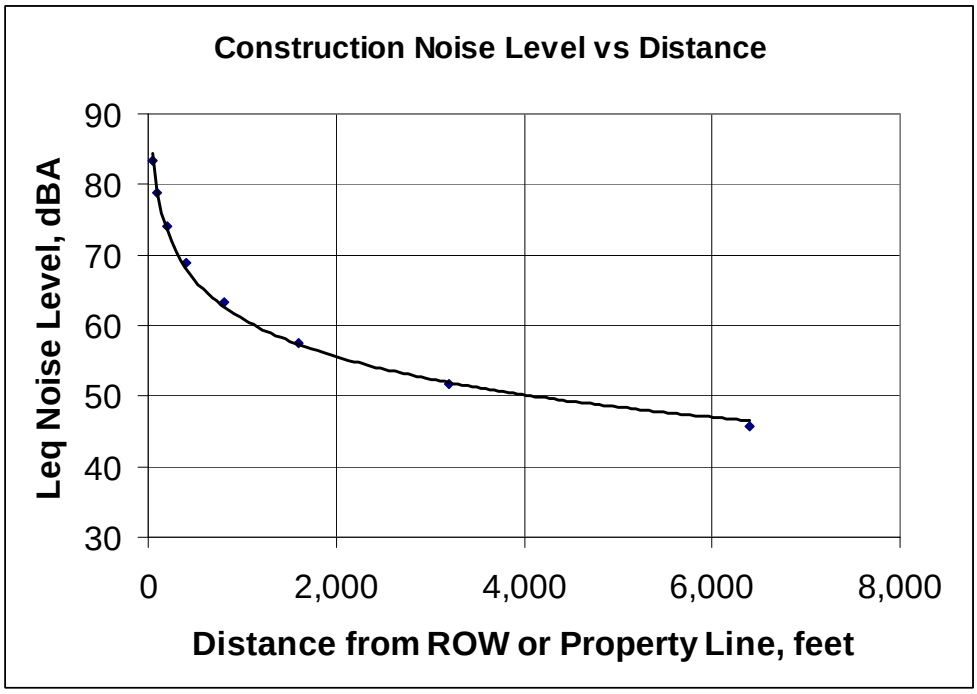
Distance from ROW or Property Line (ft)	L_{eq} Noise Level (dBA)
50	83
100	79
200	74
400	69
800	63
1,600	58
3,200	52
6,400	46

L_{eq} equivalent sound level

Figure 8-1 below plots the data in Table 8-4. The expected average construction noise levels from proposed construction activities at any particular location may be estimated using this figure. As noted in Table 8-4, some variation in construction equipment noise levels is to be expected (i.e., when engines are

under particularly heavy loads). The Applicant will not use blasting during Facility construction.

FIGURE 8-1
Estimated Construction Noise Levels



It is anticipated that the majority of heavy construction activities will be conducted during daytime and that the character of the noise would be similar to agricultural or road construction equipment operations, sources with which the communities in the Facility area are generally familiar with. Therefore, the temporary increases in noise levels resulting from construction activities are not anticipated to represent a significant impact.

(i) Blasting activities

The Applicant will not use blasting during Facility construction.

(ii) Operation of earthmoving equipment

Table 8-3 provides noise levels of various earthmoving equipment. Tables 8-4 and Figure 8-1 present estimated construction noise levels from earthmoving equipment and similar activities at various distances.

(iii) Driving of piles

Table 8-3 presents noise levels from pile driving activities.

(iv) Erection of structures

Table 8-3 provides noise levels of erection equipment. Table 8-4 and Figure 8-1 present estimated construction noise levels from erection equipment and similar activities at various distances.

(v) Truck traffic

Table 8-3 provides noise levels of from heavy trucks. Table 8-4 and Figure 8-1 present estimated construction noise levels from heavy trucks and similar activities at various distances.

(vi) Equipment installation

Table 8-3 provides noise levels of from various equipment used during installation. Table 8-4 and Figure 8-1 present estimated construction noise levels from heavy trucks and similar activities at various distances.

(b) Operational Noise Levels

The assessment studied 167 G-90 wind turbines on 328-foot (100-meter) tall towers and the associated electrical substations. As indicated in Figure 3-1, the Applicant expects to locate an additional eight turbines in the hashed area indicated located on the eastern side of the Project area. Once these locations have been identified, the acoustical analysis will be updated.

For a wind project, the noise level at a particular location is primarily determined by the wind speed at the turbines and the distance from the closest turbine. For example, when the winds are calm the turbines emit very little noise as compared with stronger wind conditions when the turbines generate their highest levels of noise. As such, the projects noise emissions may vary throughout the day and night.

It is useful to understand the difference between a noise pressure level (or noise level) and a noise power level. A noise power level (commonly abbreviated as PWL or Lw) is analogous to the wattage of a light bulb; it is a measure of the acoustical energy emitted by the source and is, therefore, independent of distance. A noise pressure level (commonly abbreviated as SPL or Lp) is analogous to the brightness or intensity of light experienced at a specific distance from a source. Noise pressure level is measured directly with a noise-level meter. Noise pressure levels always should be specified with a location or distance from the noise source. Noise power level data are used in acoustic models to predict noise pressure levels. This is because noise power levels take into account the size of the acoustical source and account for the total acoustical energy emitted by the source.

Standard acoustical engineering methods were used in the Applicant's noise analysis. The noise propagation factors used in this analysis have been adopted from ISO 9613-2, *Acoustics—Sound Attenuation During Propagation Outdoors, Part 2: General Method of Calculation* (International Organization for Standardization [ISO], 1993) and VDI 2714, *Outdoor Sound Propagation* (Verein Deutscher Ingenieure [VDI], 1988). Atmospheric absorption for conditions of 10 °C (50 °F) and 70 percent relative humidity (conditions that favor propagation) was computed in accordance with ISO 9613-1, *Acoustics—Sound Attenuation During Propagation Outdoors, Part 1: Calculation of the Absorption of Sound by the Atmosphere* (ISO, 1993).

Each wind turbine was considered to have an overall noise power level of 108.4 dBA and was modeled on an octave band basis for the nine standard octave bands from 31.5 to 8000 Hz. This overall noise power level represents the maximum turbine noise level determined in accordance with IEC61400-11, *Wind Turbine Generator Systems—Part 11: Acoustic Noise Measurement Techniques* (IEC, 2006) and includes a +2 dBA adjustment to account for typical vendor warranty, uncertainty or declared noise power levels. Four substation transformers each

with a maximum noise power level of 100 dBA were also included in the analysis.

As detailed in Appendix T, the following conservative components were incorporated into the analysis to ensure that predicted receptor levels were not minimized. These include:

Use of maximum noise output of the turbines, even though different conditions will result in lower noise levels;
Inclusion of a 2 dBA margin;
Use of atmospheric conditions conducive to noise propagation; and
Use of mixed ground factor and elevated receivers.

The predicted cumulative level from all turbines and associated substations operating at maximum noise power levels is presented in Appendix T. Appendix T is comprised of four sets of information:

Model results (in both tabular and figure format);
Receptor Coordinates;
Source Coordinates; and
Predicted noise level contour maps.

The figures in Appendix T present the predicted operational noise levels at identified residential structures, schools, hospitals, nursing homes or assisted-living and health-care facilities, religious institutions and public libraries.

The range in expected operational noise levels presented in Appendix T varies from less than 30 dBA to 53 dBA. Table 8-5 summarizes the number of receptors within specific noise pressure level ranges.

TABLE 8-5
Summary of Predicted Facility Noise Levels

Noise Level	Number of receptors
50 dBA or greater	53
45 - 50 dBA	279
40 - 45 dBA	226
35 - 40 dBA	402

This analysis is conservative, because it is based on the anticipated maximum number of turbines, while utilizing the maximum noise power level representative of the G-90 turbine, one of the louder turbines under consideration. When winds are less than those that correspond to maximum noise emissions, the noise levels will be less.

There has been some confusion regarding the presence of significant levels of low frequency noise from modern utility scale upwind turbines. High levels of low frequency noise can be associated with simple-cycle combustion turbines or natural gas compressor stations. High levels of low frequency noise were common in earlier downwind wind turbines. However, the levels of low frequency noise emitted from modern upwind turbines is significantly less than from other sources. The swishing noise associated with the rotation of turbine blades is often mistaken for low frequency noise. The frequency content of the swish is typically within the 500 to 1,000 hertz (Hz) range, which is entirely within the audible range and appropriately characterized by the A-weighting.

For wind turbines, the measurement of low frequency noise is complicated by the presence of wind and the resulting wind-induced noise (self-noise) through microphone windscreens. Recent wind tunnel testing of various windscreens (Hessler et al., 2008; Hessler, 2009), concludes that: “any casual measurement of noise using a standard windscreen in a windy field will yield ostensibly high levels of low frequency or infrasonic noise—whether a wind turbine is present or not. Such measurements, taken at face value, may be one of the reasons wind

turbines are widely, but mistakenly, believed to be significant sources of low frequency noise."

(c) Location of Noise Sensitive Areas

Figure 8-2 identifies known residential structures, schools, hospitals, nursing homes, assisted-living facilities, health-care facilities, religious institutions, and public libraries within one mile of the proposed turbines.

(d) Mitigation of Noise Emissions

The Applicant will incorporate the following mitigation measures to minimize construction noise emissions:

- Exhaust mufflers will satisfy manufacturer's requirements or be promptly replaced.
- Contractors will be required to comply with federal limits on truck noise and comply with local speed limits..
- To the extent practicable, nighttime construction will be limited to relatively quiet activities. In the event of limited nighttime construction activities, the surrounding neighbors will be notified in advance.
- Contractors will be required to notify the community in advance of any pile-driving activity. This activity would only be conducted during the day.
- A telephone number will be established for the public to report any significant undesirable noise conditions associated with the construction of the Facility.

Operational noise levels will vary depending on wind speed, final turbine layout and turbine selection. The modeling results presented are representative of the Facility noise levels and an overall reduction in Facility noise levels is expected to be realized through the micro-siting process. An overall reduction is expected to

be realized even if a turbine with higher noise power level, such as the Mitsubishi, is selected. The following mitigation measures will be implemented by the Applicant to minimize operating noise emissions:

- Using 1,200 feet for a minimum residential setback instead of the OPSB-mandated 750 feet.

- Ensuring that any minor adjustments made to turbine positions as part of the standard micro-siting process closer to construction will not result in higher noise levels than presently predicted. Additional modeling of the final layout and turbine selection will be conducted.

- Publishing a phone number for the Plant Manager so area residents can report excessive noise that might be caused by malfunctioning turbines.

- Offering Good Neighbor Agreements to the owners of all residences within one half mile of a proposed wind turbine to give financial compensation to affected residents. Special efforts will be made to contact residences with predicted noise levels of greater than 50 dBA.

(3) Water

(a) Impact to Public and Private Water Supplies

The Facility will not use any surface water resources during construction or operation and will only use limited amounts of water from groundwater resources. Information obtained from an online search of documents and public records was used to evaluate the potential impacts to public and private water supplies during construction and operation activities.

Given the rural nature of the Project area, municipal and public water supplies are generally unavailable in the Project area. Local residents rely on private wells for their drinking water, irrigation, and agricultural uses and septic systems for domestic wastewater purposes.

In western Ohio, groundwater is available from two water-bearing units: unconsolidated glacial drift deposits, and bedrock. In the Project area, unconsolidated deposits generally consist of glacial drift that ranges from 0 to 50 feet (Ohio Division of Geological Survey, 2003). Yields from wells in these deposits typically range from less than 5 gpm to 25 gpm (ODNR, 1980; ODNR, 1982; ODNR, 1985; ODNR, 1986; ODNR, 2009d; ODNR, 2009e).

Beneath these unconsolidated deposits, Silurian and Devonian age bedrock consisting of the Salina and Detroit Groups is present. The Salina Group is present under most of the Project area, except the northwest portion, and is predominantly dolomite with lesser amounts of anhydrite, gypsum, salt, and shale (Figure 5-5). The Detroit River Group, situated just to the northwest of the Project area, consists of dolomite, sandstone, and shale. Silurian bedrock can reach a total thickness of 300 to 600 feet and is capable of yielding up to 750 gpm of water (ODNR, 1982). Well logs from the "Water Well Log Report On-line Search Tool" of ODNR were reviewed for the Project area. These logs revealed that the static water level for a majority of wells installed within the Project area were at depths ranging from 8 to 18 feet bgs. An observation well, VW-1, located approximately 3 miles south of the Project area and in Van Wert County, had a maximum depth to groundwater of 33.2 feet bgs and a minimum depth to groundwater of 18.4 feet bgs for the period of record from 1957 to 2008 (ODNR, 2009f).

As part of a preliminary geotechnical investigation for the Project area, water levels were obtained during drilling of boreholes and ranged between 10 and 22 bgs. Groundwater levels in piezometers were measured on November 3, 2009 and November 17, 2009 and ranged from 6.6 to 12.5 feet and from 7.2 to 11.7 feet bgs, respectively. Based on these well logs, the reported groundwater yields for the wells installed in the Project area typically ranged between 4 and 20 gpm (ODNR, 2009h). Several deeper wells that extend deeper into bedrock had greater well yields. Well log 9981005 (for Van Wert Corporation) reported a

yield of 100 gpm during an 8-hour pump test on a 230-foot deep well (ODNR). The highest well yield identified in the Project area was 210 gpm during an 8-hour pump test (ODNR well log 259230). The depth of this well was 252 feet.

No sole source aquifers are located near the Project area. The ACACAS, situated approximately 8 miles to the southeast of the Project area, is the closest designated sole source aquifer by the USEPA.

(b) Construction Water Impacts

The Applicant is evaluating the option of constructing a concrete batch plant on the site for producing concrete required for construction. Water use during construction of the Facility would include temporary concrete batch plant operations (to produce concrete for turbine foundation construction) and dust suppression.

If a temporary batch plant were constructed for the Facility, the plant would be used temporarily for the production of concrete during Facility construction. The batch plant would be located on the 20-acre property located in the southern portion of the Project area and adjacent to the location of the future O&M building. It is estimated that the batch plant would operate 8 hours per day 6 days a week and produce up to 1,500 cubic yards of concrete cubic yards per day. Based on this production rate, the estimated water demand would be approximately 55,000 gpd (approximately 115 gpm) and would be supplied from two onsite bedrock wells. These wells would be drilled and completed at a depth of several hundred feet. Available water well logs near the temporary batch plant site indicate that the deepest local domestic well is 63 feet in depth and completed in bedrock. A production test well and associated monitoring wells would be installed in the spring of 2010 and tested to determine the specific well yield and evaluate any potential impacts. An inventory of wells adjacent to the property would be conducted as part of this evaluation. Depending on the production test well results, a water storage tank may be considered to reduce peak demand on

the water supply wells. In addition to batch plant water use, water would also be used for dust suppression along roadways. Construction water demands for the Facility would be temporary. Portable washrooms would be available for construction workers; therefore, they would not require water. Upon completion of construction, onsite wells will be used for the water supply at the O&M building.

Water usage during Facility construction will be minimal, so it is not expected to have a measurable impact on public or private water supplies near the Project area. No adverse impacts are anticipated to the aquifer systems within the Project area. Facility construction is not likely to pose any risk of contaminant release that would compromise the quality of the groundwater resources.

(c) Operation Water Impacts

Operation of the Facility would require minimal water usage, as wind turbines do not consume or use water for their operation. Water would be consumed as part of the regular potable water use at the O&M building, and is estimated to be approximately 1,000 gpd based on 20 Facility employees. Water discharges from the O&M facility include both sanitary wastewater and stormwater discharges. Sanitary wastewater from the O&M building would be discharged to a septic system constructed onsite, and be in amounts similar to a residential structure.

Water usage during Facility operation will be minimal and is not expected to have a measurable impact on public or private water supplies near the Project area. No adverse impacts are anticipated to the aquifer systems within the Project area during Facility operation. The Facility is not likely to pose any risk of contaminant release that would compromise the quality of the groundwater resources.

(4) Ice Throw

Under certain weather conditions, ice can accumulate on wind turbine blades. As ice builds up on the blades, aerodynamic lift is disturbed. As lift decreases, so does rotor speed and power output. As rotor speed decreases, the turbine will go offline. The turbine calculates the ratio of power output to wind speed. A significant mismatch sends an alarm to IBR's operations center in Portland. A technician must manually reset the turbine to bring it back online. IBR's experience is that ice must melt from the tips of the blades in order for the turbine to restart. As the ice melts, fragments can fall from an idle turbine blade or be thrown from the blade as it begins to rotate. The distance the ice is thrown is dependent upon the speed of rotation, wind speeds, ice fragment size and weight, and other factors.

As outlined above, the formation of ice on wind turbine blades will lower the rotor speed. With a lower rotor speed, the maximum theoretical distance ice can be thrown is lowered. In addition, gravity will influence departing ice to come off the blades straight down, further minimizing the likelihood of far-traveling ice.

While ice throw can occur, required setbacks are typically sufficient to alleviate any public safety concerns (AWEA, 2007). During IBR's operating experience in excess of 39 million hours in the United States, IBR has never observed ice fragment debris further than 150 m from a wind turbine base. The setbacks being proposed at this facility are 131 percent of total turbine height (623 feet [190 meters] for the G-90) from the nearest public road or structure and 1200 feet (366 meters) from a residence.

Safety concerns are primarily related to incidents resulting in human injuries. Several conditions must exist for an injury of this type to occur including:

- Weather conditions conducive to icing of the turbine blade;
- Ice falling from the turbine blade;
- Ice fragments large enough in size to remain intact;
- Ice traveling past the turbine setback; and
- A person in the path of the ice fragment.

Each of these conditions must occur simultaneously to result in an injury. Given the large setbacks, relatively low-density population in the Project Area Boundary, and relatively light traffic volume on the public roads in the area, the chance of an injury occurring from ice throw is extremely low.

As of the filing of the Application, IBR has more than 39 million hours of operating experience with wind turbines deployed in the United States with no ice-related injuries. In a study summarized by the Chatham-Kent Public Health Unit (2008), computer modeling of potential ice strikes resulted in the following results:

- Buildings: 1 ice strike every 500,000 years;
- Vehicles: 1 ice strike every 260,000 years; and
- Individuals: 1 ice strike every 137,500,000 years.

Based on the modeling results mentioned above, the probability of a human injury occurring from ice throw would be highly unlikely.

(5) Blade Shear

Blade shear or blade throw is the structural failure of one or more parts of the wind turbine. This can occur due to defects in manufacturing, poor turbine design, poor maintenance, control system malfunction, or severe weather conditions. Blade throws were more common in the early years of the wind industry; however, according to AWEA, this concern has been reduced primarily due to better turbine design and engineering (AWEA, 2009). Modern wind turbines are made of high-strength materials designed to withstand severe weather. In addition, IEC specifies essential design requirements to ensure the engineering integrity of wind turbines, which has greatly reduced the number of blade shear or blade throw events (Garrad Hassan Canada, Inc., 2007).

The Applicant's turbines will be continuously monitored by a remote monitoring and control system with Internet access. This system allows real-time operation and remote control of the wind turbines. In addition, the G-90 turbines include a SMP Predictive

Maintenance System for the early detection of potential deterioration or malfunctions in the wind turbines' main components, which is integrated within the control system. The wind turbines proposed for the Facility will be equipped with two independent braking systems that will automatically shut down the turbine blade at wind speeds over the manufacturer's recommended threshold (Gamesa, 2007).

Similar to ice throw, the primary safety measure implemented to avoid risks from blade shear or blade throw is the establishment of setbacks. Turbine setbacks required for the mitigation of potential noise impacts should be sufficient to protect residences in the unlikely event that blade shear or blade throw were to occur. The turbine setback distances are 1,200 feet from residences, and 1.31 times the maximum turbine height (approximately 623 feet) from property lines and roads.

(6) Shadow Flicker

Shadow flicker is the term used to refer to the alternating changes in light intensity that can occur when the rotating blades of wind turbines cast moving shadows on the ground or on structures. Shadow flicker occurs only when the wind turbines are operating during sunny conditions, and is most likely to occur early and late in the day when the sun is at a low angle in the sky. The intensity of shadow flicker is "…defined as the difference or variation in brightness at a given location in the presence or absence of a shadow" (National Research Council, 2007). The intensity of the shadows cast by the moving blades of wind turbines, and thus the perceived intensity of the flickering effect, is determined by the distance of the affected area from the turbine, with the most intense, distinct, and focused shadows occurring closest to the turbine (Department of Energy & Climate Change [DECC], 2009). The frequency of shadow flicker is a function of the number of blades making up the wind turbine rotor and rotor speed. Shadow flicker frequency is measured in terms of alternations per second, or hertz (Hz).

There are two primary concerns about shadow flicker. The first is that shadow flicker could potentially trigger epileptic seizures, and the second is that shadow flicker could become a source of annoyance to residents living in close proximity to wind turbines.

The Epilepsy Foundation of America notes that for a small minority (about 3 percent) of the three million people in the U.S. who are affected by epilepsy, there is a potential for epileptic seizures to be triggered by flashing light. These seizures have the potential to be triggered when the light flashes are in the range of 5 to 30 Hz. Because the frequency of the shadow flicker created by modern wind turbines is in the range of 0.6 to 1.0 Hz, the shadow flicker effects created by wind turbines do not have the potential to trigger epileptic seizures. (Epilepsy Foundation of America, 2008)

The issue of annoyance is more subjective. There could be cases in which shadow flicker cast on dwellings in very close proximity to wind turbines could be enough of a source of distraction to residents to be considered an annoyance. The National Research Council has observed that shadow flicker is more likely to be a concern in the higher latitude regions of Northern Europe where the sun is likely to be at a low angle (particularly in winter), than in the continental U.S. where it states that "…shadow flicker has not been identified as causing even a mild annoyance" (2007).

There are currently no federal or state standards regulating frequency or duration of shadow flicker for wind turbines. International studies and guidelines from Europe and Australia, including the *Best Practice Guidelines for the Irish Wind Energy Industry* (Irish Wind Energy Association [IWEA], 2008), have suggested 30 hours of shadow flicker per year as the threshold of significant impact, or the point at which shadow flicker can be considered an annoyance. The Applicant used a threshold of 30 hours per year for its analysis to identify affected residences. The threshold of 30 hours per year represents approximately 0.3 percent of the total hours (8,760) in a year, so three times this number represents shadow flicker of less than one percent of the year.

(a) Shadow Flicker Analysis

The Applicant conducted a shadow flicker analysis to evaluate the extent of potential shadow flicker experienced at each residence and primary transportation corridor in the Project area (Appendix K). The analysis was conducted using the shadow flicker module of WindFarm 4.1.1.2 (WindFarm), a comprehensive

software package developed to aid in designing wind farm projects and in evaluating their environmental effects. To calculate shadow flicker levels at a residence, WindFarm takes into account the location of the residence, the orientations of each of the residence's sides, the location of each wind turbine, turbine hub height, turbine rotor width, latitude and longitude, and data on the sun's path through the sky on each day of the year.

The WindFarm model evaluated the shadow flicker effects of 167 G-90 wind turbines on 328-foot (100-meter) tall towers. The Applicant evaluated all residences within approximately 2,950 feet (900 meters) of a turbine site for potential shadow flicker impacts. The 2,950 feet (900 meters) figure represents ten times the rotor diameter of a turbine (295 feet [90 meters]). The IWEA guidelines suggest this distance, and several government sources suggest that shadow flicker effects become relatively insignificant beyond 10 rotor diameters (IWEA, 2008; U.S. Department of Interior, 2005; DECC, 2009).

The shadow flicker analysis involved a three-step process. The first step was to make an initial model run to identify all residential structures located within 2,950 feet (900 meters) of the nearest wind turbine that would have the potential to be exposed to 30 or more hours of shadow flicker per year. Once those residences were identified, the second step included a structure-specific field survey was undertaken to determine the actual orientation of windows on each of these houses. In addition, the survey identified any potential obstructions in the line of sight between the residence and the turbine blades such as trees and other structures, and the presence of existing window treatments such as awnings that would reduce the visibility of the blade shadows at the residence.

The third step was a second modeling analysis performed to determine the shadow flicker effects at discrete points using specific house coordinates and structure specific data. At residences at which detailed date on fenestration was not available; the WindFarm model was run assuming windows face all directions. Because of this, it is likely that at these residences, the model results

over predict shadow flicker if these residences do not have windows facing a turbine that could cause shadow effects.

The shadow flicker data generated by the WindFarm program provides a worst-case assessment that overestimates the daily minutes and total annual hours of shadow flicker. The model does not account for obstructions (e.g., buildings or vegetation) that could already be casting a shadow on the house and blocking shadow flicker from a distant wind turbine. The model also assumes that turbines are always spinning, always facing directly at the house in question, and that the weather is always clear. Sky cover data from Fort Wayne, Indiana, was used to adjust model output for potential cloud cover.

(b) Shadow Flicker Results

The shadow flicker analysis resulted in predicted shadow flicker effects over 30 hours per year at 39 residences in the Project area. The information in Table 8-6 includes:

- The distance of each residence from the closest flicker-generating turbine;
- The number of hours of shadow flicker the model predicts the residence would be exposed to over the course of a year;
- An identification of the turbines that would contribute to shadow flicker at that residence; and
- Any features noted during the site visit with the potential to prevent the shadow flickering from being visible at the residence.

It is difficult to predict the effect of each obstruction, as the obstructions are not permanent.

TABLE 8-6
Predicted Shadow Flicker

Residence ID	Predicted Shadow Flicker (hours:minutes per year)[a]	Turbines Contributing to Shadow Flicker	Distance to Closest Contributing Turbine (m)	Noteworthy Obstructions
41	41:59	47, 42	430	Row of evergreen tress to north and west
44	40:19	40, 41, 42, 47	465	Large deciduous trees surrounding house
45	43:27	41, 42, 46, 47	461	Structures west of house, mixed trees north and east
96	44:03	59, 60	381	Barns west of house
98	36:08	59, 60	404	Evergreen fence surrounding house
107	33:39	26, 37, 38	424	Garage and barn east of house
114	39:55	139, 140, 141	453	Structures north of house and deciduous trees west of house
116	42:26	139, 140, 141	461	Garage southeast of house, deciduous trees south of house
117	35:33	117, 118, 119	520	Row of evergreens southwest of house
124	40:44	120, 121, 122	379	Garage north of house and barns south of house
126	42:54	117, 118, 119	424	Large deciduous trees on property
129	34:25	64, 65	415	Structures south of house
137	32:27	24, 25, 36	446	Barns north of house
183	33:11	21, 24	383	Evergreens east and west of house
212	32:35	22, 23, 33, 34	442	Property surrounded by evergreen fence
214	32:05	114, 115, 127	589	Garage south of house
221	38:43	114, 126, 127	502	Barns and garage north of house, mixed trees on property
222	34:42	111, 112, 113	378	Deciduous trees east of house
234	47:28	125, 126	396	
264	41:01	50, 51, 52	403	Garage southwest of house, deciduous tree north of house
266	32:38	13, 14	421	Garage south of house and row of evergreens east of house
269	34:55	106, 107, 108	523	Structures west of house, mixed trees north and east of house
273	51:31	132, 133, 136	387	Buildings west of house
279	32:38	131, 132, 133	580	Garage northeast of house

TABLE 8-6
Predicted Shadow Flicker

Residence ID	Predicted Shadow Flicker (hours:minutes per year)[a]	Turbines Contributing to Shadow Flicker	Distance to Closest Contributing Turbine (m)	Noteworthy Obstructions
283	52:32	3, 11, 12, 13	552	Barns and garages north of house and mixed trees south of house
285	41:34	104, 123, 124	413	House surrounded by many evergreen and deciduous trees
296	56:21	100, 103, 104, 105	377	Large barn north of house and deciduous trees south of house
316	43:38	79, 80, 83, 84	426	Structures east of house, row of evergreens north of house
317	56:26	79, 80, 83, 84	374	Structures east of house, deciduous trees south and west of house
318	35:24	99, 101, 102	482	Mixed trees on property
331	67:18	79, 81, 82, 83	391	Garage west of house, evergreens north of house, mixed trees on property
334	52:31	128, 151, 152	375	Multiple structures west and south of house
420	30:09	6	380	Large deciduous tree east of house
424	38:48	95, 145	497	
429	50:05	75, 76, 77	380	Structures east of house, many trees on property
436	51:24	70, 71, 72	384	Row of evergreens north of house, mixed trees throughout property
457	44:04	158, 159, 163, 164	388	Barn east of house
459	61:45	146, 147, 153, 154	390	Structures northeast of house, deciduous trees south and west of house
460	37:22	146, 153, 154	421	Deciduous tree southwest of house

[a] Model results adjusted by mean monthly sky cover from Fort Wayne, Indiana

Section 4906-17-08 requires the Applicant to "evaluate and describe the potential impact from shadow flicker at adjacent residential structures and primary roads…" In addition to impacts to adjacent residences detailed above, portions of primary roads U.S Highways 30, 127, and 224, and State Highway 114 within approximately 2,950 feet (900 meters) of turbines may experience shadow flicker. However, the model WindFarm assumes a stationary object, and primary road users are typically in motorized vehicles while traveling at relatively high speeds.

Any Facility-related shadow flicker impacts experienced by such users would be a small fraction of that experience by a stationary object in terms of total time per year. In addition, vehicle operators are already affected by shadow flicker while driving by stationary objects (e.g., buildings, trees, roadside signage, etc.) which will cause shadow flickers across the windows of a moving vehicle.

(c) Mitigation Measures

There are currently no federal or state standards regulating frequency or duration of shadow flicker for wind turbines. International studies and 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 can be considered a nuisance. The Applicant used a threshold of 30 hours per year for this analysis to identify affected residences

The results presented here are representative of the maximum Facility shadow flicker impacts and an overall reduction in Facility shadow flicker impacts is expected to be realized through the micro-siting process. The Applicant plans on using a number of mitigation measures to reduce projected shadow flicker impacts to 30 hours or less per year for affected residences. Mitigation measures may include:

- Turbine micro-siting to minimize projected impacts;
- GNAs to offer compensation to affected residents; and
- Window blinds, window awnings, and vegetative plantings to be offered to affected residents, including those with and without GNAs.

(B) ECOLOGICAL IMPACT

(1) Project Site Information

As part of the preparation of this application, numerous site visits to the Project area were performed during September and October 2009 to characterize the habitats, identify wetlands and waterbodies, and survey land uses. Figure 8-3 presents the ecological map

for the Project area. These evaluations involved recording habitat types and describing plant communities, which are discussed in Section 4906-17-07(B)(1)(b), *Vegetative Survey*, below. The Applicant's consultant, CH2M HILL, also conducted desktop studies for major species of biota, including those of commercial or recreational value, and those designated as threatened or endangered by the USFWS or ODNR within the Project area and the counties in which it is located. These species, as well as the animals likely to utilize the habitats evaluated during the surveys, were compiled and are listed and discussed in more detail in Section 4906-17-07(B)(1)(c), *Animal Life Survey*, of this Application.

(a) Mapping

The Applicant has provided a map, Figure 8-3, at 1:24,000 scale, containing a half-mile radius from the Project area and showing the following:

- The Project area boundary;
- Undeveloped or abandoned land, including woodlots, wetlands, or vacant fields, and;
- Recreational areas, including parks, wildlife areas, nature preserves, and other conservation areas.

(b) Vegetative Survey

The following describes the results of a vegetative survey conducted within the Project area and within a quarter-mile from the Project area boundary. Appendix U provides a comprehensive list of plant species identified in the Project area during the September through October 2009 field vegetative survey. No plant species of federal or state species were observed.

(i) Upland Habitats

The Project area is more than 95 percent row croplands, predominantly corn and soybean, and a few alfalfa fields. There are also scattered

residences with lawns. These developed areas comprise about one percent of the Project area.

Cultivated areas provide forage for some animals, but generally are considered poor vertebrate habitat because of their transient nature. The croplands in the Project area are well managed, including tillage and herbicide applications. Therefore, plant diversity is purposely controlled. Common agricultural herbs found in the croplands at the Facility include velvetleaf (*Abutilon theophrasti*), ragweed (*Ambrosia artemisiifolia* and *A. trifida*), and foxtail grass (*Setaria* spp.). Thus, the vast majority of the Project area is of limited habitat value.

Cultivated crops currently comprise a majority (95.2 percent) of the Project area (BHE Environmental, Inc., 2009). This land use is not included as a specific habitat because it is assumed to have insignificant ecological value. Similarly, residential and commercial manicured lawns were not assessed. Three small, but developed villages, and intermittent livestock operations (cattle and hog), also make up a portion of the land uses within the Project area. The 2.1 percent of the Project area not currently utilized for cultivated crops consists of the following habitat types: isolated areas of deciduous forest, wooded or scrub-shrub riparian buffers along streams, pasture areas, old fields, palustrine forested (PFO), palustrine scrub-shrub (PSS), and palustrine emergent (PEM) wetlands, and farmed wetlands.

Remnant isolated woodlands comprise about 1.8 percent of the Project area, and represents the majority of the natural habitat in the Project area. The woodland composition varies with the effectiveness of the drainage of each woodlot. The forested areas that are well-drained are dominated by northern red oak (*Quercus rubra*), bur oak (*Quercus macrocarpa*), chinquapin oak (*Quercus muhlenbergii*), black cherry (*Prunus serotina*), black walnut (*Juglans nigra*), shagbark hickory (*Carya ovata*), and sugar

maple (*Acer saccharum*). The shrub layer in well-drained woodlands is at times dominated by amur honeysuckle (*Lonicera maackii*), an invasive species. Common subcanopy and shrub layer species include hawthorns (*Crataegus* sp.), graystem dogwood (*Cornus racemosa*), prickly ash (*Xanthoxylum americanum*), mapleleaf viburnum (*Viburnum acerifolium*), prairie rose (*Rosa setigera*), buckthorn (*Rhamnus* spp.), and common privet (*Ligustrum vulgare*). In more poorly drained woodlands, green ash (*Fraxinus pennsylvanica*), pin oak (*Quercus palustris*), and swamp white oak (*Quercus bicolor*) are the more dominant trees, with dogwoods (*Cornus amomum*) and arrowwood (*Viburnum dentatum*) present in the understory. Other tree species observed in the woodlands in the Project area include honey locust (*Gleditsia triacanthos*), slippery elm (*Ulmus rubra*), cottonwood (*Populus deltoides*), and red mulberry (*Morus rubra*).

Wooded and scrub-shrub hedgerows and riparian buffers along some streams within the Project area were observed to consist of species that are also common in the deciduous forested areas, including green ash, shagbark hickory, hawthorns, cottonwood, and mulberries.

Grasslands (including pasture areas) and old fields are sparse. These areas consisted of a vegetative community dominated by upland herbaceous vegetation. The species commonly observed includes goldenrods (*Solidago* spp,), Queen Anne's lace (*Daucus carota*), teasel (*Dipsacus sylvestris*), asters (*Aster* spp.), giant ragweed (*Ambrosia trifida*), red clover (*Trifolium pretense*), thistles (*Cirsium* spp.), and upland grasses, such as Kentucky fescue (*Festuca arundincea*) and Japanese brome (*Bromus inermis*), which are planted along most roadways and farm lanes.

(ii) Wetland Habitats

The following resources were reviewed to identify the potential locations, and extent of, wetlands and waterbodies within the Project area:

- USGS topographic maps;
- National Hydrographic Dataset (NHD) (USGS-mapped streams);
- Aerial photo-based maps;
- National Wetland Inventory (NWI);
- Ohio Wetland Inventory (OWI);
- Maumee Watershed Conservancy Mapping; and
- Van Wert and Paulding County Soil Surveys.

The USGS topographic maps show intermittent and perennial streams and a few ponds. These maps do not identify any wetlands in the Project area. The NHD shows a somewhat more detailed network of drainages, many linear, leading to the named tributaries that drain the area.

A review of 2009 aerial photography of the Project area shows the predominant agricultural land use. Scattered woodlots are also visible on the aerial photograph. The vast majority of the agricultural areas appear to be effectively drained.

The NWI data shows few wetlands in the Project area (Appendix V). The largest wetlands are PFO wetlands located along Blue Creek and to the northwest of the Project area. Otherwise, there are scattered palustrine, unconsolidated bottom ponds near the Project area.

The OWI shows many of the woodlots in the Project area as "woods on hydric soil" (Appendix V). Otherwise, there are a few farmed wetlands and open water wetlands near the Project area. There are also very few small scrub-shrub, marsh, and wet meadow wetlands.

The soil surveys of Paulding and Van Wert Counties show 10 soil series and 27 soil unit types within the Project area. Hydric (wetland) soils comprise approximately 94 percent of the Project area. However, as noted

above, the majority of the Project area has been drained by a network of ditches, such that most of the soils appear effectively drained.

The delineation of wetlands and other surface waters was conducted in the potential impact area in accordance with *USACE 1987 Corps of Engineers' Wetlands Delineation Manual,* subsequent guidance documents (USACE, 1992). The potential disturbance area for this survey was defined as a 250-foot radius surrounding the proposed turbine locations, access roads and collection lines, and substation locations (Appendix V). The Facility layout underwent some changes during the course of the field studies. Some properties that fell within the 250-foot radius survey area had not been leased for the Project area at the time of the field studies; therefore, the survey area is somewhat irregular.

According to recent guidance from the USEPA and the USACE, wetlands that are adjacent to, or have a significant nexus to, TNWs are regulated under Sections 401 and 404 of the Clean Water Act (USEPA and USACE, 2007). A significant nexus must meet a number of criteria that indicate the wetland provides biological, physical, or chemical benefits to the TNW. Typically, a significant nexus requires a surface water connection to the TNW or a relatively permanent water (RPW) that is a tributary to the TNW. Each wetland was evaluated for a significant nexus to RPWs according to these directives. Those wetlands with no apparent surface nexus to a RPW or TNW were considered "isolated."

In addition, each of the identified wetlands was evaluated in accordance with the ORAM (Version 5.0), developed by OEPA. Categorization was conducted in accordance with the latest quantitative score calibration (OEPA, 2000).

Water bodies in the potential impact area were also delineated in this field survey. They are discussed in detail in Section 4906-17-05(A)(5)(a)(i), *Surface Water Resources*.

The majority of the identified wetlands are linear drainage ditches, mostly PEM, along roadsides or in agricultural fields. These linear wetlands appeared to be seasonally or periodically flooded or saturated. Plant species commonly observed in linear drainage ditches included broadleaf cattail (*Typha latifolia*), narrowleaf cattail (*Typha angustifolia*), Pennsylvania smartweed (*Polygonum pennsylvanica*), rice cutgrass (*Leersia oryzoides*), green bulrush (*Scirpus atrovirens*), softstem bulrush (*Scirpus validus*), water plantain (*Alisma subcordatum*), sedges (*Carex* spp.), giant goldenrod (*Solidago gigantea*), and barnyard grass (*Echinochloa* spp.). The linear wetlands were consistently documented as being Category 1 wetlands in accordance with Ohio Administrative Code (OAC) Rule 3745-1-54. These wetlands typically had minimal to no natural buffers, with the surrounding land use typically consisting of existing paved roads and/or active agricultural fields. Further, they exhibited little or no habitat diversity or interspersion, and the habitat is not likely to succeed naturally because of periodic dredging and/or mowing. As these ditches were largely, if not entirely, excavated through hydric soils and had a continuous connection to relatively permanent waters (named streams which connect to the Auglaize and Maumee Rivers), they were considered to have a nexus to traditionally navigable waterways; therefore, they were considered to be jurisdictional.

A few farmed wetlands were identified based on hydrology indicators, typically substantial crop suppression and rack lines of crop stubble in depressions, and the presence of invasive wetland indicator plants. While the identified farmed wetlands retained some of the planted row crops, other vegetation, including barnyard grass (*Echinochloa* sp.) and

smartweeds (*Polygonum* spp.), had also become established through the growing season. Given the recurrent disturbance and lack of any buffer, the farmed wetlands were also categorically determined to be Category 1 wetlands. Most of the farmed wetlands were considered isolated since they had no surface connections to streams.

Only 10, higher quality Category 2 wetlands were identified. All Category 2 wetlands were located within remnant woodlots, and are palustrine forested deciduous (PFO1) wetlands. Despite their occurrence on hydric soils (as indicated in the OWI), many nearby woodlots appear to be effectively drained by the surrounding agricultural tile drainage system, based on the lack of hydrophytes (particular in the understory and at the ground layer) and lack of hydrologic indicators; therefore, they were not considered wetlands.

Plant species commonly observed within the PFO1 wetlands included pin oak, swamp white oak, green ash, slippery elm, and American elm (*Ulmus americana*). Shagbark hickory and honey locust were less common elements in these wooded wetlands.

The two largest wooded wetlands (W038AC and W026AA) comprise all or the majority of remnant woodlots, and range from 6 to 8 acres in size (Appendix V). W038AC appears to be completely isolated by the adjacent agricultural lands, while W026AA appears connected to the drainage system.

Several of the wooded wetlands are remnant drainage swales along the old railroad embankment that runs south from the Village of Scott. These wetlands are nearly identical in that they are dominated by green ash with very little ground layer or understory. Two of these are isolated, while the others are located in the floodplain of Hoaglin Creek; therefore, they are considered adjacent to this stream.

The most notable wetlands in the Project area are located in a mature, predominantly upland forest adjacent to Hoaglin Creek (WMAINCF and WMAINCK, Exhibit 2D, Appendix V). Both are dominated by mature trees such as pin oak and green ash. By virtue of their buffer, depth of flooding, and habitat features, these wetlands have the highest ORAM scores of all wetlands in the Project area. WMAINCF is Category 2; WMAINCK is larger, and its ORAM score is in the Category 2 to 3 gray zone.

(c) Animal Life Survey

Through field observations recorded during the vegetative habitat and land use surveys, and through a desktop study of published data, CH2M HILL compiled a list of vertebrate fauna likely to occur in the habitat types identified within the Project area, and within a quarter-mile of the Project area boundary. Vertebrates within the Project area were also identified through analyses of published data sources, such as the following:

- *The North American Breeding Bird Survey;*
- *The Ohio Breeding Bird Atlas*;
- *The Ohio Toad and Frog Atlas;*
- *Salamanders of Ohio*;
- *A Guide to the Mammals of Ohio*;
- *Mammals of the Great Lakes Region*;
- Correspondence received from the USFWS Ecological Services Office in Columbus, Ohio; and
- Correspondence received from the ODNR Division of Wildlife and Division of Natural Areas and Preserves.

(i) Mammals

Based on published sources, mammals that are likely to occur within the Project area include white-tailed deer (*Odocoileus virginiana*), Eastern cottontail rabbit (*Sylvilagus floridanus*), red and gray fox (*Vulpes vulpes*, *Urocyon cinereoargenteus*), coyote (*Canis latrans*), striped skunk (*Mephitis mephitis*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), woodchuck (*Marmota monax*), Eastern fox squirrel (*Sciurus niger*), gray squirrel (*Sciurus carolinensis*), red squirrel (*Tamiasciurus hudsonicus*), Eastern chipmunk (*Tamias striatus*), and several smaller mammals, such as field mice (*Peromyscus* sp.), moles, shrews, and voles (*Microtus* sp.) (Gottschang, 1981; Kurta, 1995). Many of the larger mammals prefer woodlands, hedgerows, and wooded riparian areas for nesting and cover, although many will also forage in agricultural fields, pastures, and old fields. Some species, notably squirrels, raccoon and opossum, are adapted to a variety of habitats including developed areas with only scattered trees. Species that specifically prefer habitats near streams include muskrat (*Ondatra zibethicus*), mink (*Mustela vison*), weasel (*Mustela* sp.), and beaver (*Castor canadensis*) (ODNR, 2009i; Gottschang, 1981; Kurta, 1995). During field surveys, the following species were either sighted, or signs of the species occurring within the area were observed (e.g., droppings, burrows, or nests): white-tailed deer, Eastern cottontail rabbit, red fox, striped skunk, raccoon, opossum, woodchuck, Eastern fox, gray squirrel, and Eastern chipmunk.

Various bat species, including little brown bat (*Myotis lucifugus*), Keen's myotis (*Myotis keen*), Northern bat (*Myotis septentrionalis*), Indiana bat (*Myotis sodalis*), small-footed myotis (*Myotis leibii*), silver-haired bat (*Lasionycteris noctivagans*), Eastern pipistrelle (*Pipistrellus subflavus*), big brown bat (*Eptesicus fuscus*), red bat (*Lasiuris borealis*), hoary bat (*Lasiuris cinereus*), and evening bat (*Nycticeius humeralis*), are known to

occur within Van Wert County, Paulding County, and adjacent counties (Gottschang, 1981; Kurta, 1995). Because of concerns raised by the USFWS and the ODNR for potential impacts to bats from the turbines, acoustic monitoring studies using "Anabat" units are being performed to assess the temporal and spatial patterns of bat activity within the Project area during the spring, summer, and fall seasons. These studies were coordinated with ODNR and followed the methodologies and procedures set forth in the *On-Shore Bird and Bat Pre- and Post-Construction Monitoring Protocols for Commercial Wind Energy Facilities in Ohio* (OSMP) in order to prepare and approve the study plan for the assessment (Appendix W). Two "Anabat" units were installed on a meteorological tower in Van Wert County at different heights (10 feet [3 meters] and 148 feet [45 meters] above ground level) in order to conduct the monitoring activities. A preliminary report summarizes the call sequences recorded from March 5 to August 19, 2009 (Appendix X). During 274 detector-nights, 264 bat calls were recorded. A majority of these calls (78 percent) were determined either to be big brown or silver-haired bats. The lower level detector recorded 72 percent of the calls. The additional bat species that were recorded include hoary bats at 14 percent, red and evening bats at 6 percent, and *Myotis* spp. at 2 percent. The preliminary assessment showed that bat activity increased throughout the season, peaking in late July, which is a pattern that has been observed at other wind farms. The acoustic monitoring was completed in mid-November 2009, and a full report will be submitted when analysis is completed in early February 2010 (Appendix X).

(ii) Amphibians

According to the *Ohio Frog and Toad Atlas*, seven species of frogs and toads have been recorded as occurring in Paulding and Van Wert Counties. Of these seven species, the Eastern American toad (*Bufo*

americanus), Blanchard's cricket frog (*Acris crepitans blanchardi*), and Western chorus frog (*Pseudacris triseriata*) have the potential to occur in the open areas, such as the agricultural fields, pastures, and old fields, that exist within the Project area. The Eastern American toad and Western chorus frog, along with the gray tree frog (*Hyla versicolor*), could also occur within the forest habitats of the Project area. The Blanchard's cricket frog, along with the green frog (*Rana clamitans melanota*), bull frog (*Rana clamitans melanota*), and Northern leopard frog (*Rana pipiens*), would also have the potential to inhabit the edges of the streams within the Project area that are well vegetated with emergent plant species. In fact, Northern leopard frogs were sighted at one location along a drainage ditch. (Davis and Menze, 2000)

None of these species are federally or state-listed endangered, threatened, or species of concern (ODNR, 2009j).

As recorded in *Salamanders of Ohio*, seven species of salamanders are listed as occurring in Van Wert or Paulding Counties, or one of the adjacent counties (Pfingsten and Downs, 1989). Only three of the seven salamander species are likely to occur within the Project area. Eastern newt (*Notophthalmus viridescens*) is an aquatic species; therefore, it could inhabit the numerous streams within the Project area. Smallmouth salamander (*Ambystoma texanum*) could be present in the wooded areas along Hoaglin Creek where wetlands occur. Redback salamander (*Plethodon cinereus*), the most common woodland species in Ohio, is likely to occur within the woodlots throughout the Project area. The modification and the prominent siltation of the streams within the Project area limit the likelihood of the mudpuppy (*Necturus maculosus*) to occur within the Project area due to their preference of streams and rivers with riffles over rocky substrates. The spotted salamander (*Ambystoma maculatum*) typically prefers well-drained wooded areas and does not

appear to exist in highly disturbed, cleared regions; therefore, the potential for this species to occur within the Project area is low due to the large amounts of cultivated land. The tiger salamander (*Ambystoma tigrinum*), a burrowing species, also has a limited likelihood to exist within the Project area's silty, clayey, and loamy soils, due to its preference for sandy soils. The four-toed salamander (*Hemidactylium scutatum*) has been recorded in Defiance County to the north, but has a low potential to occur within the Project area due to its preferred habitat of undisturbed, mature forests with pools and sphagnum moss being limited within the Project area (Pfingsten and Downs, 1989). While woodlands with deep, wetland depressions that are at least seasonally flooded were found near Hoaglin Creek, these wetlands did not exhibit the acidic character that is preferred by this species. None of these species are federally or state-listed endangered or threatened; however, the four-toed salamander is a state-listed species of concern (ODNR, 2009j). However, because the potential for this species to occur within the Project area is low, no impacts are anticipated.

(iii) Reptiles

According to the Ohio Division of Wildlife, there are a number of reptile species that are could be found in Van Wert and Paulding Counties (ODNR, 2009k). Several turtles, including Eastern musk turtle *(Sternotherus odoratus*), snapping turtle (*Chelydra serpentine*), Midland painted turtle (*Chrysemys picta marginata*), and Eastern spiny softshell turtle (*Apalone spinifera*) are aquatic turtles that could occur in the streams in the study area. The Eastern box turtle (*Terrapene carolina*) is a common, terrestrial turtle seen in a variety of natural habitats. A single lizard, common five-lined skink (*Plestidon fasciatus*), is known in this area, and inhabits uplands, usually residing under logs, stones, and debris. Eleven snake species occur in these counties. The Midland brown snake

(*Storeria dekayi wrightorum*), Northern black racer (*Coluber constrictor*), Eastern rat snake (*Pantherophis alleghaniensis*), Eastern milk snake (*Lampropeltis triangulum*), and Eastern garter snake (*Thamnophis sirtalis*) are all terrestrial snakes. The common watersnake (*Nerodia sipedon*) is aquatic. The common ribbon snake (*Thamnophis sauritus*) and the queen snake (*Regina septemvittata*) are also associated with streams, although generally inhabit the shore. The Eastern hog-nose snake (*Heterodon platyrhino*) prefers dry upland areas.

Two snakes that have been recorded in this part of the state are listed species. The Kirtland's snake (*Clonophis kirtlandii,* state-listed threatened) prefers wet meadows. The Eastern masssasauga (*Sistrurus catenatus*, federally listed candidate species) prefers bogs, swamps, and wet prairies. Correspondence with the ODNR indicates that neither of these species is currently known to be found in the Project area (Appendix W). None of these species are federally or state-listed endangered, threatened, or species of concern (ODNR, 2009j).

(iv) Birds

Breeding bird surveys are typically required by the OSMP; however, because all of the proposed turbines are to be located in active agricultural fields, and more than 1,640 feet (500 meters) from any forested areas that are 25 acres (10 hectares) or larger, the OSMP states that no breeding bird surveys are required (Appendix W). ODNR has confirmed that a breeding bird survey in not required by the OSMP in this case (Appendix W).

Alternatively, a desktop study of birds in the Project area was performed utilizing the *Ohio Breeding Bird Atlas* (OBBA), and the *North American Breeding Bird Survey* (BBS).

The OBBA is a comprehensive, statewide survey that indicates the distribution of breeding birds in Ohio. Field data for Ohio's first breeding

bird atlas was collected from 1982 to 1987, while data collection for the second breeding bird atlas is currently underway and is projected to extend through 2010. The OBBA survey grid is based on 7.5-minute USGS topographic maps, with survey "blocks" defined by dividing topographic maps into six areas of equal size (approximately 10 square miles each). The Project area overlaps four USGS 7.5 minute maps (Convoy, Payne, Latty, and Scott) and includes one OBBA survey block located in the extreme north central portion of Van Wert County.

In the first OBBA, one block was randomly selected from each USGS map and assigned priority status, with breeding activity of birds documented only within the priority block. Within the one sampled priority block near the Project area, the number of different species observed was less than 60. The majority of species recorded in the 1982 to 1987 OBBA were common nesting birds for this region of the state. No federally listed endangered or threatened species were observed near the Project area (ODNR, 2009j). However, one state-listed endangered species (northern harrier [*Circus cyaneus*]) and three state-listed species of concern (sedge wren [*Cistothorus platensis*], bobolink [*Dolichonyx oryzivorus*], and northern bobwhite [*Colinus virginianus*]) were recorded. A "possible" status for the northern harrier was recorded within the Project area, meaning records pertaining to a single harrier being observed foraging, whose breeding status was uncertain, and that may have been a nonbreeder. The sedge wren records were also "possible" and pertained to singing males that only briefly established territory within the block, but probably did not nest, and may have been migrants. The northern bobwhite had "confirmed" records in a non-priority block adjacent to the west of the Project area, but very few nests were discovered. The bobolink records were the sole "confirmed" records within the Project area and also had "possible" records to the southwest of the Project area. No

state-listed threatened species were observed within the Project area. (OBBA, 2009a)

The goal of the second OBBA is to survey each one of the 4,437 atlas blocks in the state of Ohio. However, the data collection phase of the OBBA is still underway; therefore, results are not yet available for any survey blocks near the Project area. (OBBA, 2009b)

The North American BBS, overseen by the Patuxent Wildlife Research Center of the USGS, is a long-term, large-scale, international avian monitoring program that tracks the status and trends of North American bird populations. Each survey route is 24.5 miles long, with 50, 3-minute point counts along the length of the route. During the point counts, every bird seen or heard within a 0.25-mile radius is recorded. The Berne survey route is approximately 8.0 miles west of the Project area (USGS, 2009d). Most of the species recorded were common birds of forest, forest edge, woodland, old-field, grassland, and wetland habitats. However, one state-listed endangered species (northern harrier), one state-listed threatened species (upland sandpiper [*Bartramia longicauda*]), and two state-listed species of concern (bobolink and northern bobwhite) were observed during these surveys. No federally listed endangered or threatened species were observed (ODNR, 2009j; USGS, 2009e; USGS, 2009f).

(v) Raptor Study

According to the first OBBA, the occurrences of six raptor species within Van Wert County, Paulding County, or adjacent counties have been listed as "confirmed", "probable" or "possible." The turkey vulture (*Cathartes aura*), northern harrier (state-listed endangered species), and Cooper's hawk (*Accipiter cooperii*) have all been designated as "possible" to occur within or adjacent to the Project area. The sharp-shinned hawk (*Accipiter*

striatus) is listed as "probable" to occur within Mercer County, south of Van Wert County and the Project area. The two "confirmed" occurrences are that of the red-tailed hawk (*Buteo jamaicensis*) and American kestrel (*Falco sparverius*). (OBBA, 2009a)

During coordination, ODNR expressed concern about the potential for bird strike hazards with the turbines, particularly for raptors. With the potential for six raptor species to occur within or near the Project area, a raptor nest survey was conducted throughout the Project area and within a 1-mile perimeter, to assess raptor activities and the risk that the Facility may have on raptors. The surveys were conducted in accordance with the procedures and methodologies of the OSMP. The survey was conducted over a three-day period between February 16 and 19, 2009 utilizing magnification binoculars during stationary observation and automobile surveys. All wooded areas with potential raptor nest trees were investigated and all observed nests were recorded (Appendix Y).

Because of the agricultural use of the majority of the Project area and surrounding areas, raptor diversity and potential nesting sites are limited. A total of seven raptor nests were identified within the survey area. Three of these nests were observed within the Project area, while the remaining four were within the one-mile radius. Two of the nests were speculated to be occupied by pairs of red-tailed hawks, due to the observation of these pairs performing courtship flights, being perched in close proximity to each other near the nests, and/or engaging in nest building behavior. These activities indicate that these two nests, one in the Project area and the other in the 1-mile radius, would be used during the 2009 breeding season. A great horned owl (*Bubo virginianus*) was also observed incubating eggs on a nest within the Project area. Both the red-tailed hawk and the great horned owl are among the most common raptors in North America and their conservation status is secure. Based on the

relatively few nests observed, the probability of impacts occurring to large numbers of raptors from the proposed turbines is considered low. None of these species are federally or state-listed endangered, threatened, or species of concern (ODNR, 2009j).

(d) Summary of Ecological Studies

Concerns about the potential impacts of the turbines on Indiana bats and raptors were voiced by the USFWS and ODNR in their correspondence (Appendix W). In response to these concerns, the Applicant has conducted bat acoustic monitoring and raptor nest surveys within the Project area. The results of these surveys are discussed in detail in Section 4906-17-07(B)(1)(c), *Animal Life Surveys,* above.

(e) Major Species List

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

(i) Commercial Species

The ODNR regulates the hunting and trapping of the following furbearers in Van Wert and Paulding Counties (ODNR, 2009l; ODNR, 2009m).

- Muskrat: Muskrat are extremely common and abundant throughout the entire state. They prefer slow-moving water habitats, including small streams and wetlands. This species is likely to occur within the Project area.

- Raccoon: Raccoon are common statewide and typically occupy a wide variety of habitats, including forests, agricultural fields, as well as developed land. Raccoon are likely to occur within the Project area.

- Red Fox: Red fox are common throughout Ohio, and occur in a wide variety of habitats, including forests, agricultural fields, as well as developed land. Red fox is likely to be present within the Project area.

- Gray Fox: Gray fox are less common statewide than the red fox, and tends to avoid open areas, preferring the cover of forested and scrub-shrub habitats. The Project area is predominantly open agricultural fields; however, a small number of gray fox may occur within woodlots and scrub-shrub areas.

- Coyote: Coyotes had been extirpated from Ohio, but are now common throughout the state. They occur in a wide variety of habitats, including forests, agricultural fields, as well as developed land. Coyotes are likely to occur within the Project area.

- Mink: This semi-aquatic weasel has a statewide distribution. Their preferred habitat includes forested wetlands with abundant cover. A small number of this species may occur within the Project area.

- Opossum: Opossum are common throughout Ohio, and typically occur in a wide variety of habitats, including forests, agricultural fields, as well as developed land. Opossum are likely to occur within the Project area.

- Skunk: Skunks typically occur in a wide variety of habitats, including forests, agricultural fields, as well as developed lands, and are common statewide. This species is likely to occur within the Project area.

- Beaver: Beaver are common throughout the state, preferring permanent sources of water, typically water of any type, but particularly low gradient streams and small lakes or ponds with outlets. Beavers are likely to occur within the Project area.

(ii) Recreational Species

The ODNR regulates the hunting of the following species in Van Wert and Paulding Counties (ODNR, 2009m).

- White-tailed deer: Deer are common throughout the state and typically occupy a wide variety of habitats, including forests, scrub-shrub areas, agricultural fields, and even developed areas. Deer are likely to exist within the Project area.

- Gray and fox squirrels: The fox squirrel primarily inhabits of open wooded areas, while the gray squirrel prefers more developed forested areas. Both species have adapted well to manicured suburban areas, and are often observed around residential and commercial structures. These two species occur throughout Ohio, and are likely to occur within the Project area.

- Eastern cottontail rabbit: Cottontails are widespread and abundant throughout the state. They prefer open areas bordered with brush and open woodlands. Like the squirrels, cottontails have adapted well to developed areas. This species is likely to occur within the Project area.

- Ring-necked pheasant (*Phasianus colchicus*): Although this species is not native to North America, the pheasant is naturalized in northern and western portions of the state. They generally inhabit open areas, such as agricultural and old fields. This species has been documented near the Project area in the OBBA (2009a).

- 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 near the Project area in the OBBA and the North American BBS (OBBA, 2009a; USGS, 2009e).

- Wild turkey (*Meleagris gallopavo*): Once extirpated in Ohio, this species has been reestablished throughout Ohio, 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 has been recorded in areas with little forest cover. This species is likely to occur within the Project area.

- Mourning dove (*Zenaida macroura*): Mourning doves are common throughout the state, and typically occupy a wide variety of habitats, including agricultural fields, scrub-shrub areas, and even developed land. This species has been documented near the Project area in the OBBA and the North American BBS (OBBA, 2009a; USGS, 2009e).

- American woodcock (*Scolopax minor*): The American woodcock is common throughout the state during spring migration, but smaller numbers exist in the west-central and northwestern portions of the state. The woodcock prefers young wooded or scrub-shrub areas that have periodic open spaces, or abut pastureland or abandoned agricultural fields. There is a potential for this species to occur within the Project area.

- American crow (*Corvus brachyrhyncos*): Crow are common across the state and typically occupy a wide variety of habitats, such as forests, agricultural fields, scrub-shrub areas, and even developed land. This species has been documented near the Project area in the OBBA and the North American BBS (OBBA, 2009a; USGS, 2009e).

- Ruffed grouse (*Bonasa umbellus*): The ruffed grouse occurs across the state, but has limited habitats in which it exists. The habitats preferred by the grouse are young forested stands with mixed species and wet scrub-shrub areas. There is a potential for this species to occur within the Project area.

- Waterfowl: The following waterfowl game species have been recorded near the Project area: Canada goose (*Branta canadensis*), mallard (*Anas platyrhynchos*), and wood duck (*Aix sponsa*). (ODNR, 2009i)

(iii) Federally Listed Species

A review of USFWS published information indicates that one federally listed endangered species (Indiana bat) and one federally listed candidate species (eastern massasauga rattlesnake) are recorded as potentially occurring within either Van Wert or Paulding Counties (USFWS, 2009). However, correspondence with the USFWS (Appendix W) indicates that no records exist for either of these federally listed species within the Project area.

The USFWS voiced concerns about the potential impacts of the turbines on Indiana bats (*Myotis sodalist)* in their correspondence (Appendix W). In response to these concerns, the Applicant has conducted bat acoustic monitoring within the Project area, which is discussed in detail in Section 4906-13-08(B)(1)(c), *Animal Life Surveys*. To date, 5 calls out of 264 total recorded calls over 274 detector-nights have been in the *Myotis* genus. The *Myotis* genus includes five possible species (including the Indiana bat) known to occur within Van Wert County, Paulding County, and adjacent counties.

(iv) State Listed Species

Correspondence with the ODNR, Division of Wildlife and Division of Natural Areas and Preserves (Appendix W) indicates that there are no existing or proposed state nature preserves within the Project area, and that ODNR is unaware of any unique ecological sites, geologic features, state parks, state forests, scenic rivers, or wildlife areas within the Project area. In addition, the Division of Natural Areas and Preserves, Natural Heritage Database contains no records of state-listed endangered or threatened species within the Project area.

(2) Construction

(a) Impact of Construction

Potential ecological impacts may occur during construction as a result of the installation of turbines, access roads, and collection lines; the construction of the substations and O&M building; and if needed, the upgrade of local public roads or intersections, and the development and use of staging areas and temporary workspaces around the turbine sites. Potential impacts to upland, wetland, and waterbody habitats are discussed below.

(i) Upland Habitat

Construction activities of the Facility may result in temporary and permanent impacts to vegetation within the Project area, including site preparation, grading, and excavation, as well as backfilling activities associated with construction and installation of access roads, underground collection lines, turbine foundations, substations, the O&M building, and potential staging areas. Most of these activities would occur in cropland, which except for access roads, turbine foundations, substations and the O&M building, would be returned to its pre-construction condition. The total area of hedgerows and other natural vegetation that would be affected

by the Facility is estimated to be less than 8 acres. Access roads will be sited in agricultural areas, and will require no removal of natural upland vegetation. Some removal of natural vegetation will occur at a few locations for collection lines where the collection lines cross hedgerows and require localized removal of vegetation. Most impacts to natural vegetation will occur for the aboveground electric line along the old railroad bed south of the Village of Scott, and will require removal of scrub vegetation along the embankment. This vegetation would recover over a few years' time to a comparable condition. This minimal impact to natural vegetation would not cause a substantial loss of wildlife habitat in the Project area.

Except for the substation and O&M building properties, a majority of the Facility will be located entirely on leased land. Therefore, construction-related impacts to recreational areas, parks, wildlife areas, nature preserves, or other conservation areas would not occur.

(ii) Wetlands and Waterbodies

No wetlands or waterbodies were delineated near any of the proposed turbine locations; therefore, the construction of the turbines is not anticipated to impact wetlands or other waterbodies. However, potential impacts to wetlands or waters within the Project area may occur during the installation of the collection lines and access roads.

The construction of the proposed access roads will require the installation of culverts across some ditches and result in localized, permanent impacts to the wetlands or streams crossed. Access roads have been sited to avoid larger stream crossings and any impacts to woodlands, including wooded wetlands.

Most collection lines will be installed underground and generally utilize an open-cut method. Where the collection lines cross farmed or linear

wetlands, the wetlands will be restored to their pre-construction conditions following installation, thereby making the impacts to wetlands only temporary. At larger stream crossings, such as Blue Creek, Dry Creek, or Hagerman Creek, the underground collection lines will be installed using horizontal directional drilling to avoid impacts to these streams.

Aboveground collection lines will be installed on poles with localized impacts. It is expected that these lines can be installed with minimal or no impact to wetlands or streams, including the aboveground electric line along the old railroad embankment south of the Village of Scott. Overheard collection line poles in the Maumee Watershed Conservancy District will be placed outside the riparian ROW and no existing berms would be permanently impacted. Impacts to bermes would be restored back to pre-construction conditions.

Tree clearing along the proposed aboveground collector route would be avoided, where possible. Tree clearing in large forest stands will be conducted from November 1 to April 1 where determined necessary.

Consequently, the culverting of linear, roadside ditches at the proposed access roads would constitute the majority of the permanent impacts to wetlands and waterbodies from the Facility. All of these wetlands are considered Category 1 (lowest quality) wetlands according to the OEPA's ORAM assessment. It is anticipated that Category 2 (wooded) wetlands will be avoided. It is the intent of the Applicant to minimize impacts to wetlands, and to keep total impacts to less than 0.5 acres. In this way, it expected that the Facility can be authorized by USACE under the Nationwide Permit program. The final impact to wetlands will be assessed once final siting of the access roads and collection lines has been completed.

(b) Impact of Construction on Major Species

The Applicant is not anticipating impacts to occur to any threatened or endangered species or their habitat because of the Facility. Continued coordination with ODNR will aid the Applicant in designing the Facility to avoid impacts to threatened or endangered species and their habitat. Construction-related impacts to wildlife are generally anticipated to occur to some degree during construction activities. However, these impacts will likely be limited to incidental injury and mortality of sedentary or slow-moving species due to construction activity and increased vehicular movement; habitat disturbance or loss associated with clearing and earth-moving activities; and displacement of wildlife due to increased noise and human activities.

However, because most of the Facility is proposed to be sited in active agricultural land that provides limited wildlife habitat, and which currently (and historically) experiences frequent agricultural-related disturbances, incidental injury and mortality impacts are anticipated to be minor. Because the majority of the Facility is being sited in active agricultural land, soil disturbance and exposure due to construction activities will likely occur in areas previously subjected to regular plowing, tilling, and harvesting. As discussed in Section 4906-17-08(B)(2)(a), *Impact of Construction*, a majority of the habitat or vegetation disturbance and loss will be temporary in nature. The limited forested habitat within the Project area generally occurs within relatively small blocks. Impacts to these areas would be avoided to the extent practicable in order to prevent fragmentation of these areas due to construction activities. Tree clearing required in large forest stands will be conducted from November 1 to April 1 where determined necessary. In addition, because the Project area is comprised of agricultural fields, it is anticipated that grassland bird species will be the only species displaced or disturbed by construction activities, and that any disturbance or displacement will be temporary. In addition, limited if any, grassland habitat for these bird species exists within the Project area, and the predominant habitat

of agricultural fields does not act as a replacement habitat for grassland for these bird species.

It is not anticipated that any of the construction-related impacts will be significant enough to affect local populations of any resident or migratory wildlife species.

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

The Applicant plans to mitigate short-term construction disturbances by restoring disturbed areas to similar vegetation types in accordance with the E&SCP for the Facility. Upon completion of construction, construction road widths will be reduced and the areas outside permanent road areas will be returned to their prior land use. For a majority of the Facility, disturbed areas will once again be used as agricultural fields.

(3) Operation

(a) Estimate the Impact of Operation on Areas

The Facility has been sited in agricultural areas and avoids large woodlots. This approach minimizes the potential for operation impacts to wildlife. The Applicant plans to conduct post-construction monitoring for birds and bats in order to monitor and track impacts to these species. Based on the Project area siting, the potential impacts are expected to be low.

The Applicant will monitor impacts to avian species and bats in accordance with the Applicant's corporate policy Avian and Bat Protection Plan (ABPP), as presented in Appendix H. The ABPP complies with the internal policies, USFWS and equivalent state wildlife agency regulations, the *Endangered Species Act, Migratory Birds Treaty Act*, and *Bald and Golden Eagle Protection Act.* The ABPP identifies a series of best practices to adhere to the USFWS guidelines and to operate in an environmentally sustainable manner. It establishes procedures to understand avian and bat risks at each site and to incorporate features to avoid or

minimize risk to birds, bats, and their habitats. The ABPP applies to all wind activities, including plant development, construction, operation, and decommissioning.

(b) Estimate the Impact of Operation on Major Species

As discussed in Section 4906-17-08(B)(l)(e) *Major Species List*, according to correspondence with the USFWS and ODNR, no records of state or federally listed endangered, or threatened species exist within the Project area; therefore, no impacts to these species are anticipated from construction activities associated with the Facility.

The Applicant will continue coordination with the USFWS and ODNR in the event of design changes that may affect different areas not reviewed previously for the potential impacts to threatened or endangered species.

(c) Mitigation of Impacts

A variety of measures have been adopted in Facility planning to mitigate ecological impacts, including implementing setbacks from large wooded areas, reducing construction road areas upon completion of construction activities, and using direction drilling to avoid impacts from large drainage ditches. These measures serve to minimize long-term impacts.

(d) Post-Construction Monitoring of Wildlife Impacts

Despite the fact that significant impacts to birds, bats, or raptors are not anticipated, the Applicant is in the process of developing a post-construction monitoring plan for the Facility in accordance with the ABPP. The plan would be based on the final avian and bat impact analysis discussed in Section 4906-17-08(B)(1)(d), *Summary of Ecological Studies,* and in coordination with USFWS and ODNR. The purpose of an onsite, post-construction monitoring plan would be to determine if avian and/or bat collision fatalities are occurring as a result of

operation of the Facility, and if so, the rate of mortality. To adhere to the ABPP and federal and state laws during ongoing operations, IBR is piloting a Wildlife Monitoring and Reporting System (WMRS), focusing on a systematic approach to monitoring and reporting of bird and bat fatalities for the life of the Facility, and to assess long-term operational impacts (trends). The WMRS consists of two levels of post-construction fatality monitoring for birds and bats: Baseline and Operational.

Level 1 or baseline post-construction bird and bat monitoring consists of structured fatality surveys conducted by trained consultants that occur at most sites starting the first year of commercial operation. If the first year of Baseline post-construction monitoring suggests that additional surveys should be completed, then an intermediary second year of monitoring may be conducted. The second year of study may be a reduced sampling effort or a focused effort on a specific species or group (e.g., bats).

After the completion of the initial fatality surveys for Baseline post-construction monitoring, most formal monitoring will be stopped. Level 2 or operational monitoring for bird and bats will occur for the life of the Facility to achieve the following goal and objectives:

GOAL: Implement an acceptable method for measuring long-term operational impacts to birds and bats from the Facility.

OBJECTIVES:

- Document the occurrence of species of concern and the overall species composition of fatalities;
- Document, with high probability, large mortality events;
- Determine trends in fatality for bats, birds, and especially raptors and species of concern; and

- Demonstrate ongoing permit and policy compliance with federal and state regulations and guidelines.

(C) ECONOMICS, LAND USE AND COMMUNITY DEVELOPMENT

(1) Land Uses

According to the ODOD, agricultural uses are the predominant land use in both Paulding and Van Wert Counties. Paulding County has approximately 88 percent of its overall land use/land cover as cropland, while Van Wert County has approximately 87 percent (ODOD, 2009c). Land use surveys were conducted on September 21 and 22, 2009 to verify the land use within five miles of the Project area. These surveys confirmed the area as being predominately agricultural cropland. Based on this survey and a review of 2009 aerial photography, agricultural land represents 95.2 percent of the Project area. The predominantly agricultural use emphasizes the rural character of the region and identifies this location as an ideal location for a wind energy facility.

Currently, a comprehensive land use plan for Van Wert County has been drafted by the County Commissioners to replace their existing plan developed in 1975. Although the plan has not yet been finalized, the county has been using the draft plan as a guide for implementing their goals for development (Bowen, 2009). Several of the plan's objectives directly involve agricultural land use and open space, including continuing to develop a land use pattern that is balanced between rural and urban, encouraging open space preservation, and protecting and enhancing areas of agriculture and open space (Van Wert County, 2007).

Paulding County also currently lacks a comprehensive land use plan; however, the county has have developed a CEDS to review the county's overall economic environment and determine actions to increase their economic growth. The CEDS discusses specific goals such as creating opportunities that are more educational for residents, developing a water and sewer district, increasing funds for economic development activities, developing a telecommunications infrastructure, and pursuing tourism initiatives (Paulding County, 2004).

(a) Land Use Map

Figure 8-4 provides a 1:24,000 scale map identifying land uses within 5 miles of the Project area. Identified land uses include: residential, urban, manufacturing, commercial, mining, transport, recreational, utilities, water, wetlands, forest woodland, pasture, and cropland. Figure 8-5 depicts registered historic sites, while Figure 8-4 identifies recreational areas. The land use mapping was developed from available ODNR land use data, information obtained during land use field surveys, and from aerial photography.

(b) Residential Structures In Relation to the Boundary of the Proposed Facility

Residential structures were reviewed to determine if they will be located within either 1,000 feet or 100 feet of a Facility component including turbine towers, underground and aboveground 34.5 kV collection lines, the 115 kV aboveground collection lines, project collector substations (which includes two substations and the O&M building), project collection substation, interconnection substation, and access roads. For this analysis, the centerline was used for all linear Facility components (electric collection system and access roads), center-points for the turbine towers, and the footprint for residences, substations, and O&M building. Figure 8-4 identifies the location of these structures.

There are 147 residences within 1,000 feet of access roads or collection lines. Of these, there are 20 residences within 100 feet of access roads or collection lines. Table 8-7 lists the residential structures within 100 feet of an access road or collection line. The table also provides the residence ID, tax lot ID, owner, latitude and longitude, and distance from the access road or collection line. No residences are within 1,200 feet of a proposed turbine.

Additional information on the distances between turbines and residential structures is provided below in Subsection (c) Wind Turbine Structure Locations.

TABLE 8-7
Residential Structures within 100 feet of the Facility

Residence ID#	Tax Lot ID, Owner	Longitude, Latitude	Distance (feet)	Facility ID#	Facility Component
61	080122120100, James L & Phyllis L Rolsten JTS	-84.68302658, 40.92921748	47.89	202	Project Collector System
91	080115760000, David A Shook	-84.68365006, 40.9315185	66.10	201	Project Collector System
106	080117240200, Brenda A Delong	-84.62935656, 40.93840038	77.12	293	Access Roads
124	080117520100, Juanita L Hotmire (Niswander)	-84.59178509, 40.94179982	82.26	187	Project Collector System
134	080118120100, Carl E & Christi L Short	-84.57886514, 40.94567108	84.44	195	Project Collector System
148	080118240000, Erik R & Heather R Williams (JTS)	-84.58146044, 40.94614834	88.98	184	Project Collector System
152	080116880100, Gene D & Vickie L Pool	-84.64832087, 40.94502761	93.29	207	Project Collector System
159	080112400000, Kathleen Jo Brotherwood Liv Tr	-84.58161815, 40.94651787	50.09	184	Project Collector System
169	150391620100, Nancy Mihm	-84.57181808, 40.94707391	43.52	195	Project Collector System
182	080114720100, Marie A Nelson	-84.65223551, 40.94605631	85.68	211	Project Collector System
198	080113080100, Richard L & Tonya R Jellison JTS	-84.59187911, 40.9503038	87.57	187	Project Collector System
212	080114920200, Jason J Hoersten	-84.66709508, 40.95332616	55.01	390	Access Roads
215	080114200100, Rex L & Nancy K Replogle	-84.63025096, 40.95482816	90.14	297	Access Roads
234	080111840100, Robin Lynn Zinsmaster	-84.58245461, 40.96108018	91.00	220	Project Collector System
258	010004680000, William J & Lorraine Collins	-84.69518612, 40.96073714	64.10	402	Access Roads
284	080109720000, Arthur R Fiock	-84.6490924, 40.97290959	71.23	203	Project Collector System
304	080108360100, Gary W & Janell M Dicke	-84.64832389, 40.9753111	39.17	207	Project Collector System
321	080107040000, William Joseph Roop	-84.58259832, 40.98199099	71.87	220	Project Collector System
386	0525-00300, Annexed to Village of Haviland	-84.59984443, 40.99002456	57.94	171	Project Collector System
424	0536-00500, Karen M. Keipper	-84.59110522, 40.99724164	29.96	343	Access Roads

(c) Wind Turbine Structure Locations

As shown in Table 8-8, there are no residences within 1,000 feet of a wind turbine. In accordance with IBR policy, no residences will be within 1,200 feet of a wind turbine.

TABLE 8-8
Residential Structures Near Facility Components

Facility Component	Number of Structures within 100 feet of Facility component	Number of Structures within 1,000 feet of Facility component
Wind Turbine	0	0
Access Road	5	32
34.5 kV Collection Lines	15	106
115 kV Collection Line	0	8
Total	**20**	**146**

(i) Distance from base to property line

OAC Rule 4906-17-08(C)(1)(c)(i) requires a setback of 1.1 times the maximum height of the turbine. The Applicant is electing to use a more conservative property line setback of 1.31 times the maximum height of the turbine. The maximum height of the turbines under consideration for the Facility is 476 feet (145 meters). Therefore, the distance from the turbine base to the property line will be at least 624 feet (1.31 times the maximum height of the turbine). All turbine locations comply with the appropriate property line setbacks.

(ii) Distance from blade to residential structure

OAC Rule 4906-17-08(C)(1)(c)(ii) requires a setback of 750 feet from the tip of the horizontal turbine blade to the nearest habitable structure. The Applicant is electing to use a more conservative setback (turbine location to residential structures) than required (i.e., 1,200 feet). The rotor diameter of the G-90 turbine under consideration for the Facility is 295

feet (90 meters). If the turbine blade were at 90 degrees, the tip would extend from the base of the tower for one-half the length of the rotor diameter, approximately 148 feet. With the 1,200-foot setback to residential structures, the distance from horizontal blade tip to residential structure will be no more than 1,052 feet (1,200 feet – 148 feet). The Applicant will therefore comply with the 750-foot setback requirement.

(iii) Waiver of minimum setback

The Applicant will not require waivers of minimum setbacks. The Applicant is electing to maintain a 1,200-foot setback from all habitable structures. There are no residences within 1,200 feet of wind turbines.

The wind turbine base of any turbine in the Project area would be well within the requirements listed for OAC Rule 4906-17-08(C)(l)(c).

(d) Impact of Proposed Facility

Consistent with Paulding and Van Wert Counties, the predominant land use within one mile of the Facility is agricultural, with approximately 96 percent of land being used for cultivated crops in Paulding County, while Van Wert County has approximately 94 percent. Within the Project area, approximately 95.2 percent of the land is utilized as agricultural cropland (Table 8-9). The Facility is generally compatible with land use in the area and would not preclude existing uses or planned uses. Approximately 793 acres of land would be temporarily impacted and 237 acres of land permanently impacted by construction of turbines and associated access roads (Table 8-9).

As shown in Table 8-9, agricultural land uses account for 97.4 percent of the area that would be permanently impacted if all of the 167 turbines detailed in this application and associated facilities were constructed. Lower intensity developed uses, or open space, would account for approximately 1.1 percent of the permanently impacted land uses.

Temporarily disturbed areas at each turbine site, at underground collection lines, and along the 20-foot construction access road ROW work areas will be restored with subsoil, stockpiled topsoil, and allowed to revegetate naturally. While the Facility would result in the permanent loss of some land characterized as agricultural, developed, or forest, it is generally consistent with the goals of local planning documents and zoning ordinances and would not preclude any planned future uses.

TABLE 8-9
Land Use Within the Project Area

Land Use Type	Total Land Use		Temporary Impacts		Permanent Impacts	
	Acreage	Percent of Total	Acreage	Percent of Total	Acreage	Percent of Total
Cultivated Crops	38,601.1	95.2	782.0	98.6	230.5	97.4
Deciduous Forest	717.6	1.8	4.7	0.6	3.5	1.5
Developed, High Intensity	0.0	0.0	0.0	0.0	0.0	0.0
Developed, Low Intensity	1,075.9	2.7	6.1	0.8	2.7	1.1
Pasture Land	93.6	0.2	0.4	0.1	0.0	0
Shrub and Brush Rangeland	28.4	0.1	0.00	0.00	0.00	0.00
Lakes and Ponds	30.1	0.1	0.00	0.00	0.00	0.00
TOTAL	**40,546.7**	**100**	**793.2**	**100**	**236.7**	**100**

Note: Percentage values have been rounded, so that total is slightly more than 100 percent.

(e) Identification of Structures to be Removed or Relocated

The Applicant will not remove or relocate any structures as part of this application.

(f) Plans for Future Use

The plan objectives for Van Wert County directly involve agricultural land use and open space, including: continuing to develop a land use pattern that is balanced between rural and urban, encouraging open space preservation, and protecting and enhancing areas of agriculture and open space (Van Wert County, 2007). The Paulding County CEDS discusses specific goals such as creating

opportunities that are more educational for residents, developing a water and sewer district, increasing funds for economic development activities, developing a telecommunications infrastructure, and pursuing tourism initiatives (Paulding County, 2004). Aside from the county-adopted land use plans described above, there are no portions of the Project area in Paulding and Van Wert Counties with designated future uses.

(g) Concurrent or Secondary Uses

The Applicant has no plans for concurrent or secondary uses of the Project area. 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 could continue concurrently with Facility operation.

(2) Economics

(a) Estimated Payroll

The Facility would create employment opportunities both during the construction phase and during the 25-year operational phase. The construction work force is estimated at approximately 250 onsite laborers, which is anticipated to result in a construction payroll of approximately $20 million during both phases of construction. The present value operation payroll is $10.5 million, assuming a discount rate of 10 percent. Because the construction payroll would be incurred within two years, the present value is the same as listed above ($20 million).

The Applicant expects to employ one maintenance technician for every 17 operational wind turbines during the first two years of operation. During this period, the turbine manufacturer provides the majority of the required maintenance. Starting in the second half of 2011, six technicians would need to be hired for the first 100 turbines, and another four technicians would be hired in 2012 for the remaining turbines constructed that year. The two-year warranty

period for operational equipment installed in the first phase of construction would expire in December 2013, and in December 2014 for equipment installed during the second phase. When the warranty period expires, employment at the Facility would need to increase to a rate of approximately one maintenance technician for every 10 wind turbines (approximately 17 full-time employees), plus some additional administrative positions. Based on these staffing assumptions, and a 2 percent annual increase in the typical technician pay (which averages $60,000 per year), a total payroll of approximately $36.4 million is anticipated during the 25-year operational life of the Facility.

(b) Estimated Employment

It is anticipated that construction of the proposed Facility would employ a total work force of approximately 250 employees. While it is difficult to estimate the portion of employment that may be obtained from the Northwestern Ohio labor market, the Applicant has recently constructed a similarly sized project in Illinois where 70 percent of the construction workforce came from the local/regional workforce. Local construction employment would consist primarily of equipment operators, truck drivers, laborers, and electricians. Facility construction would also require workers with specialized skills, such as crane operators, turbine assemblers, specialized excavators, and high voltage electrical workers. It is likely that more of these specialized positions would need to be filled using non-local workforce due to the highly specialized training required for these positions.

As described previously, up to 10 full-time employees would be used during the first two years of operation, and up to 20 full-time employees (including administrative staff) would be used subsequent to the expiration of the two-year equipment warranties. These positions would likely include one O&M technician per 10 turbines, an operations manager/supervisor(s), and several administrative staff. All of these employees are expected to reside locally.

(c) Estimated Tax Revenue

Negotiations concerning an Enterprise Zone Property Abatement are ongoing between the Applicant and Van Wert and Paulding Counties. The Applicant's proposal to both Van Wert and Paulding Counties would provide a combined $10 million in new tax revenues over a period of 15 years. In addition, Facility development would raise the value of other properties near the Project area because of the increase in wages and overall economic activity within these two counties. The additional tax revenue generated by the existence of the Facility would increase the ability of both counties to provide roadways, police and fire protection, and other services to its citizens.

(d) Estimated Economic Impact

The proposed Facility would benefit the rural economies of Van Wert and Paulding Counties by providing local jobs during construction and increasing activity at local commercial businesses and industries that will provide some of the needed materials and services during construction of the wind farm. Wind farms often rely on non-turbine construction materials like sand, gravel, asphalt, and other materials for construction of access roads and foundations (Lantz and Tegen, 2008). Although exact estimates of materials required for construction of the Facility have yet to be developed, the Applicant estimates that tens of millions of dollars of these materials will be required, most of which would come from local and regional companies, if possible.

Local fuel retailers would also benefit from increased purchases of gasoline and diesel fuel required for construction vehicles and equipment. Hotels and restaurants would benefit as well, since a portion of the construction workforce would need to be obtained from non-local, highly specialized labor pools.

Lease payments to local landowners will also benefit the local economy, likely totaling $1.6 million in the first year and $53 million over the 25-year life of the

Facility. All of this activity would result in a net inflow of millions of dollars into the local economy.

(3) Public Services and Facilities

This section describes the probable impact of construction and operation on public services and facilities.

(a) Sewerage and Sewer Treatment

Construction

The only sewerage services required by the Facility during construction would be related to the handling of sewage from contract portable toilets. Sewage from the portable toilets would be disposed of at a local treatment facility. The minimal amounts of sewage that are anticipated are not likely to pose significant impacts.

Operation

An onsite septic system will be installed at the O&M building. The Applicant will install kitchen and bathroom facilities in the O&M building and the domestic-strength waste produced will be treated by the septic system. No other sewage treatment will be needed for Facility operations.

(b) Water

Construction

Peak day demand for Facility construction would occur for concrete batch plant production and could reach a maximum of 55,000 gpd. Water for construction will be obtained from two newly constructed wells adjacent to the O&M building. The Applicant will obtain applicable permits for these wells from the OEPA and the Van Wert County Health Department. If public water sources are to be used, the Applicant will coordinate with the relevant municipality to ensure that it has adequate water to supply the Facility without impairing supply to existing users.

Operations

Kitchen and bathroom facilities will be installed in the O&M building. Nominal amounts of water will be needed for domestic purposes, such as hand washing, drinking, and toilet flushing. Based on a full time staff of 20 employees and a per capita use of 50 gpd, an estimated 1,000 gpd of water will be used for the O&M building (USEPA, 2003). Given that the operational water needs of the Facility are minimal, it is likely that sufficient water will be available from the wells developed during construction of the Facility and from nearby municipalities, if needed. If blade washing is recommended by the manufacturer, it would have a de minimis impact on water requirements because it would only involve a small amount of water per turbine (estimated to be approximately 50 gallons per blade), and only a small number of the turbine blades would be washed each week.

(c) Solid Waste Management

Construction and Operations

Facility construction will generate some solid waste, primarily consisting of packaging materials (e.g., plastic shrink wrap, wood, wooden pallets, cardboard, and metal packing), construction scrap (e.g., reinforcement bar scraps, excess concrete from washout stations, cable spools, and excess electrical cable), and general refuse (e.g., trailer office materials and debris from employees). The waste anticipated to be generated during construction is estimated to be 1,550 cubic yards based on similar sized projects previously constructed. The debris and solid waste generated would be collected from turbine sites and other Facility work areas and disposed of in dumpsters located at the construction staging area. A private contractor would then empty the dumpsters on an as-needed basis, and dispose of the refuse at a licensed solid waste disposal facility. Therefore, impacts on local or municipal services are not anticipated.

(d) Police Protection

Construction and Operations

Potential adverse impacts on the ability of communities to provide police protection could occur if the Facility itself resulted in an increased need for police services (for example, from vandalism or other crime during construction or operations). Based on the rural location of the proposed Facility and that many of the construction and operational work force would consist of local residents, increased demand to local police forces is highly unlikely. Table 8-10 provides a list of local law enforcement agencies in the area.

TABLE 8-10
Local Public Services

County	Law Enforcement	Fire Departments	Medical Facilities	School Districts
Paulding County	Paulding County Sheriff's Department Paulding Police Department	Scott Volunteer Fire Department; Paulding Community Volunteer Fire Department; Payne Fire Department	Paulding County Hospital – Paulding, Ohio	Antwerp Local School District Paulding Exempt Village School District Wayne Trace Local School District Vantage Career Center
Van Wert County	Van Wert County Sheriff's Department City of Van Wert Police Department	Convoy Fire and EMS City of Van Wert Fire Department	Van Wert County Hospital – Van Wert, Ohio	Crestview Local School District Lincolnview Local School District Vantage Career Center

(e) Fire Protection and Emergency Response

Construction and Operations

During Facility construction, there could be some risk of accidental fires. However, the Facility will implement fire protection measures during construction and operation in order to minimize the potential for accidental fires. Steps that will be taken to prevent fires during construction include: establishing access roads before accessing turbine locations to keep vehicles away from grasses and dry vegetation, using diesel vehicles whenever possible to prevent potential

ignition of vegetation by catalytic converters, avoiding idling vehicles, and keeping cutting torches and similar equipment away from grasses and dry vegetation. Table 8-10 provides a list of local fire departments in the area.

(f) Health Care

Construction and Operations

It is the Applicant's formal policy that safety of people and conservation of the environment come first. The Applicant is committed to a safe and healthy workplace that promotes a zero accident culture in which no one is harmed in association with business activities. The Applicant is also committed to being an environmentally conscious company that promotes the development of clean energy production and storage with minimal adverse environmental effects. Finally, the Applicant is committed to continuous improvement to identify and control risks so that company performance meets high expectations. Therefore, relative to EHS issues, all Applicant organizations and individuals will do the following:

- Operate in compliance with, or exceed, all EHS laws, regulations, ordinances, standards and permit requirements, and established internal policies and standards;

- Ensure all employees are involved in EHS programs with appropriate training and communication to work responsibly, make decisions to carry out their duties, and be accountable for the results;

- Provide a structure that ensures effective EHS management throughout the business with risks, impacts, and legal requirements controlled through appropriate actions and governance;

- Ensure that EHS goals and stretch targets are set, communicated to all employees, and monitored to promote continuous improvement;

- Work to proactively prevent incidents, accidents, and environmental damage before these occur;

- Promote the health and wellness of employees by identifying and controlling workplace health risks, promoting work-life balance, and encouraging employees and their families to be proactive about their health through education, activities, and the provision of robust health insurance;

- Require that contractors and others associated with operations comply with EHS requirements, and not be asked to perform anything unsafe or in violation of environmental laws;

- Ensure that public safety, security of people and assets, conservation, and environmental stewardship are fundamental to company operations;

- Design, construct, and operate facilities in ways that minimize their negative EHS impacts, and maximize their positive EHS contribution, as available technology and conditions permit; and

- Play a leading role in the development of a renewable energy market through strategic relationships with industry, regulatory bodies, and other external stakeholders.

This policy commits the company to its core belief, which is integral to its business philosophy and success, that an excellent environmental, health, and safety culture among all employees will deliver superior performance that protects employees, contractors, the public, and the environment. Table 8-10 provides a list of local medical facilities in the area.

(g) Schools

Construction

Because construction work for the Facility will be short-term and temporary, and because peak construction will occur during the summer months, no new students associated with construction employees are anticipated in association with Facility construction.

Operations

Actual impacts on schools will depend on the housing choices of new residents with children, which is unknown. Given the relatively dispersed area in which new residents are likely to settle, the relatively small number of anticipated new schoolchildren, and the number of schools available, it is unlikely that any one school would receive more new students than could be accommodated. Table 8-10 provides a list of local school districts. The Project area is served by Crestview Schools, Wayne Trace Schools, Lincolnview Schools, and Vantage Career Center. Representative of the Applicant have met with representatives of all of these schools, sponsored wind energy educational programs at the first three, and given informational presentations at Wayne Trace and Crestview.

(4) Impact on Regional Development

(a) Description

This section describes the potential impact of the Facility on regional development (including housing, commercial, and industrial development) and transportation system development.

(i) Housing

Potential impacts on housing are expected to be minimal. It is likely that construction personnel will utilize motels, hotels, and recreational vehicle

parking in Van Wert or other nearby towns for lodging, although some may utilize rental housing if available. Permanent housing for anywhere from five to ten new households may be required at the beginning of commercial operation. This is not likely to have any significant impact on available housing or housing demand near the Project area.

The Facility layout was designed to minimize impacts to residences located in close proximity to the wind turbines. The turbines will be located a minimum of 1,200 feet away from residences.

(ii) Commercial and Industrial Development

Van Wert County offers incentives for development, including a Community Improvement Corporation and Industrial Development Corporation that provide financial assistance to assist new manufacturing plants and targeted projects. The county also has a Community Reinvestment Area, Enterprise Zone Program, and Land Value Jobs Credit (Van Wert County Economic Development Group [VCEDG], 2009.

Paulding County also offers incentives for development, including revolving loan funds, a Rural Enterprise Zone Abatement Program, Community Reinvestment Area Programs, and other assistance to local businesses (Paulding County Economic Development, Inc., 2009).

Significant impacts to commercial and industrial development in Van Wert and Paulding Counties, as well as the regional area surrounding the Facility, are expected to be beneficial. As mentioned previously, some commercial businesses such as hotels, motels, restaurants, and gas stations located in nearby smaller towns may find it necessary to hire additional staff during the construction phase in order to accommodate the increased demand from construction personnel. Larger towns such as Van Wert will likely experience increased revenues from hotel use by construction personnel. Some existing industrial entities that provide sand, gravel, and

other construction material could see a temporary increase in demand for materials during the three-year construction process and these entities may need to increase the size and capacities of their operations in order to meet the increased demand. This means that existing sand and gravel mining, production operations and facilities may need to expand during this period. In addition, the Applicant may elect to utilize local sources for concrete instead of or in addition to building a temporary batch plant, potentially resulting in increased economic activity at those suppliers.

In addition to the local and regional benefits on commercial and industrial employment and revenues, the Facility could have beneficial impacts statewide. According to data compiled by the Renewable Energy Policy Project through 2004, Ohio ranked second in the U.S. in the number of employees that have the technical training and skills to be employed in the manufacturing of wind components. In addition, the data showed that Ohio has the potential to become the leading state in the production of wind turbine rotors, second largest in production of nacelles, controls, and gearboxes, third largest producer of generator and associated electronics, and the fourth largest producer of turbine towers. In fact, manufacturers in Ohio already produce a variety of wind turbine components. It is estimated that for every 1,000 MW of wind power generated, 3,000 potential manufacturing jobs are created (Sterzinger and Svercek, 2005). Based on this estimate, the proposed 350 MW Facility could generate more than 1,000 jobs in the manufacturing of wind turbine components. Since Ohio already has existing manufacturers producing wind components and possesses a skilled labor force with the required technical background, the industrial sector statewide could experience immediate benefits from the development of the proposed Facility.

(iii) Transportation System Development

It is anticipated that during the turbine delivery period, 20 large trucks per day will be traveling to the Project area. This includes turbine deliveries at a rate of 10 per week and a few miscellaneous large loads throughout construction (cable deliveries, major substation equipment, and steel deliveries). In addition, approximately 160 concrete trucks per day will be needed during foundation installation. Smaller vehicles, such as pickups and automobiles, are expected at a rate of approximately 100 per day during construction. Additional traffic to and from the site is also anticipated from onsite personnel.

Adverse construction and operational impacts to traffic safety or travel times from the Facility are not anticipated. While construction-related traffic may cause short-term traffic delays (because of large, slow-moving delivery trucks), the delays would be temporary and mitigated with the following measures:

- Providing notices to adjacent landowners when construction will take place to help minimize access disruptions;
- Providing proper road signage and warnings of “Equipment on Road,” “Truck Access,” or “Road Crossings;”
- Implementing traffic diversion equipment (such as advance signage and pilot cars) whenever possible when slow or oversize loads are being hauled;
- Encouraging carpooling for the construction workforce to reduce traffic volume;

- Employing flaggers as necessary to direct traffic when large equipment is exiting or entering public roads to minimize the risk of accidents; and

- Maintaining at least one travel lane at all times so that roadways will not be closed to traffic due to construction vehicles entering or exiting public roads.

Advance warning in the form of signage and notices to landowners may reduce the effect construction vehicles have on the state and county roadways. By providing notices to landowners ahead of time, citizens would be aware of temporary access disruptions as well as potential delays and may be able to adjust their travel accordingly. To reduce further the effect of construction vehicles, flaggers would efficiently guide large or oversize vehicles as they enter or exit any public roadway.

Although short-term delays may occur, traffic operations would be maintained by keeping at least one travel lane of the transporter route open at all times. This would be important on the proposed transporter roads since they are typically only two lanes in each direction, and efficient detour routes may not be available due to the rural nature of the area.

Flaggers may facilitate two-way traffic on one lane by alternately restricting travel directions. This method would not require full lane closures, detours, or reroutes. Flaggers would also monitor through traffic on public roadways as necessary so that they are not in conflict with construction vehicles.

Unlike large construction vehicles, the construction workforce would most likely travel during the morning and afternoon peaks of a typical workday. By encouraging carpooling among construction personnel, fewer vehicles

can be anticipated on the roadway during this time; therefore, reducing the effect of construction on typical commuters

Once construction is completed, any damage to county, state, or federal highways resulting from Facility construction will be repaired by the Applicant under the guidance of the appropriate regulatory agency. The construction of new roads or the expansion of the existing road and highway system in Van Wert and Paulding Counties would not be required for construction or operation of the Facility. The Applicant is currently conducting a survey of existing local roads and will coordinate construction traffic with both County Engineers and all township roadmen.

(b) Compatibility with Regional Plans

The current land use of the Project area is predominately agricultural. The proposed Facility is compatible with the existing land use and will allow the agricultural industry to continue in this area. The Project area boundary does not overlap areas that are planned for future residential or industrial development.

According to the Economic Development Strategy for Van Wert County, the county has developed a prioritized action plan that includes diversifying the economy of the county, creating jobs, and developing a tourism base (VCEDG, 2008). The Facility will assist the county in meeting its objectives by bringing employment opportunities to the area. In addition, tourism to the area may increase as the wind farm may attract visitors to view the turbines.

Paulding County also currently lacks a comprehensive land use plan; however, the county has have developed a CEDS to review the county's overall economic environment and determine actions to increase their economic growth. The CEDS discusses specific goals such as creating opportunities that are more educational for residents, developing a water and sewer district, increasing funds for economic development activities, developing a telecommunications infrastructure, and pursuing tourism initiatives (Paulding County, 2004). The

Facility will assist the county in meeting its objective of increasing economic growth by bringing employment opportunities to the area and providing Facility-related revenue.

(D) CULTURAL IMPACT

(1) Landmarks of Cultural Significance

An archeological investigation and architectural investigation were conducted and are further described below. Appendix Z provides summary reports. Figure 8-5 identifies the location of registered landmarks of historic, religious, archeological, scenic, natural, or other cultural significance within 5 miles of the wind turbines[1].

(a) Archeological Investigation

A review was conducted of recorded archeological sites within a 51,142-acre area designated for archeological planning (archeological planning area). A total of 110 archeological sites have been recorded previously within a 5-mile (8-km) radius of the archeological planning area, including 18 sites within the archeological planning area itself. None of these archeological sites is listed in the National Register of Historic Places (NRHP). None of these previously recorded sites will be adversely affected by the Facility because none are located within the Facility's direct area of potential effects, and, as archeological sites, none will be subject to indirect effects from visual impacts.

An archeological survey was undertaken within the areas of potential direct effects. The survey areas included the following:

- The sites of the wind turbines and temporary construction workspaces within an area measuring approximately 300 feet (91.5 meters) in diameter;

[1] A draft architectural work plan was developed and submitted to OHPO for comment. This plan was refined in consultation with Dr. David Snyder of OHPO to develop project methodologies that were achievable in scope, comprehensive in approach, and appropriate to address the potential range of anticipated effects upon historic properties within a 5-mile radius of the proposed wind turbines.

- The collector/transmission line construction corridors and additional temporary workspaces within a 35-foot (10.7-meter) -wide survey corridor;
- The construction corridors and additional temporary workspaces for the access roads within a 100-foot (30.5-meter) -wide survey corridor; and
- The construction footprints for the substation sites.

All 167 proposed turbine locations were surveyed. A total of 78.22 miles (125.2 km) of underground 34.5 kV collector lines, 2.10 miles (3.36 km) of overhead collector lines, and 38.32 miles (61.31 km) of access roads also were surveyed. Portions of two proposed substation locations were surveyed as well, totaling 2.18 acres. With overlaps of the areas, a total of 853.24 acres were surveyed that are part of the current Facility areas. No survey was completed for the permanent met towers and SODAR system because no precise locations had been provided for these areas. Surveys were not completed in the following areas:

- Where landowner access was not granted (a 0.28-mile [0.45-km] section of proposed collector line);
- The project collector and interconnection substation and portions of the other two collection substations, totaling 23.93 acres;
- A 7.49 mile (12.14 km) corridor of proposed overhead collector/transmission lines;
- The eight turbines and associated facilities for which locations have yet to be defined.

Surveys are scheduled to be completed in the above listed areas during the Spring 2010. The results of the current investigation will be submitted to the OHPO in early February 2010, and are summarized in Appendix Z.

The archeological investigation identified 44 previously unrecorded archeological sites within the current Facility areas of potential direct effect. Eight sites consist of isolated historic or prehistoric artifacts. The isolated prehistoric artifacts appear to reflect brief, isolated episodes of lithic reduction or broken tool discard. The remaining isolated historic artifacts appear to reflect casual discard into agricultural fields or old fence hardware. In their isolation, these sites do not possess the potential to address significant research issues. It will be recommended to the OHPO that these isolated finds do not possess those qualities of significance and integrity defined in the National Register Criteria for Evaluation (36 CFR 60.4 [a-d]) and therefore are not historic properties, as defined in 36 CFR 800.16(l).

The remaining 36 sites are more extensive. Three sites contain prehistoric components and 33 contain historic components. The prehistoric sites appear to reflect small lithic reduction loci. The historic sites consist of 20 small scatters of historic refuse and 13 large scatters of historic material. A total of 27 of the sites lacked the artifact density and variety and evidence for intact deposits that would permit the sites to address significant research issues for the prehistory or history of Paulding and Van Wert counties. Therefore, it will be recommended to the OHPO that these 27 sites do not possess those qualities of significance and integrity defined in 36 CFR 60.4 (a-d) and therefore are not historic properties, as defined in 36 CFR 800.16(l).

Two prehistoric sites yielded evidence for temporally diagnostic material or a potential to yield such material. Therefore, these sites have a potential to address research issues related to temporally discrete lithic reduction activities and settlement patterns. Six historic sites have yielded artifacts dating to the earliest period of historic occupation in the area and have a potential to address research issues related to early historic activities. One historic site yielded evidence for integrity, with the presence of a structural foundation, and has a potential to address research issues related to farmstead spatial development and activity

areas. As a result of these considerations, it will be recommended to the OHPO that these nine sites be avoided by the Facility or, if avoidance is not possible, that Phase II archeological evaluations should be undertaken to assess whether the sites would qualify for listing on the NRHP by applying the National Register Criteria for Evaluation (36 CFR 60.4 [a-d]).

(b) Architectural Investigation

A reconnaissance-level architectural survey was conducted within a 5-mile (8-km) radius of each wind turbine identified as of September 2009 (architectural reconnaissance survey area). The architectural reconnaissance survey area is identified and discussed in the architectural reconnaissance survey report provided as Appendix Z. This report was submitted to the OHPO on November 19, 2009. Additional survey activity is anticipated to occur in spring 2010 to supplement the current investigation and reflect final Facility design.

(i) Built Resources

Three properties within the architectural reconnaissance survey area are listed in the NRHP. The 1876 Van Wert County Courthouse (NR 74001639) was listed in July 1974. The Brumback Library (NR 79001973), the first public county library in the United States, was listed in February 1979; and the George H. Marsh Homestead and the Marsh Foundation School (NR 80003239), a 24-building complex constructed from 1861 through 1927 and was listed in November 1980.

The reconnaissance-level architectural survey was undertaken in accordance with a work plan developed in consultation with the OHPO in August 2009. The survey area encompassed 261.25 square miles containing 167,190.75 acres. The architectural investigation was designed to identify buildings, structures, landscapes, and districts that may qualify as historic landmarks under the OAC. Inventory data, digital photography, and location data were recorded for 2,475 buildings,

structures, and cemeteries, along with associated landscapes in portions of Van Wert and Paulding counties in the architectural reconnaissance survey area. The results of the investigation were submitted to the OHPO on November 19, 2009 and are included as Appendix Z.

The architectural investigation identified a total of 835 properties that contain resources that possess the potential significance necessary to qualify as Ohio landmarks by applying the National Register criteria for evaluation (36 CFR 60 [a-d]). Three categories of potential historic properties were found: 2 districts, 40 properties linked by thematic association, and 23 individual properties. These resources are found in both urban and rural contexts and span a date range of circa 1870 through circa 1950.

(ii) Historic Districts

An historical continuity of properties with the potential to qualify as historic districts was found in the city of Van Wert (720 resources) and the town of Convoy (52 resources). The potential Van Wert district contains a full complement of commercial, residential, governmental, and community buildings documenting the development of the county seat during the late nineteenth through the early twentieth centuries. The three properties previously listed in the NRHP within the survey area are included within the boundaries of the identified district. The town of Convoy similarly documents community development on a smaller scale through its surviving stock of commercial, residential, and community buildings.

(iii) Rural Schools

Eleven rural schools were identified that are historically associated with public education on the township level for the period circa 1870 to 1929. As a group, these buildings share similarities in design and historical use.

All retain their overall integrity despite differences in current physical condition.

(iv) Agricultural Properties

A total of 29 properties were identified with potential importance under two areas of significance related to the broad theme of agriculture—domestic architecture and agricultural architecture.

(v) Individual Properties

Twenty-three properties were identified for further investigation for their potential significance in the areas of arts and recreation (1), commerce (6), manufacturing/industry (1), religion (1), housing (13), and transportation/communication (1). These resources range from active quarries, to commercial structures in small towns, to examples of defined house types reflecting national architectural styles.

(2) Estimated Impacts on Landmarks

(a) Archeological Resources

The recommendations of the preceding section will be presented, along with more-detailed site survey results, in a technical report to be submitted for OHPO review and concurrence in early February 2010. Sites that are not deemed to be historic properties, as defined in 36 CFR 800.16(l), will not represent landmarks of cultural significance, as defined by OPSB regulations, and no avoidance or further archeological investigation will be necessary. For the other nine sites, avoidance is planned. If avoidance is not possible, Phase II archeological evaluation will be undertaken to assess whether the sites represent historic properties, as defined in 36 CFR 800.16(l), and therefore represent landmarks of cultural significance, as defined by OPSB regulations.

(b) Built Resources

The OAC further directs the identification of impacts posed by the Facility on the preservation and continued meaningfulness of historic properties. Impacts identified in the architectural reconnaissance survey area were identified applying the *criteria of adverse effect* found in 36 CFR 800.5 of the Advisory Council on Historic Preservation regulations. These criteria recognize both direct and indirect effects to historic properties that may diminish the property's integrity of location, design, setting, materials, workmanship, feeling, or association.

No direct impacts resulting from the physical removal or alteration of historic properties are anticipated by the Facility. The Facility will introduce a new type of development to the area that differs in scale, use, and design from established patterns. This area currently contains major transmission lines, cell towers, and grain elevators. The Facility, however, differs in size and scale from existing infrastructure improvements and will introduce elements to the landscape that will be visible in varying degrees.

The quality of the historical setting likely will be the feature most affected by the Facility. Setting is defined by the National Register Program as the physical environment of a property, encompassing both the features within the historic property boundary as well as the relationship between the property and its surroundings. Distance, physical context, and resource orientation are factors considered in assessing impacts to listed and potential historic properties.

The potential historic district in Van Wert is anticipated to experience the least degree of visual impact from the Facility. Bisected by the outer limits of the architectural reconnaissance survey area, the potential district is urban in character, with streetscapes and sight lines oriented to the interior of the city rather than to the expansive rural landscape of the surrounding townships.

The other potential historic district is in the town of Convoy. While this largely residential enclave is oriented along the east-west axis created by Convoy Road,

views to the Project area are anticipated. Turbines are anticipated to be most visible from the north and east portions of the community. The relationship between elements within the district area is not anticipated to be changed, but the nature of the surrounding rural area will be altered.

The relationship between the 63 resources located in the rural area and their surroundings will experience the greatest degree of visual impact because of topography and the existing character of development. Although this rural area is dominated by agriculture, the area as a whole is an evolving landscape, with emerging land use patterns that are influenced by technology and agribusiness.

The Facility is anticipated to contribute to ongoing changes in the current rural landscape.

(3) Consideration of Landmarks

Visual impacts related to potential historic properties are anticipated in varying degrees within the architectural reconnaissance survey area through changes to the surrounding area that will affect setting, as defined by the National Register guidelines. It is anticipated that adverse visual impacts will be addressed through a formal mitigation plan designed to promote the preservation and continued meaningfulness of historic resources. Such a plan, developed in consultation with the OHPO and interested parties, such as the Van Wert County Historical Society, may be formalized through the negotiation of a formal Memorandum of Agreement that specifies mitigation measures, responsibilities, and implementation schedules.

Recommendations for a range of possible measures to mitigate the visual impacts were developed that take into account the nature of the impact, the character of the existing resource base, practicality in implementation, and public benefit. Two categories of endangered historic resources, rural schools (circa 1870 to circa1929) and agricultural outbuildings (circa 1880 to circa 1940), were identified in the architectural reconnaissance survey area. Both categories present mitigation opportunities, including in-depth documentation and public interpretation, which would increase awareness and

support private preservation of these properties in the area of greatest visibility. All of these properties are privately owned, and any mitigation measures will proceed with the cooperation of the property owners. In addition to the measures discussed below, ongoing consultation with local preservation groups, such as the Van Wert Historical Society, may identify capital improvement projects or other programs whose support would provide appropriate mitigation measures that are of direct interest to the community. It is anticipated that mitigation to address the continued meaningfulness of historic properties will be negotiated that include measures to document, to interpret, and to preserve historic properties that provides public benefit through public outreach, education, and landmark conservation.

(4) Mapping Landmarks

Figure 8-4 identifies existing and formally adopted land and water recreation areas within 5 miles of the Facility.

(5) Recreational Areas

Table 8-11 lists the six existing recreational areas within a 5-mile radius of the proposed Facility. Recreational areas were identified through USCB TIGER Database and ESRI Street Map Database.

TABLE 8-11
Recreational Areas within a 5-Mile Radius of the Facility

Recreational Areas	Location	Distance from Project Area Boundaries (miles)
Bresler Park	Paulding	0.0
Pleasant Valley Golf Course	Van Wert/Paulding	4.0
Welcome Park	Paulding	1.8
Hiestand Park	Van Wert	4.5
Willow Bend Country Club	Paulding	4.3
Van Wert County Fairgrounds	Van Wert	4.5

(6) Visual Impacts

A VIA has been prepared for the Facility that describes the Facility location, viewpoint selection process, assessment methodology and results, proposed visual mitigation measures, and photosimulations for views from eight viewpoints is included in Appendix J. This analysis is discussed in Section 4906-17-5(B)(3)(d), *Photographic Interpretation or Artist's Pictorial Sketches*, of this Application

To maximize the visual integration of the Facility into the overall pattern of the Project area landscape, the Applicant will incorporate BMPs related to Facility appearance. These measures are presented in more detail in the VIA and include use of turbines with uniform appearance, use of muted gray or white colors, and placement of as much of the Facility's electrical collection system underground, as practicable. These measures will be incorporated into Facility design to ensure an attractive appearance and good integration into its landscape setting.

(E) PUBLIC RESPONSIBILITY

(1) Public Information Program

The Applicant initiated discussions about leases with private landowners in March 2007. In November 2008, the Applicant held a meeting with all engaged landowners and received a very favorable response to the Facility. In addition, the Applicant advertised for and hosted a public meeting in January 2009 to provide an overview of the Facility. To date, numerous other meetings and presentations have taken place within the community. Based on these meetings involving hundreds of local residents, the community appears to support the Facility, as demonstrated by the success of the Applicant's leasing program, strong positive comments toward the Facility at many of the public meetings, especially the 2009 Van Wert County Fair, and the complete absence of negative comments towards the Facility.

The Applicant has also initiated public service projects, including providing wind turbine projects for local schools and sponsoring local functions. In addition, the Applicant has

conducted site tours, and given presentations and/or met with Van Wert and Paulding County employees, the ODNR Division of Wildlife, Ohio State University extension offices; USFWS; OEPA; OHPO, and multiple interested stakeholders. Table 8-12 provides a summary of the Applicant's meetings and correspondence with landowners and the public.

TABLE 8-12
Public Meetings and Correspondence

Date	Description
11/20/08	A meeting was held with approximately 200 potential landowners to discuss the Facility and lease options. A presentation was provided outlining all aspects of the Facility.
11/21/08	A tour of the site was conducted with Keith Lott of the ODNR-Division of Wildlife, and Megan Seymour of the USFWS. Both Mr. Lott and Ms. Seymour indicated that they had no specific concerns about the Facility and later confirmed that the Facility area was a low risk to wildlife. This meeting was setup as a pre-survey review of the Facility and included an informal review of the Facility maps and a field review.
1/15/09	A public meeting was held in Paulding County with approximately 50 attendees. A presentation was provided regarding all aspects of the Facility.
1/15/09	Meetings were held with the Van Wert County engineer, Paulding County engineer, Van Wert County Commissioners, and two township zoning officers in Paulding County. Potential impacts to county roads and road agreements were discussed with the county engineers. The building permit process was discussed with the township zoning officers. A general wind energy presentation was provided to the Van Wert County Commission and an overview of the Facility was provided. As part of this meeting, there were open discussions about the development, construction, and operation of the Facility. In addition, there were discussions of local permits, road and utility requirements, and the use of town and county roads and ROWs. A meeting was also conducted with the Van Wert Conservation District to discuss important issues relative to local farmers including drainage tile and agricultural land restoration.
2/11/09	A meeting was held with the Paulding County Commissioners to give a general wind energy presentation and to discuss the Facility.
2/12/09	A meeting was held with the principal and a middle school science teacher of Wayne Trace Junior and Senior High (Paulding area) to plan a wind turbine kit project for a science class.
2/12/09	The Paulding County Farm Bureau organized a public meeting and the Applicant gave a presentation about the Facility and how wind energy fits with agriculture.
2/13/09	A meeting was held with the Ohio State University extension office's Professor Andy Kleinschmidt to discuss how wind energy fits with agriculture and possible special construction techniques to minimize impact to heavy clay soils in the area.
2/13/09	A meeting was held with Crestview schools about wind turbine kit projects for science classes.
2/23/09	A presentation was given to Van Wert Lions Club about the Facility.
2/24/09	A presentation was provided to the OPSB, Keith Lott (ODNR) and Dave Snyder (OHPO) to discuss the general Facility details, forecasted surveys, and schedule. The necessary coordination that would be required to move the application forward was also discussed.
3/20/09	A teleconference was held with the Applicant's Project Engineer Jeromy Miceli and Randall Reeder of Ohio State University about ways to mitigate soil damage due to construction activities.

TABLE 8-12
Public Meetings and Correspondence

Date	Description
4/2/09	A telephone conversation was held with Mildred Chatterton of the Black Swamp Audubon Society to declare the Applicant's intent to build a Facility and detail the Applicant's ABPP. Ms. Chatterton indicated that she had no concerns about the Facility.
4/2/09	The Applicant attended a tour of the Van Wert Historical society and had further discussions with Joe Steffan regarding the history of the area. Mr. Steffan indicated that he had no concerns about the Facility.
4/2/09	A telephone conversation was held with Bill Beckham of the Paulding Soil and Water Conservation District/Black Swamp Nature Center to declare the Applicant's intent to build the Facility and detail the Applicant's ABPP. Mr. Beckham indicated that he had no concerns about the Facility.
4/23/09	The Applicant spoke with Mrs. Randy Shaffer of the Otto Ehrhart Museum of Natural History and Paulding County Historical Society. Mrs. Shaffer indicated that she had no concerns about the Facility and does not foresee opposition to the Facility.
4/24/09	On Van Wert Arbor Day, the Applicant sponsored the planting of a tree at the reservoir park located south of town.
4/28/09	The Applicant met with Les Weidenhamer of the John Paulding Historical Museum and had a tour of the museum to learn about the agricultural history of the area. Mr. Weidenhamer indicated that he had no concerns about the Facility.
5/13/09	A meeting was held with Rahel Babb (OEPA Isolated Wetlands) and a follow-up meeting with David Snyder (OHPO) to introduce the Facility and determine how to best coordinate with them.
5/15/09	A meeting was held with the Van Wert County Soil and Water Conservation District to discuss the Facility and learn how to best coordinate with them.
5/15/09	A meeting was held with Van Wert County Commissioners' Clerk Larry Clouse and Auditor Nancy Dixon to discuss tax issues.
8/13/09	A meeting was held with a resident of the project area to discuss his concerns about noise, shadow flicker, and other items. The Applicant provided him with facts regarding each of these issues. The resident left the meeting comfortable with the Facility's plans.
8/26/09	An email was submitted to area resident to address questions about noise, shadow flicker, wind turbine syndrome, and other items.
9/4/09	A meeting was held with Union Township (in Van Wert County) to discuss the Facility and tax issues. The Township is supportive of the Facility and would like to be assured of receiving adequate tax revenue. Concerns regarding conflicts of interest were also discussed. Potential conflicts of interest were identified by the Township due to township trustees being lessors and also voting to approve a property tax abatement for the Facility.
9/2/09 through 9/9/09	The Applicant had a booth at the Van Wert County fair to meet the public and answer any questions about the Facility. During the fair, all persons who approached the booth indicated positive support for the Facility.
9/24/09	A telephone conversation was conducted with Lynn Army of the Maumee Watershed Conservancy District to discuss collocation with their facilities and agreements that may be needed to cross their drainage easements.
9/29/09	A meeting was held at Lincolnview High School that was organized by Hoaglin Township. This meeting was held to discuss wind energy and property taxes.
10/7/09	The Applicant initiated a miniature wind turbine program at Wayne Trace Junior High.

TABLE 8-12
Public Meetings and Correspondence

Date	Description
10/8/09	The Applicant initiated a miniature wind turbine program at Lincolnview High School.
10/8/09	A meeting was held with Union Township to discuss the Facility and tax implications.
10/19/09	A presentation was given to the Crestview School Board to discuss the Facility and taxes.
11/19/09	A public meeting was held for the Facility with assistance from the OPSB.
11/19/09	A meeting was held with Patricia Tebie (OEPA NPDES) and Lynn Army of the Maumee Watershed Conservation District.
11/20/09	A presentation was given to a sophomore science class at Crestview School to discuss technical aspects of the proposed Facility.

Stakeholder and agency meetings and informal discussions have been designed to encourage input and a collaborative planning process. During the meetings outlined above, the Applicant has generally provided a Facility description and Facility schedule, and identified methods of working with the various stakeholders. Applicant printed more than 1,000 fact sheets that have been distributed at various venues (Appendix AA). The Applicant continues to address comments and concerns raised by the community and landowners. A website which provides a fact sheet and other information about the Facility can be accessed at the following location:
http://www.iberdrolarenewables.us/bluecreek.html

The Applicant has coordinated directly with landowners to understand their farming practices and identify drainage tile locations on their properties. This coordination has assisted the Applicant in siting the Facility components while reducing potential impacts to farming operations. In addition, the Applicant's wind lease agreements require good faith coordination with landowners about the location of Facilities to minimize any unnecessary impacts to their usual farming activities.

A voluntary Good Neighbor Program is being offered to non-leased landowners and non-leased homeowners that have a residence within 0.5 mile of a proposed wind turbine. The Applicant and the leased landowners believe that the Good Neighbor Program offers community members within the Project area an opportunity to share in the direct financial benefits of the proposed Facility.

The Applicant has made a conscious effort to make itself accessible to the local community to answer questions and hear comments about the proposed Facility. Members of the public can contact the Applicant three ways:

IBR's Midwest regional development office:
Toll-free phone: (866) 586-6048
110 N Brockway Street, Suite 110
Palatine, IL 60067

Blue Creek Wind Farm local development office:
Phone: (567) 259-3063
126 E Main Street
Van Wert, OH 45891

Blue Creek Wind Farm Project Developer:
Dan Litchfield
Mobile phone: (773) 318-1289
Dlitchfield@iberdrolausa.com

(2) Liability Insurance

The Applicant will maintain a commercial general liability insurance policy insuring itself and all lessors against loss or liability caused by Applicant's occupation and use of the property. This policy will be in an amount not less than $5 million of combined single limit liability coverage per occurrence, accident, or incident. The Applicant may choose to use a combination of primary and excess liability coverage to meet the specified limit of liability coverage or use a qualified program of self-insurance to meet the insurance requirements.

(3) Evaluation of Interference with Radio and Television

As part of the preliminary Facility design activities, the Applicant conducted an analysis of microwave systems, off-air television reception, radio (AM/FM) broadcast, and

cellular communications within the Project area. The results of the evaluations are summarized below. Associated reports and agency correspondence are included in Appendix BB.

(a) Microwave

Microwave telecommunication systems are wireless point-to-point links that communicate between two sites (antennas) and require clear line-of-site conditions. Obstructions between the transmitters reduce the reliability of transmission. A Licensed Microwave Search and Worst Case Freznel Zone Analysis were conducted in February 2009 by Comsearch to identify microwave paths within the Project area. This analysis identified 57 microwave paths that intersect the Project area. The Applicant included the microwave paths in constraints mapping and developed the current layout to avoid impacts to microwave paths intersecting the Facility.

(b) Radio

Comsearch notified the NTIA of the U.S. Department of Commerce (USDOC) of the proposed Facility on February 10, 2009 (Comsearch, 2009). Upon receipt of the notification, the NTIA distributed plans for the proposed Facility to the federal agencies in the Interdepartment Radio Advisory Committee, which consists of each government agency that operates telecommunication systems and RADAR. The Applicant received a response letter on April 3, 2009 from the NTIA and no impacts to radio (AM/FM) broadcast were identified.

(c) Television

Off-air stations are television broadcasters that transmit signals that can be received from terrestrially located broadcast facilities on a television receiver. Off-air television signals may be subject to distortion by reflections from the turbine blades and by the attenuation of the signal passing through the wind turbines. These effects apply to analog television signals and do not affect digital

signals the same way. The Applicant has retained Comsearch to perform baseline measurements of the off-air TV stations in the Facility vicinity. The measurements will be performed at various locations in population centers and at locations where the potential for signal blockage, multipath and electromagnetic noise degradation is probable. The measurements will establish the baseline TV reception conditions before installation of the wind turbines.

The purpose of these measurements is to determine reception quality of off-air television channels at the communities near the proposed Facility. Comsearch will use a spectrum analyzer and calibrated conventional TV antenna to determine the television signal strength. The measured signal strength will be compared to Class A and B contour levels for television stations and the levels established by the Federal Communications Commission for community standards. The results of the measurements will be provided to the OPSB by April 1, 2010.

In addition, a TV monitor and video recorder will be used to observe and record the video and audio of the television channels to determine their video quality. These recordings will be used to determine if any degradation of reception is present and attributable to the presence of the wind turbines after they are installed. One-minute recordings of each received television channel will be made. The Applicant expects no impacts to cable or satellite television.

(d) Cellular and Personal Communication Systems

Comsearch notified the NTIA of the USDOC of the proposed Facility on February 10, 2009 (Comsearch, 2009). Upon receipt of the notification, the NTIA distributed plans for the proposed Facility to the federal agencies in the Interdepartment Radio Advisory Committee. The Applicant received a response letter on April 3, 2009 from the NTIA and no impacts to cellular or personal communication systems were identified.

(4) Evaluation of Interference with Military Radar

Comsearch notified the NTIA of the USDOC of the proposed Facility on February 10, 2009 (Comsearch, 2009). Upon receipt of the notification, the NTIA distributed plans for the proposed Facility to the federal agencies in the Interdepartment Radio Advisor Committee. These agencies include, but are not limited to, the Department of Defense, Department of Energy, Department of Justice, Department of Homeland Security, and the FAA. After a 45-day review period, a letter response was provided to Comsearch dated April 3, 2009 (Appendix BB). This letter identified concerns raised by the Department of Navy regarding a potential blockage of a radio frequency transmission. The Applicant received determination from the Department of the Navy on May 6, 2009 that the Marine Corps is willing to adjust their microwave systems facilities for the Applicant's proposed Facility to avoid future impacts. The Applicant plans to coordinate final Facility layout with the Department of Navy (Appendix BB).

The Applicant also retained Aviation Systems, Inc. (ASI) to perform an initial aeronautical and airspace evaluation for the proposed Facility (Appendix I). The purpose of the study was to determine the feasibility of erecting wind turbines with a tip height of up to 428 feet above ground level from an aeronautical and airspace perspective. The study included review of potential impacts to military radar. The findings indicated the LaGrange Long Range Joint Use Radar Site is within 60 nautical miles of the Project area center point and that development of the Facility would be unlikely to affect Air Defense and Homeland Security radars. Further radar impact studies were not recommended. The findings also indicated minimal to no impact to Weather Surveillance Radar-1988 Doppler weather radar operations; therefore, further radar impact studies were not recommended. (Chavkin, 2009)

(5) Evaluation of Impact to Roads and Bridges

A detailed survey of roads and structures was conducted by Westwood Professional Services in October and November 2009. The results of this survey include the following plans and figures provided in Appendix CC:

- Aggregate-Turbine-Steel Delivery Flow Plan: depicts the route plan for the aggregate, steel, and turbine components to each individual turbine.

- Concrete Delivery Flow Plan: depicts the route plan for concrete to each individual turbine.

- Delivery Routing and Truck Volumes Figure: this figure considers the delivery flow plans described above and assigns the number of loads passing over a given section of road, a measure of potential impacts to existing roads.

- Existing Roadway Conditions Figure: this figure shows a high-level description of the current status of the roads in the Facility boundary (good/fair/poor) and the type of road (gravel, chip-seal, etc.).

- Existing Structures Figure: this figure shows the culverts and bridges within the Facility area, and assigns identification that reference detailed assessments and descriptions of each structure that has been completed by the Applicant.

The existing conditions survey showed that a majority of the local roads will be used within the Facility site are in "good" to "fair" condition, which will allow limited damage to local roads because stronger road is more resistant to loading damage. The Applicant will design traffic flow to minimize total road usage and limit deliveries to those roads that can withstand the impacts.

The Applicant has calculated the number of loads that will pass over a given section of road, and divided those loads out into aggregate loads, steel, concrete loads, steel loads (i.e. foundation rebar), and turbine component loads (Appendix CC). This information, coupled with a detailed Facility schedule, will assist the Applicant with communicating road needs and potential impacts to the local road commissioners/engineers on a daily basis during construction. This will also minimize traffic impact on residents and assist with tracking permitted loads (overweight, overlength, and overwidth) by local officials.

The Applicant provided this information described above to Paulding and Van Wert County Engineers at meetings late November 2009. The Applicant will continue to coordinate with both County Engineers to optimize construction traffic routes, and minimize impacts to local roads and residents. The Applicant will also enter into a Road Agreement with both county engineers. The Road Agreement will contain three main components:

1. A pre-construction survey of the condition of the roads.
2. A post-construction survey of the condition of the roads.
3. An objective standard of repair that obligates the Applicant to restore the roads to the same or better condition as they were prior to construction.

(6) Plan for Decommissioning

The Applicant expects the facility to have a useful life of up to 50 years, corresponding to the length of the term of the wind energy leases used with the Facility. The generating equipment itself is expected to be operable for 20 to 30 years, at which point, the turbines might be "re-powered" with newer generating equipment on the same tower and foundation. At the end of its useful life, the Facility would be decommissioned according to lease agreements with the landowners. The first step in decommissioning would be dismantling all turbines, towers, and related aboveground equipment.

Turbine towers, nacelles, rotors, pad-mounted transformers, aboveground cables and structures, substation equipment, conductors, and cables have considerable value and would be removed and sold for reuse or salvage of recyclable materials. Unsalvageable material would be disposed of at authorized sites in accordance with applicable rules. The interconnection substation would be owned and operated by the transmission operator and would be decommissioned and removed at their discretion.

The deconstruction and removal of all aboveground wind facilities including towers, turbine generators, transformers, aboveground cables, foundations, buildings, and ancillary equipment would be up to a depth of 4 feet below grade. Turbine foundations would be removed to a minimum depth of 4 feet below grade. All access roads would be

removed unless the landowner provides written notice that the road should be retained. All underground collector lines will remain in place to avoid a second disturbance to field drainage tile systems. This is a key point that has resulted from discussions with the Applicant's landowners. Due to the extensive use of underground drainage tile in this area, landowners prefer to leave the power lines in place and not disturb the drainage tile a second time. Any exceptions to removal of the Facility components would be recorded with the County.

It is expected that the restoration process would include movement of topsoil to fill any void left during decommissioning. Once the land is returned to farming, typical farming tillage is primarily in the 6- to 8-inch zone, and rarely over 1-foot in depth. For that reason, the buried materials would lie well below the level of any tillage activity. However, reclamation procedures would be based on site-specific requirements and techniques commonly employed at the time the area is to be reclaimed, and would likely include de-compacting soils, grading to restore original contours, and re-vegetating disturbed areas with seed mixes or agricultural crops, as appropriate, based on the use of surrounding lands..

The cost to decommission the Facility may vary over time but is generally based on the cost to remove the turbines and facilities and restore the site, offset by the scrap value of the steel, copper, concrete/gravel, and other valuable salvage materials in the turbine. This scrap value significantly offsets the cost of decommissioning. The Applicant would be responsible for all costs to decommission the Facility and associated components.

Within 90 days prior to the 10-year anniversary of commercial operations of the wind energy facility, the Applicant will have an engineering analysis be completed that estimates the net costs to remove all wind energy facilities, as described above in more detail.

The engineering analysis will include the following:

- A discussion of probable hydrologic consequences of the decommissioning and reclamation;
- An identification of areas within the project boundary that were prime farmlands before construction and a plan to return those areas to prime farmland status after decommissioning;
- A description of the engineering techniques to be used in decommissioning and reclamation and a description of the major equipment to be used;
- A plan for control of surface water drainage and of water accumulation;
- A plan for backfilling, soil stabilization, compacting, and grading;
- A schedule for decommissioning activities;
- A description of the steps to be taken to comply with the applicable air and water quality laws and regulations and any applicable health and safety standards; and
- A description of the degree to which decommissioning plan is consistent with the local physical, environmental, and climate conditions.

The Applicant will post a financial security in the amount of the estimate in the form of a corporate guaranty provided Applicant's parent company Iberdrola Renewables Holdings, Inc. (IRHI). A corporate guaranty will only be used if IRHI has a debt rating of A or higher, as rated by Moody's, Standard & Poor's or other similar rating agency. If not, Applicant shall post a letter of credit, surety bond, or cash in the same amount.

Due to the extremely high value of wind turbines that are less than 10 years old, a form of financial security to guarantee decommissioning is not necessary prior to this point. The Applicant has hundreds of megawatts of operating wind farms in Minnesota, South

Dakota, and North Dakota that do not require financial security for decommissioning at any point.

Further, the Applicant's nature as a long-term owner and operator of renewable energy facilities makes the risk of abandonment of an operating facility much lower than with other wind energy developers. The use of a parent company guaranty is a responsible option for this Applicant because of the financial strength of the Applicant's parent company. A copy of the most recent audited financial statements will be provided to the OPSB on a confidential basis upon request during the operating life of the Facility.

(F) AGRICULTURAL DISTRICT IMPACT

(1) Agricultural District Mapping

The Project area contains approximately 1,100 acres of registered agricultural district land in Van Wert County and approximately 1,150 acres of registered agricultural district land in Paulding County as shown on Figure 8-6 (Van Wert County Auditor's Office, 2009; Paulding County Auditor, 2009). Land use in the Project area is primarily agricultural with approximately 38,600 acres or 95.2 percent of the Project area in cultivation. The agricultural land is primarily used for row crops, specifically soybeans, corn, and a relatively small amount of alfalfa.

(2) Impact Assessment on Agricultural Land

The Facility would disturb some agricultural land temporarily (782.4 acres) and occupy some agricultural land permanently (230.5 acres).

Temporary disturbances during construction include temporary road widening at permanent access roads, construction areas adjacent to each turbine site, trenching for the underground and aboveground collection systems/lines, and storage/stockpile area(s). Underground collection lines will be buried to a minimum depth of 4 feet in agricultural land to further minimize post-construction impacts to farming practices. The siting of temporary access roads will take into consideration agricultural traffic patterns to reduce

the impedance or interference of farm operations on cropped fields adjacent to the access road.

The Facility would permanently affect 230.5 acres of agricultural land. Permanent impacts to agricultural land include the turbine pads/towers, the four substations, an interconnection substation, overhead collection line structures, access roads, met tower(s), SODAR facility, and the O&M building. The Applicant coordinated with landowners to understand farming practices and drainage tile locations in order to site the turbines and other Facility components in areas with the least impact to farming.

Most importantly, the widespread success of the Applicant's leasing program demonstrates that the landowners themselves are comfortable with the prospect of constructing and operating utility scale wind turbines in their fields. Lease provisions, such as coordination on access road design, crop damage payments, de-compaction, drainage tile repairs, and even protection against loss of Conservation Reserve Program or Conservation Security Program payments, have given landowners the comfort needed to move forward with this Facility.

(a) Field Operations

The Facility may result in some small-scale changes in agricultural practices on immediately surrounding lands within the Project area. These changes may include modification of cultivation, planting, and harvest patterns, changing access points or routes to farm fields, or varying application of fertilizers and other products to crops. Ground disturbance during construction can also encourage weeds that temporarily and minimally interfere with crop yields until eradicated.

Construction-related traffic might cause brief traffic delays when trucks deliver the turbines and other Facility equipment, but these delays are unlikely to impair farmers' access to local agricultural fields. The Applicant's standard practice is to direct construction contractors' vehicles to yield to agricultural vehicles. New or improved access roads are not anticipated to increase traffic that would affect

farmers' ability to move agricultural equipment, as only approximately 20 staff are anticipated during the Facility's operation. Overall, the new and improved roads would provide farmers with improved access to local agricultural fields and facilitate movement of farm equipment.

The Applicant, where necessary and feasible, will provide access across construction areas to fields within the Facility to assist farmers in continued agricultural practices. The Applicant will also implement measures to avoid or mitigate impacts to soil, such as dust and erosion control, and consult with area landowners during construction and operation of the Facility to minimize or avoid any adverse impacts to surrounding agricultural practices. The Facility will not force a significant change in accepted farm practices on the Project area or surrounding lands, or cause a significant increase in the cost of such practices.

(b) Irrigation

Irrigation systems are not widely used in the Project area. Potential impact to irrigation operations is very limited and the Applicant's coordination with affected landowners will identify and minimize any significant disruption.

(c) Field Drainage Systems

Facility construction may temporarily affect subsurface drainage systems (drain tiles). The Applicant coordinated with landowners to understand drainage tile locations in order to site the turbines and other Facility components in areas to minimize the impact to drain tile systems where feasible. As a part of landowner discussions, the Applicant has requested documentation of known drainage tile system that would be included into a construction plan to be developed at a later date. Drain tiles found during construction will be marked with labeled, highly visible lathe to ensure temporary and permanent repairs are made.

(3) Mitigation for Agricultural Land Impacts

The Applicant is working with the agricultural services contractor Key Agricultural Services, Inc., and in coordination with landowners and the Ohio State University extension, to develop mitigative measures for agricultural lands affected by the Facility. Mitigative measures will describe suggested actions to implement during Project planning, construction, and post-construction phases that considers and accounts for soil, water, and agricultural issues. Mitigation measures are intended to reduce the short, medium, and long-term impacts to the land, environment, and crop productivity while considering the cost efficiencies of each of the various potential management options. When feasible, the Applicant will implement appropriate mitigation measures as appropriate for site-specific circumstances.

Examples of potential mitigation measures that may be employed include:

- Use of environmental inspectors to monitor construction activities and advise construction staff on appropriate stormwater and erosion control practices that minimize agricultural impacts.
- Use of agronomic inspectors to monitor construction activities and advise construction staff on appropriate construction methods to avoid or reduce long term impacts to soil agricultural productivity.
- Use of agricultural construction standards for Facility components, including access roads.
- Identification of locations where construction may need to be discontinued due to wet weather.
- Stockpiling of topsoil removed during construction.
- Prevention of soil erosion through methods including sediment barriers, mulch, erosion control fabric, and temporary slope breakers.
- Properly managing any water that needs to be pumped from excavation.

- Weed control of areas within Applicant's control.
- Decompaction of soils affected during construction.
- Soil fertility sampling and use of soil amendments (e.g., fertilizer, lime, acidifiers) when warranted.
- Post-construction monitoring.

Mitigation measures typically used by the construction contractor may include prevention and mitigation measures for the following:

- Siting, drainage considerations, entrance ramps and approaches, and removal and remediation of temporary access roads;
- Siting and drainage considerations for permanent access roads;
- Aboveground structures and facilities;
- Soil removal and replacement;
- Wet weather construction;
- Installation of underground and aboveground power supply lines;
- Drain tile repair;
- Prevention of soil erosion;
- Pumping of water and pumped water management;
- Surface drainage;
- Repair and installation of soil conservation practices;
- Weed control;
- Removal of construction debris;
- Compaction and rutting;
- Decompaction;
- Soil plasticity test procedures;
- Soil amendments;
- Advance notice of private property access; and
- Landowner identified issues/reporting.

(4) Agricultural Land Viability Assessment

The temporary and permanent impact of the construction and operation of the Facility on the viability of agricultural land is quantified in Table 8-13.

TABLE 8-13
Temporary and Permanent Impacts on the Viability of Agricultural Land

Agricultural Land	Temporary Disturbance (acres)	Permanent Disturbance (acres)
Total Agricultural Land	782.4	230.5
Cultivated Lands	782.0	230.5
Pasture Land (Permanent)	0.4	0.0
Managed Wood Lots	0.00	0.00
Orchards	0.00	0.00
Nurseries	0.00	0.00
Livestock and Poultry Confinement Areas	0.00	0.00
Agricultural Related Structures	0.00	0.00

Although the Facility, including all related or supporting facilities, may result in some small-scale changes to accepted farming practices in the surrounding area, none of these changes is "significant." The changes are predominately temporary in nature and the permanent Facility footprint is small in comparison to the overall acreage in agricultural production in the surrounding lands. The Facility will not force a significant change in land use or accepted farm practices on the Project area or surrounding lands, or cause a significant increase in the cost of such practices. The Facility will promote the long-term viability of the affected farms by supplementing participating landowners with lease income.