APPENDIX D:

SUPPORTING DOCUMENTATION

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

August 19, 2010

SUBJECT: Notice of Scoping – A-SEP-61 – 600 to 750 kW Single Wind Turbine: *Arch bold Area Local School Wind Energy Project*, Fulton County, Archbold, Ohio

The U.S. Department of Energy (DOE) is proposing to provide federal funding to the Archbold School District to construct and operate a 600 to 750kW wind turbine in Fulton County, Ohio. The proposed project would construct and operate a wind turbine located on the Archbold School District property within the town of Archbold. 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:

- Identify 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-term 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

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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 and minimize environmental impacts. Reasonable alternatives are those that may be feasibly carried out based on environmental, technical, and economic factors.

As part of the EA, 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

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 9, 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

Archbold School District Wind Turbine

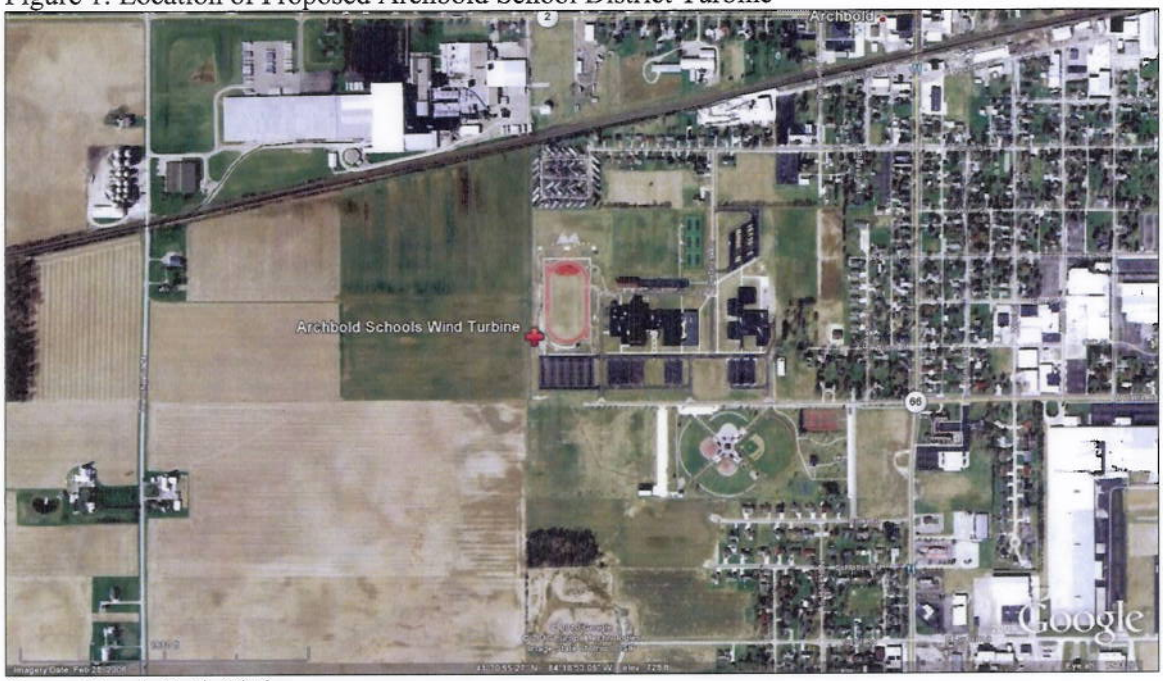
The U.S. Department of Energy is proposing to provide up to $750,000 to the Archbold School District for construction and operation of a 600 to 750 kW single wind turbine. The School District proposes to design, permit, construct, operate and maintain the 600 to 750 kW wind turbine located at 600 Lafayette Street, Archbold, Ohio (see Figure 1).

Latitude: 41-30-54.65N NAD 83
Longitude: 84-18-57.24W

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 600 to 750 kW new turbine on a 60 to 75 meter tower
- Associated generator and below ground collector cables
- Underground transmission lines and connection to the Archbold School District internal energy distribution system

Figure 1. Location of Proposed Archbold School District Turbine



Source: Google Earth, 2010.

Archbold Public Involvement

The Archbold Area Schools has provided opportunities for public involvement since November 21, 2010 in an attempt to educate the public about this project and provide an opportunity for public comment.

Media Coverage:

Archbold Buckeye – July 28, 2010 - School Board Okays Wind Turbine Action
Crescent News - July 21, 2010 - Archbold board approves resolution for wind turbines
Archbold Buckeye – June 16, 2010 - Archbold School Board Looking Into Wind Turbine Financing Options
Crescent News - June 15, 2010 - Archbold board approves resolution for wind turbine project
Archbold Buckeye – April 14, 2010 - Call For New Study Delays Wind Turbines
Archbold Buckeye – March 17, 2010 - No New Developments On Wind Turbine Project
Archbold Buckeye – March 10, 2010 - Wind Turbine Funding Unclear
Crescent News - February 17, 2010 - Archbold updated on turbine project
Archbold Buckeye – February 17, 2010 - Wind Project Up In The Air, Deskins Says
Archbold Buckeye – February 10, 2010 - Distrust Of Deskins Why?
Archbold Buckeye – February 3, 2010 - School Board Okays Wind Consultant Deal
Archbold Buckeye – January 27, 2010 - WEB EXTRA
Archbold Buckeye – December 30, 2009 - Reap The Wind
Archbold Buckeye – December 23, 2009 - Borrow $400,000 For School Wind Turbine?
Crescent News - December 7, 2009 - Archbold, Pettisville land $1.5M grant
Archbold Buckeye – December 2, 2009 - Wind Power Money Comes To Archbold, Pettisville Schools
Archbold Buckeye – November 18, 2009 - School Board Hears About Success Day
Archbold Buckeye – September 2, 2009 - Preliminary Wind Data Promising
Archbold Buckeye – May 20, 2009 - Archbold Wind Study Continues; Fayette May Put Turbine Up First
Archbold Buckeye – January 21, 2009 - Wind Tower Data Promising: Deskins
Archbold Buckeye – August 13, 2008 - Archbold Isn't The Only School Studying Wind Energy Benefits
Archbold Buckeye – June 4, 2008 - Council Grants Permit For Wind Test Tower
Archbold Buckeye – June 4, 2008 - School Districts To Split Capital Budget Cash
Archbold Buckeye – June 25, 2008 - Wind Test Tower Stands Tall
Archbold Buckeye – April 23, 2008 - Wind Turbine Could Be In Line For State Capital Budget Funds Archbold Buckeye – April 16, 2008 - BREAKING NEWS
Archbold Buckeye – April 2, 2008 - Wind Test Tower Passes Hurdle
Archbold Buckeye – March 5, 2008 - Planning Commission Approves Requests From Jim King, School Board
Archbold Buckeye – March 5, 2008 - CORRECTION
Archbold Buckeye – February 20, 2008 - Wind Power Talks Exciting
Archbold Buckeye – February 13, 2008 - School May Get Wind Study Tower
Archbold Buckeye – December 5, 2007 - Archbold Wind Study Reduces Electricity Bills
Archbold Buckeye – November 21, 2007 - Archbold Schools Wind Team Still Studies Issue

In addition, the following agencies and organizations have been contacted by the Archbold Area Schools 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 (ODNROhio Department of Transportation Office of Aviation
- Ohio Department of Development Energy Resources Division
- Archbold Village Board of Zoning
- German Township Board of Zoning

AERONAUTICA 54-750

When Megawatt-Class Turbines Are Just Too Big

These workhorses provide plenty of power for schools, industrial parks, shopping centers, neighborhood net-metering, Green Communities, wind parks and more!

- **3/4 Megawatt (750kW) design - for Class III winds**
- **Low profile: less than 270' tall on a 55m tower**
- **Active Stall Regulation (ASR) allows blades to be optimized for both low and high wind conditions**
- **Dual-wound 200/750 kW Generator**

Located in an IEC Class III wind area? *Aeronautica Windpower* is proud to introduce the 54-750: a Queen-size machine designed with a larger rotor for 'distributed wind' applications at lower wind sites. Many good wind sites just cannot accommodate huge, utility-scale turbines. A large number of sites, especially populated areas, are better suited to a smaller size machine. The 54-750 is the perfect fit.

More easily permitted, erected, and financed than its larger brothers, the 54-750 is a great choice for municipal projects, commercial/industrial sites, college or high school campuses, and other places where 'behind the meter', or net-metered power can be utilized.

With its low profile, ultra-low noise signature, and highly efficient output, the 54-750 provides the perfect balance between economic output and acceptable size. And *Aeronautica* wind turbines are *all manufactured in the United States*, reducing shipping costs and delivery times.

Fast Facts:

Orientation: *Upwind*	Rotor Diameter: *54m*
Rotor Speed: *~25.3RPM*	Active-Stall Regulated
Hub Height: *65 or 55m*	Blades: *Fiber Reinforced Polyester*

American Energy from America's Hometown

AERONAUTICA Windpower

Plymouth, MA **1-800-360-0132** www.AeronauticaWind.com

54-750 kW System Specifications:

Blades
3 blades, upwind orientation
Fiberglass reinforced polyester

Rotor

Power regulation:	Active Stall Regulation (ASR).
Rotor size:	54m diameter (177') (std—other configs. avail.)
Rotor speed:	25.3 rpm nominal
Swept area:	2,289 m^2
Tilt angle:	4°
Coning angle:	3.0° forward.
Tip speed:	62 – 63 m/s at full load.
Pitch angle:	Active Stall Regulation
Pitch bearings:	4-point ball bearings.
Air brake, normal:	Pitch to -20°, actuated by the Active Stall Regulation system.
Air brake, emergency:	Pitch to -85° fail safe, activated by accumulators in hub.
Nominal pitch speed:	7.5 °/sec
Mechanical brake:	A fail-safe type disk brake.
Brake torque:	1.8 times of nominal torque (approx).
RPM max. value:	1920 (60 Hz), 1600 (50 Hz), on the high-speed shaft.

Generator

Nom. Electric Power:	200/750 kW (dual wound)
Generator:	Closed, Synchronous induction, 4/6 pole DW, IP54 or 55.
Generator speed:	1200/1800 (60 Hz) or 1000/1500 (50 Hz) rpm synchronous
Loss in generator:	3 - 4 % at nominal power dependent on type
Generator cut-in:	Thyristor controlled gradual cut-in
Grid connection:	60 Hz – 690V or 50 Hz – 690V

Operational:

Yaw motors:	4 pcs. w/electrical brakes built in
Yaw brakes:	4 pcs. disk hydraulic brakes
Yaw bearing:	4-point ball bearing
Cut-in wind speed:	3-4 m/s, based on 10 min average
Cut-out wind speed:	25 m/s, based on 2 min average
Controller:	CC–Electronic (Mitsubishi PLC)
Noise:	100 dBA Sound Power (at Nacelle)

Monopole Tower
Conical Steel, White, 65m and 50m towers available
Nacelle access: interior tower ladder through locked door

Weights:

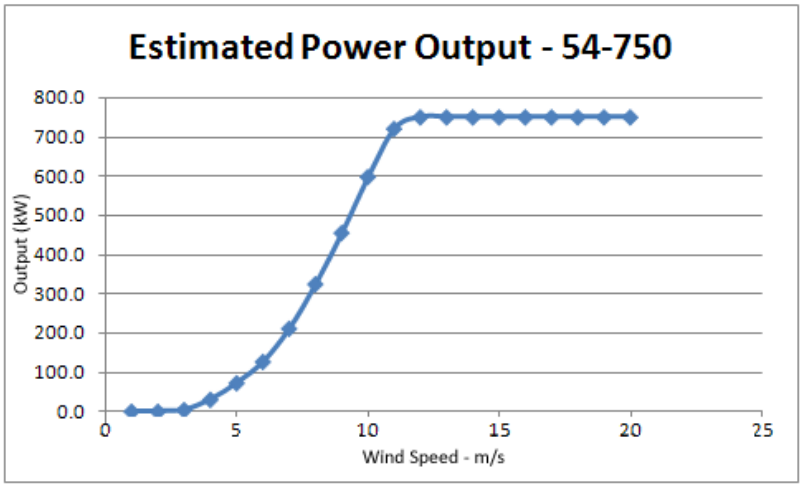
Mass of blades: (3):	Approx. 16,000 lbs (7,200 kg)
Mass of nacelle:	Approx. 48,400 lbs (22.000 kg)
Mass of hub:	Approx. 17,600 lbs (8.000 kg)
Mass total, excl tower:	Approx. 81,200 lbs (36.909 kg)

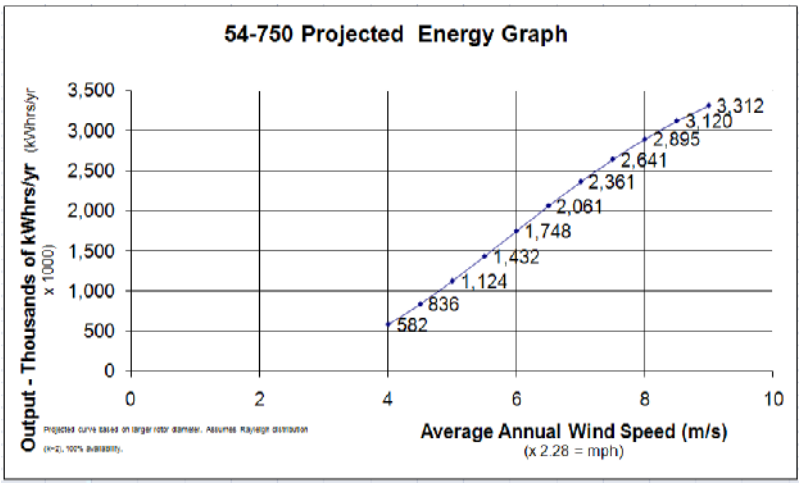
Certification: Variant of our 47-750 turbine, which is design Certified by DNV for IEC 61400 Ed. 3 Class IB and IIA

Safety Issues
Induction generator has inherent anti-islanding
Fail-safe hydraulic disk brake
Grid monitoring for shutdown and operational performance
Shipping: All Prices are FOB our plant

Warranty: Standard warranty is for two years on the drive train and on all major parts. Extended warranties are available.

Installation: Aeronautica Windpower, LLC is only a supplier of equipment. We can, however, refer you to local installers or dealers for a complete installation.
Service Agreements: Annual Service Contracts are strongly advised and are available from local dealers and installers.

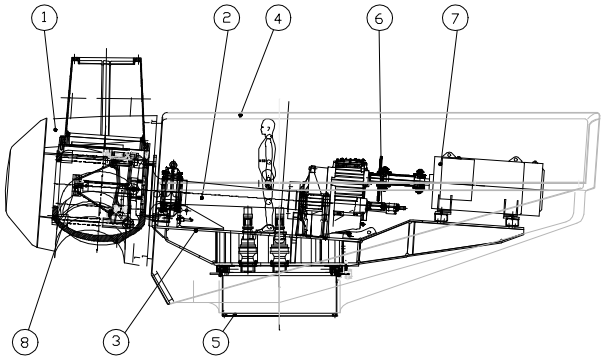




The Power and Energy Curves shown are estimated for a 750kW turbine, with a 54m rotor, double wound generator, and Active Stall Regulation. The power curve is valid for 1.225kg/m3 air density, clean blades and undisturbed horizontal air flow. For the Energy Graph, a Rayleigh wind speed distribution and 100% availability is assumed.

Power Curve Table

m/s	kW
1	0.0
2	0.0
3	4.0
4	30.4
5	72.6
6	126.7
7	211.2
8	324.7
9	455.4
10	598.0
11	720.7
12	750.0
13	750.0
14	750.0
15	750.0
16	750.0
17	750.0
18	750.0
19	750.0
20	750.0



1. Rotor System 2. Transmission 3. Yaw System and Mainframe 4. Nacelle Cover 5. Tower 6. Hydraulic Station (not shown) 7. Generator 8. Pitch system

AERONAUTICA Windpower
11 Resnik Road, Plymouth, MA 02360
1-800-360-0132 www.AeronauticaWind.com

Technical note

NOISE EMISSION FROM NORWIN-47-ASR-600 / 750 kW

Summary:

The noise emission at the reference wind speed 8 m/s, 10 m above ground, expressed as the A-weighted sound level in dB re. 1 pW, ($L_{WA,ref}$), is 100.00 dB. The relation between the noise emission and the wind speed is +0.3 dB pr. m/s.

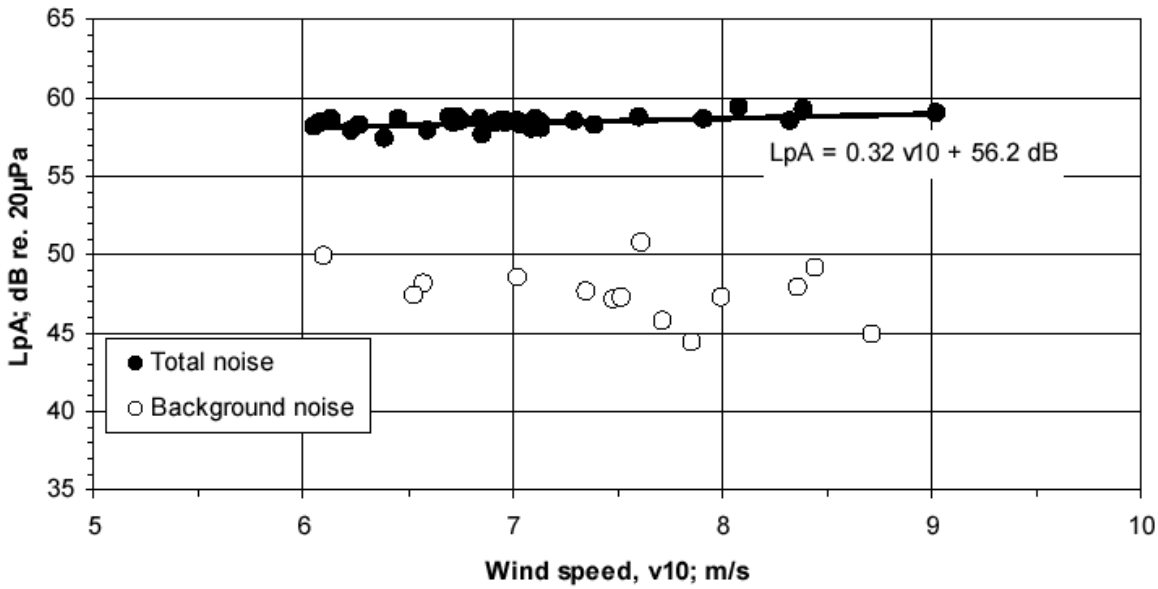
Measuring setup and method:

The noise emission is measured in compliance to the guidelines given in regulation no. 304/1991, *Bekendtgørelse om støj fra vindmøller*, published by the Danish Environmental Agency. The noise is measured with a microphone placed on the ground (acoustically reflecting plate 1.5 x 2.0 m^2), 50 m down-wind from the turbine. The noise is measured with and without the wind turbine operating, to establish the signal to noise relation.

The wind speed is measured with a cup-anemometer placed 10 m above ground, 50 m up-wind from the turbine.

Noise emission curves:

Figure 1.: A-weighted sound pressure level on the ground 50 m down-wind from the turbine.



There are no clearly audible tones present in the noise.

Figure 2.: The A-weighted sound pressure level, Lpa in dB re 20 µPa, 1.5 m above ground, calculated as function of the distance from the wind turbine, according to DEA regulation no. 304/1991

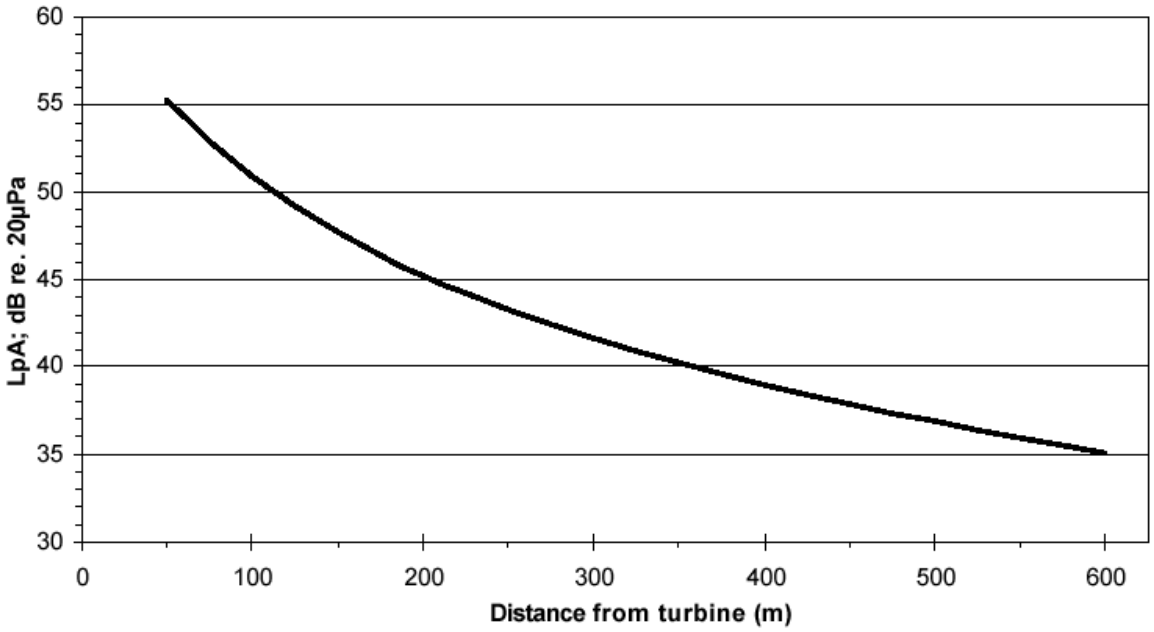


Figure 3.: From calculations the following key values have been extracted:

L_{pA}; dB re 20 µPa	Distance, m
35	607
40	359
45	206

Archbold 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 14'.)

Aeronautica Turbine Supply , 11 Resnik Rd, Plymouth, MA 02360

1.	Head **east** on **Resnik Rd** toward **Scobee Cir** About 1 min	go 0.4 mi total 0.4 mi
2.	Continue onto **Christa McAuliffe Blvd**	go 0.1 mi total 0.5 mi
3.	Turn **right** at **Commerce Way** About 2 mins	go 0.6 mi total 1.1 mi
4.	Turn **left** to merge onto **US-44 W** About 17 mins	go 14.0 mi total 15.2 mi
5.	At the traffic circle, continue straight to stay on **US-44 W** About 1 min	go 0.2 mi total 15.4 mi
6.	Merge onto **I-495 N** via the ramp to **MA-24/Marlboro/Boston** About 40 mins	go 43.0 mi total 58.4 mi
7.	Take exit **22** for **I-90** toward **Mass/Pike/Boston/Albany Ny** Toll road About 1 min	go 0.6 mi total 58.9 mi
8.	Keep **left** at the fork, follow signs for **I-90 W/Springfield/Albany** and merge onto **I-90 W** Partial toll road About 29 mins	go 27.7 mi total 86.6 mi
9.	Take exit **9** to merge onto **I-84 W** toward **US-20/Hartford/New York City** Partial toll road Passing through Connecticut, New York Entering Pennsylvania About 3 hours 53 mins	go 231 mi total 318 mi
10.	Take the exit on the **left** onto **I-81 S** toward **Wilkes-Barre** About 34 mins	go 36.3 mi total 354 mi
11.	Take exit **151B** to merge onto **I-80 W** toward **Bloomsburg** Entering Ohio About 4 hours 15 mins	go 277 mi total 631 mi
12.	Take the exit onto **I-80 W** Partial toll road About 2 hours 50 mins	go 184 mi total 814 mi
13.	Take exit **34** for **OH-108** Toll road About 2 mins	go 0.8 mi total 815 mi
14.	Turn **left** at **OH-108 S** About 2 mins	go 1.3 mi total 816 mi
15.	Turn **right** at **US-20 Alt W** About 10 mins	go 8.2 mi total 825 mi
16.	Turn **left** at **OH-66 S** About 8 mins	go 4.0 mi total 829 mi
17.	Turn **right** at **Lafayette St** About 1 min	go 0.4 mi total 829 mi

Turbine Installation Site, Archbold Schools, Lafayette Street, Archbold, Ohio

All other materials and equipment will likely be transported from within the State of Ohio and follow a similar route off of Route 80.

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.

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.

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,

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.

Wind Resource Report, Site Wind Characteristics

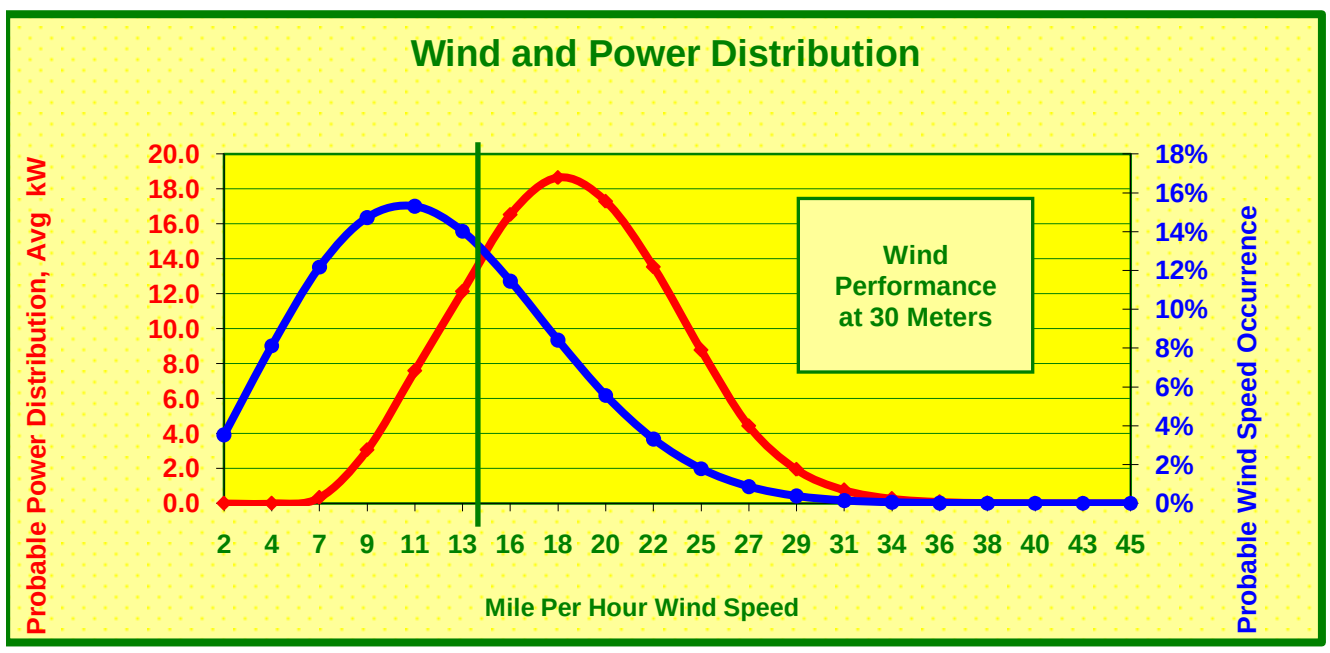
Archbold High School Site

Turbine Model Used For Estimates: Aeronautica / Norwin 54-750
Meter Description: High School 1

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	*0.0*	0.00	3.53%	0.000		
2	4.47	*0.0*	0.00	8.12%	0.000		
3	6.71	*4.0*	2.74	12.17%	0.333		
4	8.95	*30.4*	20.79	14.73%	3.061	79.3%	37.6%
5	11.18	*72.6*	49.64	15.30%	7.596		
6	13.42	*126.7*	86.64	14.01%	12.141		
7	15.66	*211.2*	144.42	11.45%	16.541		
8	17.90	*324.7*	222.03	8.41%	18.663		
9	20.13	*455.4*	311.41	5.56%	17.302		
10	22.37	*598.0*	408.92	3.31%	13.546	20.3%	61.3%
11	24.61	*720.7*	492.82	1.78%	8.782		
12	26.84	*750.0*	512.85	0.86%	4.434		
13	29.08	*750.0*	512.85	0.38%	1.940		
14	31.32	*750.0*	512.85	0.15%	0.764		
15	33.55	*750.0*	512.85	0.05%	0.271		
16	35.79	*750.0*	512.85	0.02%	0.086		
17	38.03	*750.0*	512.85	0.00%	0.025	0.2%	1.1%
18	40.26	*750.0*	512.85	0.00%	0.006		
19	42.50	*750.0*	512.85	0.00%	0.001		
20	44.74	*750.0*	512.85	0.00%	0.000		
			Totals:	99.84%	105.493	99.8%	100.0%

12.24	Site Average Wind Speed (MPH) at 30 Meters



Wind Resource Report, Site Wind Characteristics

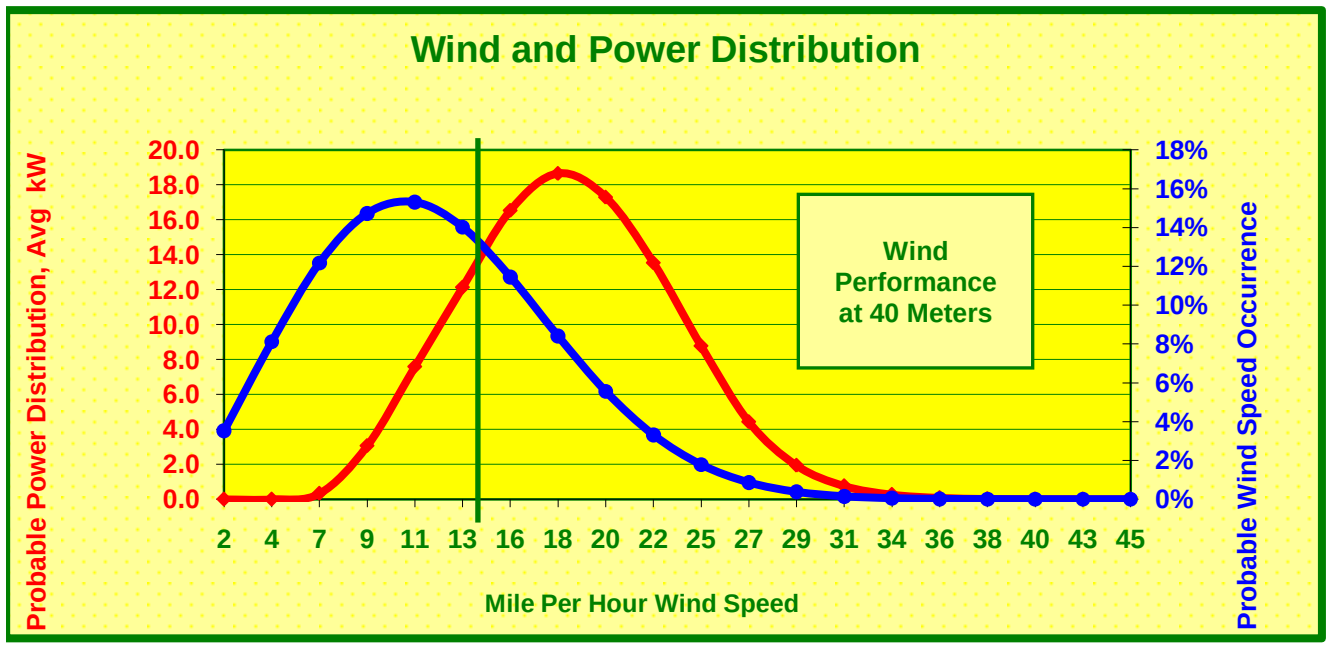
Archbold High School Site

Turbine Model Used For Estimates: Aeronautica / Norwin 54-750
Meter Description: High School 1

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	*0.0*	0.00	2.89%	0.000	72.3%	29.4%
2	4.47	*0.0*	0.00	6.71%	0.000		
3	6.71	*4.0*	2.83	10.29%	0.291		
4	8.95	*30.4*	21.51	12.86%	2.767		
5	11.18	*72.6*	51.37	14.00%	7.190		
6	13.42	*126.7*	89.65	13.61%	12.199		
7	15.66	*211.2*	149.44	11.98%	17.896		
8	17.90	*324.7*	229.75	9.61%	22.072	26.8%	67.9%
9	20.13	*455.4*	322.22	7.05%	22.719		
10	22.37	*598.0*	423.12	4.74%	20.069		
11	24.61	*720.7*	509.94	2.93%	14.926		
12	26.84	*750.0*	530.67	1.66%	8.796		
13	29.08	*750.0*	530.67	0.86%	4.569		
14	31.32	*750.0*	530.67	0.41%	2.177	0.7%	2.7%
15	33.55	*750.0*	530.67	0.18%	0.950		
16	35.79	*750.0*	530.67	0.07%	0.380		
17	38.03	*750.0*	530.67	0.03%	0.139		
18	40.26	*750.0*	530.67	0.01%	0.046		
19	42.50	*750.0*	530.67	0.00%	0.014		
20	44.74	*750.0*	530.67	0.00%	0.004		
			Totals	99.87%	137.203	99.9%	100.0%

13.38	Site Average Wind Speed (MPH) at 40 Meters



Wind Resource Report, Site Wind Characteristics

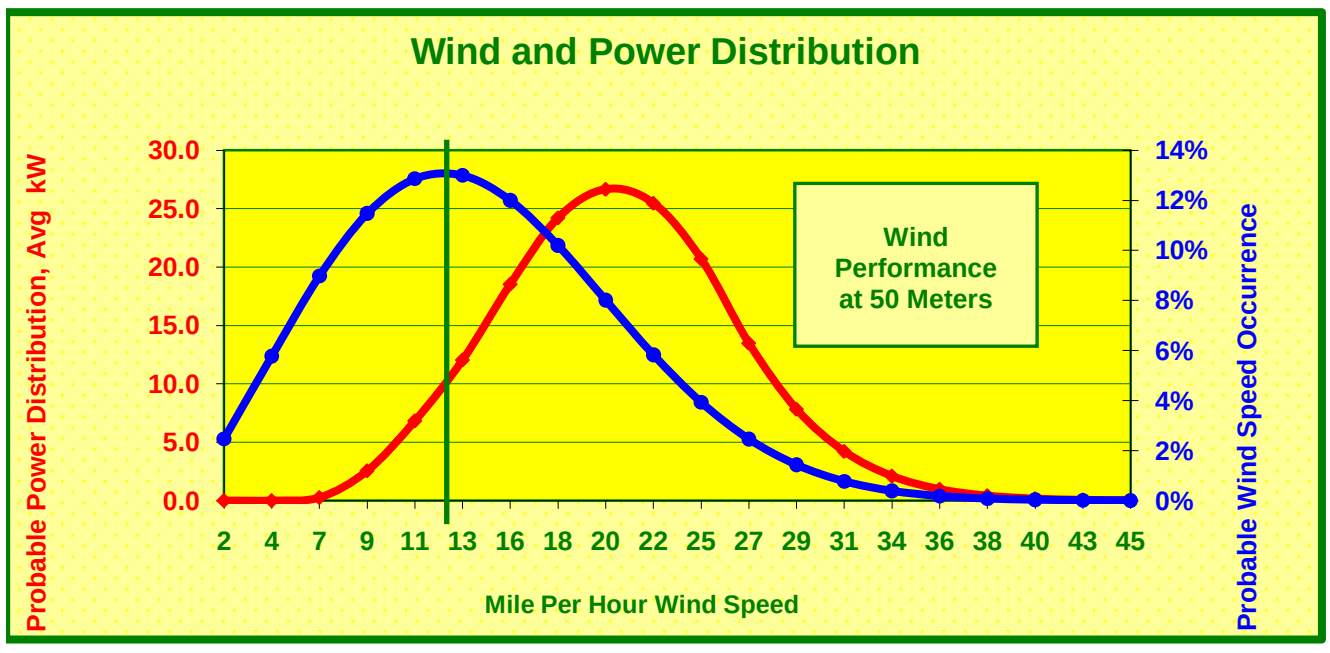
Archbold High School Site

Turbine Model Used For Estimates: Aeronautica / Norwin 54-750
Meter Description: High School 1

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*	0.00	2.47%	0.000	66.6%	24.2%
2	4.47	*0*	0.00	5.78%	0.000		
3	6.71	*4*	2.93	8.98%	0.263		
4	8.95	*30.4*	22.23	11.48%	2.552		
5	11.18	*72.6*	53.09	12.87%	6.832		
6	13.42	*126.7*	92.65	13.00%	12.047		
7	15.66	*211.2*	154.44	12.00%	18.541		
8	17.90	*324.7*	237.44	10.20%	24.221	31.9%	71.1%
9	20.13	*455.4*	333.02	8.01%	26.676		
10	22.37	*598*	437.30	5.83%	25.477		
11	24.61	*720.7*	527.03	3.93%	20.708		
12	26.84	*750*	548.45	2.46%	13.484		
13	29.08	*750*	548.45	1.43%	7.828		
14	31.32	*750*	548.45	0.77%	4.216	1.5%	4.8%
15	33.55	*750*	548.45	0.38%	2.105		
16	35.79	*750*	548.45	0.18%	0.974		
17	38.03	*750*	548.45	0.08%	0.418		
18	40.26	*750*	548.45	0.03%	0.166		
19	42.50	*750*	548.45	0.01%	0.061		
20	44.74	*750*	548.45	0.00%	0.021		
			Totals	99.89%	166.589	99.9%	100.0%

14.34	Site Average Wind Speed (MPH) at 50 Meters



Wind Resource Report, Site Wind Characteristics

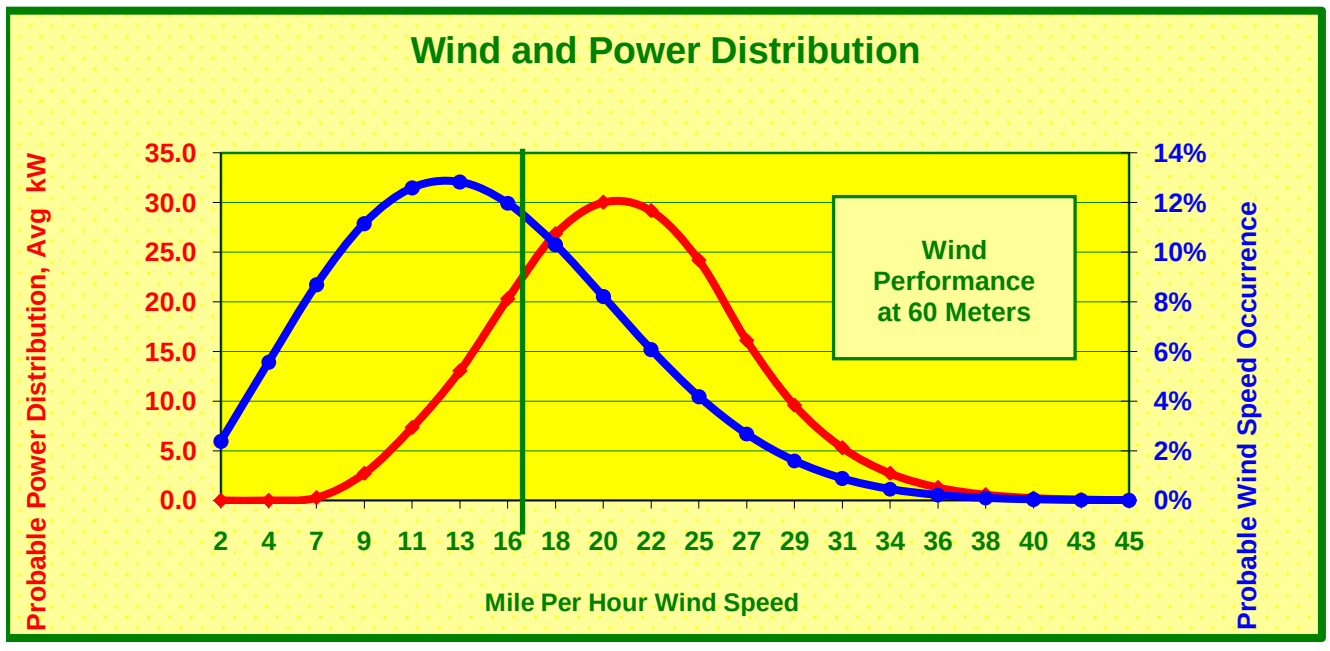
Archbold High School Site

Turbine Model Used For Estimates: Aeronautica / Norwin 54-750
Meter Description: High School 1

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	2.42%	0.000	65.8%	23.5%
2	4.47	*0.00*	0.00	5.66%	0.000		
3	6.71	*4.00*	3.02	8.82%	0.266		
4	8.95	*30.40*	22.95	11.30%	2.594		
5	11.18	*72.60*	54.81	12.71%	6.968		
6	13.42	*126.70*	95.65	12.91%	12.346		
7	15.66	*211.20*	159.44	11.99%	19.111		
8	17.90	*324.70*	245.13	10.26%	25.142	32.5%	71.4%
9	20.13	*455.40*	343.80	8.12%	27.918		
10	22.37	*598.00*	451.45	5.96%	26.918		
11	24.61	*720.70*	544.08	4.06%	22.116		
12	26.84	*750.00*	566.20	2.57%	14.577		
13	29.08	*750.00*	566.20	1.51%	8.578		
14	31.32	*750.00*	566.20	0.83%	4.689	1.6%	5.1%
15	33.55	*750.00*	566.20	0.42%	2.380		
16	35.79	*750.00*	566.20	0.20%	1.121		
17	38.03	*750.00*	566.20	0.09%	0.490		
18	40.26	*750.00*	566.20	0.04%	0.199		
19	42.50	*750.00*	566.20	0.01%	0.074		
20	44.74	*750.00*	566.20	0.00%	0.026		
			Totals:	99.89%	175.514	99.9%	100.0%

14.47	Site Average Wind Speed (MPH) at 60 Meters



Wind Resource Report, Site Wind Characteristics

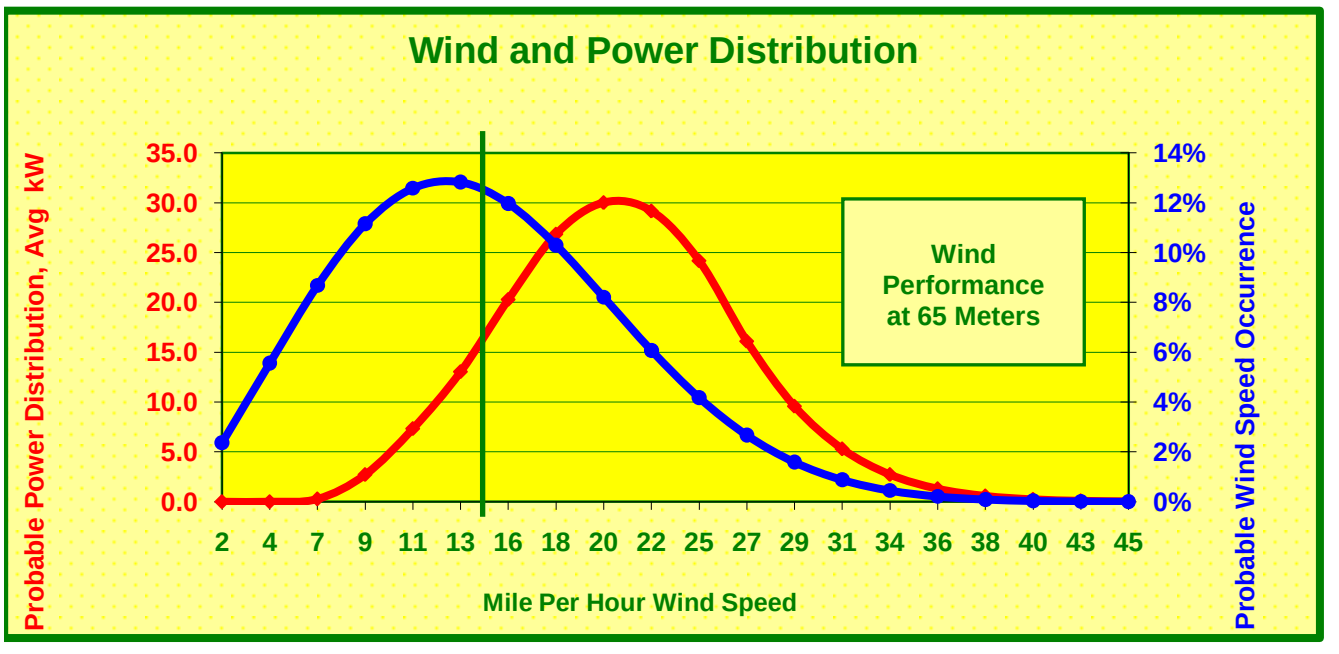
Archbold High School Site

Turbine Model Used For Estimates: Aeronautica / Norwin 54-750
Meter Description: High School 1

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*	0.00	2.39%	0.000	65.5%	23.3%
2	4.47	*0*	0.00	5.61%	0.000		
3	6.71	*4*	3.12	8.75%	0.273		
4	8.95	*30.4*	23.68	11.22%	2.658		
5	11.18	*72.6*	56.55	12.65%	7.151		
6	13.42	*126.7*	98.69	12.86%	12.696		
7	15.66	*211.2*	164.51	11.98%	19.702		
8	17.90	*324.7*	252.92	10.28%	25.998	32.8%	71.5%
9	20.13	*455.4*	354.72	8.17%	28.972		
10	22.37	*598*	465.80	6.02%	28.048		
11	24.61	*720.7*	561.37	4.12%	23.153		
12	26.84	*750*	584.19	2.63%	15.341		
13	29.08	*750*	584.19	1.55%	9.080		
14	31.32	*750*	584.19	0.86%	4.996	1.6%	5.3%
15	33.55	*750*	584.19	0.44%	2.554		
16	35.79	*750*	584.19	0.21%	1.213		
17	38.03	*750*	584.19	0.09%	0.534		
18	40.26	*750*	584.19	0.04%	0.218		
19	42.50	*750*	584.19	0.01%	0.083		
20	44.74	*750*	584.19	0.00%	0.029		
			Totals	99.89%	182.700	99.9%	100.0%

14.53	Site Average Wind Speed (MPH) at 65 Meters



Wind Resource Report, Site Wind Characteristics

Archbold High School Site

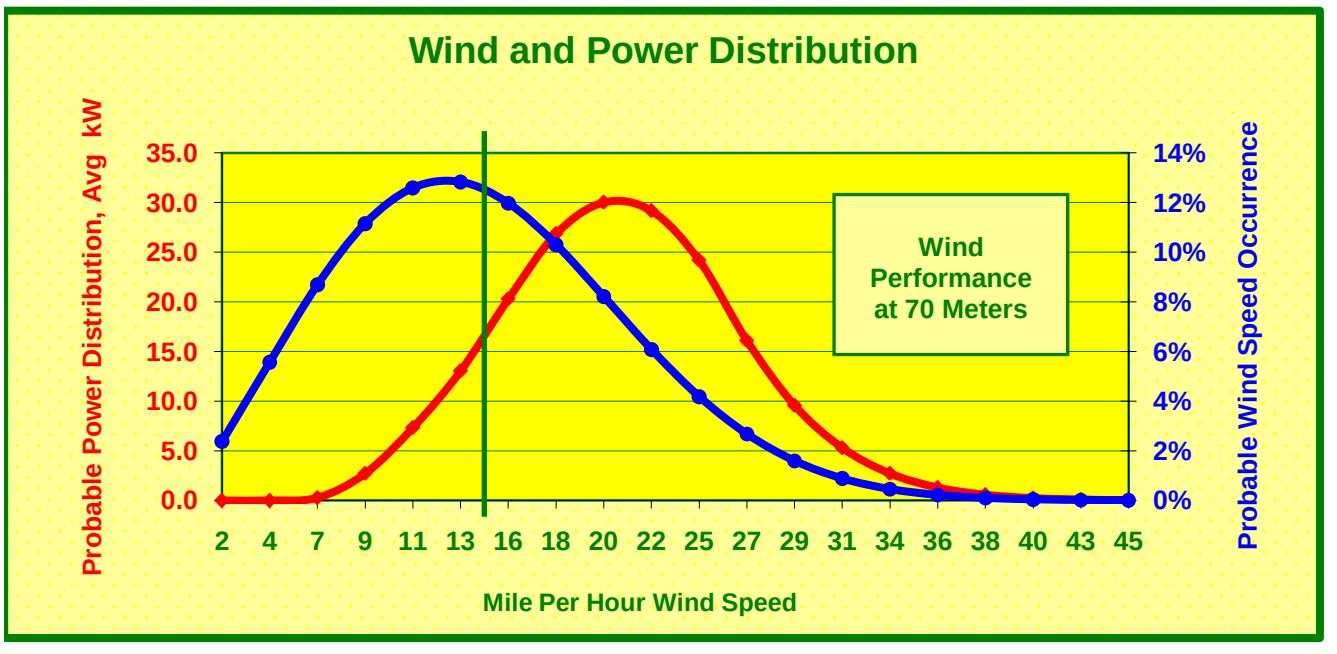
Ohio Wind Model Data Based

Turbine Model Used For Estimates: Aeronautica / Norwin 54-750
Meter Description: High School 1

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*	0.00	2.37%	0.000	65.2%	23.0%
2	4.47	*0*	0.00	5.57%	0.000		
3	6.71	*4*	3.21	8.68%	0.279		
4	8.95	*30.4*	24.41	11.15%	2.722		
5	11.18	*72.6*	58.29	12.58%	7.335		
6	13.42	*126.7*	101.73	12.82%	13.046		
7	15.66	*211.2*	169.57	11.97%	20.292		
8	17.90	*324.7*	260.70	10.30%	26.851	33.0%	71.6%
9	20.13	*455.4*	365.63	8.21%	30.020		
10	22.37	*598*	480.13	6.08%	29.172		
11	24.61	*720.7*	578.64	4.18%	24.184		
12	26.84	*750*	602.16	2.67%	16.101		
13	29.08	*750*	602.16	1.59%	9.581		
14	31.32	*750*	602.16	0.88%	5.303	1.7%	5.4%
15	33.55	*750*	602.16	0.45%	2.729		
16	35.79	*750*	602.16	0.22%	1.305		
17	38.03	*750*	602.16	0.10%	0.579		
18	40.26	*750*	602.16	0.04%	0.239		
19	42.50	*750*	602.16	0.02%	0.091		
20	44.74	*750*	602.16	0.01%	0.032		
			Totals	99.89%	189.861	99.9%	100.0%

14.58	Site Average Wind Speed (MPH) at 70 Meters



Wind Resource Report, Site Wind Characteristics

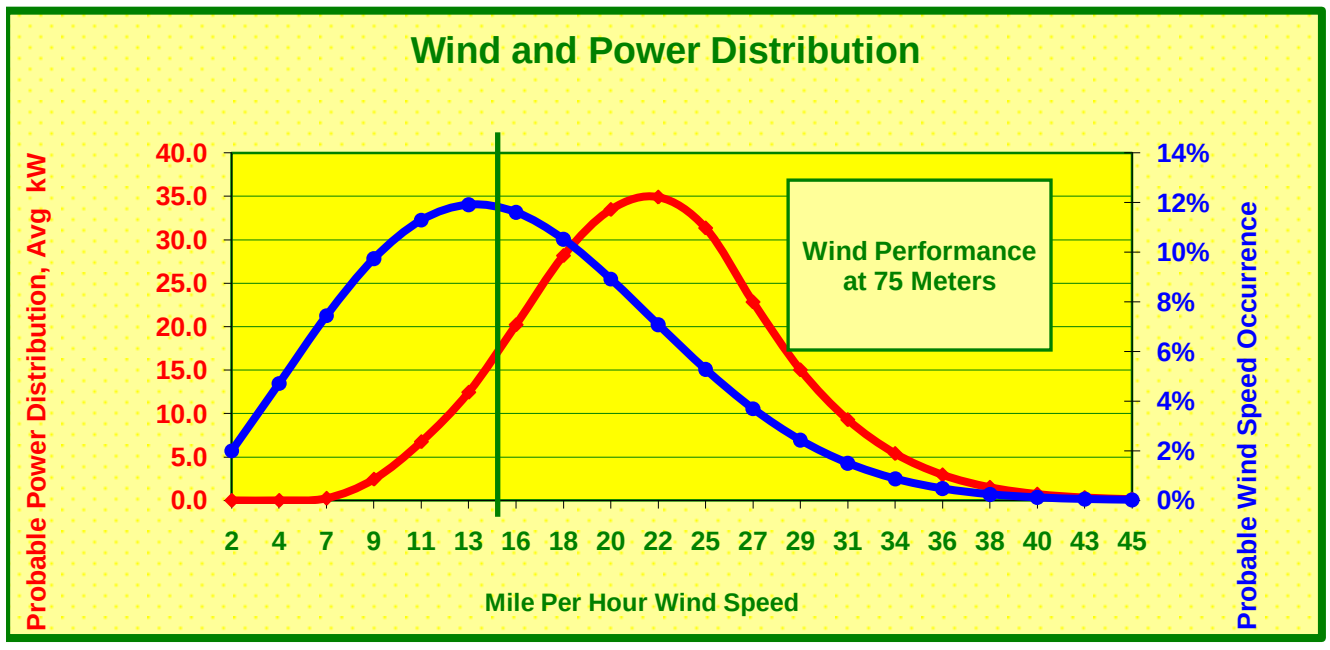
Archbold High School Site

Turbine Model Used For Estimates: Aeronautica / Norwin 54-750
Meter Description: High School 1

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	*0.0*	0.00	2.30%	0.000	63.9%	22.0%
2	4.47	*0.0*	0.00	5.39%	0.000		
3	6.71	*4.0*	3.46	8.43%	0.292		
4	8.95	*30.4*	26.32	10.87%	2.861		
5	11.18	*72.6*	62.85	12.33%	7.752		
6	13.42	*126.7*	109.69	12.66%	13.888		
7	15.66	*211.2*	182.84	11.92%	21.796		
8	17.90	*324.7*	281.10	10.37%	29.153	34.0%	71.9%
9	20.13	*455.4*	394.26	8.37%	33.008		
10	22.37	*598.0*	517.71	6.29%	32.548		
11	24.61	*720.7*	623.93	4.40%	27.434		
12	26.84	*750.0*	649.30	2.87%	18.609		
13	29.08	*750.0*	649.30	1.74%	11.307		
14	31.32	*750.0*	649.30	0.99%	6.403	2.0%	6.0%
15	33.55	*750.0*	649.30	0.52%	3.379		
16	35.79	*750.0*	649.30	0.26%	1.660		
17	38.03	*750.0*	649.30	0.12%	0.760		
18	40.26	*750.0*	649.30	0.05%	0.323		
19	42.50	*750.0*	649.30	0.02%	0.128		
20	44.74	*750.0*	649.30	0.01%	0.047		
			Totals	99.89%	211.346	99.9%	100.0%

14.80	Site Average Wind Speed (MPH) at 75 Meters



Wind Resource Report, Site Wind Characteristics

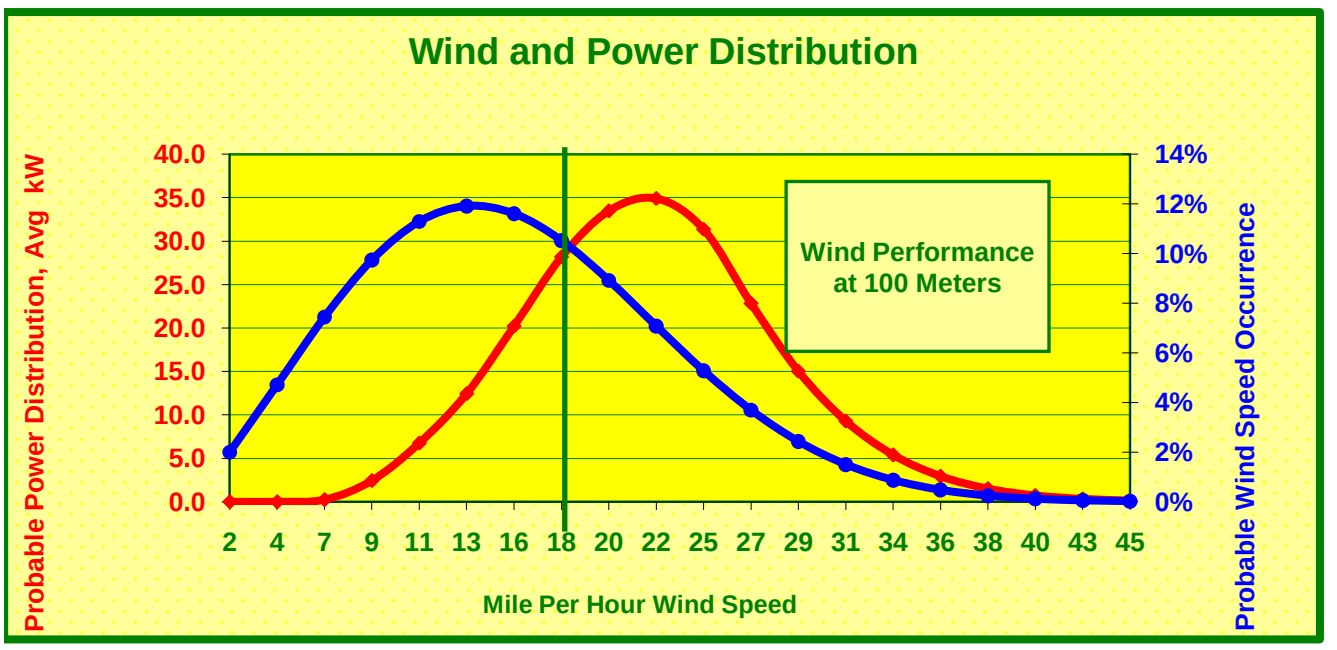
Archbold High School Site

Turbine Model Used For Estimates: Aeronautica / Norwin 54-750
Meter Description: High School 1

Weibull Performance Calculations:

Yearly Average Wind Speed Bin (m/s)	(mph)	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.:
1	2.24	*0*	0.00	1.99%	0.000		
2	4.47	*0*	0.00	4.71%	0.000		
3	6.71	*4*	3.30	7.44%	0.245		
4	8.95	*30.4*	25.08	9.74%	2.442	58.7%	18.5%
5	11.18	*72.6*	59.89	11.29%	6.761		
6	13.42	*126.7*	104.51	11.91%	12.451		
7	15.66	*211.2*	174.21	11.61%	20.222		
8	17.90	*324.7*	267.84	10.52%	28.183		
9	20.13	*455.4*	375.65	8.92%	33.490		
10	22.37	*598*	493.27	7.08%	34.917	37.9%	72.6%
11	24.61	*720.7*	594.49	5.28%	31.360		
12	26.84	*750*	618.66	3.69%	22.845		
13	29.08	*750*	618.66	2.43%	15.028		
14	31.32	*750*	618.66	1.50%	9.291		
15	33.55	*750*	618.66	0.87%	5.397		
16	35.79	*750*	618.66	0.48%	2.946		
17	38.03	*750*	618.66	0.24%	1.510	3.3%	8.9%
18	40.26	*750*	618.66	0.12%	0.726		
19	42.50	*750*	618.66	0.05%	0.328		
20	44.74	*750*	618.66	0.02%	0.139		
			Totals	99.90%	228.281	99.9%	100.0%

15.75	Site Average Wind Speed (MPH) at 100 Meters



SOIL EXPLORATION,
PROPOSED WIND TURBINE,
ARCHBOLD SCHOOLS,
600 LAFAYETTE STREET,
ARCHBOLD, FULTON COUNTY, OHIO

The Renaissance Group
c/o Buehrer Group Architecture & Engineering, Inc.
Attention: Sam Muhsen, P.E., SECB, LEED AP
314 Conant Street
Maumee, Ohio 43537-3358

Report No. 152731-1110-2635

November 30, 2010

BOWSER MORNER

BOWSER-MORNER

1419 Miami Street (43605) • P. O. Box 838 • Toledo, Ohio 43697-0838
419-691-4800

Geotechnical Laboratory Report

Report To:	The Renaissance Group	**Date:**	November 30, 2010
c/o:	Buehrer Group Architecture & Engineering, Inc.	**Laboratory Job No.:**	152731
Attention:	Sam Muhsen, P.E., SECB, LEED AP 314 Conant Street Maumee, Ohio 43537-3358	**Report No.:**	152731-1110-2635
		Report Consists of	**22 Pages**

Report On: SOIL EXPLORATION,
Proposed Wind Turbine, Archbold Schools, 600 Lafayette Street,
Archbold, Fulton County, Ohio

Ladies and Gentlemen:

Bowser-Morner, Inc. has completed the authorized subsurface exploration and geotechnical engineering evaluation at the above referenced project. The following report briefly reviews our exploration procedures, describes existing site and subsurface conditions, and presents our evaluations, conclusions, and recommendations.

1.0 AUTHORIZATION

The purpose of this subsurface exploration and geotechnical engineering evaluation was to determine the subsurface conditions at the project site and to analyze these conditions as they relate to foundation design and construction. All work was performed in accordance with Bowser-Morner technical proposal No. T-19886, dated October 26, 2010, and its attached *Proposal Acceptance Sheet* between The Renaissance Group and Bowser-Morner, Inc., dated November 3, 2010. The scope of the exploration included subsurface drilling and sampling, limited laboratory testing, engineering evaluation of the field and laboratory data, and the preparation of this report.

2.0 WORK PERFORMED

2.1 Field Exploration

During this exploration, two soil test borings were drilled at the approximate locations shown on the attached *Boring Location Plan*. The borings were drilled to a depth of 40 feet. Boring locations were established in the field by Bowser-Morner by measuring

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distances and estimating right angles from existing site features. Boring elevations were not obtained. Since these measurements are not precise, the locations shown on the *Boring Location Plan* should be considered approximate.

All soil sampling and standard penetration testing was conducted in general accordance with ASTM D 1586. The borings were advanced by a truck-mounted drilling rig by mechanically twisting hollow-stem augers into the soil. At regular intervals, soil samples were obtained with a standard 2-inch O. D. split spoon sampler driven 18 inches into the soil with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and designated the "standard penetration resistance." The standard penetration resistance, or "N" value, when properly evaluated, is an index of the soil's strength, density, and ability to support foundations. The disturbed samples recovered by the split spoon sampler were visually classified in the field, logged, sealed in glass jars, and returned to the laboratory for testing and evaluation by a geotechnical engineer.

In Boring 2, the split spoon samplers were fitted with liners to obtain samples of the subsurface soils for laboratory unconfined compressive strength testing. Although the liner samples are disturbed due to pounding from the standard penetration test and the thick sidewalls of the split spoon sampler and liner, they are protected from swelling and other post-sampling disturbances and, therefore, are less disturbed than conventional split spoon samples. The unconfined compressive strength test results obtained from liner samples, while approximate, do provide the geotechnical engineer with a means to evaluate relative soil strengths.

Boring Logs indicating soil descriptions, penetration resistances, and observed ground-water levels are attached.

2.2 Previous Soil Explorations

Bowser-Morner previously performed a soil exploration for the proposed football field bleachers in April 2006. During this study, Bowser-Morner reviewed relevant soil boring and laboratory data from the previous geotechnical study to assist in the evaluation of this project.

2.3 Laboratory Testing

In the laboratory, each of the samples recovered from the borings was examined and visually classified by a geotechnical engineer. In addition, samples of cohesive soils from the split spoon samplers were tested to determine the soil's approximate strength using a hand-held, calibrated spring penetrometer. These values were used by the geotechnical engineer to assist in the evaluation of the relative strengths of the subsurface soils and to aid in classification of the samples.

Nine unconfined compressive strength tests were performed on the disturbed samples recovered by the liner samplers. These tests were performed on a constant rate of strain apparatus with a deformation rate adjusted to cause failure of the sample in less than 10 minutes. Note that care should be utilized in applying these test values due to the method of sampling. The results of these tests have been summarized and tabulated below.

Boring and Sample No.	Sample Depth (ft)	Moisture Content (%)	Dry Unit Weight (pcf)	Unconfined Compressive Strength (psf)	Strain at Failure (%)
2 - 2	3.5 - 5.0	23.6	103.8	7,025	7.5
2 - 3	6.0 - 7.5	22.3	105.8	2,617	7.1
2 - 4	8.5 - 10.0	18.8	120.5	4,546	20.0
2 - 5	13.5 - 15.0	21.9	105.8	4,417	20.0
2 - 6	18.5 - 20.0	23.0	101.8	2,460	18.2
2 - 7	23.5 - 25.0	30.1	97.5	4,742	14.8
2 - 8	28.5 - 30.0	29.6	95.8	3,502	15.1
2 - 9	33.5 - 35.0	22.6	115.3	4,072	20.0
2 - 10	38.5 - 40.0	16.5	119.0	5,457	20.0

Soil samples are normally retained in our laboratory for a period of 60 days before they are discarded. To view the samples or arrange for longer storage of samples, please contact us.

3.0 SITE AND SUBSURFACE CONDITIONS

3.1 Site Description

The proposed site is located adjacent to and southwest of the existing football field at Archbold High School in Archbold, Fulton County, Ohio.

3.2 Soil Profile

Data from the soil test borings are shown on the attached *Boring Logs*. The subsurface conditions discussed in the following paragraphs and those shown on the *Boring Logs* represent an estimate of the subsurface conditions based on interpretation of the boring data using normally accepted geotechnical engineering judgments. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

Geologically, the project site is situated in a glacial ground moraine that consists of till containing an unsorted, unstratified mixture of clay, silt, sand and coarser fragments deposited discontinuously by advancing ice. Overlying the glacial till is a layer of laminated silts and clays of lacustrine origin.

Topsoil covers the ground surface at both boring locations and was recorded by the drillers as 5 to 8 inches in thickness. Below the topsoil are fill materials. The fill materials consist predominantly of brown and dark brown silt with varying amounts of clay, sand and gravel. The fill materials extended to depths between 2 and 2.5 feet. Underlying the fill are lacustrine soil materials generally described as medium stiff to stiff brown and gray silt and clay or clay and silt. At Boring 1, the soil at 2.5 feet deep is sandy and at 6 feet is saturated silt. The lacustrine soil extended to depths between 32 and 33.5 feet, where glacial till was encountered. The glacial till was described as gray clay and silt with some sand and a trace of gravel. The glacial till extended to the bottom of both borings.

The estimated undrained shear strength of the lacustrine soil in the top 15 feet of the soil profile is in the range of 2,000 to 3,500 pounds per square foot (psf). Below 15 feet, the undrained shear strength is in the range of 1,200 to 2,300 psf. The glacial till has undrained shear strength on the order of 2,000 to 2,500 psf.

3.3 Groundwater Observations

During the field exploration, the drilling rods and sampling equipment were continuously checked by the drillers for indications of groundwater or seepage. The *Boring Logs* list our driller's observations of groundwater or seepage. Three readings are recorded on the logs. The initial groundwater level indicates the depth(s) at which groundwater or seepage was initially noted by the drillers as the boring was being advanced and the intensity of the seepage. The completion groundwater level represents the depth groundwater was observed in the borehole immediately after the completion of the hole. The last reading on the *Boring Logs* represents the depth groundwater was observed in the borehole after an increment of time has passed. In this case, both the depth and time are listed.

Groundwater was encountered in both boring locations at depths between 5.5 and 6 feet.

Groundwater levels fluctuate with seasonal and climatic variations and may be different at other times. More specific information regarding groundwater levels, standard penetration resistances, and soil descriptions is detailed on the attached *Boring Logs*.

4.0 PROPOSED CONSTRUCTION

It is our understanding that the proposed construction is to consist of a new wind turbine. The turbine will be 197 feet tall to the hub. We understand that the vertical load for the tower will be about 115 kips with a lateral load of about 50 kips and an overturning moment of about 5,000 kip-ft. The proposed foundation is a reinforced concrete mat that is octagonal and has a nominal width of 40 feet. If these assumptions are not appropriate for the intended construction, please contact us so we can re-evaluate our recommendations.

5.0 EVALUATIONS AND CONCLUSIONS

The following evaluations and conclusions are based on our interpretation of the field and laboratory data obtained during the exploration and our experience with similar subsurface conditions. Soil penetration data and laboratory data have been used to estimate allowable bearing pressures using commonly accepted geotechnical engineering practices. Subsurface conditions in uninvestigated locations between borings may vary considerably from those encountered in the borings. If structure location, loadings, or levels are changed, we request we be advised so we may re-evaluate our recommendations.

5.1 Foundations

The proposed wind turbine may be supported on either a mat foundation bearing in the glacial soils or on deep foundations. Mat foundations bearing on the original undisturbed glacial silty clay soil may be designed for a net allowable soil bearing capacity of 4,000 pounds per square foot (psf) at frost depth (3.5 feet) or below.

Deep foundations may also be used. Drilled piers are typically selected for this application. Drilled piers may be designed for a combination of skin resistance and end-bearing. The following typical soil profile can be used to estimate drilled pier capacities.

Design Soil Profile
(Ultimates – Use F. S. = 3.0 for Design)

Approx. Depth (ft)	Typical Soil Deposit	Ultimate Skin Resistance {Compression} (psf)	Ultimate End Bearing (psf)
0.0 – 2.5	Fill	---	---
2.5 – 15.0	Stiff Lacustrine Silt and Clay	1,300	20,000
15.0 – 33.5	Medium Stiff Lacustrine	1,000	15,000
33.5 – 40.0	Glacial Till	1,300	20,000

The values given in the above tables are ultimates and should be divided by a suitable factor-of-safety to achieve the design working capacities of the piles. A factor-of-safety of 3.0 is recommended for this application. Skin friction values are reduced for drilled piers for uplift conditions. For uplift capacity, the above skin friction values should be multiplied by 0.7.

Settlement under static load conditions for either a mat foundation or a drilled pier should be small and likely will be less than 0.5 inches for an octagonal mat foundation that is placed at a depth of 5 feet and has a nominal width of 40 feet.

5.2 Foundation Construction and Evaluation

5.2.1 Spread Footings

Bottoms of foundation excavations should be evaluated by a geotechnical engineer prior to the placement of reinforcing steel and concrete to verify adequate bearing materials are present and all debris, mud, and loose, frozen, or water-softened soils are removed.

Foundation excavations should be concreted as soon as practical after they are excavated. Water should not be allowed to pond in any excavation. If an excavation is left open for an extended period, a thin mat of lean concrete should be placed over the bottom to minimize damage to the bearing surface from weather or construction activities. Foundation concrete should not be placed on frozen or flooded subgrades.

5.2.2 Drilled Piers

If drilled piers are chosen as a design alternate, it would be our recommendation they be installed in substantial accordance with the attached *Suggested Items for Inclusion in the Specification for Drilled Piers*. Drilled piers installation should be continuously monitored by Bowser-Morner to verify adequate bearing materials are present, to check that the drilled piers are plumb and bells are properly sized, and to help ensure that the bottom of the caissons have been properly cleaned.

5.3 Special Inspections

The International Building Code (IBC) requires "Special Inspections". These inspections are required in 14 major categories of work and are over and above the inspections that building officials commonly provide per Section 109. The purpose of the special inspector is to review aspects of construction that require special knowledge and training that the code official does not possess.

For each project, the Department of Commerce's Division of Industrial Compliance requires the principal designer to identify which materials and contracted work require special inspections and specify the frequency of inspection. The designer is to submit this completed list with the building permit application.

At the completion of the project, a *Final Report of Special Inspections* must be submitted by the registered design professional in responsible charge of the project in order to receive the final occupancy permit.

Bowser-Morner, Inc. is capable of providing the special inspection services. Based on our current understanding of your project, we have developed the following summary of the required Special Inspections:

SOILS AND FOUNDATIONS – 1704.4	
Item	**Scope**
1. Shallow Foundations	*Inspect soils below footings for adequate bearing capacity and consistency with geotechnical report.* *Inspect removal of unsuitable material and preparation of subgrade prior to placement of controlled fill.*
2. Deep Foundations: Drilled Piers:	*Inspect installation of drilled pier foundations. Verify pier diameter, bell diameter, lengths, embedment into bedrock, and suitability of end bearing strata.*
3. Load Testing	*Compressive load testing (ASTM D1143)* *Tensile load testing (ASTM D3689)*
Cast-in-Place Concrete – 1704.4	
1. Mix Design	*Review concrete batch tickets and verify compliance with approved mix design. Verify that water added at the site does not exceed that allowed by the mix design.* *Mix designs, mix verifications.*
2. Material Certification	
3. Reinforcement Installation	*Inspect size, spacing, cover, positioning, and grade of reinforcing steel. Verify that reinforcing bars are free of form oil or other deleterious materials. Inspect bar laps and mechanical splices. Verify that bars are adequately tied and supported on chairs or bolsters*
4. Post-Tensioning Operations	*Inspect placement, stressing, grouting, and protection of post-tensioning tendons. Verify that tendons are correctly positioned, supported, tied, and wrapped. Record tendon elongations.*
5. Welding of Reinforcing	*Visually inspect all reinforcing steel welds. Verify weldability of reinforcing steel. Inspect preheating of steel when required.*
6. Anchor Rods	*Inspect size, positioning, and embedment of anchor rods. Inspect concrete placement and consolidation around anchors.*
7. Concrete Placement	*Inspect placement of concrete. Verify that concrete conveyance and depositing avoids segregation or contamination. Verify that concrete is properly consolidated*
8. Sampling and Testing of Concrete	*Test concrete compressive strength (ASTM C31 and C39), slump (ASTM C143), air-content (ASTM C231 or C173), and temperature (ASTM C1064).*
9. Curing and Protection	*Inspect curing, cold weather protection, and hot weather protection procedures.*

Structural Steel – 1704.2 and 1704.3	
1. Fabricator Certification/Quality Control Procedures ☐ Fabricator Exempt	*Review shop fabrication and quality control procedures.*
2. Material Certification	*Review certified mill test reports and identification markings on wide-flange shapes, high-strength bolts, nuts, and welding electrodes.*
3. Open Web Steel Joists	*Inspect installation, field welding, and bridging of joists.*
4. Bolting	*Inspect installation and tightening of high-strength bolts. Verify that splines have separated from tension control bolts. Verify proper tightening sequence. Continuous inspection of bolts in slip-critical connections.*
5. Welding	*Visually inspect all welds. Inspect pre-heat, post-heat, and surface preparation between passes. Verify size and length of fillet welds.* *Ultrasonic testing of all full-penetration welds.*
6. Shear Connectors	*Inspect size, number, positioning, and welding of shear connectors. Inspect suds for full 360-degree flash. Ring test all shear connectors with a 3-pound hammer. Bend test all questionable studs to 15 degrees.*
7. Structural Details	*Inspect steel frame for compliance with structural drawings, including bracing, member configuration, and connection details.*
8. Metal Deck	*Inspect welding and side-lap fastening of metal roof and floor deck.*

5.4 Soil Seismic Site Classification

We have evaluated the available soil profile data developed during this study to determine the Site Class in accordance with the 2009 International Building Code. The test borings for this project did not extend to 100 feet deep and, therefore, we have estimated the depth to rock based on records we keep on file. We have also estimated the soil strength and soil types below the bottoms of the on-site borings. Based on this analysis, we have determined the Site Class is D. We may be able to upgrade the class to C with seismic wave testing. We can perform this service.

5.5 Groundwater Control

During the field exploration, groundwater was encountered in both boring locations at depths between 5.5 and 6 feet. We do not expect significant difficulties with groundwater during mat foundation; however, it may be problematic for caisson construction. Groundwater flow into caisson excavations that pass through the saturated silty soil layers may be moderate in some holes, and caving conditions may occur. As with any open excavation, groundwater may accumulate in foundation excavations. We anticipate that the amount of water, if any, that does accumulate will be light. Any water that does accumulate should be pumped out prior to placing concrete.

The amount and type of dewatering required during construction will depend on the weather and groundwater levels at the time of construction and the effectiveness of the contractor's techniques in preventing surface runoff from entering open excavations. Typically, groundwater levels are highest during winter and spring months and lower in summer and early fall.

5.6 Slopes and Temporary Excavation

The owner and the contractor should make themselves aware of and become familiar with applicable local, state, and federal safety regulations, including current OSHA excavation and trench safety standards. Construction site safety generally is the sole responsibility of the contractor. The contractor shall also be solely responsible for the means, methods, techniques, sequences, and operations of construction operations. Bowser-Morner is providing the following information solely as a service to the client. Under no circumstances should Bowser-Morner's provision of the following information be construed to mean Bowser-Morner is assuming responsibility for construction site safety or the contractor's activities; such responsibility is not implied and should not be inferred.

The contractor should be aware that slope height, slope inclination, and excavation depths (including utility trench excavations) should in no case exceed those specified in local, state, or federal safety regulations, e.g., OSHA Health and Safety Standards for Excavations, 29 CFR Part 1926, or successor regulations. Such regulations are strictly enforced and, if not followed, the owner, the contractor, or earthwork or utility subcontractors could be liable for substantial penalties.

For this site, the overburden soil encountered in our exploration is mostly silty clay of lacustrine origin. Some fill, estimated at depths of 2 to 2.5 feet or more, will be encountered. We anticipate OSHA will classify the fill materials as Type C. The underlying naturally occurring undisturbed clay soils would be likely classified as Type B.

Note: Soils encountered in the construction excavations may vary significantly across the site. Our preliminary soil classifications are based solely on the materials encountered in widely spaced borings. The contractor should verify similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, Bowser-Morner recommends we be contacted immediately to evaluate the conditions encountered.

If any excavation, including a utility trench, is extended to a depth of more than 20 feet, OSHA requires the side slopes of such excavation be designed by a professional engineer.

6.0 QUALIFICATIONS

The evaluations, conclusions, and recommendations in this report are based on our interpretation of the field and laboratory data obtained during the exploration, our understanding of the project, and our experience with similar sites and subsurface conditions. Data used during this exploration included, but was not necessarily limited to:

- two exploratory borings performed during this study;
- observations of the project site by our staff;
- results of limited laboratory soil testing;
- preliminary site plans and drawings furnished by Buehrer Group Architecture & Engineering, Inc.;
- limited interaction with Mr. Sam Muhsen; and
- published soil or geologic data of this area.

In the event changes in the project characteristics are planned, or if additional information or differences from the conditions anticipated in this report become apparent, Bowser-Morner, Inc. should be notified so the conclusions and recommendations contained in this report can be reviewed and, if necessary, modified or verified in writing.

The subsurface conditions discussed in this report and those shown on the *Boring Logs* represent an estimate of the subsurface conditions based on interpretation of the boring data using normally accepted geotechnical engineering judgments. Although individual test borings are representative of the subsurface conditions at the boring locations on the dates shown, they are not necessarily indicative of subsurface conditions at other locations or at other times.

Regardless of the thoroughness of a subsurface exploration, there is the possibility conditions between borings will differ from those at the boring locations, conditions are not as anticipated by designers, or the construction process has altered the soil conditions. As variations in the soil profile are encountered, additional subsurface sampling and testing may be necessary to provide data required to re-evaluate the recommendations of this report. Consequently, after submission of this report, it is recommended Bowser-Morner be authorized to perform additional services to work with the designer(s) to minimize errors and/or omissions regarding the interpretation and implementation of this report.

Prior to construction, we recommend that Bowser-Morner:

- work with the designers to implement the recommended geotechnical design parameters into plans and specifications;
- consult with the design team regarding interpretation of this report;
- establish criteria for the construction observation and testing for the soil conditions encountered at this site; and
- review final plans and specifications pertaining to geotechnical aspects of design.

During construction, we recommend that Bowser-Morner:

- observe the construction, particularly site preparation, fill placement, and foundation excavation or installation;
- perform in-place density testing of all compacted fill;
- perform materials testing of soil and other materials as required; and
- consult with the design team to make design changes in the event differing sub-surface conditions are encountered.

If Bowser-Morner is not retained for these services, we shall assume no responsibility for construction compliance with the design concepts, specifications, or recommendations.

Our professional services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices. No other warranty, expressed or implied, is made.

The scope of our services did not include an environmental assessment for the presence or absence of hazardous or toxic materials in the soil, surface water, groundwater, or air, on, within, or beyond the site studied. Our work also did not include anything related to mold. Our scope of services also did not include an evaluation for the presence or absence of wetlands or protected species. Any statements in the report or on the *Boring Logs* regarding odors, staining of soils, or other unusual items or conditions observed are strictly for the information of our client.

To evaluate the site for possible environmental liabilities, we recommend an environmental assessment, consisting of a detailed site reconnaissance, a record review, and report of findings. Additional subsurface drilling and sampling, including groundwater sampling, may be required. The presence or absence of wetlands or protected species should be determined by a wetlands study. Bowser-Morner, Inc. can provide these services and would be pleased to provide a cost proposal to perform these studies, if requested.

This report has been prepared for the exclusive use of The Renaissance Group for specific application to Proposed Wind Turbine at Archbold Schools in Archbold, Fulton County, Ohio. Specific design and construction recommendations have been provided in the various sections of the report. The report should, therefore, be used in its entirety. This report is not a bidding document and shall not be used for that purpose. Anyone reviewing this report must interpret and draw their own conclusions regarding specific construction techniques and methods chosen. Bowser-Morner is not responsible for the independent conclusions, opinions, or recommendations made by others based on the field exploration and laboratory test data presented in this report.

Respectfully submitted,

BOWSER-MORNER, INC.

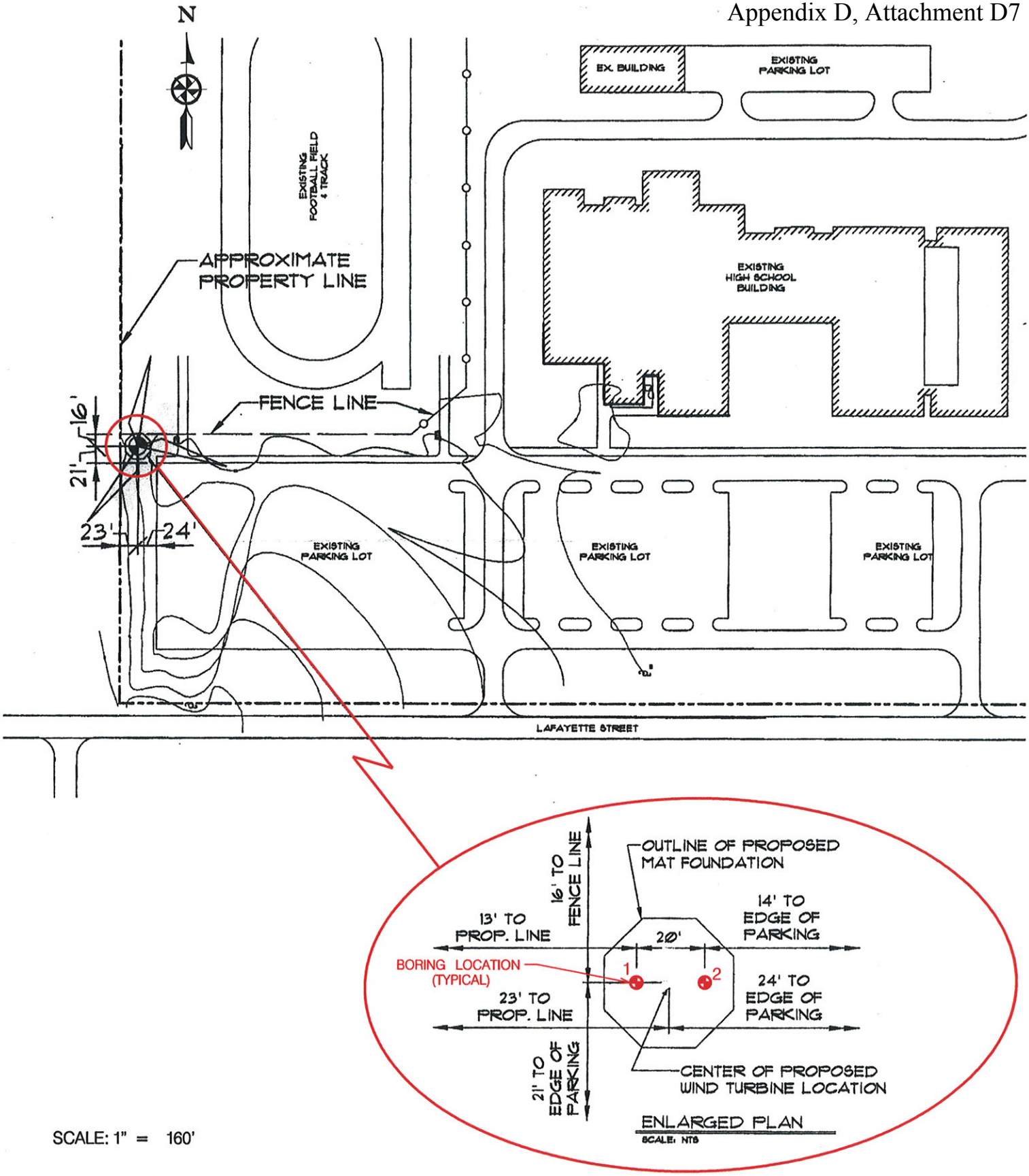
A. K. Rashid AKR

Ahmad K. Rashid, E.I.
Geotechnical Engineer

J. R. Hoppenjans

J. Richard Hoppenjans, P.E., F. ASCE, D. GE
Vice President, District Manager, Chief Engineer

AKR/JRH:caw
Attachments: *Boring Location Plan*
Boring Log Terminology
Boring Logs
Suggested Items for Inclusion in the Specification for Drilled Piers
2-Client (1 via e-mail to sam@buehrergroup.com and 1 bound copy via U. S. mail)
1-The Renaissance Group, Attn: Mr. Aaron Godwin (1 bound via U. S. mail)



SCALE: 1" = 160'

DATE: 11-17-10
JOB NO. 152731

BORING LOCATION PLAN
PROPOSED WIND TURBINE
ARCHBOLD SCHOOLS
600 LAFAYETTE STREET
ARCHBOLD, FULTON COUNTY, OHIO

BOWSER MORNER.

BORING LOG TERMINOLOGY

Stratum Depth:

Distance in feet and/or inches below ground surface.

Description of Materials:

When the color of the soil is uniform throughout, the color recorded will be such as brown, gray, or black and may be modified by adjectives such as light and dark. If the soil's predominant color is shaded by a secondary color, the secondary color precedes the primary color, such as gray and brown, yellow and brown. If two major and distinct colors are swirled throughout the soil, the colors will be modified by the term mottled, such as mottled brown and gray.

There are two types of visual classification methods currently used by Bowser-Morner, Inc. The first is ASTM D2488. This method results in classifications such as "lean clay". The second method is the ASEE system or Burmister system. This system results in classifications such as "silt and clay, with traces of sand" and is described below.

Particle Size		Visual
Boulders		Larger than 8"
Cobbles		8" to 3"
Gravel:	Coarse	3" to 3/4"
	Fine	3/4" to 2 mm
Sand:	Coarse	2 mm to 0.6 mm (pencil size)
	Medium	0.6 mm to 0.2 mm (table sugar & salt size)
	Fine	0.2 mm to 0.06 mm (powdered sugar size)
Silt		0.06 mm to 0.002 mm
Clay		0.002 mm and smaller (particles of silt and clay size are not visible to the naked eye)

Soil Components	
Major Components	**Minor Component Term**
Gravel	Trace.....1 - 10%
Sand	Some.....11 - 35%
Silt	And.....36 - 50%
Clay	

Moisture Content	
Term	**Relative Moisture**
Dry	Powdery
Damp	Moisture content below plastic limit
Moist	Moisture content above plastic limit, but below liquid limit
Wet	Moisture content above liquid limit

Condition of Soil Relative to Compactness (Granular Material)	
Condition	**N**
Very Loose	5 blows/ft or less
Loose	6 to 10 blows/ft
Medium Dense	11 to 30 blows/ft
Dense	31 to 50 blows/ft
Very Dense	51 blows/ft of more

Condition of Soil Relative to Consistency (Cohesive Material)	
Condition	**Approximate Undrained Shear Strength**
Very Soft	Less than 250 psf
Soft	250 to 500 psf
Medium Stiff	500 to 1,000 psf
Stiff	1,000 to 2,000 psf
Very Stiff	2,000 to 4,000 psf
Hard	Greater than 4,000 psf

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Sample Number:

Sample numbers are designated consecutively, increasing with depth for each boring.

Sample Type:

"A" Split spoon, 2-inch O.D., 1-3/8-inch I.D., 18 inches in length.
"B" One of the following:
- Power Auger Sample
- Piston Sample
- Liner Sample
- Denison Sample
- Sonic Sample

"C" Shelby Tube 3-inch O.D., except where noted.

Sample Depth:

The depth below top of ground at which the sample was taken.

Blows per 6 inches on Sampler:

The number of blows required to drive a 2-inch O.D., 1-3/8-inch I.D., split spoon sampler, using a 140-pound hammer with a 30-inch free fall, is recorded for 6 inch drive increments. (Example: 3/8/9)

"N" Blows/Feet:

Standard penetration resistance. This value is based on the total number of blows required for the last 12 inches of penetration. (Example: 3/8/9 : N = 8 + 9 = 17)

Water Observations:

The depth of water recorded in the test boring is measured from the top of ground to the top of the water level. Initial depth indicates the water level during boring, completion depth indicates the water level immediately after boring, and depth after "X" number of hours indicates the water level after letting the water rise or fall over a time period. Water observations in pervious (sand and gravel) soils are considered reliable ground water levels for that date, Water observations in impervious (silt and clay) soils cannot be considered accurate unless records are made over a time period of several days to a month. Factors such as weather, soil porosity, etc. will cause the ground water level to fluctuate for both pervious and impervious soils.

CLIENT	JOB NO.		
THE RENAISSANCE GROUP	**152731**		
PROJECT	BORING STARTED **11/15/10**	BORING COMPLETED **11/15/10**	**B-1** Boring No.
PROPOSED WIND TURBINE, ARCHBOLD SCHOOLS, 600 LAFAYETTE STREET, ARCHBOLD, FULTON COUNTY, OHIO	DRILLER **Clint J.**	METHOD **3 1/4" HSA**	**Sheet 1 of 2**
	TYPED BY **kms**		

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

COMMENTS

N VALUE, blows/ft. ◇ 10 20 30 40 50 60 70 80 90

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE	REMARKS
				Topsoil			
1.0–2.0	1A			(FILL) Very stiff gray and brown silt, some clay, some sand, trace of gravel	6 6 7	13	
3.0–6.0	2A			Medium stiff brown silt and sand, moist	5 6 6	12	▽
6.0–9.0	3A, 4A			Stiff brown and gray silt, some clay, trace of sand, wet	5 9 8 / 2 4	17	
9.0–13.0	4A			Medium stiff gray clay and silt, trace of sand, moist	5	9	
13.0–18.0	5A			Medium stiff gray silt, some clay, trace of sand, wet	3 5 6	11	
18.0–22.0	6A			Medium stiff gray clay and silt, trace of sand, moist	3 4 5	9	

Continued Next Page

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	5.5	▽ 11/15/2010
AT COMPLETION	NONE	▼ 11/15/2010
OTHER	N/A	▼ N/A

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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GINT Report Used: NEWLOGIN Report No.: 152731.1110.XXXX.GPJ GINT Template Used: NEWLOGIN.GDT Date Printed: 11/30/10

CLIENT THE RENAISSANCE GROUP	JOB NO 152731		B-1 Boring No.
PROJECT PROPOSED WIND TURBINE, ARCHBOLD SCHOOLS, 600 LAFAYETTE STREET, ARCHBOLD, FULTON COUNTY, OHIO	BORING STARTED 11/15/10	BORING COMPLETED 11/15/10	Sheet 2 of 2
	DRILLER Clint J.	METHOD 3 1/4" HSA	
	TYPED BY kms		

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

COMMENTS

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
23.0							
24.0	7A				3 4 6	10	
25.0							
26.0							
27.0							
28.0							
29.0	8A				4 5 6	11	
30.0							
31.0							
32.0							
33.0							
34.0	9A			Medium stiff gray clay and silt, some sand, trace of gravel, moist	4 5 8	13	
35.0							
36.0							
37.0							
38.0							
39.0	10A				3 6 8	14	
40.0				Bottom of boring at 40.0 feet			
41.0							
42.0							
43.0							
44.0							
45.0							
46.0							
47.0							
48.0							

GINT Report Used: NEWLOGIN Report No.: 152731.1110.XXXX.GPJ GINT Template Used: NEWLOGIN.GDT Date Printed: 11/19/10

CLIENT	JOB NO.		
THE RENAISSANCE GROUP	**152731**		
PROJECT	BORING STARTED **11/15/10**	BORING COMPLETED **11/15/10**	**B-2** Boring No.
PROPOSED WIND TURBINE, ARCHBOLD SCHOOLS, 600 LAFAYETTE STREET, ARCHBOLD, FULTON COUNTY, OHIO	DRILLER **Clint J.**	METHOD **3 1/4" HSA**	
	TYPED BY **kms**		**Sheet 1 of 2**

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

COMMENTS

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
				Topsoil			
1.0	1A			(FILL) Very stiff brown and dark brown silt, some clay, trace of sand, moist	7 7 7	14	
2.0				Very stiff clay and silt, trace of sand, moist			
3.0							
4.0	2A				6 7 7	14	
5.0							
6.0							▽
7.0	3A			Very stiff brown silt, some clay, trace of sand, moist	7 6 8	14	
8.0							
9.0	4A			Stiff gray clay and silt, trace of sand, moist	3 9 5	14	
10.0							
11.0							
12.0							
13.0							
14.0	5A				5 10 12	22	
15.0							
16.0							
17.0							
18.0							
19.0	6A				2 3 4	7	
20.0							
21.0							
22.0							

Continued Next Page

WATER LEVEL MEASUREMENTS

	DEPTH	DATE
INITIAL	6.0	▽ 11/15/2010
AT COMPLETION	NONE	▼ 11/15/2010
OTHER	N/A	▼ N/A

A — SPLIT SPOON
B — ROCK CORE
C — SHELBY TUBE
D — SOIL PROBE
E — AUGER CUTTINGS
F — SONIC

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GINT Report Used: NEWLOGIN Report No.: 152731.1110.XXXX.GPJ GINT Template Used: NEWLOGIN.GDT Date Printed: 11/30/10

CLIENT THE RENAISSANCE GROUP	JOB NO. 152731		
PROJECT PROPOSED WIND TURBINE, ARCHBOLD SCHOOLS, 600 LAFAYETTE STREET, ARCHBOLD, FULTON COUNTY, OHIO	BORING STARTED 11/15/10	BORING COMPLETED 11/15/10	B-2 Boring No.
	DRILLER Clint J.	METHOD 3 1/4" HSA	
	TYPED BY kms		Sheet 2 of 2

PROJECT LOCATION
LAT. LONG.
SURFACE ELEVATION
BORING LOCATION
As shown on Boring Location Plan.

DEPTH	SAMPLE NO.	SAMPLER TYPE / RECOVERY	GRAPHIC LOG	VISUAL CLASSIFICATION OF THE MATERIAL	BLOW COUNTS	N VALUE, blows/ft. (10 20 30 40 50 60 70 80 90)	REMARKS
23.0							
24.0	7A				3 3 8	11	
25.0							
26.0							
27.0							
28.0							
29.0	8A				5 5 9	14	
30.0							
31.0							
32.0				Stiff gray clay and silt, some sand, trace of gravel, moist			
33.0							
34.0	9A				3 5 7	12	
35.0							
36.0							
37.0							
38.0							
39.0	10A				6 7 10	17	
40.0				Bottom of boring at 40.0 feet			
41.0							
42.0							
43.0							
44.0							
45.0							
46.0							
47.0							
48.0							

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SUGGESTED ITEMS FOR INCLUSION IN THE SPECIFICATION FOR DRILLED PIERS

1. The Contractor shall furnish all labor and equipment necessary or incidental to the completion of all drilled piers in strict accordance with drawings and specifications.

2. The piers shall be formed by means acceptable to the Owner.

3. The work includes the excavation of all materials encountered, both wet and dry, and the removal of all excavated material from the job site.

4. The maximum variation of the center of piers from the required location shall be no greater than 50 mm (1 inch) at the ground surface, and no pier shall be out of plumb more than 1% (one percent).

5. The diameter of each pier and bell shall conform to the dimensions shown on the drawings.

6. If boulders are encountered in the piers, they shall be removed as extra work. The Contractor shall establish in his contract a unit price for removing boulders. Boulders are considered as being larger than 0.028 cubic meter (one cubic foot) in size. Smaller material shall not be classified as boulders.

7. Drilled piers shall extend to the depth shown on the drawings unless otherwise specified by the Owner or his representative.

8. The depth of drilled piers, for contract work purposes, is shown on the drawings. If, in order to reach suitable material (as determined by the Owner or his representative), the depth of piers is deeper or more shallow, the price shall be adjusted in accordance with the contract.

9. Each pier shall be examined by the Owner or his representative to confirm that the pier is bearing on suitable material, that the bell is of the required size, and that it is free of debris and water before concrete is placed. The Contractor shall case any pier into which

workmen or other personnel will enter and will use confined space entry procedures. Concrete shall not be placed until the pier is approved by the Owner or his representative.

The Contractor shall provide a mechanical device on the belling tool to measure the size of any required bell. Observation of the soil cuttings and measurement made from the ground surface shall be used to assess the suitability of the bearing material and size and depth of the shaft. If there is any question as to the suitability of the excavation, the Contractor shall install a full-length casing into the shaft and provide all equipment necessary to enter the hole for inspection by the Owner or his representative. Confined space entry procedures will be required.

10. The Contractor shall provide and operate all equipment necessary to pump and remove all water that may be encountered in the construction of piers, without additional payment therefor. The Contractor shall case all piers where necessary to shut off the flow of water and belling shall be done in a dry shaft below the casing.

11. The drilled pier shall be filled with concrete as specified below. In instances where it is necessary to case a shaft, the shaft shall be filled with concrete prior to extraction of the casing. The casing shall be pulled by a slow, even lift. Once begun, the pulling shall be continuous and additional concrete shall be placed to keep the shaft full.

12. Concrete shall be produced, placed, and protected in accordance with ACI 301 unless otherwise stated. Concrete shall have a minimum compressive strength of 20,700 kPa (3,000 psi) in 28 days. It shall be placed with a slump of 75 mm to 150 mm (3 to 6 inches).

13. Concreting of the piers shall be done in such a manner that segregation of the concrete is avoided. The concrete shall be placed by means of an "elephant's trunk" or funnel so that the concrete is deposited in the center of the shaft and does not impact on reinforcing steel or the sides of the shaft.

14. The placing of concrete for any one pier shall be continuous. Any interruption in the progress of excavation, protection of the excavation with steel liners, or placing of the concrete must have the approval of the Owner or his representative.

Archbold Area Schools Wind Energy Project Mailing List

Company	Title	Department	Last	First	Address	Address Line 2	City	State	Zip Code	email	Phone
Fulton County Economic Development	Director		Arend	Lisa	152 South Fulton Street	Suite 230	Wauseon	OH	43567-1726		
Federal Aviation Administration		Air Traffic Airspace Branch, ASW-520	Blaich	Mike	2601 Meacham Blvd.		Forth Worth	TX	76137-0520		
Fulton County Regional Planning Director	Director		Brown	Steven	152 South Fulton Street	Suite 230	Wauseon	OH	46567		
United States Senate (D-OH)	Senator		Brown	Sherrod	713 Hart Senate Office Building		Washington	DC	20510		
Ohio Senate		District 1	Buehrer	Steve	1 Capitol Square	1st Floor	Columbus	OH	43215		
U.S. Department of Commerce / NTIA Herbert C Hoover Building (HCHB)		National Telecommunications and Information Administration	Davidson	Edward M.	1401 Constitution Avenue, N.W.		Washington	DC	20230		
Ohio Historic Preservation Office	Department Head	Resource Protection and Review	Epstein	Mark	1982 Velma Avenue		Columbus	OH	43211-2497	guy@orcoast.com	961-1762
Meyer, Glitzenstein & Crystal			Eubanks	William	1601 Connecticut Ave NW,	Suite 700	Washington	DC	20009		996-2859
Meyer, Glitzenstein & Crystal			Glitzenstein	Eric	1601 Connecticut Ave NW,	Suite 700	Washington	DC	20009	SAllen@pewtrusts.org	(503) 231-2718
		USFWS	Gosse	Jeff	1 Federal Drive		Fort Snelling	WI	55111-4056		
Ohio House of Representative		District 74	Goodwin	Bruce W.	77 South High Street	10th Floor	Columbus	OH	43215-6111		
Office of Regional Environmental and Government Affairs - North Attn: SAIE-ESDH	Assistant Secretary of Army (Installations & Environment)		Hartman	Dr. James	5179 Hoadley Road		Aberdeen Proving Ground	MD	21010-5401		
Ohio Department of Development	Energy Public Policy Liaison		Huddle	Patricia	77 South High Street	PO Box 1001	Columbus	OH	43216-1001		
Ohio Department of Development	Advanced Energy Program Manager		Meqadows	David	78 South High Street	PO Box 1002	Columbus	OH	43216-1001		
United States Congress	Congressman	District 5	Latta	Robert	1045 North Main Street, Ste 6	Suite 6	Bowling Green	OH	43402		
Ohio Division of Wildlife	Wind Energy Wildlife Biologist		Lott	Keith	2514 Cleveland Road East		Huron	OH	44839		
ODOT Office of Aviation			Milling	John	2829 W. Dublin-Granville Road		Columbus	OH	43235		
		ODNR	Mitch	Brian	2054 Morse Road	Building F-3	Columbus	OH	43229		
Ohio Schools Facilities Commission			Murry	Richard C.	10 West Broad Street	Suite 1400	Columbus	OH	43215		
Sierra Club Ohio Chapter	Chair		Nagel	Enid	131 North High Street	#605	Columbus	OH	43125	Ann_E_Gray@fws.gov	503-231-6909
Ohio Department of Development		Ohio Energy Resources Division	Payne	Greg	77 South High Street	PO Box 1001	Columbus	OH	43216-1001	dlindly@co.lincoln.or.us	
National Audubon Society	General Counsel		Scott	Michelle P.	225 Varick Street	7th floor	New York	NY	10014		
Ohio Division of Wildlife			Scott	Dave	2514 Cleveland Road East		Huron	OH	44839		
Ohio Historic Preservation Office	Project Manager	Resource Protection and Review	Cook	Justin	1982 Velma Avenue		Columbus	OH	43211-2497	cabbott@peak.org	563-2257
United States Fish and Wildlife Service			Seymour	Megan	4625Morse Road, Suite 104	Suite 104	Columbus	OH	43216-1001		
Ohio Air Quality Development Authority			Shanahan	Mark	50 West Broad Street	Suite 1718	Columbus	OH	43215		
Ohio Public Utility Commission			Siegfried	Stuart	180 East Broad Street		Columbus	OH	43125		
Grange Insurance Audubon Center	Center Director		Starck	Heather	505 W. Whittier Street		Columbus	OH	43215	Onno_Husing@class.orednet.org	
Northwest State Community College	President		Stuckey	Dr. Thomas	22600 State Route 34		Archbold	OH	43502		
National Audubon Society	Important Bird Area Coordinator and Staff Biologist		Van Fleet	Kim	225 Varick Street	7th floor	New York	NY	10014	poconnor@occc.cc.or.us	574-7109
Untied State Senate (R-OH)	Senator		Voinovish	George	524 Hart Senate Office Building		Washington	DC	20510		
Ohio House of Representative, District 75		District 75	Wachtmann	Lynn R.	77 South High Street	10th Floor	Columbus	OH	43215-6111		
National Audubon Society	Vice President		Wallis	Phil	225 Varick Street	7th floor	New York	NY	10014	867-3474	
Ohio Environmental Protection Agency	Chief	Office of Federal Facility Oversight	Winston	Tom	401 East 5th Street		Dayton	OH	45402-2911	Cplybon@surfrider.org	867-3982
Village of Archbold	Mayor		Wyse	Jim	Post Office Box 406 300 North Defiance		Archbold	OH	43502		
Board of Education		Archbold Area Schools			600 Lafayette Street		Archbold	OH	43502		
Fulton County Commissioners					152 South Fulton Street		Wauseon	OH	43567		
Fulton County Historical Society					229 Monroe Street		Wauseon	OH	43567		
German Township Board of Trustees					5001 State Route 66		Archbold	OH	43502		
Governor's Office		Riffe Center			77 South High Street	30th Floor	Columbus	OH	43125-6108		
Eastern Band of Cherokee Indians of North Carolina	NAGPRA Officer		Holt	Clara P	P.O. Box 455		Cherokee	NC	28719		
Absentee-Shawnee Tribe of Indians of Oklahoma	Tribal Historic Preservation Officer		Kaniatobe	Karen	2025 South Gordon Cooper Drive		Shawnee	OK	74801-9381		
Chief, Eastern Shawnee Tribe of Oklahoma	Chief		Wallace	Glenna	P.O. Box 350		Seneca	MO	64865		
United Keetoowah Band of Cherokee Indians of Oklahoma	Historic Preservation Coordinator		Stopp	Lisa	P.O. Box 746		tahlequah	OK	74465-0746		
Forest County Potawatomi Community of Wisconsin Potawatomi Indians	Chairman		Frank	Harold	P.O. Box 340		Crandon	WI	54520		
Huron Potawatomi Nation			Spurr	Laura	2221 1½ Mile Road		Fulton	MI	49052		
THPO, Lac Courte Oreilles Band of Lake Superior Chippewa Indians of Wisconsin			Smith	Jerry	13394 West Trepania		Hayward	WI	54843		
Delaware Nation	NAGPRA Director		Wahahrockah-Tasi	Phyllis	P.O. Box 825		Anadarko	OK	73005		
Cherokee Nation of Oklahoma	NAGPRA		Allen	Richard	P.O. Box 948		Tahlequah	OK	74465		
Shawnee Tribe	Tribal Administrator		Hawkins	Rebecca	P.O. Box 189		Miami	OK	74355		
Red Cliff Band of Lake Superior Chippewa Indians of Wisconsin	Chairman		DePerry	Pat	P.O. Box 529		Bayfield	WI	54814		
Minnesota Chippewa Tribe, Fond du Lac Reservation Business Committee	Chairman		Peacock	Robert	1720 Big Lake Road		Cloquet	MN	55720		
Peoria Tribe of Oklahoma	Chief		Froman	John	PO Box 1527	118 S. Eight Tribe Trail	Miami	OK	74355		
Minnesota Chippewa Tribe, Executive Committee	President		DeFoe	Peter	Box 217		Cass Lake	MN	56633		
Ottawa Tribe of Oklahoma	Chief		Todd	Charles	P.O. Box 110		Miami	OK	74355		
Little River Band of Ottawa Indians of Michigan	Chairman		Guenthardt	Robert	375 River Street		Manistee	MI	49660-2729		
Prairie Band of Potawatomi Indians of Kansas			Wahwasuck	Badger	16281 Q Road Government Center		Mayetta	KS	66509		
Red Lake Band of Chippewa Indians			Jourdain, Jr.	Floyd	P.O. Box 550		Red Lake	MN	56671		

Archbold Area Schools Wind Energy Project Mailing List

Company	Title	Department	Last	First	Address	Address Line 2	City	State	Zip Code	email	Phone
Saginaw Chippewa Indian Tribe of Michigan	Chief		Peters	Philip G.	Isabella Reservation	7070 East Broadway Road	Mount Pleasant	MI	48858		
Seneca-Cayuga Tribe of Oklahoma	Chief		Howard	LeRoy	P.O. Box 1283		Miami	OK	74355		
Delaware Nation NAGPRA Office			Francis	Tamara	P.O. Box 825		Anadarko	OK	73005		
Seneca-Cayuga Tribe of Oklahoma	Chief		Spicer	Paul	P.O. Box 1283	R2301 East Steve Owens Blvd.	Miami	OK	74355		
Absentee-Shawnee Tribe of Oklahoma	Governor		Nuckolls	Larry	2025 Gordon Cooper Drive		Shawnee	OK	74801		
Miami Nation of Oklahoma	Chief		Leonard	Floyd	P.O. Box 1326	202 South Eight Tribes Trail	Miami	ok	74355		
Oneida Tribe of Indians of Wisconsin	Chairman		Danforth	Gerald	P.O. Box 365		Oneida	WI	54155		
Seneca Nation of Indians	President		Snyder, Sr.	Barry E.	P.O. Box 231		Salamanca	NY	14779		
St. Regis Mohawk Tribe	Chief		Ransom	Jim	412 State Route 37		Akwesasne	NY	13655		
Tuscarora Nation	Chief		Henry	Leo R.	2006 Mount Hope Road		Lewiston	NY	14092		
Chippewa-Cree Tribe of the Rocky Boy's Reservation	Chairman		Boy	Alvin Windy	RR 1, P.O. Box 544		Box Elder	MT	59521		
Grand Traverse Band of Ottawa and Chippewa Indians of Michigan	Chairman		Kewaygoshkum	Robert	2605 NW Bayshore Drive		Peshawbestown	MI	49682		
Keweenaw Bay Indian Community of L'Anse and Ontonagon Bands of Chippewa Indians	Chairman		Cohen	Summer Sky	107 Beartown Road		Baraga	MI	49908		
Little Travers Bay Band of Odawa Indians of Michigan	Tribal Chairman		Ettawageshik	Frank	7500 Odawa Circle		Harbor Spings	MI	49740		
Match-e-be-nash-she-wish - Band of Pottawatomi Indians of Michigan	Chairman		Sprague	D. K.	P.O. Box 218		Door	MI	49323		
Minnesota Chippewa Tribe	Chairman		Des Champe	Norman	Grnade Portage Reservation Business Committee	83 Steven Street	Grnade Portage	MN	55605		
THPO, Minnesota Chippewa Tribe, Mille Lac Reservation Business Committee			Boyd	Brenda	43408 Oodena Drive		Onamia	MN	56359		
Minnesota Chippewa Tribe	Chairman		Donald	Gary	Nett Lake Reservation Business Committee	P.O. Box 16	Nett Lake	MN	55772		
THPO, Lac du Flambeau Band of Lake Superior Chippewa Indians			Jackson	Kelly	P.O. Box 67		Lac du Flambeau	WI	54538		
Pokagon Band of Potawatomi Indians			Miller	John	901 Spruce Street	PO Box 180	Dowagiac	MI	49047		
Sokaogon Chippewa Community Lake Band of Chippewa Indians, Wisconsin	Chairwoman		Rachal	Sandra L.	3051 Sand Lake Road		Crandon	WI	54520		
Tonawanda Band of Seneca Indians of New York			Hill	Darwin	7027 Meadville Road		Basom	NY	14013		
Wyandotte Nation - Attn: Ms. Sherri Clemons	Chief		Bearskin	Leaford	P.O. Box 250		Wyandotte	OK	74370		
Turtle Mountain Band of Chippewa Indians	THPO, Office of Archaeology and Historic Preservation		Grant	Brady	P.O. Box 900		Belcourt	ND	58316		
THPO, Miami Tribe of Oklahoma			Olds	Julie	202 South Eight Tribes Trail	P.O. Box 1326	Miami	OK	74355		
Sault Ste. Marie Tribe of Chippewa Indians of Michigan			Pavlat, Sr.	Cecil E.	523 Ashmun Street		Sault Ste. Marie,	MI	49783		
THPO, Seneca Nation of Indians			Mitchell	Kathleen	PO Box 231		Salamanca	NY	14779		
St. Croix Chippewa Indians of Wisconsin	Chairman		Emery	Albert	P.O. Box 287		Hertel	WI	54845		
Cayuga Nation	Chief		Halftown	Clint	PO Box 11		Versailles	NY	14168		
Cherokee Nation of Oklahoma			Halftown	Clint	P.O. Box 948		Ada	OK	74820		
Citizen Potawatomi Nation	Chairperson		Barrett	John	1601 South Gordon Copper Drive		Shawnee	OK	74801		
Loyal Shawnee Tribe			Squirrel	James	Route 4, Box 30		Jay	OK	74346		
Delaware Nation	President		French	Edgar	P.O. Box 825		Anadarko	OK	73005		
Oneida Indian Nation	Nation Representative		Halbritter	Raymond	223 Genesse Street		Oneida	NY	13421		
Onondaga Indian Nation	Chief		Powless, Jr.	Irving	258 Route 11a		Nedrow	NY	13120		
Shawnee Tribe	Chairman		Sparkman	Ron	P.O. Box 189		Miami	OK	74355		
Tonawanda Band of Seneca	Chief		Hill	Rodger	7027 Meadville Road		Basom	NY	14013		
			Bostleman	Ken	224 Burke St		Archbold	OH	43502		
			Swisher	Vic	204 Sylvanus St.		Archbold	OH	43502		
			Humbert	Derek	600 Park St. Lot 9		Archbold	OH	43502		

NOTICE OF PUBLIC SCOPING

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

Archbold Area Local School Wind Energy Project

DOE's Golden Field Office has prepared an EA in accordance with the National Environ-mental Policy Act (NEPA). Archbold Local Schools is proposing to use American Reinvestment and Recovery Act funds from DOE for the purchase and installation of a single 750 kW wind turbine at Archbold High School in Archbold, Fulton County, Ohio. The draft EA is available for review on the DOE Golden Field Office website:

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

No formal public scoping meeting is currently planned for this project. Public comments on any potential issues and/or associated environmental impacts of implementing the proposed action will be accepted until ***February 9, 2011***. You may submit 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.

 New West Technologies

State of Ohio, Fulton County, ss.

Mary Huber being duly sworn, says she is the general manager of the Archbold Buckeye, a weekly newspaper published in the Village of Archbold, County of Fulton and State of Ohio, and of general circulation in said County, and that the printed notice attached to this affidavit was published in said newspaper each week for consecutive weeks, the first publication being made on Wednesday, the 26th day of January, 2011, and the last publication being made on Wednesday, the 26th day of January, 2011.

Mary Huber

Nancy L. Hogrefe

Nancy L. Hogrefe
NOTARY PUBLIC, STATE OF OHIO
My Commission Expires March 29, 2012

NOTARIAL SEAL STATE OF OHIO

Sworn to, before me, and subscribed in my presence, this 26th day of January, 2011.

NOTICE OF PUBLIC SCOPING

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

Archbold Area Local School Wind Energy Project

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