DOE/EA-1815

FINAL
ENVIRONMENTAL ASSESSMENT

FOR

CUYAHOGA COUNTY AGRICULTURAL SOCIETY WIND ENERGY PROJECT

BEREA
CUYAHOGA COUNTY, OHIO

U.S. Department of Energy
Office of Energy Efficiency and Renewable Energy
Golden Field Office

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COVER SHEET

RESPONSIBLE AGENCY: U.S. Department of Energy

TITLE: *Final Environmental Assessment for Cuyahoga County Agricultural Society Wind Energy Project, Berea, Cuyahoga County, Ohio* (DOE/EA-1815)

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ABSTRACT: The U.S. Department of Energy (DOE) has provided funding to the Ohio Department of Development (ODOD) under the State Energy Program (SEP) and to Cuyahoga County under the Energy Efficiency and Conservation Block Grant Program (EECBG). ODOD would provide $1,275,000 of its SEP funds to the Cuyahoga County Agricultural Society (Agricultural Society) to design, permit, and construct a single 660-kilowatt wind turbine at the Cuyahoga County Fairgrounds in the center of the Fairgrounds complex on 164 Eastland Road, Berea, Ohio. Cuyahoga County is also seeking to provide $391,486 of its EECBG funds to the Agricultural Society for the proposed project.

ODOD and Cuyahoga County are authorized to use a percentage of their Federal funding for preliminary activities, which include EA preparation, conducting analyses, and agency consultation. Such activities are associated with the proposed project and do not significantly impact the environment nor represent an irreversible or irretrievable commitment by DOE in advance of its conclusion of the potential environmental impacts from the proposed project. The 660-kilowatt proposed wind turbine would provide renewable energy to fulfill nearly 100 percent of the Cuyahoga County Fairgrounds' annual electricity demand and help to reduce greenhouse gas emissions. The Agricultural Society has selected a Vestas V47-660 kW wind turbine, which has a 154-foot rotor diameter and full turbine height of 274 feet.

The Agricultural Society is also funding and constructing the Energy Center at the Fairgrounds with approximately $475,000 of Cuyahoga County funds. Both EECBG and SEP would fund the wind turbine project; EECBG would fund educational materials for the Energy Center. The proposed turbine would connect to the Energy Center via approximately 300 feet of underground electrical transmission line. The project would not require new access roads or improvements to existing road.

This Environmental Assessment (EA) analyzes the potential environmental impacts as a result of the proposed construction, operation, and decommissioning of the Cuyahoga County Agricultural Society's Wind Energy Project and the alternative of not implementing this project (the No-Action Alternative).

AVAILABILITY: This EA is available for review on the DOE Golden Field Office Reading Room Website, http://www.eere.energy.gov/golden/Reading_Room.aspx, and the DOE NEPA Website, http://nepa.energy.gov/DOE_NEPA_documents.htm.

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ACRONYMS

APE	area of potential effect
ARRA	*American Recovery and Reinvestment Act of 2009*
BMP	best management practice
CFR	*Code of Federal Regulations*
dBA	decibel on an A-weighted scale, used to approximate the human ear's response to sound
DNL	Day Night Average Sound Level
DOE	U.S. Department of Energy
EA	Environmental Assessment
EECBG	Energy Efficiency and Conservation Block Grant (Program)
EISA	*Energy Independence and Security Act*
EMF	electromagnetic field
EPA	U.S. Environmental Protection Agency
FAA	Federal Aviation Administration
IBA	Important Bird Area
MBTA	*Migratory Bird Treaty Act*
NHPA	*National Historic Preservation Act*
NEPA	*National Environmental Policy Act*
NOA	Notice of Availability
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTIA	National Telecommunications and Information Administration
ODOD	Ohio Department of Development Energy Resources Division
ODNR	Ohio Department of Natural Resources
ODOW	Ohio Department of Natural Resources Division of Wildlife
OHPO	Ohio Historic Preservation Office
OSHA	Occupational Safety and Health Administration
PM_n	particulate matter with an aerodynamic diameter equal to or less than *n* micrometers
SEP	State Energy Program
SHPO	State Historic Preservation Officer
Stat.	U.S. Statutes at large
U.S.C.	*United States Code*
USFWS	U.S. Fish and Wildlife Service

1. INTRODUCTION

1.1 National Environmental Policy Act

The *National Environmental Policy Act* (42 U.S.C. 4341 *et seq*.; NEPA), the Council on Environmental Quality's NEPA regulations [40 Code of Federal Regulations (CFR) Parts 1500 to 1508], and the U.S. Department of Energy's (DOE's) NEPA implementing procedures (10 CFR Part 1021) require that DOE consider the potential environmental impacts of a proposed action before making a decision. This requirement applies to decisions about whether to provide different types of financial assistance to States and private entities.

In compliance with these regulations and with its NEPA implementing procedures, DOE must evaluate the potential environmental impacts of its proposed action that could have a significant impact on human health and the environment, including decisions on whether to provide financial assistance to government agencies and private entities. In compliance with these regulations and DOE procedures, this Environmental Assessment (EA):

- Examines the potential environmental impacts of the Proposed Action and the No-Action Alternative;
- Identifies unavoidable adverse environmental impacts of the Proposed Action;
- Describes the relationship between local short-term uses of the environment and the maintenance and enhancement of long-term productivity; and
- Characterizes any irreversible and irretrievable commitments of resources that would be involved should DOE decide to implement its Proposed Action.

DOE must meet these requirements before it can make a final decision to proceed with any proposed Federal action that could cause adverse impacts to human health or the environment. This EA provides DOE and other decisionmakers the information needed to make an informed decision about the installation, operation, and eventual decommissioning of the proposed wind turbine. The EA evaluates the potential individual and cumulative impacts of the proposed project. For purposes of comparison, this EA also evaluates the impacts that could occur if DOE did not provide funding (the No-Action Alternative), under which DOE assumes the project would not proceed. The EA does not analyze other action alternatives, such as alternative technologies or alternative project locations.

1.2 Background

The Cuyahoga County Agricultural Society (Agricultural Society) is proposing to construct, operate, and eventually decommission a single 660-kilowatt wind turbine and install approximately 300 feet of associated underground electrical transmission equipment at the Cuyahoga County Fairgrounds in the center of the complex on 164 Eastland Road, Berea, Ohio. The current estimated cost of the proposed project is $1,666,486 (which does not include construction of the Energy Center, discussed below). The Ohio Department of Development's (ODOD's) Energy Resources Division selected this project to receive a $1,275,000 grant because

the proposed project meets the State Energy Program (SEP) criteria for selection of reducing fossil fuel use and because of its educational value in displaying a renewable energy project. This grant would come from funding the State of Ohio received from DOE under the *American Recovery and Reinvestment Act of 2009* (Pub. L. 111-5, 123 Stat. 115; ARRA) and DOE's SEP. The purpose of the SEP is to promote the conservation of energy and reduce dependence on imported oil by helping states develop comprehensive energy programs and by providing them with technical and financial assistance. SEP is authorized under the *Energy Policy and Conservation Act*, as amended (42 U.S.C. 6321 *et seq*.). States can use SEP funds for a wide variety of activities related to energy efficiency and renewable energy (42 U.S.C. 6321 *et seq*. and 10 CFR Part 420.)

Additionally, Cuyahoga County selected the proposed project to receive a portion of its EECBG funds because it meets the EECBG criteria of empowering local communities to make strategic investments to meet the nation's long-term goals for energy independence and leadership on climate change. The EECBG Program was authorized in Title V, Subtitle E of the *Energy Independence and Security Act of 2007* (42 U.S.C. 17001 *et seq*.; EISA) and signed into law on December 19, 2007. EECBG is intended to assist U.S. cities, counties, states, territories, and Indian tribes develop, promote, implement, and manage energy efficiency and conservation projects and programs designed to reduce fossil fuel emissions; reduce the total energy use of the eligible entities; improve energy efficiency in the transportation, building, and other appropriate sectors; and create and retain jobs.

The Agricultural Society is also proposing to construct an Energy Center onsite at the Fairgrounds. The Energy Center would be funded with approximately $475,000 of Cuyahoga County funds and would tie into the proposed turbine. This would provide educational opportunities to the public about wind energy and other renewable energies. Cuyahoga County proposed the Energy Center to augment the SEP- and EECBG-funded wind turbine at the Fairgrounds. The Energy Center is not part of DOE's Proposed Action; however, this EA analyzes it as a connected action and in the cumulative impacts analysis.

The potential use of Federal SEP and EECBG funds to assist in the financing of the proposed project constitutes a Federal action subject to review under NEPA.

In compliance with NEPA regulations, this EA examines the potential environmental impacts of the DOE's Proposed Action (providing funding for the proposed project) and the No-Action Alternative, under which DOE assumes the proposed project would not proceed. This EA also describes options that the Agricultural Society considered during development of its application to the State of Ohio, which is the recipient of Federal funding under the DOE's SEP and to Cuyahoga County, the recipient of Federal funds under the EECBG Program. This EA will provide DOE with the information needed to make an informed decision about whether allowing the State of Ohio and Cuyahoga County to provide certain Federal funds for the proposed project may result in significant environmental impacts.

1.3 Purpose and Need

1.3.1 DOE'S PURPOSE AND NEED

DOE's purpose and need is to ensure that SEP and EECBG funds are used for activities that meet congressional statutory aims to improve energy efficiency, reduce dependence on imported oil, decrease energy consumption, create and retain jobs, and promote renewable energy. Providing funding as part of the Ohio SEP and the EECBG grant to Cuyahoga County would partially satisfy the needs of these programs to assist U.S. cities, counties, states, territories, and American Indian tribes to develop, promote, implement, and manage energy efficiency and conservation projects and programs designed to:

- Reduce fossil fuel emissions;
- Reduce the total energy use of the eligible entities;
- Improve energy efficiency in the transportation, building, and other appropriate sectors; and
- Create and retain jobs

Congress enacted ARRA to create jobs and restore economic growth through measures that, among other things, modernize the nation's infrastructure and improve energy efficiency. Provision of SEP and EECBG funds for the proposed project would partially meet these goals.

1.3.2 OHIO AND CUYAHOGA COUNTY PURPOSE AND NEED

Ohio's purpose and need is to grow the economy of the state by connecting companies and communities to financial and technical resources to deploy renewable energy technologies, and to support the goals of SEP and ARRA to reduce energy costs, reduce reliance on imported energy, reduce the impacts of energy production and energy use on the environment, and to preserve and create jobs.

Cuyahoga County's purpose and need is to identify and fund projects that support the mission of the EECBG Program, which is implemented by DOE, to reduce energy use and emissions at a local and regional level. Providing EECBG funding to the proposed project would partially satisfy the need of EECBG by assisting in developing, promoting, implementing, and managing energy efficiency and conservation projects and programs designed to:

- Reduce fossil fuel emissions;
- Reduce the total energy use of the eligible entities; and
- Improve energy efficiency in the transportation, building, and other appropriate sectors.

Cuyahoga County received an EECBG formula grant of $5,783,000 and allocated $391,486 for construction and installation of the proposed project and associated educational outreach.

Cuyahoga County has allocated approximately $475,000 of County funds to construct an Energy Center at the Fairgrounds. The proposed turbine would connect to the Energy Center, and EECBG Program-funded educational materials would be available at the Energy Center.

1.4 Ohio's SEP and Cuyahoga County EECBG Project Selection Process

The Ohio SEP is using its ARRA funding for programs to increase the energy efficiency of businesses and industry while promoting deployment of clean energy projects that will help improve the cost-effectiveness and economic stability of businesses and industry in the state.

Ohio's SEP, administered by ODOD, includes five sub-programs:

- Deploying Renewable Energy in Ohio
- Making Efficiency Work
- Targeting Industry Efficiency
- Banking on New Energy Financing
- Setting the Stage for Ohio's Carbon Management Strategy

ODOD has selected the proposed project to receive a grant through its sub-program, "Deploying Renewable Energy in Ohio," which provides grants to public and private entities to fund a variety of renewable energy projects, including solar, wind, fuel cell, and waste to energy technologies. ODOD issued a Request for Proposals for the SEP-funded "Deploying Renewable Energy in Ohio" sub-program and used the following criteria for selection: project readiness; matching capabilities, financing, and cost effectiveness; economic impact on Ohio; project characteristics and potential for innovation; and a project's ability to: (1) provide emission-free energy; and (2) create jobs during the construction of the project.

A criterion of the SEP grant is that funds must be obligated to sub-recipients by September 30, 2010, and spent by March 2012; therefore, all conditions on SEP awards must be removed by March 2012. The Agricultural Society was one of eight wind energy grant applicants awarded SEP funds by ODOD in 2009. A total of $5,831,000 was awarded to these eight applicants.

The EECBG Program was enacted in part to create jobs, restore economic growth, and strengthen America's middle class through measures that modernize the nation's infrastructure, enhance America's energy independence, expand educational opportunities, preserve and improve affordable health care, provide tax relief, and protect those in greatest need. Cuyahoga County selected the proposed turbine project to receive a portion of its funds through the EECBG Program because it would partially satisfy the goals of EECBG and would reduce energy costs for the Fairgrounds, provide educational opportunities for renewable energy to over 250,000 visitors per year, and assist in leading the region in the development of wind energy manufacturing, a goal of the State of Ohio.

For this proposed project, DOE is the Federal agency, ODOD and Cuyahoga County are the recipients of Federal funding, and the Cuyahoga County Agricultural Society is the sub-recipient of SEP and EECBG funding. The proposed project would be implemented at the Cuyahoga County Fairgrounds.

1.5 Public and Agency Involvement

1.5.1 DOE PUBLIC SCOPING PROCESS

DOE sent scoping letters to potentially interested local, State, and Federal agencies; including the Governor of Ohio, the Ohio Historic Preservation Office (OHPO), the U.S. Fish and Wildlife Service (USFWS), the Federal Aviation Administration (FAA), and the National Telecommunications and Information Administration (NTIA). DOE also sent scoping letters to other potentially interested individuals and organizations, including 24 tribal representatives regularly notified of Federal actions in Cuyahoga County, to solicit public comment (see Appendix D, Attachment D1). These notices solicited comments on the proposed project. DOE published the scoping letter on the DOE Golden Field Office Reading Room Website (http://www.eere.energy.gov/golden/Reading_Room.aspx). The scoping letter described the proposed project and requested assistance in identifying potential issues to be evaluated in this EA (Appendix D, Attachment D1).

In response to the scoping letters, DOE received a letter from the USFWS that was part of the ongoing consultation between DOE and the USFWS and is discussed in detail in Section 3.2.2.6 of this EA. To conclude consultation, the USFWS sent a subsequent letter dated October 29, 2010, indicating that the USFWS believed that the proposed project is not likely to result in the take of, or adverse impacts to, the Indiana bat (*Myotis sodalis*). DOE also received a letter in response to scoping from American Tower Corporation (Appendix D, Attachment D2). This letter stated that American Tower believed the wind turbine would interfere with its cell tower service. In response, a Microwave Study was prepared and the results are discussed in Section 3.2.2.11 of this EA. American Tower's letter objected to the proximity of the proposed wind turbine to its telecommunications facility at 164 Eastland Road, Berea, Ohio.

1.5.2 CUYAHOGA COUNTY AGRICULTURAL SOCIETY PUBLIC INVOLVEMENT

The Agricultural Society has provided opportunities for public involvement since July 4, 2008, in an attempt to educate the public about this project and to provide an opportunity for public comment. These opportunities have included public engagement by the City of Berea, the City of Middleburg Heights, and other presentations, as well as coverage of the project in local media outlets. Although the initial location for the turbine was Middleburg Heights and it was approved in that municipality, the turbine was moved to the City of Berea to increase the distance from two concerned properties: Century Oak Care Center and Quadex. Letters of support for the project have been received from various public and private entities. A complete timeline of public outreach effort and City of Berea meeting minutes are provided in Appendix D, Attachment D3.

Middleburg Heights City Department Public Meetings and Approvals:

DATE	WITH	PURPOSE	RESULT
5/22/08	Mayor	Introduction	Proceed
9/17/08	Building & Zoning	250' Zoning	Approved

10/29/08	Planning	Project	Approved
11/24/08	Council Comm.	Zoning	Approved
12/2/08	Council & Mayor	Final	Approved
9/16/09	Building & Zoning	Permit end date	Expired
12/16/09	Building & Zoning	280' Zoning	Approved
3/10/10	Planning	Project	Approved
3/23/10	Council & Mayor	Final	Denied

Berea City Department Public Meetings and Approvals:

3/26/10	Mayor & Legal	Introduction	Application
4/21/10	Arch & Building	Architectural	Approved
5/6/10	Planning	Project	Approved

1.5.3 DOE PUBLIC INVOLVEMENT

The following agencies and organizations were contacted by the Agricultural Society and/or DOE:

- USFWS
- FAA
- NTIA
- OHPO
- Ohio Department of Natural Resources (ODNR), Ohio Division of Wildlife (ODOW)
- Ohio Department of Transportation, Office of Aviation
- Middleburg Heights Board of Zoning Appeals
- Berea Board of Zoning Appeals
- Berea Historical Society

1.5.4 DRAFT ENVIRONMENTAL ASSESSMENT

DOE issued the Draft EA for comment on November 19, 2010, and posted it on the DOE Golden Field Office Reading Room Website (http://www.eere.energy.gov/golden/Reading_Room.aspx) and the DOE NEPA Website (http://nepa.energy.gov). DOE sent postcards to the individuals listed in Appendix D, Attachment D4 of this EA to notify them of the EA's availability on the web and to announce a 15-day public comment period on the EA. The NOA was also published in the local paper, *The Cleveland Plain Dealer* (see Appendix D, Attachment D5). The comment period ended on December 4, 2011. DOE received no comments on the Draft EA.

2. PROPOSED ACTION AND ALTERNATIVES

2.1 DOE's Proposed Action

The Cuyahoga County Agricultural Society has received two subgrants under two DOE formula grant programs: one through ODOD's SEP; the other through DOE's EECBG Program. DOE is proposing to authorize the expenditure of these Federal funds to design, permit, and construct a single 660-kilowatt wind turbine at the Cuyahoga County Fairgrounds (proposed project).

DOE has authorized expenditure of a percentage of the Federal funding for preliminary activities related to the proposed project, which include EA preparation and studies. Such activities are associated with the proposed project and would not significantly impact the environment nor represent an irreversible or irretrievable commitment by of resources in advance of DOE completing the NEPA process for the proposed project.

2.2 Proposed Project

The proposed project was chosen based on the following ODOD criteria: project readiness; match, financing, and cost effectiveness; economic impact on Ohio; project characteristics and potential for innovation; and its ability to (1) provide emission-free energy, and (2) create jobs during the construction of the project. For this proposed project, DOE is the Federal agency whose Proposed Action is to authorize funding, ODOD and Cuyahoga County are the recipients of Federal funding, and the Cuyahoga County Agricultural Society is the sub-recipient of SEP funding. The proposed project would be implemented at the Cuyahoga County Fairgrounds.

Cuyahoga County selected the proposed turbine to receive a portion of its EECBG grant because it would partially satisfy the goals of EECBG and would reduce energy costs for the Fairgrounds, provide educational opportunities for renewable energy to over 250,000 visitors per year, and assist in leading the region in the development of wind energy manufacturing, a goal of the State of Ohio. The EECBG funds would also pay for renewable energy outreach and educational materials, which would be available at the Energy Center (which is not Federally funded, but is a connected action).

The proposed project includes the installation and operation of a single 660-kilowatt wind turbine at the Fairgrounds. The turbine model would be a Vestas V47-660 kW with a 154-foot rotor diameter and a 197-foot tower height. Overall, the turbine would stand 274 feet at its tallest blade tip extent. The turbine would be designed to be mounted on a monopole made up of tubular conical steel segments (see Appendix D, Attachment D6). The proposed project also includes approximately 300 linear feet of buried electrical transmission line that would connect the turbine to the proposed Energy Center, which would be funded by Cuyahoga County with non-Federal funds. The monopole design would eliminate the need for guy wires for support of the wind turbine. Guy wires can be a challenge for birds and bats to locate and maneuver around, which can lead to injury or death. The proposed design would not include the use of lattice towers for support, which have been found to be roosting sites for birds at other wind project sites.

2.2.1 PROJECT LOCATION

The proposed turbine would be located at the Cuyahoga County Fairgrounds in Berea, Ohio (see Appendix A, Figures 1a, 1b and 2) in the center of the Fairgrounds, on the south side of the fairway located in the center of the racetrack. The approximate center point of the turbine would be 41° 21′ 59.50″ north longitude and 81° 50′ 21.10 ″ west latitude at a ground elevation of 801 feet above mean sea level (see Figure 2-1 and Appendix A, Figures 3 and 4b). The final ground-level footprint once the project was installed would be less than 16 feet in diameter, or 256 square feet.

Figure 2-1. Site Plan

The future Energy Center would be located approximately 300 feet north of the proposed turbine at a ground elevation of 799 feet above mean sea level (see Appendix A, Figures 4a and 4b). The proposed turbine would power the Energy Center via 300 linear feet of underground transmission lines. As proposed, the Energy Center would be a single story, pitched roof building approximately 2,000 square feet and would be oriented for a direct view of the wind turbine (see Appendix A, Figures 5a, 5b, and 5c).

2.2.2 CONSTRUCTION AND INSTALLATION

2.2.2.1 Wind Turbine

Site construction would include installation of the foundation systems, turbine, transformer, electrical distribution wiring, and switchgear. No access roads or road improvements would be required due to the high quality and availability of the site's existing roadways. Construction vehicles are anticipated to access the site from a similar route.

An area equal to the possible fall zone (within a 301-foot radius) would be closed during the erection phase of the project. Crane pads would be used during erection as needed to protect the existing roadways and surfaces. The foundation would be composed of approximately 300 cubic yards of reinforced concrete. The foundation would be buried 10 feet deep and would require approximately 23,000 pounds of reinforcing steel.

The electrical grid interconnect of the turbine would be composed of the turbine's controller (contained within the turbine tower-based section), approximately 300 feet of buried 4-inch electrical conduits, including the portions of the run embedded within the turbine tower foundation, a 690- to 12,470-volt transformer, an automatic disconnect switch, a UL1741-compliant monitoring and control device, and a fused disconnect within the site's existing switchgear. The system would also have a parallel run of 2-inch conduit for data transfer and control runs. The full system would meet all local, State, and Federal codes and regulations.

2.2.2.2 Energy Center

The Energy Center is proposed to be constructed concurrently with the wind turbine and would consist of two exterior doors (designed for flow through), radiant slab heating, base-load heating for air conditioning and hot water, high-efficiency lighting, building structure, components, utilities, and mechanical features that would be visible for educational purposes. The Energy Center would have a south-facing roof that would hold approximately 4 kilowatts of roof-mounted, photovoltaic solar cells (pitched plus or minus 41 degrees). The Energy Center would include a kitchenette, exhibit space, a conference room, two bathrooms; the entire building would be *Americans with Disabilities Act* accessible (see Appendix A, Figures 6a and 6b).

2.2.2.3 Construction Timing and Best Management Practices

Construction would be performed in accordance with an approved Erosion and Sedimentation Control Plan and in compliance with all local, State, and Federal applicable requirements. Construction activities for wind turbine foundations, tower erection, turbine nacelle placement, and blade installation would be contingent on temperature and weather conditions. The turbine nacelle and blades would be installed during calm wind periods. Foundations for the proposed turbine and Energy Center would not be installed during cold winter months. These and similar factors would determine the final construction timeline. The proposed project ground disturbance area would not exceed 1 acre; thus, it would not exceed the State of Ohio threshold for National Pollutant Discharge Elimination System (NPDES) permitting.

The installation of the proposed project, including site preparation, erection, final commissioning, generator installation, and overall systems tie-in and startup, is planned to be completed within approximately 10 months of groundbreaking.

The construction of the Energy Center is planned to be completed in approximately 4 months with the majority of activities occurring during daytime working hours (likely to occur Spring/Summer 2011). All parking and staging would occur on the Fairgrounds property.

Construction activities would occur within a 2-acre footprint that is currently used as open space and overflow parking within the Fairgrounds. Approximately 4,000 square feet of previously disturbed area would be temporarily disturbed during construction. During construction, these areas would be closed and secured using fencing and locked gates to prevent unauthorized individuals from entering the work zone. The Energy Center development footprint would require the removal of three trees, one silver maple approximately 40 feet tall and in poor health and two red maples approximately 9 feet tall and in fair health (discussed in detail in Section 3.2.2.9). Three additional trees located in the vicinity of the Energy Center development footprint would require protective measures during construction.

Aviation Lighting

Aviation lighting for the proposed turbine would be in compliance with the FAA standards (FAA 2007). White strobe lights at the minimum number, minimum intensity, and minimum number of flashes per minute allowable by the FAA would be used at this site.

2.2.3 OPERATIONS AND MAINTENANCE

The Agricultural Society would operate and maintain the proposed turbine according to operating, maintenance, and safety procedures and requirements specifically recommended by the turbine's manufacturer, Vestas. Routine preventive maintenance and inspection of the turbine would be necessary to maximize performance and identify potential problems or escalating maintenance issues. The turbine would be remotely monitored daily to ensure operations were proceeding efficiently. This monitoring would occur through the use of trained onsite staff and remote monitoring via a service provider contract. The turbine would have the ability to monitor and report faults both locally and remotely, as well as automatically shut down if a fault should occur outside the normal operating parameters of the turbine per the manufacturer's specifications. The turbine would also have the capacity for a remote shutdown by authorized personnel. For the first 5 years of operation, the Agricultural Society would subcontract all formal service and maintenance functions to a nationally experienced firm. During this period, local staff and resources would be trained and gain experience in the maintenance and service procedures for the machine. A 5-year extended warranty would also be included in the initial purchase contract of the turbine from the original provider to optimize performance and safety. After this 5-year period, the service and maintenance plans and providers would be reevaluated and contracted as necessary. All routine servicing would be performed without using a crane to remove the turbine from the tower.

2.2.4 DECOMMISSIONING

Impacts evaluated with respect to the decommissioning of the turbine are similar to those examined in the construction section of this EA (Section 2.2.2). The turbine and other infrastructure are expected to have a useful life of at least 20 years. Retrofitting the turbine with upgrades may allow the turbine to produce efficiently for many years after the original useful life. When the project is terminated, the Agricultural Society will decommission the turbine and other infrastructure, and all turbine-related facilities would be removed to a depth of approximately 3 feet below grade. The soil surface would be restored as close as possible to its original condition. Underground facilities would either be removed or safely secured and left in place. Salvageable items (including fluids) would be sold, reused, or recycled as appropriate; unsalvageable material would be disposed of at authorized and approved disposal sites. All decommissioning construction activities would be performed in accordance with the manufacturer's guidelines as well as all applicable Federal, State, and local regulations.

2.3 Alternative

2.3.1 DOE ALTERNATIVE

The Ohio SEP funds are from a formula grant—the amount granted to the State is determined pursuant to a formula established in the DOE SEP grant procedures (10 CFR 420.11). Allocation of funds among the states is based on population and other factors. Recipients of these formula grants have broad discretion in how they use these funds.

Cuyahoga County's funds received under the DOE EECBG Program also are from a formula grant. EECBG Program funds are apportioned under a series of formulas specified by EISA and as determined by DOE (Section 541 of EISA). Recipients must use these funds for activities that are in accordance with Section 544 of the Act.

This EA examines the potential environmental impacts of DOE's Proposed Action (providing funding for the proposed project) and the No-Action Alternative. This EA also describes options that the Agricultural Society considered during development of its application to the State of Ohio, which is the recipient of Federal funding under the SEP, and to Cuyahoga County, the recipient of Federal funds under the EECBG Program. This EA provides DOE with the information necessary to make an informed decision about whether allowing the State of Ohio and Cuyahoga County to provide some of their Federal funds for the proposed project might result in significant environmental impacts.

2.3.2 NO-ACTION ALTERNATIVE

Under the No-Action Alternative, DOE would not allow the State of Ohio and Cuyahoga County to use Federal funds (SEP and EECBG, respectively) for the proposed project. For this EA, DOE assumes that the proposed project would not proceed without Federal funding. This assumption allows a comparison between the potential impacts of the project as proposed and the impacts of not proceeding with the project. Without the proposed project, the Fairgrounds' operations would continue as otherwise planned, but without installation or operation of the proposed wind turbine.

2.3.3 SITING OPTIONS CONSIDERED BY THE CUYAHOGA COUNTY AGRICULTURAL SOCIETY

The Agricultural Society considered three main sites for the location of the wind turbine at its site in Berea, Ohio. All of the potential sites are owned by the Agricultural Society and are similar with regard to environmental considerations, such as wildlife impact avoidance, wetland and stream avoidance, and compatibility with existing zoning and land uses. Further considerations used by the Agricultural Society for siting the turbine within the Fairgrounds are the following:

- Distance from adjacent properties
- Maximization of distances to occupied structures (no closer than 1.25 times the blade tip height)
- Ease of access and adequate room for construction, installation, and maintenance
- Proximity to existing hardened roadways (minimization of new construction)
- Minimization of disruption of Fairgrounds operations
- Availability for educational programs (school, community, and college partnerships)
- Minimization of wind turbulence due to adjacent buildings and trees
- Utilization of previously disturbed land (avoidance of natural areas)
- Soil conditions (foundation suitability)
- Maximum avoidance of potential wildlife habitats
- Topography
- Wind resource optimization
- Existing infrastructure avoidance
- Utility interconnect distances
- Architectural, visual balance and icon siting

The proposed site was selected because it would allow the construction area to be easily controlled, as it is already within an existing fenced area. The proposed project site is also in the closest proximity to the proposed Energy Center, which would allow direct sightlines to the turbine's operation as well as having the shortest utility interconnecting distance.

2.4 Required Agency Permits and Approval Types

Prior to construction, all required Federal, State, and local permits and approvals would be obtained. The required permits and approvals are listed in Table 2–1. All permit documentation and approval letters are contained in Appendix C.

Table 2-1. Federal, State, and Local Permits and Approvals

Agency	Permit Approval / Type
Federal	
Federal Aviation Administration	Federal Aviation Administration Aeronautical Determination (issued July 6, 2010)
National Telecommunications and Information Administration	Radio Frequency Transmission Approval (issued October 19, 2010)
U.S. Fish and Wildlife Service	Compliance with the *Endangered Species Act*, the *Migratory Bird Treaty Act*, and the *Bald and Golden Eagle Protection Act* (letter dated October 29, 2010).
State	
Ohio Historic Preservation Office	Compliance with the *National Historic Preservation Act* (letter dated February 10, 2011).
Ohio Department of Natural Resources, Division of Wildlife	Concurrence that the proposed project does not pose a substantial risk to State-protected species, including birds (pursuant to Ohio Revised Code Chapter 1531) (received August 27, 2010).
Local	
Berea Township Planning & Zoning Commission	Height Variance Approval (March 23, 2010).

2.5 Project Proponent-Committed Practices

The Agricultural Society has committed to the following measures and procedures to minimize or avoid environmental impacts if the proposed project is implemented.

2.5.1 BIRD, BAT, AND RAPTOR AVOIDANCE AND MINIMIZATION MEASURES

Project coordination occurred with USFWS and ODOW concerning the project's location and potential impacts on birds, bats, and other wildlife; rare, threatened, and endangered species; and other protected natural features. According to the USFWS letter dated September 21, 2009 (see Appendix C, Attachment C2), there are no bald eagle nests within 5 miles of the proposed project. The USFWS letter also noted that an Indiana bat capture was documented approximately 4.5 miles from the project site, and ODOW indicated in its letter dated August 27, 2010 (see Appendix C, Attachment C1) that this occurrence was 4.3 miles away. ODOW stated in its letter that the proposed project was not likely to impact any State-listed species. However, because the proposed project lies within the range of the Indiana bat, ODOW concluded that tree removal should occur between September 30 and April 1 of any given year or Indiana bat mist net surveys would be required. If tree removal associated with the Energy Center construction could not occur between September 30 and April 1, the Agricultural Society would have a qualified biologist conduct mist net surveys. ODOW and USFWS would receive results of the mist net survey prior to tree removal.

2.5.2 HEALTH, SAFETY, AND NOISE

The Agricultural Society has prepared a Health and Safety Plan; this plan, all Occupational Safety and Health Administration (OSHA) requirements, and Vestas V47-660 kW guidelines, would be followed. Therefore, all facilities would include high-voltage warning signs. All

construction activities would occur during normal working hours to avoid noise disturbances to surrounding areas. The construction of the proposed project would comply with all applicable Federal, State, and local requirements.

2.5.3 SOIL

The Agricultural Society would use best management practices (BMPs) during construction and operation to protect topsoil and minimize soil erosion. BMPs would include, at a minimum, the following: containing excavated material, using silt fences, protecting exposed soil, stabilizing restored material, and revegetating disturbed areas.

2.5.4 WASTE MANAGEMENT

Any waste generated during construction, operation, and decommissioning, including used lubricants, would be handled, collected, transferred, and reused/recycled in accordance with applicable Federal, State, and local regulations.

2.5.5 FLICKER EFFECTS

Based on the shadow flicker assessment prepared for this project, shadow flicker is not expected to have an adverse impact on any potential receptors. However, if shadowing becomes a nuisance to a nearby resident, the Fairgrounds would plant screening trees or purchase window coverings for the resident. Also, if flickering is an annoyance during events at the Fairgrounds, the Agricultural Society would temporarily shut down the turbine.

2.5.6 ICING AND FIRE

The turbine system would have an automated system fault shut-off triggered at a minimum by the following sensors: system temperature, power quality, vibration, over-speed, fire and icing (vibration caused by blade icing induced imbalances would automatically shut down the turbine). This system is designed to automatically send fault codes to preauthorized personnel through a "Web" interface. The turbine's nacelle would have a cold-weather package including nacelle heaters. All icing related turbine shutdowns would require a direct inspection and an onsite manual restart. The site personnel and the system maintenance personnel would shut down the turbine in the event of an icing condition. The site would adopt an ice safety zone around the turbine for implementation during icing events.

2.5.7 CULTURAL RESOURCES

Based on the cultural and historic resources analysis, encountering archaeological resources during excavation activities is considered unlikely and not anticipated. Due to extensive snow cover a field survey of the area of ground disturbance associated with the proposed project was not feasible. As part of DOE's ongoing Section 106 Consultation, OHPO recommended that a Phase 1 survey be conducted within the area of ground disturbance for the Energy Center. In light of this recommendation, prior to ground disturbing activities, the Agricultural Society has committed to a preparation of a Phase 1 survey for archaeological resources that will be conducted by a qualified archaeologist and submitted to the OHPO for their review. If archaeological resources are discovered as part of the survey, an appropriate treatment plan would be developed in consultation with OHPO in accordance with the *National Historic Preservation Act* (16 U.S.C. 470 *et seq.*; NHPA).

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL IMPACTS

This chapter of this EA examines in detail the potential environmental impacts of the proposed project and the No-Action Alternative on the affected environmental resource areas.

3.1 No-Action Alternative

The No-Action Alternative would result in the continued use of fossil fuel energy to meet the demands of the Fairgrounds. The current composition of emissions generated by energy production at the Fairgrounds is, in general, similar to the overall national composition and includes carbon dioxide, nitrogen dioxide, and sulfur dioxide (EPA 2010a). Under the No-Action Alternative, DOE would not authorize the use of Federal funds for the design, and construction of the proposed project; therefore there would not be any impacts to the resource areas analyzed in this EA. Additionally, without the proposed project, it is unlikely that the Energy Center would be constructed and there would be no temporary construction impacts and no permanent commitment of approximately 2,000 square feet of previously disturbed land to the Energy Center footprint. Additionally, it is unlikely that the trees which would need to be removed for construction of the Energy Center would occur in the immediate future.

However, if the proposed project is not implemented, construction of the wind turbine or Energy Center is unlikely to occur, and baseline conditions would continue pursuant to current Fairgrounds energy usage and operations and the nearly 100 percent of the Fairgrounds' electrical power that could be provided by the proposed project would continue to be purchased First Energy Solutions. In 2009, First Energy Solutions generated electricity using coal (72.8 percent), oil (0.4 percent), natural gas (2.7 percent), nuclear (22.3 percent), and renewable energy sources (1.1 percent) (EPA 2010a). Thus, carbon dioxide emissions from electricity generation to serve the Fairgrounds would be higher under the No-Action Alternative and neither the Agricultural Society nor ODOD would meet their objective of providing emission-free energy.

3.2 Ohio and Cuyahoga County's Proposed project

3.2.1 CONSIDERATIONS NOT CARRIED FORWARD FOR FURTHER ANALYSIS

Consistent with NEPA implementing regulations and guidance, DOE focuses the analysis in an EA on topics with the greatest potential for significant environmental impact. For the reasons discussed below, the proposed project is not expected to have any measurable effects on certain resources; therefore, those resources are not carried forward for further analysis.

3.2.1.1 Water Resources

Floodplains and Wetlands

Pursuant to 10 CFR Part 1022, DOE reviewed USFWS National Wetlands Inventory maps (USFWS 2010) and Federal Emergency Management Agency floodplain maps (FEMA 1979) and identified no floodplains, wetlands, or surface water sources, such as streams or drainage channels, that are located on the proposed project site or that could be affected by the construction and operation of the proposed project (see Appendix A, Figure 7a and 7b).

Additionally, the site was field-checked and no evidence of wetlands or other potentially jurisdictional aquatic features are present at the proposed turbine or Energy Center site.

Wild and Scenic Rivers

No Ohio Scenic Rivers or waterways included in the National Wild and Scenic River System occur in the project vicinity (USFWS 2010). The closest Ohio Scenic River is the Chagrin River, located in Cuyahoga County, approximately 25 miles east of the proposed project site (see Appendix A, Figure 8). The proposed project would not be visible from the Chagrin River (ODNR 2010). The closest National Wild and Scenic River is Little Beaver Creek, located mainly in Columbiana County and about 83 miles southeast of the Fairgrounds (USDA Forest Service 2009). The proposed project would not affect Federal or state wild and scenic rivers.

Ground Water

Based on the review of existing Ohio Environmental Protection Agency and ODNR groundwater resource maps, the proposed project site is not located in an endorsed well-head protection area, where certain activities are restricted within an Ohio Environmental Protection Agency-designated protection area. Additionally, the proposed project site is not located within any designated Public Water System supply areas (sole-source aquifer, community/non-community systems, and drinking-water source protection areas using groundwater/surface water). Groundwater is generally not a source of drinking water in this part of Cuyahoga County. There are no private well-water supplies on or near the project site. The proposed project would have no adverse effect on any groundwater resources.

Surface Water

In compliance with the Clean Water Act, the proposed project site was investigated for surface water. The nearest surface-water bodies are Baldwin Lake and Wallace Lake (also known as Coe Lake), which are both located about 0.60 miles to the west and are part of the Roadside Park Area. The nearest streams are Baldwin Creek and Rocky Creek; both are located approximately 0.65 mile southwest of the Fairgrounds and are part of the Lake Erie drainage system. No runoff or discharges from the construction of the proposed project would directly enter neighboring bodies of water, including the lakes to the west or the two creeks to the southwest. Because ground-disturbing activity would affect less than 1 acre, an NPDES permit would not be required prior to any construction-related earthwork. However, the Agricultural Society has committed to using sediment and erosion pollution control BMPs in conformance with a plan specific to the proposed project.

3.2.1.2 Waste Management

Solid wastes that are anticipated to be generated during construction include equipment packaging materials and construction-related material debris. Solid wastes generated during operation of the turbines would be minimal. Solid waste generated by the operation of Energy Center is anticipated to generate typical household/commercial waste and would be removed via existing municipal waste handling services that serve the Fairgrounds. Solid wastes that are anticipated to be generated during decommissioning of the wind turbine include dismantled equipment, which would likely be recycled, and construction-related material debris would be handled in accordance with all local, state and Federal regulations. Hazardous, regulated nonhazardous, and universal wastes are not anticipated to be generated during construction,

operation, or decommissioning. All wastes generated over the life of the proposed project would be handled, collected, transferred, reused/recycled, and disposed of in accordance with all applicable Federal, State, and local regulations. Used oil (e.g., spent gear box oil, hydraulic fluid, and gear grease) would not be considered a waste because it can be reused and/or recycled. Used oil would be generated during operation of the wind turbine and recycled utilizing a qualified recycling facility.

3.2.1.3 Intentional Destructive Acts

DOE considers intentional destructive acts (i.e., acts of sabotage or terrorism) in all its EAs and environmental impact statements (DOE 2006). Construction and operation of the proposed project would not involve the transportation, storage, or use of radioactive, explosive, or toxic materials. The proposed project would not offer any particularly attractive targets of opportunity for terrorists or saboteurs to inflict adverse impacts on human life, heath, or safety.

3.2.2 CONSIDERATIONS CARRIED FORWARD FOR FURTHER ANALYSIS

This section of this EA examines in detail the potential environmental impacts of the proposed project on the following resource areas:

- Land use
- Visual
- Noise
- Cultural resources
- Geology and soils
- Biological resources
- Human health and safety
- Transportation
- Socioeconomics and environmental justice
- Air quality and climate change
- Utilities and energy

3.2.2.1 Land Use

The project site is located on the Cuyahoga County Fairgrounds property. The Fairgrounds are bounded to the north by Bagley Road, a four-lane highway made up mostly of commercial and light industrial use; to the northeast by University Street and a residential area; to the east by Old Oak Boulevard with commercial and light industrial use; to the south by Waverly Street with residential areas; and to the west by Eastland Road with residential areas and portions of Baldwin-Wallace College. Interstate 71 and its industrial corridor is less than a mile to the east of the site.

The Fairgrounds are located partially within the city of Berea and partially within the city of Middleburg Heights. Most of the Fairgrounds buildings and structures, including the proposed project site, as well as the Fairgrounds' regular activities, are located in the city of Berea. The area of the Fairgrounds located in Middleburg Heights consists of open fields used for parking.

The majority of land in the immediate vicinity of the Fairgrounds in Berea is zoned as Standard Single Family Residential-B District. In addition to this designation, the following zoning areas exist within a 1-mile radius of the proposed project site: Standard Single Family Residential-A District, Multiple Family Medium Density, Residence Office, Townhouse, and Commercial Center (City of Berea 2010) (see Figure 3-1 and Appendix A, Figure 9a).

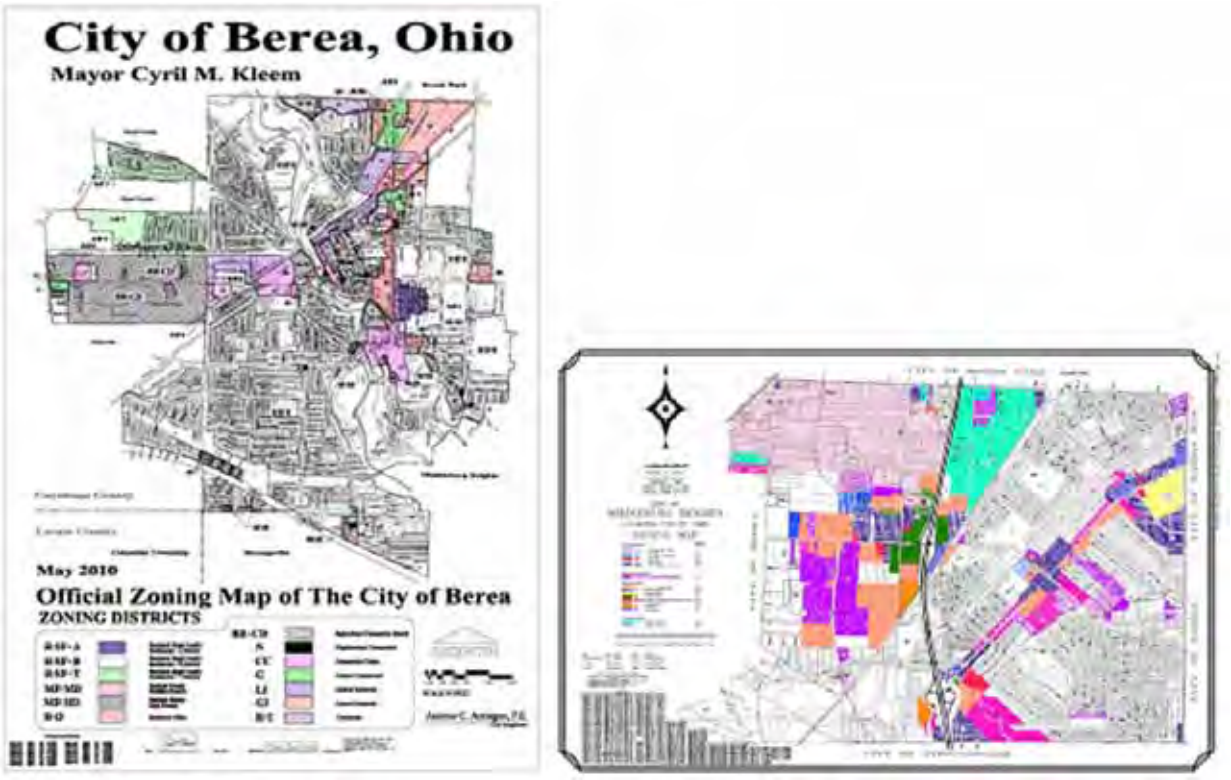

Figure 3-1. City of Berea and Middleburg Heights Zoning Maps

The majority of land in the immediate vicinity of the Fairgrounds in Middleburg Heights (see Figure 3-1 and Appendix A, Figure 9b) is zoned as Mixed Use, General Business, Motorist Services, Office Building, Public Facilities Districts, and General Industrial (City of Middleburg Heights 2003). The landscape surrounding the Fairgrounds is generally urban and commercial interspersed with some light industry. Lake Abram Metropolitan Reservation lies less than 0.5 mile to the north of the Fairgrounds.

On December 16, 2009, an application for zoning variance for the height of the proposed turbine was submitted to and approved by the Middleburg Board of Zoning Appeals (CBMPC 2010). The zoning and height variance approval expired on September 16, 2009 and was reapplied for by the Fairgrounds. On December 16, 2009 Middleburg Heights Building and Zoning re-approved the variance, and project approval from the Middleburg Heights Planning Commission was received on March 10, 2010. On March 23, 2010, the re-approved variance was heard before the Middleburg Heights City Council and was denied.

The denial by the City Council meant the proposed project could not be constructed within Middleburg Heights. However, the Fairgrounds are located in both the cities of Middleburg

Heights and Berea, and project proponents determined that the proposed turbine should be relocated to that portion of the Fairgrounds located in Berea. On December 16, 2009, the City of Berea Building and Zoning approved the proposed project and a height variance. On March 20, 2010, Berea Planning approved the proposed project and height variance. On March 23, 2010, the project was placed on the calendar for hearing by the Berea City Council who approved the proposed project and variance (see Appendix D, Attachment D3).

The Energy Center would require a City of Berea building permit, but is not likely to require a zoning or other variance.

Direct and Indirect Impacts

Implementation of the proposed project would permanently commit 256 square feet of previously disturbed and developed land aboveground for the wind turbine foundation and 300 linear feet of belowground for the underground transmission line. Approximately 2,000 square feet of land would be temporarily disturbed for construction of the wind turbine. Approximately 4,000 square feet of previously disturbed land would be disturbed for construction of the future Energy Center. The future Energy Center would permanently commit approximately 2,000 square feet. The overall use of the general area would not change as a result of construction and operation of the proposed project.

Neither direct nor indirect impacts on land use are expected to occur outside of the project site. Land-disturbing activities would be relegated to the area needed for construction and operation of the proposed project. No other lands, including natural or residential areas, would be affected.

3.2.2.2 Visual Quality

Viewshed

A visual analysis was conducted for the proposed project, the wind turbine (as the Energy Center would not be visible beyond the Fairgrounds property) to assess potential impacts on the local viewshed (Appendix B, Attachment B1). The results of a visual analysis are intended to give a sense of how the proposed turbine would appear to potential receptors in the surrounding landscape. The actual visibility of the proposed turbine in the surrounding area is affected by many factors: the size of the machine; tower and blade tip heights; turbine color; distance to the viewer; obstructions such as trees, hills, and buildings; atmospheric conditions; sun angle; and the curvature of the earth. Of these factors, the overall height of a turbine, obstructions in the sightline between the viewer and the turbine, and the distance between the machine and the viewer have the potential for the greatest impact.

The Fairgrounds are located in a fairly urbanized and suburban environment. Areas to the east, north and west of the proposed project are entirely developed with residential and commercial facilities, roadways and Interstate 71 (due east). Residential development borders the Fairgrounds to the west, north and southeast, with parking facilities and commercial development to the south and to the east. Also present are urban forested areas around the Fairgrounds property. The landscape surrounding the Fairgrounds contains relatively low topographic relief. Expansive views over the surrounding area are not readily present due to the surrounding urban forest, topography, and existing infrastructure. Trees vary in height, but tend to range from 15 to 75 feet.

Visual simulations were used to illustrate the effect of the proposed project from vantages that are representative of typical views that would be affected from the total height of 274 foot wind turbine. Vertical elements present in the landscape include buildings, existing communications towers, overhead power lines, and other vertical elements that dominate the viewshed (see Figure 3-2). Existing viewer groups in the area include residents, roadway users, commercial facilities, and educational facilities.

Visual simulations for properties listed in Table 3-1 are located in Appendix B, Attachment B1. Due to local obstruction proximities and densities to typical sightlines such as trees and buildings, much of the surrounding area would not be able to see the proposed turbine. However, some of the surrounding residents and commercial facilities would be able to see the turbine due to their proximity to the project site.

Table 3-1. Cuyahoga County Visual Simulations

Fairgrounds Visualizations						
Set Number	Picture Number	Distance from Turbine (miles)	Site Description	Latitude	Longitude	Direction
1	1388	1.24	Berea Union Depot	41° 22' 51.12" N	81° 51' 15.93" W	140°
2	1418	0.40	Berea District 7 School	41° 22' 20.93" N	81° 50' 28.07" W	165°
3	1427	0.26	Nursing Home on Old Oak Blvd	41° 22'06.09" N	81° 50' 05.06" W	246°
4	1434	0.39	Southwest General Hospital Parking Garage	41° 22' 08.65" N	81° 49' 56.40" W	247°
5	1441	0.41	Quadax	41° 21' 41.89" N	81° 50' 09.39" W	335°
6	1448	0.34	Corner of Austin & Andrew	41° 21' 43.62" N	81° 50' 22.86" W	4°
7	1480	0.27	352 Waverly	41° 21' 48.35" N	81° 50' 28.78" W	24°
8	1499	0.25	211 Eastland	41° 21' 59.93" N	81° 50' 38.87" W	84°
9	1516	0.15	University Drive	41° 22' 09.11" N	81° 50' 21.33" W	181°
10	1518	0.37	Bagley Road - Fairgrounds Entrance	41° 22' 19.22" N	81° 50' 11.77" W	202°
11	1733	0.67	Coe Lake	41° 21' 49.26" N	81° 51' 04.65" W	70°
12	1515	0.45	Corner of Eastland and Bagley	41° 22' 21.00" N	81° 50' 37.94" W	148°
13	1505	0.71	Corner of Front Street	41° 22' 01.11" N	81° 51' 10.85" W	90°

Figure 3-2. An Existing Tower at the Fairgrounds

Figure 3-3. Visual Simulation Depicted from the Corner of Austin and Andrews Streets

Figure 3-4. Visual Simulation Depicted from the Top of the Southwest General Hospital Parking Garage

Figure 3-5. Visual Simulation Depicted from 352 Waverly

Figure 3-6. Visual Simulation Depicted from 211 Eastland

Shadow Flicker

Shadow flicker is the moving/flickering shadows produced when sunlight passes through the spinning rotor blades of a turbine. This phenomenon can become an annoyance to nearby residents when the shadows pass directly over their line of sight, i.e., windows or other transparent surfaces. While the adverse effects of shadows can be subjective, the shadows themselves can be precisely modeled for location and duration.

For shadow receptor sites within a turbine's shadow's reach, not all would receive shadow due to existing obstructions that block the shadows path such as other buildings, hills or trees. While evergreen trees would fairly consistently block shadows year-round, deciduous trees would have a lesser impact in the winter months when they have no leaves. Although no official U.S. policy has been adopted, international standards appear to be in consensus that flickering shadows in excess of thirty hours per year impacting a particular location are considered a potential nuisance (see Appendix B, Attachment B2).

A shadow flicker analysis (see Appendix B, Attachment B2) was completed for the proposed project to evaluate the amount of shadow flicker that would be experienced by local receptors. The analysis considered several aspects affecting the casting of shadows and potential impacts on local receptors, including the distance to receptors, angle of incoming solar insolation, and the amount of sunlight experienced at the project site during each of the four seasons.

The following are the closest receptors to the proposed wind turbine.

Receptor A: LifeWorks Fitness to the Southeast, 7390 Old Oak Blvd, approximately 1000, feet. Shadows would not impact this receptor.

Receptor B: 208 Eastland Road, approximately 1150 feet: Shadows would be highly diffused, to completely blocked, as the receptor is substantially blocked by multiple trees. It is possible that this receptor would receive shadow flicker during portions of mid-April and mid-August to early-September mornings with a total average of less than 5 hours of morning shadow flicker per year.

Receptor C: Fair buildings to the Northwest, approximately 650 feet: Shadows would be limited, but may be possible during portions of late-November to mid-January mornings with a total average of less than 4 hours of shadow flicker per year.

Receptor D: 142 Eastland Road, approximately 1,270 feet: Shadows would be highly diffused, to completely blocked, as the receptor is substantially blocked by multiple trees. It is possible that this receptor would receive shadow flicker during portions of mid-May through July with a total average of less than 11 hours of moving morning shadow per year.

Because of the strobe-like effect of shadow flicker, there have been investigations into whether it might have the potential to produce epileptic seizures in individuals with photosensitivity. It has been determined that modern utility-scale wind turbines do not have the potential to cause these types of problems because of their relatively slow blade rotation. One study (Harding et al. 2008) reported that flickers with a frequency greater than 3 hertz could pose a potential for inducing photosensitive seizures (that is, a light flashing at a rate of more than 3 times per second). The American Epilepsy Foundation reports that lights flashing in the range of 5 to 30 hertz are most likely to trigger seizures and recommends that flash rates of visual alarms be kept under 2 hertz (Epilepsy Foundation 2010). A wind turbine with three blades would have to make a full revolution every second (or 60 revolutions per minute) to reach a frequency of 3 hertz. The Vestas-V47 wind turbine proposed for this project operates at 28.5 revolutions per minute (Appendix D, Attachment D6). This would indicate a flicker frequency created by this wind turbine at less than one-half the rates identified with photosensitivity issues.

Some data suggest that shadow flicker has the potential to cause a disorienting effect on a small segment of the population. The data also suggest that rotor rotation below 2.5 hertz can avoid such effects (BLM 2005). As stated above, the rotor speeds involved with the project would be well below this level.

Direct and Indirect Impacts

Visual

The results of the visual analysis indicate that the proposed project would be visible to the nearest receptors, particularly during winter months. However, much of the local community's viewshed is already dominated by existing vertical features. Due to obstruction proximities and densities because of trees and buildings, the local viewshed would not be substantially altered by the proposed project. In the instances where the proposed project could be viewed by the larger community, it would be similar in appearance to the region's existing communication towers. Overall, effects on the local viewshed are anticipated to be minimal.

Of the representative visual simulations, the sites with the most unobstructed view of the turbine would be: FG-V-3 Nursing Home on Old Oak Blvd, FG-V-4 Southwest General Hospital; FG-V-7 352 Waverly; and FG-V-9 University Drive (see photos above). The proposed turbine would be fairly clear from these locations. The simulation shows that the turbine would be readily seen in the foreground from some vantages and would be a prominent visual element because its light-colored surface makes it stand out against its surroundings. While the proposed turbine appears to be of similar height to other vertical features for the receptors that have partial or very obscured views of the turbine, the light coloring prevents the turbine from melding into the

existing landscape. In other locations, the turbine would be much less visible due to existing obstructions and distance, such as the view that appears in FG-V-6 Austin Road and FG-V-8 University Drive (see Appendix B, Attachment B2).

Shadow Flicker

The shadow flicker study completed for the proposed project indicated that no homes or occupied business structures outside the Fairgrounds property within the proposed turbines shadow influence would receive flickering shadows of over 30 hours per year. While some of the surrounding buildings would receive shadows, none of the offsite receptors would receive more than 11 hours of shadowing annually. Some of the Fairgrounds' buildings would receive shadow flicker, but most of these are out-buildings and do not have windows. The northern part of the track inside the grandstand would receive moving shadows year round; however, the Agricultural Society will turn off the turbine during events at the track if shadows would be an annoyance (see Appendix D, Attachment D7). The following are the closest receptors to the proposed wind turbine.

Receptor A: LifeWorks Fitness to the Southeast, 7390 Old Oak Blvd, approximately 1000, feet. Shadows would not impact this receptor.

Receptor B: 208 Eastland Road, approximately 1150 feet: Shadows would be highly diffused, to completely blocked, as the receptor is substantially blocked by multiple trees. It is possible that this receptor would receive shadow flicker during portions of mid-April and mid-August to early-September mornings with a total average of less than 5 hours of morning shadow flicker per year.

Receptor C: Fair buildings to the Northwest, approximately 650 feet: Shadows would be limited, but may be possible during portions of late-November to mid-January mornings with a total average of less than 4 hours of shadow flicker per year.

Receptor D: 142 Eastland Road, approximately 1,270 feet: Shadows would be highly diffused, to completely blocked, as the receptor is substantially blocked by multiple trees. It is possible that this receptor would receive shadow flicker during portions of mid-May through July with a total average of less than 11 hours of moving morning shadow per year.

Off-property shadow impacts would be very limited due to the distance of all the nearest receptors, with all offsite properties sites receiving less than 10 hours of shadow flicker per year, with most being blocked by existing trees. Impacts on Fairgrounds buildings would also be limited due to their locations and the fact that most structures do not have windows. The northern part of the horse racetrack that surrounds the project site would receive moving shadows year-round. Although current use of this track is very limited, if horse races or similar events were scheduled in periods of potential shadow, the Fairgrounds Board will temporarily turn off the turbine to avoid event distractions or annoyance (see Appendix D, Attachment D7). Shadow flicker effects as a result of the proposed project would not be adverse.

3.2.2.3 Noise

Noise is any unwanted, undesirable sound. It has the potential to interfere with communication, damage hearing, and, in many cases, is viewed as an annoyance. Noise can occur at different levels and frequencies, depending on the type of source and the distance away from the listener.

The standard unit for measuring sound pressure levels is the decibel. A decibel is a unit that describes the amplitude (or difference between levels) of sound, equal to 20 times the logarithm to the base 10 of the ratio of the measured pressure to the reference pressure, which is 20 micropascals. Typically, environmental and occupational sound pressure levels are measured in decibels on an A-weighted scale (dBA). The A-weighted scale de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear [i.e., using the A-weighting filter adjusts certain frequency ranges (those that humans detect poorly)] (Colby et al. 2009). Table 3-2 shows some sound pressure levels associated with common activities measured in dBA.

Table 3-2. Typical Sound Pressure Levels Measured in the Environment and Industry

Noise Source At a Given Distance	A-Weighted Sound Level in Decibels	Qualitative Description
Carrier deck jet operation	140	
	130	Pain threshold
Jet takeoff (200 feet)	120	
Auto horn (3 feet)	110	Maximum vocal effort
Jet takeoff (1000 feet) Shout (0.5 feet)	100	
N.Y. subway station Heavy truck (50 feet)	90	Very annoying Hearing damage (8-hour, continuous exposure)
Pneumatic drill (50 feet)	80	Annoying
Freight train (50 feet) Freeway traffic (50 feet)	70 to 80	
	70	Intrusive (Telephone use difficult)
Air conditioning unit (20 feet)	60	
Light auto traffic (50 feet)	50	Quiet
Living room Bedroom	40	
Library Soft whisper (5 feet)	30	Very quiet
Broadcasting/Recording studio	20	
	10	Just audible

Adapted from Table E, "Assessing and Mitigating Noise Impacts", NY DEC, February 2001.
Table 3-2 is cited in Colby et al. 2009.

For a point source such as a stationary compressor or construction equipment, sound attenuates based on geometry at rate of 6 decibels per doubling of distance. For a line source such as free flowing traffic on a freeway, sound attenuates at a rate of 3 decibels per doubling of distance. Atmospheric conditions including wind, temperature gradients, molecular absorption, and humidity can change how sound propagates over distance and can affect the level of sound received at a given location. The degree to which the ground surface absorbs acoustical energy also affects sound propagation for sources located close to the ground. Sound that travels over an acoustically absorptive surface such as grass attenuates at a greater rate than sound that travels over a hard surface such as pavement. The increased attenuation is typically about 1.5 per doubling of distance (Caltrans 2009). Barriers such as buildings and topography that block the line of sight between a source and receiver also increase the attenuation of sound over distance.

Table 3-3 provides definitions of commonly used acoustical terms.

Table 3-3. Definition of Commonly Used Acoustical Terms

Sound Measurements	Definition
Decibel (dB)	A unitless measure of sound on a logarithmic scale, which indicates the squared ratio of sound pressure amplitude to a reference sound pressure amplitude. The reference pressure is 20 micropascals.
A-Weighted Decibel (dBA)	An overall frequency-weighted sound level in decibels that approximates the frequency response of the human ear.
Maximum Sound Level (L_{max})	The maximum sound level measured during the measurement period.
Minimum Sound Level (L_{min})	The minimum sound level measured during the measurement period.
Equivalent Sound Level (L_{eq})	The equivalent steady state sound level that in a stated period of time would contain the same acoustical energy as a time-varying sound level.
Percentile-Exceeded Sound Level (L_{xx})	The sound level exceeded "x" percent of a specific time period. L10 is the sound level exceeded 10 percent of the time. L90 is the sound level exceeded 90 percent of the time. L90 is often considered to be representative of the background ambient noise level in a given area.
Day-Night Level (DNL or L_{dn})	The energy average of the A-weighted sound levels occurring during a 24-hour period, with 10 decibels added to the A-weighted sound levels occurring during the period from 10 p.m. to 7 a.m.
Frequency: Hertz (Hz)	The number of complete pressure fluctuations per second above and below atmospheric pressure.

Background Information on Wind Turbines and Noise

Operating wind turbines can generate two types of sound: first, the mechanical sound from components such as gearboxes, generators, yaw drives, and cooling fans, and second, the aerodynamic sound from the flow of air over and past the rotor blades. Modern wind turbine design has greatly reduced mechanical sound and it generally can be ignored in comparison to the aerodynamic sound, which is often described as a "swishing" or "whooshing" sound (BLM 2005).

Wind turbines produce a broadband sound; that is, the sound occurs over a wide range of frequencies, including low-frequencies. Low-frequency sounds are in the range of 20 to 100 hertz and infrasonic sound (or infrasound) is low-frequency sound of less than 20 hertz. Compared to higher frequency sound, low-frequency sound propagates over longer distances, is transmitted through buildings more readily, and can excite structural vibrations (for example, rattling windows or doors). The threshold of perception, in decibels, also increases as the frequency decreases. For example, in the frequency range where humans hear best (in the low kilohertz), the threshold of hearing is at about 0 decibel, but at a frequency of only 10 hertz, the threshold of human hearing is at about 100 decibels (Rogers 2006).

Older designs of wind turbines, particularly those in which the blades were on the downwind side of the turbine tower, produced more low frequency sound as a result of the blades passing through more turbulent air as a result of the tower blocking wind flow. Modern, upwind turbines produce a broad band sound emission that includes low-frequency sounds, but not at the levels produced by older wind turbines. A primary cause for low-frequency sounds in modern turbines is the blade passing through the change in air flow at the front of the tower and this can be aggravated by unusually turbulent wind conditions.

The University of Massachusetts at Amherst reported (Rogers 2006) on noise measurements made at four different wind turbines ranging in size from 450 kilowatts to 2 megawatts. The results indicated that at distances of no more than 118 meters (387 feet) from the turbines, all infrasound levels were below human perception levels. The report further states that there is "no reliable evidence that infrasound below the hearing threshold produces physiological or psychological effects." This lack of effects at levels below the hearing threshold was supported by a scientific advisory panel comprised of medical doctors, audiologists, and acoustic professionals established by the American and Canadian Wind Energy Associations to review wind turbine sound and health effects (Colby et al. 2009). It was also supported by the findings from Canadian and Australian government reviews of available scientific literature (CMOH 2010; Australia NHMRC 2010).

Existing Noise Conditions

Ambient noise monitoring was conducted to establish baseline sound conditions in the area of the proposed wind turbine. Ambient noise monitoring was conducted at three locations indicated in Figure 3-7 and Appendix A, Figure 10. The monitoring sites surround the proposed wind turbine site and were selected to be representative of the residential receptor areas that would be the closest to the wind turbine.

Figure 3-7. Monitoring Sites for Measuring Baseline Sound Conditions and Sound Power Output

Measurements were conducting using Larson-Davis Model 820 Type I sound level meters. Data at each site were collected between the hours of 2 p.m. on Thursday November 11, 2010 and 2 p.m. on Thursday November 12, 2010. Table 3-4 provides a summary of the baseline sound monitoring results.

Table 3-4. Summary of Baseline Sound Monitoring Results in A-weighted Decibels

Monitoring Site	Distance to Turbine Site (feet)	L_{eq} 24 Hours	Hourly L_{90} Range	Leq Daytime	Leq Nighttime	DNL
Position 1	1,100	60.2	37.6 to 51.6	61.9	49.0	61.3
Position 2	1,030	52.0	40.5 to 51.0	53.1	47.5	55.4
Position 3	1,010	51.1	36.5 to 49.7	52.2	47.8	55.2

Daytime: 7 a.m. to 10 p.m.
Nighttime: 10 p.m. to 7 a.m.
DNL = Day Night Average Sound Level.

The types of sounds consistently heard in and around the site were car and truck traffic, air conditioning units, trains with whistles, track noise from multiple tracks, and rail lines in every direction around the Fairgrounds. These trains run as much as 40 times a day and 40 times a night (PUCO 2010) with multiple grade crossings where locomotive warning horns are sounded. Other sounds heard during the field monitoring included those from commercial and industrial sources, aircraft associated with the Cleveland Hopkins Airport, insects, birds, and activities at the Fairgrounds, itself.

Noise Guidelines and Regulations

The U.S. Environmental Protection Agency (EPA) identifies noise levels necessary to protect public health and welfare against hearing loss, annoyance, and activity interference in its document, *Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety* (EPA 1974). This document recommends an exterior Day Night Average Sound Level (DNL) of 55 dBA for residential uses. However, this document contains recommendations only and the levels are not Federally enforceable. Furthermore, in 1981, the Federal Government concluded that noise issues were best handled at the State or local government level. As a result, EPA phased out Federal oversight of noise issues to transfer the primary responsibility of regulating noise to the State and local governments. However, EPA recommendations remain useful for assessing the affected environment.

EPA has also evaluated general public response to changes in noise levels. In general, an increase to ambient or average noise levels of 5 decibels would be noticeable to most people and may elicit widespread complaints. An increase of 20 decibels would likely result in vigorous community response. An increase of ambient noise levels of less than 3 dBA is usually considered minute.

The Noise Control Ordinance of the City of Berea does not place specific limits on noise, but rather states that "[n]o person shall unreasonably make, continue or cause to be made or continued, or permit a noise disturbance."

Direct and Indirect Impacts

Construction of the wind turbine will temporarily result in increased noise and vibration. Operation of the wind turbine would be a permanent source of noise until the turbine was decommissioned.

Construction of the turbine would involve the use of heavy construction including the equipment listed in Table 3-5. Table 3-5 also summarizes typical noise levels produced by this equipment. Lmax sound levels at 50 feet are shown along with the typical acoustic use factor. The acoustic use factor is the percentage of time each piece of construction equipment is assumed to be operating at full power (i.e., its noisiest condition) during construction operation and is used to estimate Leq values from Lmax values. For example the Leq value for a piece of equipment that operates at full power 50 percent of the time (acoustical use factor of 50) is 3 decibels less than the Lmax value.

Table 3-5. Typical Construction Noise Emission Levels

Equipment	Typical Noise Level (L_{max})[a]	Acoustical Use Factor	Typical Noise Level (L_{eq})[a]
Compactor (ground)	83	20	76
Dozer	82	40	78
Dump Truck	76	40	72
Excavator	81	40	77
Generator	81	50	78
Grader	85	40	81
Pickup Truck	75	40	71
Warning Horn	83	5	70
Crane	81	16	73

Source: US DOT 2006.
a. A-weighted decibel level, measured at 50 feet.

The three noisiest pieces of equipment likely to operate at the same time include a grader, a dozer, and a generator. Simultaneous operation of this equipment would result in a noise level of 84 dBA (L_{eq}) at 50 feet. Based on the assumed simple geometric attenuation of 6 decibels per doubling of distance, the noise level at the nearest residences (at about 1,000 feet) would be 71 dBA (L_{eq}). Because construction noise would be temporary and intermittent during daytime hours, no adverse effect from construction noise is expected. With regard to vibration, no highly dynamic equipment such as a pile driver would be used. Given this and the fact that residences are about 1,000 feet from the turbine site, no adverse vibration impacts from construction activity would occur.

Agricultural Society has selected the Vestas V-47 wind turbine, and it has several characteristic that reduce aerodynamic sounds levels in comparison with other and primarily older wind turbine designs. The Vestas V-47 is an upwind turbine, meaning the turbine faces into the wind and the wind encounters the rotor blades before the tower and the nacelle, which makes for quieter operations than a downwind turbine. It has relatively low rotational speeds and pitch control on the rotors, both of which reduce sound levels. Complete technical information including sound data is provided in Appendix D, Attachment D6 of this EA. Figure 3-8 shows wind turbine noise levels at a wind speed of 8 meters (26 feet) per second as a function of distance from the turbine. These levels include geometric and atmospheric attenuation.

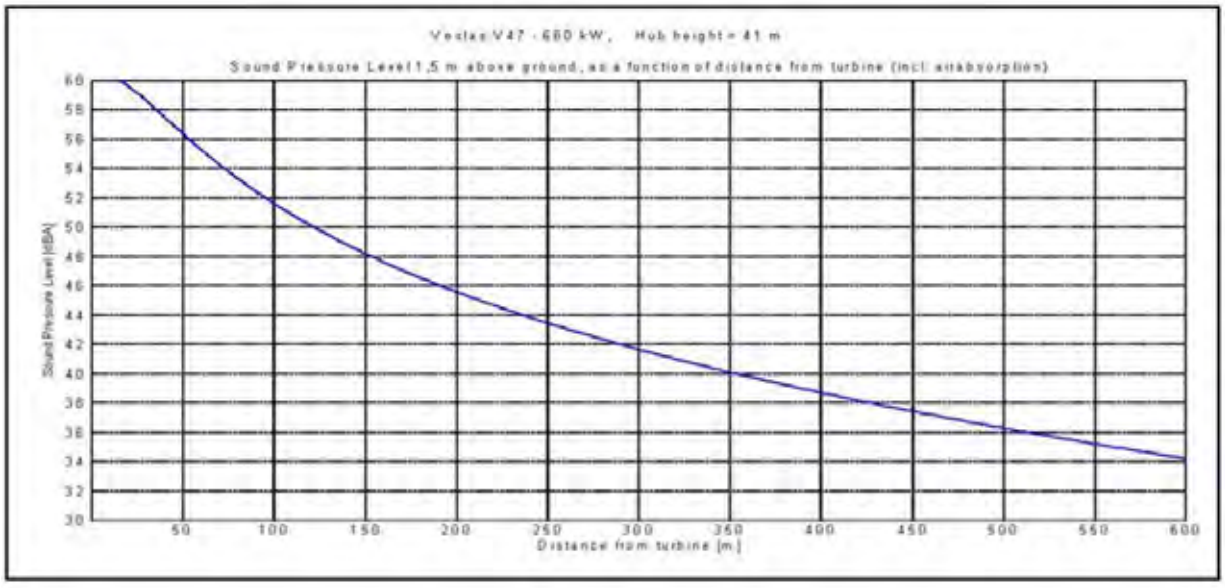

Figure 3-8. Vestas V47 Sound Pressure Level as a Function of Distance

The closest residences are about 1,000 feet from the turbine site. Based on Figure 3-8, the turbine sound level at this distance would be 41.5 dBA. DNL can be calculated from this value assuming that the turbine operates continuously over a 24-hour period. The calculated DNL value at the nearest residences would be 48 dBA.

Since the City of Berea does not have a specific limit on noise, the EPA-recommended sound level of 55 dBA (DNL) is used here. The predicted turbine sound level of 41.5 dBA is below this level.

Figure 3-7 shows that the predicted noise levels on the Fairgrounds closest to the wind turbine would be within the range of 40 to 50 dBA. Turbine sound is likely to occur on the Fairgrounds but is not expected to have an adverse effect because sound levels would be well below the speech interference level (60 to 65 dBA). Ambient noise levels (e.g., crowd noise) would likely be high and would mask turbine noise levels.

Wind turbine noise levels are expected to be at or above many of the hourly L_{90} values measured at each site. Therefore turbine sound may be audible at nearby residences. Audibility does not necessarily mean an adverse noise effect will occur. The magnitude of the increase in noise level relative to ambient noise conditions is evaluated to determine the severity of the noise impact.

An adverse noise impact is considered to occur if the wind turbine noise is predicted to increase the ambient daytime or nighttime L_{eq} value at residences by more than 3 dBA. Tables 3-6 and 3-7 summarize the noise impact analysis.

Table 3-6. Daytime Noise Impact Analysis

Site	Daytime Ambient L_{eq} (dBA)	Turbine Sound (dBA)	Daytime Ambient plus Turbine Sound	Increase (dBA)
1	61.9	41.5	61.9	0
2	53.1	41.5	53.4	0.3
3	52.2	41.5	52.6	0.4

dBA = A-weighted decibel.

Table 3-7. Nighttime Noise Impact Analysis

Site	Nighttime Ambient L_{eq} (dBA)	Turbine Sound (dBA)	Nighttime Ambient plus Turbine Sound	Increase (dBA)
1	49.0	41.5	49.7	0.7
2	47.5	41.5	48.5	1.0
3	47.8	41.5	48.7	0.9

dBA = A-weighted decibel.

The results in Tables 3-6 and 3-7 indicate that operation of the proposed wind turbine would not result in noise increases greater than 3 dBA at residences in the project vicinity. Operation of the proposed wind turbine is not expected to result in an adverse noise impact.

3.2.2.4 Cultural Resources

Cultural resources are archaeological sites, historical structures and objects, and traditional cultural properties. Historic properties are cultural resources that are listed on or eligible for listing on the National Register of Historic Places because they are significant and retain integrity (36 CFR 60.4). Section 106 of the NHPA requires that Federal agencies take into account the effects of their actions on historic properties. Section 101(b)(4) of NEPA requires a Federal agency to coordinate and plan its actions to identify any unique historic or cultural characteristics of the geographic area (40 CFR 1508.27) of the proposed project and act accordingly. Regulations for Protection of Historic Properties (36 CFR Part 800) describe the process for compliance with Section 106, including defining the APE, steps to identifying resources, evaluate effects, and consultation with interested parties including the State Historic

Preservation Officer (SHPO) and other concerned parties regarding the Federal action (Undertaking).

A Section 106 Compliance Report, *Section 106 Compliance Report for Cuyahoga County Agricultural Society Wind Energy Project* for the proposed project was prepared and submitted to DOE and the OHPO in October 2010 and is provided in Appendix E, Attachment E-2. The OHPO issued a response to the October 2010 Section 106 compliance submission on December 10, 2010 requesting additional information on the following: (1) establishment of the area of potential effect (APE) for the Undertaking; (2) inventory and evaluation efforts to identify National Register of Historic Places-eligible properties within the APE; (3) a Finding of Effect, linking the presence of historic properties within the APE with the known impacts associated with the Undertaking; and (4) determination of potential archaeological resources within the area of ground disturbance.

Consulting Party Participation

The Renaissance Group, on behalf of the Agricultural Society, conducted analyses and data retrieval for historic properties located within two miles of the proposed turbine site. This underlying data was reviewed and analyzed by a senior architectural historian who meets the Secretary of the Interior's Professional Qualification Standards (36 CFR Part 61) in architectural History, History or Archeology. The report and The Renaissance Group's underlying technical data was submitted with DOE's cultural/historical resources Section 106 consultation request to OHPO on October 29, 2010. In response to the OHPO's comments regarding the initial Section 106 submission, DOE had a certified historical architect conduct a field visit to address items 1 through 3 listed above. The results of the field survey are included in the supplemental report that was submitted to OHPO on February 1, 2011 (Appendix E, Attachment E4).

According to "Indian Entities Recognized and Eligible to Receive Services" from the U.S. Bureau of Indian Affairs in 72 FR 13648, dated March 22, 2007, there are no Federally recognized tribes in the state of Ohio. There is no Tribal Historic Preservation Officer for the State of Ohio according to the National Association of Tribal Historic Preservation Officers at: www.nathpo.org. However, DOE has provided the Notice of Scoping and NOA to a total of 24 tribal representatives that are regularly notified of Federal actions in Cuyahoga County. To date, none of the tribal representatives contacted has responded to DOE's scoping letter or the Notice of Availability (NOA) for the Draft EA. DOE will continue its outreach to these tribes by providing them with the NOA of this Final EA.

The following organizations were notified of the project through the DOE EA scoping process, were sent a full copy of the Section 106 report and all attachments and were invited to comment on the draft EA:

- Cuyahoga Department of Development
- Cuyahoga County Commissioners
- Cuyahoga County Planning Commission
- Western Reserve Historical Society
- Western Reserve Heritage Association
- Cuyahoga County Fairgrounds Board
- City of Berea

- City of Middleburg Heights
- Berea Historical Society
- Board of Trustees, The Berea Little Red Schoolhouse, Center for the Fine Arts

A complete list of public meetings and newspaper articles related to the proposed project are located in Appendix D, Attachment D3. DOE sent Notice of Scoping postcards and the NOA for the Draft EA (Appendix D, Attachment D5) to Federal, State, and local agencies to solicit comments on the scope of potential environmental issues to be examined in this EA. Discussion of the scoping process and the NOA for the proposed project is provided in Section 1.4.

Archaeological and Aboveground APEs

The direct APE is defined as the area disturbed for construction of a project. However there is no definitive rule for determining an indirect APE for a wind turbine, which can create both visual and audible effects on the adjacent properties (the aboveground APE).

Clarification of the Archaeological APE

The APE determined for archaeological resources focuses on the zone of direct ground disturbance associated with the construction of the proposed project. The installation of the proposed project would result in temporary ground disturbing activities to 1,600 square feet for the turbine foundation (ultimately a 256 square foot permanent footprint). The wind turbine foundation would extend approximately 20 feet below the ground surface.

The direct APE also includes an approximately 2,000 square foot Energy Center building that would be constructed approximately 380 feet north of the turbine site and would receive power directly from the turbine via an underground transmission line. Total excavation for the Energy Center and transmission line would be approximately 4,000 square feet. The final footprint of the Energy Center would be approximately 2,000 square feet.

Clarification of the Aboveground APE

In defining the aboveground APE, both direct and indirect effects were considered. In the initial submission to OHPO, DOE used a conservative 1-mile APE for indirect effects to potentially historic properties. This aboveground APE was developed based on previous wind turbine projects submitted to OHPO that used a 1-mile radius that considered the height of the proposed wind turbine, the surrounding topography, tree cover and urban forest in the vicinity of the proposed tower and simulated visualizations of the proposed wind turbine. Noise and flicker effects are quite localized and would not extend far beyond the Fairgrounds' property, and therefore selection of the indirect APE was based on the visual analysis. The 1- mile APE was initially selected as the maximum distance from which the turbine would be seen (see Appendix E, Attachment E2), and based on previous Section 106 consultations with the OHPO wherein 1-mile seemed acceptable. In determining the APE for indirect effects, the visual character and the setting of the surrounding area was considered, especially the presence of existing industrial towers in the viewshed. A computer-generated visual simulation of the viewshed of the proposed project as it would be viewed from public spaces was analyzed to determine an appropriate APE. This visual simulation, as well as potential impacts on the visual character of the community and the region's associated landscape, is discussed in greater detail in Section 3.2.2.2 of this EA. Based on the visual simulations prepared for the proposed project and the field survey conducted in January 2011 by the certified historian, it was determined that the proposed project turbine

would not be seen from most vantages beyond one half mile due to the developed and urban nature of the area and the urban forest. A detailed analysis of the visual impacts on historic aboveground properties in the APE can also be found in the Section 106 report and the supplemental Section 106 report found in Appendix E, Attachments E2 and E4, respectively.

The likelihood of a clear, unobstructed view of the proposed project beyond one mile is almost non-existent and is unlikely from beyond one half mile. The simulations depict that the proposed wind turbine would be small and diminishes rapidly as one travels farther away from the site. Varied topography, such as elevation changes, and other site-specific characteristics, such as power line corridors, structures associated with human development, tall towers, the tree canopy, and natural areas of dense vegetation, all serve as common visual obstructions that block expansive views of a given project site from various directions. In particular, the extent to which a single turbine dominates the landscape diminishes with distance. Based on the supplemental Section 106 analysis, the aboveground APE for the proposed project was reevaluated relying upon the onsite observations of the historian, the earlier and additional photo simulation, the APE was reduced in size. Based on the foregoing analyses, DOE defined a more-focused rectangular-shaped APE as follows: Waverly Road on the south; Eastland Road on the west; University Road on the north; and Old Oak Road on the east (Figure 3-9).

Figure 3-9. APE for Proposed Project

Identification of Historic Aboveground Properties in the APE

The Fairgrounds are located in the City of Berea, Ohio, and is effectively suburb of Cleveland. Berea has a long history independent of its larger metropolitan neighbor. It a was founded in 1836 and the community prospered in the 19th century as a stone working industrial area; and local sandstone was used in much of the city architecture. Because it is an older city, the one half -mile radius indirect APE includes thousands of pre-1960 properties, as well as numerous properties that are listed in the National Register, in the Ohio inventory, or under local landmark ordinances and private lists. Berea is historically sensitive because it has been settled by Euro-Americans for 180 years and there are many buildings that have survived from that period.

Initial 1-mile APE Properties

The old Berea downtown is located approximately 0.8 mile northwest of the fairgrounds, and all existing National Register-listed properties are within this area. Similarly, the vast majority of the properties on the Ohio Inventory are also within the old downtown. Some of the historical properties listed in these areas include: the Berea Historical Museum, sited in a home from the late 1850s; the Victorian Gothic Berea Depot built in 1876, (still a prominent landmark in downtown Berea); Baldwin-Wallace College, a Methodist university dating to the 1840s; and the Rectory for St. Adelbert Church. The old downtown includes a wide array of functional building types from the turn of the last century, including college buildings, the depot, churches, commercial buildings, and a number of older residences. The Berea Historical Society has a "Century Home" program and it installs plaques on residences that are at least 100 years old. It has placed plaques on at least 53 century-plus homes. These are all near old downtown Berea.

The character of the indirect APE is considerably different southwest, southeast, and northeast of the proposed turbine site. The area southwest of the proposed turbine site is a floodplain that historically defined the limits of the old town. There are no National Register, state inventory, or other known designated historic buildings in the southwest area. The region to the southeast is dominated by parks associated with the river. Due east of the proposed turbine site is the community of Middleburg Heights, which was incorporated in 1961, with very few pre-1960 buildings. There are two properties on the Ohio inventory that are located in Middleburg Heights, a house and a barn built in the late 1860s and located across from one another on Eastland Road, almost due south of the turbine site. The northeast is predominantly industrial and Cleveland-Hopkins Airport (the largest airport in Ohio) is several miles northeast of the proposed turbine site. No pre-1960s properties were identified.

The Renaissance Group inventoried all buildings and structures built before 1960, located within a 1.5- mile radius of the project site. A full inventory of these properties is summarized in the October 2010 Section 106 report submitted to the OHPO (Appendix E, Attachment E2).

Five properties listed on the National Register of Historic Places (NRHP) were identified within the 1-mile of the proposed project. However, all of these properties are outside the refined rectangular-shaped APE that is shown in Figure 3-9. None of the properties were found to have specific architectural elements or orientations designed to capitalize on a particular view or viewshed. The nearest NRHP property is the School House District #7 building, located approximately 0.5 miles from the project site. The view of the proposed project from the School House District #7's building would be blocked by trees and the Berea School (see Appendix B, Attachment B1 Visualization number FG-V-2).

Refined Rectangular APE

The refined APE includes a diverse group of homes, in terms of dates of construction as well as style. The oldest homes are along Eastland Road and the western edges of University and Waverly streets, with a large number of 19th Century residences located there. These are joined, however, by buildings from the 1920s as well as a substantial number of homes from the immediate post-World War II era. Seventy-four buildings within the refined APE were constructed before 1960, and therefore potentially eligible for listing on the National Register of Historic Places. Most of these properties have been modified and only three were determined to be eligible for listing in the National Register of Historic Places. The properties located at 120, 227, and 244 Eastland Road were all determined to be eligible for the national-register by the certified historian (see Appendix E, Attachment E4 for photos and eligibility characteristics).

As part of the field investigation in January 2011, research using data gathered from the Fair Board on the Cuyahoga County Fairgrounds was conducted. The historical data included reliable dates of construction and function for each of the 33 buildings at the Fairgrounds. DOE prepared an inventory and evaluation document and concluded that none of the properties within the Fairgrounds qualify for the National Register, individually or as a group (Appendix E, Attachment E4).

Identification Historic Belowground Properties in APE

There are no National Register-listed properties within the direct APE for this proposed project. The direct APE, as discussed earlier, is the area that would experience ground disturbance for installation of the turbine foundation, associated underground transmission line, and the Energy Center (approximately 4,000 square feet). There are no buildings at the site where the turbine would be constructed, and the only structure in the near vicinity is the grandstands for the racetrack. In terms of potential for buried properties (e.g., archaeological sites), the December 10, 2010, letter from OHPO indicated a need for a pedestrian survey of the immediate construction area. However, such a survey was not possible in December 2010 and January 2011 due to heavy snow cover at the site. During construction a certified archeologist will be on site to survey the area. Background research conducted as part of the supplemental Section 106 report showed little about the use of the specific site, except that it has been used by the Fair Board since the property was acquired in the 1890s. The infield area where the turbine would be installed has been used for rodeo events, concerts, demolition derbies, and other entertainment venues for more than a century. The Energy Center site would be about 300 feet from the racetrack and has been part of the Fairgrounds parcel since the 1890s.

Direct and Indirect Impacts

As discussed in Section 3.2.2.3, no eligible or listed property adjacent to the proposed project site would be adversely affected by noise above or near the local ordinance levels or above the existing ambient levels. Also, no eligible or listed property adjacent to the proposed project site would receive shadow flicker (see Section 3.2.2.2).

Based on the information provided herein and through consultation with the OHPO, no direct impacts (ground-disturbing impacts) on listed or potentially listed historic properties or cultural resource are anticipated. However, as part of the DOE's ongoing Section 106 Consultation, OHPO recommended that a Phase 1 survey be conducted within the area of ground disturbance for the Energy Center. In light of this recommendation, prior to ground disturbing activities, the

Agricultural Society has committed to a preparation of a Phase 1 survey for archaeological resources that would be conducted by a qualified archaeologist and submitted to the OHPO for their review. If archaeological resources are discovered as part of the survey, an appropriate treatment plan would be developed in consultation with OHPO in accordance with the NHPA.

Visual impacts to historic properties are diminished greatly by the three variables which affect the potential for such impact: distance from the source; intervening barriers, and the degree to which the significance of historic properties depends upon an unobstructed setting. The greatest concentration of historic properties, located in old downtown Berea, is sheltered by distance and intervening barriers, including buildings and trees. Most of the old downtown is 0.75 to 1 mile from the proposed turbine site. The areas in which the proposed turbine may be most clearly seen, a business park to the northeast, has no historic properties. The results of the Visual Simulation indicate that the turbine would be most visible within a 0.5 mile radius of the proposed turbine site and most noticeable to the hospital and business park, neither of which are historic properties. DOE's historian concluded that there were three National-Register eligible properties within the designated rectangular-shaped indirect APE. However, in OHPO's letter of concurrence issued February 10, 2011 (Appendix E, Attachment E1), it indicated that none of these three properties met the NHPA Criteria for placement on the National Register of Historic Places. Therefore, DOE has concluded that the proposed project would result in No Adverse Effect to any historic properties within the APE (Appendix E, Attachments E2 and E4).

3.2.2.5 Geology and Soils

According to the Natural Resources Conservation Service, the majority (63 percent) of the soil found within the project site consists of Mahoning silt loam and Bogart loam (see appendix D, Attachment D9). Table 3-4 shows a complete list of soils present within the project site. No soils listed by the U.S. Department of Agriculture as prime farmlands or unique or rare soils exist within the project site (see Appendix D, Attachment D9).

Table 3-8. Cuyahoga County, Ohio Project Site Soil Comparison

Map Unit Symbol	Map Unit Name	Acres in Area of Interest	Percent of Area of Interest
BgB	Bogart loam, 2 to 6 percent slopes	15.6	11.0
Ct	Condit silty clay loam	13.4	9.5
HaA	Haskins loam, 0 to 2 percent slopes	1.4	1.0
HbA	Haskins-Urban land complex, nearly level	13.3	9.4
JtA	Jimtown loam, 0 to 3 percent slopes	6.3	4.5
MgA	Mahoning silt loam, 0 to 2 percent slopes	73.1	51.7
MgB	Mahoning silt loam, 2 to 6 percent slopes	9.1	6.5
MmB	Mahoning-Urban land complex, undulating	9.0	6.4
Totals for Area of Interest		**141.4**	**100.0**

Direct and Indirect Impacts

Site preparation and project construction would result in soil disturbance. As part of the proposed project construction, approximately 2,000 square feet of current open space would be temporarily disturbed for the turbine foundation. Construction of the Energy Center and electric transmission line would temporarily disturb 4,000 square feet, with the permanent development

footprint of approximately 2,000 square feet for the Energy Center and 256 square feet for the wind turbine foundation. Overall, ground-disturbing activity would be less than 1 acre, thus would not require an NPDES Storm Water Program Permit. However, the Agricultural Society has committed to using sediment and erosion pollution control BMPs in conformance with a plan specific to the proposed project.

3.2.2.6 Biological Resources

Biological resources include native or naturalized plants and animals and the habitats that support their various life stages. Species that are considered sensitive, either under pertinent Federal or state government agencies, are specifically addressed in this section.

Project Site

The proposed project site consists of approximately 100 acres of primarily disturbed land that is mowed grass, unvegetated exposed dirt and paved areas with several outbuildings and a grandstand, all of which is regularly used for various Fairgrounds events. The greater surrounding area is mainly suburban and urban development that is part of the Cleveland Metropolitan area. However, a 12-acre isolated wooded lot is located adjacent to the proposed project site approximately 750 feet east, with other scattered trees/wooded areas located south of the project site. The wooded areas surrounding the site are not contiguous with larger wooded tracts and there are no streams within 1,000 feet.

State- and Federally Listed Species

Information regarding the potential occurrence of Federally listed species was reviewed using the USFWS Endangered Species website and a list of potentially occurring listed species for Cuyahoga County, Ohio (USFWS 2010). Species with potential to occur in Cuyahoga County include Indiana bat (*Myotis sodalis*), Kirtland's warbler (*Dendroica kirtlandii*) and Piping plover (*Charadrius melodus*).

Kirtland's warblers are known to migrate along the Lake Erie shoreline counties (Ashtabula, Cuyahoga, Erie, Lake, Lorain, Lucas, Ottawa, Sandusky counties) through Ohio in late April-May and late August-early October. The Lake Erie shoreline also provides habitat for piping plover. The project site lies over 8 miles south of the Lake Erie shoreline and does not provide suitable habitat for either of these species.

The project site lies within the range of Indiana bat and there is a known occurrence of Indiana bat approximately 4.5 miles away. Indiana bat are known to utilize wooded lots for foraging, roosting and maternity colonies. The wooded areas surrounding the site are not contiguous with larger wooded tracts and there is no riparian corridor within 1,000 feet. There is no suitable roosting or hibernacula habitat on the project site and no known or suspected hibernacula is located within 20 miles of the project site (see Appendix C, Attachment C4).

ODOW, a division under ODNR, was contacted to complete a review of the proposed project and the proposed project's potential to impact state-listed species that may occur in the vicinity of the proposed project . According to their letter regarding the proposed project dated August 27, 2010, ODNR conducts their review "by an interdisciplinary team within ODOW in accordance with its authority under the *Fish and Wildlife Coordination Act* (48 Stat. 401, as

amended; 16 U.S.C. 661 *et seq*.), NEPA, the *Coastal Zone Management Act*, Ohio Revised Code, and other applicable laws and regulations: (Appendix C, Attachment C1)

ODOW responded with information concerning the proposed project's potential impacts on wildlife species on August 27, 2010 (Appendix C, Attachment C1) and stated that the ODOW Ohio Biodiversity Database did not contain data for the project site. ODOW also determined that the project site lies within the range of the Indiana bat (both State- and Federally listed as an endangered species), and an occurrence of an Indiana bat was documented just over 4 miles away from the project site. Their letter stated that Indiana bat habitat consists of suitable trees that include dead and dying trees of the species listed below with exfoliating bark, crevices, or cavities in upland areas or riparian corridors and living trees of the species listed below with exfoliating bark, cavities, or hollow areas formed from broken branches or tops. ODOW identified the following species of trees as having relatively high value as potential Indiana bat roost trees: shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa*), bitternut hickory (*Carya cordiformis*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*), shingle oak (*Quercus imbricaria*), northern red oak (*Quercus rubra*), slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), Eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), sassafras (*Sassafras albidum*), post oak (*Quercus stellata*), and white oak (*Quercus alba*).

The project site also lies within the range of the bald eagle (*Haliaeetus leucocephalus*), a State-listed threatened species. However, ODOW determined that the Ohio Biodiversity Database currently has no records of this species near the project site.

The project site is within the range of the Canada darner (*Aeshna canadensis*), a State-Listed endangered dragonfly. This species is highly mobile and may or may not be in the vicinity of the proposed project.

The project site is within the range of the black bear (*Ursus americanus*) and the bobcat (*Lynx rufus*), both of which are State-listed endangered species. The project site is developed and is surrounded by urban and suburban uses and is not likely suitable habitat for either of these species.

The project site is within the range of the golden-winged warbler (*Vermivora chrysoptera*), a State-listed endangered bird; the king rail (*Rallus elegans*), a State-listed endangered bird; and the yellow-bellied sapsucker (*Sphyrapicus varius*), a State-listed endangered bird. The proposed project site is a developed area and is surrounded by urban and suburban uses and does not contain suitable habitat for any of these species.

Migratory Birds and Bald Eagle

The *Migratory Bird Treaty Act* (16 U.S.C. 703-7012; MBTA) implements four treaties that provide for international protection of migratory birds. The MBTA prohibits taking, killing, possessing, transporting, and importing migratory birds, their eggs, parts, and nests, except when specifically authorized by the U.S. Department of the Interior. While the MBTA has no provision for allowing unauthorized take, USFWS recognizes that some migratory birds may be taken during activities such as wind turbine operation even if all reasonable measures to avoid a take have been implemented.

Bald and golden eagles are included under the MBTA, and are afforded additional legal protection under the *Bald and Golden Eagle Protection Act* (16 U.S.C. 668-668d). In its letter dated September 18, 2009, USFWS indicated that no bald eagle nests exist within 5 miles of the project site and that the project area does not appear to support suitable bald eagle habitat (e.g., mature woods, ponds, streams). Therefore, bald eagles are not likely to regularly occur in the project area (see Appendix C, Attachment C2). In a subsequent letter from the USFWS dated September 2, 2010, they noted that an eagle nest does exist within 5 miles, but that it is approximately 4.5 miles away (see Appendix C, Attachment C3).

The proposed project site is located in an area that is predominantly developed with urban and suburban, residential and commercial development, which does generally provide highly suitable nesting habitat for migrating birds. Portions of the Audubon-designated Rocky River East Branch Important Bird Area (IBA) are approximately 1 mile west of the proposed turbine location. The Rocky River East Branch IBA runs north and south and is within the greater Cleveland area and Rocky River Reservation parklands, which are located in the municipalities of Berea, Brook Park, Cleveland, Fairview Park, Lakewood, North Olmsted, Olmsted Township, and Rocky River. The Rocky River East Branch IBA consists of the watershed for the East Branch of the Rocky River, which extends from Hinckley to North Olmsted and then north to the mouth of the river in Lake Erie near downtown Cleveland. The valuable forests and wetlands of Rocky River, Mill Stream Run, and Hinckley reservations are all part of the Rocky River East Branch IBA. The project site is closest to Mill Stream Run, located midway along the IBA, which stretches over 30 miles. Mill Stream Run is surrounded on both sides by urban and suburban development.

USFWS indicated in its letter that it one bald eagle nest is located approximately 4.5 from the proposed project site and that the project site did does not provide suitable habitat.

Vegetation

As part of the Energy Center construction it was determined that tree removal may be necessary. A Tree Survey was conducted to determine the need for tree removal and any protective measures that may be required for trees that were in close proximity to construction activities, but could be avoided (Appendix D, Attachment D10). The tree survey examined a total of seven trees that were located within or in close proximity to the construction area. Species of trees identified in this area included: three silver maple (*Acer saccharum*), two red maple (*Acer rubrum*), one river birch (*Betula nigra*), and one shagbark hickory (*Carya tomentosa*). The report noted health and vigor, size of the trees as well as their potential to be affected by construction. The large silver maple was noted to be in poor health and two of the red maples were determined to be in fair health. The remaining trees were noted as being in excellent condition.

Direct and Indirect Impacts

Federal- and State-Listed Species

ODOW indicated in the letter to the recipient that the Ohio Biodiversity Database currently has no records of bald eagle near the project site. Based on the lack of records for bald eagle near the project site, therefore the proposed project is not anticipated to affect this species. Although the project site lies within the range of the Canada darner, ODOW concluded that, due to the mobility of this species, the proposed project is not likely to affect this species. The project site

is also within the range of the black bear and bobcat. However, ODOW concluded that, due to the mobility of these species, the proposed project is not likely to have an impact on these species.

Although the project site is within the range of the golden-winged warbler, the king rail and the yellow-bellied sapsucker, ODOW concluded that, due to the location of the project site and the habitat requirements of these species, the proposed project is not likely to affect these species.

An initial letter sent to the recipient in September 2009 from the USFWS (Appendix C, Attachment C2) indicated that the proposed project would have no effect on Indiana bat based on lack of suitable habitat t the project site. In a subsequent letter sent to the DOE in September 2010 (Appendix C, Attachment C3), the USFWS indicated that although the project site did not provide suitable habitat for Indiana bat, that it was within 1,000 feet of a wooded lot, which, based on new information, may be considered suitable habitat for Indiana bat. Additional information was provided to the USFWS by the project proponent regarding the project site and specifics related to the urban nature of the area surrounding the project site and the lack of contiguous other habitat with the wooded lot, which is located approximately 750 feet east of the turbine site. In a letter received in November 2010, the USFWS concluded that, based on the additional information and due to the lack of suitable habitat on the project site and the fact that the proposed project is a single small turbine, take of Indiana bat as a result of the proposed project was extremely unlikely and the project was not likely to adversely affect this species (Appendix C, Attachment C4).

The USFWS also concluded that due to the project type, size and location, it did not anticipate any impact on the piping plover. For these same reasons, the proposed project would not adversely affect Kirtland's warbler.

Migratory Birds and Bald Eagle

Bald eagles are not anticipated to be affected by the proposed project. Additionally, as part of turbine siting, and design and installation of the Proposed Action, the Agricultural Society gave consideration to the recommendations contained within the *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (USFWS 2003) and incorporated those recommendations, including them as Project Proponent Committed Measures as appropriate, to avoid and minimize potential impacts on migratory birds and bald and golden eagles. The proposed project consists of a single wind turbine located in already disturbed and urbanized habitat. The proposed turbine design is a monopole, no external features are proposed to the design, and all electric lines would be placed underground. The area around the project site is developed and does not provide significant bird habitat nor would the proposed project fragment any such habitat. Although the proposed project site lies approximately 1 mile west of an Audubon-designated IBA, the area between the IBA and the project site is developed and does not contain suitable nesting or stopover habitat for migratory birds (with the exception of a few scattered large trees within the developed area). The proposed project would not require temporary access roads or excavation for staging areas, as the site is predominantly devoid of vegetation, including asphalt areas that are used for the fair and other venues. Aviation lighting would utilize the minimum required by FAA in order to minimize potential bird and bat impacts. Impacts on migratory birds as a result of the proposed project are not anticipated to be significant.

The USFWS concluded that the nearest bald eagle nest is approximately 4.5 miles away, but the project site did not provide high quality bald eagle habitat and that the rotor sweep of the single wind turbine was small, therefore, it did not anticipate take of bald eagles as a result of the proposed project (see Appendix C, Attachment C4).

Vegetation

All construction activities would occur on Fairgrounds property on previously disturbed areas and there would be no affects to ground vegetation. However, a total of three trees would be removed for construction of the Energy Center, including, one 41 foot tall silver maple which was determined to be in poor health would be removed prior to construction activities. Additionally, two nine foot tall red maples would be removed prior to construction activities. Two other trees were recommended for protective measures during construction, a 12-foot river birch and 26-foot shagbark hickory.

Tree removal would occur in accordance with the ODOW requirement that all trees are to be cut down between September 30 and April 1 or a mist net survey be conducted if tree removal occurs between April 2 and September 29. All other trees would be either avoided or protected during construction activities and are not anticipated to be affected as a result of the proposed project. These measures are included in Section 2.4 Applicant Committed Measures. Based on implementation of the foraging, there would be minimal impacts to vegetation would result from the proposed project.

3.2.2.7 Human Health and Safety

Workers have the potential to be injured or killed during construction, operation, and decommissioning of wind turbines through industrial accidents such as falls, fires, and dropping or collapsing equipment. Such accidents are uncommon in the wind industry and are avoidable through implementation of proper safety practices and equipment maintenance.

Collapse of a turbine or breakage (and throwing) of one or more turbine blades is possible, but both are very unlikely occurrences. Debris falling from these occurrences would likely be limited to a calculated fall zone, which is defined to approximate the area around the base of the turbine that would likely receive the tower and turbine if it were to fall. Estimates of blade throw vary, but MacQueen, et al., (1983) estimate the probability of being struck outside of the fall zone (i.e., within one blade diameter of the tower base) is about 10^{-7} per year for a fixed building, and substantially less for people who are mobile. The fall zone for the proposed project was determined to be 301 feet, well short of the nearest receptor which is approximately 940 feet to the north (see Appendix A, Figure 3).

Another potential source of accidents is ice shedding. Ice shedding, or ice throw, refers to the phenomenon that can occur when ice accumulates on rotor blades and subsequently breaks free or melts and falls to the ground. Although a potential safety concern, it is important to note that, while more than 90,000 wind turbines have been installed worldwide, there has been no reported injury caused by ice thrown from a turbine (Tetra Tech EC, Inc. 2007).

A study conducted for the National Renewable Energy Laboratory was successful in identifying damage mechanisms due to direct and indirect effects of lightning strikes on wind turbines.

Lightning strikes can cause extensive damage to the turbine blades, controllers, and power electronics (NREL 2002). However, this damage can be reduced by protection from tall nearby communication towers, integral blade protection in the form of conductors, bonding to minimize arcing, good turbine grounding, controller cable and controller shielding, and transient voltage surge suppression. The amount of lightning damage is a factor of the lightning activity in the area, the height and prominence of the turbine, the terrain, and the lightning protection system in place. According to the National Oceanic and Atmospheric Organization, Ohio has mid-range lightning activity (between 40 and 50 annual thunderstorm days).

The Agricultural Society has no plans of installing a fence around the turbine pedestal. However, during construction, the site would be secured as described in the *Turbine Use, Safety Policies and General Background* document (see Appendix D, Attachment D7). In addition, the Vestas V-47V47-660 kW does not allow opportunities for outside climbing.

Because no fuel is used in wind energy projects, there would be no process waste streams generated during operation of the wind turbine that could cause health and safety concerns. Some lubricants are used in wind turbines, including gearbox oil, hydraulic fluid, and gear grease, that require periodic replacement. These lubricants would be managed in accordance with Federal and state regulations.

According to FAA, the Cleveland Hopkins International Airport in Cleveland, Ohio, is located 2.67 nautical miles north of the project site.

The term electromagnetic fields (EMF) refers to electric and magnetic fields that are present around any electrical device. Electric fields arise from the voltage or electrical charges and magnetic fields arise from the flow of electricity or current that travels along transmission lines, collector lines, substation transformers, house wiring, and electrical appliances. The intensity of the electric field is related to the voltage of the line and the intensity of the magnetic field is related to the current flow through the conductors (wire). EMF can occur indoors and outdoors. While the general consensus is that electric fields pose no risk to humans, the question of whether exposure to magnetic fields potentially can cause biological responses or even health effects continues to be the subject of research and debate. However, wind turbines are not considered a significant source of EMF exposure since emissions levels around wind farms are low (CMOH 2010).

Direct and Indirect Impacts

No adverse public security impacts are anticipated due to the proposed project. Safety signage would be posted around the tower (where necessary); transformers and other high-voltage facilities would be in conformance with applicable Federal and state regulations and no residences or buildings that are not part of the Fairgrounds are located within the 301 foot fall zone.

All contractors, subcontractors, and their personnel are required to comply with all Federal and state worker safety requirements, specifically all of the applicable requirements of OSHA. Safety procedures specific to the Vestas V47-660 kW turbine would be observed whenever work is being done on the turbine.

The soil sample collected as part of the initial soil field and laboratory study exhibited concentrations of volatile organic compounds, semivolatile organic compounds, and metals well below Ohio Voluntary Action Plan standards. Therefore, excavation of the soils would pose no risks to contractor health or to the environment in general (PSI 2009).

The turbine system would have an automated system fault shut-off triggered at a minimum by the following sensors: System temperature, power quality, vibration, over-speed, fire and icing (vibration caused by blade icing induced imbalances would automatically shut down the turbine). This system would also automatically send fault codes to preauthorized personnel through a "Web" interface. The turbine's nacelle would have a cold-weather package including nacelle heaters. These heaters are designed to maintain nacelle temperatures above the dew-point and well above freezing. This system would automatically melt snow and ice accumulation on top of the nacelle. The turbine system would have a staff accessible emergency shut-offs. All icing related turbine shutdowns would require a direct inspection and an onsite manual restart. The site personnel and the system maintenance personnel would shut down the turbine during icing conditions. The site would adopt an ice safety zone around the turbine for implementation during icing events, if they should occur.

The FAA has issued a Determination of No Hazard to Air Navigation July 6, 2010 for the proposed project (Appendix C Attachment C6). Based on this determination, the proposed project is not anticipated to have a substantial adverse effect on the safe and efficient utilization of navigable airspace by aircraft or on the operation of air navigation facilities. Aviation lighting would be in compliance with FAA standards (FAA 2007). The proposed turbine's proximity to the Cleveland Hopkins International Airport was considered and found to be acceptable.

Based on the most current research on EMF, the turbine would have no impact to public health and safety due to EMF.

3.2.2.8 Transportation

The project site is served locally by Bagley Road, Eastland Road, and Bagley Drive. Access to the interstate transportation system is available via the nearby interchange with I–71 less than 1 mile to the west. No new access or other roads would be necessary for construction and operation of the proposed project. Construction equipment would travel to the project site via I-90 and I-71 (see Appendix D, Attachment D8).

Direct and Indirect Impacts

During the construction phase of the proposed project, a minor increase in vehicular traffic on the local roads surrounding the project site is anticipated. This traffic increase would occur for a period of approximately 6 to 8 weeks throughout the course of construction. No long-term or permanent impacts on the local transportation systems would occur as a result of this project. No new access or other roads would be required for construction and operation of the proposed project. Heavy equipment traffic would be spread through the initial construction phase and likely limited to two to three weeks of cumulative days where this type of traffic would occur (cement trucks, excavation equipment, delivery trucks and possibly a small crane). Other project traffic would be construction worker commuter vehicles such as pickup trucks and cars for

approximately 2 to 10 workers per day. No long-term or permanent impacts on the local transportation systems would occur as a result of the Proposed Action.

3.2.2.9 Socioeconomics and Environmental Justice

Executive Order 12898 (February 11, 1994) directs Federal agencies to identify and address "disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." The racial makeup of Cuyahoga County in the 2000 census was 66.7 percent white, compared to 84.7 percent for the state of Ohio as a whole, with the remainder of both populations constituting minorities. The median household income in dollars for a household in Cuyahoga County in 2008 was $44,324, compared to $48,011 for the state of Ohio as a whole. About 15.9 percent of individuals were below the poverty level in 2008, compared to 13.3 percent for the state of Ohio as a whole (Bureau of the Census 2010).

Direct and Indirect Impacts

No potential high and adverse impacts related to socioeconomics or environmental justice would occur as a result the proposed project. Therefore, there would be no disproportionately high and adverse socioeconomics- or environmental justice-related impacts on minority populations and low-income populations.

The construction of the proposed project is expected to generate short-term and small increase in employment due to temporary construction related jobs for both the wind turbine and Energy Center construction. Operation of the proposed project is anticipated to generate approximately 0 .5 full time job as most of the building operations will be volunteer driven. Additional revenue due to the presence of the wind turbine may be experienced due to both its tourist attraction and educational value.

3.2.2.10 Air Quality and Climate Change

The affected air environment can be characterized in terms of concentrations of the criteria pollutants carbon monoxide, sulfur dioxide, particulate matter, nitrogen dioxide, ozone, and lead. EPA has established National Ambient Air Quality affected environment and environmental impacts standards for these pollutants. There are two standards for particulate matter, one for particulates with an aerodynamic diameter less than or equal to a nominal 10 micrometers and one for particulates with an aerodynamic diameter less than or equal to a nominal 2.5 micrometers ($PM_{2.5}$). According to the Northeast Ohio Area-wide Coordinating Agency (NOACA 2005), Cuyahoga County, Ohio, is located in a nonattainment area for $PM_{2.5}$. The EPA has found that the "aggregate group of the well-mixed greenhouse gases" constitutes an air pollutant that contributes to climate change (EPA 2009).

Electricity is provided to the Fairgrounds by First Energy Solutions. First Energy Solutions currently has a mix of fuel sources (Table 3-9). First Energy Solutions reports an average estimated Grid Line Loss of 6.14 percent, resulting in higher realized grid power offsets for renewable energy generating sites than their actual onsite production (EPA 2010b).

Table 3-9. First Energy Fuel Mix and Emissions

Source Fuel Mix (percent)	
Coal	72.8
Oil	0.4
Natural Gas	2.7
Nuclear	22.3
Renewable	1.1

Direct and Indirect Impacts

The proposed project would essentially be an emissions-free energy generation project that would not degrade air quality. Grading and construction for the proposed project would result in short-term air quality impacts, such as dust generated by clearing and grading activities, exhaust emissions from gas- and diesel-powered construction equipment, and vehicular emissions associated with the commuting of construction workers. Emissions from construction would be minimized to the extent practicable (for example, by watering dry exposed or excavated dirt areas).

The proposed project is expected to generate approximately 861,890 kilowatt-hours per year, offsetting nearly 100 percent of electricity used by the Fairgrounds, which is currently provided by First Energy Solutions. The proposed project would not result in any adverse impacts on air quality and would reduce the reliance on and emissions from fossil fuels for electricity for the Fairgrounds. The proposed project would not require any air permits.

The information reported from the EPA's eGRID database for calendar year 2005 shows the fuel mix for the Cleveland area as 72.8 percent coal, 2.7 percent natural gas and 0.4 percent oil resulting in 75.9 percent fossil fuel use (EPA 2010a). Therefore, the project carbon reduction is calculated as follows:

> 75.9 percent fossil fuel use × 2.0562 pounds of carbon dioxide per kilowatt-hour × 861,890 kilowatt-hours per year = 1,345,511 pounds of carbon dioxide per year. The proposed project would reduce the Fairgrounds' carbon footprint by reducing its reliance on fossil fuels.

3.2.2.11 Utilities and Energy

The Fairgrounds are well served by utility infrastructure, including electric power transmission and municipal potable water and sanitary sewer. Electricity is provided to the Fairgrounds by First Energy Solutions and the Illuminating Company; municipal sewer is provided by Northeast Ohio Sewer District; and electric and solid waste removal is provided by Allied.

The National Telecommunications and Information Administration (NTIA) is responsible for managing the Federal spectrum and is involved in resolving technical telecommunications issues for the Federal government and private sector. This information aids in siting wind turbines, so they do not cause interference in radio, microwave, radar, and other frequencies, disrupting critical lines of communication. Upon submittal by a wind project proponent, the NTIA provides project specific information to the members of the Administration's Interdepartment Radio

Advisory Committee for review and comment on whether the proposed project could potentially interfere with Federal radio communication links. On August 30, 2010 DOE received a letter from American Tower Corporation, a telecommunications company that owns a tower close to the proposed project, stating that they objected to the wind turbine at the proposed location (Appendix D, Attachment D2).

A Microwave Study was performed in October 2010 for towers and radio frequency facilities licensed by the Federal Communications Commission near the proposed project site. No microwave paths of transmission of Commission-licensed facilities were found to be within the microwave path of the proposed turbine. The closest radio frequency facilities are 0.17 mile and 0.88 mile away (Appendix D, Attachment D11) owned by Verizon Wireless and Sprint Wireless, respectively.

Direct and Indirect Impacts

The electrical grid interconnect of the proposed project would be composed of the turbine's controller (contained within the turbine tower-based section), approximately 300 feet of buried 4-inch electrical conduits, including the portions of the run embedded within the turbine tower foundation, a 690- to 12,470-volt transformer, an automatic disconnect switch, a UL1741-compliant monitoring and control device and a fused disconnect within the Fairgrounds' existing switchgear. The system would also have a parallel run of 2-inch conduit for data transfer and control runs. The full system would meet all local, State, and Federal codes and regulations.

The proposed project would have a capacity of 660 kilowatts and generate approximately 861,890 kilowatt-hours per year on average, or enough electricity to supply up to 78 homes each year (DOE 2010). The energy generated from the proposed project would meet nearly 100 percent of the Fairgrounds' annual electricity needs. The proposed project is anticipated to produce a total of 17,237,800 kilowatt-hours of clean electricity for the 20-year design life of the project. The Energy Center would be directly connected to the turbine and it is anticipated that it would be powered by the proposed turbine. Alternate electric power, if necessary and all other utilities for the Energy Center would be supplied by the existing utilities serving the Fairgrounds.

The proposed project would not result in any adverse energy impacts and would reduce carbon emissions by 1,345,511 pounds of carbon dioxide per year and allow the Agricultural Society to meet its objective to reduce its carbon footprint.

On October 19, 2010 NTIA issued a letter indicating that no Federal agencies identified any concerns regarding the blockage of their radio frequency transmissions (Appendix C, Attachment C7). No microwave communications exist in the areas surrounding the proposed project site. It is not expected that the proposed project would interfere with the existing telecommunications tower located at the Fairgrounds.

Although American Tower expressed potential concerns to the siting of the wind turbine at this location, the Microwave Study did not find that there would be any direct interference with these transmitting stations.

3.3 Irreversible/Irretrievable Commitment of Resources

A commitment of resources is irreversible when its primary or secondary impacts limit the future options for a resource or limit those factors that are renewable only over long periods of time. Examples of nonrenewable resources are minerals, including petroleum. An irretrievable commitment of resources refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations. Examples of irretrievable resources are the loss of a recreational use of an area. While an action may result in the loss of a resource that is irretrievable, the action may be reversible. Irreversible and irretrievable commitments of resources are primarily related to construction activities.

For the proposed project, resources consumed during construction of the project, including labor, fossil fuels and construction materials, would be committed for the life of the project. Nonrenewable fossil fuels would be irretrievably lost through the use of gasoline- and diesel-powered construction equipment during construction. Approximately 256 square feet of land would be irreversibly committed for the wind turbine foundation and approximately 2,000 square feet for the Energy Center during the functional life of the project. The expenditure of ARRA funding from DOE would also be irreversible.

3.4 Unavoidable Adverse Impacts

Unavoidable adverse impacts associated with the proposed project include:

- Long-term loss of approximately 2,500 square feet of vegetation resulting from the construction of the tower foundation and Energy Center
- Removal of one silver maple and two red maple trees
- A minimal increase in noise levels during construction and operation
- Introduction of an additional vertical element into the existing viewshed
- Minimal shadow flicker impacts for the adjacent horse racetrack
- A risk of tower collapse within 684 feet of the tower

These impacts are both temporary, in the case of the construction noise, and long-term, in regard to the loss of vegetation, visual and shadow flicker impacts, and the risk of tower collapse. Overall, impacts of the proposed project on the environment and human health would be minimal.

3.5 The Relationship Between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

Short-term use of the environment, as the term is used in this document, is that used during the life of the project, whereas long-term productivity refers to the period of time after the project

has been decommissioned, the equipment removed, and the land reclaimed and stabilized. The short-term use of the project area for the proposed project would not affect the long-term productivity of the area. If it is decided at some time in the future that the project has reached its useful life, the turbine, tower, and foundation could be decommissioned and the site reclaimed and revegetated to resemble the pre-disturbance conditions (mowed grass). The installation of a wind turbine at this site would not preclude using the land for purposes that were suitable prior to this project.

4. CUMULATIVE IMPACTS

Cumulative impacts are those potential environmental impacts that result "from the incremental impact of the action when added to other past, present, or reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR 1508.7).

4.1 Reasonably Foreseeable Projects

DOE considered other proposed wind turbine projects for which ARRA grants have been sought in Ohio, as well as the proposed 20-megawatt offshore wind turbine project in Lake Erie anticipated to begin construction in 2012, in connection with this project with respect to potential cumulative impacts. According to the Ohio Siting Board (http://www.opsb.ohio.gov/Opsb/), there are three other proposed wind turbine projects in Ohio, all located from 130 to 210 miles from the project site. The following is a list of ARRA SEP-awarded project. Specific locations are shown in Appendix A, Figure 10. NEPA documentation related to these projects is available on the DOE Golden Field Office Reading Room website at http://www.eere.energy.gov/golden/Reading_Room.aspx.

Green City Growers Wind Development – DOE/EA-1817
(Notice of Scoping issued august 2010)
1.5-megawatt wind turbine
Inner City of Cleveland Greenhouse 55th St. and Woodland Ave, Cleveland, Ohio 44104

Archbold Area Schools Wind Energy Project – DOE/EA-1820
(Draft EA issued January 2011)
500-kilowatt wind turbine
600 Lafayette Street, Archbold, Ohio 43502

Toledo Joint Apprenticeship and Training Committee – Categorical Exclusion
(Issued February 2010)
100-kilowatt wind turbine
803 Lime City Road, Rossford, Ohio, 43460

Lincoln Electric – DOE/EA-1777
(Final EA and FONSI issued August 2010)
2.5-megawatt wind turbine
22800 St. Clair Ave, Euclid, OH

City of Toledo – EA
(Project is in the early design phase)
1- megawatt Wind Turbine at Collins Park Wastewater Treatment Facility
Toledo, Ohio

Kilowatts for Kenston – DOE/EA-1819
(Draft issued January 2011)

600-kilowatt wind turbine
9500 Bainbridge Road, Chagrin Falls, Ohio 44023

Pettisville Local Schools Wind Energy Project – DOE /EA-1818
(Draft EA issued February 2011)
500-kilowatt wind turbine
232 Summit Street, Pettisville, Ohio 43553

Each of the DOE-funded projects includes the construction and operation of a single turbine. Two are located in Cuyahoga County. The closest, Green City Growers Wind Development Project, is approximately 13 miles northeast of the Fairgrounds site, and Lincoln Electric is approximately 22 miles northeast of the site. The Kilowatts for Kenston project, located in Geauga County, is approximately 32 miles northeast of the Fairgrounds. The Cuyahoga County Fairgrounds project, Green City Growers, and Lincoln Electric all are in highly developed and urban areas. Although the Lake Erie shoreline is known to provide habitat for migrating birds, the projects do not share a major migratory bird pathway. The Archbold Area Schools and Pettisville Local Schools wind energy projects are approximately 140 miles west of the Fairgrounds site, and the Toledo Joint Apprenticeship and Training Committee and City of Toledo projects are approximately 100 miles to the west.

Kenston, Green City Growers, and the Lake Erie wind turbine projects are the nearest projects that have been analyzed for potential cumulative impacts to biological resources. The proposed offshore wind farm on Lake Erie is approximately 15 miles from the Fairgrounds and will be installed approximately 5 miles offshore. The Indiana bat would not likely fly 5 miles offshore in a vast open space such as the lake and these projects do not share a major migratory pathway for birds. The nearest non-prioritized , suspected Indiana bat hibernacula lies 7 miles east-northeast of the Fairgrounds project, near the city of Twinsburg, Ohio. The USFWS determined that the proposed project was not likely to adversely affect the Indiana bat, but it is within the overall range of migrating Indiana bats. Although impacts to migrating Indiana bats as a result of the proposed project are thought to be very unlikely, the proposed project may add to the overall small potential cumulative impact to migrating Indiana bats. The addition of the proposed project to potential cumulative impacts to migratory birds is considered very low.

4.2 Summary of Cumulative Impacts

4.2.1 GREENHOUSE GAS IMPACTS

While the scientific understanding of climate change continues to evolve, the Intergovernmental Panel on Climate Change Fourth Assessment Report has stated that warming of the earth's climate is unequivocal, and that warming is very likely attributable to increases in atmospheric greenhouse gases caused by human activities (anthropogenic) (IPCC 2007). The Panel's Fourth Assessment Report indicates that changes in many physical and biological systems, such as increases in global temperatures, more frequent heat waves, rising sea levels, coastal flooding, loss of wildlife habitat, spread of infectious disease, and other potential environmental impacts are linked to changes in the climate system, and that some changes may be irreversible (IPCC 2007).

The proposed project would not have direct greenhouse gas emissions but would result in some emissions of greenhouse gases associated with electricity from sources used to power the facility. The facility would consume 1,336,305 kilowatts of electricity per year, corresponding to 1,354,511 tons per year of carbon dioxide-equivalent emissions. There would also be small amounts of greenhouse gases emitted as a result of construction and transportation activities related to the facility.

The release of anthropogenic greenhouse gases and their potential contribution to global warming are inherently cumulative phenomena. Greenhouse gas emissions from the proposed facility are relatively small compared with the 8,026 million tons of carbon dioxide-equivalent greenhouse gases emitted in the United States in 2007 (DOE 2007) and the 54 billion tons of carbon dioxide-equivalent anthropogenic greenhouse gases emitted globally in 2004 (IPCC 2007). However, emissions from the proposed project in combination with past and future emissions from all other sources would contribute incrementally to the climate change impacts described above. At present, there is no methodology that would allow DOE to estimate the specific impacts (if any) this increment of climate change would produce in the vicinity of the facility or elsewhere.

4.2.2 VISUAL RESOURCES

None of the projects listed in Section 4.1 would present significant cumulative impacts on visual resources. Because of the small scale of each DOE-funded individual project and the distance between the proposed project and those turbines, no cumulative visual impacts from these projects are anticipated. Additionally, there would be limited visibility of the offshore wind farm from any upland vantage point due to its distance from the shoreline, and the fact it is over 15 miles distant from the proposed project precludes cumulative visual impacts. The closest communication tower is approximately 190 feet in height and is located approximately one half mile from the proposed project site. Within 3 miles of the proposed project site there are 18 vertical structures that range from 75 to 200 feet in height. Although the installation of the proposed wind turbine would provide an additional vertical structure within the viewshed, because the area is highly urbanized and developed, and because of there are so many other vertical structures in the region, there would not be a cumulative impact on the viewshed.

4.2.3 BIOLOGICAL RESOURCES

All of the DOE-funded wind turbine projects are reasonably foreseeable single wind turbine projects and have received a letter from the USFWS and ODNR indicating that the Indiana bat is not at risk as a result of the turbines individually (with the exception of the City of Toledo project, which is still in early design phase, and the Toledo Joint Apprenticeship, which was categorically excluded). ODOW and USFWS would require all of the above-referenced wind projects to consider or have considered the recommendations contained in the *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (USFWS 2003) as part of their siting, design, and installation, thereby reducing potential impacts to migratory birds and other species. The closest wind projects (Lake Erie, Green City Growers, and Lincoln Electric) do not share a known migratory bird pathway with the proposed project, and the areas between these projects consist mainly of developed and suburban land, with scattered wooded areas. The potential for cumulative impacts on migratory birds is minimal. The installation of single wind

turbines in this part of eastern Ohio would negligibly increase a potentially low cumulative impact on migrating Indiana bats.

Because of the small scale of each individual project and the sufficient distance between projects, there are no reasonably foreseeable potentially cumulative impacts.

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Cuyahoga County Fairgrounds Wind Turbine Location

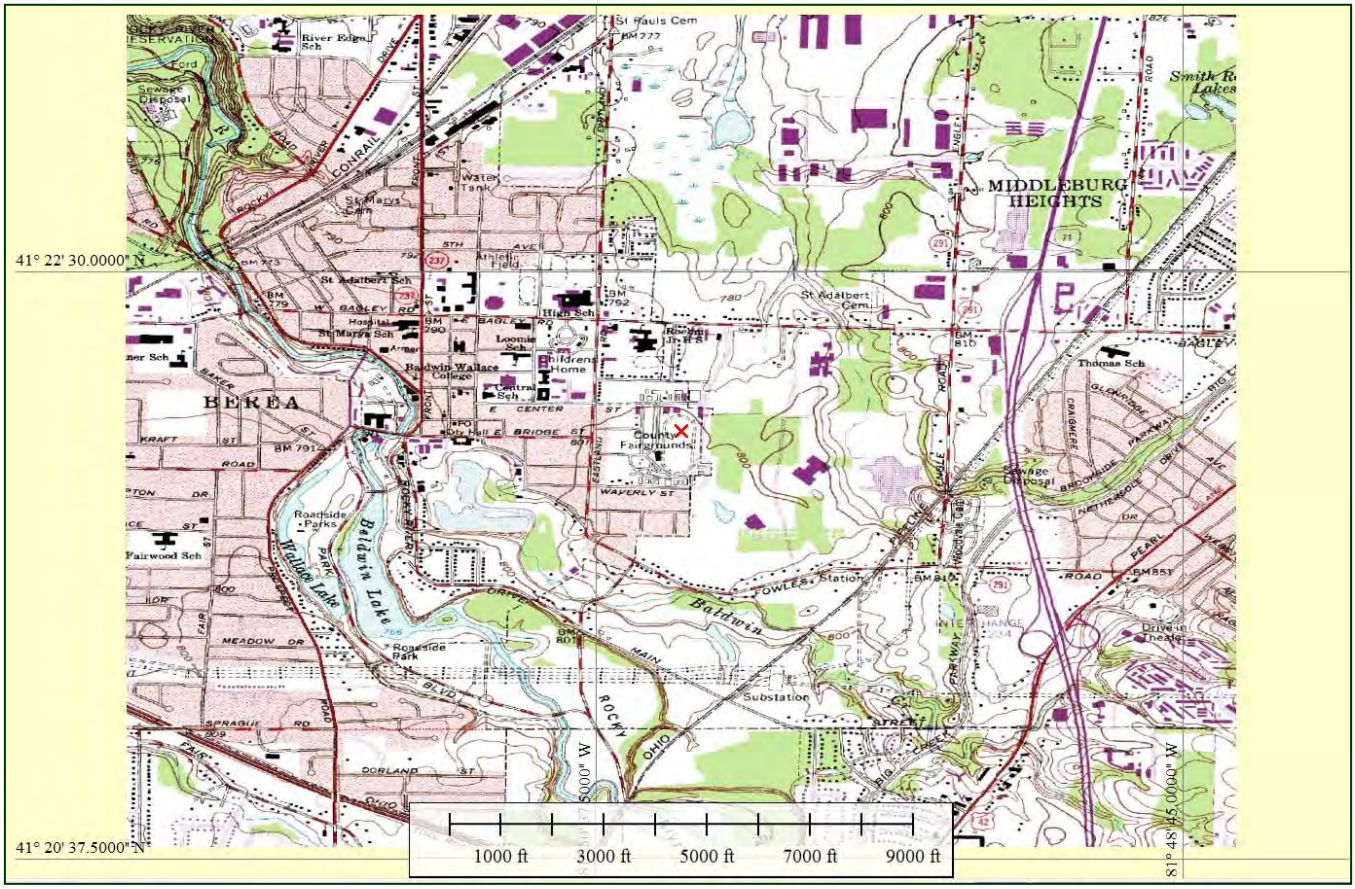


Figure 1a

USGS Berea Quad

× Wind Turbine Site Location:

Cuyahoga County Fairgrounds
164 Eastland Road
Berea, Ohio 44017

Latitude: 41.365528
Longitude: -81.229194

Elevation: 801 Feet

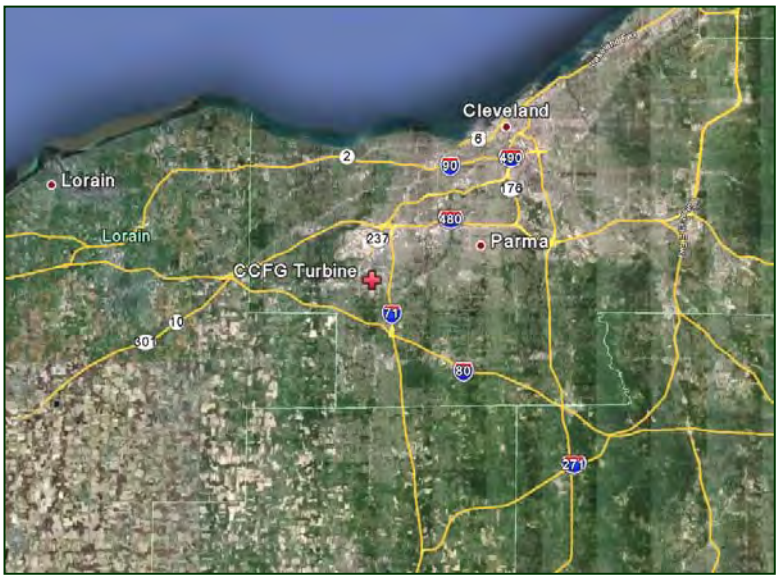
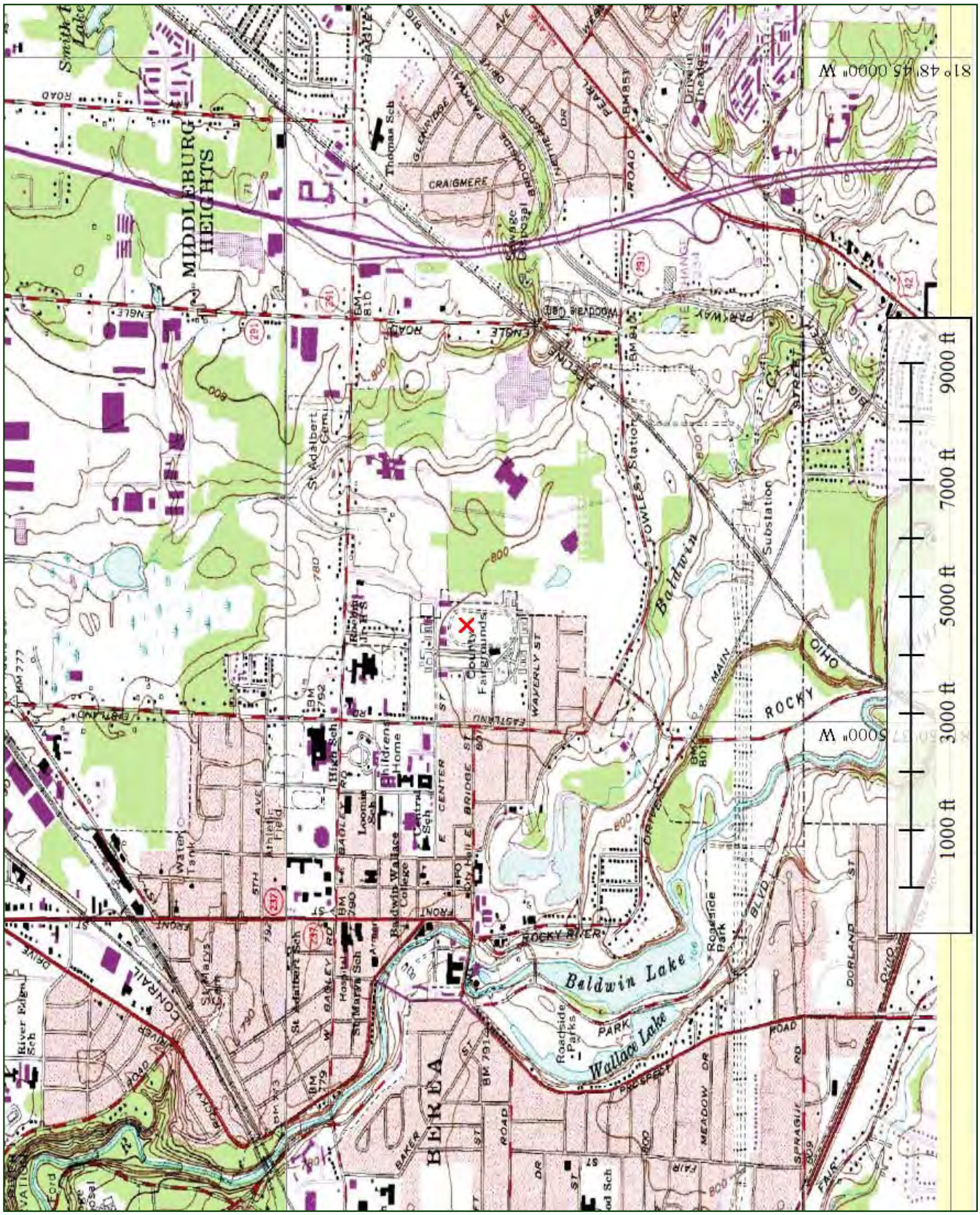


Figure 1b

Project Name: ***Cuyahoga County Fairgrounds Wind Turbine***	THE RENAISSANCE GROUP — A Conserve First Company
Source Information: *USGS, TRG Survey*	
Notes: × *Turbine Location*	Figure Name*: Turbine Location*



Project Name: ***Cuyahoga County Fairgrounds Wind Turbine***

Source Information: *USGS, TRG Survey*

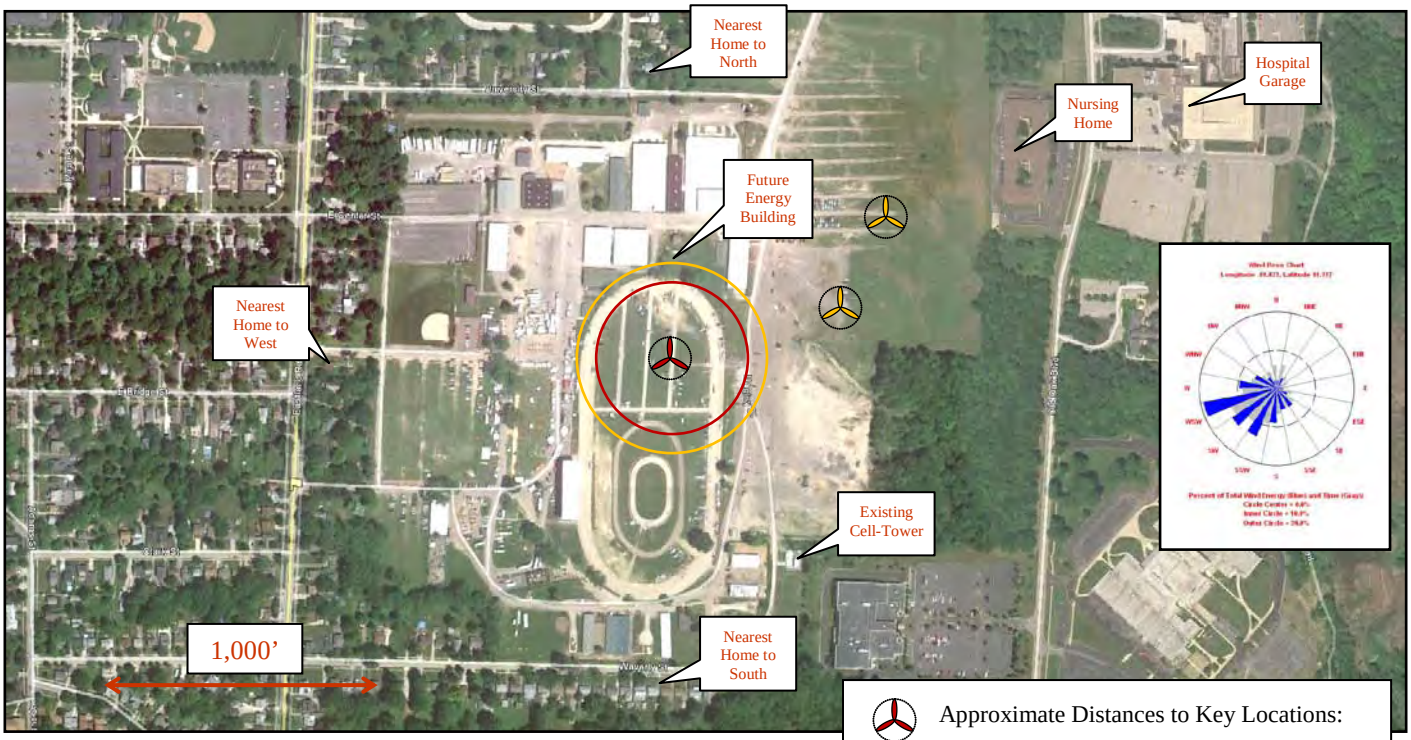
Notes: × *Turbine Location, USGS Berea Quad*

THE RENAISSANCE GROUP
A Conserve First Company
TRG

Figure 2

Figure Name*: Topographic Map*

CCFG Turbine Placement, Fall Zone and Alternate Locations



Approximate Distances to Key Locations:

- 940' to nearest property line to the North
- 1,330' to the nursing home to the Northeast
- 1,115' to nearest property line to the South
- 1,050' to nearest property line to the West
- 850' to Cell-Tower to the Southeast

Maximum Radius (1X Blade Tip Height) 274'
Maximum Radius (1.25X Blade Tip Height) 343'
Maximum Hub Height: 197'
Actual Blade Reach (Critical Fall Zone)

Proposed Turbine Location:

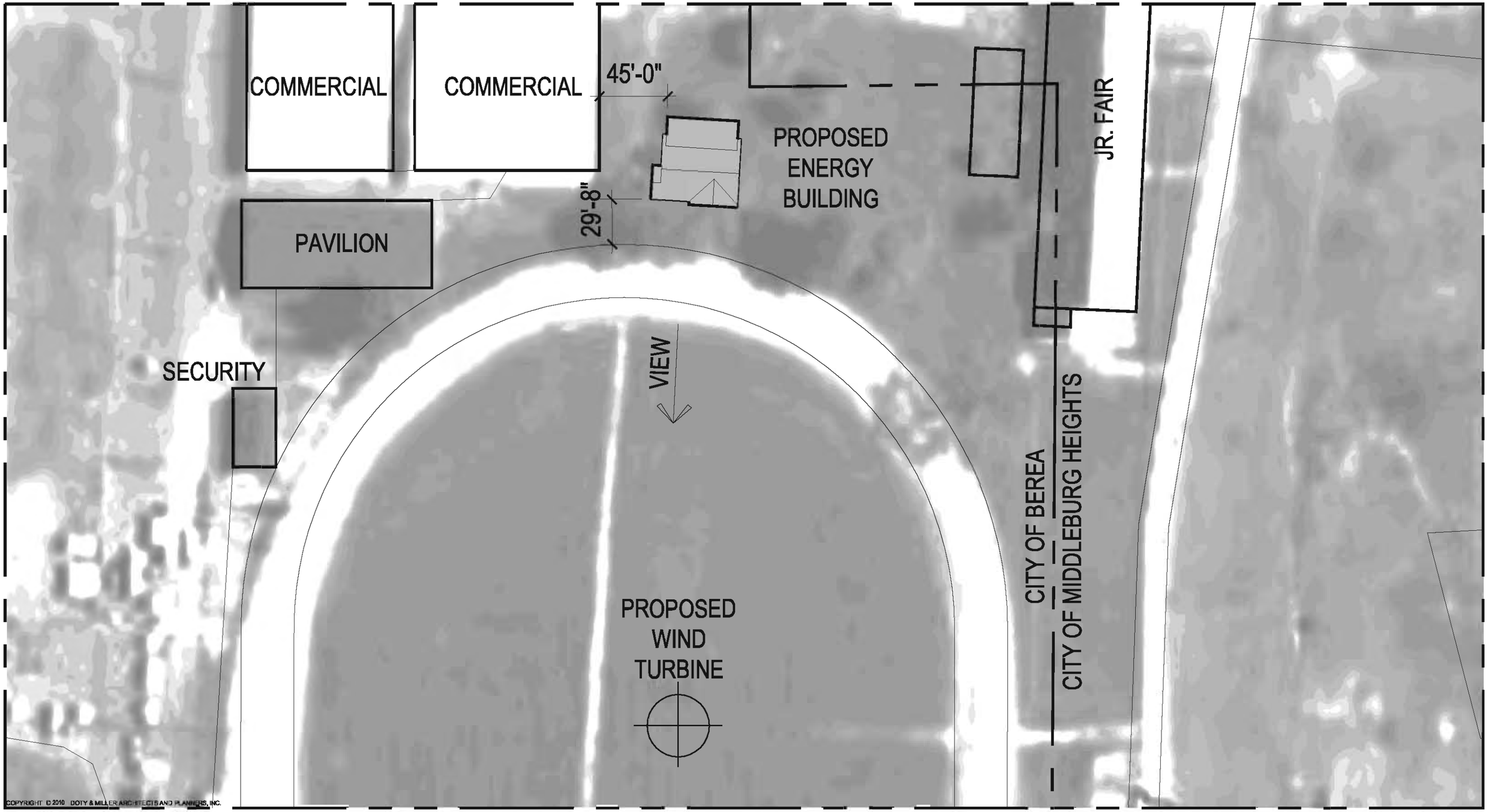
41° 21' 59.50" N
81° 50' 21.10" W
Elevation 801' (above sea-level)

Alternate Locations Considered (Declined Due To Reasons Listed):

- Closer distances to inhabited structures.
- Greater possibility for shadow flicker impacts off-site.
- Longer electrical interconnect distances.
- Although not expected to be significant for any considered site, greater chance of acoustic propagation off-site.
- Increased installation costs.
- More difficult to secure during construction.
- Closer to property lines.
- More difficult interface with future proposed energy education building

All sites are located on previously developed land and have similar benign environmental resource attributes and thus did not play into the final site selections. (Concurrence from ODNR and USFWS on selected site environmental impact.)

Project Name: ***Cuyahoga County Fairgrounds Wind Turbine***	Figure 3
Source Information: *Aerial Photo, TRG Survey*	TRG
Notes: *Turbine Location*	Figure Name: *Turbine Placement, Fall Zone and Alternate Locations*



P:\2009 Projects\09085_Cuy_County_Fairgrnds_Energy_Bldg\Construction Documents\Xref\09085_Site.dwg, 1117layout, 4/20/2010 2:31:14 PM, Kevin, CutePDF Writer.pc3

Figure 4a

Appendix A

SKETCH 2.0

Doty & Miller
ARCHITECTS

Detail Title:	Proposed Site Plan	Sheet Referenced:	SD1.00
		Scale:	1" = 60'-0"
Project:	Wind Turbine Energy Building	Notes:	
Client:	Cuyahoga County Fairgrounds	Reviewed By:	
Project #:	09085	Revised:	04-20-10
		File Name:	

600 Broadway Avenue
Bedford, OH 44146
T.(440) 399-4100
F.(440) 399-4111
www.dotyandmiller.com


Proposed Wind Turbine
Proposed Energy Building
©2010 Google

Doty & Miller Architects
600 broadway avenue
bedford, ohio 44146
tel: 440-399-4100
fax: 440-399-4111
www.dotyandmiller.com

Figure 5a
Appendix A

view of exhibit space
scale : none

600 broadway avenue
bedford, ohio 44146
tel: 440-399-4100
fax: 440-399-4111
www.dotyandmiller.com

child's view of wind turbine
view is 12'-0" from window at 4'-4" high

adult's view of wind turbine
view is from console at 5'-8" high

child's view of wind turbine
view is 8'-0" from window at 4'-4" high

Figure 5b
Appendix A

Doty & Miller Architects
600 broadway avenue
bedford, ohio 44146
tel: 440-399-4100
fax: 440-399-4111
www.dotyandmiller.com

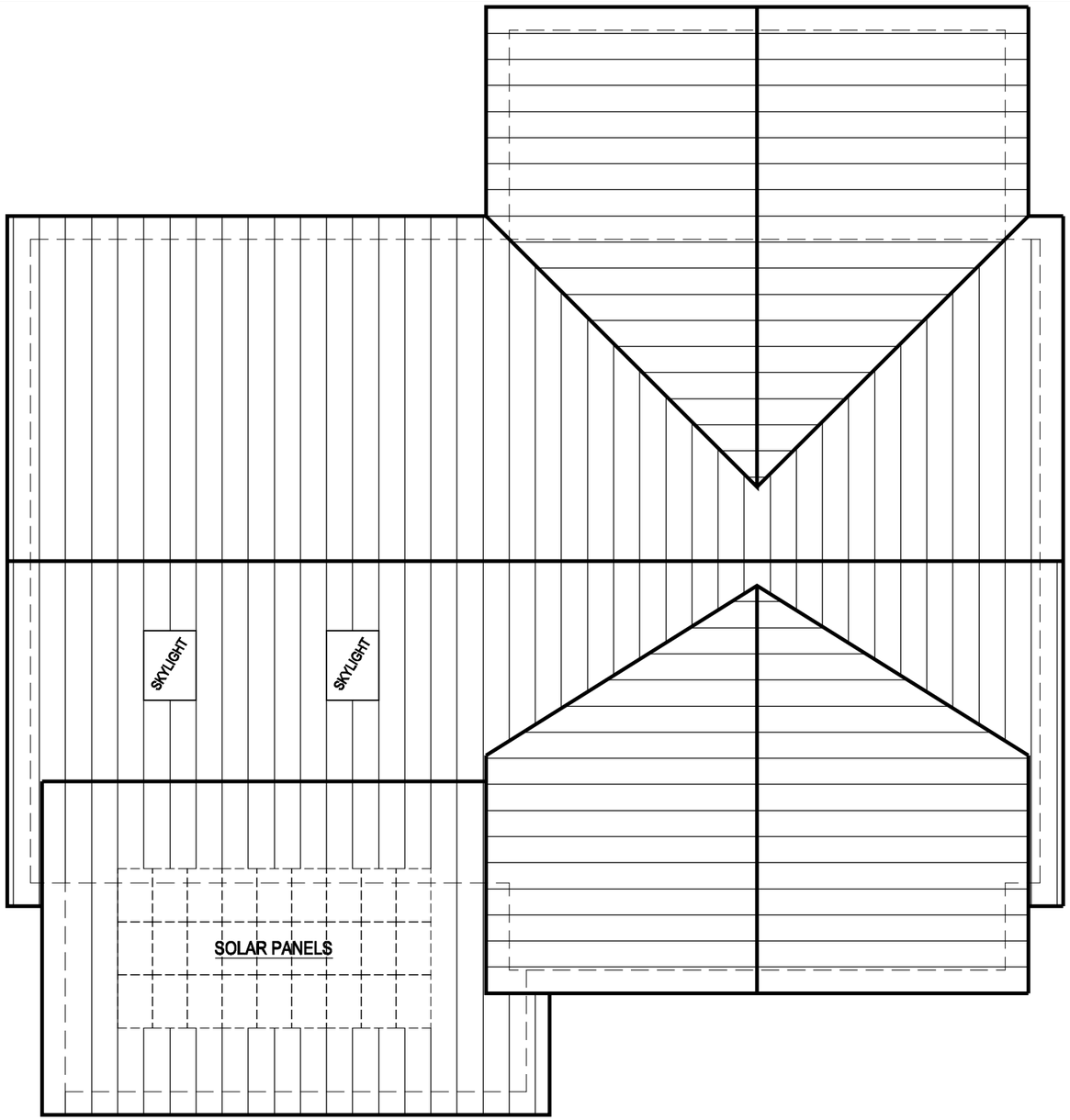
NORTHWEST ELEVATION
SCALE: 1/4" = 1'-0"
0 2' 4'

SOUTHWEST ELEVATION
SCALE: 1/4" = 1'-0"
0 2' 4'

Figure 5a

exterior elevations

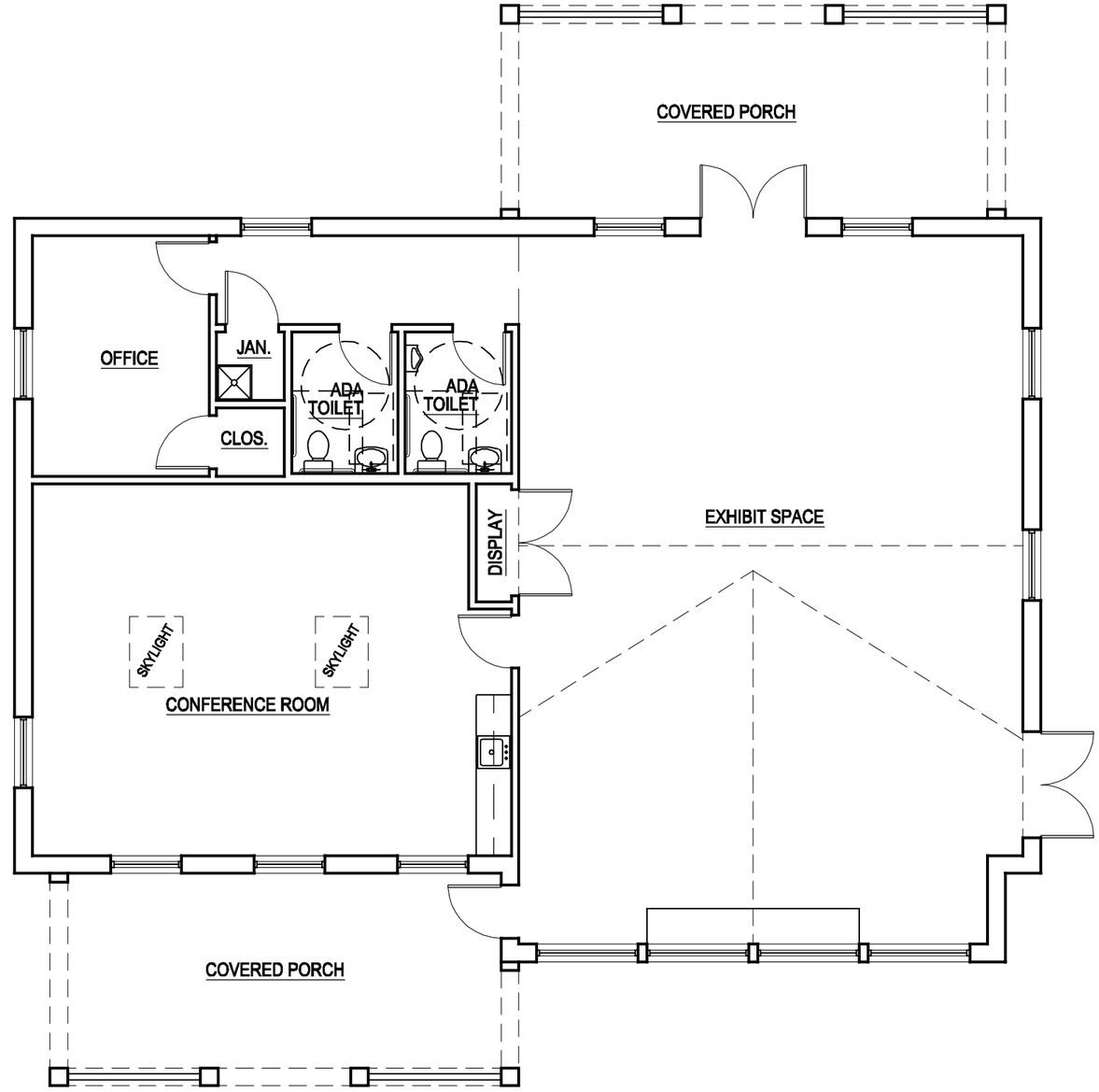
Figure 5c
Appendix A



ROOF PLAN

SCALE: 1/8" = 1'-0"

0 4' 8'



FLOOR PLAN

SCALE: 1/8" = 1'-0"

0 4' 8'

0' 4' 8' 16' 32'

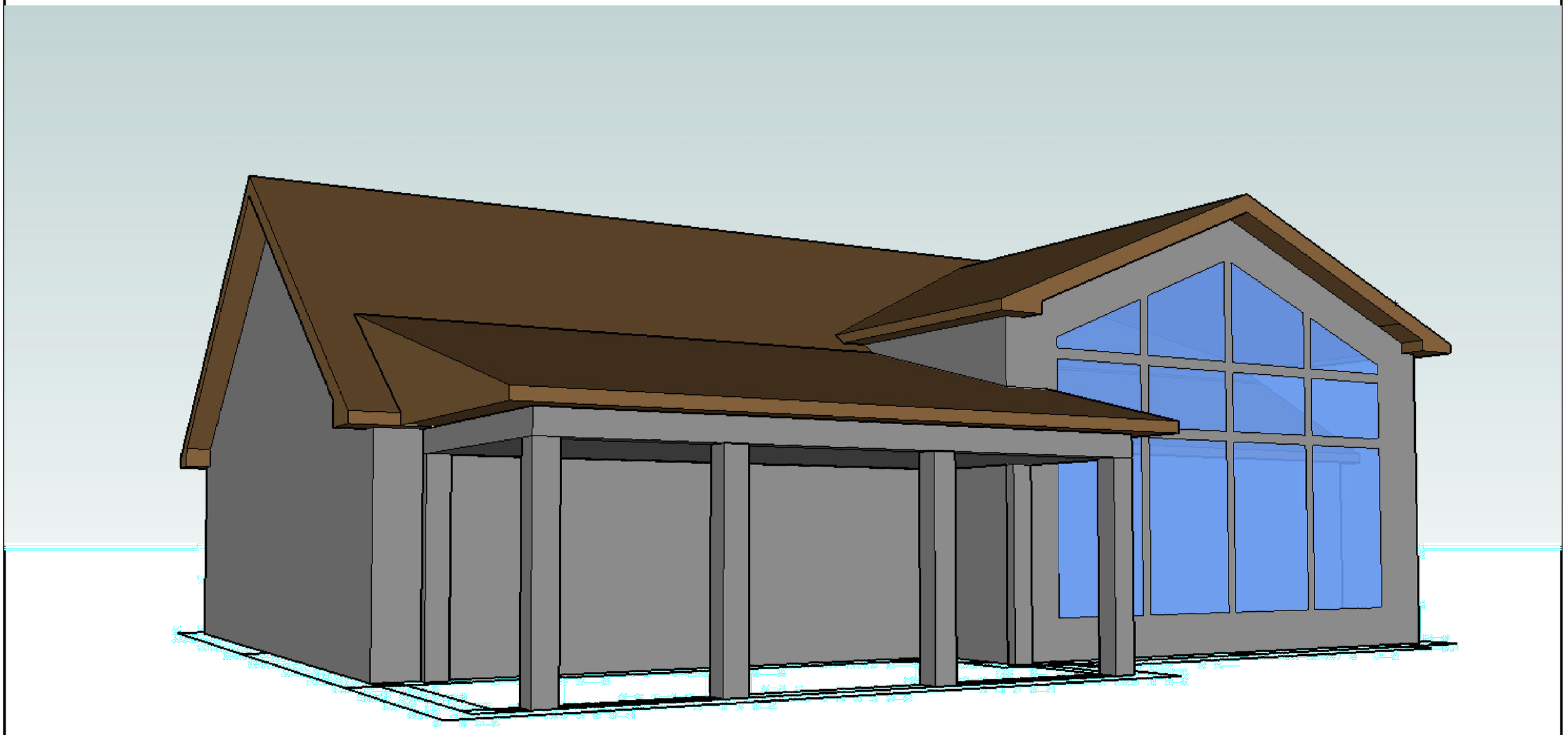
Figure 6a

Appendix A

SKETCH 1

Detail Title:	PROPOSED FLOOR & ROOF PLAN	Sheet Referenced:	A2.00
		Scale:	1/8"=1-0"
Project:	CUYAHOGA COUNTY FAIR GROUNDS ENERGY BUILDING	Notes:	
Client:	xxx	Reviewed By:	PWB/WD
Project #:	09085	Revised:	09/27/10
		File Name:	09085_Plan01.dwg

Doty & Miller ARCHITECTS
600 Broadway Avenue
Bedford, OH 44146
T.(440) 399-4100
F.(440) 399-4111
www.dotyandmiller.com



0' 4' 8' 16' 32'

Figure 6b

Appendix A *SKETCH 1*

Detail Title:	CONCEPTUAL PERSPECTIVE	Sheet Referenced:	A2.00
		Scale:	1/8"=1-0"
Project:	CUYAHOGA COUNTY FAIR GROUNDS ENERGY BUILDING	Notes:	
Client:	xxx	Reviewed By:	PWB/WD
Project #:	09085	Revised:	09/27/10
		File Name:	09085_Plan01.dwg

Doty & Miller
ARCHITECTS
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Bedford, OH 44146
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F.(440) 399-4111
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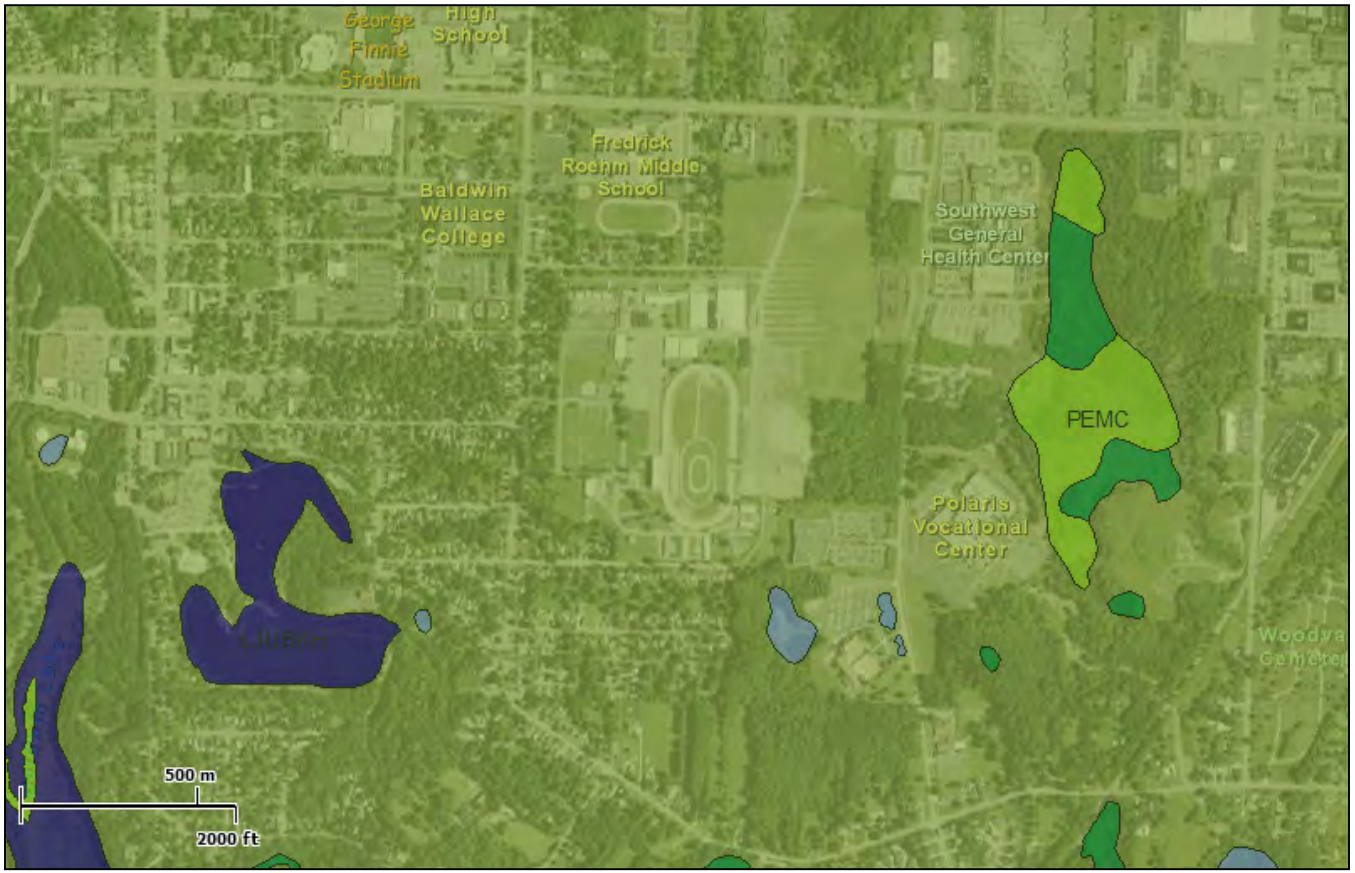
U.S. Fish and Wildlife Service

National Wetlands Inventory

Cuyahoga County

Aug 2, 2010



Wetlands

- Freshwater Emergent
- Freshwater Forested/Shrub
- Estuarine and Marine Deetwater
- Estuarine and Marine
- Freshwater Pond
- Lake
- Riverine
- Other

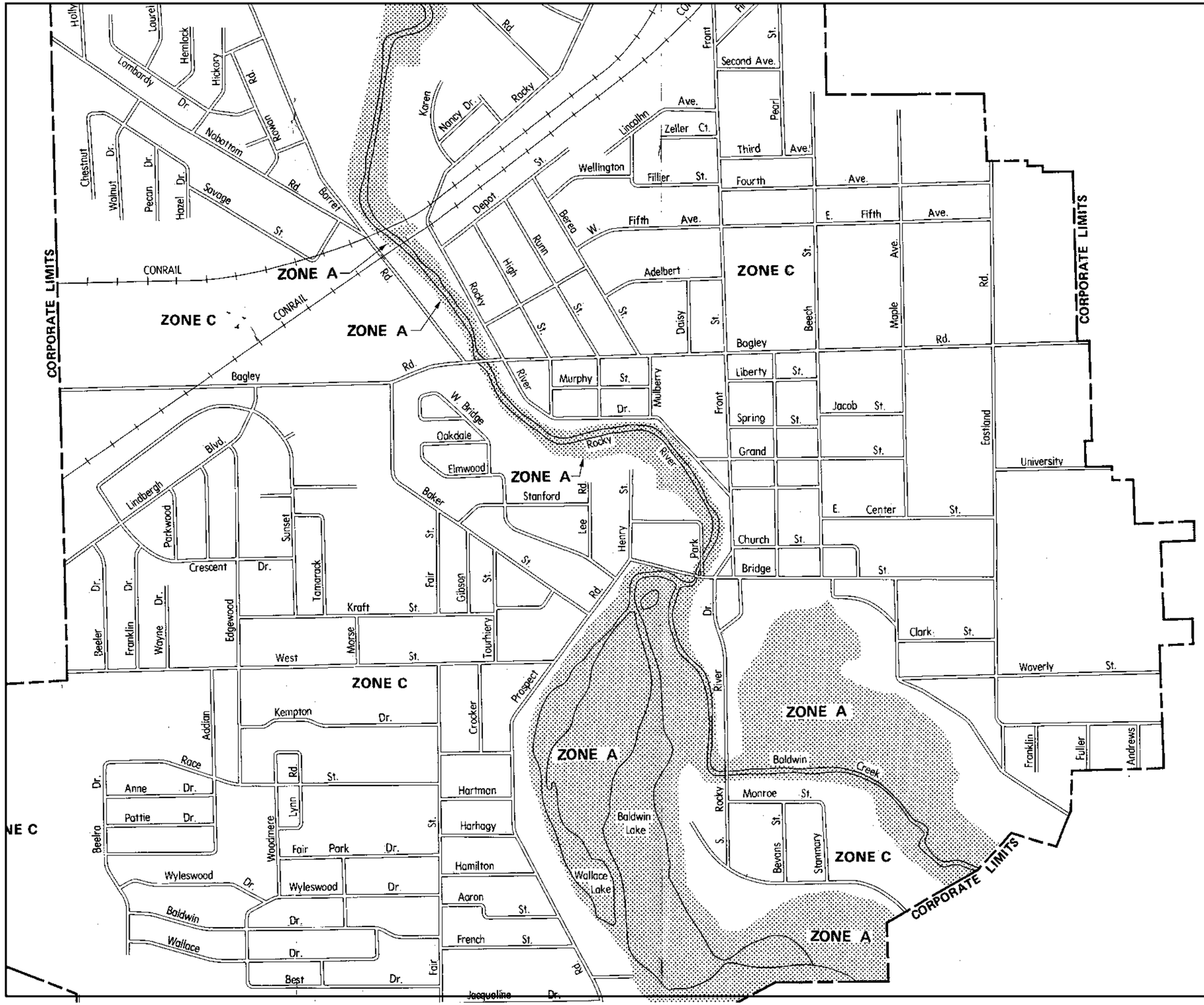
Riparian

- Herbaceous
- Forested/Shrub

Status

- Digital
- Scan
- Non-Digital
- No Data

User Remarks:



APPROXIMATE SCALE
1000 0 1000

NATIONAL FLOOD INSURANCE PROGRAM

FIRM
FLOOD INSURANCE RATE MAP

CITY OF
BEREA, OHIO
CUYAHOGA COUNTY

ONLY PANEL PRINTED

COMMUNITY - PANEL NUMBER
390097 0001 B

EFFECTIVE DATE:
JUNE 1, 1979

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
FEDERAL INSURANCE ADMINISTRATION

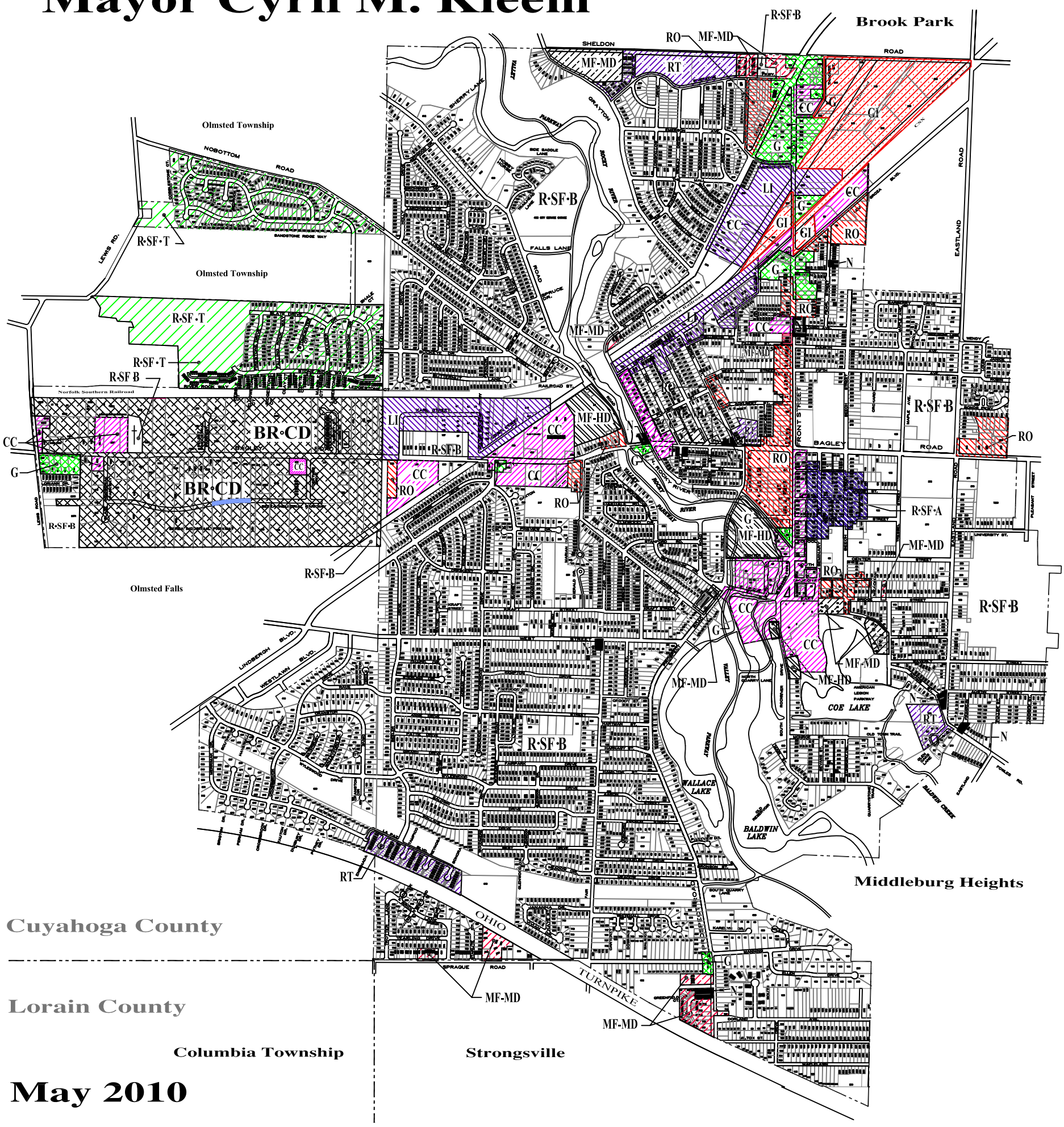
Ohio Department of Natural Resources
Natural Areas, Ohio Scenic Rivers Program
2045 Morse Road, Building C-3
Columbus, OH 43229-6693
(614) 265-6453

Ohio Scenic Rivers Program

Ohio Rivers also listed as National Wild and Scenic Rivers
Little Beaver Creek, Big and Little Darby Creeks and Little Miami River

City of Berea, Ohio

Mayor Cyril M. Kleem



May 2010

Official Zoning Map of The City of Berea

ZONING DISTRICTS

R·SF·A		Standard Single Family Residential - A District	BR·CD		Bagley Road Commercial District
R·SF·B		Standard Single Family Residential - B District	N		Neighborhood Commercial
R·SF·T		Standard Single Family Residential - T District	CC		Commercial Center
MF·MD		Multiple Family Medium Density	G		General Commercial
MF·HD		Multiple Family High Density	LI		Limited Industrial
R·O		Residence Office	GI		General Industrial
			R·T		Townhouse

NORTH

0 200 600 1000 1400 2200 3000

SCALE IN FEET

Antonio C. Armagno, P.E.
City Engineer

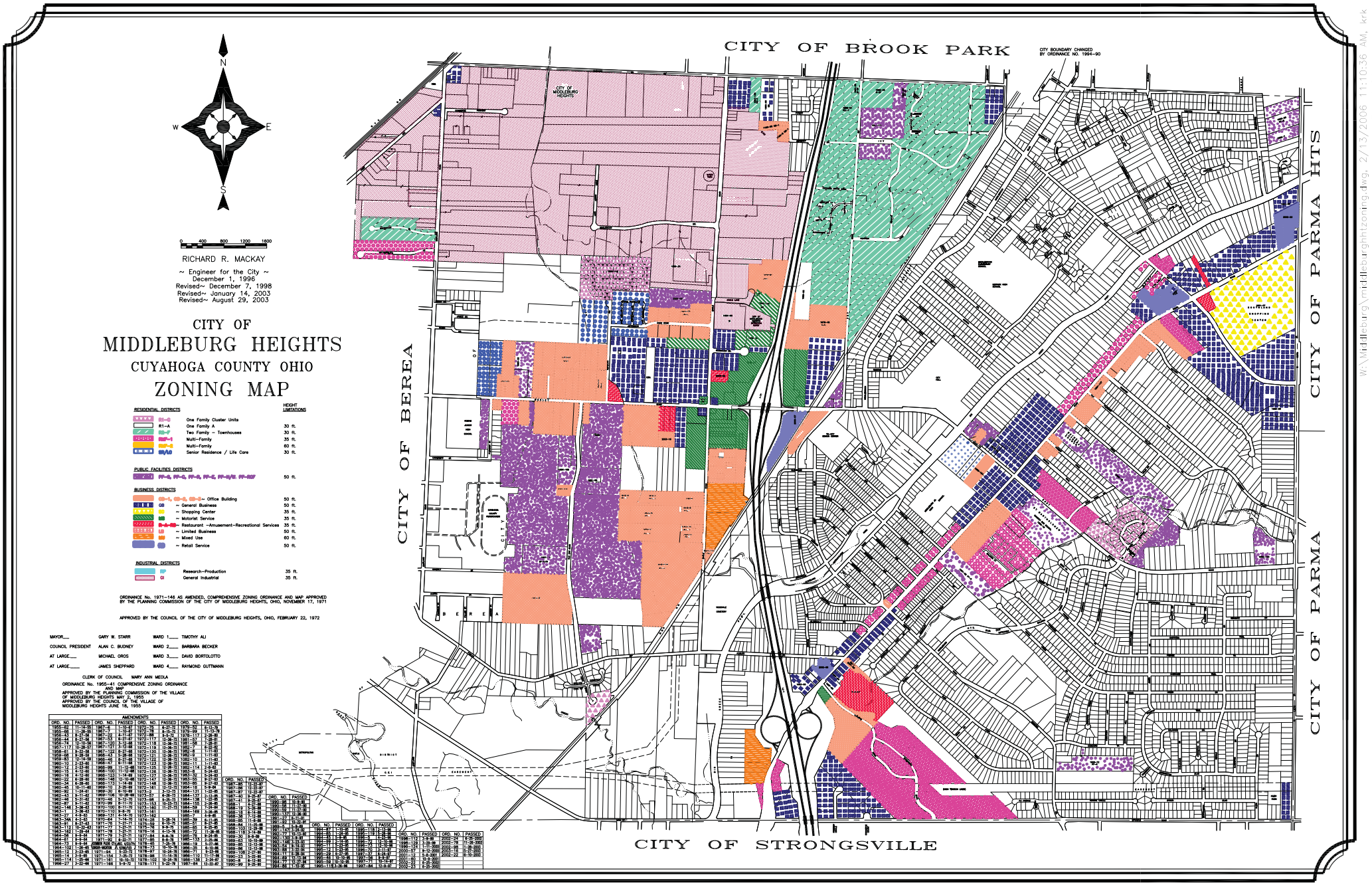
Zoning Amendments

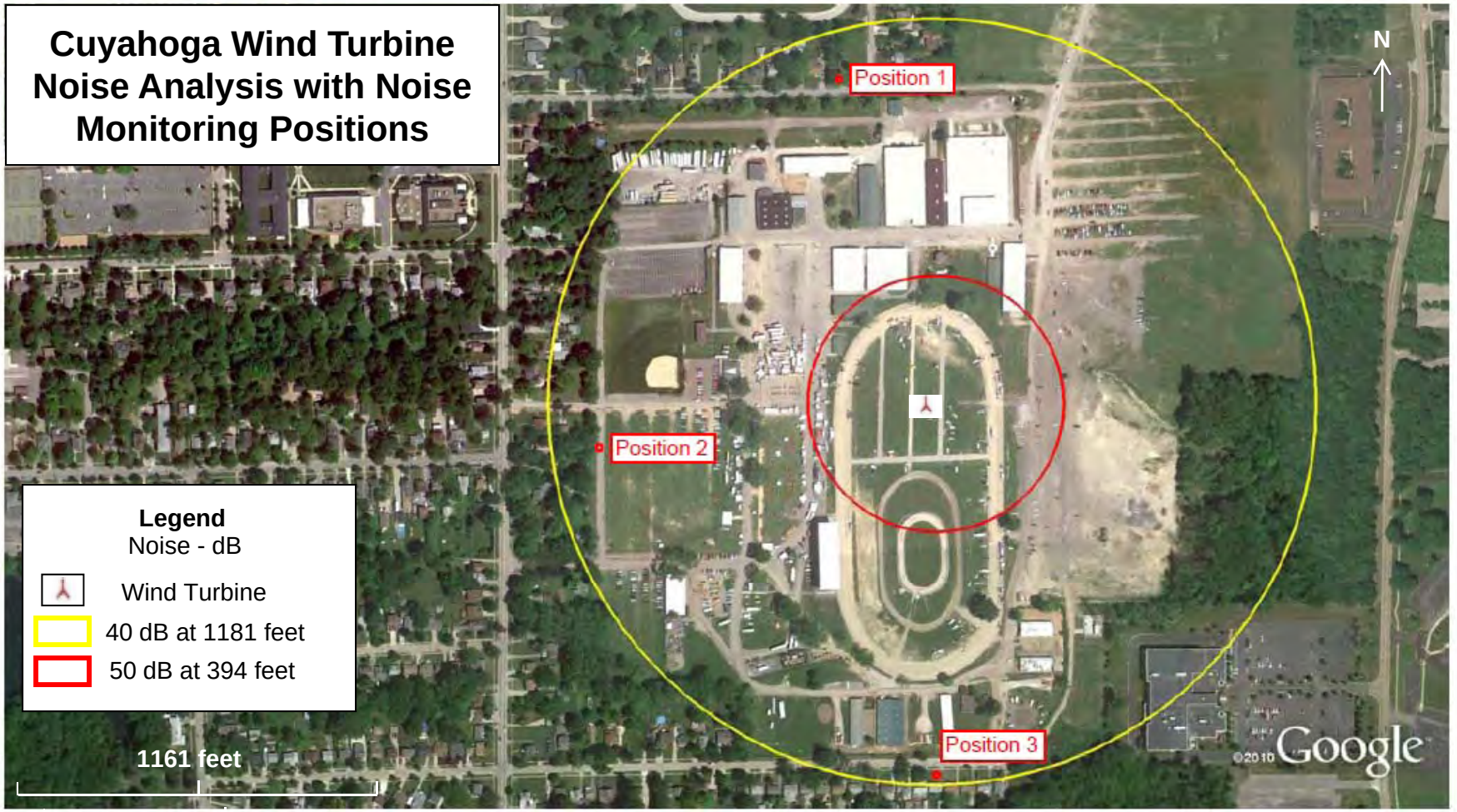
Ordinance No.	2002-37	Date	10-16-2002	Ordinance No.	2005-70	Date	12-21-2005
Ordinance No.	2002-38	Date	10-16-2002	Ordinance No.	2007-42	Date	07-10-2007
Ordinance No.	2002-46	Date	11-06-2002	Ordinance No.	2007-68	Date	11-20-2007
Ordinance No.	2002-59	Date	01-01-2003	Ordinance No.	2008-01	Date	01-08-2008
Ordinance No.	2003-25	Date	06-18-2003	Ordinance No.	2008-45	Date	08-28-2008
Ordinance No.	2003-48	Date	11-19-2003	Ordinance No.	2008-50	Date	10-02-2008
Ordinance No.	2004-20	Date	03-15-2004	Ordinance No.	2009-21	Date	04-01-2009
Ordinance No.	2004-52	Date	06-16-2004	Ordinance No.	2009-80	Date	01-21-2010
Ordinance No.	2004-64	Date	07-22-2004	Ordinance No.	2010-24	Date	05-05-2010
Ordinance No.	2005-06	Date	03-09-2005				

Mayor Cyril Kleem Date 5/06/2010

Clerk of Council Kathleen Russell Oborski Date 5/06/2010

This is to certify that this Offical Zoning Map supersedes and replaces the Offical Zoning Map adopted as part of the Zoning Code of the City of Berea.




Cuyahoga Wind Turbine Noise Analysis with Noise Monitoring Positions
N
Position 1
Position 2
Position 3
Legend
Noise - dB
Wind Turbine
40 dB at 1181 feet
50 dB at 394 feet
1161 feet
©2010 Google

ARRA SEP - Awarded Wind Turbine Projects in Ohio

Project Name: *Applicable to All Ohio ARRA Wind Turbine Projects*	THE RENAISSANCE GROUP A Conserve First Company TRG
Source Information: *TRG Survey*	
Notes:	Figure Name*: ARRA SEP – Awarded Wind Turbine Projects in Ohio*

THE RENAISSANCE GROUP

A Conserve First Company

Cuyahoga County Fairgrounds
Wind Turbine Project
Turbine Visualization and Photo Analysis

Prepared for:
Cuyahoga County Commissioners
Cuyahoga County Fairgrounds Board

Prepared by:
The Renaissance Group, a Conserve First LLC Company
AAron Godwin, Founder, AAron@ConserveFirst.com
Dick Kotapish, GIS Specialist, Dick@ConserveFirst.com
8281 Euclid Chardon Road, Suite E
Kirtland, OH, 44094
(440) 256-2800
www.ConserveFirst.com

Submitted September 2, 2010

Thank You for Choosing The Renaissance Group, a Conserve First LLC Company

Introduction

Although the visual impact of wind turbine installations is highly subjective, some people consider them a tremendous asset to their landscape and community and others say “not in my backyard”. This said, it is often beneficial to get a sense of what an installation will look like before it is installed. The actual visibility of a turbine installation is affected by many factors: the size of the machine, the number of machines, tower and blade tip heights, turbine color, distance to the viewer, obstructions such as trees, hills and buildings, atmospheric conditions, Sun angle and even the curvature of the Earth. All things considered, the overall height of a turbine, obstructions in the sightline between the viewer and the turbine and the distance between the machine and the viewer has the greatest impact. Even in open unobstructed ground very tall towers become very small in the distance and even the largest of machines can be blocked by relatively short obstructions close to the viewer. All this said, when in an open sightline in close proximity, a modern wind turbine can be an imposing or an awe inspiring presence in the view-shed pending ones point of view. In all such cases, few would argue that the turbine was not a significant element of the said view-shed. (Further understanding concerning the relative view-shed size of turbines at distance and their visibility in relation to obstructions can be viewed on the following addendums at the end of this report: Horizon View Impact Calculator, Example Turbine View Calculator, Wind Turbine Visibility Over Obstruction Tables and Sample Wind Turbine View Calculator.)

Methods

Using field surveys, mathematical modeling and stake holder interests, the study team identified representative sightline locations for actual turbine visualization studies. At these sites, precise location logs were taken with accompanying photographs toward the turbine site. Camera bearings were confirmed using detailed maps and compass bearings. The camera height above ground was approximately 68” and the tilt was maintained at zero degrees/level. The camera’s focal length was maintained at 28 mm which was entered into the rendering software and which approximates a typical person’s field of view for the camera used, or approximately 65%. WindPro 2.7, an internationally accepted wind project modeling software, was used to create the visualizations. The software uses the input data such as turbine location, viewer location, topographical baselines maps, turbine model and height, camera bearing, camera tilt and camera focal length to calculate the distance of the turbine, its perspective height, differential ground levels and Sun angles to correctly locate, scale and shade the turbine onto the base sightline photograph. The technician then verifies for scale and location using secondary plots. The technician also manually removes the portions of the turbine overlay that would be blocked by the obstruction shown in the photo that would between the viewer and the turbine.

Special consideration was given to identifying potentially historically or culturally significant view-sheds for historic buildings, sites and landscapes. This review was done in conjunction with the local Historical Society and utilizing the Ohio Historic Preservation Office database.

Panoramic photos were also taken at sample locations including the turbine installation site.

A Sony DSC-HX1 camera was used for all source imagery.

Results

See the following pages for representative turbine visualizations. Due to local obstruction proximities and densities to typical sightlines such as trees and buildings, much of the community will not be able to see the turbine.

No historical or cultural site view-sheds were found that would be significantly impacted by the turbines installation.

For sites not modeled, the Report's included "Visualization Tables" can be used to determine approximate turbine visibility in relationship to viewer obstructions. A "Sample Wind Turbine View Calculator" has also been developed to mathematically model locations of concern upon community request, a sample of which is included in this report.

Fairgrounds Visualizations

Set Number	Picture Number	Distance from Turbine (miles)	Site Description	Latitude	Longitude	Direction
1	1388	1.24	Berea Union Depot	41° 22' 51.12" N	81° 51' 15.93" W	140°
2	1418	0.40	Berea District 7 School	41° 22' 20.93" N	81° 50' 28.07" W	165°
3	1427	0.26	Nursing Home on Old Oak Blvd	41° 22'06.09" N	81° 50' 05.06" W	246°
4	1434	0.39	Southwest General Hospital Parking Garage	41° 22' 08.65" N	81° 49' 56.40" W	247°
5	1441	0.41	Quadax	41° 21' 41.89" N	81° 50' 09.39" W	335°
6	1448	0.34	Corner of Austin & Andrew	41° 21' 43.62" N	81° 50' 22.86" W	4°
7	1480	0.27	352 Waverly	41° 21' 48.35" N	81° 50' 28.78" W	24°
8	1499	0.25	211 Eastland	41° 21' 59.93" N	81° 50' 38.87" W	84°
9	1516	0.15	University Drive	41° 22' 09.11" N	81° 50' 21.33" W	181°
10	1518	0.37	Bagley Road - Fairgrounds Entrance	41° 22' 19.22" N	81° 50' 11.77" W	202°
11	1733	0.67	Coe Lake	41° 21' 49.26" N	81° 51' 04.65" W	70°
12	1515	0.45	Corner of Eastland and Bagley	41° 22' 21.00" N	81° 50' 37.94" W	148°
13	1505	0.71	Corner of Front Street	41° 22' 01.11" N	81° 51' 10.85" W	90°

Proposed Site Panoramic Photos Looking Out

Looking North

Looking East

Looking South

Looking West

Turbine View Visualizations

FG-V-1

Berea Union Depot
Turbine not Visible

FG-V-2

Berea District 7 School
Turbine not Visible behind Trees

FG-V-3

Nursing Home on Old Oak Blvd

FG-V-4

Southwest General Hospital Parking Garage
Image taken from top of Parking Garage (49’ off of Ground)

FG-V-5

Quadax off of Old Oak Blvd
Turbine not Visible behind Trees

FG-V-6

Corner of Austin & Andrews
Blades Visible between two homes

FG-V-7

South by Southwest, Typical Yard, Off of Waverly

FG-V-8

211 Eastland
Blades visible behind Trees

FG-V-9

University Drive

FG-V-10

Bagley Road Fairgrounds Entrance
Turbine not Visible behind Trees

FG-V-11

Coe Lake

FG-V-12

Corner of Eastland and Bagley
Turbine not Visible behind Trees and Built Structures

FG-V-13

Corner of Front Street
Turbine not Visible behind Trees

Downtown Berea

Example Images of Other Regional Tall Structures

Tower on Fairgrounds Property

Fairgrounds Grandstands

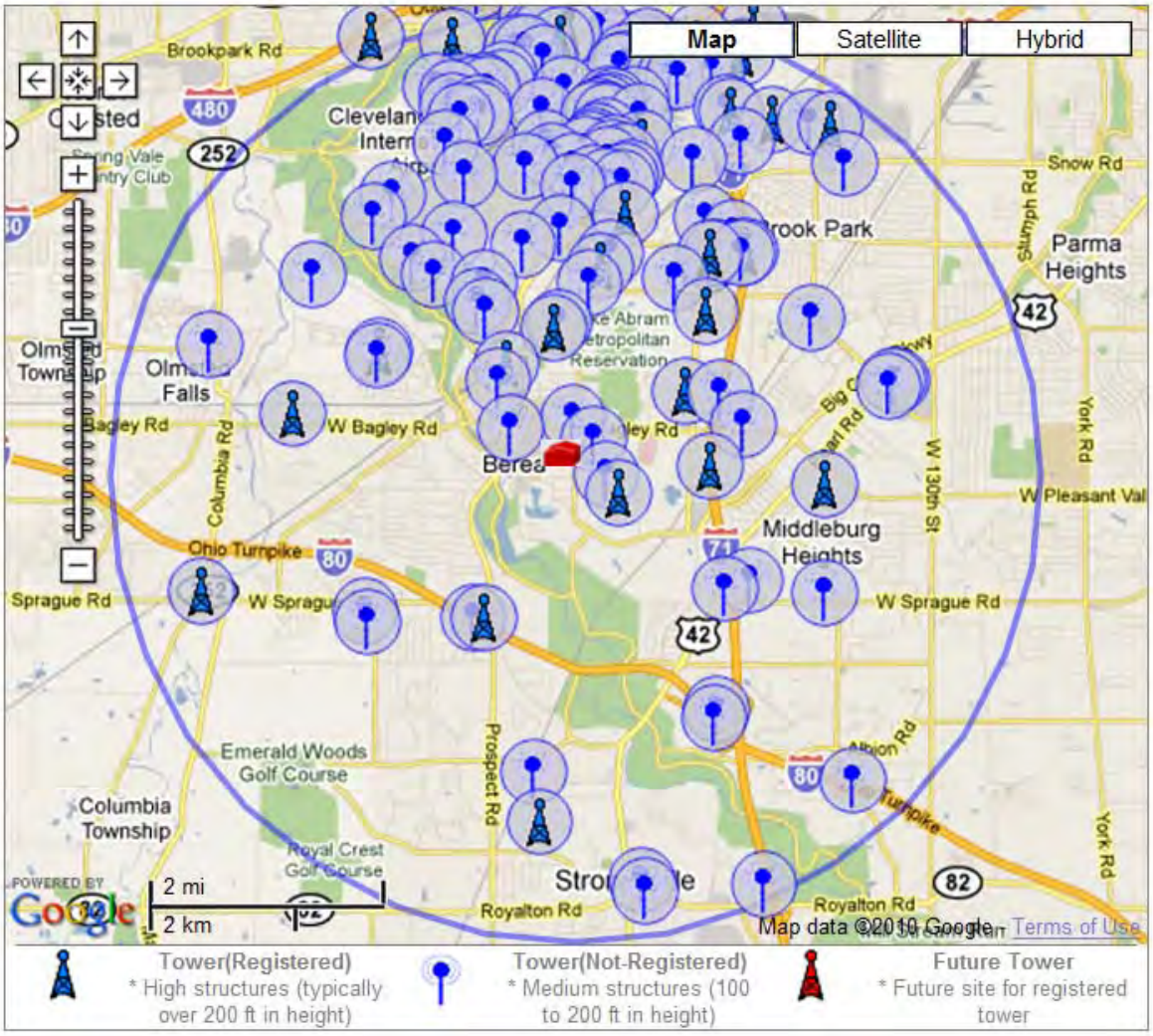
Baldwin Wallace Skystream Wind Turbine

Other Local Towers

(Also See Tall Tower Tables Below)

Existing Tall Towers Within 4 Miles of The Proposed Turbine Site

- **Tower Structures - (194 Eastland Rd, Berea, OH 44017)**



	Registered Towers		
1	New Par	190 feet	.44 miles
2	Norfolk Southern Railway Company	75 feet	1.14 miles
3	Sbc Tower Holdings Llc	107 feet	1.17 miles
4	Crown Castle Gt Company Llc	139 feet	1.29 miles
5	Stc Two Llc	170 feet	1.36 miles
6	Ohio Turnpike Commission	141 feet	1.46 miles
7	New Par	160 feet	1.64 miles
8	New Cingular Wireless Pcs, Llc	202 feet	1.84 miles
9	Spectrasite Communications, Inc. Through American Towers, Inc.	101 feet	2.08 miles
10	City Of Brook Park	105 feet	2.20 miles
11	Crown Castle Gt Company Llc	149 feet	2.26 miles
12	Stc Two Llc	128 feet	2.36 miles
13	Stc Two Llc	130 feet	2.46 miles
14	Mobilitie Investments Ii, Llc	125 feet	2.56 miles
15	Norfolk Southern Railway Company	43 feet	2.66 miles
16	Sba Properties, Inc.	200 feet	2.71 miles
17	Stc Two Llc	129 feet	2.98 miles
18	Sbc Tower Holdings Llc	137 feet	3.22 miles
19	Ullrich, Jonathan	42 feet	3.38 miles
20	New Par	155 feet	3.41 miles
21	Tower Assets Newco Iii, Llc	43 feet	3.43 miles
22	New Par	54 feet	3.44 miles
23	Stc Two Llc	82 feet	3.53 miles
24	New Cingular Wireless Services, Inc	80 feet	3.60 miles
25	Stc Two Llc	95 feet	3.68 miles
26	New Cingular Wireless Services, Inc	145 feet	3.76 miles
27	Norfolk Southern Railway Company	39 feet	3.93 miles
28	New Par	140 feet	3.98 miles
29	T-mobile Central Llc	166 feet	4.00 miles

Non-Registered Towers			
1	Mr. Jim Yates	200 feet	.30 miles
2	Blank	70 feet	.34 miles
3	Blank	70 feet	.45 miles
4	Ameritech Wireless Communciatons, Inc.	113 feet	.77 miles
5	Northcoast Communications Llc	139 feet	1.10 miles
6	22218-ib-27	100 feet	1.20 miles
7	Sobota, James	80 feet	1.51 miles
8	Ohio Turnpike Commission	135 feet	1.54 miles
9	Blank	70 feet	1.59 miles
10	Gte Mobilnet Of Ohio	161 feet	1.61 miles
11	Blank	70 feet	1.69 miles
12	Northcoast Communications Llc	146 feet	1.75 miles
13	Voicestream Wireless	120 feet	1.76 miles
14	Ameritech New Media Enterprises	100 feet	1.76 miles
15	Medina Supply Company	65 feet	1.77 miles
16	Blank	70 feet	1.82 miles
17	Surenergy, Llc	317 feet	1.87 miles
18	Itt Corporation	30 feet	1.92 miles
19	Cellular One Technical Operations	150 feet	1.94 miles
20	Sprint Pcs	124 feet	2.14 miles
21	Cleveland Airport System	23 feet	2.24 miles
22	Brookpark, City Of	114 feet	2.25 miles
23	Brook Park Land Development Co	28 feet	2.25 miles
24	Blank	70 feet	2.26 miles
25	Cleveland Hopkins Intl Airport	49 feet	2.30 miles
26	Continental Airlines Inc.	64 feet	2.30 miles
27	Northern Ohio Cellular Telephone Co	195 feet	2.31 miles
28	Blank	105 feet	2.31 miles
29	At&t Wireless Services	200 feet	2.32 miles
30	Ameritiech Wireless Comm Inc	185 feet	2.33 miles
31	Brookpark, City Of	80 feet	2.39 miles
32	Department Of Port Control	50 feet	2.40 miles
33	Itt Corporation	42 feet	2.40 miles
34	Blank	70 feet	2.41 miles
35	Tower Assets Newco Iv, Llc	165 feet	2.42 miles
36	Brookpark, City Of	215 feet	2.42 miles
37	American Tower-schaumburg, Il	166 feet	2.44 miles
38	National Weather Service	30 feet	2.46 miles
39	Department Of Port Control	45 feet	2.47 miles
40	Blank	70 feet	2.48 miles
41	Cleveland Hopkins International Airport (cle)	90 feet	2.49 miles
42	Department Of Port Control	45 feet	2.52 miles
43	Cleveland Hopkins International Airport	50 feet	2.53 miles
44	United Airlines - Trent Surles	60 feet	2.53 miles
45	Department Of Port Control	45 feet	2.56 miles
46	Itt Corporation	56 feet	2.56 miles
47	City Of Cleveland Dpc	52 feet	2.59 miles
48	Department Of Port Control	45 feet	2.59 miles
49	Faa Ani-480	45 feet	2.60 miles
50	Department Of Port Control	45 feet	2.63 miles
51	Department Of Port Control	45 feet	2.69 miles
52	Nextel West Corp	94 feet	2.71 miles
53	Ford Motor Land Ser Corporation	125 feet	2.72 miles
54	Northcoast Communications	127 feet	2.72 miles
55	Department Of Port Control	45 feet	2.80 miles
56	Cleveland Airport System - Dept Of Port Control	100 feet	2.80 miles
57	Cleveland Airport System - Dept Of Port Control	100 feet	2.81 miles
58	Department Of Port Control	45 feet	2.82 miles
59	City Of Clev	792 feet	2.84 miles
60	Cingular Wireless-gd	190 feet	2.85 miles
61	Cleveland Airport System - Dept Of Port Control	65 feet	2.87 miles
62	Cleveland Airport System - Dept Of Port Control	65 feet	2.89 miles
63	Nextel West Corp	120 feet	2.90 miles
64	City Of Brookpark	40 feet	2.91 miles
65	Department Of Port Control	50 feet	2.91 miles
66	Cleveland Airport System - Dept Of Port Control	65 feet	2.91 miles
67	Cleveland Airport System - Dept Of Port Control	65 feet	2.93 miles
68	Itt Corporation	43 feet	2.97 miles
69	Paul Wolff	25 feet	2.97 miles
70	Faa Ani-480	45 feet	2.99 miles
71	Cleveland Airport System - Dept Of Port Control	150 feet	3.02 miles
72	Itt Corporation	66 feet	3.03 miles
73	Southwest Cab Co,	140 feet	3.10 miles
74	Itt Corporation	50 feet	3.13 miles
75	Sensis Corporation	60 feet	3.13 miles
76	Cleveland Hopkins	822 feet	3.14 miles
77	Ameritech Wireless Communications, Llc	96 feet	3.15 miles
78	National Aeronautics And Space Administo	101 feet	3.16 miles
79	Mr. Heinz L. Wimmer	72 feet	3.18 miles
80	At&t Wireless	260 feet	3.20 miles
81	City Of Cleveland Department Of Port Control	28 feet	3.20 miles
82	City Of Cleveland Department Of Port Control	25 feet	3.20 miles
83	Federal Aviaition Administration	786 feet	3.21 miles
84	Cleveland Airport System	21 feet	3.22 miles
85	Nasa Lewis Research Center	91 feet	3.22 miles
86	Cleveland Airport System	28 feet	3.23 miles
87	Blank	65 feet	3.23 miles
88	Nasa Lewis Research Center	100 feet	3.25 miles
89	Cleveland Airport System	34 feet	3.25 miles
90	Department Of Port Control	50 feet	3.26 miles
91	Sprint Pcs	150 feet	3.27 miles
92	Gte Mobilnet Of Ohio Limited Partnership	96 feet	3.28 miles
93	Department Of Port Control	50 feet	3.28 miles
94	Nasa Lewis Research Center	130 feet	3.34 miles
95	Nextel West Corp	64 feet	3.35 miles
96	Sensis Corporation	50 feet	3.35 miles
97	Nasa Lewis Research Center	50 feet	3.36 miles
98	Ms. Tracey Tilden	96 feet	3.38 miles
99	New Par	82 feet	3.43 miles
100	Cleveland Hopkins International Airport	30 feet	3.43 miles
101	Faa Central Service Area	108 feet	3.44 miles
102	Ohio Department Of Transportation	21 feet	3.44 miles
103	Dana Ryan	60 feet	3.47 miles
104	Dana Ryan	60 feet	3.58 miles
105	Ohio Department Of Transportation	42 feet	3.60 miles
106	Alltel Communications Inc Co Airspac	85 feet	3.62 miles
107	Blank	70 feet	3.63 miles
108	At&t Wireless Services	148 feet	3.66 miles
109	Sprintcom Inc	145 feet	3.70 miles
110	At&t Wireless Services Cl 165 06	199 feet	3.70 miles
111	Amsdell Construction, Inc.	80 feet	3.74 miles
112	Amsdell Construction Inc	57 feet	3.77 miles
113	Amsdell Construction Inc	57 feet	3.82 miles
114	Blank	70 feet	3.91 miles
115	New Par	112 feet	3.93 miles

Multiple Antennas on Listed Towers

1	Nextel License Holdings 4, Inc.	100 feet	1.00 miles
	Felhc	102 feet	.99 miles
2	Nextel License Holdings 4, Inc.	137 feet	1.14 miles
	Fibertower Network Services Corp.	137 feet	1.14 miles
	Berea, City Of	151 feet	1.13 miles
3	Middleburg Heights, City Of	138 feet	1.33 miles
	Fibertower Network Services Corp.	139 feet	1.32 miles
	Nextel License Holdings 4, Inc.	139 feet	1.32 miles
	Alltel Ohio Limited Partnership	NA	1.33 miles
	Berea, City Of	138 feet	1.33 miles
4	Nextel License Holdings 4, Inc	102 feet	2.13 miles
	Nextel License Holdings 4, Inc.	102 feet	2.13 miles
	Nextel License Holdings 4, Inc	102 feet	2.13 miles
5	Ford Communications Inc	NA	2.37 miles
	Ford Communications Inc	NA	2.37 miles
	Ford Communications Inc	NA	2.37 miles
	Ford Communications Inc	30 feet	2.37 miles
	Ford Communications Inc	30 feet	2.37 miles
6	Progressive Plastics Inc	NA	2.82 miles
	Rybicki & Son Funeral Home	NA	2.82 miles
	Aeronautical Radio Inc	NA	2.83 miles
	Cleveland Communications Inc	NA	2.82 miles
	Holiday Inn Of Middleburg Heights	NA	2.82 miles
	Fci 900, Inc.	49 feet	2.83 miles
	Fci 900, Inc.	NA	2.83 miles
	Gilcrest Electric	NA	2.82 miles
	Mercury Air Center	20 feet	2.82 miles
	Continental Airlines Inc Airport Communicatio Ns Dept	56 feet	2.83 miles
	United Airlines Inc	NA	2.82 miles
	Cardpak Incorporated	NA	2.82 miles
	Fci 900, Inc.	49 feet	2.83 miles
	Fci 900, Inc.	NA	2.83 miles
	Rak Contracting Inc	NA	2.82 miles
	Cairns Construction Inc	NA	2.82 miles
	Us Airways, Inc.	45 feet	2.83 miles
	Baldwin Wallace College	NA	2.82 miles
	Us Airways, Inc.	45 feet	2.83 miles
7	Nextel License Holdings 4, Inc.	140 feet	2.99 miles
	Fibertower Network Services Corp.	129 feet	2.99 miles
8	Nextel License Holdings 4, Inc	171 feet	3.25 miles
	Brook Park, City Of	171 feet	3.25 miles
	Nextel License Holdings 4, Inc.	171 feet	3.25 miles
	Nextel License Holdings 4, Inc	171 feet	3.25 miles
9	Ford Communications Inc	NA	3.26 miles
	Ford Communications Inc	10 feet	3.26 miles
	Ford Communications Inc	69 feet	3.26 miles
10	Baldwin Wallace College	NA	.30 miles
	Baldwin Wallace College	NA	.30 miles
	Baldwin Wallace College	49 feet	.30 miles
11	Berea, City Of	75 feet	.61 miles
	Berea, City Of	59 feet	.61 miles
	Berea, City Of	75 feet	.61 miles
12	Gregory J Norman Inc	NA	.64 miles
	Gregory J Norman Inc	49 feet	.64 miles
13	Berea City Schools	89 feet	.66 miles
	Berea Board Of Education	89 feet	.66 miles
	Berea Board Of Education	89 feet	.66 miles

14	Berea, City Of	92 feet	.70 miles
	Middleburg Heights, City Of	92 feet	.70 miles
	Southwest General Health Care Center	49 feet	.70 miles
	Southwest General Health Center	NA	.69 miles
	Southwest General Hospital	79 feet	.70 miles
	Berea Board Of Education	NA	.70 miles
	Southwest General Health Center	49 feet	.69 miles
	Southwest General Health Care Center	NA	.70 miles
	Southwest General Health Care Center	49 feet	.70 miles
15	Polaris Career Center	NA	.70 miles
	Polaris Career Center	NA	.70 miles
16	Middleburg Heights, City Of	95 feet	.81 miles
	Southwest General Health Center	92 feet	.81 miles
17	Dearborn Inc	NA	.84 miles
	Dearborn Inc	NA	.84 miles
	Dearborn Inc	NA	.84 miles
18	Ohio Turnpike Commission	NA	1.33 miles
	Ohio Turnpike Commission	NA	1.33 miles
19	Elyria Auto Parts Incorporated	39 feet	1.50 miles
	Elyria Auto Parts	39 feet	1.51 miles
	Baldwin Wallace College Union	NA	1.50 miles
20	Oc-sma, Llc	79 feet	1.85 miles
	Quality Block And Supply Inc	79 feet	1.85 miles
21	Cleveland Metropolitan Park District	49 feet	2.04 miles
	Cleveland Metropolitan Park District	NA	2.04 miles
22	Ici Paints	NA	2.11 miles
	Ici Paints	20 feet	2.11 miles
23	Middleburg Heights, City Of	NA	2.21 miles
	Middleburg Heights, City Of	59 feet	2.21 miles
24	Parking Co. Of America	15 feet	2.24 miles
	Brighton Best Socket Screw Manufacturing	NA	2.24 miles
25	Berea City Schools	39 feet	2.28 miles
	Berea Board Of Education	39 feet	2.28 miles
26	Global Ground Service	20 feet	2.35 miles
	Air Services Of Cleveland Inc	NA	2.35 miles
	Mercury Air Center	840 feet	2.35 miles
	Servisair	20 feet	2.35 miles
	Global Ground Service	NA	2.35 miles
27	Fibertower Corporation	128 feet	2.41 miles
	Park Place Inc	NA	2.40 miles
28	Ppg Industries Inc	NA	2.56 miles
	Ppg Industries	NA	2.56 miles
29	Aero Mag - Contego Cle Llc	NA	2.58 miles
	Aero Mag - Contego Cle Llc	15 feet	2.58 miles
30	Continental Airlines, Inc.	43 feet	2.61 miles
	Continental Airlines, Inc.	NA	2.61 miles
	Continental Airlines, Inc.	NA	2.61 miles
31	Avis Rent A Car Systems Inc	NA	2.64 miles
	Avis Rent A Car Systems Inc	NA	2.64 miles
32	Hukill Chemical Corporation	NA	2.68 miles
	Hukill Chemical Corporation	NA	2.68 miles
33	Notre Dame, University Of	NA	2.88 miles
	Notre Dame, University Of	NA	2.88 miles
	Notre Dame, University Of	NA	2.88 miles
	Sheraton Hopkins Airport Hotel	NA	2.88 miles
	Notre Dame, University Of	NA	2.88 miles
	Sheraton Hopkins Airport Hotel	NA	2.88 miles

34	Cleveland, City Of	135 feet	2.91 miles
	Ohio, State Of	121 feet	2.91 miles
	Ohio, State Of	135 feet	2.91 miles
	Ohio, State Of	135 feet	2.91 miles
	Cleveland ,city Of	119 feet	2.89 miles
	Cleveland, City Of	135 feet	2.91 miles
35	United Airlines, Inc.	NA	2.94 miles
	United Air Lines, Inc., Debtor-in-possession	20 feet	2.94 miles
36	Oc-sma, Llc	80 feet	2.96 miles
	Oc-sma, Llc	NA	2.96 miles
	Oc-sma, Llc	66 feet	2.96 miles
37	Hertz Corporation	7 feet	3.01 miles
	Hertz Corporation	NA	2.99 miles
	Hertz Corporation	13 feet	2.99 miles
38	Ford Communications Inc	41 feet	3.03 miles
	Ford Communications Inc	NA	3.03 miles
39	Aircraft Service International Inc	72 feet	3.06 miles
	Aircraft Service International Inc.	NA	3.05 miles
	Aircraft Service International Inc.	15 feet	3.05 miles
40	City Of Strongsville	36 feet	3.12 miles
	City Of Strongsville	36 feet	3.12 miles
41	Arbys 201	NA	3.20 miles
	Arbys Inc 201	NA	3.18 miles
42	Norfolk Southern Railway Company	10 feet	3.22 miles
	Penn Central Communications Company	NA	3.22 miles
43	Ford Communications Inc	NA	3.27 miles
	Ford Communications Inc	59 feet	3.27 miles
44	United Parcel Service	NA	3.36 miles
	United Parcel Service	49 feet	3.36 miles
45	Ford Communications Inc	82 feet	3.47 miles
	Ford Communications Inc	NA	3.47 miles
	Ford Communications Inc	NA	3.47 miles
	Fci 900, Inc.	69 feet	3.47 miles
	Ford Communications Inc	NA	3.47 miles
	Ford Communications Inc	49 feet	3.47 miles
	Ford Communications Inc	NA	3.47 miles
46	Olmsted Falls, City Of	NA	3.61 miles
	Olmsted Falls, City Of	121 feet	3.61 miles
	Olmsted Falls, City Of	98 feet	3.61 miles
	Olmsted Falls, City Of	NA	3.61 miles
47	Richard E Jacobs Group Dba South Park Center	75 feet	3.70 miles
	Southpark Mall Security	75 feet	3.70 miles
	Southpark Mall Security	NA	3.70 miles
48	T-mobile License Llc	199 feet	2.30 miles
	Alltel Ohio Limited Partnership	NA	2.29 miles
	New Par	195 feet	2.29 miles
49	Ohio Turnpike Commission	140 feet	1.43 miles
	Ohio Turnpike Commission	140 feet	1.43 miles
50	Cleveland, City Of	70 feet	2.85 miles
	Cleveland, City Of	66 feet	2.85 miles

See the Website below for full details on these sites including precise locations, heights and frequencies.

http://www.antennasearch.com/

Single Antennas on Area Towers

54	Norfolk Southern Railway Company	7 feet	1.26 miles
52	Nextel License Holdings 4, Inc.	189 feet	2.66 miles
53	Nextel License Holdings 4, Inc.	377 feet	3.02 miles
54	Nextel License Holdings 4, Inc.	64 feet	3.36 miles
55	Ams Spectrum Holdings, Llc	154 feet	3.46 miles
56	Nextel License Holdings 4, Inc	39 feet	3.97 miles
57	Cuyahoga County Agricultural Society	52 feet	.07 miles
58	Southwest General Health Center	NA	.55 miles
59	Baldwin Wallace College	NA	.61 miles
60	Hexagram, Inc.	NA	.64 miles
61	Mal Mac Enterprises Inc Dba Mcdonald S	NA	.64 miles
62	Ohio Turnpike Commission	NA	.68 miles
63	Greater Cleveland Hospital Association	NA	.70 miles
64	Ohio Turnpike Commission	66 feet	1.39 miles
65	Ohio, State Of	13 feet	1.39 miles
66	United Parcel Service	49 feet	1.44 miles
67	Bridgestone Firestone Inc	NA	1.54 miles
68	Jims Leasing	79 feet	1.56 miles
69	Dontes Pizza Inc	NA	1.62 miles
70	Lagf Operating Associates-west Llc	NA	1.64 miles
71	Ohio, State Of	49 feet	1.66 miles
72	Home Depot U.s.a., Inc.	NA	1.75 miles
73	Columbia Gas Of Ohio	NA	1.75 miles
74	Fabrizi Trucking & Paving Company	NA	1.80 miles
75	Brook Park, City Of	20 feet	1.89 miles
76	Krispy Kreme Corporation	NA	1.96 miles
77	I X Center Inc	NA	2.11 miles
78	Middleburg Heights, City Of	NA	2.16 miles
79	Brook Park, City Of	105 feet	2.24 miles
80	Varbros Corporation	NA	2.30 miles
81	Cleveland Hopkins International Airport	49 feet	2.35 miles
82	Ohio Turnpike Commission	NA	2.42 miles
83	Brook Park, City Of	NA	2.43 miles
84	Apcoa Inc	NA	2.44 miles
85	Van Dorn Demag Corp	49 feet	2.48 miles
86	Park & Fly Of Ohio Inc	NA	2.50 miles
87	Ohio Turnpike Commission	NA	2.53 miles
88	Federal Express Corporation	NA	2.58 miles
89	Hertz Corporation	20 feet	2.68 miles
90	Avis Rent A Car Systems Inc	16 feet	2.68 miles
91	K Ii Inc	NA	2.69 miles
92	Delta Air Lines, Inc.	33 feet	2.70 miles
93	Cleveland, City Of Hopkins Airport Fire Department	NA	2.75 miles
94	Independence Air, Inc.	NA	2.81 miles
95	Us Airways, Inc.	NA	2.83 miles
96	Southwest Airlines Company	32 feet	2.89 miles
97	Trans Airlines Inc.	NA	2.92 miles
98	Polaris Joint Vocational School District	NA	2.93 miles
99	Hertz Corporation	NA	2.96 miles
100	Dyment Distribution	NA	2.96 miles
101	American Airlines Inc.	36 feet	2.98 miles

102	American Steel & Wire Corporation	NA	3.00 miles
103	Fairview Park, City Of	NA	3.01 miles
104	Van Dorn Demag Inc	20 feet	3.02 miles
105	Strongsville Board Of Education	NA	3.05 miles
106	Cuyahoga Concrete Inc	60 feet	3.06 miles
107	Hamamey Inc	32 feet	3.12 miles
108	Navco Ent Inc Dba Mcdonalds	NA	3.13 miles
109	Strongsville, City Of	141 feet	3.20 miles
110	Delta Air Lines Inc	NA	3.20 miles
111	Wendys	NA	3.24 miles
112	Safety Sign Co.	NA	3.32 miles
113	Apcoa Inc Dba Park Air Express	13 feet	3.33 miles
114	Mal Mac Ii Enterprises Inc Dba Mcdonald S	NA	3.34 miles
115	Gap Inc	NA	3.38 miles
116	Target Store T985	NA	3.39 miles
117	Albums Inc	NA	3.42 miles
118	Applied Construction Technologies Inc	NA	3.48 miles
119	Vitamix Corporation	17 feet	3.49 miles
120	Strongsville City Schools	NA	3.50 miles
121	Ohio, State Of	NA	3.51 miles
122	B & O Auto Parts	NA	3.54 miles
123	Miami Computer Supply Corp Dba Dreher Business Products	NA	3.56 miles
124	Aja Restaurant Group, Llc	NA	3.56 miles
125	General Electric Radio Services Corporation	20 feet	3.57 miles
126	Dollar Operations Inc	NA	3.63 miles
127	Jcpenney Corp Inc.	NA	3.65 miles
128	Giant Eagle Inc	NA	3.67 miles
129	Fawn Lake Apartments	NA	3.67 miles
130	Sysco Food Services Of Cleveland Inc	49 feet	3.67 miles
131	Central Reserve Life	NA	3.74 miles
132	Vallier, Walter G	NA	3.74 miles
133	Aja Restaurant Group, Llc	NA	3.74 miles
134	Stahl Construction	NA	3.85 miles
135	Home Depot U.s.a., Inc.	NA	3.87 miles
136	Olmsted Falls, City Of	NA	3.92 miles
137	Olmsted Falls, City Of	197 feet	3.93 miles
138	Alltel Ohio Limited Partnership	144 feet	2.30 miles
139	Usa Mobility Wireless, Inc.	90 feet	.84 miles
140	Ams Spectrum Holdings, Llc	56 feet	2.73 miles
141	The Ohio Bell Telephone Company	NA	3.80 miles
142	Usa Mobility Wireless, Inc.	88 feet	3.82 miles
143	Baldwin-wallace College	100 feet	.32 miles
144	Fibertower Network Services Corp.	190 feet	.43 miles
145	Metropolitan Area Networks, Inc.	168 feet	2.42 miles
146	Itt Corporation	41 feet	2.46 miles
147	Cleveland Electric Illuminating Company	98 feet	3.11 miles
148	Itt Corporation	46 feet	3.16 miles
149	Itt Corporation	46 feet	3.18 miles
150	Metropolitan Area Networks, Inc.	54 feet	3.49 miles
151	Spacenet Services License Sub, Inc.	31 feet	3.72 miles

See the Website below for full details on these sites including but not limited to: precise locations, heights, frequencies and owners.

http://www.antennasearch.com/

Horizon View Impact Calculator

Rotor Diameter	154.2	Feet

Viewer Distance From Turbine		Percent of Total Horizon View-shed Affected	Percent of Total Average Persons Field of View Affected
Feet	Miles		
100	0.02	24.54%	100.00%
200	0.04	12.27%	73.63%
400	0.08	6.14%	36.81%
800	0.15	3.07%	18.41%
1,600	0.30	1.53%	9.20%
3,200	0.61	0.77%	4.60%
5,280	1.00	0.46%	2.79%
10,560	2.00	0.23%	1.39%
15,840	3.00	0.15%	0.93%
21,120	4.00	0.12%	0.70%
26,400	5.00	0.09%	0.56%
52,800	10.00	0.05%	0.28%

Assumptions:

Model assumes absolute worst case for all variables.

Viewer is stationary, focused and looking directly at and centered on the turbine.

Viewer's field of view is 60 degrees.

Model assumes no sightline obstructions, crystal clear atmospheric visibility and 100% of the turbine is visible.

Model assumes the largest rotor diameter under consideration for the site.

Model assumes the turbine rotor is perpendicular to and fully visible to the viewer.

Model assumes worst case as if the turbine rotor diameter influences the entire column of the horizon as if the turbine was a solid plane covering the entire portion of the horizon at a width of the turbine's rotor.

Sample Turbine View Calculations

Baselines For Calculations

Turbine Height to Blade Tip	274	Feet
Turbine Height to Hub	197	Feet
Persons Eye Height Based on Level Ground.	5.5	Feet

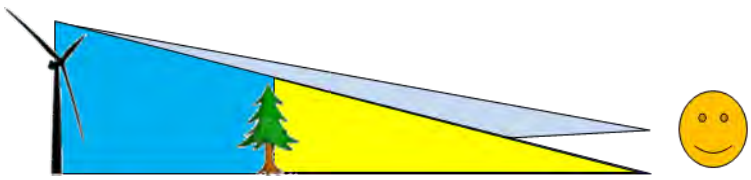
Listed Obstruction Height (Feet) Will Block Turbine View Within Listed Distance of Viewer (Feet)

		Typical One Story House or Short Tree		Typical Two Story House or Tree		Typical Tall Tree or Tall Building		Apparent Height of Turbine at 3' Arm's Length (Inches Tall) (If You Could See the Entire Turbine)
Obstruction Height (Feet)		17.5		35		70		
Minimum Visible Target to be Blocked		Hub Up	Blade Tip	Hub Up	Blade Tip	Hub Up	Blade Tip	
Viewer Distance From Turbine (Feet)	500	23	18	57	44	126	97	23.9
	1000	47	36	115	88	251	193	11.9
	1500	70	54	172	133	377	290	8.0
	2000	93	72	230	177	502	387	6.0
	2500	117	90	287	221	628	483	4.8
	3000	140	108	344	265	753	580	4.0
	3500	163	126	402	310	879	677	3.4
	4000	187	144	459	354	1004	774	3.0
	4500	210	162	517	398	1130	870	2.7
	5000	234	180	574	442	1255	967	2.4

Example: At a distance of 2,500 feet from the turbine your view of the turbine would be blocked by any 17.5 foot structure or tree if it was less than 90 feet from you. The apparent height of an unobstructed turbine view at this distance would 4.8 inches tall at a 3 foot arms length from your eye.

Typical community and natural obstructions will block the view of the turbine for many residences and businesses, even some in close proximity to the site.

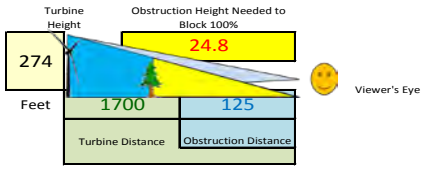
Values are approximate.



Sample Wind Turbine Visibility Over Obstructions Tables

Turbine Information:

	Feet	Meters
Tower Height	196.9	60.0
Rotor Diameter	154.2	47.0
Tip Height	274.0	83.5
Eye Height	5.0	1.5



Example: Using the tables below, a wind turbine 1700 feet away from you would be blocked by any obstruction over 24.8 feet tall 125 feet or less away from you. Based on flat ground and provided eye height. As can be seen, relatively low obstructions close to the viewer typical of many residential, urban or wooded areas will completely obstruct your view of a wind turbine.

Obstruction Height \ Turbine Distance	100	125	150	175	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
10	31.9	26.5	22.9	20.4	18.4	14.0	11.7	10.4	9.5	8.8	8.4	8.0	7.7	7.4	7.2	7.1	6.9	6.8	6.7	6.6	6.5	6.4	6.3
20	58.8	48.0	40.9	35.7	31.9	22.9	18.4	15.8	14.0	12.7	11.7	11.0	10.4	9.9	9.5	9.1	8.8	8.6	8.4	8.2	8.0	7.8	7.7
30	85.7	69.5	58.8	51.1	45.3	31.9	25.2	21.1	18.4	16.5	15.1	14.0	13.1	12.3	11.7	11.2	10.8	10.4	10.0	9.7	9.5	9.2	9.0
40	112.6	91.1	76.7	66.5	58.8	40.9	31.9	26.5	22.9	20.4	18.4	17.0	15.8	14.8	14.0	13.3	12.7	12.2	11.7	11.3	11.0	10.7	10.4
50	139.5	112.6	94.7	81.8	72.2	49.8	38.6	31.9	27.4	24.2	21.8	19.9	18.4	17.2	16.2	15.3	14.6	14.0	13.4	12.9	12.5	12.1	11.7
60	166.4	134.1	112.6	97.2	85.7	58.8	45.3	37.3	31.9	28.1	25.2	22.9	21.1	19.7	18.4	17.4	16.5	15.8	15.1	14.5	14.0	13.5	13.1
70	193.3	155.6	130.5	112.6	99.1	67.8	52.1	42.7	36.4	31.9	28.5	25.9	23.8	22.1	20.7	19.5	18.4	17.6	16.8	16.1	15.5	14.9	14.4
80	220.2	177.1	148.4	127.9	112.6	76.7	58.8	48.0	40.9	35.7	31.9	28.9	26.5	24.6	22.9	21.6	20.4	19.3	18.4	17.7	17.0	16.3	15.8
90	247.1	198.6	166.4	143.3	126.0	85.7	65.5	53.4	45.3	39.6	35.3	31.9	29.2	27.0	25.2	23.6	22.3	21.1	20.1	19.2	18.4	17.7	17.1
100	274.0	220.2	184.3	158.7	139.5	94.7	72.2	58.8	49.8	43.4	38.6	34.9	31.9	29.5	27.4	25.7	24.2	22.9	21.8	20.8	19.9	19.2	18.4
125	NA	274.0	229.1	197.1	173.1	117.1	89.0	72.2	61.0	53.0	47.0	42.4	38.6	35.6	33.0	30.9	29.0	27.4	26.0	24.8	23.7	22.7	21.8
150	NA	NA	274.0	235.5	206.7	139.5	105.9	85.7	72.2	62.6	55.4	49.8	45.3	41.7	38.6	36.0	33.8	31.9	30.2	28.7	27.4	26.2	25.2
175	NA	NA	NA	274.0	240.3	161.9	122.7	99.1	83.4	72.2	63.8	57.3	52.1	47.8	44.2	41.2	38.6	36.4	34.4	32.7	31.1	29.8	28.5
200	NA	NA	NA	NA	274.0	184.3	139.5	112.6	94.7	81.8	72.2	64.8	58.8	53.9	49.8	46.4	43.4	40.9	38.6	36.6	34.9	33.3	31.9
225	NA	NA	NA	NA	NA	206.7	156.3	126.0	105.9	91.4	80.6	72.2	65.5	60.0	55.4	51.5	48.2	45.3	42.8	40.6	38.6	36.8	35.3
250	NA	NA	NA	NA	NA	229.1	173.1	139.5	117.1	101.1	89.0	79.7	72.2	66.1	61.0	56.7	53.0	49.8	47.0	44.6	42.4	40.4	38.6
500	NA	NA	NA	NA	NA	NA	NA	274.0	229.1	197.1	173.1	154.4	139.5	127.3	117.1	108.4	101.1	94.7	89.0	84.1	79.7	75.8	72.2
1000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	274.0	249.5	229.1	211.9	197.1	184.3	173.1	163.2	154.4	146.6	139.5

Obstruction Height \ Turbine Distance	2100	2200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500	2600	2700	2800	2900	3000	3100	3200	3300
10	6.3	6.2	7.1	6.9	6.8	6.7	6.6	6.5	6.4	6.3	6.3	6.2	6.2	6.1	6.1	6.0	6.0	6.0	5.9	5.9	5.9	5.8	5.8
20	7.6	7.4	9.1	8.8	8.6	8.4	8.2	8.0	7.8	7.7	7.6	7.4	7.3	7.2	7.2	7.1	7.0	6.9	6.9	6.8	6.7	6.7	6.6
30	8.8	8.7	11.2	10.8	10.4	10.0	9.7	9.5	9.2	9.0	8.8	8.7	8.5	8.4	8.2	8.1	8.0	7.9	7.8	7.7	7.6	7.5	7.4
40	10.1	9.9	13.3	12.7	12.2	11.7	11.3	11.0	10.7	10.4	10.1	9.9	9.7	9.5	9.3	9.1	9.0	8.8	8.7	8.6	8.5	8.4	8.3
50	11.4	11.1	15.3	14.6	14.0	13.4	12.9	12.5	12.1	11.7	11.4	11.1	10.8	10.6	10.4	10.2	10.0	9.8	9.6	9.5	9.3	9.2	9.1
60	12.7	12.3	17.4	16.5	15.8	15.1	14.5	14.0	13.5	13.1	12.7	12.3	12.0	11.7	11.5	11.2	11.0	10.8	10.6	10.4	10.2	10.0	9.9
70	14.0	13.6	19.5	18.4	17.6	16.8	16.1	15.5	14.9	14.4	14.0	13.6	13.2	12.8	12.5	12.2	12.0	11.7	11.5	11.3	11.1	10.9	10.7
80	15.2	14.8	21.6	20.4	19.3	18.4	17.7	17.0	16.3	15.8	15.2	14.8	14.4	14.0	13.6	13.3	13.0	12.7	12.4	12.2	11.9	11.7	11.5
90	16.5	16.0	23.6	22.3	21.1	20.1	19.2	18.4	17.7	17.1	16.5	16.0	15.5	15.1	14.7	14.3	14.0	13.6	13.3	13.1	12.8	12.6	12.3
100	17.8	17.2	25.7	24.2	22.9	21.8	20.8	19.9	19.2	18.4	17.8	17.2	16.7	16.2	15.8	15.3	15.0	14.6	14.3	14.0	13.7	13.4	13.2
125	21.0	20.3	30.9	29.0	27.4	26.0	24.8	23.7	22.7	21.8	21.0	20.3	19.6	19.0	18.4	17.9	17.5	17.0	16.6	16.2	15.8	15.5	15.2
150	24.2	23.3	36.0	33.8	31.9	30.2	28.7	27.4	26.2	25.2	24.2	23.3	22.5	21.8	21.1	20.5	19.9	19.4	18.9	18.4	18.0	17.6	17.2
175	27.4	26.4	41.2	38.6	36.4	34.4	32.7	31.1	29.8	28.5	27.4	26.4	25.5	24.6	23.8	23.1	22.4	21.8	21.2	20.7	20.2	19.7	19.3
200	30.6	29.5	46.4	43.4	40.9	38.6	36.6	34.9	33.3	31.9	30.6	29.5	28.4	27.4	26.5	25.7	24.9	24.2	23.5	22.9	22.4	21.8	21.3
225	33.8	32.5	51.5	48.2	45.3	42.8	40.6	38.6	36.8	35.3	33.8	32.5	31.3	30.2	29.2	28.3	27.4	26.6	25.9	25.2	24.5	23.9	23.3
250	37.0	35.6	56.7	53.0	49.8	47.0	44.6	42.4	40.4	38.6	37.0	35.6	34.2	33.0	31.9	30.9	29.9	29.0	28.2	27.4	26.7	26.0	25.4
500	69.0	66.1	108.4	101.1	94.7	89.0	84.1	79.7	75.8	72.2	69.0	66.1	63.5	61.0	58.8	56.7	54.8	53.0	51.4	49.8	48.4	47.0	45.8
1000	133.1	127.3	211.9	197.1	184.3	173.1	163.2	154.4	146.6	139.5	133.1	127.3	121.9	117.1	112.6	108.4	104.6	101.1	97.7	94.7	91.8	89.0	86.5

Obstruction Height \ Turbine Distance	3400	3500	3600	3700	3800	3900	4000	4100	4200	4300	4400	4500	4600	4700	4800	4900	5000	5100	5200	5300	5400	5500	5600
10	5.8	5.8	5.7	5.7	5.7	5.7	5.7	5.7	5.6	5.6	5.6	5.6	5.6	5.6	5.6	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5
20	6.6	6.5	6.5	6.5	6.4	6.4	6.3	6.3	6.3	6.3	6.2	6.2	6.2	6.1	6.1	6.1	6.1	6.1	6.0	6.0	6.0	6.0	6.0
30	7.4	7.3	7.2	7.2	7.1	7.1	7.0	7.0	6.9	6.9	6.8	6.8	6.8	6.7	6.7	6.6	6.6	6.6	6.6	6.5	6.5	6.5	6.4
40	8.2	8.1	8.0	7.9	7.8	7.8	7.7	7.6	7.6	7.5	7.4	7.4	7.3	7.3	7.2	7.2	7.2	7.1	7.1	7.0	7.0	7.0	6.9
50	9.0	8.8	8.7	8.6	8.5	8.4	8.4	8.3	8.2	8.1	8.1	8.0	7.9	7.9	7.8	7.7	7.7	7.6	7.6	7.5	7.5	7.4	7.4
60	9.7	9.6	9.5	9.4	9.2	9.1	9.0	8.9	8.8	8.8	8.7	8.6	8.5	8.4	8.4	8.3	8.2	8.2	8.1	8.0	8.0	7.9	7.9
70	10.5	10.4	10.2	10.1	10.0	9.8	9.7	9.6	9.5	9.4	9.3	9.2	9.1	9.0	8.9	8.8	8.8	8.7	8.6	8.6	8.5	8.4	8.4
80	11.3	11.1	11.0	10.8	10.7	10.5	10.4	10.2	10.1	10.0	9.9	9.8	9.7	9.6	9.5	9.4	9.3	9.2	9.1	9.1	9.0	8.9	8.8
90	12.1	11.9	11.7	11.5	11.4	11.2	11.1	10.9	10.8	10.6	10.5	10.4	10.3	10.2	10.0	9.9	9.8	9.7	9.7	9.6	9.5	9.4	9.3
100	12.9	12.7	12.5	12.3	12.1	11.9	11.7	11.6	11.4	11.3	11.1	11.0	10.8	10.7	10.6	10.5	10.4	10.3	10.2	10.1	10.0	9.9	9.8
125	14.9	14.6	14.3	14.1	13.8	13.6	13.4	13.2	13.0	12.8	12.6	12.5	12.3	12.2	12.0	11.9	11.7	11.6	11.5	11.3	11.2	11.1	11.0
150	16.9	16.5	16.2	15.9	15.6	15.3	15.1	14.8	14.6	14.4	14.2	14.0	13.8	13.6	13.4	13.2	13.1	12.9	12.8	12.6	12.5	12.3	12.2
175	18.8	18.4	18.1	17.7	17.4	17.1	16.8	16.5	16.2	15.9	15.7	15.5	15.2	15.0	14.8	14.6	14.4	14.2	14.1	13.9	13.7	13.6	13.4
200	20.8	20.4	19.9	19.5	19.2	18.8	18.4	18.1	17.8	17.5	17.2	17.0	16.7	16.4	16.2	16.0	15.8	15.5	15.3	15.1	15.0	14.8	14.6
225	22.8	22.3	21.8	21.4	20.9	20.5	20.1	19.8	19.4	19.1	18.8	18.4	18.2	17.9	17.6	17.3	17.1	16.9	16.6	16.4	16.2	16.0	15.8
250	24.8	24.2	23.7	23.2	22.7	22.2	21.8	21.4	21.0	20.6	20.3	19.9	19.6	19.3	19.0	18.7	18.4	18.2	17.9	17.7	17.5	17.2	17.0
500	44.6	43.4	42.4	41.3	40.4	39.5	38.6	37.8	37.0	36.3	35.6	34.9	34.2	33.6	33.0	32.4	31.9	31.4	30.9	30.4	29.9	29.5	29.0
1000	84.1	81.8	79.7	77.7	75.8	74.0	72.2	70.6	69.0	67.5	66.1	64.8	63.5	62.2	61.0	59.9	58.8	57.7	56.7	55.7	54.8	53.9	53.0

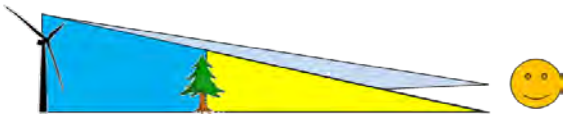
Obstruction Height \ Turbine Distance	5700	5800	5900	6000	6100	6200	6300	6400	6500	6600	6700	6800	6900	7000	7100	7200	7300	7400	7500	7600	7700	7800	7900
10	5.5	5.5	5.5	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.4	5.3	5.3	5.3
20	5.9	5.9	5.9	5.9	5.9	5.9	5.9	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
30	6.4	6.4	6.4	6.3	6.3	6.3	6.3	6.3	6.2	6.2	6.2	6.2	6.2	6.2	6.1	6.1	6.1	6.1	6.1	6.1	6.0	6.0	6.0
40	6.9	6.9	6.8	6.8	6.8	6.7	6.7	6.7	6.7	6.6	6.6	6.6	6.6	6.5	6.5	6.5	6.5	6.5	6.4	6.4	6.4	6.4	6.4
50	7.4	7.3	7.3	7.2	7.2	7.2	7.1	7.1	7.1	7.0	7.0	7.0	6.9	6.9	6.9	6.9	6.8	6.8	6.8	6.8	6.7	6.7	6.7
60	7.8	7.8	7.7	7.7	7.6	7.6	7.6	7.5	7.5	7.4	7.4	7.4	7.3	7.3	7.3	7.2	7.2	7.2	7.2	7.1	7.1	7.1	7.0
70	8.3	8.2	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.9	7.8	7.8	7.7	7.7	7.7	7.6	7.6	7.5	7.5	7.5	7.4	7.4	7.4
80	8.8	8.7	8.6	8.6	8.5	8.5	8.4	8.4	8.3	8.3	8.2	8.2	8.1	8.1	8.0	8.0	7.9	7.9	7.8	7.8	7.8	7.8	7.7
90	9.2	9.2	9.1	9.0	9.0	8.9	8.8	8.8	8.7	8.7	8.6	8.6	8.5	8.5	8.4	8.4	8.3	8.3	8.2	8.2	8.1	8.1	8.1
100	9.7	9.6	9.6	9.5	9.4	9.3	9.3	9.2	9.1	9.1	9.0	9.0	8.9	8.8	8.8	8.7	8.7	8.6	8.6	8.5	8.5	8.4	8.4
125	10.9	10.8	10.7	10.6	10.5	10.4	10.3	10.3	10.2	10.1	10.0	9.9	9.9	9.8	9.7	9.7	9.6	9.5	9.5	9.4	9.4	9.3	9.3
150	12.1	12.0	11.8	11.7	11.6	11.5	11.4	11.3	11.2	11.1	11.0	10.9	10.8	10.8	10.7	10.6	10.5	10.5	10.4	10.3	10.2	10.2	10.1
175	13.3	13.1	13.0	12.8	12.7	12.6	12.5	12.4	12.2	12.1	12.0	11.9	11.8	11.7	11.6	11.5	11.4	11.4	11.3	11.2	11.1	11.0	11.0
200	14.4	14.3	14.1	14.0	13.8	13.7	13.5	13.4	13.3	13.2	13.0	12.9	12.8	12.7	12.6	12.5	12.4	12.3	12.2	12.1	12.0	11.9	11.8
225	15.6	15.4	15.3	15.1	14.9	14.8	14.6	14.5	14.3	14.2	14.0	13.9	13.8	13.6	13.5	13.4	13.3	13.2	13.1	13.0	12.9	12.8	12.7
250	16.8	16.6	16.4	16.2	16.0	15.8	15.7	15.5	15.3	15.2	15.0	14.9	14.7	14.6	14.5	14.3	14.2	14.1	14.0	13.8	13.7	13.6	13.5
500	28.6	28.2	27.8	27.4	27.0	26.7	26.3	26.0	25.7	25.4	25.1	24.8	24.5	24.2	23.9	23.7	23.4	23.2	22.9	22.7	22.5	22.2	22.0
1000	52.2	51.4	50.6	49.8	49.1	48.4	47.7	47.0	46.4	45.8	45.1	44.6	44.0	43.4	42.9	42.4	41.8	41.3	40.9	40.4	39.9	39.5	39.0

Sample Wind Turbine View Calculator

		Address		Longitude	Latitutude
Project Turbine	Cuyahoga County Fairgrounds	194 Eastland Road		81° 50' 21.10" W	41° 21' 59.50" N
		Berea	Ohio		

Suject Viewpoint Property

Point of View — Sample



User Inputs	Calculations

Turbine Information:	Feet	Meters	Notes:
Tower Height	196.9	60.0	
Rotor Diameter	154.2	47.0	
Tip Height	274.0	83.5	
Turbine Location Elevation Above Sea-level	801.0	244.1	

Viewpoint Information:	Feet	Meters	Notes:
Viewpoint Distance From Turbine	500.0	152.4	
Viewpoint Eye Height Above Ground	5.5	1.7	
Viewpoint Ground Elevation Above Sea-level	1260.0	384.0	
Net Viewpoint Ground Elevation Above Sea-level	1265.5	385.7	Eye height + ground elevation above sea-level (Level Line For Calculations)

Obstruction Information:	Feet	Meters	Notes:
Obstruction Distance From Viewpoint	125.0	38.1	
Obstruction Height Above Ground	35.0	10.7	
Obstruction Ground Elevation Above Sea-level	1265.0	385.6	
Net Obstruction Height Above Sea-Level	1300.0	396.2	

Results:			Notes:	
Will The Turbine Be Visible?	Yes	78.9%	Percent of Total Turbine and Tower	
Relative Visible Turbine Height at Obstruction Distance	129.3	39.4	Feet / Meters	Usefull for landscape scale
Actual Portion of Turbine Showing	216.2	65.9	Feet / Meters	
Will Blades Be Visible?	Yes	100%	Percent Rotor Diameter	
Will Hub Be Visible?	Yes			
Apparent Height of Visible Portion of Turbine, at Distance From Eye Below	2.068	0.6	Feet / Meters	
	24.8	63.0	Inches / Centimeters	
Distance From Eye	2	0.61	Feet / Meters	

Although this calculator does take into account relative topography, it does not take into account the width of obstructions or their shape. It calculates on a single vertical plane at a time. Although a good guide, it should only be used as a rough indicator of the magnitude of potential turbine visibility from a particular viewpoint.

THE RENAISSANCE GROUP

A Conserve First Company

Cuyahoga County Fairgrounds
Wind Turbine Project
Shadow Flicker Analysis

Prepared for:
Cuyahoga County and Cuyahoga County Fair Board

Prepared by:
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Submitted September 2, 2010

Thank You for Choosing The Renaissance Group, a Conserve First LLC Company

Introduction

Proposed Turbine Location:

Cuyahoga County Fairgrounds
164 Eastland Road
Berea, Ohio 44017

Latitude: 41° 21' 59.50" N
Longitude: 81° 50' 21.10" W

While all tall objects cast shadows, wind turbines, due to their spinning blades, can cause moving/flickering shadows which can become an annoyance, especially in residential areas when they pass over windows. Fortunately, while the adverse effects of shadows can be subjective, the shadows themselves can be precisely modeled for location and duration. While modeling shadows for location knowing the latitude of site, the topography and the height and rotor diameter of a wind turbine is a precise science, quantifying the frequency of the shadow's actual occurrence is more difficult due to changing weather patterns affecting the actual Sun's intensity and presence. Further, weather patterns affect the orientation of the wind turbines blades as they follow the wind and hence their orientation to the Sun and the site. In short, on a cloudy day, there will be no shadows, and similarly, when the blades are parallel or close to parallel to the observer, none to limited moving shadow will be visible, and of course, if the wind is not sufficiently blowing to rotate the blades of the turbine, you will not have any moving shadow. Further, it is important to note the higher the angle of the Sun, the shorter the reach of the shadow and the smaller the area of potential impact. Further yet, it also important to note, due to the diffusion of light over distance, shadow intensity drops off significantly with distance. The thickness of the obstruction to the Sun, in this case the blades, also plays significantly into the actual apparent intensity and realized length of shadows. It is for these reasons that shadow distances over ten rotor diameters away from the turbine are considered insignificant. For shadow receptor sites within a turbine's shadow's reach, not all will receive shadow due to existing obstructions that block the shadows path such as other buildings, hills or trees. While evergreen trees will fairly consistently block shadows year-round, deciduous trees will have a lesser impact in the winter months when they have no leaves. Pending the density of the tree stand, single tree to an entire wooded area, winter shadows in these situations can go from being just slightly diffused to still totally obstructed. To properly model the true impacts of shadow flicker, all these considerations must be taken into account. Unobstructed shadows in latitudes similar to this study site will typically have a bow tie or flatten cross shape. In the winter, the sun rises lower on the horizon in the Southeast and sets in the Southwest and in the Summer, the Sun rises in the Northeast and sets in the Northwest all creating a path or area of potential shadow. The southern portion of the bowtie typically is larger due to there being more sunny days in the Summer although Winter shadows will be longer overall and tend to last for longer periods due to the lower angle of the Sun's rays. You will typically see more impacts in alignment with the site's predominate wind direction due to the corresponding predominate turbine blade orientation perpendicular to this direction and thus more visible moving shadows in this direction.

Although no official US policy has been adopted, international standards appear to be in consensus that flickering shadows in excess of thirty hours per year impacting a particular location are considered a potential nuisance.[i] This said, the qualitative impacts of the shadows are subjective.

When considering potential health impacts from wind turbine shadows/flicker, photosensitivity triggered epilepsy is the only issue that is discussed and has been dismissed for mid to large scale modern wind turbines such as the one being considered by the site due to turbine operating frequencies being too low to trigger seizures. According to the British Epilepsy Association, approximately five percent of individuals with epilepsy have sensitivity to light, and most people with photosensitive epilepsy are sensitive to flickering around 16-25Hz (Hertz or Hz = 1 flash per second), although some people may be sensitive to rates as low as 3Hz and as high as 60Hz (British Epilepsy Association, 2007). Specific to wind power projects, the British Epilepsy Association (2007) states that there is no evidence that wind turbines can trigger seizures, and newer wind commercial scale turbines are built to operate at a frequency of 1Hz or less. This conclusion is also supported by the epilepsy thresholds published by the American Epilepsy Foundation.[ii] Therefore, health effects due to projected shadow flicker are not anticipated or further evaluated. The primary concern with shadow flicker is the annoyance it could cause for adjacent home and business owners.

Methods

WindPro 2.7, an internationally accepted software modeling tool, was used to generate the areas of potential shadow flicker impact around the proposed turbine installation site. The software imports historic weather variable averages from the nearest national weather station to obtain average numbers of days with sunshine and the average wind direction distributions. Local Latitude drives the solar path models. Local topographical information is input to determine if there are any natural geographic influences such as hills or valleys. The turbine information including tower height and rotor diameter are input as variables to the location's shadow source models. Rotor diameter is also used to determine the study area of influence, a ten rotor diameters radius around the turbine or 1542 feet for the largest rotor diameter being considered for this site, based on internationally accepted standards.[iii] Wind turbine operational variables for the site are also input which correspond to the turbine's overall percentage of operational time such as percentage of time when the wind speed is too low to rotate the blades and industry norms for availability driven from scheduled and unscheduled maintenance downtime. Wind speed Weibull distributions are from The Renaissance Group and State of Ohio wind data sets and models. Trees and other local obstructions are not considered in the base model (although can be added if desired) and thus the model can be considered a worst case, as if no obstructions existed. If a particular shadow receptor is found to be of potential concern, a receptor specific analysis of potential shadow flicker hours and occurrence periods/times is conducted, otherwise, the results are plotted for the area as a whole as average not-to-exceed threshold iso-lines on the map. Models were run at a two thousand meter hyper-conservative distance well beyond the likely observable shadows for this location and the turbines under consideration.

Results

See “Cuyahoga County Fairgrounds WTG Shadow Flicker Analysis” map for a visualization of the results. No homes or occupied business structures outside the owner’s property within the turbines shadow influence will receive significant flickering shadows of over 30 hours per year. In fact, off-property shadow impacts will be very limited with all such sites receiving less than 10 hours of moving shadow per year and most of this shadow being blocked by existing trees. Impacts to Fair buildings will also be very limited to their locations and the fact that almost no structures have windows. The northern part of the track that surrounds the turbine site will receive significant moving shadows year-round. Although current use of this track is very limited, if formal horse races or similar formal events were scheduled in periods of potential shadow, the Fair Board would have the option to temporarily turn off the turbine to avoid event distractions or annoyance. (See below for further information and recommendations for the potentially impacted receptor sites.) (Also see “Turbine Use, Safety Policies and General Background” document for information on the Schools Turbine policies relating to shadow flicker.)

Models were run using a hyper-conservative two thousand meters, a distance well beyond the industry norm of ten rotor diameters, to insure full reporting of potential impacts. The models show the same iso-lines contour results for general shadow hour thresholds based on the actual average site conditions, but the tabular information shows worse case shadow hours and the potential hours of impact for particular receptor locations, as if it was always sunny. Also, note the further away from the turbine a receptor is the less intense the shadow will be. Beyond ten rotor diameters, shadows will be diffuse and difficult to see.

Overview of Tabular Results for Particular Sample Receptors:

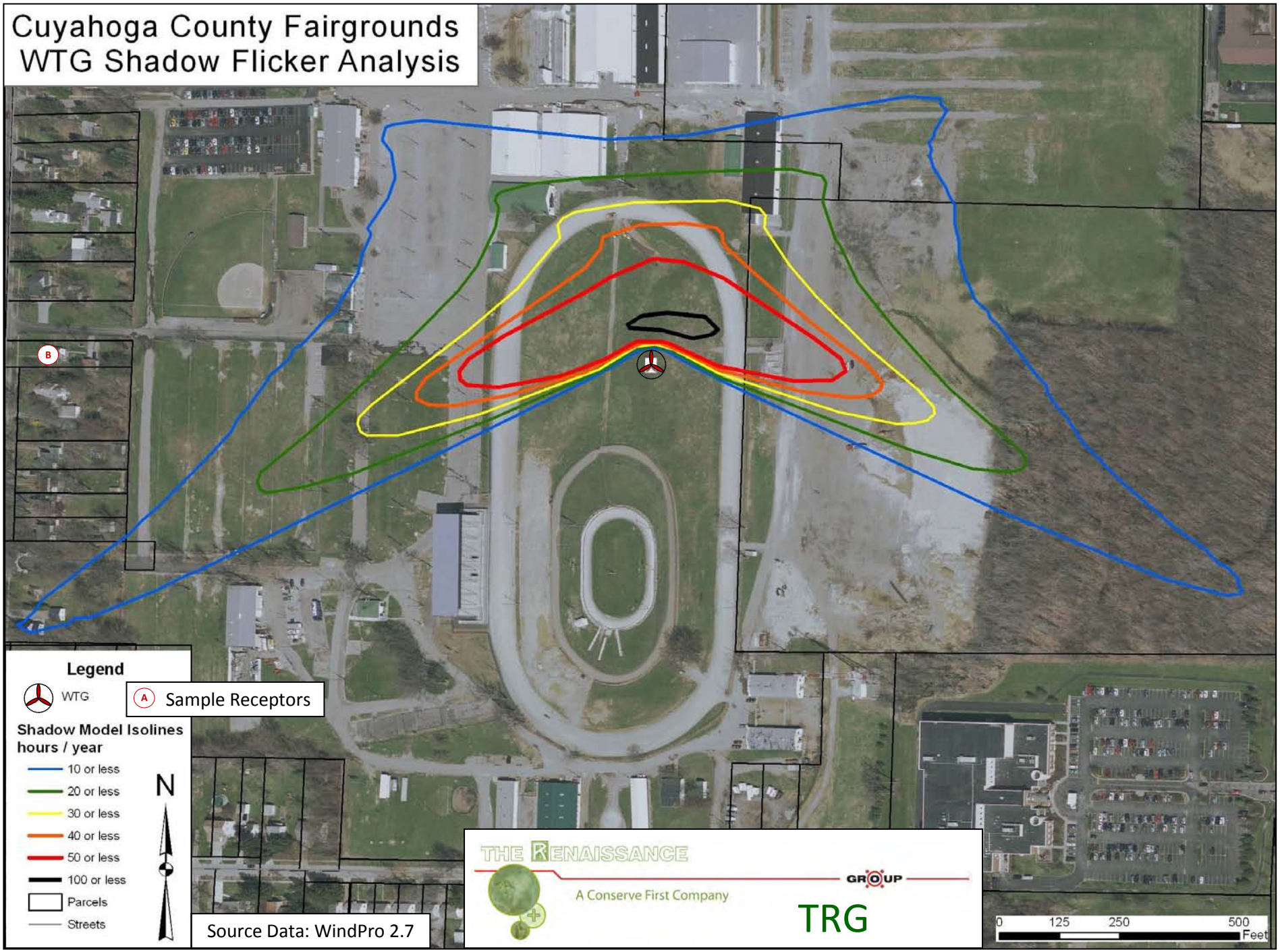
- Receptor A: 1000 Feet Away: LifeWorks Fitness to the Southeast, 7390 Old Oak Blvd: Shadows will not impact this receptor.
- Receptor B: 1150 Feet Away: 208 Eastland Road: Shadows will be highly diffuse, to completely blocked, as the receptor is substantially blocked by multiple trees, but possible during portions of mid-April and mid-August to early-September mornings with a total average of less than 5 hours of moving morning shadow per year.
- Receptor C: 650 Feet Away: Fair buildings to the Northwest: Shadows will be limited, but possible during portions of late-November to mid-January mornings with a total average of less than 4 hours of moving shadow per year.
- Receptor D: 1,270 Feet Away: 142 Eastland Road: Shadows will be highly diffuse, to completely blocked, as the receptor is substantially blocked by multiple trees, but possible during portions of mid-May through July with a total average of less than 11 hours of moving morning shadow per year.

The duration of particular shadow events can vary from a minute to hours pending the receptor. See the following tables at the end of this report for precise dates and times where shadows could occur for each listed sample receptor.

Note the iso-line diagram on the following page shows hour thresholds of shadow impact based on average site conditions with results being referenced to one meter squares of potential impact, i.e. a meter square area within an iso-line area will receive up to the threshold of shadow hours per year. As the tabular information represents larger areas and adds up the entire receptor as if it was one location, its cumulative hour results may be higher. This equates to watching if a shadow will enter a window to watching if it will enter any portion of an entire ball field or yard. Although impacts can be subjective, shadows impacting a specific receptor window are considered significantly more severe than those that impact a yard.

Recommendations

Based on the study findings, no occupied structure will receive over 30 hours of moving shadow per year, the currently accepted consensus on nuisance thresholds for moving shadows/flickering. No local, State or Federal policy or regulation exists to govern shadow flicker thresholds. This said, some receptors will receive some shadow which the affect of will be subjective to the receptor owners' views on the project and their sensitivity. With this in mind, the study authors would recommend that the project site owner follow the guidelines and mediation strategies outlined in "Turbine Use, Safety Policies and General Background".



Project:

CCFG Shadow Receptor Potential Impacts Analysis, 2000 Meters

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AAron Godwin / AAron@ConserveFirst.com
Calculated:
8/28/2010 8:11 PM/2.7.473

SHADOW - Main Result

Assumptions for shadow calculations

Maximum distance for influence
Calculate only when more than 20 % of sun is covered by the blade
Please look in WTG table

Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW
407	472	288	208	185	253	359	366	473	681	799	853

W	WNW	NW	NNW	Sum
598	471	330	329	7,072

Idle start wind speed: Cut in wind speed from power curve

A ZVI (Zones of Visual Influence) calculation is performed before flicker calculation so non visible WTG do not contribute to calculated flicker values. A WTG will be visible if it is visible from any part of the receiver window. The ZVI calculation is based on the following assumptions:
Height contours used: 2 ft contours
Obstacles used in calculation
Eye height: 1.5 m
Grid resolution: 10 m

New WTG Scale 1:7,500 Shadow receptor

WTGs

	UTM WGS84 Zone: 17 East	North	Z	Row data/Description	WTG type Valid	Manufact.	Type-generator	Power, rated	Rotor diameter	Hub height	Shadow data Calculation distance	RPM
	UTM WGS84 Zone: 17		[m]					[kW]	[m]	[m]	[m]	[RPM]
1	429,822	4,579,772	243.2	VESTAS V47 660-200 47.0...	No	VESTAS	V47-660/200	660	47.0	60.0	2,000	26.0

Shadow receptor-Input

No.	UTM WGS84 Zone: 17 East	North	Z	Width	Height	Height a.g.l.	Degrees from south cw	Slope of window	Direction mode
			[m]	[m]	[m]	[m]	[°]	[°]	
A	430,011	4,579,520	245.1	1.0	1.0	1.0	-180.0	90.0	"Green house mode"
B	429,457	4,579,749	243.8	1.0	1.0	1.0	-180.0	90.0	"Green house mode"
C	429,672	4,579,979	243.2	1.0	1.0	1.0	-180.0	90.0	"Green house mode"
D	429,424	4,579,617	244.2	1.0	1.0	1.0	-180.0	90.0	"Green house mode"

Calculation Results

Shadow receptor

No.	Shadow, expected values Shadow hours per year [h/year]
A	0:00
B	4:46
C	3:13
D	10:35

Project:
CCFG3

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Calculated:
8/28/2010 8:11 PM/2.7.473

SHADOW - Main Result

Total amount of flickering on the shadow receptors caused by each WTG

No.	Name	Worst case [h/year]	Expected [h/year]
1	VESTAS V47 660-200 47.0 !#! hub: 60.0 m (1)	74:31	18:35

Project:
CCFG3

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Calculated:
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SHADOW - Calendar

Shadow receptor: A - Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (1)

Assumptions for shadow calculations

Maximum distance for influence	2,000 m
Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
407	472	288	208	185	253	359	366	473	681	799	853	598	471	330	329	7,072

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May	June	July	August	September	October	November	December
1	07:54	07:40	07:04	07:12	06:26	05:57	05:58	06:22	06:53	07:24	06:59	07:34
	17:09	17:43	18:18	19:52	20:24	20:54	21:05	20:47	20:04	19:11	17:24	16:59
2	07:54	07:39	07:02	07:11	06:25	05:57	05:58	06:23	06:54	07:25	07:00	07:35
	17:10	17:45	18:19	19:53	20:25	20:54	21:05	20:46	20:02	19:09	17:23	16:59
3	07:54	07:38	07:00	07:09	06:24	05:56	05:59	06:24	06:55	07:26	07:01	07:36
	17:10	17:46	18:20	19:54	20:26	20:55	21:05	20:45	20:00	19:08	17:21	16:59
4	07:54	07:37	06:59	07:07	06:22	05:56	05:59	06:25	06:56	07:27	07:02	07:37
	17:11	17:47	18:21	19:56	20:27	20:56	21:05	20:43	19:57	19:06	17:20	16:59
5	07:54	07:36	06:57	07:06	06:21	05:56	06:00	06:26	06:57	07:28	07:03	07:38
	17:12	17:48	18:22	19:57	20:28	20:57	21:05	20:42	19:55	19:04	17:19	16:59
6	07:54	07:35	06:56	07:04	06:20	05:55	06:01	06:27	06:58	07:29	07:05	07:39
	17:13	17:50	18:24	19:58	20:29	20:57	21:04	20:41	19:54	19:03	17:18	16:58
7	07:54	07:34	06:54	07:02	06:19	05:55	06:01	06:28	06:59	07:30	07:06	07:40
	17:14	17:51	18:25	19:59	20:30	20:58	21:04	20:40	19:52	19:01	17:17	16:58
8	07:54	07:33	07:52	07:01	06:17	05:55	06:02	06:29	07:00	07:31	07:07	07:41
	17:15	17:52	19:26	20:00	20:31	20:59	21:04	20:39	19:50	18:59	17:16	16:58
9	07:54	07:31	07:51	06:59	06:16	05:54	06:03	06:30	07:01	07:32	07:08	07:42
	17:16	17:53	19:27	20:00	20:32	20:59	21:04	20:37	19:49	18:58	17:15	16:58
10	07:54	07:30	07:49	06:57	06:15	05:54	06:03	06:31	07:02	07:33	07:09	07:42
	17:17	17:55	19:28	20:01	20:33	21:00	21:03	20:36	19:47	18:56	17:14	16:58
11	07:53	07:29	07:48	06:56	06:14	05:54	06:04	06:32	07:03	07:34	07:11	07:43
	17:18	17:56	19:29	20:02	20:34	21:00	21:03	20:35	19:45	18:54	17:13	16:58
12	07:53	07:28	07:46	06:54	06:13	05:54	06:05	06:33	07:04	07:36	07:12	07:44
	17:19	17:57	19:30	20:03	20:35	21:01	21:02	20:34	19:44	18:53	17:12	16:59
13	07:53	07:26	07:44	06:53	06:12	05:54	06:05	06:34	07:05	07:37	07:13	07:45
	17:20	17:58	19:32	20:04	20:36	21:01	21:02	20:32	19:42	18:51	17:11	16:59
14	07:52	07:25	07:43	06:51	06:11	05:54	06:06	06:35	07:06	07:38	07:14	07:46
	17:22	18:00	19:33	20:05	20:37	21:02	21:01	20:31	19:40	18:50	17:10	16:59
15	07:52	07:24	07:41	06:49	06:10	05:54	06:07	06:36	07:07	07:39	07:15	07:46
	17:23	18:01	19:34	20:06	20:38	21:02	21:01	20:29	19:38	18:48	17:09	16:59
16	07:52	07:22	07:39	06:48	06:09	05:54	06:08	06:37	07:08	07:40	07:17	07:47
	17:24	18:02	19:35	20:07	20:39	21:03	21:00	20:28	19:37	18:47	17:08	16:59
17	07:51	07:21	07:38	06:46	06:08	05:54	06:09	06:38	07:09	07:41	07:18	07:48
	17:25	18:03	19:36	20:08	20:40	21:03	21:00	20:27	19:35	18:45	17:07	17:00
18	07:51	07:20	07:36	06:45	06:07	05:54	06:09	06:39	07:10	07:42	07:19	07:48
	17:26	18:05	19:37	20:10	20:41	21:03	20:59	20:25	19:33	18:43	17:07	17:00
19	07:50	07:18	07:34	06:43	06:06	05:54	06:10	06:40	07:11	07:43	07:20	07:49
	17:27	18:06	19:38	20:11	20:42	21:04	20:58	20:24	19:32	18:42	17:06	17:00
20	07:50	07:17	07:33	06:42	06:05	05:54	06:11	06:41	07:12	07:44	07:21	07:50
	17:29	18:07	19:39	20:12	20:43	21:04	20:58	20:22	19:30	18:40	17:05	17:01
21	07:49	07:16	07:31	06:40	06:04	05:54	06:12	06:42	07:14	07:46	07:23	07:50
	17:30	18:08	19:40	20:13	20:44	21:04	20:57	20:21	19:28	18:39	17:04	17:01
22	07:48	07:14	07:29	06:39	06:04	05:55	06:13	06:43	07:15	07:47	07:24	07:51
	17:31	18:10	19:41	20:14	20:45	21:05	20:56	20:19	19:26	18:38	17:04	17:02
23	07:48	07:13	07:27	06:37	06:03	05:55	06:14	06:44	07:16	07:48	07:25	07:51
	17:32	18:11	19:43	20:15	20:46	21:05	20:55	20:18	19:25	18:36	17:03	17:02
24	07:47	07:11	07:26	06:36	06:02	05:55	06:15	06:45	07:17	07:49	07:26	07:52
	17:33	18:12	19:44	20:16	20:47	21:05	20:54	20:16	19:23	18:35	17:02	17:03
25	07:46	07:10	07:24	06:34	06:01	05:55	06:15	06:46	07:18	07:50	07:27	07:52
	17:35	18:13	19:45	20:17	20:48	21:05	20:54	20:15	19:21	18:33	17:02	17:03
26	07:45	07:08	07:22	06:33	06:01	05:56	06:16	06:47	07:19	07:51	07:28	07:52
	17:36	18:14	19:46	20:18	20:49	21:05	20:53	20:13	19:19	18:32	17:01	17:04
27	07:45	07:07	07:21	06:32	06:00	05:56	06:17	06:48	07:20	07:53	07:29	07:53
	17:37	18:15	19:47	20:19	20:50	21:05	20:52	20:12	19:18	18:30	17:01	17:05
28	07:44	07:05	07:19	06:30	05:59	05:56	06:18	06:49	07:21	07:54	07:30	07:53
	17:38	18:17	19:48	20:20	20:50	21:05	20:51	20:10	19:16	18:29	17:01	17:05
29	07:43		07:17	06:29	05:59	05:57	06:19	06:50	07:22	07:55	07:32	07:53
	17:40		19:49	20:21	20:51	21:05	20:50	20:08	19:14	18:28	17:00	17:06
30	07:42		07:16	06:27	05:58	05:57	06:20	06:51	07:23	07:56	07:33	07:54
	17:41		19:50	20:22	20:52	21:05	20:49	20:07	19:13	18:26	17:00	17:07
31	07:41		07:14		05:58		06:21	06:52		07:57		07:54
	17:42		19:51		20:53		20:48	20:05		18:25		17:08
Potential sun hours	297	297	370	399	449	453	460	429	375	345	297	287
Total, worst case												
Sun reduction												
Oper. time red.												
Wind dir. red.												
Total reduction												
Total, real												

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
CCFG3

THE RENAISSANCE GROUP — A Conserve First Company

Printed/Page
8/28/2010 8:12 PM / 4

Licensed user:
Conserve First LLC, d/b/a The Renaissance Group, Renewables
8281 Euclid Chardon Road, Suite E
US-44094 Kirtland, Ohio
4717
AAron Godwin / AAron@ConserveFirst.com

Calculated:
8/28/2010 8:11 PM/2.7.473

SHADOW - Calendar

Shadow receptor: B - Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (2)

Assumptions for shadow calculations

Maximum distance for influence	2,000 m
Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
407	472	288	208	185	253	359	366	473	681	799	853	598	471	330	329	7,072

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April		May	June	July	August		September		October	November	December
1	07:54	07:40	07:04	07:12		06:26	05:57	05:58	06:22		06:53	07:29 (1)	07:24	06:59	07:34
	17:09	17:43	18:18	19:52		20:24	20:54	21:05	20:47		20:04	29 07:58 (1)	19:11	17:24	16:59
2	07:54	07:39	07:02	07:11		06:25	05:57	05:58	06:23		06:54	07:29 (1)	07:25	07:00	07:35
	17:10	17:45	18:19	19:53		20:25	20:54	21:05	20:46		20:02	29 07:58 (1)	19:09	17:23	16:59
3	07:54	07:38	07:00	07:09		06:24	05:56	05:59	06:24		06:55	07:29 (1)	07:26	07:01	07:36
	17:10	17:46	18:20	19:55		20:26	20:55	21:05	20:45		20:00	28 07:57 (1)	19:08	17:22	16:59
4	07:54	07:37	06:59	07:07	07:40 (1)	06:22	05:56	05:59	06:25		06:56	07:30 (1)	07:27	07:02	07:37
	17:11	17:47	18:21	19:56	13 07:53 (1)	20:27	20:56	21:05	20:43		19:57	26 07:56 (1)	19:06	17:20	16:59
5	07:54	07:36	06:57	07:06	07:38 (1)	06:21	05:56	06:00	06:26		06:57	07:30 (1)	07:28	07:03	07:38
	17:12	17:48	18:23	19:57	17 07:55 (1)	20:28	20:57	21:05	20:42		19:55	24 07:54 (1)	19:04	17:19	16:59
6	07:54	07:35	06:56	07:04	07:35 (1)	06:20	05:55	06:01	06:27		06:58	07:31 (1)	07:29	07:05	07:39
	17:13	17:50	18:24	19:58	22 07:57 (1)	20:29	20:57	21:04	20:41		19:54	22 07:53 (1)	19:03	17:18	16:58
7	07:54	07:34	06:54	07:02	07:33 (1)	06:19	05:55	06:01	06:28		06:59	07:33 (1)	07:30	07:06	07:40
	17:14	17:51	18:25	19:59	24 07:57 (1)	20:30	20:58	21:04	20:40		19:52	18 07:51 (1)	19:01	17:17	16:58
8	07:54	07:33	07:52	07:01	07:33 (1)	06:17	05:55	06:02	06:29		07:00	07:35 (1)	07:31	07:07	07:41
	17:15	17:52	19:26	20:00	26 07:59 (1)	20:31	20:59	21:04	20:39		19:50	13 07:48 (1)	18:59	17:16	16:58
9	07:54	07:31	07:51	06:59	07:31 (1)	06:16	05:54	06:03	06:30		07:01	07:40 (1)	07:32	07:08	07:42
	17:16	17:53	19:27	20:00	28 07:59 (1)	20:32	20:59	21:04	20:37		19:49	2 07:42 (1)	18:58	17:15	16:58
10	07:54	07:30	07:49	06:57	07:31 (1)	06:15	05:54	06:03	06:31		07:02		07:33	07:09	07:42
	17:17	17:55	19:28	20:01	29 08:00 (1)	20:33	21:00	21:03	20:36		19:47		18:56	17:14	16:58
11	07:53	07:29	07:48	06:56	07:30 (1)	06:14	05:54	06:04	06:32		07:03		07:35	07:11	07:43
	17:18	17:56	19:29	20:02	29 07:59 (1)	20:34	21:00	21:03	20:35		19:45		18:54	17:13	16:58
12	07:53	07:28	07:46	06:54	07:29 (1)	06:13	05:54	06:05	06:33		07:04		07:36	07:12	07:44
	17:19	17:57	19:30	20:03	30 07:59 (1)	20:35	21:01	21:02	20:34		19:44		18:53	17:12	16:59
13	07:53	07:26	07:44	06:53	07:29 (1)	06:12	05:54	06:05	06:34		07:05		07:37	07:13	07:45
	17:20	17:58	19:32	20:04	30 07:59 (1)	20:36	21:01	21:02	20:32		19:42		18:51	17:11	16:59
14	07:52	07:25	07:43	06:51	07:28 (1)	06:11	05:54	06:06	06:35		07:06		07:38	07:14	07:46
	17:22	18:00	19:33	20:05	30 07:58 (1)	20:37	21:02	21:01	20:31		19:40		18:50	17:10	16:59
15	07:52	07:24	07:41	06:50	07:29 (1)	06:10	05:54	06:07	06:36		07:07		07:39	07:15	07:46
	17:23	18:01	19:34	20:06	29 07:58 (1)	20:38	21:02	21:01	20:29		19:38		18:48	17:09	16:59
16	07:52	07:23	07:39	06:48	07:28 (1)	06:09	05:54	06:08	06:37		07:08		07:40	07:17	07:47
	17:24	18:02	19:35	20:07	29 07:57 (1)	20:39	21:03	21:00	20:28		19:37		18:47	17:08	16:59
17	07:51	07:21	07:38	06:46	07:29 (1)	06:08	05:54	06:09	06:38		07:09		07:41	07:18	07:48
	17:25	18:03	19:36	20:09	28 07:57 (1)	20:40	21:03	21:00	20:27		19:35		18:45	17:07	17:00
18	07:51	07:20	07:36	06:45	07:29 (1)	06:07	05:54	06:09	06:39		07:10		07:42	07:19	07:48
	17:26	18:05	19:37	20:10	26 07:55 (1)	20:41	21:04	20:59	20:25		19:33		18:43	17:07	17:00
19	07:50	07:18	07:34	06:43	07:30 (1)	06:06	05:54	06:10	06:40		07:12		07:43	07:20	07:49
	17:27	18:06	19:38	20:11	25 07:55 (1)	20:42	21:04	20:58	20:24		19:32		18:42	17:06	17:00
20	07:50	07:17	07:33	06:42	07:31 (1)	06:05	05:54	06:11	06:41		07:40 (1)	07:13	07:45	07:21	07:50
	17:29	18:07	19:39	20:12	22 07:53 (1)	20:43	21:04	20:58	20:22	12	07:52 (1)	19:30	18:40	17:05	17:01
21	07:49	07:16	07:31	06:40	07:32 (1)	06:04	05:54	06:12	06:42		07:38 (1)	07:14	07:46	07:23	07:50
	17:30	18:08	19:40	20:13	20 07:52 (1)	20:44	21:04	20:57	20:21	16	07:54 (1)	19:28	18:39	17:04	17:01
22	07:48	07:14	07:29	06:39	07:33 (1)	06:04	05:55	06:13	06:43		07:36 (1)	07:15	07:47	07:24	07:51
	17:31	18:10	19:42	20:14	16 07:49 (1)	20:45	21:05	20:56	20:19	20	07:56 (1)	19:26	18:38	17:04	17:02
23	07:48	07:13	07:27	06:37	07:36 (1)	06:03	05:55	06:14	06:44		07:34 (1)	07:16	07:48	07:25	07:51
	17:32	18:11	19:43	20:15	11 07:47 (1)	20:46	21:05	20:55	20:18	23	07:57 (1)	19:25	18:36	17:03	17:02
24	07:47	07:11	07:26	06:36		06:02	05:55	06:15	06:45		07:33 (1)	07:17	07:49	07:26	07:52
	17:33	18:12	19:44	20:16		20:47	21:05	20:54	20:16	25	07:58 (1)	19:23	18:35	17:03	17:03
25	07:46	07:10	07:24	06:34		06:01	05:55	06:16	06:46		07:32 (1)	07:18	07:50	07:27	07:52
	17:35	18:13	19:45	20:17		20:48	21:05	20:54	20:15	26	07:58 (1)	19:21	18:33	17:02	17:03
26	07:45	07:08	07:22	06:33		06:01	05:56	06:16	06:47		07:31 (1)	07:19	07:51	07:28	07:52
	17:36	18:14	19:46	20:18		20:49	21:05	20:53	20:13	28	07:59 (1)	19:19	18:32	17:01	17:04
27	07:45	07:07	07:21	06:32		06:00	05:56	06:17	06:48		07:30 (1)	07:20	07:53	07:29	07:53
	17:37	18:15	19:47	20:19		20:50	21:05	20:52	20:12	29	07:59 (1)	19:18	18:31	17:01	17:05
28	07:44	07:05	07:19	06:30		05:59	05:57	06:18	06:49		07:30 (1)	07:21	07:54	07:31	07:53
	17:38	18:17	19:48	20:20		20:50	21:05	20:51	20:10	29	07:59 (1)	19:16	18:29	17:01	17:05
29	07:43		07:17	06:29		05:59	05:57	06:19	06:50		07:29 (1)	07:22	07:55	07:32	07:53
	17:40		19:49	20:21		20:51	21:05	20:50	20:08	30	07:59 (1)	19:14	18:28	17:00	17:06
30	07:42		07:16	06:28		05:58	05:57	06:20	06:51		07:29 (1)	07:23	07:56	07:33	07:54
	17:41		19:50	20:23		20:52	21:05	20:49	20:07	30	07:59 (1)	19:13	18:27	17:00	17:07
31	07:41		07:14			05:58		06:21	06:52		07:29 (1)		07:57		07:54
	17:42		19:51			20:53		20:48	20:05	30	07:59 (1)		18:25		17:08
Potential sun hours	297	297	370	399		449	453	460	429			375	345	297	287
Total, worst case					484					298		191			
Sun reduction					0.57					0.65		0.55			
Oper. time red.					0.81					0.81		0.81			
Wind dir. red.					0.62					0.62		0.62			
Total reduction					0.28					0.32		0.27			
Total, real					137					97		52			

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
CCFG3

Printed/Page
8/28/2010 8:12 PM / 5
Licensed user:
Conserve First LLC, d/b/a The Renaissance Group, Renewables
8281 Euclid Chardon Road, Suite E
US-44094 Kirtland, Ohio
4717
AAron Godwin / AAron@ConserveFirst.com
Calculated:
8/28/2010 8:11 PM/2.7.473

SHADOW - Calendar

Shadow receptor: C - Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (3)

Assumptions for shadow calculations

Maximum distance for influence	2,000 m
Minimum sun height over horizon for influence	3 °
Day step for calculation	1 days
Time step for calculation	1 minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
407	472	288	208	185	253	359	366	473	681	799	853	598	471	330	329	7,072

Idle start wind speed: Cut in wind speed from power curve

	January			February	March	April	May	June	July	August	September	October	November			December		
1	07:54		09:30 (1)	07:40	07:04	07:12	06:26	05:57	05:58	06:22	06:53	07:24	06:59			07:34		09:21 (1)
	17:09	37	10:07 (1)	17:43	18:18	19:52	20:24	20:54	21:05	20:47	20:04	19:11	17:24			16:59	25	09:46 (1)
2	07:54		09:31 (1)	07:39	07:02	07:11	06:25	05:57	05:58	06:23	06:54	07:25	07:00			07:35		09:20 (1)
	17:10	36	10:07 (1)	17:45	18:19	19:53	20:25	20:54	21:05	20:46	20:02	19:09	17:23			16:59	27	09:47 (1)
3	07:54		09:31 (1)	07:38	07:00	07:09	06:24	05:56	05:59	06:24	06:55	07:26	07:01			07:36		09:20 (1)
	17:10	36	10:07 (1)	17:46	18:20	19:55	20:26	20:55	21:05	20:45	20:00	19:08	17:21			16:59	29	09:49 (1)
4	07:54		09:32 (1)	07:37	06:59	07:07	06:22	05:56	05:59	06:25	06:56	07:27	07:02			07:37		09:19 (1)
	17:11	35	10:07 (1)	17:47	18:21	19:56	20:27	20:56	21:05	20:43	19:57	19:06	17:20			16:59	31	09:50 (1)
5	07:54		09:33 (1)	07:36	06:57	07:06	06:21	05:56	06:00	06:26	06:57	07:28	07:03			07:38		09:19 (1)
	17:12	34	10:07 (1)	17:48	18:22	19:57	20:28	20:57	21:05	20:42	19:55	19:04	17:19			16:59	32	09:51 (1)
6	07:54		09:33 (1)	07:35	06:56	07:04	06:20	05:55	06:01	06:27	06:58	07:29	07:05			07:39		09:19 (1)
	17:13	33	10:06 (1)	17:50	18:24	19:58	20:29	20:57	21:04	20:41	19:54	19:03	17:18			16:58	33	09:52 (1)
7	07:54		09:34 (1)	07:34	06:54	07:02	06:19	05:55	06:01	06:28	06:59	07:30	07:06			07:40		09:19 (1)
	17:14	32	10:06 (1)	17:51	18:25	19:59	20:30	20:58	21:04	20:40	19:52	19:01	17:17			16:58	34	09:53 (1)
8	07:54		09:35 (1)	07:33	07:52	07:01	06:17	05:55	06:02	06:29	07:00	07:31	07:07			07:41		09:19 (1)
	17:15	31	10:06 (1)	17:52	19:26	20:00	20:31	20:59	21:04	20:39	19:50	18:59	17:16			16:58	35	09:54 (1)
9	07:54		09:37 (1)	07:31	07:51	06:59	06:16	05:54	06:03	06:30	07:01	07:32	07:08			07:42		09:19 (1)
	17:16	29	10:06 (1)	17:53	19:27	20:00	20:32	20:59	21:04	20:37	19:49	18:58	17:15			16:58	36	09:55 (1)
10	07:54		09:38 (1)	07:30	07:49	06:57	06:15	05:54	06:03	06:31	07:02	07:33	07:09			07:42		09:20 (1)
	17:17	27	10:05 (1)	17:55	19:28	20:01	20:33	21:00	21:03	20:36	19:47	18:56	17:14			16:58	36	09:56 (1)
11	07:53		09:39 (1)	07:29	07:48	06:56	06:14	05:54	06:04	06:32	07:03	07:34	07:11			07:43		09:20 (1)
	17:18	25	10:04 (1)	17:56	19:29	20:02	20:34	21:00	21:03	20:35	19:45	18:54	17:13			16:58	37	09:57 (1)
12	07:53		09:41 (1)	07:28	07:46	06:54	06:13	05:54	06:05	06:33	07:04	07:36	07:12			07:44		09:20 (1)
	17:19	23	10:04 (1)	17:57	19:30	20:03	20:35	21:01	21:02	20:34	19:44	18:53	17:12			16:59	38	09:58 (1)
13	07:53		09:42 (1)	07:26	07:44	06:53	06:12	05:54	06:05	06:34	07:05	07:37	07:13			07:45		09:20 (1)
	17:20	20	10:02 (1)	17:58	19:32	20:04	20:36	21:01	21:02	20:32	19:42	18:51	17:11			16:59	38	09:58 (1)
14	07:52		09:44 (1)	07:25	07:43	06:51	06:11	05:54	06:06	06:35	07:06	07:38	07:14			07:46		09:20 (1)
	17:22	17	10:01 (1)	18:00	19:33	20:05	20:37	21:02	21:01	20:31	19:40	18:50	17:10			16:59	38	09:58 (1)
15	07:52		09:47 (1)	07:24	07:41	06:49	06:10	05:54	06:07	06:36	07:07	07:39	07:15			07:46		09:21 (1)
	17:23	13	10:00 (1)	18:01	19:34	20:06	20:38	21:02	21:01	20:29	19:38	18:48	17:09			16:59	38	09:59 (1)
16	07:52		09:51 (1)	07:23	07:39	06:48	06:09	05:54	06:08	06:37	07:08	07:40	07:17			07:47		09:21 (1)
	17:24	4	09:55 (1)	18:02	19:35	20:07	20:39	21:03	21:00	20:28	19:37	18:47	17:08			16:59	39	10:00 (1)
17	07:51			07:21	07:38	06:46	06:08	05:54	06:09	06:38	07:09	07:41	07:18			07:48		09:21 (1)
	17:25			18:03	19:36	20:09	20:40	21:03	21:00	20:27	19:35	18:45	17:07			17:00	39	10:00 (1)
18	07:51			07:20	07:36	06:45	06:07	05:54	06:09	06:39	07:10	07:42	07:19			07:48		09:22 (1)
	17:26			18:05	19:37	20:10	20:41	21:03	20:59	20:25	19:33	18:43	17:07			17:00	39	10:01 (1)
19	07:50			07:18	07:34	06:43	06:06	05:54	06:10	06:40	07:11	07:43	07:20			07:49		09:23 (1)
	17:27			18:06	19:38	20:11	20:42	21:04	20:58	20:24	19:32	18:42	17:06			17:00	39	10:02 (1)
20	07:50			07:17	07:33	06:42	06:05	05:54	06:11	06:41	07:13	07:45	07:21			07:50		09:23 (1)
	17:29			18:07	19:39	20:12	20:43	21:04	20:58	20:22	19:30	18:40	17:05			17:01	39	10:02 (1)
21	07:49			07:16	07:31	06:40	06:04	05:54	06:12	06:42	07:14	07:46	07:23			07:50		09:24 (1)
	17:30			18:08	19:40	20:13	20:44	21:04	20:57	20:21	19:28	18:39	17:04			17:01	39	10:03 (1)
22	07:48			07:14	07:29	06:39	06:04	05:55	06:13	06:43	07:15	07:47	07:24			07:51		09:24 (1)
	17:31			18:10	19:42	20:14	20:45	21:05	20:56	20:19	19:26	18:38	17:04			17:02	39	10:03 (1)
23	07:48			07:13	07:27	06:37	06:03	05:55	06:14	06:44	07:16	07:48	07:25			07:51		09:24 (1)
	17:32			18:11	19:43	20:15	20:46	21:05	20:55	20:18	19:25	18:36	17:03			17:02	39	10:03 (1)
24	07:47			07:11	07:26	06:36	06:02	05:55	06:15	06:45	07:17	07:49	07:26			07:52		09:25 (1)
	17:33			18:12	19:44	20:16	20:47	21:05	20:54	20:16	19:23	18:35	17:03			17:03	39	10:04 (1)
25	07:46			07:10	07:24	06:34	06:01	05:55	06:15	06:46	07:18	07:50	07:27			07:52		09:25 (1)
	17:35			18:13	19:45	20:17	20:48	21:05	20:54	20:15	19:21	18:33	17:02			17:03	39	10:04 (1)
26	07:45			07:08	07:22	06:33	06:01	05:56	06:16	06:47	07:19	07:51	07:28		09:31 (1)	07:52		09:26 (1)
	17:36			18:14	19:46	20:18	20:49	21:05	20:53	20:13	19:19	18:32	17:01	2	09:33 (1)	17:04	39	10:05 (1)
27	07:45			07:07	07:21	06:32	06:00	05:56	06:17	06:48	07:20	07:53	07:29		09:26 (1)	07:53		09:26 (1)
	17:37			18:15	19:47	20:19	20:50	21:05	20:52	20:12	19:18	18:30	17:01	12	09:38 (1)	17:05	39	10:05 (1)
28	07:44			07:05	07:19	06:30	05:59	05:56	06:18	06:49	07:21	07:54	07:31		09:24 (1)	07:53		09:27 (1)
	17:38			18:17	19:48	20:20	20:50	21:05	20:51	20:10	19:16	18:29	17:01	17	09:41 (1)	17:05	38	10:05 (1)
29	07:43				07:17	06:29	05:59	05:57	06:19	06:50	07:22	07:55	07:32		09:23 (1)	07:53		09:27 (1)
	17:40				19:49	20:21	20:51	21:05	20:50	20:08	19:14	18:28	17:00	20	09:43 (1)	17:06	38	10:05 (1)
30	07:42				07:16	06:27	05:58	05:57	06:20	06:51	07:23	07:56	07:33		09:22 (1)	07:54		09:28 (1)
	17:41				19:50	20:23	20:52	21:05	20:49	20:07	19:13	18:27	17:00	23	09:45 (1)	17:07	37	10:05 (1)
31	07:41				07:14		05:58		06:21	06:52		07:57				07:54		09:29 (1)
	17:42				19:51		20:53		20:48	20:05		18:25				17:08	38	10:07 (1)
Potential sun hours	297			297	370	399	449	453	460	429	375	345	297			287		
Total, worst case		432												74			1126	
Sun reduction		0.36												0.27			0.20	
Oper. time red.		0.81												0.81			0.81	
Wind dir. red.		0.59												0.59			0.59	
Total reduction		0.17												0.13			0.10	
Total, real		75												10			109	

Table layout: For each day in each month the following matrix apply

Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
CCFG3

Printed/Page
8/28/2010 8:12 PM / 6
Licensed user:
Conserve First LLC, d/b/a The Renaissance Group, Renewables
8281 Euclid Chardon Road, Suite E
US-44094 Kirtland, Ohio
4717
AAron Godwin / AAron@ConserveFirst.com
Calculated:
8/28/2010 8:11 PM/2.7.473

SHADOW - Calendar

Shadow receptor: D - Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (4)

Assumptions for shadow calculations

Maximum distance for influence	2,000	m
Minimum sun height over horizon for influence	3	°
Day step for calculation	1	days
Time step for calculation	1	minutes

Sunshine probability S (Average daily sunshine hours) [CLEVELAND]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
3.47	4.37	4.90	7.57	8.91	9.33	10.21	9.01	6.89	5.70	2.71	1.87

Operational time

N	NNE	NE	ENE	E	ESE	SE	SSE	S	SSW	SW	WSW	W	WNW	NW	NNW	Sum
407	472	288	208	185	253	359	366	473	681	799	853	598	471	330	329	7,072

Idle start wind speed: Cut in wind speed from power curve

	January	February	March	April	May		June		July		August	September	October	November	December
1	07:54	07:40	07:04	07:12	06:26		05:57	06:35 (1)	05:58	06:43 (1)	06:22	06:53	07:24	06:59	07:34
	17:09	17:43	18:18	19:52	20:24		20:54 27	07:02 (1)	21:05 23	07:06 (1)	20:47	20:04	19:11	17:24	17:00
2	07:54	07:39	07:02	07:11	06:25		05:57	06:36 (1)	05:58	06:43 (1)	06:23	06:54	07:25	07:00	07:35
	17:10	17:45	18:19	19:53	20:25		20:54 27	07:03 (1)	21:05 24	07:07 (1)	20:46	20:02	19:09	17:23	16:59
3	07:54	07:38	07:00	07:09	06:24		05:56	06:36 (1)	05:59	06:44 (1)	06:24	06:55	07:26	07:01	07:36
	17:10	17:46	18:20	19:55	20:26		20:55 26	07:02 (1)	21:05 24	07:08 (1)	20:45	20:00	19:08	17:22	16:59
4	07:54	07:37	06:59	07:07	06:22		05:56	06:36 (1)	05:59	06:43 (1)	06:25	06:56	07:27	07:02	07:37
	17:11	17:47	18:21	19:56	20:27		20:56 26	07:02 (1)	21:05 24	07:07 (1)	20:43	19:57	19:06	17:20	16:59
5	07:54	07:36	06:57	07:06	06:21		05:56	06:36 (1)	06:00	06:43 (1)	06:26	06:57	07:28	07:03	07:38
	17:12	17:48	18:23	19:57	20:28		20:57 26	07:02 (1)	21:05 25	07:08 (1)	20:42	19:55	19:04	17:19	16:59
6	07:54	07:35	06:56	07:04	06:20		05:55	06:37 (1)	06:01	06:43 (1)	06:27	06:58	07:29	07:05	07:39
	17:13	17:50	18:24	19:58	20:29		20:57 25	07:02 (1)	21:04 25	07:08 (1)	20:41	19:54	19:03	17:18	16:58
7	07:54	07:34	06:54	07:02	06:19		05:55	06:37 (1)	06:01	06:43 (1)	06:28	06:59	07:30	07:06	07:40
	17:14	17:51	18:25	19:59	20:30		20:58 25	07:02 (1)	21:04 26	07:09 (1)	20:40	19:52	19:01	17:17	16:58
8	07:54	07:33	07:52	07:01	06:17		05:55	06:38 (1)	06:02	06:43 (1)	06:29	07:00	07:31	07:07	07:41
	17:15	17:52	19:26	20:00	20:31		20:59 24	07:02 (1)	21:04 25	07:08 (1)	20:39	19:50	18:59	17:16	16:58
9	07:54	07:31	07:51	06:59	06:16		05:54	06:38 (1)	06:03	06:43 (1)	06:30	07:01	07:32	07:08	07:42
	17:16	17:53	19:27	20:00	20:32		20:59 24	07:02 (1)	21:04 26	07:09 (1)	20:37	19:49	18:58	17:15	16:58
10	07:54	07:30	07:49	06:57	06:15		05:54	06:38 (1)	06:03	06:43 (1)	06:31	07:02	07:33	07:09	07:42
	17:17	17:55	19:28	20:01	20:33		21:00 24	07:02 (1)	21:03 27	07:10 (1)	20:36	19:47	18:56	17:14	16:58
11	07:53	07:29	07:48	06:56	06:14		05:54	06:38 (1)	06:04	06:43 (1)	06:32	07:03	07:35	07:11	07:43
	17:18	17:56	19:29	20:02	20:34		21:00 24	07:02 (1)	21:03 26	07:09 (1)	20:35	19:45	18:54	17:13	16:58
12	07:53	07:28	07:46	06:54	06:13		05:54	06:39 (1)	06:05	06:43 (1)	06:33	07:04	07:36	07:12	07:44
	17:19	17:57	19:30	20:03	20:35		21:01 23	07:02 (1)	21:02 27	07:10 (1)	20:34	19:44	18:53	17:12	16:59
13	07:53	07:26	07:44	06:53	06:12	06:43 (1)	05:54	06:39 (1)	06:05	06:43 (1)	06:34	07:05	07:37	07:13	07:45
	17:21	17:58	19:32	20:04	20:36 8	06:51 (1)	21:01 23	07:02 (1)	21:02 28	07:11 (1)	20:32	19:42	18:51	17:11	16:59
14	07:52	07:25	07:43	06:51	06:11	06:40 (1)	05:54	06:40 (1)	06:06	06:44 (1)	06:35	07:06	07:38	07:14	07:46
	17:22	18:00	19:33	20:05	20:37 14	06:54 (1)	21:02 22	07:02 (1)	21:01 27	07:11 (1)	20:31	19:40	18:50	17:10	16:59
15	07:52	07:24	07:41	06:50	06:10	06:39 (1)	05:54	06:40 (1)	06:07	06:43 (1)	06:36	07:07	07:39	07:15	07:46
	17:23	18:01	19:34	20:06	20:38 16	06:55 (1)	21:02 22	07:02 (1)	21:01 27	07:10 (1)	20:29	19:38	18:48	17:09	16:59
16	07:52	07:23	07:39	06:48	06:09	06:39 (1)	05:54	06:40 (1)	06:08	06:43 (1)	06:37	07:08	07:40	07:17	07:47
	17:24	18:02	19:35	20:07	20:39 18	06:57 (1)	21:03 22	07:02 (1)	21:00 28	07:11 (1)	20:28	19:37	18:47	17:08	16:59
17	07:51	07:21	07:38	06:46	06:08	06:38 (1)	05:54	06:40 (1)	06:09	06:44 (1)	06:38	07:09	07:41	07:18	07:48
	17:25	18:03	19:36	20:09	20:40 20	06:58 (1)	21:03 22	07:02 (1)	21:00 27	07:11 (1)	20:27	19:35	18:45	17:07	17:00
18	07:51	07:20	07:36	06:45	06:07	06:37 (1)	05:54	06:41 (1)	06:09	06:44 (1)	06:39	07:10	07:42	07:19	07:48
	17:26	18:05	19:37	20:10	20:41 22	06:59 (1)	21:03 21	07:02 (1)	20:59 27	07:11 (1)	20:25	19:33	18:43	17:07	17:00
19	07:50	07:18	07:34	06:43	06:06	06:36 (1)	05:54	06:42 (1)	06:10	06:44 (1)	06:40	07:12	07:43	07:20	07:49
	17:27	18:06	19:38	20:11	20:42 23	06:59 (1)	21:04 21	07:03 (1)	20:58 27	07:11 (1)	20:24	19:32	18:42	17:06	17:00
20	07:50	07:17	07:33	06:42	06:05	06:35 (1)	05:54	06:42 (1)	06:11	06:44 (1)	06:41	07:13	07:45	07:21	07:50
	17:29	18:07	19:39	20:12	20:43 25	07:00 (1)	21:04 21	07:03 (1)	20:58 27	07:11 (1)	20:22	19:30	18:40	17:05	17:01
21	07:49	07:16	07:31	06:40	06:04	06:35 (1)	05:54	06:42 (1)	06:12	06:44 (1)	06:42	07:14	07:46	07:23	07:50
	17:30	18:08	19:40	20:13	20:44 25	07:00 (1)	21:04 21	07:03 (1)	20:57 27	07:11 (1)	20:21	19:28	18:39	17:04	17:01
22	07:48	07:14	07:29	06:39	06:04	06:35 (1)	05:55	06:42 (1)	06:13	06:45 (1)	06:43	07:15	07:47	07:24	07:51
	17:31	18:10	19:42	20:14	20:45 26	07:01 (1)	21:05 21	07:03 (1)	20:56 25	07:10 (1)	20:19	19:26	18:38	17:04	17:02
23	07:48	07:13	07:27	06:37	06:03	06:35 (1)	05:55	06:42 (1)	06:14	06:45 (1)	06:44	07:16	07:48	07:25	07:51
	17:32	18:11	19:43	20:15	20:46 26	07:01 (1)	21:05 21	07:03 (1)	20:55 25	07:10 (1)	20:18	19:25	18:36	17:03	17:02
24	07:47	07:11	07:26	06:36	06:02	06:34 (1)	05:55	06:43 (1)	06:15	06:46 (1)	06:45	07:17	07:49	07:26	07:52
	17:33	18:12	19:44	20:16	20:47 27	07:01 (1)	21:05 21	07:04 (1)	20:54 24	07:10 (1)	20:16	19:23	18:35	17:03	17:03
25	07:46	07:10	07:24	06:34	06:01	06:35 (1)	05:55	06:43 (1)	06:16	06:47 (1)	06:46	07:18	07:50	07:27	07:52
	17:35	18:13	19:45	20:17	20:48 27	07:02 (1)	21:05 21	07:04 (1)	20:54 23	07:10 (1)	20:15	19:21	18:33	17:02	17:03
26	07:45	07:08	07:22	06:33	06:01	06:34 (1)	05:56	06:42 (1)	06:16	06:48 (1)	06:47	07:19	07:51	07:28	07:52
	17:36	18:14	19:46	20:18	20:49 28	07:02 (1)	21:05 22	07:04 (1)	20:53 21	07:09 (1)	20:13	19:19	18:32	17:01	17:04
27	07:45	07:07	07:21	06:32	06:00	06:34 (1)	05:56	06:43 (1)	06:17	06:49 (1)	06:48	07:20	07:53	07:29	07:53
	17:37	18:15	19:47	20:19	20:50 27	07:01 (1)	21:05 22	07:05 (1)	20:52 19	07:08 (1)	20:12	19:18	18:31	17:01	17:05
28	07:44	07:05	07:19	06:30	05:59	06:35 (1)	05:57	06:43 (1)	06:18	06:49 (1)	06:49	07:21	07:54	07:31	07:53
	17:38	18:17	19:48	20:20	20:50 27	07:02 (1)	21:05 22	07:05 (1)	20:51 17	07:06 (1)	20:10	19:16	18:29	17:01	17:05
29	07:43		07:17	06:29	05:59	06:34 (1)	05:57	06:43 (1)	06:19	06:50 (1)	06:50	07:22	07:55	07:32	07:53
	17:40		19:49	20:21	20:51 28	07:02 (1)	21:05 23	07:06 (1)	20:50 15	07:05 (1)	20:08	19:14	18:28	17:00	17:06
30	07:42		07:16	06:28	05:58	06:35 (1)	05:57	06:43 (1)	06:20	06:52 (1)	06:51	07:23	07:56	07:33	07:54
	17:41		19:50	20:23	20:52 27	07:02 (1)	21:05 23	07:06 (1)	20:49 11	07:03 (1)	20:07	19:13	18:27	17:00	17:07
31	07:41		07:14		05:58	06:35 (1)			06:21	06:55 (1)	06:52		07:57		07:54
	17:42		19:51		20:53 27	07:02 (1)			20:48 6	07:01 (1)	20:05		18:25		17:08
Potential sun hours	297	297	370	399	449		453		460		429	375	345	297	287
Total, worst case					441		692		733						
Sun reduction					0.62		0.62		0.69						
Oper. time red.					0.81		0.81		0.81						
Wind dir. red.					0.65		0.65		0.65						
Total reduction					0.32		0.33		0.36						
Total, real					143		226		266						

Table layout: For each day in each month the following matrix apply

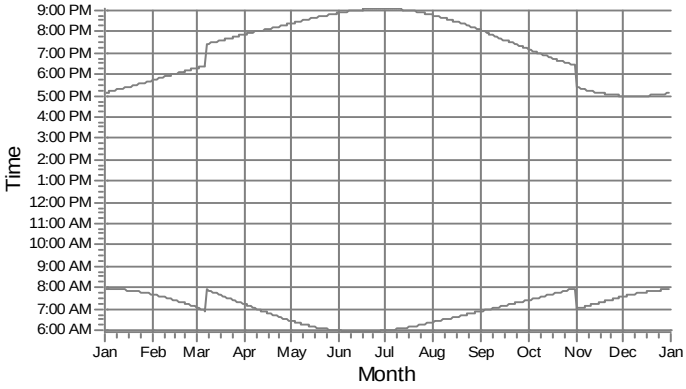
Day in month	Sun rise (hh:mm)		First time (hh:mm) with flicker	(WTG causing flicker first time)
	Sun set (hh:mm)	Minutes with flicker	Last time (hh:mm) with flicker	(WTG causing flicker last time)

Project:
CCFG3

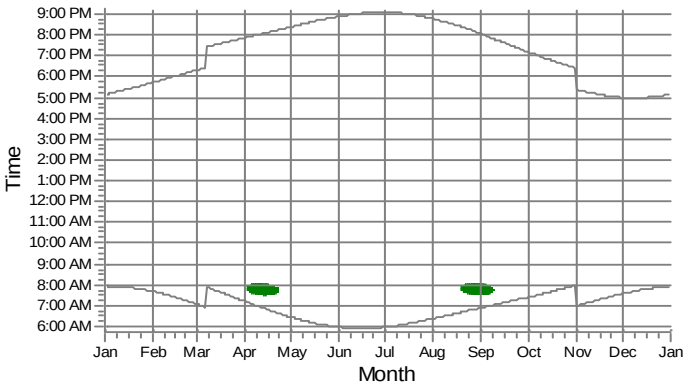
Printed/Page
8/28/2010 8:12 PM / 7
Licensed user:
Conserve First LLC, d/b/a The Renaissance Group, Renewables
8281 Euclid Chardon Road, Suite E
US-44094 Kirtland, Ohio
4717
AAron Godwin / AAron@ConserveFirst.com
Calculated:
8/28/2010 8:11 PM/2.7.473

SHADOW - Calendar, graphical

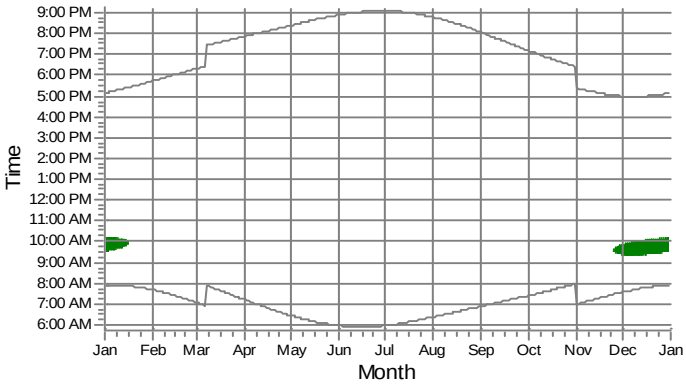
A: Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (1)



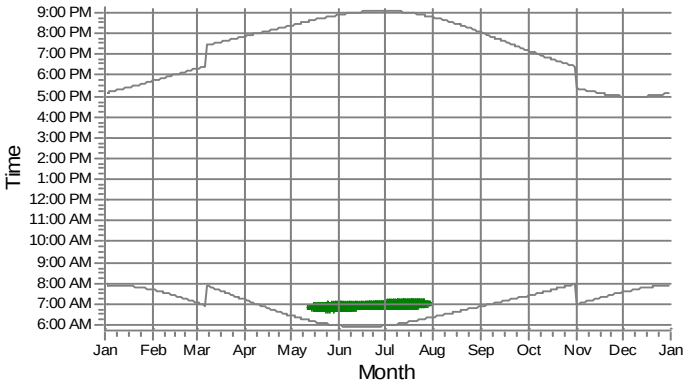
B: Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (2)



C: Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (3)



D: Shadow Receptor: 1.0 × 1.0 Azimuth: -180.0° Slope: 90.0° (4)



WTGs

1: VESTAS V47 660-200 47.0 !#! hub: 60.0 m (1)

Turbine Use, Safety Policies and General Background

Security:

- Tower Climbing: The wind turbine utilizes a smooth exterior monopole tower with no climbing surfaces or apparatus. Tower climbing is only achieved through the use of an internal ladder system. This system is only reachable through a locked plate steel door.
- Availability: Only preauthorized personnel will be given access to the internal tower and turbine systems.

Tower Climbing Safety:

- Safety Climb: For maintenance personnel climbing of the tower, an OSHA approved "safety climb" system is included in the tower climbing system. This system is comprised of a ladder, a steel cable for the safety climb device, a full body harness designed and approved for the purpose, a locking safety climb device, safety lanyards with self-locking clips and additional tie-in points throughout the turbine system where a cable system is not available.
- OSHA approved safety equipment such as hardhats will be worn by all maintenance personnel climbing or working on the turbine.
- No individual shall climb the tower without a partner.

Electrical Safety:

- All electrical components and their installations shall meet all Local, State and Federal applicable laws and regulations.
- The turbine system shall meet UL1741 and IEC requirements for Utility Grid Protection in case of Grid power failures or power quality abnormalities.
- All electrical supply/grid interconnect services to and from the turbine shall be in buried conduits.
- The turbine system will have a staff accessible emergency shut-offs.
    - Utility room
    - Tower base
    - Nacelle
    - Remote through "Web" interface.

- The turbine system will have an automated system fault shut-off triggered at a minimum by the following sensors: System temperature, power quality, vibration, over-speed, fire and icing.
    - This system will also automatically send fault codes to preauthorized personnel through a "Web" interface.
- All safety sensors and equipment shall fault to a turbine fault state in case of their own failure.

Fire:

- The turbine shall have fire detection devices at the tower base and within the nacelle that shall be linked to the Site's existing fire detection/alarm systems (if present).
- The local fire department shall be contacted and a fire/emergency response plan shall be adopted.
- Although formal fire suppression systems are extremely rare for wind turbines, the site shall investigate passive and active fire suppression systems for possible implementation in the turbine system.
- Local fire department approved fire extinguishers shall be located within the tower base and within the nacelle.
- The turbine system will have staff accessible emergency shut-offs.
    - Utility room
    - Tower base
    - Nacelle
    - Remote through "Web" interface.
- The turbine system will have an automated system fault shut-off triggered at a minimum by the following sensors: System temperature, power quality, vibration, over-speed, fire and icing.
    - This system will also automatically send fault codes to preauthorized personnel through a "Web" interface.
- Safety zones similar to any fire related incident will be utilized, if a fire should occur.

Lightening:

- The turbine system is equipped with a full grounding loop meeting or exceeding all Local, State and Federal regulations concerning grounding and lightening protection.
- Surge suppressing technology will be utilized to protect key electronics.
- See fire policies above.

Icing:

- Although icing of wind turbines is very rare and safety issues related to icing even rarer, it can occur, similar to any built structure (roofs, power lines, stadium lights, etc.).
- Although not an absolute brake, blade icing induced airfoil shape spoiling will naturally reduce the efficiency of the blades and thus reduce their rotational speed.
- Although formal icing detection systems are extremely rare for wind turbines, the site shall investigate active icing detection systems for possible implementation in the turbine system.
- The turbine system will have an automated system fault shut-off triggered at a minimum by the following sensors: System temperature, power quality, vibration, over-speed, fire and icing (vibration caused by blade icing induced imbalances will automatically shut down the turbine).
    - This system will also automatically send fault codes to preauthorized personnel through a "Web" interface.
- The turbine's nacelle will have a cold-weather package including nacelle heaters. These heaters are designed to maintain nacelle temperatures above the dew-point and well above freezing. This system will automatically melt snow and ice accumulation on top of the nacelle.
- The turbine system will have a staff accessible emergency shut-offs.
    - Utility room
    - Tower base
    - Nacelle
    - Remote through "Web" interface.
- All icing related turbine shut-downs will require a direct inspection and an on-site manual restart.
- The site personnel and the system maintenance personnel will shut down the turbine in the event of an icing condition.
- The site shall adopt an ice safety zone around the turbine for implementation during icing events, if they should occur.

High Wind:

- The turbine automatically shuts down in high winds and turns itself out of the wind.
- The turbine system will have an automated system fault shut-off triggered at a minimum by the following sensors: System temperature, power quality, vibration,

over-speed, fire and icing (vibration caused by blade icing induced imbalances will automatically shut down the turbine).
    - This system will also automatically send fault codes to preauthorized personnel through a "Web" interface.

Aviation Safety:

- The project has been review by both FAA and ODOT and "No Hazard to Aviation" determinations were issued.
- An FAA approved red obstruction marking light will be located on top of the nacelle.

Shadow Flicker:

- Although all structures cast shadows, shadows from wind turbines that reach occupied structures or areas can be considered a nuisance due to the fact that they move or flicker as the blades rotate in front of the Sun.
- A formal shadow flicker study has been conducted for the site based on the turbine's rotor diameter and height, the site latitude and longitude, weather records, existing site topography and the existing area obstructions.
- Per international standards, shadow flicker impacting a particular location above 30 hours per year is considered a potential nuisance. While the turbine's shadow will reach some of the area properties, no residential or business property locations will receive more than 30 hours of shadow per year. Other factors that mitigate the shadows' impact include:
    - Shadow intensity drops off with distance. Shadow edges soften and shadow bodies become more muted. Shadows beyond ten rotor diameters from the tower base are considered insignificant with shadows within five rotor diameters being the most significant.
    - Shadows move and do not remain in one spot for extended periods of time.
    - The longest extended period shadows occur in the winter when there are fewer sunny days.
    - Many local natural and built environmental elements such as trees will block or significantly diffuse shadows.
- If extended adverse shadows should impact a particular dwelling, the wind turbine site owner will take one or more of the following mitigating measures:
    - Plant evergreen trees to block the shadow.
    - Provide blinds for the dwelling.
    - Turn off the turbine during the shadowing periods that excessively affect the dwelling.

Sound:

- Wind turbines of the size to be installed are inherently quite devices, especially over distance, and are typically very hard to hear over the wind itself and the existing ambient area noise levels.
    - Sound from a single wind turbines typically comes from the following areas:
        - Wind noise off of the blades as they are driven by the wind (swooshing that drops off over distance and typically competes with the area's natural wind noise).
        - Drive-train noise (mechanical sound typically not heard outside the immediate vicinity of the turbine).
        - Yaw system noise (mechanical sound typically not heard outside the immediate vicinity of the turbine and that is only present when the turbine turns into the wind).
        - Electrical noise from the turbine's electrical equipment and transformer (buzz, typically not heard outside the immediate vicinity of the turbine).
- Sound modeling for the proposed wind turbine supports that turbine produced audio levels will not exceed any local code or ordinance at the site's property lines. To be conservative, this modeling was done at an 8 mps/17.9 mph wind speed, well above site averages.
- Sound measurement of existing ambient sound levels for both day and evening periods at multiple locations surrounding the site show existing ambient sound levels above what the wind turbine will produce.

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[i] The only known shadow flicker regulation to date was enacted in Germany, where a court ruled that the maximum allowable flicker would be 30 hours per year (Klepinger, 2007). In addition, Dobesch and Kury (2001) recommended that shadow flicker should not exceed 30 hours per year, and the guidelines for wind power development in the State of Victoria, Australia state that shadow flicker may not exceed 30 hours per year at any dwelling in the surrounding area (Sustainable Energy Authority Victoria, 2003). Since there are no known national or local regulations that govern shadow flicker in the United States, New York State, or Steuben County, the 30-hour per year threshold is used in this analysis to determine potentially impacted structures.
http://www.eon.com/en/downloads/Appendix_M_Shadow_Flicker_Modeling_Report.pdf

[ii] Epilepsy Foundation. (n.d.). Photosensitivity and Epilepsy.
http://www.epilepsyfoundation.org/about/photosensitivity/

[iii] As there is a possibility of a turbine model change on the project, the worst case largest model under consideration was used for the shadow flicker models.

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

August 19, 2010

SUBJECT: Notice of Scoping – DOE EA No. 1815 - 660 kW Single Wind Turbine and Energy Education Facility: *Cuyahoga County Agricultural Society Wind Energy Project*, Berea, Cuyahoga County, Ohio

The U.S. Department of Energy (DOE) is proposing to provide federal funding to the Cuyahoga County Fairgrounds to construct and operate an approximately 660 kW wind turbine in Cuyahoga County, Ohio. The proposed project would construct and operate a wind turbine and an energy education facility located on the Cuyahoga County Fairgrounds within the town of Berea. Details of the proposed wind turbine are provided in the attachment to this Scoping Notice. Pursuant to the requirements of the National Environmental Policy Act (NEPA) the Council on Environmental Quality (CEQ) regulations for implementing the procedural provision of NEPA (40 CFR Parts 1500-1508), and DOE's implementing procedures for compliance with NEPA (10 CFR 1021), DOE is preparing an Environmental Assessment (EA) to:

- Indentify any adverse environmental effects that cannot be avoided should this proposed project be implemented.
- Evaluate viable alternatives to the proposed project.
- Describe the relationship between local and short-tern uses of the environment and the maintenance and enhancement of long-term productivity.
- Characterize any irreversible and irretrievable commitments of resources that would be involved should this proposed project be implemented.

Potential Environmental Effects or Issues Identified for the Environmental Assessment

The EA will describe and analyze any potential impacts on the environment that would be caused by the project and will identify possible mitigation measures to reduce or eliminate those impacts. At a minimum, DOE will evaluate potential impacts that may result from the proposed project related to:

- Land Use
- Biological Resources
- Cultural Resources
- Noise
- Safety and Occupational Health
- Socioeconomics and Environmental Justice
- Utilities
- Traffic and Transportation
- Aviation Hazards
- Electromagnetic Interferences
- Aesthetics and Shadow Flicker
- Water Resources

Development of a Reasonable Range of Alternatives
DOE is required to consider a reasonable range of alternatives to the proposed action during an environmental review. The definition of alternatives is governed by the "rule of reason", as described within the CEQ regulations regarding the administration of NEPA. An EA must consider a reasonable range of options that could accomplish the agency's purpose and need reduce environmental effects. Reasonable alternatives are those that may be feasibly carried out based on environmental, technical, and economic factors.

The No Action Alternative will be addressed. The need for project redesign, or a project alternative, will be determined during the course of environmental review.

Public Scoping

The DOE is sending this letter to interested federal, state and local agencies to provide information on issues to be addressed in the EA. Agencies are invited to indentify the issues within their statutory responsibilities that should be considered in the EA. The general public is also invited to submit comments on the scope of the EA. The general public is also invited to submit comments on the scope of the EA.

This letter and the draft EA, when it is available, will be posted in the DOE Golden Field Office online reading room: http://www.eere.energy.gov/golden/Reading_Room.aspx.

The DOE Golden Field Office welcomes your input throughout our NEPA process, but to ensure that your comments are received in time to be considered in the draft EA, please provide them on or before September 6, 2010 to:

Melissa Rossiter
NEPA Document Manager
Department of Energy
1617 Cole Boulevard
Golden, CO 80401
Melissa.Rossiter@go.doe.gov

We look forward to hearing from you.

Sincerely,

Melissa Rossiter

Attachment

Cuyahoga County Fairgrounds Wind Turbine and Energy Education Facility

The U.S. Department of Energy is proposing to provide up to $1.4 million to Cuyahoga County Fairgrounds for construction and operation of an approximately 660 kW single wind turbine and energy education facility. The Fairgrounds proposes to design, permit, construct, operate and maintain the approximate 660 kW wind turbine located on the Cuyahoga County Fairgrounds 164 Eastland Road, Berea, Ohio.

Latitude: 41-21-59.50N NAD 83
Longitude: 81-50-21.10W

The DOE funding for this project would be paid for by the American Recovery and Reinvestment Act of 2009 and would include the following components:

- A single 660 kW new turbine on a 60 meter tower
- Associated generator and below ground collector cables
- Underground transmission lines and connection to Cuyahoga County Fairground's internal energy distribution system
- A single building of approximately 2,000 square feet

AMERICAN TOWER®
CORPORATION

August 30, 2010

Melissa Rossiter
U.S. Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, CO 80401

RE: Cuyahoga County's proposal to erect 280 foot wind turbine located at 164 Eastland Road, Public comments to U.S. Department of Energy Environmental Assessment

Dear Ms. Rossiter,

Please accept this letter as formal notice that American Tower objects to the proposed wind turbine to be located in close proximity to our telecommunications facility at 164 Eastland Road. In support of our objection, please consider the following information:

- Our telecommunications facility has been operational for 19 years and has 31 years remaining on a 50 year lease with the County.
- American Tower provided expert testimony to the City of Middleburg Heights Planning Commission on March 10, 2010 and to the Middleburg Heights City Council on March 23, 2010 that the proposed location of the wind turbine may cause interference with radio frequency transmissions with our existing customers at the facility. The proposal to locate the turbine was defeated by the Middleburg Heights City Council.
- American Tower provided comment to the City of Berea Planning Commission voicing our objection to the proposed wind turbine. The City of Berea Planning Commission approved the petition of the turbine proponents.
- Current tower customers include: Verizon Wireless, T-Mobile, FiberTower and Clearwire. American Tower and our customers are concerned with interference with the radio frequency transmission of these carriers and that the turbine could cause disruption to the E911 service offered by the carriers and relied upon by the County and City's emergency providers. This life-saving service requires a strong signal to operate properly, thus making wireless infrastructure a critical public safety necessity.

- Please accept notice that there are no interference issues at this time.
- The turbine will negatively affect the future marketability of the telecommunications facility as customers will seek out another site or sites where they would not have to install additional mitigation equipment to overcome the proximity of the turbine. Additional equipment brings additional costs.
- Turbine proponents have stated that there will be no interference to the radio frequency transmission, yet they have failed to provide the testimony of any experts to support their position. They further suggest that mitigation is available if there is interference caused by the wind turbine; however mitigation is not as simple as the turbine proponents have suggested and carries an increase in costs for the initial mitigation equipment and ongoing maintenance. American Tower is concerned with: (i) how the mitigation will be funded; will the County or the U.S. Department of Energy agree to pay for mitigation; (ii) an inability to counter-act the deterrence to future customers who will disqualify the site as part of their network due to the proximity of the turbine; and (iii) the likelihood that our customers will move to another telecommunications facility that does not present any interference issues that require mitigation. Again, we are concerned about the potential damages that are caused by the proposed turbine.
- The County through their attorney, the County prosecutor's office refused to enter into an agreement to mitigate or compensate American Tower for any damages caused by the turbine. They strongly assert that there will be no interference; so why not enter into an agreement.
- The turbine proponent asked American Tower to provide coordinates for where to locate the turbine but turbines are sited based upon wind studies as to where to build for an optimal location. The results of a wind study have been referred to but never provided in any of the materials and I respectfully ask why the study has not been provided.

In conclusion, American Tower supports new technology and applauds the U.S. Department of Energy and the County for its attempt to implement innovative solutions to its energy needs; however, the proposed location in proximity to our leased area makes it impossible for American Tower to support this project due to the negative impact the turbine will have on our existing business. American Tower is actively researching wind turbines and how they may be able to be incorporated into our telecommunication infrastructure and by pursuing green initiatives for our business and workplace whenever possible. We are committed to providing quality infrastructure to our customers especially as the demand for wireless, broadband and E911 use increases.

For the reasons stated herein, American Tower respectfully requests that you do not provide funding or approve the proposed wind turbine at this location as we believe it will have a detrimental effect on our business which has successfully operated at this location for 19 years.

Respectfully submitted,

Bonnie Belair

Bonnie Belair
Zoning Attorney
American Tower
10 Presidential Way
Woburn, MA 01801
781 926-4637

Cuyahoga County Fairgrounds Public Involvement

Cuyahoga County has provided opportunities for public involvement since July 4, 2008 in an attempt to educate the public about this project and provide an opportunity for public comment.

Public Engagement

1. City of Berea

    - 5/6/10 – Planning Commission public hearing – Project unanimously approved
    - 4/22/10 – Architectural Review public hearing – Project unanimously approved

2. City of Middleburg Heights

    - 3/23/10 – City Council & Mayor public hearing – Project denied ("no benefit to City")
    - 3/10/10 – Planning Commission public hearing – minutes – Approved by Planning
    - 1/13/10 - Planning Commission public hearing - minutes– heard but tabled
    - 12/16/09 – Zoning application public hearing – minutes– 230' Variance approved
    - 11/11/08 – City Council & Mayor public hearing – minutes– Project approved
    - 10/8/08 – Planning Commission public hearing minutes–Approved by Planning
    - 9/17/08 – Zoning application public hearing. Minutes– 200' Variance approved

3. Presentations (other than city application hearings)

    - Cleveland Building & Construction Trades Council
    - Great Lakes Energy Development Task Force

4. Letters of Support

    - Building Laborers Local 310
    - IBEW Local 38
    - Western Reserve Audubon Society
    - Polaris Career Center
    - Cuyahoga County Board of County commissioners
    - Great Lakes Energy Development Task Force
    - Baldwin-Wallace College
    - Letters from (80) residents of Middleburg Heights to Councilman Matt Castelli – 90% in favor
    - News Sun suburban newspaper's online poll: 80% in favor

Media Coverage

Berea Newsletter – June 2010 – Planning Commission OKs wind turbine

Cleveland.com – May 10, 2010 – Berea OKs Wind Turbine at fairgrounds
Cleveland Plain Dealer – May 8, 2010 – Berea approves wind turbine for Cuyahoga County Fairgrounds
Sun News – May 7, 2010 - Berea approves wind turbine at Cuyahoga County Fairgrounds
Sun News – April 22, 2010 – Cuyahoga County Fairgrounds moves wind turbine to Berea
Cleveland Plain Dealer – April 21, 2010 – Middleburg Heights rejects Cuyahoga County wind turbine, but Berea might take it
Sun News – March 24, 2010 – Middleburg Heights Council votes down wind turbine at Cuyahoga County fairgrounds
Sun News – March 11, 2010 – Middleburg Heights wind turbine meets resistance
EcoWatch Journal – February 2010
Sun News – January 21, 2010 – County, Middleburg Heights officials in talks over wind turbine plan
Cleveland Plain Dealer – November 30, 2009 – Ohio awards over $13 million for wind and solar projects
Cleveland Plain Dealer – October 8, 2009 – Cuyahoga County commissioners call fairgrounds wind turbine plan too pricey
Cleveland Plain Dealer – August 18, 2009 – Cuyahoga County commissioners move ahead on wind turbine for county fairgrounds
Cleveland Plain Dealer – August 18, 2009 – Cuyahoga County fairgrounds may get wind turbine by next summer with commissioners' approval to seek proposals
Cleveland Plain Dealer – September 8, 2008
Cleveland Plain Dealer- July 4, 2008

In addition, the following agencies and organizations have been contacted by Cuyahoga County and/or DOE:

- United States Fish and Wildlife Service (USFWS)
- Federal Aviation Administration (FAA)
- United States Department of Commerce – National Telecommunications and Information Administration (NTIA)
- Ohio Historic Preservation Office (OHPO)
- Ohio Department of Natural Resources (ODNR), Division of Wildlife (ODOW)
- Ohio Department of Natural Resources (ODNR), Ohio Department of Transportation Office of Aviation
- Ohio Department of Development Energy Resources Division
- Middleburg Heights Board of Zoning Appeals
- Berea Board of Zoning Appeals
- Berea Historical Society
- First Energy

CITY OF BEREA

"The Grindstone City"

Cyril Kleem
Mayor

11 Berea Commons
Berea, Ohio 44017
440) 826-5800
Fax. (440) 826-4800
Website www.bereaohio.com

August 2, 2010

Mr. Nick Willis, Project Manager
Cuyahoga County
1642 Lakeside Ave.
Cleveland, OH 44114

Re: Wind Turbine Project
Cuyahoga County Fairgrounds

Dear Mr. Willis:

This letter is being written to establish that the Wind Turbine Project at the Cuyahoga County Fairgrounds came before the Berea Municipal Planning Commission on May 6, 2010 for Conditional Use Approval and the Berea Municipal Planning Commission voted unanimously to grant the Conditional Use Approval, please see copies of the minutes of that meeting enclosed herewith.

Should you have any further questions regarding this issue, please do not hesitate to contact me at 440-826-5803.

Very truly yours,

CITY OF BEREA

Matthew J. Madzy
Building, Engineering, Planning

BEREA MUNICIPAL PLANNING COMMISSION
MAY 6, 2010

The Berea Municipal Planning Commission met on May 6, 2010 and was called to order by Mr. Walters. Present: Borowski, Brown, Draves, Fay, Walters, Rump, Sawyer. Absent: None.

This meeting was held in compliance with all legal requirements including Section 121.22 of the Ohio Revised Code and Chapter 109 of the Codified Ordinances of the City of Berea. All applicable notices were sent out prior to this meeting.

Moved by Draves, seconded by Borowski to approve the minutes from the March 18, 2010 meeting. Vote on motion was all ayes; no nays; Abstained: Borowski, Fay. The motion carried.

Moved by Draves, seconded by Rump to approve the minutes from the April 1, 2010 meeting. Vote on motion was all ayes; no nays; Abstained: Fay, Sawyer. The motion carried.

Witnesses were sworn in by Mr. Walters.

Mr. Walters explained that due to the number of items on this evening's agenda, he would like to change the order of the agenda as follows:

1. Kidforce Collectibles (Variance Business I.D. Sign)
2. Berea Family Chiropractic (Variance Business I.D. Signage)
3. Ziegler & Tomlinson/Carnegie Group (Business I.D. Sign)
4. Berea Square Storage (Business I.D. Sign)
5. Christian Women in Action Ministries (Business I.D. Sign)
6. Circle K (Business I.D. Sign) – have been notified by the applicant that they are unable to be here this evening. When this item comes up Mr. Walters said he will ask for a motion to table it.
7. Wing Warehouse (Business I.D. Sign)
8. Patrick Williams (Driveway Expansion)
9. Robert & Holly Porter (Demolition of Residential Home)
10. Anthony McGowan (Appeal Order of Condemnation – 555 Fair Street) – this has been the subject of a request by the applicant that it be tabled to a date certain of June 17th. Mr. Walters announced that if anyone was here to speak on this issue they did not need to wait because it is being tabled.
11. Financial Asset Services, Inc. (Appeal Order of Condemnation)
12. Cuyahoga County Fairgrounds (Conditional Use Wind Turbine)

Mr. Walters also reported to the members of the audience and members of the Commission that around 8:00 there will be a court reporter arriving to take down the proceedings especially related to the Financial Asset Services' appeal and the Cuyahoga County Fairgrounds' application. That discussion will be taken down verbatim by the court reporter as well as recorded for the record here.

Moved by Draves, seconded by Fay to amend the agenda as read above. Vote on motion was all ayes; no nays. The motion carried.

Application #10-05-04
Approval of Variance for Business Identification Sign
Kidforce Collectibles – 50 Front Street, P.P. #364-11-019

Mr. Walters read the Administrative Review. The applicant, Joseph Kiskis and the agent, Rich Denman with Sign-A-Rama, were present this evening. Mr. Denman reported that initially they did go to the H.A.R.B. where they were asked to resubmit colors and styles a little more consistent with the architecture of the downtown area. They came back to H.A.R.B. with three different versions with the only difference being the color combinations. The materials are the same for all three versions. Mr. Denman distributed copies of the color combinations.

Mrs. Draves asked which color combination they decided to go with and Mr. Kiskis told her that he preferred the black and white version versus the green and white. He reported that the H.A.R.B. approved the design and left the color up to the Planning Commission. Mr. Walters read the findings of the H.A.R.B. into the record.

Mr. Denman explained that the sign materials will be a matte/flat finish in whatever color combination they approve this evening. In response to Mr. Fay, he said he was unaware that a 1.5 foot size variance was required and it would not be a problem to reduce the size of the sign so a variance would not be required. Mr. Fay stated that the green and white combination went along with what they were looking for in the downtown area. Mr. Denman pointed out that they were looking to match the green awning. He displayed a green and tan version of the sign.

Moved by Draves, seconded by Fay to approve the proposed sign with the condition that the size of the sign be reduced so a variance will not be required and the sign have a white background with green letters to match the green awning. Vote on motion was ayes: Borowski, Brown, Draves, Fay, Walters, Rump, Sawyer. Nays: None. The motion carried.

Mr. Hurley also pointed out that this property is in a location where it is on a high traffic street and it backs up to the turnpike. He felt this would take down the demand for this vacant land to sell. It was his opinion that the best option for this property would be to put the house back together and restore the utilities/services. Mr. Walters asked Mr. Madzy and Mr. Freshwater if they had any further comments or questions and they both indicated no. Mr. Walters asked if anyone else had any further comments or questions and there was no response.

Moved by Rump, seconded by Fay to uphold the City's demolition order. Vote on motion was ayes: Brown, Draves, Fay, Walters, Rump, Sawyer, Borowski. Nays: None. The motion carried.

Mr. Madzy asked Mr. Walters if he could have one moment to speak to Mr. Freshwater. After brief discussion, Mr. Madzy reported that based upon his conversation with Mr. Freshwater and Mr. Hurley, anytime a property is going to be razed, a demolition permit must be approved by the Planning Commission and notice must be given to the neighbors, however, this is also the same notice that went out to the neighbors for the appeal this evening. They would want the Planning Commission to entertain the idea of giving permission this evening to demo the home. Mr. Freshwater added that otherwise they will not be able to touch the property until they have another hearing on whether they can demolish the property or not.

Moved by Fay, seconded by Rump to approve the issuance of a demolition permit. Vote on motion was ayes: Draves, Fay, Walters, Rump, Sawyer, Borowski, Brown. Nays: None. The motion carried. Mr. Walters announced that the Planning Commission has not only upheld the order of the City to demolish the property but has also approved the issuance of a demolition permit. He thanked Mr. Freshwater and Mr. Hurley for being here this evening.

Mr. Walters announced that there were empty seats in the front of the room for those who were standing in the hallway. They would now move onto the final item this evening.

Application #10-05-05
Approval of Conditional Use
Cuyahoga County Fairgrounds – 164 Eastland Road, P.P. #364-07-007

Mr. Walters read the Administrative Review. He reported that this matter came before the Heritage Architectural Review Board (H.A.R.B.) on April 22, 2010 and they recommended at that time for Planning Commission to approve this application, as submitted.

The agent, Nick Willis, introduced Stan Trupo of 304 Bonds Parkway, Berea. Mr. Trupo indicated that Mr. Willis is the Project Director for this project and he is also representing the County, not just the Fairgrounds. He explained that this project is for an approximately 275 foot high wind turbine which would be the first in this area, not counting the one off of Pearl Road. This is a device that they hope will ease some of the cost to the Fairgrounds by generating enough electricity to cut back on the cost of electricity.

Mr. Trupo urged the Planning Commission Members to think about this as a way to begin changing the attitudes of people around the area about alternate energy sources. It would not cause any real problems of any kind. It is a mechanism in which they hope the people from all over Ohio will begin using turbines as an alternate energy for securing electricity. He introduced Joanne Scudder who started this project and has been the real spearhead and has driven home the need for alternative energy.

Joanne Scudder of 10234 Log Cabin Court, Brecksville thanked the Commission for giving them the opportunity to speak this evening about the wind turbine project and corresponding energy education center. She stated that she knows it has been a long night and it is late but they will try to give all of the information regarding the project. She referred everyone to the booklet that they received which includes letters of support and details of not only the wind turbine but the proposed education center.

Ms. Scudder reported that the mission of their Fair is to educate, demonstrate and exhibit. They feel this project fits extremely well into that mission. As part of the turbine project, there will be an energy education center connected to it. They have developed a partnership with Polaris Career Center who is also here this evening. They have spoken with Dr. David Krueger from Baldwin-Wallace College on a number of occasions to discuss their participation and partnership in this project. They have indicated to them that they would be willing to provide interns to help staff the energy education center.

Ms. Scudder explained that the energy education center will be connected to the turbine and will be utilized by not only the immediate community but also schools, universities and will probably go way beyond the city limits. They know there is no type of facility of its kind in this area tied directly to a turbine. She mentioned the wind turbine located at the Science Center in downtown Cleveland and encouraged everyone to go down there and just stand next to it.

Ms. Scudder said this proposed turbine at the Fairgrounds will be to educate people on alternative ways of energy, broaden their horizons and look at some alternate ways of producing energy. She referred to the oil spill currently going on down in the Gulf coast and hoped that they could start

moving away from this and get into some of the alternative kinds of energy. However, the educational aspect is the major goal of this project. She introduced Nick Willis for a more technical view of the project as well as display some photo simulations.

Mr. Willis stated that he is a Project Manager for the Cuyahoga County Commissioners. He was on the Offshore Turbine Task Force when Ms. Scudder became interested in having a wind turbine at the Fairgrounds. With his contacts and knowledge they put together this proposal a few years ago. He hoped that the education from this will lead to more turbines, more solar cells/solar panels and hopefully will give Cleveland the image of being friendly to renewable energy and friendly to wind turbines.

Mr. Willis said he hopes that European and U.S. manufacturers will see this change in the Cleveland area and expand the market here. He said the American market is growing 40% a year so maybe new plants will come to Cleveland and create manufacturing jobs. The type of jobs Cleveland used to have with the auto plants, refineries and fab/rebuilding shops.

Mr. Willis displayed an aerial photograph of the proposed location for the wind turbine. Mr. Walters asked him to make sure to turn it around so the audience could also view the photograph. Mr. Willis explained that the large pink circle indicated the proposed turbine location inside the harness track area which is in Berea. The small rectangle shows where the energy center/educational building would be located. This building will have readouts of turbine production, wind speed, solar production and a large conference room. He stated that the turbine would be a minimum of 300 feet from any building at the Fairgrounds and more than 1,000 feet from any residential structures in the surrounding neighborhood.

Mr. Willis next displayed a photo simulation of what the turbine will look like looking into the Fairgrounds from the Gate #2 entrance off of Eastland Road. The next photo simulation was a view from Old Oak Boulevard actually looking across the Fairgrounds parking lot (off of Bagley Road) at the turbine. Mr. Willis pointed out that they could see the grandstand in the background to the left of the turbine in the photograph.

Mr. Walters opened the floor first to questions from the Commission members. Mrs. Draves noted that she passed the wind turbine off of 480 the other day. She asked what the exterior finish is on these and how long does it last. Mr. Willis explained that they use a paint similar to Dupont's Imron. It's a very, durable, long-lasting coating.

Mr. Willis reported that the proposed wind turbine will be a used one from Europe because they do not manufacture this size turbine in the United States currently. They will bring the turbine over from Europe and fully

recondition and remanufacture it here in Ohio. In fact, they have specified that all the work be done in Ohio including the tower, refinishing the tower and the support.

In response to Mrs. Draves, Mr. Willis discussed where the money for this project will come from. There is already $1 million for this project with additional funds coming from the DOE and the County. He explained that the County has said they will make up the balance whatever that may be and they do have the $1.4 million today. Aaron Godwin of 10299 Longview Avenue, Kirtland, Ohio introduced himself and said he was a consultant for the County on this project. He pointed out that the $200,000 grant from the State is not a competitive grant process. They just need to meet the State's criteria. Mr. Willis said they were pretty confident they would receive these funds but there was no guarantee.

Mr. Fay pointed out that there are two different start dates mentioned in the material they received. One refers to August and the other one refers to November. Mr. Willis explained that the Department of Energy (DOE) who is initiating the funds have decided that all of the wind projects need to have an environmental assessment first. The original guess for this was August and it could be done in approximately three months. Now they are being a little more realistic and saying probably not until November. So until that is done, the funds are not finalized and available. They cannot really do anything until November. In response to Mr. Walters, Mr. Willis clarified that this environmental impact study is about to begin.

Mr. Sawyer inquired about Polaris Career Center being involved in this project. Doug Miller, Director of Community Outreach at Polaris introduced himself and said he lives at 9173 Stonebriar Lane, North Ridgeville, Ohio. He said Polaris has been around since 1975 and since that time they actually started out with an electronics program. That program over the years has gone through a metamorphosis and they actually are in the middle of one right now.

Mr. Miller stated that five years ago the Polaris program was called electronics and computer technology. They were teaching kids to repair televisions and VCR's which today is a dead-end career opportunity. So they have morphed this program into an electronics and advanced energy program. They are learning about solar fuel cells and wind technology which is a great opportunity for their students. They currently are learning about it in the classroom and the proposed wind turbine will give them real world lab exposure to what wind technology is all about. They will get to see it, feel it, touch it and be a part of the education center. They are about training the future wind technicians, the future solar technicians and electrical engineers of the future. This is a really great opportunity for Polaris and a great opportunity for their students.

Mr. Sawyer stated that there is nothing in the information packet mentioning how the nursing home on Old Oak Boulevard feels about the turbine. Mr. Willis replied that the nursing home has said they really do not want to look at it. The turbine has now been moved 600 feet further away from the nursing home so they will see less of it. Mrs. Draves told them shame on them for making the Berea location their second choice. She asked if all of the letters in their information packet pertain to the original proposed location in Middleburg Heights and if so, did everything still stand for the new Berea location. Mr. Willis told her they had to reapply to the FAA and this is currently pending. It is about a two-month process and approximately one month has lapsed so far. He said he was totally confident the FAA will approve the new location.

Mrs. Draves said if she remembered correctly, the only issue Middleburg Heights seemed to have with the original turbine location was that they basically thought it was unsightly and did not want it in their backyard. In response to Mrs. Draves, Mr. Willis said the nursing home and Quadax said they did not want to look at the turbine and they did not want their employees looking at it.

Mr. Fay indicated that this has got to be one of the most exciting times in Berea's history. He referred to what is going on with the schools, the condemnation of property so new homes can be built and now this opportunity for Berea to be a center for renewable resources. He said he was proud of Polaris for jumping in on this project so quickly and looking at programs that will not only give the City a chance to be seen but also actually teaching our children a future.

Mr. Willis reported that in addition to Polaris, Ms. Scudder had mentioned Dr. Krueger who is with Baldwin-Wallace College who is extremely enthused about this project and wants their students to use the energy center. This project is a perfect match for the Fairgrounds, Polaris and Baldwin-Wallace College. In response to Mr. Sawyer, Mr. Willis indicated that Baldwin-Wallace College actually has a degree in sustainability. Mr. Rump noted that at the Tri-C downtown campus they also have a wind turbine.

Mr. Godwin reported that he is the Co-Chair of the ESA International and just happens to reside here in Ohio. Ohio is only behind California in potential jobs for this industry and Cuyahoga County is number one in the State of Ohio. This industry has been growing in double digits every year. What other industry does this Country have that is growing at this rate and has a guaranteed growth pattern for approximately 50 years.

Mr. Godwin reported that in addition, the education center will have real-time data collection that any school will be able to access directly from a program that his company has developed called "Real Kids Doing Real Science". He stated that although there were comments and complaints from people in Middleburg Heights who did not want to see the wind turbine in their backyard, there were also comments and complaints from people who were upset because the turbine was where they could not see it. He said there has been a tremendous amount of due diligence done on this already. He said he was very excited about this and this is an exciting time.

– 473 Wellsford, Berea, OH 44017

John Serafini introduced himself and said he has worked for NASA for 43 years and has also been a professor at the University of Akron. He is an aeronautical engineer, however, he is here this evening as a citizen of Berea and of the United States of America. He said he was really upset when Middleburg Heights turned this project down although at that time he was unaware that Berea would be an option for the turbine. He stated that he was happy about this and would be glad to volunteer in any capacity. He urged the Commission to unanimously approve this project tonight and he hoped the people in Berea realize what a chance they have to make a name for themselves.

Stan Searles of 7807 English Drive, Brecksville, Ohio introduced himself and said he is here tonight representing the Western Cuyahoga Audubon Society who is 100% behind this project. They have offered to lend their expertise and energy to study the mortality issues that may occur with wildlife. If you put a structure on the landscape, you are going to impact wildlife. If you generate energy, you are going to impact wildlife. However, this method has substantially less impact on wildlife and has only been recently studied in North America (20 to 30 years). The factor of mortality with birds on wind turbines versus office buildings or power lines is not a factor at about 1 to 1,000 so it really is not an issue. He reiterated that the Western Cuyahoga Audubon Society supports this project 100%.

Ellen Kuntz of 285 University Street, Berea said she owns a century home right across the street from the Fairgrounds. She raised concerns regarding hawks, bald eagles and falcons that migrate in this area. She said she was concerned about the height of the turbine and the migration of the animals and wondered if any studies have been done on this. Mr. Searles stated that this area is not a migratory flight path and some of the birds Ms. Kuntz mentioned are not really migrants, they are residents. This is no different than putting up a communication tower, an office building or any other kind of structure. There will be much fewer impacts with the wind turbine then with the office buildings in Berea at any given time.

Mr. Godwin referred to a letter from the Division of Fish and Wildlife in the packet of information. They reviewed this site and found no issues. The wind turbine will be a solid tower, not a lattice tower and will not offer perches. In response to Mr. Sawyer, Mr. Godwin reported that the blades will rotate approximately 28 rpm's which is relatively slow. Generally, the larger the machine, the slower it goes. In response to Mr. Walters, Mr. Godwin stated that the wind turbine is not designed to allow a bird to land on it.

Moved by Rump, seconded by Draves to approve the conditional use for a wind turbine, as submitted. Vote on motion was ayes: Fay, Walters, Rump, Sawyer, Borowski, Brown, Draves. Nays: None. The motion carried.

OTHER BUSINESS: None.

ADJOURNMENT:

There being no further business to come before the Planning Commission, moved by Fay, seconded by Borowski to adjourn. Vote on motion was all ayes; no nays. The meeting was adjourned at 10:30 p.m.

Jim Walters, Acting Chairman

Attest: Carol A. Hubler
Carol A. Hubler, Secretary

CERTIFICATE OF COMPLIANCE

The meeting of the Municipal Planning Commission held this 6th day of May, 2010 has been conducted in compliance with all legal requirements, including C.O. Chapter 109 and Section 121.22 of the Ohio Revised Code.

Carol A. Hubler
Carol A. Hubler, Secretary

Notice of Scoping List Fairgrounds

Mark Epstein, Department Head
Resource Protection and Review
Ohio Historic Preservation Office
1982 Velma Avenue
Columbus, OH 43211-2497

Laura Segna, Project Manager
Resource Protection and Review
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1982 Velma Avenue
Columbus, OH 43211-2497

Paul Oyaski, Director
Cuyahoga Department of Development
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Cuyahoga County Planning Commission
323 Lakeside Avenue West, Suite 400
Cleveland, OH 44113

Western Reserve Historical Society
10825 East Blvd.
Cleveland, OH 44106

Western Reserve Heritage Association
P.O. Box 314
14485 N. Cheshire Street
Burton, OH 44021

Cuyahoga County Commissioners
1219 Ontario Street
Cleveland, Ohio 44113-1611

Cuyahoga County Fairgrounds Board
164 Eastland Road
Berea, Ohio 44017-2066

Cleveland Metroparks
Board of Park Commissioners
4101 Fulton Parkway
Cleveland, Ohio 44144

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Columbus, OH 43230

Greg Payne
Ohio Energy Resources Division
Ohio Department of Development
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New York, NY 10014

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New York, NY 10014

Kim Van Fleet, Important Bird Area Coordinator
and Staff Biologist
National Audubon Society
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New York, NY 10014

Heather Starck, Center Director
Grange Insurance Audubon Center
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William Eubanks
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Mr. Tom Winston
Chief, Office of Federal Facility Oversight
Ohio Environmental Protection Agency
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Dayton, OH 45402-2911

Governor's Office
Riffe Center, 30th Floor
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Columbus, OH 43215-6108

Keith Lott, Wind Energy Wildlife Biologist
Ohio Division of Wildlife
2514 Cleveland Road East
Huron, OH 44839

Dave Scott
Ohio Division of Wildlife
2514 Cleveland Road East
Huron, OH 44839

Enid Nagel, Chair
Sierra Club Ohio Chapter
131 North High Street #605
Columbus, Ohio 43215

Notice of Scoping List Fairgrounds

Stuart Siegfried
Ohio Public Utility Commission
180 East Broad Street
Columbus, Ohio 43215

Mark Shanahan
Ohio Air Quality Development Authority
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Columbus, OH 43215

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United States Senate (D-OH)
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Washington DC 20510

George Voinovish
Untied State Senate (R-OH)
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Washington DC 20510

Dennis J. Kucinich
United State Congress
2445 Rayburn House Bldg
Washington, DC 20515

Dale Miller
Ohio Senate
1 Capitol Square, Ground Floor
Columbus, OH 43215

Timothy J. DeGeeter
Ohio House of Representatives, District 15
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Columbus, Ohio 43215-6111

Matt Patten
Ohio House of Representative, District 18
77 South High Street, 13th Floor
Columbus, Ohio 43215-6111

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U.S. Department of Commerce / NTIA
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Washington, D.C. 20230

Mike Blaich
Federal Aviation Administration
Air Traffic Airspace Branch, ASW-520
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Forth Worth, TX 76137-0520

John Milling
ODOT Office of Aviation
2829 W. Dublin-Granville Road
Columbus, OH 43235

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Ohio Department of Development
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Patricia Huddle, Energy Public Policy Liaison
Ohio Department of Development
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Gregory Zucca, Strategic Program Officer
Cuyahoga Department of Development
112 Hamilton Court
Cleveland, OH 44114

Dr. James Hartman
Assistant Secretary of Army (Installations & Environment)
Office of Regional Environmental and Government Affairs - North
Attn: SAIE - ESDH
5179 Hoadley Road
Aberdeen Proving Ground, MD 21010-5401

City of Berea
Honorable Cyril M. Kleem
11 Berea Commons
Berea, Ohio 44017

City of Middleburg Heights
Honorable Gary W. Starr
15700 Bagley Road
Middleburg Heights, Ohio 44130

Ms. Bonnie Belair, Zoning Attorney
American Tower Corporation
10 Presidential Way
Woburn, MA 01901

Century Oak Care Center
7250 Old Oak Blvd
Middleburg Heights, Ohio 44130

Mr. John Leskiw
Quadax Inc
7500 Old Oak Blvd
Middleburg Heights, Ohio 44130

Berea Historical Society
118 East Bridge Street

Notice of Scoping List Fairgrounds

Berea, Ohio 44017-2128

Richard W. Durst, MFA - President
Baldwin Wallace College
300 Front Street
Berea, Ohio 44017

Robert Timmons, Superintendent
Polaris Career Center
7285 Old Oak Blvd
Middleburg Heights, Ohio 44130

Board of Trustees
The Berea Little Red Schoolhouse
Center for the Fine Arts
323 Bagley Road
Berea, Ohio 44017

Tribes:

Honorable Eugene Bigboy Sr., Chairman
Bad River Band of the Lake Superior Tribe of Chippewa Indians
P.O. Box 39
Odanah, WI 54861

Honorable John A. Barrett, Jr., Chairman
Citizen Potawatomi Nation
1601 S Gordon Cooper Dr.
Shawnee, OK 74801-8699

Chief Harold Frank
Forest County Potawatomi Community
P.O. Box 340
Crandon, WI 54520

Ms. Summer Sky Cohen, THPO
Keweenaw Bay Indian Community
107 Beartown Road
Baraga, MI 49908

Honorable Frank Ettawageshik
Tribal Chairman and all Council/Government Operations
Little Traverse Bay Bands of Odawa Indians
7500 Odawa Circle
Harbor Springs, MI 49740

Honorable John Miller, Chairman
Pokagon Band of Potawatomi Indians
P.O. Box 180
Dowagiac, MI 49047

Honorable LeRoy Howard, Chief
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R2301 E. Steve Owens Blvd.
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Miami, OK 74355

Honorable David Brien, Tribal Chairman
Turtle Mountain Band of Chippewa Indians
P.O. Box 900
Highway 5 West
Belcourt, ND 58316

Honorable Jeff Parker, President
Bay Mills Indian Community
Route #1, Box 313
Brimley, MI 49715

Honorable Kenneth Meshigaud, Chairman
Hannahville Indian Community
N14911 Hannahville B-1 Road
Wilson, MI 49896

Honorable Louis Taylor, Chairman
Lac Courte Oreilles Band of Lake Superior Chippewa
1394 West Trepania Road
Hayward, WI 54843

Honorable D. K. Sprague, Chairman
Match-e-be-nash-she-wish Band of Pottawatomi
P.O. Box 218
Dorr, MI 49323

Honorable Steve Ortiz, Tribal Chair
Prairie Band of Potawatomi Nation
Government Center
16281 Q Road
Mayetta, KS 66509

Honorable Elmer Emery, Chairman
St. Croix Chippewa Band of Lake Superior Chippewa
24663 Angeline Avenue
Webster, WI 54893-9246

Honorable Sandra L. Rachal, Chair
Sokaogon Chippewa Community
ATTN: Cultural Director
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Crandon, WI 54520

Sherri Clemons, Tribal Liaison
Wyandotte Tribe of Oklahoma
P.O. Box 250
Wyandotte, OK 74370

Honorable John Houle, Tribal Chairman

Notice of Scoping List Fairgrounds

Chippewa-Cree Tribe of the Rocky Boy's Reservation
RR 1, Box 544
Box Elder, MT 59521

Dr. Brice Obermeyer
Delaware Tribe of Indians
Dept. of Sociology & Anthropology
Emporia State University
Roosevelt Hall, Rm 121
1200 Commercial, Box 4022
Emporia, KS 66801

Honorable Laura Spurr, Chairperson
Nottawaseppi Huron Band of the Potawatomi Indians
2221 1½ Mile Road
Fulton, MI 49052

Honorable Larry Romanelli, Tribal Ogema
Little River Band of Ottawa Indians
375 River Street
Manistee, MI 49660

Honorable Charles Todd, Chief
Ottawa Tribe of Oklahoma
P.O. Box 110
Miami, OK 74355

Honorable Rose Gurnoe-Soulier, Chair
Red Cliff Band of Lake Superior Chippewa
88385 Pike Road Hwy 13
Bayfield, WI 54814

Honorable Barry E. Snyder Sr., President
Seneca Nation of Indians
P.O. Box 231
Salamanca, NY 14779

Honorable Roger Hill, Chief
Tonawanda Seneca Nation
7027 Meadville Road
via Basom, NY 14013

NOTICE OF AVAILABILITY

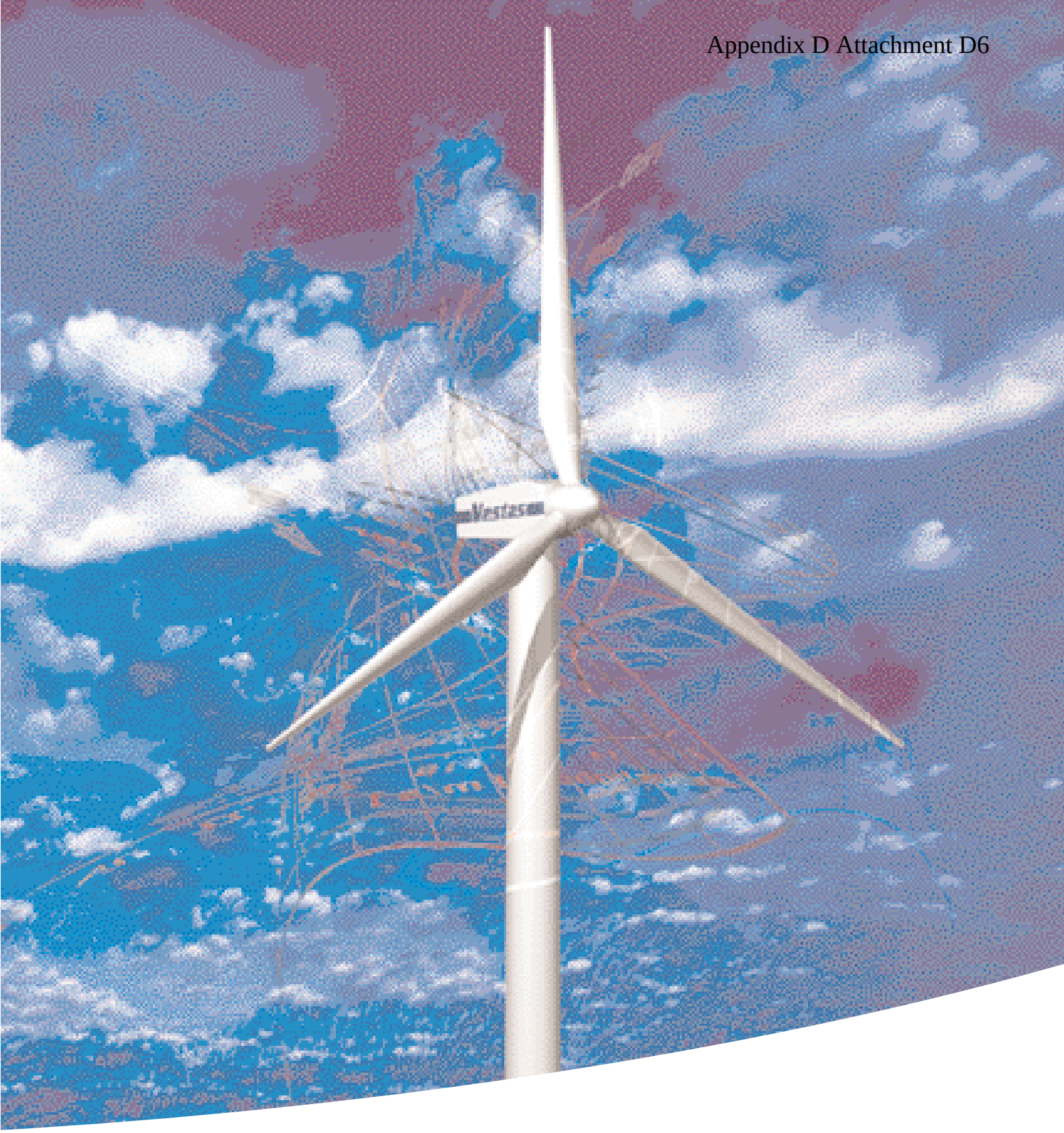
The U.S. Department of Energy (DOE) has prepared a draft Environmental Assessment (EA) to analyze and describe the potential environmental impacts associated with the:

Cuyahoga County Agricultural Society Wind Energy Project
City of Berea, Ohio
DOE/EA 1815

DOE's Golden Field Office has prepared a draft EA in accordance with the National Environmental Policy Act (NEPA). Cuyahoga County Agricultural Society is proposing to use Federal funding from DOE under the American Recovery and Reinvestment Act of 2009 to design, permit, and construct a single 660-kilowatt wind turbine at the Cuyahoga County Fairgrounds in the center of the fairgrounds complex on 164 Eastland Road, Berea, Ohio. The draft EA is available for review on the DOE Golden Field Office website:

http://www.eere.energy.gov/golden/Reading_Room.aspx

Public comments on the results of the environmental impacts of implementing the proposed action will be accepted until **December 4, 2010.** Please mail comments to the **DOE Golden Field Office**, c/o Melissa Rossiter, 1617 Cole Boulevard, Golden, CO 80401, or by email to melissa.rossiter@go.doe.gov.



Vestas

V47–660 kW

with OptiTip® and OptiSlip®

One or two generators

The V47-660 kW is delivered as standard with a single generator, which is highly efficient in the vast majority of wind conditions. However, a two-generator version is also available. This model contains a second, smaller, generator for use in wind speeds as low as 7 m/s. This means a lower sound level where it is most needed, as well as more efficient exploitation of modest wind conditions.

Optimal pitch with OptiTip®

Just like all other Vestas turbines, the V47-660 kW turbine is equipped with microprocessor-controlled OptiTip® pitch regulation, which ensures continuous and optimal adjustment of the angles of the blades in relation to the prevailing wind. The OptiTip® system makes it possible to find the best possible solution to the often contradictory requirements for high output and low sound levels, depending on the location.

OptiSlip®

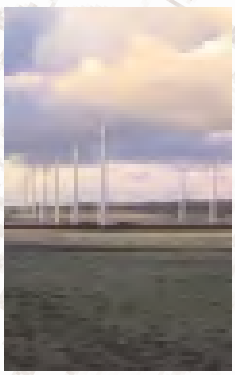
As mentioned above, the V47-660 kW turbine features the unique generator principle OptiSlip®, which allows both the rotor and the generator to vary their RPM by up to 10% to cope during violent gusts of wind. In addition to minimising the load on various parts of the turbine, the OptiSlip® system also ensures an appreciably better power quality.

Lightning protection

The V47-660 kW turbine is equipped with Vestas Lightning Protection, which protects the entire turbine from the tips of the blades to the foundations.

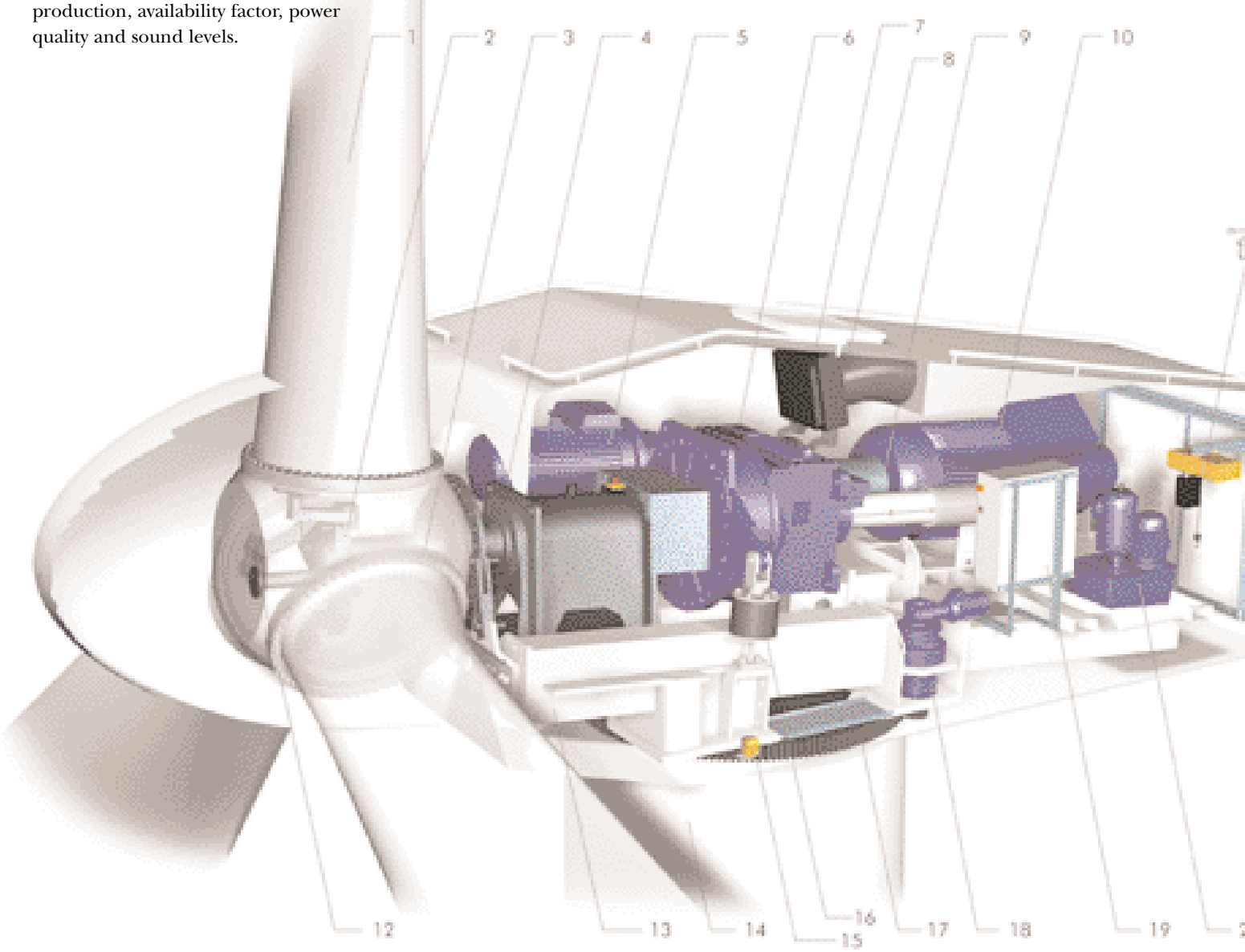
Flexible blades

Vestas always measures and tests all new products down to the smallest detail before releasing them on the market. The flexible blades underwent a 6-month dynamic distortion test under extreme loads – more than they would normally be exposed to in their 20-year service lives. The maximum loads and outward distortion of the blades were then checked in a static test. The blades passed all the tests and now make an appreciable contribution to the efficient production of the V47-660 kW turbine.



Proven Performance

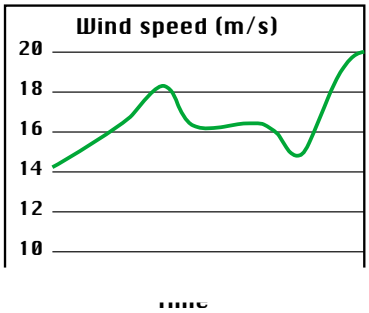
We have spent many months testing and documenting the performance of this Vestas turbine. When we were finally satisfied, we ran one last check by allowing an independent organisation to verify the results. This is standard practice at Vestas – a procedure we call Proven Performance. It is your guarantee that your Vestas turbines meet the very highest requirements for energy production, availability factor, power quality and sound levels.



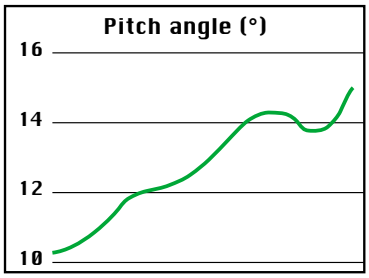
1. *Blade*
2. *Blade hub*
3. *Blade bearing*
4. *Main shaft*
5. *Secundary generator (V47-660/200 kW)*
6. *Gearbox*
7. *Disc brake*
8. *Oil cooler*
9. *Cardan shaft*
10. *Primary generator*
11. *Service crane*
12. *Pitch cylinder*
13. *Machine foundation*
14. *Tower*
15. *Yaw control*
16. *Gear tie rod*
17. *Yaw ring*
18. *Yaw gears*
19. *VMP top control unit*
20. *Hydraulic unit*

ROTOR	V47-660 kW	V47-660/200 kW
Diameter:	47 m	47 m
Area swept:	1,735 m²	1,735 m²
Revolution speed:	28.5	26/20
Number of blades:	3	3
Power regulation:	Pitch/OptiSlip®	Pitch/OptiSlip®
Air brake:	Feathered	Feathered
TOWER		
Hub height (approx.)	: 40-45-50-55 m	40-45-50-55-60-65 m
OPERATIONAL DATA		
Cut-in wind speed:	4 m/s	3.5 m/s
Nominal wind speed (660 kW):	15 m/s	16 m/s
Stop wind speed:	25 m/s	25 m/s
GENERATOR		
Large generator:	Asynchronous with OptiSlip®	Asynchronous with OptiSlip®
Nominal output:	660 kW	660 kW
Operational data:	50 Hz 690 V 1,515-1,650 rpm	50 Hz 690 V 1,515-1,650 rpm
Small generator:		Asynchronous
Nominal output:		200 kW
Operational data:		50 Hz 690 V 1,500-1,516 rpm
GEARBOX		
Type:	Planet /parallel axles	Planet /parallel axles
CONTROL		
Type:	Microprocessor-based control of all turbine functions with the option of remote monitoring. OptiSlip® output regulation and OptiTip® pitch regulation of the blades.	

Actual measurements of a Vestas 660 kW turbine with OptiSlip®



Time



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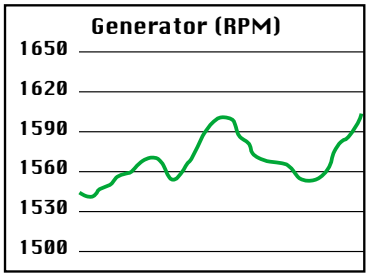
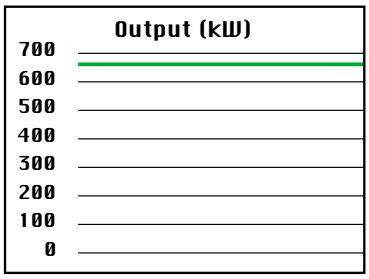


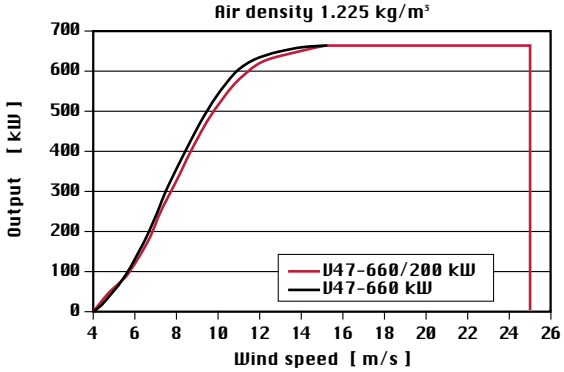
Time



Time

OptiSlip® allows the revolution speeds of both the rotor and the generator to vary by approx. 10%. This minimises both unwanted fluctuations in the grid supply and the loads on the vital parts of the construction.

Power curve
Air density 1.225 kg/m³



Turbine Use, Safety Policies and General Background

Security:

- Tower Climbing: The wind turbine utilizes a smooth exterior monopole tower with no climbing surfaces or apparatus. Tower climbing is only achieved through the use of an internal ladder system. This system is only reachable through a locked plate steel door.
- Availability: Only preauthorized personnel will be given access to the internal tower and turbine systems.

Tower Climbing Safety:

- Safety Climb: For maintenance personnel climbing of the tower, an OSHA approved "safety climb" system is included in the tower climbing system. This system is comprised of a ladder, a steel cable for the safety climb device, a full body harness designed and approved for the purpose, a locking safety climb device, safety lanyards with self-locking clips and additional tie-in points throughout the turbine system where a cable system is not available.
- OSHA approved safety equipment such as hardhats will be worn by all maintenance personnel climbing or working on the turbine.
- No individual shall climb the tower without a partner.

Electrical Safety:

- All electrical components and their installations shall meet all Local, State and Federal applicable laws and regulations.
- The turbine system shall meet UL1741 and IEC requirements for Utility Grid Protection in case of Grid power failures or power quality abnormalities.
- All electrical supply/grid interconnect services to and from the turbine shall be in buried conduits.
- The turbine system will have a staff accessible emergency shut-offs.
    - Utility room
    - Tower base
    - Nacelle
    - Remote through "Web" interface.

- The turbine system will have an automated system fault shut-off triggered at a minimum by the following sensors: System temperature, power quality, vibration, over-speed, fire and icing.
    - This system will also automatically send fault codes to preauthorized personnel through a "Web" interface.
- All safety sensors and equipment shall fault to a turbine fault state in case of their own failure.

Fire:

- The turbine shall have fire detection devices at the tower base and within the nacelle that shall be linked to the Site's existing fire detection/alarm systems (if present).
- The local fire department shall be contacted and a fire/emergency response plan shall be adopted.
- Although formal fire suppression systems are extremely rare for wind turbines, the site shall investigate passive and active fire suppression systems for possible implementation in the turbine system.
- Local fire department approved fire extinguishers shall be located within the tower base and within the nacelle.
- The turbine system will have staff accessible emergency shut-offs.
    - Utility room
    - Tower base
    - Nacelle
    - Remote through "Web" interface.
- The turbine system will have an automated system fault shut-off triggered at a minimum by the following sensors: System temperature, power quality, vibration, over-speed, fire and icing.
    - This system will also automatically send fault codes to preauthorized personnel through a "Web" interface.
- Safety zones similar to any fire related incident will be utilized, if a fire should occur.

Lightening:

- The turbine system is equipped with a full grounding loop meeting or exceeding all Local, State and Federal regulations concerning grounding and lightening protection.
- Surge suppressing technology will be utilized to protect key electronics.
- See fire policies above.

Icing:

- Although icing of wind turbines is very rare and safety issues related to icing even rarer, it can occur, similar to any built structure (roofs, power lines, stadium lights, etc.).
- Although not an absolute brake, blade icing induced airfoil shape spoiling will naturally reduce the efficiency of the blades and thus reduce their rotational speed.
- Although formal icing detection systems are extremely rare for wind turbines, the site shall investigate active icing detection systems for possible implementation in the turbine system.
- The turbine system will have an automated system fault shut-off triggered at a minimum by the following sensors: System temperature, power quality, vibration, over-speed, fire and icing (vibration caused by blade icing induced imbalances will automatically shut down the turbine).
    - This system will also automatically send fault codes to preauthorized personnel through a "Web" interface.
- The turbine's nacelle will have a cold-weather package including nacelle heaters. These heaters are designed to maintain nacelle temperatures above the dew-point and well above freezing. This system will automatically melt snow and ice accumulation on top of the nacelle.
- The turbine system will have a staff accessible emergency shut-offs.
    - Utility room
    - Tower base
    - Nacelle
    - Remote through "Web" interface.
- All icing related turbine shut-downs will require a direct inspection and an on-site manual restart.
- The site personnel and the system maintenance personnel will shut down the turbine in the event of an icing condition.
- The site shall adopt an ice safety zone around the turbine for implementation during icing events, if they should occur.

High Wind:

- The turbine automatically shuts down in high winds and turns itself out of the wind.
- The turbine system will have an automated system fault shut-off triggered at a minimum by the following sensors: System temperature, power quality, vibration,

over-speed, fire and icing (vibration caused by blade icing induced imbalances will automatically shut down the turbine).

- This system will also automatically send fault codes to preauthorized personnel through a "Web" interface.

Aviation Safety:

- The project has been review by both FAA and ODOT and "No Hazard to Aviation" determinations were issued.
- An FAA approved red obstruction marking light will be located on top of the nacelle.

Shadow Flicker:

- Although all structures cast shadows, shadows from wind turbines that reach occupied structures or areas can be considered a nuisance due to the fact that they move or flicker as the blades rotate in front of the Sun.
- A formal shadow flicker study has been conducted for the site based on the turbine's rotor diameter and height, the site latitude and longitude, weather records, existing site topography and the existing area obstructions.
- Per international standards, shadow flicker impacting a particular location above 30 hours per year is considered a potential nuisance. While the turbine's shadow will reach some of the area properties, no residential or business property locations will receive more than 30 hours of shadow per year. Other factors that mitigate the shadows' impact include:
  - Shadow intensity drops off with distance. Shadow edges soften and shadow bodies become more muted. Shadows beyond ten rotor diameters from the tower base are considered insignificant with shadows within five rotor diameters being the most significant.
  - Shadows move and do not remain in one spot for extended periods of time.
  - The longest extended period shadows occur in the winter when there are fewer sunny days.
  - Many local natural and built environmental elements such as trees will block or significantly diffuse shadows.
- If extended adverse shadows should impact a particular dwelling, the wind turbine site owner will take one or more of the following mitigating measures:
  - Plant evergreen trees to block the shadow.
  - Provide blinds for the dwelling.
  - Turn off the turbine during the shadowing periods that excessively affect the dwelling.

Sound:

- Wind turbines of the size to be installed are inherently quite devices, especially over distance, and are typically very hard to hear over the wind itself and the existing ambient area noise levels.
    - Sound from a single wind turbines typically comes from the following areas:
        - Wind noise off of the blades as they are driven by the wind (swooshing that drops off over distance and typically competes with the area's natural wind noise).
        - Drive-train noise (mechanical sound typically not heard outside the immediate vicinity of the turbine).
        - Yaw system noise (mechanical sound typically not heard outside the immediate vicinity of the turbine and that is only present when the turbine turns into the wind).
        - Electrical noise from the turbine's electrical equipment and transformer (buzz, typically not heard outside the immediate vicinity of the turbine).
- Sound modeling for the proposed wind turbine supports that turbine produced audio levels will not exceed any local code or ordinance at the site's property lines. To be conservative, this modeling was done at an 8 mps/17.9 mph wind speed, well above site averages.
- Sound measurement of existing ambient sound levels for both day and evening periods at multiple locations surrounding the site show existing ambient sound levels above what the wind turbine will produce.

Cuyahoga County Fairgrounds Turbine Equipment Transportation Plan:

Likely delivery route for turbine: Subject to change with equal or greater weight handling roads being selected. In all cases for turbine components, cranes and other materials, oversized or overweight loads and routes will be permitted through the standard processes of the state/s of travel and utilize transport equipment and procedures suitable to meet or exceed all regulatory requirements for the path of travel and the equipment being transported. (Heaviest expected single turbine component load expected is 62,000 lbs with a max width of 13'.)

Turbine Supply , 4126 Saint Clair Avenue, Cleveland, Ohio

1.	Head **southwest** on **St Clair Ave** toward **E 41st St** About 2 mins	go 0.7 mi total 0.7 mi
2.	Turn **right** at **E 26th St** About 1 min	go 0.2 mi total 0.9 mi
3.	Turn **right** to merge onto **I-90 W** About 4 mins	go 3.1 mi total 4.1 mi
4.	Continue onto **I-71 S** About 14 mins	go 12.3 mi total 16.4 mi
5.	Take exit **235** for **Bagley Rd**	go 0.3 mi total 16.7 mi
6.	Turn **right** at **Bagley Rd** About 2 mins	go 0.8 mi total 17.5 mi
7.	Turn **left** at **Bagley Dr** Destination will be on the right About 1 min	go 0.4 mi total 17.9 mi
	"CCFG Turbine" Bagley Dr	

Turbine Installation Site, Cuyahoga County Fairgrounds, Bagley Road, Berea, Ohio

All other materials and equipment will likely be transported from within the State of Ohio and follow a similar route off of Interstate 71 South.

Appendix D Attachment D9

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Units

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other

Special Line Features
- Gully
- Short Steep Slope
- Other

Political Features
- Cities

Water Features
- Oceans
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

MAP INFORMATION

Map Scale: 1:6,260 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:15,840.

Please rely on the bar scale on each map sheet for accurate map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 17N NAD83

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Cuyahoga County, Ohio
Survey Area Data: Version 11, Jan 27, 2010

Date(s) aerial images were photographed: 8/2/2004

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Cuyahoga County, Ohio (OH035)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
BgB	Bogart loam, 2 to 6 percent slopes	15.6	11.0%
Ct	Condit silty clay loam	13.4	9.5%
HaA	Haskins loam, 0 to 2 percent slopes	1.4	1.0%
HbA	Haskins-Urban land complex, nearly level	13.3	9.4%
JtA	Jimtown loam, 0 to 3 percent slopes	6.3	4.5%
MgA	Mahoning silt loam, 0 to 2 percent slopes	73.1	51.7%
MgB	Mahoning silt loam, 2 to 6 percent slopes	9.1	6.5%
MmB	Mahoning-Urban land complex, undulating	9.0	6.4%
Totals for Area of Interest		**141.4**	**100.0%**

FRED J. ROBINSON & ASSOCIATES, INC.
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September 22, 2010

Cuyahoga County Agricultural Society
164 Eastland Road
Berea, OH 44017

Attn: Joanne Scudder, Cuyahoga County Fair Board

RE: Wind Turbine Project; Tree Inspection at Energy Center Site.

Gentlemen:

EXECUTIVE SUMMARY

The proposed Wind Turbine Project at the Cuyahoga County Fairgrounds will have an Energy Center Building and a buried power line that will impact up to seven trees. These trees were inspected on September 20, 2010 by Registered Consulting Arborist Fred J. Robinson. Three trees are recommended to be removed due to their location, condition, expected construction damage, potential safety risk, and/or impact on the proposed solar panels. These trees are the largest Silver Maple and the two adjacent small Red Maples.

A large Shagbark Hickory and a relatively new River Birch are magnificent specimens and should be afforded all the protection possible during construction. Two other Silver Maples can be retained and protected but safe life expectancy is short. One is hollow with an active Honey Bee hive and the other has a recent large scar on the trunk that may decay.

INTRODUCTION

Environmental concerns about removal of a tree for this project were reported to me by Ms. Scudder, especially the large Silver Maple on the south side of the building. At the request of Ms. Scudder and with a copy of the Wind Turbine Project Plot Plan I inspected the trees that may be impacted by construction of the Energy Center Building and the underground power line installations.

On Monday September 20, 2010, Maintenance Supervisor Bob Cartmell showed me the approximate location of the building and advised it was to be 50' E-W and 40' N-S. Because tree damage could occur well beyond the footprint of the building and power line trenching, all seven trees in the vicinity were inspected. I prepared a Tree Inspection spreadsheet to record pertinent information, observations, and action recommendations for each tree.

A typed copy of the Tree Inspection form is attached. The information on this form allows me to provide a shorter narrative in this report.

PURPOSE OF THE REPORT

The purpose of this report is to provide the Cuyahoga County Agriculture Society and/or the Fair Board with sufficient information to make the best judgment regarding the subject trees. It will also provide backup support for decisions and long term planning.

LIMITING FACTORS

Because the site had not been staked out nor were detailed engineering plans provided at the time of my inspection, I could not determine the exact location of expected construction activity or the solar panels in relation to tree location and future shading. The inspection of each tree took place from the ground. Aerial inspection was limited to views up through the canopy and from afar when digital photos were taken for reference.

OBSERVATIONS

Investigation Methods

The seven trees were numbered starting with the largest Silver Maple (#1) at the southwest corner of the site and working east to #4, then north from #1 to #5 and #6, and then east to #7. A black permanent marker was used to discreetly number each tree at about 5.5' up on the north side. The numbers may be hard to see and will fade in a year or so.

A tree location sketch follows. North is to the top. A drive is to the west. The race track and wind turbine are to the south. The photo below is from the northwest with tree numbers and the proposed turbine site in the background.

		Gazebo		
	#6 River Birch			#7 Silver Maple
	#5 Red Maple			
	#1 Silver Maple	#2 Red Maple	#3 Shagbark Hickory	#4 Silver Maple

#7 #4 #3 #6 #2 #5 #1 ^ Turbine site

Tools
A 200' tape was used to measure distances. A diameter tape was used to measure trunk diameter. The handle of a "Soil Knife" was used to sound for cavities within each trunk. A thin 16" screwdriver was used to probe the extent of decay. The "Soil Knife" was also used to break off loose bark around scars to expose ants, earwigs, and decay.

Tree Health
The vigor of the trees was based on foliage density, color, and annual twig elongation where possible. Two trees were in excellent condition; the Shagbark Hickory (#3) and the River Birch (#6). The foliage in the Silver and Red Maples looked healthier in the photographs than when looking up. The lower branches were much more stressed than the tops. Their vigor ranged from fair to good (#7) but the latter recently suffered a large scar with sapwood damage.

Structural Problems
The large Silver Maple (#1) is at the age and size when stems and branches may break and cause damage or harm. The SW stem is long and heavy, although it could be lightened by cutting back.

The two red maples (#2 and #5) have potential points of failure at or just above grade. They may actually be hybrids of red and silver maples.

The southeast Silver Maple (#4) has a low NW branch that has a cavity which apparently extends down into the trunk and contains a very active Honey Bee hive. CAUTION! This tree is not yet a high risk for breaking and is partially protected from storm winds by the hickory.

Insect Pests and Diseases
The only insects of concern were the Carpenter Ants on/in Silver Maple #4. However, the ants are creating more space for the Honey Bees.

Construction Impact
Mr. Cartmell advised me the footer for the foundation will cut into the root flare of Silver Maple #1 on the north side. The topsoil will be stripped within the footers. It is probable that all the roots on the north side will be lost. If that is the case, I can not predict whether this tree would die or fall first. It would be very out of balance, even if the SW stem would be cut back. The trench for the buried power line from the wind turbine to the transformer, in its plotted location, could increase the root loss to as much as 75%. The current and potential condition of tree #1 does not justify the cost of a directional bore under the roots.

Red Maple #2 may also suffer extensive root loss. Red Maple #5 may be within the building footprint.

The rest of the trees (#3, #4, #6, and #7) should be protected from construction equipment and activity and worker parking within the critical root zone (CRZ). Trees can tolerate some root loss but a minimal amount must be undisturbed for stability and health. The CRZ is within a radius from the center of the stump depending on trunk diameter and also to some extent; height, crown density and spread, exposure, soil properties, and root depth. Temporary fencing around the outer edge of the CRZ is normally used. A Consulting Arborist or at least a Certified Arborist should be consulted if it is determined that there will be encroachment into the CRZ. Mulching, steel plating, or soil boring may be recommended.

Shading of Solar Panels
The solar panels proposed for the south half of the Energy Center roof could be partially shaded when trees are in full leaf, especially when the sun is low in spring and fall. Trees #1 and #2 would cause shade.

The hickory would only shade in the morning when the sun would be low and at a low angle to the panels.

Conclusions

The useful life expectancy of the trees around the Energy Center site has to be considered, along with the benefits and detriments the trees provide. There are sufficient reasons to remove the large Silver Maple and the two adjacent Red Maples; trees #1, #2, and #5. The Shagbark Hickory and the River Birch should be protected as necessary. The other two Silver Maples are OK for now with possible protection. However, their safe condition will decline in future years.

CONSULTING ARBORIST DISCLOSURE STATEMENT

Consulting Arborists are tree specialist who use their education, knowledge, training and experience to examine trees and other woody plants, recommend measures to enhance the beauty and health of trees and other woody plants, and attempt to reduce the risk of living, working, or passing by trees and other woody plants. Clients may choose to accept or disregard the recommendations of the consulting arborist, or seek additional advice. Consulting arborists may not have any information about whether the recommendations are actually carried out, if they were carried out correctly, or when they were carried out. Timing of carrying out recommendations is often critical for success.

Consulting arborists cannot detect every condition that could possibly lead to the structural failure of a tree or other woody plant. Trees and other woody plants are living organisms that fail in ways we do not fully understand. Conditions are often hidden within trees, high up in and/or below ground. Consulting arborists cannot guarantee that a tree or other woody plant will be healthy or safe under all circumstances, or for a specified period of time. Likewise, recommended treatments, like any medicine, cannot be guaranteed.

Consulting Arborists rely on complete and accurate information being provided. The person, company, municipality, or organization hiring or contracting with the consulting arborist accepts full responsibility for authorizing the recommended treatment or remedial measures or actions. Trees can be managed, but they cannot be controlled. To live, work, or pass near a tree is to accept some degree of risk. The only way to eliminate all risks is to eliminate all trees, and there are other risks, reduced real values, and discomforts without trees.

I have inspected the subject trees, and to my knowledge and belief, all statements and information in this report are true and correct.

Respectfully submitted,

Fred J. Robinson
Registered Consulting Arborist, # 150 ASCA
Certified Arborist, # OH 0066 A M (Arboriculture and Municipal) ISA

Enclosures: Tree Inspection Form
Credentials

TREE INSPECTION
WIND TURBINE PROJECT, Cuyahoga County Fairgrounds, Berea, OH

#	Species	Size	Critical Root Zone Radius	Location	Vigor	Structural Defects	Insects/ Disease	Observations	Action
1	Silver Maple	41.5"	22'	SW tree in Energy Center Site.	Poor Pale leaf color. Sparse foliage.	SW stem is long and heavy with possible breakage seams below crotch in trunk. There are 1 or 2 small cavities in the SW stem. Higher cavity has slight potential to split.	Cottony Maple Scale.*	Eight dead branches over 3" width. Scars around root flare. Decay on N side. Extensive root loss expected in construction of building, grade change, and possible power line trench; thus subject to uprooting or rapid decline. Crown will shade some solar panels.	REMOVE
2	Red Maple (2 stems @DSH)	9.0" @ 32" above grade	10'	48' E of #1.	Fair	Girdled at grade by its roots.	None observed.	Suckering from below the girdle. Will shade some solar panels. May break at grade.	REMOVE
3	Shagbark Hickory	26.0"	18'	96' E of #1 48' E of #2	Exc.	None observed.	None Obs.	Great specimen. Has embedded wires and insulators.	PROTECT roots & low branches during construction with temporary fencing @ 18' radius.
4	Silver Maple	29.0"	18'	134' E of #1. 38' E of #3	Fair	NW branch and trunk are partially hollow.	Carpenter Ants & Cottony Maple Scale.*	Active Honey Bee hive in NW branch and probably in the trunk, as it sounds hollow. Risk of breakage of trunk or NW branch is not high, so would not be high on a Silver Maple removal list.	WARN of bee activity and protect roots if proposed construction activity is within 18'.

NOTES: Size is Diameter at Standard Height (DSH) measured at 4.5' above average grade, unless otherwise noted. The Critical Root Zone (CRZ) data I use is based on the "Trenching Formula" developed by the Dept. of Forestry, Toronto, Ontario. The radius is theoretically measured from mid-stump.

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Inspected on: September 20, 2010
By: Fred J. Robinson

TREE INSPECTION
WIND TURBINE PROJECT, Cuyahoga County Fairgrounds, Berea, OH

#	Species	Size	Critical Root Zone Radius	Location	Vigor	Structural Defects	Insects/ Disease	Observations	Action
5	Red Maple	9.3"	10'	38' N of #1.	Fair	More than 50% of trunk is dead @ grade due to an old scar.	Ants were under loose bark.	Could break at grade. Tree is probably within proposed building.	REMOVE
6	River Birch	12.3"	11'	64' N of #1.	Exc.	None observed.	None damaging.	Girdling roots NW. Basal scars NW and SE, but not decayed and are closing.	PROTECT roots & low branches during construction with temporary fencing @ 12' radius. Do not raise grade within CRZ radius or use bank run gravel as fill.
				18' N of #5			(Earwig)		
7	Silver Maple	14.0'	12'	70' E of #6.	Good	None observed.	None damaging.	New large scar on NW side starts at 6" above grade to 26" higher and is 9" wide. This tree should be far from construction. Exposed sapwood may decay before scar closes.	PROTECT if necessary @ 12' radius.
							(Earwig)		
*	Cottony Maple Scale is only a nuisance insect as it drops sticky "honeydew" on to surfaces below on which Sooty Mold Fungus grows. At worst, a few branches may be sucked dry. The scales are naturally controlled by predatory insects after scale populations have peaked every 7 to 12 years.								

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CREDENTIALS: FRED J. ROBINSON

Fred J. Robinson is actively involved in the field of arboricultural consultation and woody plant appraisal. He started with the F.A. Bartlett Tree Expert Company in Cleveland in 1966. Prior to starting his own consulting business in November, 1988, he was Consulting Arborist and Vice President of Osborne Tree Service, a Division of JTO, Inc. in Mentor. Mr. Robinson taught "Care of Woody Plants" and various other horticultural classes in the Continuing Education Division of Cleveland State University for 16 years. He is also a frequent lecturer for garden clubs, civic organizations, horticultural training sessions, arborist certification review classes, and both introductory and advanced tree appraisal seminars and workshops.

Mr. Robinson has BS degrees from both Syracuse University and the State University of New York College of Environmental Science and Forestry. His major was Forest Entomology and was followed by one year of post graduate study in Forest Entomology. He was employed as an instructor and lab assistant while a student. Since 1966, Mr. Robinson has attended numerous professional seminars and workshops on subjects such as Treatment of Tree Wounds and Compartmentalization of Decay in Trees, Pollution Injury to Trees, Shade Tree Evaluation, Hazardous Tree Assessment, Building Around Trees, Expert Witness/Litigation Consulting, Historic Landscape Maintenance, Technical Report Writing, Plant Pest & Disease Diagnosis, *i-Tree* Inventory System, and Advanced Tree Appraisal.

In 1975, Mr. Robinson was elected into the American Society of Consulting Arborists, which has world wide membership. He is a Registered Consulting Arborist (No. 150). He is also a member of the International Society of Arboriculture and is an Ohio Certified Arborist (No. OH 0066 AM) having additional certification in municipal arboriculture. Extensive continuing education credits are required to retain both ASCA Registration and ISA Certification.

For many years, Mr. Robinson served as an evaluator at the Shade Tree Evaluation Plot at the Ohio Agriculture Research and Development Center in Wooster. He also served on the Garden and Landscape Committee at Stan Hywet Hall and Gardens in Akron, prior to which he had directed the reopening of the historic vistas blocked by fifty years of tree growth and advised on tree preservation and supervised the installation of lightning protection in key trees.

As an expert on trees and other woody plants, Mr. Robinson is retained in much litigation and has given testimony in numerous courts of law in Ohio and Pennsylvania. His expertise has been called upon by property owners, historic sites, tree and/or landscape contractors, insurance companies, attorneys, municipalities, utility companies, engineers, architects, and landscape architects. The Cleveland Botanical Garden calls on Mr. Robinson for tree assessment and advice on tree protection during construction of the Children's Garden and the more recent building and garden construction and restoration. In 1998, Tishman Speyer Properties retained FJR Assoc. to find & provide care for the Rockefeller Center Christmas Tree.

Mr. Robinson has served as Consulting Arborist to the Village of Gates Mills, the City of Richmond Heights, and Mayfield Village. In Gates Mills he was responsible for the preservation of trees and shrubs on Village property, reviews plans for tree protection and reforestation at construction sites and development in the Protected Hillside Zones. In Richmond Heights he was Administrator of the Tree Planting Program, care of existing trees, and advisor to the City Engineer for tree protection. In Mayfield Village he has consulted about trees along streets and on property purchased by the Village.

In the City of Willoughby Hills, Mr. Robinson is appraising natural and planted vegetation on and near easements for the Euclid Creek Tributary Interceptor and Watershed Sanitary Sewer projects. The City of Cleveland has used Mr. Robinson for inspection of trees to be impacted by sidewalk replacement. The City of Solon has contracted with Fred J. Robinson & Associates for tree preservation on their Aurora East Sanitary and Storm Sewer/Pettibone Road Reconstruction Project. Many other municipalities, or their attorneys, use Mr. Robinson for assistance in tree issues, including assessment, appraisal, and damage, injury, or death due to tree failures.

CT Consultants of Willoughby contracted with Fred J. Robinson & Assoc. in the fall of 2005 for the Pre-Construction Tree Evaluation and Preservation Recommendations along the proposed Norton Parkway across the Newell Creek Preserve in Mentor. In 2006, Pre-Construction Tree Assessment was done for DLZ Ohio Inc. in their engineering for the Forest Hill Park project for the North East Regional Sewer District.

A recent project was consulting with PWP-Landscape Architecture of Berkeley, California on extensive tree planting projects at the Cleveland Clinic Foundation. It included a 289 tree allee at the new entrance, massive screening along the Euclid Corridor Project, and a follow-up tree inspection report in 2009.

Another recent project was consulting with Karlsberger Architects of Columbus, Ohio at TriPoint Medical Center in Concord, Ohio.

Mr. Robinson has served on the Tree Evaluation Committee of the Ohio Chapter of the International Society of Arboriculture since 2001. During that time the Committee has prepared two editions of the "Guide to Appraisal of Trees and Other Plants in Ohio." The Sixth Edition was published by the Ohio Chapter in 2002 and the Seventh Edition in 2007.

Wireless Applications Corp. Report on the Effects upon FCC-licensed Microwave and RF Facilities due to the construction of the Berea, OH Wind Turbine

October 11, 2010

I. Executive Summary

Wireless Applications, Corp. performed an analysis to evaluate the potential effects of the proposed Berea, OH wind turbine located in Cuyahoga County, Ohio on FCC-licensed microwave systems and two-way RF transmitting facilities. This document illustrates the location of the wind turbine with respect to the microwave paths, possible RF obstruction to nearby RF transmitting stations, along with recommendations concerning the wind turbine location. All illustrations, calculations and conclusions contained in this document are subject to field verification. The databases used in creating the attached tables and maps are generally accurate, but irregularities have been known to happen. A field verification survey is suggested as part of the pre-construction surveys.

Frequently, wind turbines located on land parcels near RF transmitting facilities or receivers can cause an impact that affects spectrum users. This study will calculate the impact of placing wind turbines close to FCC-licensed RF facilities.

The proposed wind turbine's tower height will be 60 meters (196.8 ft) with a rotor diameter of 47 meters (154.2 ft). The total tip height will be 83.5 meters (273.9 ft) above ground level. The wind turbine will be located in the Cuyahoga County Fairgrounds in eastern Berea, Cuyahoga County, Ohio (see Figure 1 attached).

Using Wireless Applications Corp's Site Sync online software, a search was conducted to identify existing and proposed microwave paths crossing the wind turbine location. In addition, FCC-registered structures and other two-way RF facilities within 2 miles of the wind turbine location were searched. Site Sync provides a graphical representation of the microwave paths and FCC structures, which were then overlaid on Google Earth base maps. Five FCC-licensed microwave paths and zero pending applications were found as shown in Figures 2 and 3) in the vicinity of the wind turbine location. No FCC-licensed and pending microwave paths were found to impact the location. Also, no land mobile or public safety antenna sites were found to be significantly impact by the wind turbine location.

The following analysis investigates the wind turbine location in detail against all pertinent FCC licensed services for significant unwanted impact. This analysis assumes that all licensed services have been designed and constructed according to FCC requirements and good engineering practice. All data has been taken from FCC databases.

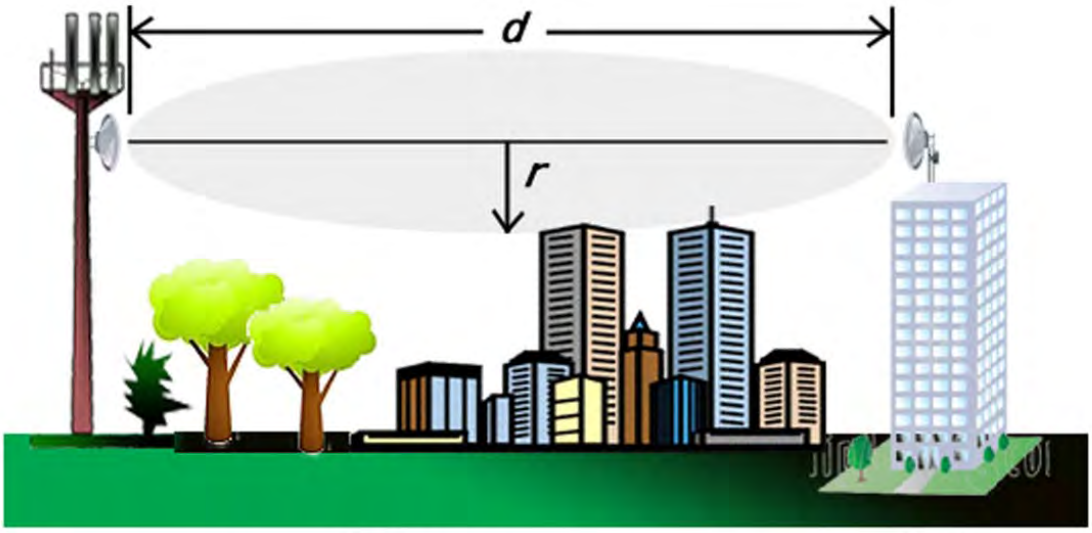
Important Note: Microwave path and fixed station studies are derived from the FCC databases and other third party data, which normally exhibit a high degree of accuracy and reliability. However, database errors do exist that may lead to incomplete results. A field survey is recommended prior to construction in order to confirm the site locations, antenna placements, antenna azimuths and other parameters are in service.

Each of the RF analyses is described separately in the following sections.

II. Microwave links Analysis

A comprehensive analysis was done to determine the likely effect of the new wind turbine location on existing and proposed microwave paths, consisting of a Fresnel x/y axis study. The microwave paths are overlaid on the Google Earth base maps, see Figures 2 and 3, and are also available as overlays for the Google Earth program (kmz files).

Wireless Applications Corp. calculated the Worse Case Fresnel Zones (WCFZ), which is the mid-point of a microwave path where the widest (or worst case) Fresnel zone occurs, for each microwave path. The radius *r* of the Worst Case Fresnel Zone, in meters, is calculated for each path using the following formula:



$$r_{(\text{in mts})} = 17.32 \times \sqrt{\frac{d\ (\text{in Km})}{4f\ (\text{in GHz})}} \qquad r_{(\text{in ft})} = 72.05 \times \sqrt{\frac{d\ (\text{in miles})}{4f\ (\text{in GHz})}}$$

where *d* is the microwave path length in kilometers or miles and F_{GHz} is the frequency in gigahertz.

The WCFZ is the main microwave beam that is cylindrical in shape with its axis as the direct line between the microwave end points and whose radius is *r* as calculated above. This is the zone where the placing of obstructions should be avoided.

As shown in Table 1 below, these are the five FCC-licensed microwave paths that are close to the proposed wind turbine location.

Path ID	Radio Service Code	Site Name 1	Site Name 2	Call Sign Site 1	Call Sign Site 2	Entity Name	Tx Freq (MHz)	Rx Freq (MHz)	WCFZ (m)	WCFZ (ft)	Clearance (m)	Clearance (ft)
1	AS	Location 1	Location 2	WMU969		BALDWIN-WALLACE COLLEGE	945.5		23.7	77.8	736.4	2415.9
2	MG	3124	1325	KBH77	KBH78	FELHC	6585	6705	16.9	55.3	755.2	2477.8
3	MG	0354	1325	KBH78	KQF91	FELHC	6625	6745	15.0	49.3	1142.5	3748.2
4	CF	CLE0805	CLE0806	WQBJ363	WQBJ361	FiberTower Network Services Corp.	17960	19520	3.1	10.1	8.5	27.9
5	CF	CLE0849	CLE0806	WQFD636	WQBJ361	FiberTower Network Services Corp.	23070	21870	2.4	7.9	232.1	761.4

Table 1 – Microwave Links Close to the Wind Turbine Location

The Fresnel zone radius was calculated with respect to the position of the proposed wind turbine along the microwave paths. Table 1 also shows the distance by which the proposed wind turbine cleared the microwave paths.

Figure 2 shows these microwave links overlaid on the Google Earth base map. These microwave links will not impact the proposed wind turbine location. The licensed 18 GHz microwave link with callsigns WQBJ363 and WQBJ361 came close to the WCFZ but the proposed wind turbine location does not obstruct this microwave link.

No pending microwave applications were found within 10 miles that will be impacted by the proposed wind turbine location.

Final placement of the proposed wind turbine should be done in coordination with a land surveyor to verify the coordinates of the end points of the microwave path. Any change in the coordinates of these locations may alter the results of this study.

III. FAA and Department of Defense Issues

An FAA Form 7460-1 is required to be filed for the proposed wind turbine as the first step in the site development process. The FAA obstruction clearance includes public airports and military flight routes analysis. Once the FAA obstruction clearance is received, it must not be allowed to expire. Registering the structure for an Antenna Structure Registration (ASR) number with the FCC will solve this issue.

The Department of Defense wind farm interference report was released to the public on September 27, 2006. Notification should be made to the Department of Defense and the Department of Homeland Security Long Range Radar Joint Program Office "JPO". The JPO previously adopted an interim policy of objecting to any turbines located within line of sight of any air defense or Homeland Security radar. The mitigation measures that have been approved so far are terrain shielding, as well as placing turbines beyond line of sight to military radar.

IV. Other Government RF Facilities

The National Telecommunication Information Agency (NTIA) manages the operation of RF frequencies for federal use. The technical specifications for most government facilities are not available to the public. The NTIA should be notified of the proposed wind turbine project during pre-construction planning to avoid any issues. The NTIA has a review process where the Interdepartmental Radio Advisory Committee (IRAC), consisting of different government agencies' representatives, reviews new wind turbine projects for impact on government frequencies. In almost all cases, no adverse impact is found, and IRAC usually issues a determination within 30 days. All three agencies, FAA, NTIA and JPO, should be notified of the proposed wind turbine project.

V. Other RF (Telecommunications) Facilities

According to the FCC and FAA databases, the closest land mobile station is about 0.17 miles SE from the wind turbine location. Its ASR number is 1019672 and it is owned by Verizon Wireless. Sprintcom Inc is located 0.88 miles East of the wind turbine location with ASR number 1215229 (see Figures 7 and 8). At this time, we found no direct interference issues with these RF transmitting stations. Without field measurement studies, of which Wireless Applications Corp. does not perform, there may be unknown spectral noise generation and indirect interference at the locations not analyzed in this report.

During the pre-construction surveys, it is imperative to check whether or not Verizon Wireless and Sprintcom Inc are in operation at the notified coordinates. The licensee should be notified of the proposed wind turbine as part of the public review process. Two miles is the industry standard for which comments from FCC-licensed facilities for possible RF impact by a wind project are solicited. This is not an FCC requirement, but rather a "good neighbor" policy.

VI. Conclusion

1. The proposed wind turbine located is geo-coded at 41/21/59.50 N and 81-50-21.10 W, in Cuyahoga County, Berea, OH.
2. There are no FCC-licensed or pending microwave paths that are impacted by the proposed wind turbine location. The wind turbine should be placed as shown in attached Figures 4, 5 and 6. With the assistance of a land surveyor, determine the exact locations of the transmit and receive sites of the microwave stations with regard to the proposed wind turbine.
3. There is no evidence of direct interference issues with RF transmitting stations. However, it is recommended that you notify the existing licensees as part of the public review process. They may want to perform field verification of the Verizon Wireless and SprintCom Inc land mobile stations in reference to the proposed wind turbine.
4. It is recommended that an inspection is completed to determine if there are any undocumented non-broadcast transmitters of any type within the wind turbine location parcels or within a half-mile of the property boundaries. There may be other cellular base station locations that are not individually registered to the FCC. There are no telecommunications towers found in the FCC license database search that was conducted. However, checking the FCC structure records for tower registration yield the two telecommunications operators. Unregistered towers should be checked by on-site inspection.
5. The wind turbine project should be submitted to NTIA and JPO to assure that no unlisted RF facilities are impacted by the wind turbine.

Attached Figures:

Figure 1 - Proposed Wind Turbine Location at Berea, OH
Figure 2 – FCC-Licensed Microwave Links
Figure 3 – Pending FCC Microwave Applications
Figure 4 – Proposed Wind Turbine drawn to scale
Figure 5 – FCC-Licensed Microwave Links over the Wind Turbine Location
Figure 6 – FCC-Licensed Microwave Links over the Wind Turbine Location (looking North)
Figure 7 – FCC-Registered Structures over the Wind Turbine Location
Figure 8 – Other Structures over the Wind Turbine Location

About Wireless Applications Corp

Wireless Applications, Corp. provides valuable products and services for cellular, PCS, and broadband wireless industries.

Over the last 10 years Wireless Applications has developed our on-line software platform, SiteSync to include a nationwide database of tower/structure data, and other database layers such as census demographics. SiteSync includes tools to aid in wireless design, such as eCoverage for RF propagation modeling, eMwave for microwave analysis and design, and spectrum search and analysis utilities. All of this is delivered in an on-line, web based tool that performs high-end analysis at lighting speeds. That means no software loading, compatibility issues, or internal IT department maintenance for our clients. With the SiteSync Pro Enterprise Microwave suite, designers can useThe Network Tool (TNT2) for automated microwave backhaul generation. 10 man-months of engineering can now be accompished in a week!

Additionally, Wireless Applications also integrates our software tools into client's websites either as as service or developers can write their own calls via our new Telecom API Suite.

Wireless Applications, Corp. also uses our own tools to be a service provider of FAA/FCC regulatory analysis and filing, GIS services, wireless network analysis, as well as microwave backhaul design. With our Microwave Coordination services, our team uses high-end automation software for interference descrimination calculations and for analyzing the terrain for blockage.

Our regulatory service clients enjoy our high-tech virtual vaults for accessing their opinion letter and other site information. Using the virtual vault, the client can download all of the site analysis we provide as well as upload any documentation such as photos or surveys.

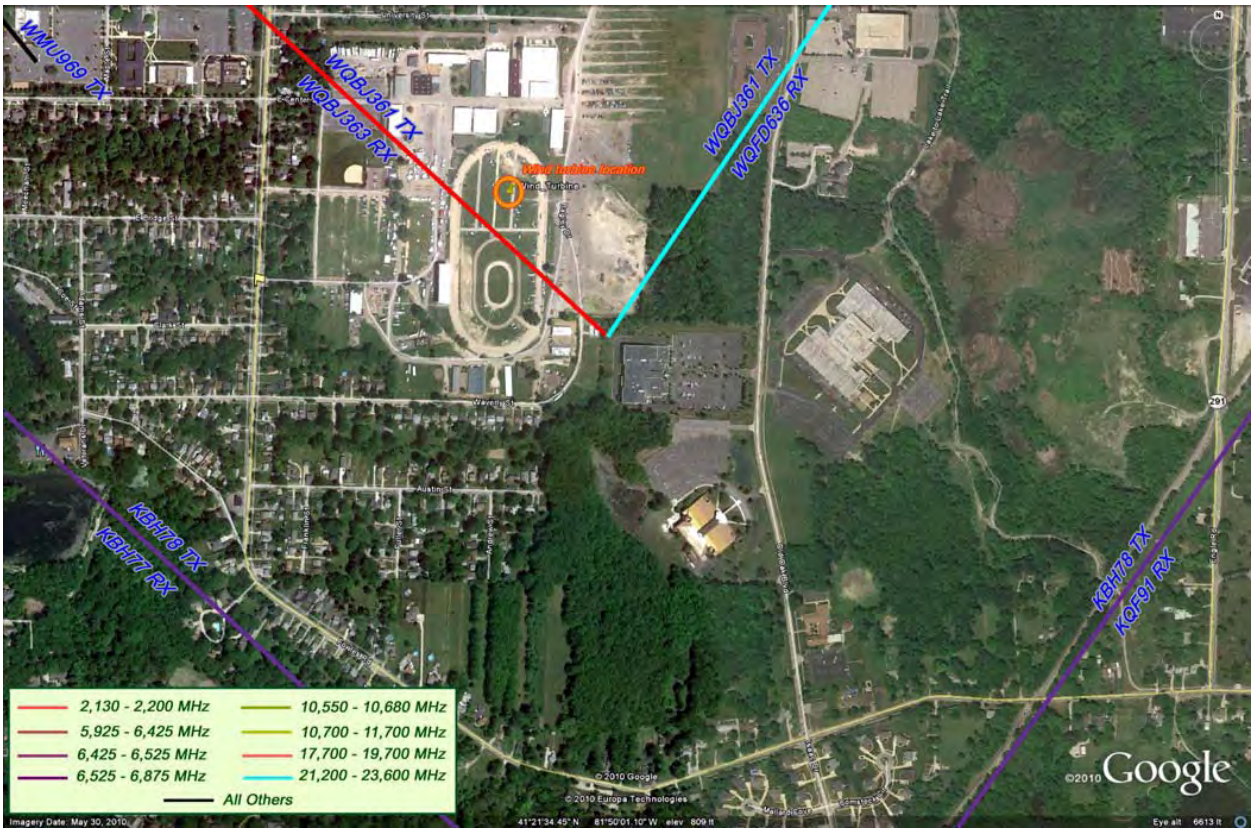
Wireless Applications Corp. Contact:

Jesus De Jesus
Senior RF Engineer
(425) 649-1810
jesus.dejesus@wacorp.net

Figure 1 – Proposed Wind Turbine Location at Berea, OH

Turbine Location – 41-21-59.50 and 81-50-21.10, in Cuyahoga County, Berea, OH

Figure 2 – FCC-Licensed Microwave Links



There are one existing 900 MHz, 6 GHz, 18 GHz and 23 GHz microwave link close to the wind turbine location.

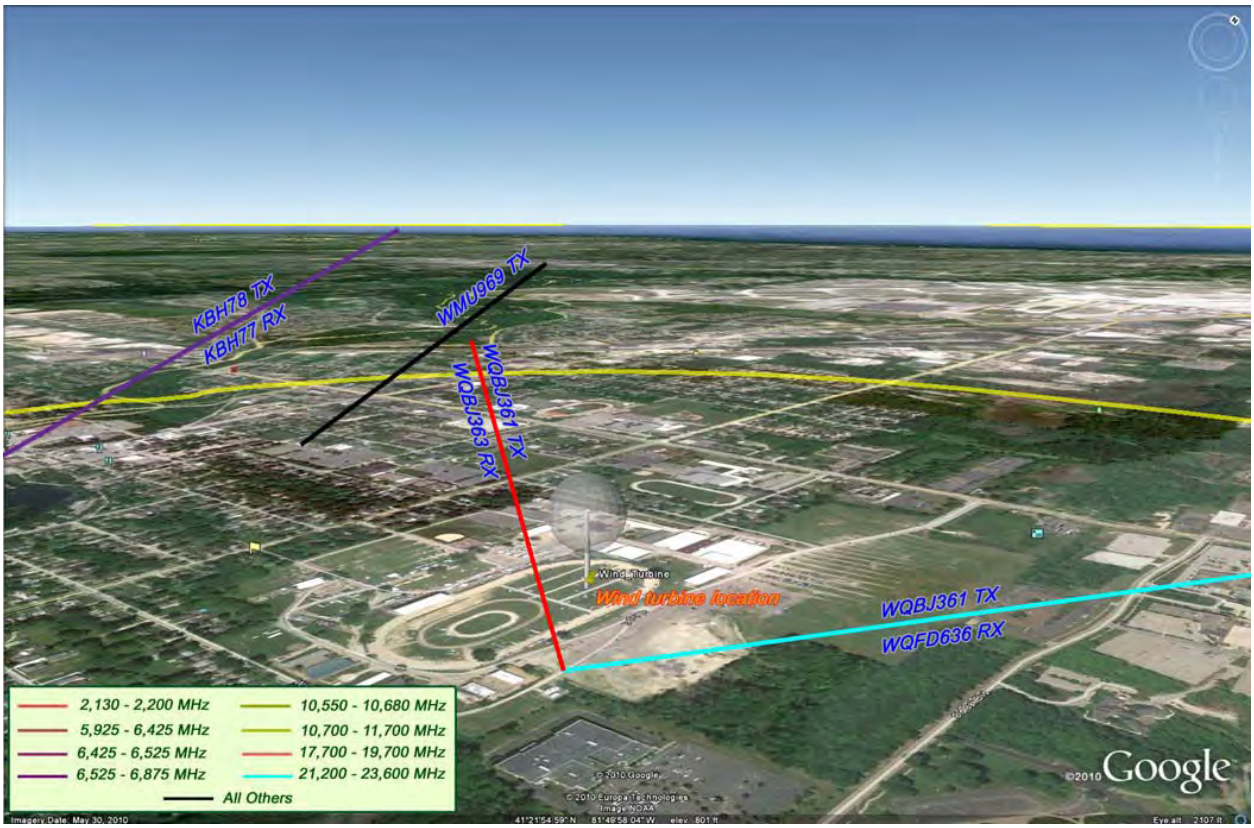
Figure 3 – Pending FCC Microwave Applications

There are no pending microwave applications within 1 mile of the wind turbine location.

Figure 4 – Proposed Wind Turbine drawn to scale

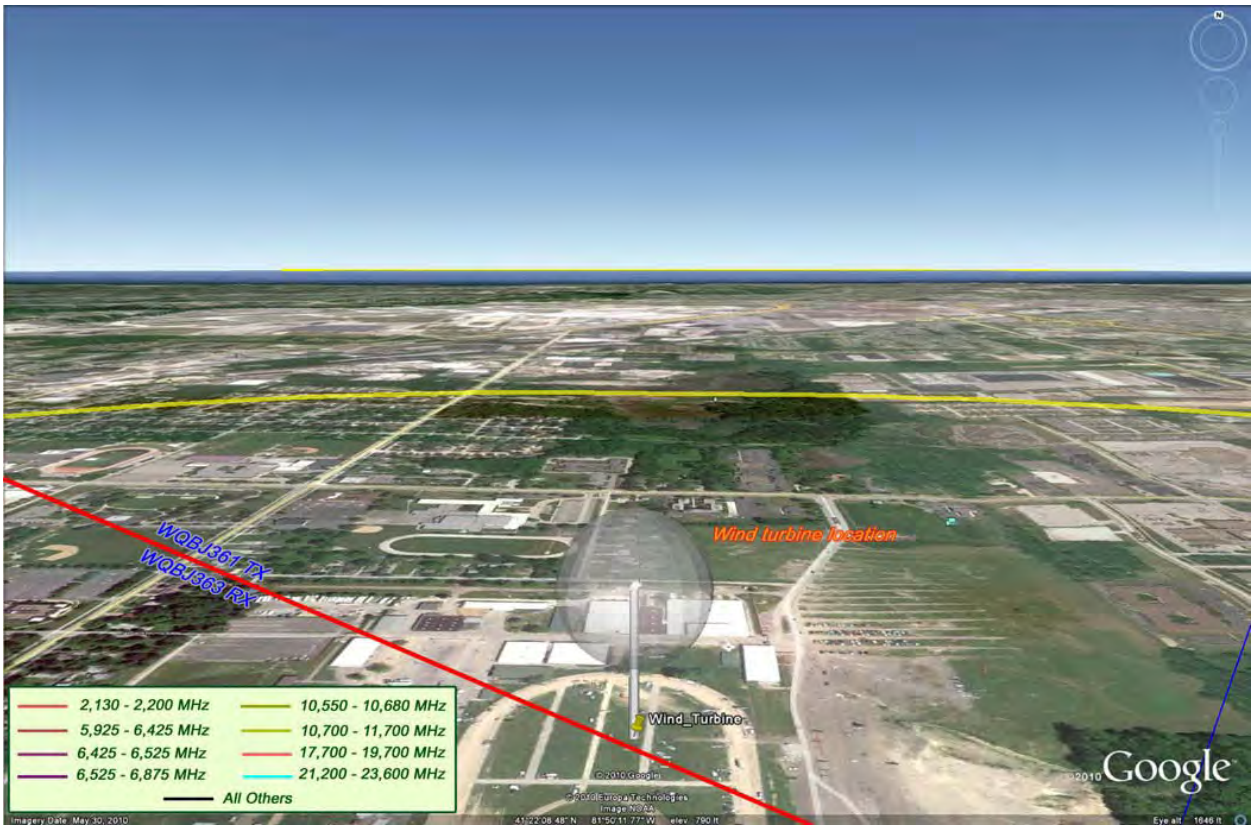
The original location was drawn to scale (turbine tip height = 83.8 m with blade diameter = 47 m) to illustrate the proposed wind turbine location.

Figure 5 – FCC-Licensed Microwave Links over the Wind Turbine Location



The existing microwave links are represented as they pass through close to the wind turbine location.

Figure 6 – FCC-Licensed Microwave Links over the Wind Turbine Location (looking North)



Wind turbine was drawn to scale (turbine tip height = 83.8 m, blade radius = 47 m) to show its impact to the existing and pending microwave links.

Figure 7 – FCC-Registered Structures over the Wind Turbine Location

These are the FCC-registered towers within 1 mile of the wind turbine location.

Figure 8 – Other Structures over the Wind Turbine Location

These are the FCC-registered, FAA-approved and Tower Company-owned structures within 1 mile of the wind turbine location.

THE RENAISSANCE GROUP — A Conserve First Company

Wind Resource Report, Ohio Wind Model Data Based

Prepared For:	*Cuyahoga County Fairgrounds*			
Contact:	*Nick Willis*	1642 Lakeside Avenue, Cleveland, OH 44114		
Site Location:	*Cuyahoga County Fairgrounds*	164 Eastland Road, OH 44017	Berea	
Wind Data Source:	*Ohio Wind Explorer*			
Prepared By:	*The Renaissance Group*	*(440) 936-0494 Office*	*(216) 832-1931 Mobile*	AAron@ConserveFirst.com
Date:	*1/4/2008*	*10299 Longview Drive Kirtland, Ohio 44094*		

NOTE: **This report should only be used as a rough estimation tool. Data inputs were taken from the most reliable sources available at the time of report's production. More precise calculations and estimates will require actual data collection on the site through the erection of a metrological tower and adjoining full wind resource assessment study.**

Site Geographical Information:

				Elevation (Above Sea-Level):	
Latitude:	*41° 21' 59.50"N*	Longitude:	*81° 50' 21.10" W*	Meters:	*244*
Decimal:	*41.3665*	Decimal:	*81.8392*	Feet	801
Map:	*4,579,800*	Map:	*429,800*	Lake Erie:	571

Wind Resource Data Geographical Source:

				Elevation (Above Sea-Level):			
Latitude:	*41 ° 22'29.35" N*	Longitude:	*81 ° 49'51.98" W*	Meters:	*242*	Roughness:	*0.9*
Decimal:	*41.3750*	Decimal:	*-81.8310*	Feet:	794		
Map:	*430,500*	Map:	*4,580,700*	Lake Erie:	571		0.001

Wind Resource:

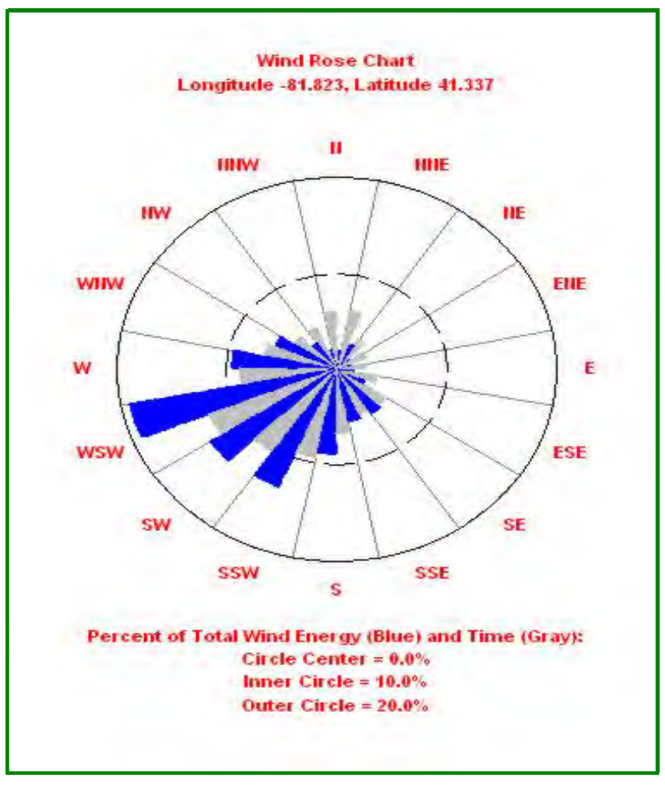
Annual Average Wind Speed					Average Wind Power Density		Weibull Parameters	
							c	k
30 Meter	*4.61*	m/s	*10.31*	mph	*108*	W/m^2	*NA*	*NA*
35 Meter	*4.84*	m/s	*10.82*	mph	*125*	W/m^2	*NA*	*NA*
40 Meter	*5.04*	m/s	*11.28*	mph	*141*	W/m^2	*NA*	*NA*
45 Meter	*5.23*	m/s	*11.71*	mph	*158*	W/m^2	*NA*	*NA*
50 Meter	*5.41*	m/s	*12.10*	mph	*174*	W/m^2	*6.17*	*2.257*
55 Meter	*5.56*	m/s	*12.44*	mph	*191*	W/m^2	*NA*	*NA*
60 Meter	*5.71*	m/s	*12.77*	mph	*206*	W/m^2	*NA*	*NA*
65 Meter	*5.84*	m/s	*13.07*	mph	*221*	W/m^2	*NA*	*NA*
70 Meter	*5.97*	m/s	*13.35*	mph	*236*	W/m^2	*NA*	*NA*
75 Meter	*6.09*	m/s	*13.63*	mph	*251*	W/m^2	*NA*	*NA*
80 Meter	*6.21*	m/s	*13.89*	mph	*266*	W/m^2	*NA*	*NA*
85 Meter	*6.32*	m/s	*14.14*	mph	*280*	W/m^2	*NA*	*NA*
90 Meter	*6.43*	m/s	*14.38*	mph	*295*	W/m^2	*NA*	*NA*
95 Meter	*6.53*	m/s	*14.61*	mph	*309*	W/m^2	*NA*	*NA*
100 Meter	*6.63*	m/s	*14.83*	mph	*325*	W/m^2	*NA*	*NA*

Predicted Wind Shear:			
Heights:	Exponent:	Heights:	Exponent:
30 to 50	0.313	30 to 70	0.305
50 to 70	0.293	30 to 100	0.302
70 to 100	0.294	50 to 100	0.293

Significant	*7%+*	**Map Area Speed Variation at 70 Meters.**	***Extrapolated**

Directional Wind Data at 50 Meters

Tabular Data Calculation Using Closest Data Point Within 1 KM.							Weibull Parameters	
Direction:	Frequency:		Power:		AVG. Wind Speed:		c	k
N	*5.75*	%	*1.93*	%	*3.72*	m/s	*4.47*	*2.654*
NNE	*6.67*	%	*2.97*	%	*4.11*	m/s	*4.87*	*2.538*
NE	*4.07*	%	*1.54*	%	*4.01*	m/s	*4.56*	*2.391*
ENE	*2.94*	%	*1.44*	%	*4.43*	m/s	*4.94*	*2.327*
ENE	*2.62*	%	*1.32*	%	*4.48*	m/s	*4.99*	*2.334*
ESE	*3.58*	%	*2.32*	%	*4.84*	m/s	*5.44*	*2.352*
SE	*5.07*	%	*5.36*	%	*5.76*	m/s	*6.48*	*2.484*
SSE	*5.18*	%	*5.83*	%	*5.80*	m/s	*6.52*	*2.327*
S	*6.69*	%	*8.90*	%	*6.21*	m/s	*6.81*	*2.237*
SSW	*9.63*	%	*13.54*	%	*6.39*	m/s	*7.20*	*2.620*
SW	*11.29*	%	*15.25*	%	*6.21*	m/s	*7.02*	*2.464*
WSW	*12.06*	%	*18.58*	%	*6.26*	m/s	*7.34*	*2.475*
W	*8.45*	%	*9.10*	%	*5.73*	m/s	*6.52*	*2.486*
WNW	*6.66*	%	*6.43*	%	*5.47*	m/s	*6.15*	*2.280*
NW	*4.67*	%	*3.30*	%	*4.72*	m/s	*5.47*	*2.165*
NNW	*4.66*	%	*2.16*	%	*4.04*	m/s	*4.79*	*2.234*



Rough Expected Average Turbine kWh Power Production Based on Wind Turbine Nameplate kW Ratings and Differing Tower Heights for The Site

Ohio Wind Model Data Based

Turbine KW	Hub Height (Meters)			
	30	50	70	100
10	6,173	10,909		
20	12,346	21,817		
30	18,519	32,726	46,791	
40	24,692	43,635	62,388	
50	30,865	54,544	77,985	
60	37,038	65,452	93,581	
70	43,211	76,361	109,178	
80	49,384	87,270	124,775	
90	55,557	98,178	140,372	
100	61,730	109,087	155,969	
150	92,595	163,631	233,954	
200	123,459	218,174	311,938	
250	154,324	272,718	389,923	
300	185,189	327,261	467,907	
350	216,054	381,805	545,892	
400	246,919	436,349	623,876	
450	277,784	490,892	701,861	
500	308,649	545,436	779,845	1,030,214
550	339,514	599,979	857,830	1,133,236
600		654,523	935,814	1,236,257
650		709,067	1,013,799	1,339,279
700		763,610	1,091,783	1,442,300
750		818,154	1,169,768	1,545,322
800		872,697	1,247,752	1,648,343
850		927,241	1,325,737	1,751,365
900		981,784	1,403,721	1,854,386
950		1,036,328	1,481,706	1,957,407
1000		1,090,872	1,559,690	2,060,429
1100			1,715,659	2,266,472
1200			1,871,629	2,472,515
1300			2,027,598	2,678,558
1400			2,183,567	2,884,600
1500			2,339,536	3,090,643
1600			2,495,505	3,296,686
1700			2,651,474	3,502,729
1800			2,807,443	3,708,772
1900			2,963,412	3,914,815
2000			3,119,381	4,120,858

Wind Resource Report, Site Wind Characteristics

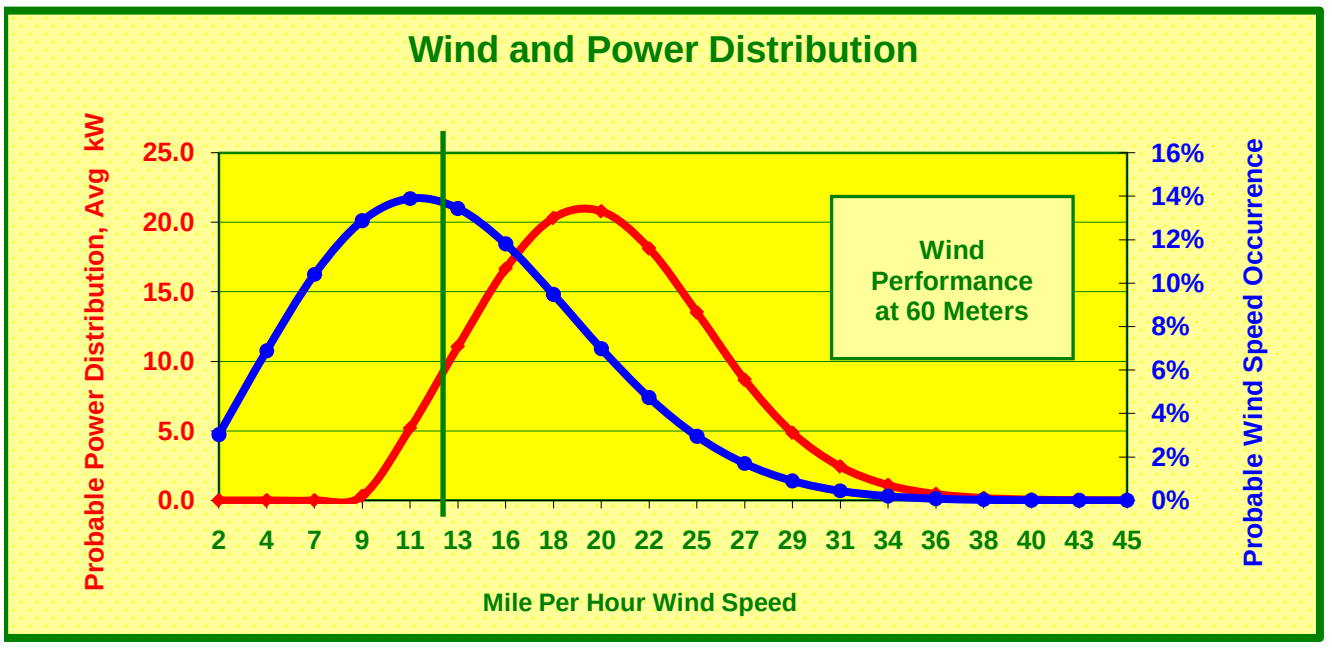
Cuyahoga County Fairgrounds

Turbine Model Used For Estimates: Vestas V-47-660
Meter Description: First Energy (110026622644) 686589723

Weibull Performance Calculations:

Yearly Average Wind Speed		Turbine Power Curve For Given Average Wind Speeds (kW)	Site Weather Constants	Wind Probability (f)	Average Net kW @ V	Area Wind Dist.:	Area Power Dist.:
Bin (m/s)	(mph)						
1	2.24	*0.00*	0.00	3.35%	0.000		
2	4.47	*0.00*	0.00	7.57%	0.000		
3	6.71	*0.00*	0.00	11.32%	0.000		
4	8.95	*2.90*	2.33	13.78%	0.321	75.9%	30.4%
5	11.18	*43.80*	35.13	14.56%	5.114		
6	13.42	*96.70*	77.57	13.69%	10.620		
7	15.66	*166.00*	133.15	11.62%	15.466		
8	17.90	*252.00*	202.14	8.95%	18.087		
9	20.13	*350.00*	280.74	6.28%	17.636		
10	22.37	*450.00*	360.96	4.03%	14.536	23.5%	67.3%
11	24.61	*538.00*	431.54	2.36%	10.182		
12	26.84	*600.00*	481.28	1.26%	6.082		
13	29.08	*635.00*	509.35	0.62%	3.152		
14	31.32	*651.00*	522.19	0.28%	1.446		
15	33.55	*657.00*	527.00	0.11%	0.596		
16	35.79	*659.00*	528.60	0.04%	0.223		
17	38.03	*660.00*	529.40	0.01%	0.076	0.5%	2.3%
18	40.26	*660.00*	529.40	0.00%	0.024		
19	42.50	*660.00*	529.40	0.00%	0.007		
20	44.74	*660.00*	529.40	0.00%	0.002		
			Totals:	99.84%	103.568	99.8%	100.0%

12.77 Site Average Wind Speed (MPH) at 60 Meters



February 10, 2011

Melissa Rossiter
NEPA Document Manager
U.S. Department of Energy
1617 Cole Boulevard
Golden, CO 80401

Dear Ms. Rossiter:

RE: Cuyahoga County Agricultural Society Wind Turbine Project (DOE/EA-1815)
164 Eastland Road, Berea, Cuyahoga County, Ohio

This is in response to your correspondence dated February 1, 2011 (received February 4, 2011). Our comments are made pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, and the associated regulations at 36 CFR Part 800.

The Cuyahoga County Agricultural Society proposes to use State Energy Program and Energy Efficiency and Conservation Block Grant funds originating from the U.S. Department of Energy (USDOE) and administered by the Ohio Department of Development to facilitate the construction of a 274' wind turbine in the infield of the racetrack at the Cuyahoga County Fairgrounds. You have requested the comments of the Ohio Historic Preservation Office regarding the effects of this project on historic properties.

We have reviewed the supplemental information submitted by ICF International, a cultural resource management consultant retained by USDOE to facilitate Section 106 consultation. ICF International's report concludes that the proposed wind turbine will have no adverse effect on properties listed in or eligible for listing in the National Register of Historic Places (NRHP) located within the revised Area of Potential Effects (APE) for this project.

It is unclear to us how the adjusted boundaries of the new APE were established since it is not explained in the submission and no supporting documentation is presented. If a reduced APE can be adequately justified due to limited visual impact of the proposed project, we encourage using it. Since we are not able to visit the site, factors that influenced the delineation of the APE should be described in future project submissions so that we can effectively and expeditiously conduct our review.

The supplemental information provided by the consultant also lacks basic mapping that is a critical to establishing the proximity of surveyed properties to the proposed project location and for properly gauging visual effects of the project on those properties. We had to use online mapping resources to plot the location of surveyed properties using addresses provided by the consultant. Please be sure to include a key linking photographs and other documentation to mapping in future submissions.

OHIO HISTORICAL SOCIETY
Ohio Historic Preservation Office
1982 Velma Avenue, Columbus, Ohio 43211-2497 ph: 614.298.2000 fx: 614.298.2037
www.ohiohistory.org

Of the 74 surveyed properties in the revised APE, the consultant determined that three properties were eligible for listing in the NRHP: the houses at 120 Eastland Road, 227 Eastland Road and 244 Eastland Road. We are not able to agree with these opinions. Insufficient analysis was provided to support the recommendation that the vernacular Victorian-era house located at 244 Eastland Road is historically significant. While the property retains considerable integrity, the submission lacks the contextual data to substantiate that the property has sufficient significance to meet National Register Criterion C. Specifically, the submission does not discuss the number of similar houses that are present in the surrounding area or what their condition is. Similarly, while the houses at 120 and 227 Eastland Road appear to be largely intact, we do not think that they meet Criterion C since bungalows constitute a very common architectural type found throughout Ohio and these examples do not demonstrate any particularly high-style characteristics. Familiarity with the local context is critical in the evaluation of properties for eligibility in the NRHP.

In an effort to help USDOE meet deadlines related to American Recovery and Reinvestment Act (ARRA) funding faced for this project, we decided not to request additional information and analysis – which we feel is warranted – but to combine information from your most recent submission and your previous submission and to do additional research on our own to develop a baseline context that allows us to conclude that it is unlikely that historic built resources will be adversely affected by the proposed project.

In a letter dated December 10, 2010, we requested that a Phase 1 archaeological survey of the construction area be completed. Your most recent correspondence states that the requested survey could not be completed in December 2010 or January 2011 due to heavy snow cover at the site. It is our understanding that USDOE cannot wait until spring to have the applicant perform the requested survey due to ARRA deadlines. We wish to note that our recommendation was made based on the professional opinion of a staff archaeologist taking into account our understanding of conditions at the project site and the archaeological record in the area. This recommendation did not consider ARRA deadlines, nor should it. Nonetheless, we understand the ARRA-related pressures faced by USDOE and offer the following comments in an effort to help the agency consider the effects of the project on historic properties in good faith.

The applicant proposes to have a professional archaeologist on site to monitor construction activities and contact OHPO to develop a treatment plan if archaeological resources are discovered. We have found that similar monitoring efforts implemented for previous federal undertakings have rarely, if ever, meaningfully contributed to the archaeological record or our understanding of the past. Reports are rarely submitted and information about resources that were uncovered during excavation that the archaeologist on site determined did not constitute "archaeological properties" is lost. Accordingly, we see little value in the proposed monitoring. If timing will allow, we would prefer that construction of the turbine commence immediately and that a Phase 1archaeological survey of the footprint of the proposed Energy Center building be completed prior to commencement of construction within that area. Such a survey would produce a report that adds to the archaeological record for this area in a meaningful way.

Please note that if historic properties are identified during implementation of the project, this office must be notified pursuant to 36 CFR Section 800.13.

If you have any questions, please contact Jamie Bertram or Justin Cook by phone at (614) 298-2000. Thank you.

Sincerely,

Mark Epstein
Department Head, Resource Protection & Review

MJE:JLB/JMC

copy: Stephen D. Mikesell, Senior Architectural Historian, ICF International, 630 K Street, Suite 400, Sacramento, California 95814
Pete Yerace, NEPA Compliance Officer, Office of Logistics Management, U.S. Department of Energy, 250 East Fifth Street, Suite 500, Cincinnati, Ohio 45202

Section 106 Compliance Report for Cuyahoga County Agricultural Society Wind Energy Project

Cuyahoga County fairgrounds, Berea, Cuyahoga County, Ohio

October 26, 2010

Prepared for: U.S. Department of Energy
Prepared by: Stephen D. Mikesell, ICF International

Purpose of Document

This document was prepared on behalf of the U.S. Department of Energy (DOE), for Ohio Department of Development (ODOD) State Energy Program (SEP) and Energy Efficiency and Conservation Block Grant (EECBG) grants for a single wind turbine and associated energy center for the Cuyahoga County Agricultural Society (proposed project or proposed turbine). This report is intended to achieve Section 106 compliance for DOE for their funding of the proposed project at the Cuyahoga County Fairgrounds (Fairgrounds). This report is a focused Section 106 compliance document and relies on technical studies prepared for this project by The Renaissance Group (TRG), who are acting as the Owner's Representative for the County. Also included in this submission are numerous other documents that were prepared as appendices for the National Environmental Policy Act (NEPA) Environmental Assessment (EA) DOE is preparing for this project. While all of the documents are attached to this Section 106 submission, the most pertinent of the documents used in this evaluation are referenced herein and located in Enclosure 1: Attachment 8, "Cuyahoga Parcel Map Index and Maps," and Attachments 4, 5, 6, and 7, which list designated and potentially significant historic properties within the vicinity of the proposed undertaking. Also useful are Attachment 10, "CCFG Visualization Analysis," which is used in the current report to analyze visual impacts, Attachment 9, "Cuyahoga County Fairgrounds Wind Turbine Project, Ambient and Turbine Produced Sound Level Analysis," and Attachment 11, Flicker Analysis used in the current report to analyze the potential for noise impacts. The findings of these technical reports are summarized below to analyze the potential for adverse effects. These technical reports offer a more thorough scientific analysis of visual and noise issues.

1. **Qualifications of Preparer**

This Section 106 Compliance Document was prepared by Stephen D. Mikesell. Mr. Mikesell is a senior architectural historian with ICF International. He has worked 30 years in the Section 106 compliance field. Before coming to ICF in February 2010, he worked for nine years as the Deputy State Historic Preservation Officer for the State of California. Between 1991 and 2001, he was a partner in a mid-sized cultural resource management firm, specializing in Section 106 compliance. Before 1980 and 1991, he worked as an architectural historian with the State of California, first with the State Historic Preservation Office (SHPO) and later with the California Department of Transportation.

2. **Summary of Findings**

DOE concludes that the proposed project will result in No Adverse Effect to properties that might qualify for listing in the National Register of Historic Places. The Area of Potential Effects for this undertaking is very densely populated, even in a 1 mile radius, or two mile diameter from the turbine site – there are thousands of potentially eligible properties within the Area of Potential Effect (APE). For the purpose of analyzing potential effects to historic properties, this report assumes that all pre-1960s properties are eligible for listing in the National Register of Historic Places (NHRP). This assumption applies only to this

proposed undertaking. This report concludes that, even if every older property was National Register eligible, there would not be an adverse effect to any historic properties.

3. **Project Description**

DOE has provided an EECBG grant to Cuyahoga County and a SEP grant to ODOD. ODOD selected the County to receive a portion of its SEP grant funds. DOE would authorize the recipient to continue to expend federal funding to design, permit, and construct the proposed project for which an EA is underway. The proposed project would be installed in the infield of the horse racetrack at the Fairground's property. The proposed turbine is a 600kW turbine mounted on a tower that is 60 meters tall (197 feet) with a 47 meter diameter rotor (155 feet). At its tallest extent, when a rotor is straight up, the total height would be approximately 83.5 meters (274 feet). A more detailed project overview is contained in Attachment 1.

The Fairgrounds' address is 164 Eastland Road, Berea, Ohio. When there is no racing, the infield is used for other events and parking. The site is part of a parcel that has been used extensively for the last century. Because it will be built near the center of a large parcel, the proposed turbine will be several hundred feet from the Fairground's property boundary. Attachment 2 contains the site location on a USGS Topographic Map.

The proposed project is an undertaking (36 CFR 800) because the majority of funding derives from the American Recovery and Reinvestment Act funded SEP and EECBG grants, which are appropriated to the DOE and distributed through the state of Ohio.

4. **Consulting Party Participation**

As part of the public notification for the EA being conducted for the proposed project, public participation as allowed per 36 CFR Part 800 will be integrated into the EA. Documentation of DOE Section 106 consultation with OHPO will be included in the EA, which will be open for public review and comment for 15 days. The following are some organizations notified of the project through the EA scoping process and these organizations will be invited to comment on the Draft EA when it is released to the public.

- Cuyahoga Department of Development
- Cuyahoga County Planning Commission
- Western Reserve Historical Society
- Western Reserve Heritage Association
- Cuyahoga County Commissioners
- Cuyahoga County Fairgrounds Board
- City of Berea
- City of Middleburg Heights
- Berea Historical Society
- Board of Trustees, The Berea Little Red Schoolhouse, Center for the Fine Arts

According to Indian Entities Recognized and Eligible to Receive Services from the US Bureau of Indian Affairs in Federal Register, Volume 72, Number 55 dated March 22, 2007 (72 FR 13648) and the National Association of Historic Preservation Officers at http://www.nathpo.org, there are no Federally-recognized Tribes in the State of Ohio nor is there a Tribal Historic Preservation Officer for the State of Ohio. However, DOE has provided the Notice of Availability to 24 tribal representatives that are regularly notified of Federal Actions in Cuyahoga County.

Attachment 3 contains a list of public meetings and newspaper articles related to the proposed project.

5. **Inventory and Evaluation**

The proposed turbine will physically affect a very small piece of land – a foundation for the turbine and associated equipment, and associated construction zones, expected to comprise less than an acre. Apart from that small foundation, however, the tower has the potential to have visual and noise impacts to properties far from the fairground where the tower will be installed.

a. Area of Potential Effect

The Cuyahoga County Fairground turbine project has two Areas of Potential Effect, or APEs. There is a direct APE, which is a 1600 square foot area within the infield for the horserace track at the fairground. The undertaking involves installation of a tower that is approximately 197 feet, with a total height of approximately 274 feet when the rotor is vertical. The direct APE also includes an approximately 2,000 square foot Energy Center building that would be constructed approximately 380 feet north of the turbine site and would receive power directly from the turbine via an underground transmission line. Total excavation for the Energy Center and transmission line would be approximately 4,000 square feet.

There is no definitive rule for determining an indirect APE for a wind turbine, which can create both visual and audible effects on the adjacent properties. As a conservative measure, the proponent has elected to study a 1.0 mile APE for indirect effects. The 1.0 mile radius is defined by visual impacts. Noise effects are quite localized and do not extend far beyond the fairground property. The 1.0 mile APE was selected as the maximum distance in which the tower will be seen.

b. Discussion of the area in which the turbine will be located

The Cuyahoga County Fairground is located in the city of Berea, Ohio, now effectively a suburb of Cleveland but which has a long history independent of its larger metropolitan neighbor. Berea was founded in 1836 and was regarded as a Methodist community in its early years. [The name was selected by a Methodist minister and comes from a Greek village visited by St. Paul in the early years of Christianity.] The community prospered in the 19th century as a stone working industrial area; local sandstone was used in architecture as well as in the making of grindstones. Because it is such an older city, the 1.0 mile radius indirect APE includes thousands of pre-1960 properties, as well as numerous properties that are listed in the National Register, in the Ohio inventory, or under local landmark

ordinances and private lists. The city of Berea is historically sensitive because it has been settled by Euro-Americans for 180 years and there are many buildings that have survived from that long period of settlement.

Not all of Berea, however, is equally sensitive in terms of historic properties. The old community of Berea is located northwest of the fairgrounds. All National Register-listed properties within the indirect APE for this undertaking are within the old Berea downtown (Please see Attachment 4 for a photo log of NRHP listed properties). Similarly, the vast majority of the properties on the Ohio Inventory that are within the one-mile radius of the proposed turbine site are also within the old Berea downtown (Attachment 5). The Berea Historical Society has a "Century Home" program through which it installs plaques on residences that are at least 100 years old. These are all in the oldest region of Berea, northwest of the turbine site. Attachment 6 contains a photo log of the Berea Historical Society Recognized Properties. As part of the data compilation, TRG inventoried all buildings and structures built before 1960, located within a 1.5 mile radius of the project site (Attachment 7). This report focuses, however, on a 1-mile radius, which was determined to be the APE based on turbine visibility.

The character of the indirect APE is considerably different southwest, southeast, and northeast of the proposed turbine site. To the southwest, there are relatively few neighborhoods; the area is dominated by the floodplain for the Cuyahoga River. The region to the southeast is similarly dominated by parks associated with the river. Due east of the turbine site is the community of Middleburg Heights, which was incorporated in 1961. Very few pre-1960 buildings exist there. To the northeast, the APE is predominantly industrial; Cleveland-Hopkins Airport (the largest airport in Ohio) is several miles northeast of the turbine site.

c. National Register eligibility of properties, direct APE

There are no National Register-listed properties within the direct APE for this undertaking. The direct APE, as discussed earlier, is the area that would experience ground disturbance for installation of the turbine foundation, associated underground transmission line, and the Energy Center. The direct APE is illustrated in the photograph below. There are no buildings at the exact site in which the turbine would be constructed, and the only buildings in the vicinity are the grandstands for the race track. In terms of potential for buried properties (e.g. archaeological sites), the parcel is so graded and has been used for so many years, there is no reason to suspect that an intact archaeological site exists at this property.

Location of Turbine, with Grandstands in Background

d. National Register eligibility of properties, indirect APE

Attachments 4, 5, 6, and 7 list and illustrate thousands of pre-1960 properties within a radius of up to 3 miles of the turbine site. As discussed above, the character of these properties differ greatly from one area to the next and this report focuses on the properties located within 1 mile of the turbine site. In the discussion below, the potentially historic properties within the indirect APE (1-mile APE) are characterized according to directions: northwest, southwest, southeast, and northeast. Attachment 8 contains parcel maps for the Cuyahoga Fairgrounds project area.

Properties to the northwest. The old town of Berea is located northwest of the turbine site and the northwest area includes all National Register properties, all state inventory properties, all Berea Century home properties, and the vast majority of all other pre-1960s properties.

The character of the historic properties in this area may be inferred from the properties listed in the National Register. The Berea Historical Museum is sited in a home from the late 1850s, shown below.

Mahler Museum, 118 E. Bridge Street, Berea

The Victorian Gothic Berea Depot was built in 1876, although no longer used as a depot, it is still a prominent landmark in downtown Berea and built of Berea sandstone.

Berea Depot, Depot Street, Berea

Baldwin-Wallace College is a Methodist university dating to the 1840s. The 1895 Marting Hall is shown below (this photograph is from the National Register nomination); it too is built of Berea sandstone.

Marting Hall, Baldwin Wallace College

Even some of the Century Homes, designated by the Berea Historical Society but not listed in the National Register, are built of the same Berea sandstone, including the Rectory for St. Adelbert Church, shown below.

Rectory of St. Adelbert Catholic Church, 66 Adelbert Street, Berea

The old part of Berea includes a wide array of functional building types from the turn of the last century, including the college buildings mentioned earlier, the depot, a collection of lovely churches, commercial buildings, and a large number of older residences. The Berea Historical Society Century Homes program, for example, has placed plaques on at least 53 century-plus homes.

Properties to the Southwest. The area southwest of the turbine site (south of old Berea) is a floodplain that defined the limits of the old town historically. There are no National Register, state inventory, or other known designated historic buildings in the area. In fact, there are few buildings of any age in this area, which comprises parklands and wetlands associated with the flood plain of the river.

Properties to the Southwest. This area includes an older farming region that was suburbanized during the years after 1945 and incorporated as Middleburg Heights in 1961. There are two properties carried on the Ohio inventory that are located in Middleburg Heights, a house and a barn both built in the late 1860s. They are located across from one another on Eastland Road, almost due south of the turbine site. The house is show in the photograph below.

7705 Eastland Road, Middleburg Heights

Research for this analysis identified one other old farmhouse in Middleburg Heights at 18150 Fowles Road, not far from the home on Eastland Road. It is shown in the photograph below.

18150 Fowles Road, Middleburg Heights

The other buildings in Middleburg Heights that were built before 1960 date chiefly to the post-World War II boom era, with most dating to the 1950s.

Properties to the Northeast. The area to the Northeast of the turbine site has been developed for hospital use and for industrial uses, chiefly associated with its proximity to Cleveland-Hopkins Airport. No pre-1960s properties were identified in this quadrant through any of the research tools listed above. The visual qualities of this area are illustrated below is "Application of Criteria of Adverse Effect."

6. Application of Criteria of Adverse Effect

In applying the Criteria of Adverse Effect, it is useful to consider both the nature of the potential impacts and the character of the resources, specifically the qualities that make it eligible for listing in the National Register. The broad definition of an adverse effect, taken from 36 CFR 800.5 (a) (1) is when "an undertaking may alter, directly or indirectly, any of the characteristics that qualify the property for listing in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling or association."

The ACHP regulations also provide specific examples of adverse effects. These examples will be discussed separately below, as there are different examples that might apply to potential impacts from ground disturbance, noise, and visual impacts.

a. Assessment of impacts from ground disturbance.

As noted in Section 5 above, there are no buildings at this site and there is no reason to suspect that any intact archaeological sites could have survived the many years of use of this parcel for horseracing and other county fair related uses. DOE concludes that there will be No Effect within the direct APE because there are no properties there that qualify for listing in the National Register.

b. Assessment of impacts from noise.

Potential noise impacts for this undertaking are discussed in detail in Attachment 9, "Cuyahoga County Fairgrounds Wind Turbine Project, Ambient and Turbine Produced Sound Level Analysis." The analysis concludes two things pertinent to a potential adverse effect. First, the ambient noise level in the immediate vicinity of the turbine site is relatively high, owing to the presence of numerous highways and other sound generators, including activities at the fairground itself. Second, it concludes that increases of 50 dB attributable to the turbine (a key threshold) would be restricted to the fairground racetrack itself, a site that is used for horse races, concerts, and, during the fair season, demolition derbies and other loud events.

Relying upon the analysis in Attachment 9, DOE concludes that there will be No Effect to historic properties because of auditory impacts associated with the installation of the proposed wind turbine.

c. Assessment of effects from visual impacts.

Visual impacts vary according to at least three variables: the distance of a historic property from the visual intrusion; intervening barriers that might diminish visual impacts; and the degree to which the significance of a property hinges upon the presence or absence of visual intrusions.

The potential visual effects from turbine installation are simulated in a series of photo simulations in Attachment 10, "Cuyahoga County Fairgrounds Wind Turbine Project Turbine Visualization and Photo Analysis." These simulations take into account the distance from the turbine and intervening barriers. It does not take into account the degree to which the potential significance of historic properties hinge upon the absence of visual intrusions, a factor that will be discussed in this report.

As noted, the vast majority of National Register-listed, state-inventoried, and locally recognized properties are to the northwest of the fairground site. Attachment 10 includes photo simulations from several vantage points within the old community of Berea.

Photo Simulation FG-1 is taken from the National Register-listed Berea Depot, looking toward the turbine site. The depot is 1.24 miles away from the turbine and, as shown in that simulation, the turbine is not visible.

Photo Simulation FG-1, Looking Toward Turbine Site from Berea Depot

FG-13 is taken from Front Street near Church Street, near the current and historic downtown of Berea. The photograph was taken .71 miles from the turbine. The turbine cannot be seen from that vantage point.

Photo Simulation FG-13, Front Near Church, Old Berea

The exact location of the photograph below is not noted but it is near the FG-13 site. The turbine is not visible at this location, which is the commercial core of Berea.

Photo Simulation of Commercial Core of Berea

As noted, there are relatively few buildings within a mile to the southwest of the turbine site. FG-11 illustrates Coe Lake, .67 miles southwest of the turbine; the turbine cannot be seen there.

Photo Simulation FG-11 from Lake Coe, .67 miles southwest of the turbine site

It appears the only photo simulation from the southeastern quadrant is FG-5, taken from a business called Quadax at a distance of .41 miles. The turbine is not visible in that view. The old farmhouses in Middleburg Heights, on Eastland and Fowles Road, are located due south of the Quadax site, about .5 miles further away from the proposed turbine. If the turbine cannot be seen from the Quadax site, is almost certainly will not be visible from those old farmhouses.

Photo Simulation FG-5, from Quadax Business site, .41 miles southeast of turbine location

The turbine is visible from the northeast, a generally industrial area with large parking lots and relatively few trees. It appears there are no pre-1960 buildings in this quadrant. The view below Simulation FG-4) is taken from a parking garage at a hospital .4 miles from the turbine.

Photo Simulation FG-4, of Turbine from Parking Garage at Southwest General Hospital, .39 miles northeast of turbine

The photo simulations in Attachment 10 show two things clearly. First, the properties in the northwest quadrant – old Berea – are sheltered from the view of the turbine, chiefly through distance but also by the height and scale of buildings and the urban forest. The turbine is visible chiefly from the northeast industrial area, which appears to be devoid of any pre-1960 properties. Additionally, the turbine was not visible in any of the photo simulations that were greater than 0.5 mile distant (See Attachment 10, photos FG-1, 12, 13 and 14). From the simulations it can be concluded that nearer properties, those under 0.5 mile have the best vantage of the turbine and that properties outside a 0.5 mile radius (the area were most of the pre-1960s properties are located) will not readily be able to see the proposed turbine.

The analysis in Attachment 10 also helps analyze the impacts of visual intrusions on the significance of the potential historic properties within the APE. The photographs and tables on pages 19 through 28 illustrate the presence of numerous tall towers and buildings in the vicinity of the proposed turbine. This is not surprising as Berea is adjacent to an industrial zone and is not far from Cleveland's principal airport. Of particular note in evaluating the impact of the proposed turbine are the photographs on

page 19, two of which are reproduced below. The first is a communications tower on the fairground property. The second is a wind turbine at Baldwin-Wallace College, a National Register-listed property in the Northwestern quadrant.

Communication Tower at Fairground, near the Turbine Site

Wind Energy Turbine on grounds of Baldwin-Wallace College

The general conclusion from that part of Attachment 10 is that the pre-1960 properties in and near Berea do not exist in a park-like setting that is free from industrial-type visual impacts. This is especially true of the properties to the northeast, which is a business park. It is true as well of the Fairgrounds and even the oldest part of historic Berea, including the Baldwin-Wallace campus.

One may conclude from this analysis that the potential significance of the many properties within a 1.0 mile radius of the proposed tower do not derive their significance from an absence of tall structures and visual intrusions. Stated differently, it is quite unlikely that construction of this turbine would so diminish the setting for one of the properties within that radius as to render it ineligible for listing in the National Register.

Visual impacts vary according to at least three variables: the distance of a historic property from the visual intrusion; intervening barriers that might diminish visual impacts; and the degree to which the significance of a property hinges upon the presence or absence of visual intrusions.

Relying upon the analysis and photo simulations in Attachment 10, DOE concludes that there will be No Adverse Effect to historic properties because the proposed undertaking will not introduce a visible element that will diminish the integrity of the significant historic features of any of the properties within the APE. Visual impacts are diminished greatly by the three variables which affect the potential for such impact: distance from the source; intervening barriers, and the degree to which the significance of historic properties depends upon an unobstructed setting. The greatest concentration of historic properties, those in the old town of Berea, is sheltered by distance and intervening barriers, including buildings and trees. Most of old Berea is 0.75 to 1 mile from the turbine site. The other quadrants have

few historic properties. There are a few recorded old farm houses in what is now Middleburg Heights, but these are more than a mile away from the turbine. The areas in which the turbine may be most clearly seen – the business park to the northeast – has no historic properties. The results of the Visual Simulation indicate that the turbine would be visible mainly within a 0.5 mile radius, which does not contain a large number of pre-1960 properties. Finally, the presence of other vertical elements – communication towers and even other wind energy turbines – indicates that the potential significance of these properties does not derive from a pristine setting. Taking into account these three elements of visual impacts coupled with the visibility of the turbine beyond 0.5 mile, DOE concludes that the proposed undertaking will result in No Adverse Effect to any of the assumed historic properties within the APE.

d. Assessment of impacts from shadow flicker impacts.

A shadow flicker analysis (Attachment 11) was completed for the proposed project area to determine the amount of shadow flicker that would be experienced for local receptors as a result of turbine construction. The analysis considered several aspects affecting the casting of shadows and potential impacts on local receptors, including the distance to receptors, angle of incoming solar insolation, and the amount of sunlight experienced at the project site during each of the four seasons.

Results of the shadow flicker analysis indicate that no homes or occupied business structures outside the school would receive significant flickering shadows of over 30 hours per year. While a very few residences located south/southeast of the proposed turbine site would receive summer morning shadows, these effects would be partially blocked by tree canopy and are anticipated to be minimal.

Relying upon the analysis in Attachment 11, DOE concludes that there will be No Effect to historic properties owing to shadow flicker impacts associated with the installation of the proposed wind turbine.

7. Conclusions

This report supports the conclusion that the Cuyahoga Agricultural Society Wind Energy Project will result in No Adverse Effects to properties that may qualify for listing in the National Register of Historic Places.

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

October 29, 2010

Dr. Mark Epstein, Director
Ohio Historic Preservation Office
1982 Velma Avenue
Columbus, Ohio 43211-2497

RE: Cuyahoga County Agricultural Society Wind Turbine Project (DOE/EA-1815)
164 Eastland Road, Berea, Cuyahoga County, Ohio

Dear Dr. Epstein:

The U.S. Department of Energy (DOE) has granted the Ohio Department of Development (ODOD) State Energy Program (SEP) and Energy Efficiency and Conservation Block Grant (EECBG) funding through the Energy Policy and Conservation Act, as amended (43 U.S.C § 6321 et seq.) and Energy Independence and Security Act of 2007 (Title V, Subtitle E), with funds appropriated under the American Reinvestment and Recovery Act of 2009. ODOD selected the Cuyahoga Agricultural Society to receive a grant through their SEP. Cuyahoga County received direct funding through the EECBG program. Funds from both programs would facilitate the construction and operation of a single 600 kilowatt wind turbine which would be approximately 274 feet at its tallest extent and is intended to provide electricity to the Cuyahoga County Fairgrounds (proposed project). The DOE funding of the wind turbine and associated facilities represents the proposed federal undertaking.

This letter initiates consultation pursuant to Section 106 of the National Historic Preservation Act (NHPA) and its implementing regulations 36 CFR Part 800 "Protection of Historic Properties" (Section 106) for construction of the proposed project. An OHPO Section 106 Review – Project Summary Form is enclosed for your reference (Enclosure A).

To assist in the development of the Section 106 consultation materials, DOE enlisted the assistance of Mr. Stephen D. Mikesell, a senior architectural historian who meets the Secretary of the Interior's Professional Qualification Standards (36 CFR Part 61) in architectural history, history or archeology. Mr. Mikesell's *Section 106 Compliance Report for Cuyahoga County Agricultural Society Wind Energy Project* (report), utilized data gathered by The Renaissance Group (TRG) related to historic properties registered or eligible for listing on the National Register of Historic Places within the Area of Potential Effect (Enclosure B).

Although there are some cultural resources in the indirect APE, DOE has determined that the proposed undertaking will result in No Adverse Effect on NRHP listed or eligible properties or archeological resources. If you agree with DOE's determination that there will be no effects to historic or archaeological resources, please concur, as your concurrence is required for DOE's record of compliance under Section 106.

DOE is preparing an Environmental Assessment (EA) for the proposed project in compliance with the National Environmental Policy Act (NEPA). As part of the public notification for the EA for the proposed project, public participation will be integrated into the NEPA process. Documentation of DOE's Section 106 consultation with OHPO will be included in the EA, which will be open for public comment for 15 days. All notices of the EA public comment period will reference the public's ability to comment on the proposed undertaking's potential effects on NRHP listed and eligible properties. DOE finds this proposed public participation process to be consistent with 36 CFR 800.2*(d)*.

Should you have any questions about this information, please contact me at Melissa.Rossiter@go.doe.gov or 720-356-1566.

Thank you in advance for your consideration.

Sincerely,

Melissa Rossiter
NEPA Document Manager
U.S. Department of Energy
1617 Cole Boulevard
Golden, CO 80401

Attachments

cc: Franco Ruffini, Deputy SHPO, OHPO
James Huth, Advanced Energy Program Manager, ODOD
AAron Godwin, Owners Representative, Renaissance Group
Nick Willis, Project Manager, Cuyahoga County
Steve Mikesell, ICF International

List of Enclosures and Attachments

Enclosures:

Enclosure A – Section 106 – OHPO Project Summary Form

Enclosure B – Section 106 Compliance Report for Archbold Local Schools Wind Energy Project

Attachments:

Attachment 1 – Project Overview

Attachment 2 – USGS Topographic Map

Attachment 3 – Archbold Public Involvement

Attachment 4 – National Historic Register Properties, Cuyahoga County Fairgrounds Map

Attachment 5 – Ohio Historic Registry Properties, Cuyahoga County Fairgrounds Map

Attachment 6 – Berea Historical Society Recognized Properties

Attachment 7 – Photo log of Cuyahoga County Fairgrounds Non-Listed Properties

Attachment 8 – Cuyahoga County Fairgrounds Project Area Parcel Maps

Attachment 9 – Ambient and Turbine Produced Sound Level Analysis

Attachment 10 – Turbine Visualization and Photo Analysis

Attachment 11 – Shadow Flicker Analysis

Department of Energy
Golden Field Office
1617 Cole Boulevard
Golden, Colorado 80401-3393

February 1, 2011

Dr. Mark Epstein, Director
Ohio Historic Preservation Office
1982 Velma Avenue
Columbus, Ohio 43211-2497

RE: Cuyahoga County Agricultural Society Wind Turbine Project (DOE/EA-1815)
164 Eastland Road, Berea, Cuyahoga County, Ohio

Dear Dr. Epstein:

Per DOE's ongoing Section 106 consultation and our recent communications with OHPO, enclosed please find supplemental information regarding the above-referenced project.

This information support's DOE's determination of no adverse effects and further solidifies our commitment to monitor the project site during excavation.

Should you have any questions about this information, please contact me at Melissa.Rossiter@go.doe.gov or 720-356-1566.

Thank you in advance for your consideration.

Sincerely,

Melissa Rossiter
NEPA Document Manager
U.S. Department of Energy
1617 Cole Boulevard
Golden, CO 80401

Enclosures

Supplemental Section 106 Compliance Report for the Cuyahoga County Agricultural Society Wind Energy Project:

Establishing an Area of Potential Effects, Evaluating Historic Properties, and Assessing Effects

Berea, Cuyahoga County, Ohio

January 24, 2011

Prepared for: U.S. Department of Energy

Prepared by: Stephen D. Mikesell, ICF International

ACRONYMS

APE	area of potential effect
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
EECBG	Energy Efficiency and Conservation Block Grant
NEPA	National Environmental Policy Act
ODOD	Ohio Department of Development
OHPO	Ohio Historic Preservation Office
SEP	State Energy Program
U.S.C.	United States Code

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Introduction

Statement of Purpose

This report supplements the Section 106 compliance document for the Federally funded Cuyahoga County Fairgrounds Wind Energy Project (proposed project) submitted to the Ohio Historic Preservation Office on October 26, 2010. The U.S. Department of Energy (DOE) is submitting this report to the Ohio Historic Preservation Office in compliance with the regulations of the Advisory Council on Historic Preservation, 36 CFR Part 800. This report represents DOE's response to the December 10, 2010, letter from the Ohio Historic Preservation Office (OHPO) (Dr. David Snyder to Ms. Melissa Rossiter), in which the OHPO requested clarification on three regulatory issues.

This report seeks to further clarify four crucial points: (1) establishment of the area of potential effect (APE) for the Undertaking; (2) inventory and evaluation efforts to identify National Register of Historic Places-eligible properties within the APE; (3) a Finding of Effect, linking the presence of historic properties within the APE with the known impacts associated with the Undertaking; and (4) determination of potential archaeological resources within the area of ground disturbance. Each major point is discussed separately below.

DOE has defined the APE as the area bounded by University Street, Eastland Road, Waverly Street, and Old Oak Roads in Berea (Figure 1). Within this APE, there are 74 properties 50 years or older, of which three qualify for listing in the National Register of Historic Places. The proposed project would not adversely affect these three properties. Due to heavy snow cover, DOE could not conduct an onsite archaeological survey of the area that would be excavated for placement of the wind turbine and associated facilities. However, the Cuyahoga County Agricultural Society has committed to providing an onsite, registered archaeologist to monitor ground disturbance during excavation activities for the turbine and related facilities. If archaeological resources were identified, all ground-disturbing activities would be halted and, in consultation with OHPO, a treatment plan would be devised.

Description of the Undertaking

The Cuyahoga County Agricultural Society has received Federal funds from the DOE through the Ohio Department of Development (ODOD) Energy Resources Division State Energy Program (SEP) in the amount of $1,275,000 for the installation and operation of a single 660-kilowatt wind turbine at the Cuyahoga County Fairgrounds. The Agricultural Society is also receiving $391,486 from Cuyahoga County as part of its DOE Energy Efficiency and Conservation Block Grant (EECBG) Program, which provides formula grants to States, territories, counties, cities, and tribes. Both programs receive funding under the *American Recovery and Reinvestment Act of 2009* (Pub. L. 111-5, 123 Stat. 115). The provision of Federal funds for the proposed wind turbine project represents the Undertaking under Section 106 of the National Historic Preservation Act (NHPA) (36 CRF. Part 800)

Section 101(b)(4) of the *National Environmental Policy Act* (42 U.S.C. 4321 et seq.; NEPA) requires a Federal agency to coordinate and plan its actions to identify any unique historic or cultural characteristics of the geographic area (40 CFR 1508.27) of the Undertaking and act accordingly. The

Figure 1: Area of Potential Effect

potential use of Federal SEP and EECBG Program funds to assist in financing the Undertaking constitutes a Federal action subject to review under the NEPA.

The wind turbine would be installed in the infield of the racetrack on Fairgrounds property, and a proposed Energy Center (which is not Federally funded, but is a connected action) would be constructed approximately 300 feet north in an area that is currently unvegetated dirt and maintained grass. The Fairgrounds is located at 164 Eastland Road, Berea, Ohio.

The proposed project involves a single 660-kilowatt turbine that would be mounted on a tower 197 feet tall with a 154-foot-diameter rotor. Overall, the turbine would stand 274 feet at its tallest blade tip extent. The turbine would be mounted on a monopole made of tubular conical steel segments. The project site is part of a Fairgrounds parcel that has been used extensively for over a century. Because the turbine would be installed near the center of this large parcel, it would be several hundred feet from the edge of the Fairgrounds property.

Establishment of the APE for the Undertaking

The APE for the Undertaking is defined by a rectangle bounded by University Street to the north, Waverly Street to the south, Eastland Road to the west, and Old Oak Road to the east. The APE is illustrated in Figure 1.

Defining the APE

DOE defined the APE through a two-step process. In its initial submission to the OHPO, DOE defined the APE as a 1-mile radius, an expansive APE that included thousands of properties more than 50 years old. The OHPO recommended that DOE study a smaller area, with more intensity, because the photo simulations of the previous APE indicated the turbine would be visible from fairly limited distances.

In January 2011, a certified historian, on behalf of DOE, conducted a field inspection which resulted in a more refined APE reflecting the area in which effects could reasonably be anticipated to occur.

Based on this field inspection, DOE determined that properties to the north, east, and south of the turbine site should be examined further for potential effects and eligibility determinations. To the east are wetlands that separate the Fairgrounds from occupied buildings. The properties east of the wetlands, however, have the most direct view of the proposed turbine because there are no intervening buildings in the area.

Relying upon these onsite observations and earlier photo simulations, DOE defined a more-focused APE as follows: Waverly Road on the south; Eastland Road on the west; University Road on the north; and Old Oak Road on the east (Figure 1).

Inventory and Evaluation Efforts to Identify National Register-eligible Properties within the APE

Inventory and Evaluation of Archaeological Properties within the APE

The project site would be in the infield of a racetrack, near the center of the Cuyahoga County Fairgrounds property. The underground transmission line would extend 300 feet underground north to the proposed Energy Center building. The total area of ground disturbance from construction activities would be approximately 4,000 square feet. The December 10, 2010, letter from OHPO indicated a need for a pedestrian survey of the immediate construction area. However, such survey was not possible in December 2010 and January 2011 due to heavy snow cover at the site. Background research showed little about the use of the specific site, except that it has been used by the Fair Board since the property was acquired in the 1890s. The infield area where the turbine would be installed has been used for rodeo events, concerts, demolition derbies, and other entertainment venues for more than a century. The Energy Center site would be about 300 feet from the racetrack and has been part of the Fairgrounds parcel since the 1890s, as well. Cuyahoga County Agricultural Society has committed to providing an onsite, registered archaeologist to monitor ground disturbance during excavation activities for the turbine and related facilities. In the unlikely event that unanticipated archaeological properties were identified by the onsite archaeologist, all ground-disturbing activities would halt and the Agricultural

Society would contact OHPO for development of a treatment plan in accordance with the *National Historic Preservation Act* (16 U.S.C. 470 et seq.)

Inventory and Evaluation of Properties within the Cuyahoga County Fairgrounds, entirely within the APE

The proposed project would be located within the boundaries of the Cuyahoga County Fairgrounds. Because the Fairgrounds has been in operation at the same location since the 1890s, the area has the potential of being registered as an historic property.

DOE performed a field investigation and conducted research using data gathered from the Fair Board. The historical data included reliable dates of construction and function for each of the 33 buildings at the Fairgrounds. DOE prepared an inventory and evaluation document, which is attached to this report as Attachment 1. The report concludes that none of the properties within the Fairgrounds qualify for the National Register, individually or as a group.

Inventory and Evaluation of Buildings, Other than the Fairground Structures, within the APE

The APE is on the eastern edge of the town of Berea, with an urban area of Berea historically centered on what is now Front Street, approximately 0.8 mile west of the turbine site and outside the APE. A secondary urban node is the campus of Baldwin-Wallace College, which is centered on Seminary Street, east of Front Street, approximately 0.7 mile west of the turbine site and outside the APE.[1] The land within the APE was settled to some degree early in the history of the community of Berea, using the dates of construction of the oldest homes in the area as a basis. (These dates are provided by the Cuyahoga County Auditor and are not always accurate. Experience shows that the older the home, the more likely the date is an estimate rather than a firm and documented date of construction.) The County Auditor has dated a few of the homes within the APE from the 1850s and 1860s; a larger number are dated from the 1880s. The character of this neighborhood likely changed dramatically with the establishment of the Cuyahoga County Fairgrounds in 1893.[2]

The APE includes a remarkably diverse group of homes, in terms of dates of construction as well as style. The oldest homes are along Eastland Road and the western edges of University and Waverly streets, with a large number of 19th Century residences located there. These are joined, however, by buildings from the 1920s as well as a substantial number of homes from the immediate post-World War II era.

[1] The physical relationship between the college, the town, and surrounding farmland is outlined in Mary K. Assad, *Baldwin-Wallace College,* 2008, Arcadia Publishing Company. The third economic engine in the area, the Berea Quarries, is chronicled in Mickey Sego, *Then There Was None: A History of the Berea Sandstone Quarries*, Berea Area Historical Society, 1996.

[2] The general history of Berea is documented in Patricia M. Mote, *Berea: Images of America*, 2004, part of Arcadia Press Images of America series.

One thing common to nearly every home within the APE is that most have been extensively modified. The degree and nature of the modifications are consistent, regardless of the era in which the home was originally constructed. Almost every home has been fitted with vinyl siding and vinyl windows. A substantial number of homes also have additions, usually in the form of an attached garage or an infill porch area.

Seventy-four buildings within the APE were constructed before 1960. An inventory and evaluation document of the 74 properties is included as Attachment 2 to this report. The dates of construction documented in County records appear to be increasingly reliable for the newer properties. A 1955 date of construction, for example, was likely established based upon actual building permits. An 1855 date of construction, however, is far more likely to be an estimate, possibly due to the passage of time, destruction of records, and/or absence of building permits in early years. The records for the Berea area appear to be based on informed estimates, resulting in a reasonably reliable group of estimated dates of construction for the buildings within the APE.

Of the 74 buildings within the APE, three appear to be eligible for listing in the National Register of Historic Places. These properties are illustrated and discussed below.

Figure 2. House at 244 Eastland Road

The Berea Area Historical Society describes this property as a "Victorian style farm house," which, according to the Historical Society and the County Auditor, was built in 1875. It is an intact example of a 19th Century Victorian home with Eastlake influences, eligible for the National Register under Criterion C[3].

[3] Criterion (c) covers properties that embody distinctive characteristics of a type, period or method of construction, or high artistic value. (36 CFR 800 Section 800.4(c): Identification of Historic Properties).

Figure 3. House at 120 Eastland Road

The Berea Area Historical Society describes this property as a "Craftsman influence home" that is quite intact. The home qualifies for the National Register under Criterion C as a good example of an early 20th Century home with Craftsman influences.

Figure 4. House at 227 Eastland Road

This property is a remarkably intact Craftsman home and qualifies for the National Register under Criterion C for its architecture.

Application of the Criteria of Adverse Effect, Finding of Effect

The Section 106 process involves a series of steps: establishing the APE; identifying and evaluating resources; applying the Criteria of Adverse Effect and making a finding of effect; and, if necessary, developing potential mitigation strategies. Based on the foregoing, there are three eligible properties within the APE for this Undertaking: the houses at 120, 227, and 244 Eastland Road. Therefore, a determination of whether the project would result in an adverse effect on any or all of these historic properties is necessary.

The regulations of the Advisory Council on Historic Preservation define an adverse effect as follows: "An adverse effect is found when an undertaking may alter, directly or indirectly, any of the characteristics of a historic property that qualify the property for inclusion in the National Register in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association" (36 CFR 800.5 (a) (1).

The Advisory Council's regulations also provide examples of adverse effects. These include the following:

> (i) Physical destruction of or damage to all or part of the property;
>
> (ii) Alteration of a property, including restoration, rehabilitation, repair, maintenance, stabilization, hazardous material remediation, and provision of handicapped access, that is not consistent with the Secretary's standards for the treatment of historic properties (36 CFR part 68) and applicable guidelines;
>
> (iii) Removal of the property from its historic location;
>
> (iv) Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance;
>
> (v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features;
>
> (vi) Neglect of a property which causes its deterioration, except where such neglect and deterioration are recognized qualities of a property of religious and cultural significance to an Indian tribe or Native Hawaiian organization; and
>
> (vii) Transfer, lease, or sale of property out of Federal ownership or control without adequate and legally enforceable restrictions or conditions to ensure long-term preservation of the property's historic significance (36 CFR 800.5 (a) (2).

These examples cover nearly every type of adverse effect imaginable. Of these, few are pertinent to the potential impact of the Undertaking on the three eligible properties within the APE. Any potential effect of the Undertaking on historic properties would most likely fall under example v. Therefore, the remainder of this discussion addresses the introduction of visual, atmospheric, or audible elements that diminish the integrity of the property's significant historic features.

Introduction of audible elements that diminish the integrity of the property's significant features

DOE reviewed the noise impacts from the proposed project in detail for impacts to all potential receptors, including the three National Register-eligible properties. That analysis concludes that the ambient noise levels in the vicinity of the proposed turbine site is relatively high, reflecting the urban nature of neighborhood, particularly its proximity to busy streets to the north and heavily used medical centers to the east. Based on 24-hour ambient noise readings conducted in October 2010, ambient noise levels at the nearest receptors range from 58 to 62 A-weighted decibels (dBA) during the daytime and 47 to 49 dBA during the nighttime. The U.S. Environmental Protection Agency has determined that an increase in ambient or average noise levels of 5 dBA would be noticeable to most people. An increase of 20 dB likely would result in vigorous community response; increases of less than 3 dBA are generally considered unnoticeable. The turbine would result in ambient noise level increases of less than 1 dBA at all receptors. Relying on that analysis, DOE concluded that the Undertaking would have no adverse effects from the introduction of audible (noise) elements.

Introduction of visual effect from shadow flicker

Shadow flicker is a potential impact that is unique to wind turbines and refers to a flickering shadow caused by the turning rotor. The Renaissance Group (TRG) conducted a visual analysis for the proposed project (Attachment 11 to the October 26, 2010, Section 106 submission), using established modeling tools to determine where shadow flicker would occur. In the figure below, the area inside the blue outline represents the area with the lowest threshold for impacts. The three National Register-eligible properties are located outside of this outline; therefore DOE concluded that the proposed project would have no adverse effects from shadow flicker.

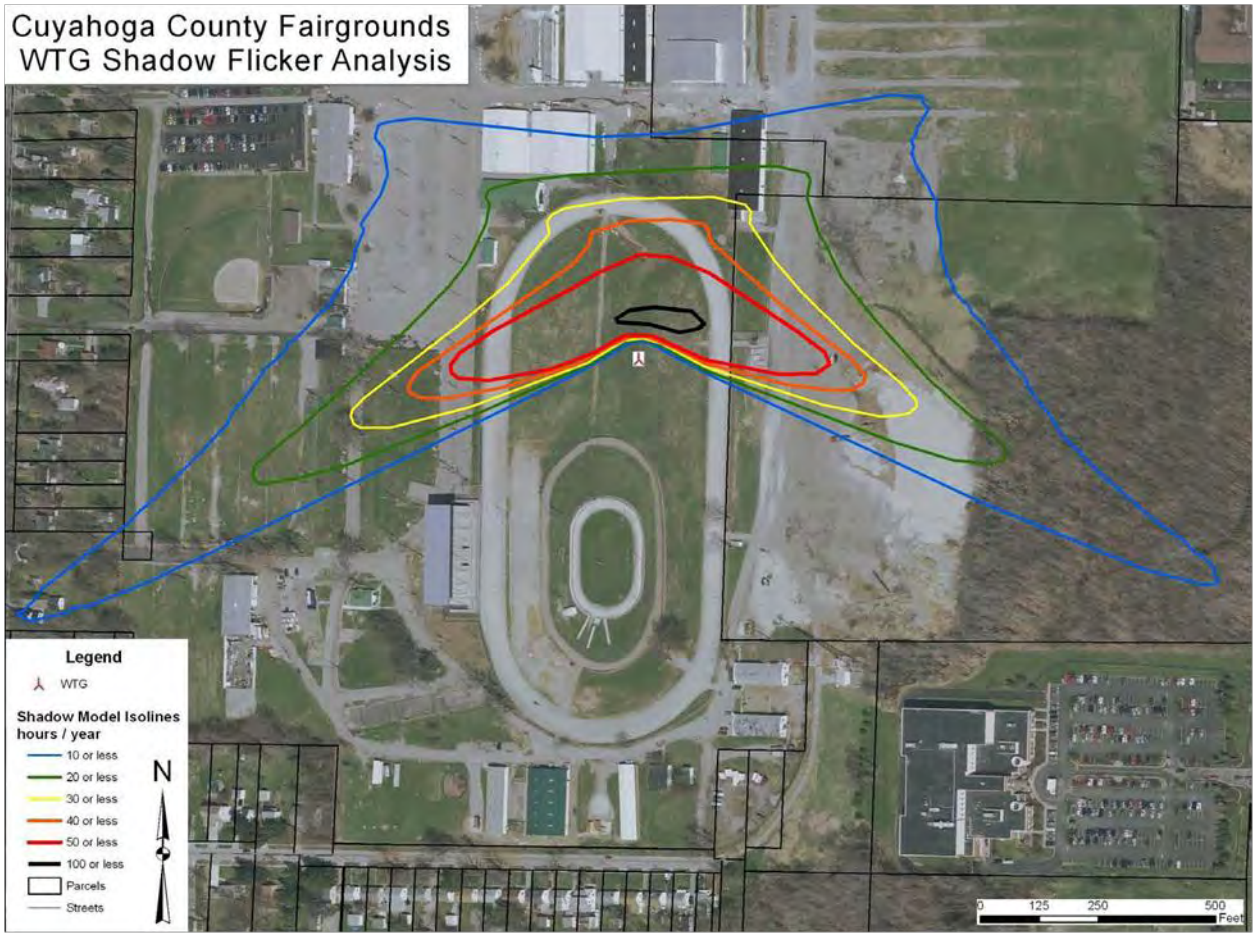

Figure 5. Cuyahoga County Fairgrounds Shadow Flicker Analysis

Introduction of visual effects from visibility of the turbine and rotor

TRG conducted several rounds of visual impact analyses, relying on photo simulations and formulas to determine sightlines from various data points. As part of the field inspection conducted in January 2011, TRG prepared additional simulations to refine the APE to ensure the eligible properties were included and to account for wintering trees.

The following two photo simulations show how the turbine might look in relation to the historic properties along Eastland Road. The first view was taken from a secondary entrance to the Cuyahoga County Fairgrounds, located near 211 Eastland Road. This location along the northern part of Eastland Road, a short distance from the properties at 227 and 244 Eastland and has the most potential to see the turbine.

Figure 6. Photo simulation number 1: entrance to the Fairgrounds

The second view is of the main entrance to the Fairgrounds. This is the general location of the property at 120 Eastland Road, which is barely visible on the left of this panorama (to the south of the entrance).

Figure 7. Photo simulation number 2: view of 120 Eastland Road

To test the impact of the turbine on individual properties, TRG conducted an in-depth simulation of one property, 244 Eastland Road. This simulation must be considered the worst-case scenario, in that the deciduous trees are entirely bare, allowing the maximum visual opportunity. In the summertime, the house itself is nearly hidden by the dense urban forest around it. The simulation found that while the turbine would not be visible during summertime, a small tip of an upright rotor would be visible during wintertime. In addition, this view specifically shows the one angle in which any part of the rotor would be visible. As can be seen in the simulation photos below (Figures 8 and 9), which are aimed directly at the property, no part of the rotor blade shows.

Figure 8. Photo simulation number 4: 244 Eastland side view

Figure 9. Photo simulation number 5: 244 Eastland front view

The streetscape of Eastland Road includes buildings from nearly every decade from the 1870s to the 1970s. It is an attractive suburban landscape but is not an intact historic district. Two of the three eligible homes (120 and 244) face the Fairgrounds and have done so for more than a century. The three homes are eligible for listing in the National Register of Historic Places, and the presence of the proposed turbine at the Fairgrounds would not diminish the qualities that make the properties eligible. The turbine and rotor would not be visible during summertime and would scarcely be visible during wintertime; the Energy Center would not be visible at all. Therefore, the visual impact should not be considered a presence so pronounced that it would "diminish the integrity of the property's significant historic features" for any of the three homes.

Considering the setting, the qualities of the individual properties, and the minimal visual impact of the turbine and rotors, DOE concluded that the Undertaking would have no adverse effects on the three National Register-eligible properties within the APE.

Conclusions

Based on the visual analysis prepared for the proposed project and the site inspections conducted, DOE has determined that the APE is defined as the area bounded by University Street, Eastland Road, Waverly Street, and Old Oak Roads in Berea. Within this APE there are 74 properties 50 years or older, of which three qualify for listing in the National Register of Historic Places; and the proposed project (Undertaking) would not result in an adverse effect to any of the three National Register-eligible properties. Because an onsite archaeological survey was not feasible due to a deep snow cover at the site, Cuyahoga County Agricultural Society has committed to providing an onsite, registered archaeologist to monitor ground disturbance during excavation activities for the turbine and related facilities. If archaeological resources were identified, all ground-disturbing activities would be halted and OHPO would be consulted for resolution and development of a treatment plan.

Supplemental Section 106 Compliance Report for the Cuyahoga County Agricultural Society Wind Energy Project:

Attachment 1 Inventory and Evaluation of Cuyahoga County Fairgrounds

Berea, Cuyahoga County, Ohio

January 24, 2011
Prepared for: U.S. Department of Energy
Prepared by: Stephen D. Mikesell, ICF International

The Cuyahoga County Fairgrounds are situated in the community of Berea in Cuyahoga County, Ohio, east of Cleveland a short distance south from the Cleveland Hopkins Airport. It comprises a complex of 33 buildings in a parcel of 117 acres. The county fair began in 1893 on a much smaller parcel and has been an annual event, except for a brief shut-down during World War II. The existing building stock and landscape elements of the fairground were constructed over a very long period of time, with one dating to the decade of the 1900s, five from the 1910s, one from the 1940s, five from the 1950s, six from the 1960s, five from the 1970s, two from the 1980s, and seven from the 2000s. The list of fairground buildings may is reproduced as **Figure 1: "Cuyahoga County Fairgrounds – Berea, Ohio, Revised 5/17/2010."**

The operation of the fairground may be inferred from the types of buildings there. For example, Buildings 6A, 6B, 8, 10, 12, 14, 21, 23, and 39 are all used to house or show animals. Building 30 is used to show produce, Building 29 is used for "home and hobby," Building 33 for floral works, and Buildings 15 and 20 for general exhibitions. The remaining buildings are support structures: maintenance, security, comfort stations, offices, and so forth. The Cuyahoga County Fairgrounds, in other words, operates today and likely has operated form more than a century as a place where local animal owners and crafts persons can show and compete in shows for their work. In that sense, it operates in the manner of thousands of county fairgrounds throughout the United States.

It will be observed from Figure 1 that essentially all of the larger buildings were constructed after 1961 (the 50-year cut off commonly used to evaluate properties for eligibility for listing in the National Register, unless those properties can be shown to be exceptionally significant.) Using 10,000 square feet to distinguish large from smaller buildings, Building 1 (720,000 sf) was built in 1981; Building 6B 11,200 sf) in 1962-5; Building 14 (10,400 sf) in 2006; Building 16 (11,720 sf) in 1959; Building 20 (15,360 sf) in 1975); Building 21 (53,100 sf) in 1958; Building 23 (26,450 sf) in 2000; Building 23 (11,050 sf) in 1917; Building 29 (10,000 sf) in 1976; and Building 38 (12,000 sf) in 1965.

Stylistically, the buildings may be seen as falling into three categories: the oldest buildings, all constructed in 1917 and made of stone; buildings from the 1950s and 1960s, large wooden buildings that resemble World War II temporary structures; and very recent buildings.

It appears that in about 1917, a complex of fairground building was constructed using chiseled stone masonry, likely using the sandstone for which the Berea Quarry was famous. There are only four building that continue to exemplify that style: Building 27, the Arts and Crafts building, which was built in 1917, Building 28, a Comfort Station and ATM station, also building in 1917; and two horse stables. These are shown below.

Building 28, comfort station and ATM machine

Building 27, Arts and Crafts

There are two additional building from this era, both horse barns (Buildings 10 and 11) that have the same design and the same date of construction; these are shown below.

The only other structure from this early period is the Eastland Road Arch, which does not have a building number but which dates to 1929. The picture below shows the arch in place from a main entrance from

Eastland Road. Since this photograph was taken, however, the arch has been dismantled and stored, awaiting fundraising to pay for its rehabilitation and re-installation.

The buildings from the 1950s are wooden and utilitarian in design, as with the 1958 “Cow Palace” (Building 21) and Building 29, Home & Hobby.

Attachment 1: Inventory and Evaluation of the Cuyahoga County Fairgrounds

Another typical building from recent decades is Building 38, which was built in 1965.

The most prominent element of the Fairground property is the racetrack and pavilion. The racetrack has been in place in some form since the early years of the fair. The Pavilions, shown below, were built in 2003.

Evaluation of National Register Eligibility

The Cuyahoga County Fairgrounds does not appear to be eligible for listing in the National Register of Historic Places because it is not significant architecturally or historically, and because it lacks integrity to any specific period of significance.

The county fair is a distinctively American institution and property type. A variety of recent studies have analyzed the county fair as an institution. These general studies tend to focus on the activities that occur at county fairs and on the temporary architecture of fair operations, principally the carnival operations that move from one county fair to the next.

It does not appear that there has been a systematic study of permanent county fair architecture. A search of the National Register database revealed that only a small number of county fairgrounds in the Nation have been listed in the National Register. The State of Mississippi has listed the Neshoba County Fair Historic District and the State of Kansas has listed one building – a 1923 octagonal barn – at the Pottawatomie County Fair Grounds. In Ohio, two buildings from the Geauga County Fairgrounds, both dating to the 19th century, are listed in the National Register. Beyond these, it appears that a relatively small number of county fair properties have been listed in or determined eligible for listing in the National Register of Historic Places.

Because the Cuyahoga County Fair is operationally a single unit, it is best evaluated as a single entity. In the language of the National Register program, the group of buildings at the fairgrounds is best evaluated as a potential historic district, unless it appears one or more of the buildings might be seen as eligible on an individual basis.

In terms of individual eligibility, only the four 1917 properties would appear to have any potential for National Register listing. These do not appear to be significant, whether considered in the general context of fairground buildings or in the highly localized context of construction with Berea's local sandstone.

Analyzed within the historic district context, the Cuyahoga County Fairgrounds does not constitute "a significant concentration, linkage, or continuity of buildings united historically or aesthetically by plan or physical development "[the definition of a historic district in National Register guidelines.] The buildings are united by plan in that they fit into the general scheme of fair operations and historically in that they were all built to support fair operations. Beyond these considerations, however, the structures within the fair grounds are not united architecturally or historically, in the sense that they were built over many decades. Taken as a whole, the buildings within the Cuyahoga County Fairground property represent an assemblage of related properties, but that assemblage is not significant, whether considered from the historical or architectural perspectives. For these reasons the properties at the Cuyahoga County Fairgrounds do not qualify for listing in the National Register, individually or as a group.

Supplemental Section 106 Compliance Report for the Cuyahoga County Agricultural Society Wind Energy Project:

Attachment 2: Inventory and Evaluation of 74 Buildings within the APE for the Cuyahoga County Agricultural Society Wind Turbine Project

Berea, Cuyahoga County, Ohio

January 24, 2011
Prepared for: U.S. Department of Energy
Prepared by: Stephen D. Mikesell, ICF International

298 Waverly Street.

This is a two-story woodframe home with one-story wings at either side. It was built in 1883, according to County Auditor records. The home is sided in vinyl siding and all but one of the original wooden windows have been replaced with vinyl windows. It is a "Plaqued Century Home," carried on a list maintained by the Berea Area Historical Society.

This home does not appear to meet the criteria for listing in the National Register of Historic Places because it lacks integrity of design, materials, workmanship, feeling and association. The installation of vinyl siding and windows detracts so significantly from the original appearance of the home that it no longer reads as a product of 19th century construction.

320 Waverly Street.

County Auditor records indicate this home was built in 1949. The building, however, appears to have been built in very recent years. It is possible that a 1949 building exists beneath new siding, windows, and other parts of a recent remodel. More likely, however, the home was constructed in recent years and that record has not made its way to publicly available records.

The home at 320 Waverly does not appear to qualify for listing in the National Register of Historic Places because it is effectively much less than 50 years old and is not exceptionally significant.

326 Waverly Street.

The home at 326 Waverly Street is a gable front and wing home, built in 1888 according to County Auditor records. There is a large garage and living quarters wing to the left of the two-story front gabled element; this garage is almost certainly an addition, and disrupts one's appreciation of the original form of the house. The building is sided in vinyl siding and has vinyl windows throughout.

The house at 326 Waverly does not appear to qualify for listing in the National Register of Historic Places because it lacks integrity of design, materials, workmanship, feeling, and association. The installation of vinyl siding and windows, coupled with the construction of a large addition have so compromised the appearance of this building that it no longer retains the qualities that might qualify it for listing in the National Register.

244 Eastland Road.

The house at 244 Eastland Road is a rambling vernacular style home, with Eastlake influences. The home was built in 1875 according to County Auditor records and the records of the Berea Area Historical Society. It is a complex structure with a dominant side gable with a prominent front gabled dormer atop the entry and a long saltbox form to the rear.

Whether considered as a Folk Victorian or an Eastlake (the home was likely not architect design, making Folk Victorian a better classification), this home is a distinctive and extraordinarily well-preserved example of late 19th century domestic architecture in rural Ohio. Research in local historical society records yielded no information on the occupants or builders of this home, so no case is made for National Register eligibility under Criteria A or B. Under Criterion C, however, it is a distinguished and intact example of late 19th century designs, likely for a prosperous local farm family. The home appears to qualify for National Register listing under Criterion C.

312 Eastland Road.

The house at 312 Eastland Road was constructed in 1893, according to County Auditor's records. As originally built, it was likely a two-story wood frame home with a front and side porch. At some point in recent decades, the porches were enclosed and the entire home was re-sided with Type T-111 plywood siding. At the same time, all windows were replaced with vinyl windows – double hung in the original building and horizontal sliders in the enclosed porch area.

The home at 312 Eastland Road does not appear to qualify for listing in the National Register because it lacks integrity of design, materials, workmanship, feeling, and association. The installation of vinyl siding and windows, coupled with the enclosure of the front and side porches have so compromised the appearance of this building that it no longer retains the qualities that might qualify it for listing in the National Register.

270 University Street.

The house at 270 University Street is a two story wood frame residence with one story wings at the rear and right side. The house has been designated as a "Plaqued Century Home" by the Berea Area Historical Society. The siding on the home appears to be a narrow vinyl material. All windows that are visible are vinyl; a prominent window at the second story façade has been blocked off.

The house at 270 University Street does not appear to qualify for listing in the National Register because it lacks integrity of design, materials, workmanship, feeling, and association. The installation of vinyl siding and windows has so compromised the appearance of this building that it no longer retains the qualities that might qualify it for listing in the National Register.

341 University Street.

The house at 341 University Street was built in 1951, according to County Auditor records. It is a simple rectangular plan. Stylistically, it is of a type called Minimal Traditional by some architectural historians. It also bears some resemblance to the Cape Cod tract home, which was briefly popular in the 1930-1950 era in America, particularly East of the Mississippi. The roof is side-gabled with a small gabled roof form over the picture window, rather than over the doorway. The unbalanced placement of the gable is also used on several post-World War II buildings on Waverly, suggesting the same builder or developer may have constructed houses on both streets.

This post-World War II home is largely intact except for the replacement of its original windows with vinyl windows. It does not appear to be an important example of the postwar tract home, whether considered in the Minimal Traditional or Cape Code context. Lacking significance and having marginal integrity, the building does not appear to be National Register eligible.

335 University Street

The house at 335 University Street was built in 1948, according to County Auditor records. It is a Minimal Traditional home with a dominant side gable roof, with a series of front gabled ells, including a garage. There is also a large two-story element rising from the rear of the building, almost certainly an addition. The home is sided in vinyl siding and includes all new vinyl windows.

This home is so extensively modified that it lacks integrity of design, materials, workmanship, feeling, and association. Because it lacks integrity to its original Minimal Traditional style, the home does not appear to be National Register eligible.

333 University Street.

Like several other 1940s homes within the APE, the house at 333 University Street is a Minimal Traditional home with characteristics of the Cape Cod home. The home was built in 1941, according to County Auditor records. It is sided in vinyl siding and has vinyl windows. A detached garage has been sided in similar material.

This modest Minimal Traditional home would likely not be National Register eligible in its original condition. Because it has also been extensively modified, it does not appear to meet the criteria for listing in the National Register.

321 University Street.

The house at 321 University Street was built in 1949, according to County Auditor records. It is a Minimal Traditional style home with front- and side-gabled elements. The home is sided in vinyl siding. The windows appear to be a mix of original wood sash and vinyl replacements. The three-part picture window right of the front entry appears to be original, as does the first story window to the left of the entry. All other visible windows appear to be vinyl replacements.

The house at 321 University Street does not appear to be eligible for listing in the National Register because it is not a distinguished example of post-war tract housing and it has only marginal integrity.

305 University Street.

The house at 305 University Street was built in 1853, according to County Auditor records; the older the building, however, the more likely that the auditor date is an estimate, not a documented date of construction. This is a two-story home, sided in vinyl siding and fitted with vinyl windows. There is a front porch that links with a one-story ell, not shown in the photograph below. A two-car garage exists near the rear of the parcel.

This home does not appear to be National Register eligible. It is likely a 19th century building but does not appear to be as old as suggested by the County Auditor. Because it has been extensively modified, the home does not appear to meet the criteria for listing in the National Register.

295 University Street.

County auditor records indicate the house at 295 University Street was built in 1900. It is a gable front and wing home, a recurring vernacular form found throughout the APE. There is a porch connecting the two-story gable front and one-story wing elements, supported on metal posts. The home has vinyl siding and vinyl windows.

The home does not appear to meet the criteria for listing in the National Register because it has been extensively modified and does not retain integrity of design, materials, workmanship, feeling, or association. Although clearly a very old home, the property does not retain sufficient integrity to be considered for National Register eligibility.

285 University Street.

The house at 285 University Street is a gable front and wing vernacular form. According to County Auditor records, the home was built in 1853, although the earlier the date of construction the more likely it is that the date is an estimate, not a documented fact. The windows on the home are a combination of vinyl window and wood sash behind storm windows. The siding is a wide single, possibly wooden or possibly an asbestos shingle. The eaves of the roof have been boxed with vinyl. There is a shed-roofed addition to the rear of the home.

The house at 285 University Street does not appear to meet criteria for listing in the National Register. Clearly, it is a very old home and retains its original geometry as well as some original material. Although it retains more original material than most of the homes in the APE, it does not retain sufficient integrity to be considered an important example of this vernacular form.

276 University Street.

The house at 276 University Street was built in 1955. It is a one-story brick building with a gabled dormer, which may or may not be original to the home. This 1955 home is best considered a Minimal Traditional style residence. The dormer is sided in vinyl and all visible windows are also vinyl.

This 1955 home does not appear to qualify for National Register listing because it is not an important example of its style and because it retains only marginal integrity.

267 University Street.

The house at 267 University Street is a split-level Ranch home, built in 1960. The siding is vinyl except for brick around the garage. All visible windows appear to be vinyl replacements.

This home does not appear to meet the criteria for listing in the National Register. It is not an important example of a very common post-war residential type and retains only marginal integrity.

94 Eastland Road.

The house at 94 Eastland Road was built in 1931, according to County Auditor records. The home has a most unusual roof form. The offset first and second stories have side gables. But there is a large, steeply pitched gabled dormer over the entrance. The home is sided in vinyl siding and fitted with vinyl windows except in the arched opening in the dormer, which appears to be an original window. Bothe the second story and steep dormer may be additions.

This home does not appear to qualify for listing in the National Register. The architecture is interesting but not significant and the integrity of design, materials, and workmanship is low.

105 Eastland Road.

The house at 105 Eastland Road was built in 1941, according to County Auditor records. It is possible that it was originally a one-story Minimal Traditional home in the manner of nearly every other home in the area from the 1940s but was expanded to a two-story appearance at a later date. The home is sided in vinyl and has horizontal sliding windows.

The home at 105 Eastland Road does not appear to meet the criteria for listing in the National Register because it has been extensively modified and does not retain sufficient integrity to warrant consideration for eligibility.

102 Eastland Road.

The house at 102 Eastland Road is a one- and one-half story brick building. It includes a complex roof form, including a series of front-gabled elements and a flat-roofed ell at the right of the façade. A small deck has been added atop the flat roof. All visible windows have been replaced with vinyl windows. According to County Auditor records, the home was built in 1937.

The house does not appear to qualify for listing in the National Register. Although a handsome home, it is not a significant example of this variation on Period Revival homes, which was briefly popular during the 1930s.

107 Eastland Road.

The home at 107 Eastland Road is a small Minimal Traditional residence that was built in 1940. The house is sided in vinyl siding and has vinyl windows. An awkward front porch and deck were added in recent years.

This home does not appear to qualify for listing in the National Register because it is not a significant example of its style and because it lack integrity.

112-114 Eastland Road.

The property at 112-114 Eastland Road is a two-story brick building that was constructed in 1931. The right half of the duplex is faced in brick on both levels. The left portion is brick on the first level and vinyl sided at the second level. The duplex features vinyl windows on both sides.

The duplex does not appear to qualify for listing in the National Register of Historic Places. It does not appear to represent an important example of early 1930s architecture and has marginal integrity.

115 Eastland Road.

The house at 115 Eastland Road is a Minimal Traditional with Cape Cod influences, built in 1940 according to County Auditor records. The one-story side-gabled residence has vinyl siding and windows.

The house 115 Eastland does not appear to meet the criteria for listing in the National Register. It is not a significant example of its type or style has no known associations with persons or events important to our history and has only marginal integrity.

120 Eastland Road.

The house at 120 Eastland Road is a two-story home built in 1928, according to County Auditor records. The home exhibits elements of Craftsman design, somewhat unusual for Cuyahoga County and an unusually late example, if the 1928 date of construction is accurate. The home appears to be largely intact. It rests on a brick foundation and is sided in what appears to be wood shingles. The paired one-over-one double hung windows appear to be original. A broad Craftsman style porch covers most of the first story façade. The roof form is an unusual dormer on gable, with double-breaking gabled forms.

The home at 120 Eastland Road may qualify for listing in the National Register and should be assumed to be National Register eligible for the purpose of this project. It is largely intact and is a handsome and unusual example of its style.

121 Eastland Road.

The house at 121 Eastland Road is a Minimal Traditional home with Cape Cod characteristics, built in 1940 according to County Auditor records. It is sided in vinyl siding. Its metal casement windows appear to be original.

The home at 121 Eastland Road does not appear to be National Register eligible. It is not a significant example of its style and retains modest integrity.

126-128 Eastland Road.

There are two residences at this parcel: 126 Eastland is a two-story home illustrated below; 128 is a "granny flat" near the rear of the parcel. County Auditor records indicate the house at 126 Eastland was built in 1936 but it was likely built at a much earlier date. It is a two-story residence with a front-gabled roof and a broad front porch. It is sided in vinyl siding and its windows are vinyl.

The home does not appear to meet National Register criteria because it has been substantially modified. It also may have been moved; incorrect auditor dates often reflect a date of moving, not a date of construction. In either case, this home does not appear to be National Register eligible.

160 Eastland Road.

The house at 160 Eastland Road is a two story wood frame residence with a front facing gabled roof. It includes one story wings to either side of the main two story element. The building is sided in vinyl siding and features vinyl windows at every location visible from the street.

The home at 160 Eastland Road does not appear to be National Register eligible because it does not retain sufficient integrity of design, materials, workmanship, feeling, and association.

166 Eastland Road.

The home at 166 Eastland Road is a one and one-half story residence, built in 1946. It is a Minimal Traditional home with Cape Cod influences. It is sided in vinyl siding and includes vinyl windows at every location visible from the street.

The home at 166 Eastland does not appear to be National Register eligible because it is not a significant example of its type or style of construction, and because it lacks sufficient integrity to warrant consideration for listing in the National Register.

159 Eastland Road.

The house at 159 Eastland Road is a two-story home with a two-story garage addition to the left of the original element. The home was built in 1914 according to County Auditor records. It is sided in vinyl siding and has vinyl windows at every opening visible from the street.

The house at 159 Eastland Road does not appear to qualify for listing in the National Register because it has been modified extensively and does not retain integrity of design, materials, workmanship, feeling, or association.

170 Eastland Road.

The house at Eastland Road was built in 1948 according to County Auditor records; this date seems improbable but may relate to a date for relocation or substantial modification. In it current condition, the home has a variety of gabled forms in its one and two-story wings. It is sided in vinyl siding and has vinyl siding at every opening visible from the street, including one elaborate Palladian widow on the second story of the faced.

The home does not appear to qualify for the National Register because it lacks integrity of design, materials, workmanship, feeling, or association.

174 Eastland Road.

The house at 174 Eastland Road is a one and one-half story Cape Cod/ Minimal Traditional home that was built in 1946. It has been fitted with vinyl siding and vinyl windows, and features an oversized timber ramp and deck at the front entrance.

The home does not appear to be National Register eligible because it is not a significant example of its type or period of construction and because it lacks integrity.

178 Eastland Road.

The house at 178 Eastland is a one and one-half story Cape Cod/Minimal Traditional home, built in the late 1940s like its next door neighbor at 174 Eastland. It has been fitted with vinyl siding and vinyl windows in all openings visible from the street.

The home does not appear to be eligible for listing in the National Register because it is not a significant example of its type or period of construction and because it lacks integrity.

198 Eastland Road.

The house at 198 Eastland Road is a two-story wood frame home with attached ell to the right rear, which in turn connects to a large garage. According to the County Auditor, the home was built in 1856. Whether that date is completely accurate, it is clearly a very old home. A large porch that covers the front of the two story element and connects with the rear ell has been enclosed with glass and siding. The home is sided in vinyl siding and includes vinyl windows on all elevations visible from the street.

The home is an interesting piece of 19th century rural home design but does not appear to qualify for listing in the National Register because it has been too extensively modified, through the porch enclosure, vinyl siding and windows, and perhaps through construction of the ell at the right rear, which connects with the large outbuilding.

218 Eastland Road.

The house at 218 Eastland Road is a one and one-half story brick home, built in the 1940s. It features a gabled dormer over the central front entrance. The windows have been replaced in all elevations visible from the street.

This modest home does not appear to qualify for listing in the National Register because it is not a significant example of its type or period of construction.

220 Eastland Road.

The house at 200 Eastland Road was built in 1873 according to the County Auditor and the records of the Berea Area Historical Society. The historical society notes at least two major additions to the home, which likely consist of the addition to the rear (visible near the right edge of this photograph) and the one-story addition to the left of the main two-story element. The roof form is extremely complex, with a saltbox form to the rear, and two front gabled dormers, with the left dormer having a long sloping gable. The Berea Historical Society indicates the home has 14 rooms, seven of which are bedrooms, suggesting that it may have been used as a boarding house or as home to a very large family.

Although this home has been spared the vinyl siding and vinyl windows that were added to most buildings in the APE, it lacks architectural coherence due to numerous additions. It does not appear to qualify for listing in the National Register under Criterion C.

227 Eastland Road.

The house at 227 Eastland Road is a one and one-half story Craftsman home with a side-gabled roof and large gabled dormer centered on the façade. The most character-defining elements are banks of multi-light windows at the right of the porch and in the dormer. These windows are original, as is the shake siding and brick foundation.

The property is an excellent example of Craftsman design and should be considered eligible for listing in the National Register of Historic Places.

211 Eastland Road.

The house at 211Eastland Road was built in 1918, according to County Auditor records. It features a full width front porch and a central chimney. The home includes vinyl siding and vinyl windows in all openings visible from the street.

This home does not appear to qualify for listing in the National Register because it does not retain sufficient integrity to warrant consideration for listing.

221 Eastland Road.

The home at 221 Eastland Road is a two-story residence with a full-width front porch. It has been sided with vinyl siding and fitted with vinyl windows at every elevation visible from the street.

This home does not appear to meet the criteria for listing in the National Register because it has been modified so extensively that it does not retain integrity of design, materials, workmanship, feeling, or association.

224 Eastland Road.

The house at 224 Eastland Road is set back at the rear of a large parcel. County Auditor records indicate it was built in 1950, a date that is implausible. There may have been another home near the street that has since been removed. The home has two separate structural elements: a two story hip roofed element and another building which includes a two-car garage on the ground floor and a porch and room above the garage. The two are linked by a bridge roof that shelters stairs.

The structural history of this building is something of a mystery, given its date of construction in Auditor records and the somewhat improbable structural form. The building does not retain integrity to any era except the relatively modern period in which the garage and second story room were constructed. For that reason, it does not qualify for listing in the National Register.

255 Eastland Road.

The house at 225 Eastland Road is a 1200 square foot Cape Cod cottage, built in 1950. It features vinyl siding and vinyl windows on all visible elevations. The home does not appear to qualify for listing in the National Register because it is not an important example of its type or period of construction and because it retains a marginal degree of integrity.

236 Eastland Road.

According to County Auditor records, this home was built in 1853. Although that date cannot be independently verified, this clearly is a very old residence. It features a two story central core with a large shed-roofed addition to the right of the façade. It rests on what appears to be a stone masonry foundation. The building has been sided in vinyl and fitted with vinyl windows on all visible elevations.

The home, although a very old property, does not appear to retain sufficient integrity to warrant listing in the National Register of Historic Places.

250 Eastland Road.

The house at 250 Eastland is a small Minimal Traditional home that was built in 1948. It is set at the rear of a large parcel. It includes vinyl siding and large vinyl windows. The property does not appear to qualify for listing in the National Register because it is not an important example of its type and period of construction and because it has been modified extensively.

266 Eastland Road.

The home at 266 Eastland Road was built in 1853, according to County Auditor records. It is a gable front with a one-story wing building containing a porch enclosing the entry. The home has been fitted with vinyl siding and vinyl windows on all elevations visible from the street.

Although a very old home, the building at 266 Eastland Road does not appear to qualify for listing in the National Register because it has been extensively modified. As much as any building within the APE, this home illustrates the detrimental impact of new siding and windows on the historic integrity of these older homes.

268 Eastland Road.

This home was constructed in 1947 according to County Auditor records. It is one and one-half stories tall and includes an attached garage. It has been sided with narrow lap vinyl siding. The front windows have been replaced with vinyl but it appears that the windows on the right side are still the original 6 over 6 wooden sashes.

This 1947 residence does not appear to be National Register eligible because it is not a significant example of its type or period of construction and because it retains a modest degree of integrity.

274-300 Eastland Road.

On the east side of Eastland Road, there exist five essentially identical homes, built between 1949 and 1951. The five differ as to finish (brick or other siding) and the placement of the front gabled elements on a dominant side gabled roof form. In all cases the windows have been replaced.

274 Eastland Road.

280 Eastland Road.

292 Eastland Road.

296 Eastland Road.

300 Eastland Road.

These properties do not appear to qualify for listing in the National Register of Historic Places, individually or as a group. They are not important examples of their type and they have little integrity to their original design.

312 Eastland Road.

According to County Auditor records, this home was built in 1893. It has been substantially altered, however, in recent decades. A front porch was enclosed and it appears a large one-story addition was constructed at the rear. The entire building was re-sided in Type T-111 siding and fitted with aluminum or vinyl windows. Although the core of the building may be very old, this property does not qualify for listing in the National Register because it has been so extensively altered.

352-428 Waverly Street.

These sixteen homes represent a small subdivision of Minimal Traditional/Cape Cod homes. All built in 1947. The homes are essentially all the same, with minor variations having to do with placement of dormers and other small details. All but one are side gabled; only the home at 428 Waverly is front gabled. Each has an area of about 1200 square feet, except for the few that have been substantially enlarged. The buildings have also been modified in much the same way, except as noted for the few that have been enlarged a great deal. All now have vinyl siding and vinyl windows.

The cluster of homes does not appear to qualify for listing in the National Register, individually or as a group. The Minimal Traditional/Cape Cod appearance is common throughout the APE and throughout much of Berea. The homes are not distinguished architecturally as examples of post-war tract home construction. In addition, all of the homes have been modified to one degree or another, to an extent that the homes do not retain sufficient integrity to warrant listing, individually or as a small historic district.

428 Waverly Street.

422 Waverly Street.

416 Waverly Street.

412 Waverly Street.

406 Waverly Street.

402 Waverly Street.

396 Waverly Street.

392 Waverly Street.

386 Waverly Street.

382 Waverly Street.

376 Waverly Street.

372 Waverly Street.

366 Waverly Street.

360 Waverly Street.

356 Waverly Street.

352 Waverly Street.

340 Waverly Street.

The house at 340 Waverly Street was built in 1903, according to County Auditor records. The house has a multiplicity of roof forms, suggesting additions over time. Especially notable are shed-roofed elements to the rear and right side. The home is sided in vinyl siding and includes a variety of vinyl windows: a fixed picture window at the façade, several horizontal sliders, and a tall one-over-one at the second story.

This homes does not appear to qualify for listing in the National Register because it has been extensively modified through installation of vinyl siding and windows and probably major additions.

327 Waverly Street.

County Auditor records indicate this home was built in 1913. It is a boxy form, sometimes called a Foursquare. The home has been re-sided in vinyl and all windows visible from the street have been replaced with vinyl as well.

This home does not appear to qualify for listing in the National Register of Historic Places because it has been so extensively modified that it does not retain integrity.

321 Waverly Street.

The house at 321 Waverly was built in 1931, according to County records. It is a Minimal Traditional home with a side-gabled roof and a canted bay window. It is sided in vinyl siding and includes vinyl windows on all elevations visible from the street. The home does not appear to meet the criteria for listing in the National Register because it is not an important example of its type and because it retains marginal integrity.

308 Waverly Street.

This home was built in 1923 according to county records. The Craftsman-style home rests on a stone foundation and includes stone bases for the columns at the porch. It features a side-gabled roof with a dominant gabled dormer, centered on the façade. The home is sided in vinyl siding. It does retain a few original windows, including the four Craftsman-style windows to the left of the entry.

Although it retains some of its original elements, the Craftsman home illustrates the destructive effect of vinyl elements, particularly in a building for which the presence of wooden elements is so character-defining. It lacks sufficient integrity to warrant listing in the National Register.

299 Waverly Street.

This gable front with wing home was built in 1888 according to County Auditor records. While the essential form of the building is intact, it has been re-sided with vinyl siding and features vinyl windows on all elevations visible from the street. Generally, the property does not appear to retain sufficient integrity to warrant National Register listing.

300 Waverly Street.

The house at 300 Waverly Street is a Minimal Traditional home, built in the early 1940s. The home is sided in vinyl siding and features vinyl windows on all visible elevations. It does not appear to qualify for National Register listing because it is not an important example of its type and because it has marginal integrity.

285 Waverly Street.

This is a Craftsman-influenced home, built in 1919. The essential form of the building is largely intact. The building has been res-sided in vinyl, however, and all windows visible from the street have been replaced. Although it retains some of its original elements, the Craftsman home illustrates the destructive effect of vinyl elements, particularly in a building for which the presence of wooden elements is so character-defining. It lacks sufficient integrity to warrant listing in the National Register.

290 Waverly Street.

County Auditor records indicate this home was built in 1955. It is possible that the 1955 home is the first story of this building. It is also possible that this is an entirely new building for which County Auditor records have not been updated. In either case, the building "reads" as a home from the 21st century and could not qualify as an example of homes from the middle of the last century.

December 10, 2010

Ms. Melissa Rossiter
NEPA Document Manager
U.S. Department of Energy
1617 Cole Boulevard
Golden, CO 80401

Re: Cuyahoga County Agricultural Society Wind Turbine Project (DOE/EA-1815)
164 Eastland Road, Berea, Cuyahoga County, Ohio

Dear Ms. Rossiter,

This is in response to correspondence from your office dated October 29, 2010 (received November 2) regarding the above referenced project. The comments of the Ohio Historic Preservation Office (OHPO) are submitted in accordance with provisions of the National Historic Preservation Act of 1966, as amended (16 U.S.C. 470 [36 CFR 800]).

The undertaking involves the construction of a wind turbine to generate electrical power for the City of Euclid. The turbine hub height will be 197 feet above ground surface with blade tip maximum height at 274 feet above ground surface.

Further consultation is recommended for this undertaking. We disagree with the finding concerning archaeology and recommend an archaeological survey for all of the areas where ground disturbance is likely including contractor work space. The archaeological survey should also include the construction limits for the new energy building. Archaeological site 33-CU-377 is located about 0.5 miles west of the project area near the quarries. Because the Fairgrounds was not heavily developed there is a reasonable probability that archaeological deposits may have survived in places within the Fairgrounds with better preservation than found throughout much of Ohio.

Please provide an extended discussion of the effects of the project. We do not understand the basis for the findings that the project will not have adverse effects when effects are not discussed. We recommend that the discussion of effects provide a scalable, measurable approach. That is, what are the effects at 0.25 miles, at 0.5 miles, at 0.75 miles, and at 1.0 miles?

Please re-shoot the photographs where a view of the turbine would be obscured by a building or tree by moving the camera 20' or 30' left or right to show a view towards the project looking past the building and through trees that no longer have leaves.

OHIO HISTORICAL SOCIETY
Ohio Historic Preservation Office
1982 Velma Avenue, Columbus, Ohio 43211-2497 ph: 614.298.2000 fx: 614.298.2037
www.ohiohistory.org

The Fairgrounds wasn't included in the evaluation of historic properties. Why not? There are places within the Fairgrounds that are steeped in history and readily recognizable as such. From the web page for the Fairgrounds, accessed November 30, 2010, here is one quote:

> As the automobile emerged in American life, thrill shows started to appear at the fair, with jalopies leaping over flaming bales of hay. The famous Eastland Road arch went up at the fairgrounds in 1929 as the stock market crashed.
> When people enter under that arch today, they find many of the same traditions of past fairs, from arts and crafts to farm produce; picnics and musicians; food and conversation; rides and grandstand thrill shows.

We recommend that you record the most recognizable and famous features at the Fairgrounds and prepare a detailed evaluation of the Fairgrounds within a thoughtful context of Ohio fairgrounds. Completing an Ohio Historic Inventory form would be a helpful starting point.

The documentation contains a long list of buildings. There is no analysis of their eligibility. The documentation does not present a survey strategy to identify historic properties either from within existing databases or from systematic efforts of current fieldwork. We recommend that you conduct a systematic analysis based on survey information from all buildings lining the residential blocks within four blocks of the project. That is, within roughly one or two blocks west and south of the Fairgrounds. Use of the table options contained with the Project Summary Form is recommended.

In a hurried scan of the information in the documentation submitted October 29, 2010, we initiated an analysis of data on buildings along the east side of Eastland Road from roughly Bagley Street south to Waverly Street, along University Street on the block east of Eastland, and along Waverly Street along the block east of Eastland. We used the parcel mapping from Appendix D, correlated with data provided in Appendix L. The data come from the County Auditor's web site. We specifically noted data in the field titled "Age" which provides a first approximation of the date of construction. We then searched for photographs or other information specific to the Map ID field number in other parts of the documentation. Within 1 block of the proposed turbine location, from this analysis we identified 7 (seven) properties that are listed as built in the nineteenth century. Three of these were built prior to the Civil War. We were not able to find photographs for any of these properties. We were not able to find information describing these properties. We were not able to find any analysis providing a basis for the application of National Register of Historic Places criteria. We were not able to find that the National Register criteria were applied. These appear to represent some of the earliest construction in this part of Cuyahoga County.

Map ID	Age	Photograph or other Information
1676	1875	No
4804	1876	No
370	1853	No
3132	1853	No
2523	1873	No
4065	1856	No
1176	1888	No

The data from our hurried scan also shows that there is a neighborhood immediately south of the Fairgrounds along Waverly Street with at least 11 consecutive houses built in 1947. It seems likely that this is related to the post World War II housing construction boom. What is the specific story of this neighborhood? Was there an architectural plan or architect? Was this a designed neighborhood? It would be helpful to provide analysis of this neighborhood including an evaluation of National Register eligibility. We recommend that the analysis should incorporate principles for evaluating the recent past presented in the "Ohio Modern: Preserving Our Recent Past, Statewide Historic Context" prepared for the Ohio Historic Preservation Office, 2010.

Our preliminary analysis that we initiate here is of data in the correspondence for buildings within one or two blocks of the project area. We recommend that additional documentation is needed that provides analysis of survey data of architectural properties. The first priority should be the analysis of data needed to apply National Register criteria and criteria of effect for all buildings and structures within 4 blocks of the project. We also recommend that additional documentation is needed to provide analysis of information on built resources extending from this inner core area throughout the Area of Potential Effects. We suggest that the selection of properties to include in the analysis at increasing distance should be increasingly focused. You may wish to consult with this office concerning survey strategy and analytical framework at increasing distance.

There are historic properties in the Area of Potential Effects. It is our opinion that there will be effects from this undertaking. The most direct approach to deal with effects of an undertaking is to deal with the effects of the undertaking. We are unable to understand the basis of your finding that there will be no adverse effects and we are unable to concur with the finding that there will be no adverse effects. You may wish to redirect your efforts to accepting that there will be effects and finding ways to resolve the potential for adverse effects through consultation.

In summary, we will wait for receipt of the completed archaeological survey report and completed reports containing analysis of architecture-history survey data before providing further comments.

Any questions concerning this matter should be addressed to David Snyder at (614) 298-2000, between the hours of 8 am. to 5 pm. Thank you for your cooperation.

Sincerely,

David Snyder

David Snyder, Ph.D., RPA, Archaeology Reviews Manager
Resource Protection and Review

DMS/ds (OHPO Project Number 2010-CUY-11607; Serial Number 1032381)