Dated: Thursday, October 6, 2016

Amended Application for a Wind Overlay Zoning District, a Special Use Permit for Wind Energy Conversion Systems ("WECS") and an amendment of the Hanover Zoning Law to increase the maximum height for WECS

Town of Hanover, Chautauqua County, NY

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Dated: Thursday, October 6, 2016

Ball Hill Wind Energy Project

Executive Summary

Ball Hill Wind Energy, LLC (the "Applicant") , a commercial business unit of RES Group, Inc., proposes to develop, construct, own, operate and maintain an approximately 100.5-megawatt (MW) wind energy facility to be known as the "Ball Hill Wind Energy Project" or "Project" in portions of the towns of Villenova and Hanover in Chautauqua County, New York. The Ball Hill Wind Energy Project will produce electricity from wind, a renewable energy source. The proposed layout for the Project is shown in the attached Figure 1.

Pursuant to Article XVI the Town of Hanover Zoning Law ("Wind Law"), the Applicant hereby submits an amended application for the creation of a Wind Overlay District, for the issuance of a Special Use Permit and an increase of the maximum height restriction contained in Section 1608(E) of the Wind Law from 420 feet to 495 feet to allow for the use of newer, more efficient turbine technology that was not previously available. Specifically, the Applicant seeks to amend the language of Section 1608(E)(3) to read as follows:

> 3. WECS shall not exceed a total height of 495 feet including the turbine and blades.

The Amended Application, if approved, would allow for the development, construction, operation, ownership and maintenance of the Ball Hill Wind Energy Project by the Applicant.

Project Description and Comparison to the SDEIS Layout

This Amended Application is the continuation of the development of the previously proposed Noble Ball Hill Windpark project utilizing the same project area, but will incorporate new turbine technology in a modified project layout described below.

In January 2016, as part of this continued development, the Applicant submitted a Supplemental Draft Environmental Impact Statement ("SDEIS") which included and analyzed a different layout and turbine technology than had been proposed in the 2008 Draft Environmental Impact Statement. In this portion of the Amended Application, we will describe the new layout of the Project and how it differs from the layout proposed in the SDEIS. Table 1 below specifically describes the changes for each WECS, the substation, switchyard and operations and maintenance building. In addition, this Amended Application provides information required by the Wind Law for the revised layout. Figure 2 shows the revised layout as compared to the layout included in the SDEIS.

Project Purpose and Layout

Generally, the Project calls for the construction of a number of wind energy conversion systems ("WECS") to generate ± 100 MW of electricity within the Project Area.

- The Project Area for the layout proposed in the Amended Application is located in the same portions of the towns of Villenova and Hanover in Chautauqua County as was proposed in the SDEIS. See Figure 2.
- The revised project layout in the Amended Application consists of 29 WECS (23 of which will be located in Villenova and 6 of which will be located in Hanover). In the SDEIS, the Applicant proposed 36 turbines (28 of which were proposed in Villenova and 8 in Hanover). See Figure 2 which compares the layout included in the SDEIS and the current revised layout.
- There are no WECS to be located within 1200' feet of any residence in the revised layout included in the Amended Application.
- Each V126 turbine can generate 3.45MW of electricity.
- As a result of the reduction of the number of turbines and the revised locations, the Project

reduced the need for ancillary facilities as described above, avoided and/or minimized related impacts while maintaining the +/-100 MW capacity for electrical production.

- The Applicant is proposing to install 29 Vestas V126 3.45MW wind energy conversion systems (the "V126 turbine"), the maximum height for which is ±492 feet (150 meters) when a rotor blade is at the top of its rotation.
- The V126 turbine is a three-bladed, upwind, horizontal-axis wind turbine with a rotor diameter of ±413 feet (126 meters). The blades will be approximately 79 feet (24 meters) from the ground at its nearest point. The nacelle is located at the top of each tower and contains the electrical generating equipment. The brochure for the Vestas 3.45 MW Series Wind Turbine is included as Appendix A.
- In the SDEIS, two similar WECS were presented and analyzed – the Vestas V-110 2.2 MW and the GE 2.3 MW. Both turbines were similarly sized to the V126 Turbine in that the maximum height of those WECS when the blade was in the vertical position was 492' for the Vestas 110 and 499' for the GE model respectively. As such, the height of the WECS proposed in the Amended Application will be the same or less that the WECS studied in the SDEIS.

Table 1 shows the specific changes for each WECS and other wind energy facilities.

Access Roads, Electrical Collection Lines and Substation

Each WECS will have an access road constructed and the electricity generated will be collected and delivered via underground collection lines to a substation. While the routes for these access road and underground lines are slightly different due to the revisions to the layout, they serve the same purpose and will be constructed in the same manner as described in the SDEIS. See Figure 2.

- Access roads will be constructed to a width of 35' during construction and restored when complete to a permanent width of 16'. The revised layout requires fewer miles of access roads to be built than was proposed in the SDEIS (14.9 miles in the SDEIS and 13.4 miles proposed in the Amended Application, including less than 4.0 miles in the Town of Hanover).
- The electrical collection system is currently designed to be entirely underground as required in the Wind Law § 1608(D). To the extent practicable, the collection lines will follow the access roads or run parallel to municipal rights-of way. The length of the collection lines was reduced from 21.3 miles in the SDEIS to 15.4 miles in the Amended Application, including less than 4.5 miles in the Town of Hanover).
- The electrical collection lines will bring the electricity generated by the WECS to a substation located near the middle of the Project Area in the Town of Hanover. The SDEIS also called for a substation of similar size but was located ±850 southeast of the substation proposed in the Amended Application.

Transmission Line and Switchyard

The Amended Application includes a 5.7 mile overhead 115 kV transmission line in the Town of Hanover to bring the electricity from the substation north to a switchyard where it will interconnect the Project with the existing 230 kV National Grid Dunkirk-Gardenville transmission line. See Figure 2.

- The design changed the voltage from 230 kV as proposed in the SDEIS to 115 kV as proposed in the Amended Application.
- The nature and extent of clearing will be substantially similar to that proposed in the SDEIS (though less clearing is required due to the final design of the Project layout). The lines would be placed on single wood poles or wood look-alike structures within a 120' right-of-way ("ROW") which generally would be cleared to a width of eighty feet (80') with 20' on both sides having selected tree removal as needed.
- The switchyard is proposed in the same location as in the SDEIS.
- As in the SDEIS, no poles will be placed in delineated wetlands.

Table 1: Ball Hill Wind Project Summary of Changes from the SDEIS	
Facility	**Modifications and Rationale**
Turbine 1	Turbine and access road eliminated to minimize slope impacts. Engineering constraints (steep slopes) made access difficult.
Turbine 2	Moved approximately 530 feet southeast; new access road location from Round Top Road. Moved from wooded area to open farm field. Eliminated difficult stream crossing and impacts associated with stream and woodlands - fragmentation.
Turbine 3	Moved approximately 450 feet southwest. Increased setback from adjacent landowner and houses to northeast.
Turbine 4	Moved approximately 230 feet southeast, to allow proper turbine spacing for the V126 turbine.
Turbine 5	Moved approximately 208 feet southeast. Increased spacing required for V126 turbine.
Turbine 6	Moved approximately 350 feet southwest. Moved to minimize steep slope impacts within turbine footprint.
Turbine 7	Moved approximately 220 feet northwest to address engineering constraints, and avoid wetland impacts.
Turbine 8	Remained in the same location as presented in the SDEIS.
Turbine 9	Moved access road to minimize agriculture impacts.
Turbine 11	Remained in the same location as presented in the SDEIS.
Turbine 12	Turbine and access road eliminated in response to engineering constraints, to increase Project energy production, and accommodate proper turbine spacing.
Turbine 13	Remained in the same location as presented in the SDEIS.
Turbine 14	Moved approximately 220 feet southwest, to allow proper turbine spacing for the V126 turbine.
Turbine 15	Moved approximately 500 feet east to increase Project energy production.
Turbine 16	Moved approximately 50 feet southeast, to allow proper turbine spacing for the V126 turbine.
Turbine 17	Moved approximately 580 feet northeast, to minimize wetland impacts. Road moved to minimize wetland impacts as well.
Turbine 18	Minor road shifts to minimize wetland impacts and impacts to agricultural lands.
Turbine 19	Moved approximately 350 feet north, for proper turbine spacing for the V126 turbine.
Turbine 20	Moved approximately 820 feet northeast, to allow proper turbine spacing for the V126 turbine, and to comply with setbacks in Villenova's Wind Law.
Turbine 21	Moved approximately 200 feet southwest, in response to engineering constraints, to avoid steep slopes and impacts, and minimize tree clearing.
Turbine 23	Moved approximately 230 feet east, for wetland avoidance.
Turbine 25	Turbine and access road eliminated to avoid wetland impacts, and minimize tree clearing.
Turbine 26	Turbine and access road eliminated to avoid wetland impacts, and minimize tree clearing.
Turbine 27	Moved approximately 1,100-feet northeast to avoid wetland impacts, and minimize tree clearing

Table 1: Ball Hill Wind Project Summary of Changes from the SDEIS	
Facility	**Modifications and Rationale**
Turbine 28	Moved approximately 220 feet west, to avoid wetland impacts and gas pipeline/wells.
Turbine 29	Turbine removed and access road eliminated to allow for proper turbine spacing for the V126 turbine, to minimize tree clearing, and avoid wetlands impacts.
Turbine 30	Moved approximately 90 feet southwest. To minimize wetland impacts, and respond to engineering constraints.
Turbine 31	Remained in the same location as presented in the SDEIS.
Turbine 32	Turbine and access road eliminated, for proper turbine spacing.
Turbine 33	No change.
Turbine 34	Moved approximately 430 feet southeast, to increase setbacks from adjacent parcel.
Turbine 35	Moved approximately 309 feet southwest, to avoid wetland impacts.
Turbine 36	Moved approximately 500 feet southeast, for proper turbine spacing for the V126 turbine. Associated access road and collection line moved accordingly.
Turbine 37	Moved approximately 1,200-feet northwest for proper turbine spacing. Associated access road and collection lines moved accordingly.
Turbine 38	Turbine eliminated, for proper turbine spacing, for the V126 turbine and to avoid wetland impacts.
Southern Substation	Moved approximately 850 feet northwest, to minimize tree clearing and increase setback from residence.
Northern Substation/Switchyard	After extensive assessment of potential alternative locations, the original proposed location of Northern Substation was retained as optimal.
O & M Building	Location of the O&M Building will be finalized to avoid and/or minimize wetland impacts.
Note: Facilities located in the Town of Hanover are shaded.	

Laydown Areas

The Amended Application also calls for several areas to be used as laydown areas for WECS components or construction trailers, parking and equipment. See Figure 2. The size, location and nature of these areas are the same as was shown in the SDEIS.

Operations and Maintenance Building

The Amended Application includes a building to be constructed and used during operation of the Project as an operations and maintenance building. This location of this building is shown on Figure 2 and is essentially the same as was analyzed in the SDEIS.

Project Timeline

In 2008, Noble Ball Hill Windpark, LLC submitted applications to the Towns of Hanover and Villenova to develop, construct, own, operate and maintain the Noble Ball Hill Windpark project.

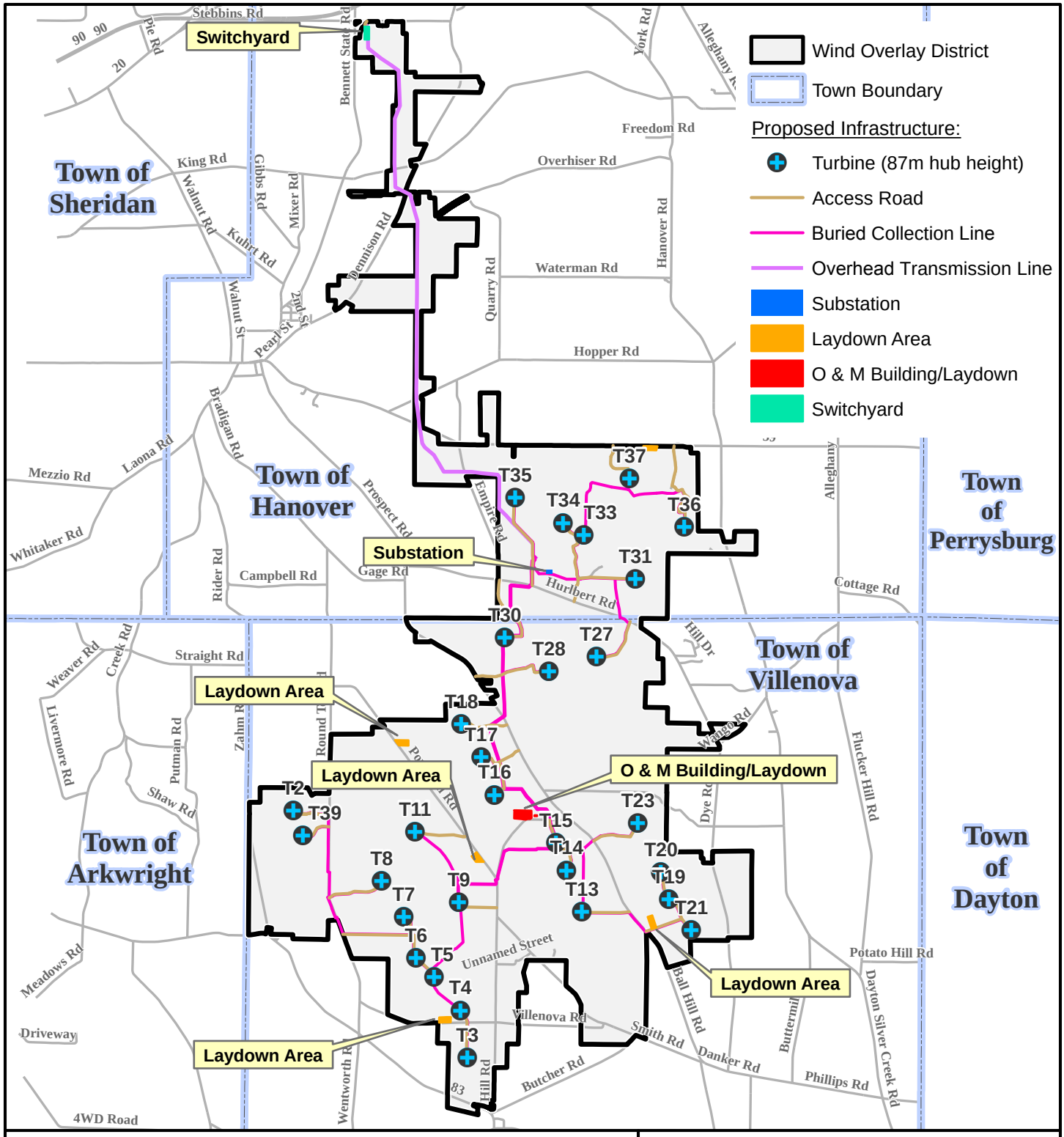
Upon receipt of the Noble application, the Town of Hanover Town Board ('Town Board") consented to Town of Villenova Town Board being designated as Lead Agency ("Lead Agency") pursuant to the State Environmental Quality Review Act (ECL Article 8 and its implementing regulations at 6 NYCRR Part

617) ("collectively SEQRA") for purposes of review of the project. The Lead Agency received, reviewed and accepted a Draft Environmental Impact Statement ("DEIS") as complete for purposes of commencing public review, distributed the DEIS to all involved agencies including the Town Board, opened a 45 day comment period and held a public hearing on the application and DEIS.

By Resolution dated October 28, 2015 the Lead Agency resolved to continue as Lead Agency for the continued development of the Project, that Ball Hill Wind Energy, LLC shall be recognized by the Lead Agency as the Applicant, and ordered preparation of a Supplemental Draft Environmental Impact Statement ("SDEIS") addressing a range of impacts related to the implementation of new turbine technology, the modification of the prior project layout and the passage of time. On January 18, 2016, the Applicant submitted an SDEIS to the Lead Agency, which was reviewed by the Town Board's consultants and accepted as complete for purposes of commencing public review, distributed the SDEIS to all involved agencies as required and opened a 45 day public comment period.

The Applicant presented the SDEIS at a Public Hearing in the Town of Villenova on March 2, 2016. During the 45 day public comment period, comments from the NYS Public Service Commission ("NYSPSC"), NYS Department of Environmental Conservation ("NYSDEC"), and members of the public were received.

After consideration of comments received on the SDEIS and in the course of optimizing Project design to avoid and/or minimize impacts, including impacts to wetlands, the Project was modified as set forth in this Amended Application. All impact studies associated with this revised design have been updated and have been submitted herewith or will be included in the Final Environmental Impact Study (FEIS).



Ball Hill Wind Energy Project

Figure 1: Project Facilities

Chautauqua County, New York

Renewable Energy Systems

powering change®

11101 W. 120th Ave., Suite 400 Broomfield, CO, 80021
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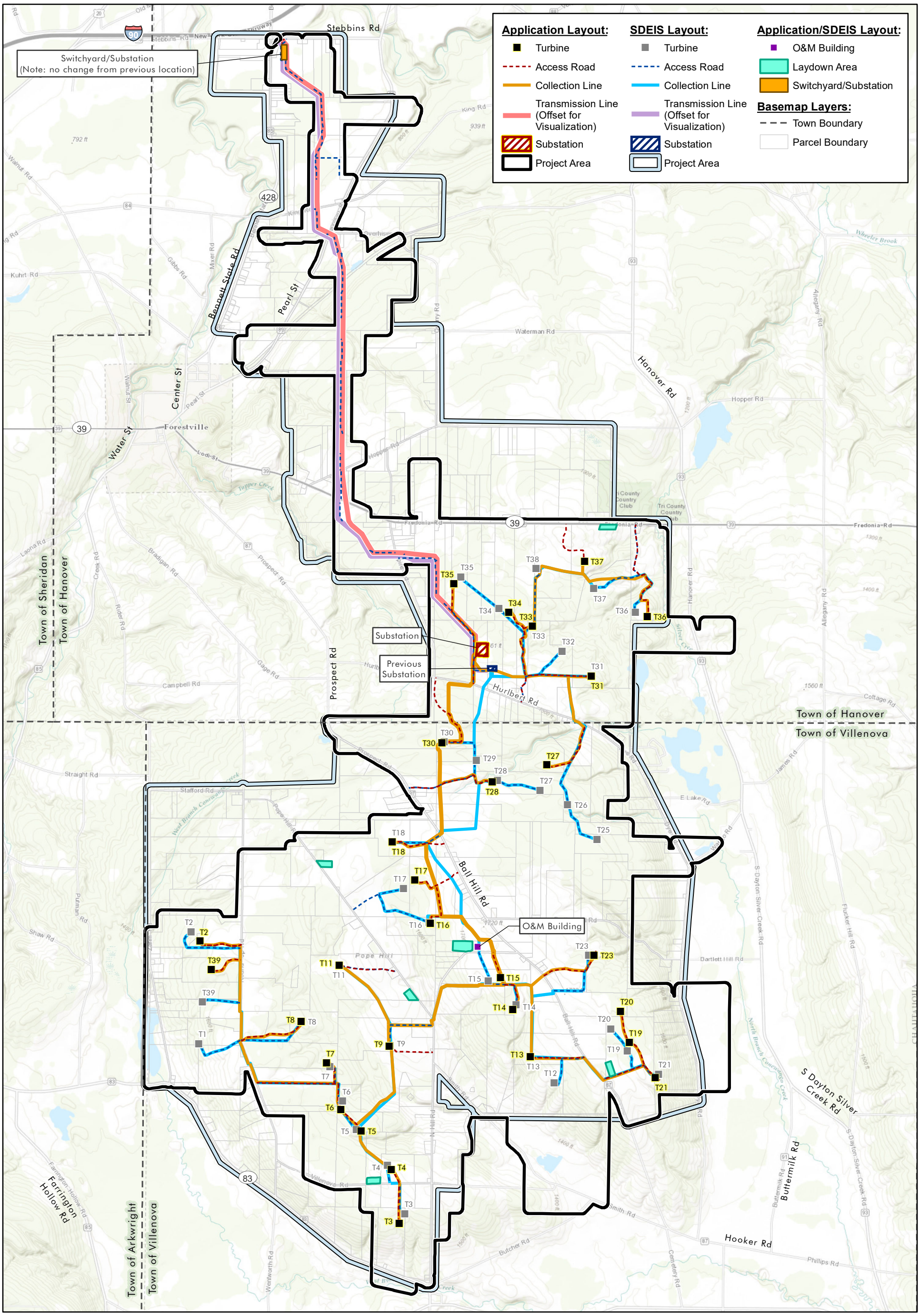

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Note: The actual substation footprint will be smaller than the area shaded on this figure, but within the boundary of the area shaded. Specific siting of the substation will be provided in the FEIS

Figure 2
Project Comparison
Application Layout (August 2016) SDEIS layout (January 2016)
Chautauqua County, New York
Ball Hill Wind Energy, LLC

0 0.25 0.5 1 Miles

A. Project Location and Description

A.1 Project Location

The portion of the Ball Hill Wind Energy Project to be constructed and operated in Hanover consists of six (6) WECS, associated buried electrical collection lines, a 115kV transmission line, an electrical collection substation and an interconnection substation. Figure 1 identifies the wind energy facilities in the town of Hanover. Figures 3 and 4 identify the location of the wind energy facilities with setback requirements from Article XVI of the Zoning Law and the proposed Wind Overlay Zoning District identified are presented in Section D. Table 2 identifies the properties and location coordinates of each proposed WECS in the Town of Hanover; the addresses of these properties are shown in Table 6 (see Section B.2 of this amended Application).

- Figure 1 identifies the Project's wind energy facilities in both the Towns of Hanover and Villenova;
- Table 2 on the following page identifies the properties and location coordinates of each proposed WECS in the Town of Hanover;
- Figures 3 and 4 identify the location of the WECS and the applicable setback requirements set forth in Article XVI of the Hanover Zoning Law and are located in Section D of this Amended Application; and
- The proposed boundary of the Wind Overlay Zoning District encompassing the Project's wind energy facilities is identified on Figures 3 and 4 and located in Section D of this Amended Application.

Table 2: Property Identification, Location Coordinates, and Elevation of Each Turbine				
WECS ID	**Tax Map ID**	**Latitude**	**Longitude**	**Elevation (feet)**
T31	118.00-1-38	79° 06' 39.8460" W	42° 26' 26.8178" N	1,510
T33	118.00-1-41	79° 07' 12.2458" W	42° 26' 46.9644" N	1,491
T34	118.00-1-8	79° 07' 25.2089" W	42° 26' 52.6233" N	1,492
T35	118.00-1-4	79° 07' 55.3796" W	42° 27' 04.0738" N	1,441
T36	118.00-1-37	79° 06' 09.3936" W	42° 26' 51.0842" N	1,373
T37	118.00-1-11	79° 06' 43.9175" W	42° 27' 13.4079" N	1,386

A.2 Project Description

Please refer to the detailed description of the Project in the Executive Summary above.

B. Applicant and Property Owner Information

B.1. Applicant Information

Ball Hill Wind Energy, LLC.
1101 W. 120th Ave., Suite 400
Broomfield, CO 80021
(303) 439-4200

Daniel P. Boyd, Senior Director, Project Development,
Renewable Energy Systems, Americas
455 Boston Post Road, Suite 206
Old Saybrook, CT 06475
(860) 661-3818

RES Experience and Qualifications

Project Development Experience
The RES Development Team has extensive experience developing utility scale renewable energy projects in the US, including the northeast (See information below). RES has extensive knowledge and experience in the integral services required to develop utility-scale wind, solar, and energy storage projects. The RES development team has developed over 3,300 MW of renewable energy and energy storage projects across North America.

Top North American Developer
RES is proud to have been ranked the top development company in North America by IHS Inc., an industry-standard information and analytics organization. In 2014 RES developed and contracted close to 1,300 MW of renewable energy projects.

Developer ranking by capacity contracted

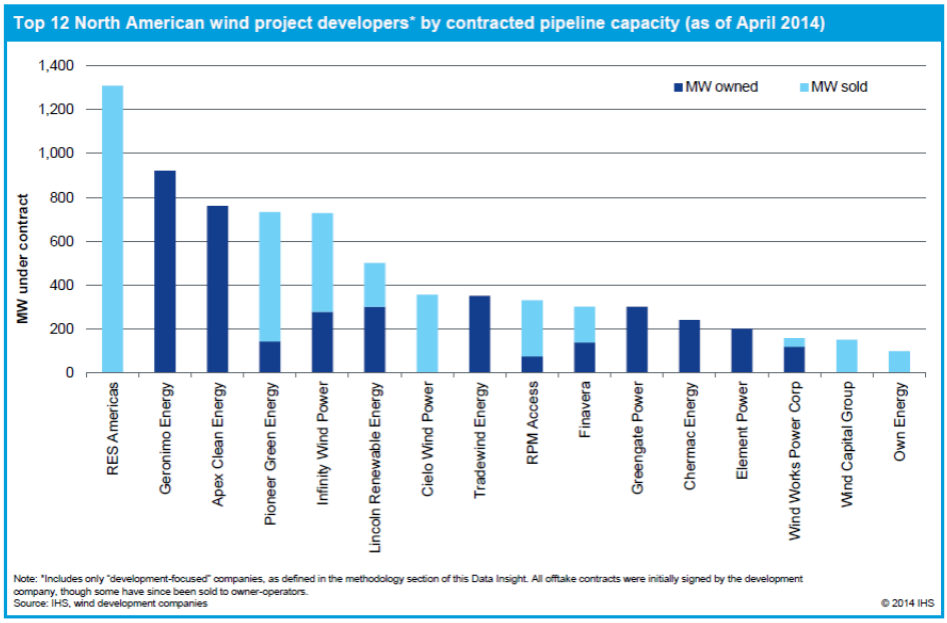

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Table 3 showcases the complete RES portfolio of North American wind, solar, energy storage, and transmission line projects developed since 2010 and constructed or under construction.

Table 3: RES Americas Developed and/or Constructed Renewable Energy Projects since 2010

Projects	MW	EPC	Dev	BOP BOS	Technology	Owner	Year	State/ Country
Flat Water Wind	60			X	GE	Gestamp and Banco Santander, SA	2010	NE and KS
Dunlap Wind	111			X	GE SLE	PacifiCorp	2010	WY
SNEEC Wind	4			X	REpower MN92	Technocentre eolien Gaspesie	2010	Canada
Hatchet Ridge Wind	101		X	X	Siemens	Pattern Energy	2010	CA
Talbot Wind	99	X	X		Siemens	Enbridge	2010	Canada
Crossroads Wind	227		X	X	Siemens	OG&E	2011	OK
Greenwich Wind	99	X	X		Siemens	Enbridge	2011	Canada
Webberville Solar	30			X	Trina Solar	SunEdison	2011	TX
Blue Canyon VI Wind	99			X	Vestas	Horizon	2011	OK
Cedar Point Wind	250	X	X		Vestas V90	Enbridge	2011	CO
Gaines Cavern Wind	2			X	Gamesa	TX Dispatchable Wind 1	2012	TX
NREL - Gamesa	2			X	Gamesa G97 Class IIIA	NREL	2012	CO
Mehoopany Wind	140			X	GE	BP Wind Energy	2012	PA
Harbor Wind	9			X	Guodian United Pwr	Revolution Energy	2012	TX
Rutley Solar (BOS)	10			X	MEMC/ SunEdison	SunEdison	2012	Canada
Twin Ridges Wind	140			X	REpower MM 92	Everpower	2012	PA
Lower Snake River Wind	343		X	X	Siemens	Puget Sound Energy	2012	WA
Wildcat Wind	27			X	Suzlon S97	Exelon	2012	NM
Brooke-Alvinston Wind	10			X	Samsung	One World Energy	2012	Canada
Halkirk Wind 1	150			X	Vestas V90	Capital Power	2012	Canada
Buffalo Dunes Wind	250			X	GE	Tradewind	2013	KS
Norfolk Solar	10			X	SunEdison	SunEdison	2013	Canada
MATL Transmission (214 miles OHL)						Enbridge	2013	US & Canada
Alamo 1 Solar	41			X	Yingli	OCI	2013	TX
South Kent Wind	270			X	Siemens	SRE SKW EPC L.P.	2014	Canada
Demorestville Solar	10			X	Canadian Solar	Canadian Solar	2014	Canada

Table 3: RES Americas Developed and/or Constructed Renewable Energy Projects since 2010								
Projects	**MW**	**EPC**	**Dev**	**BOP BOS**	**Technology**	**Owner**	**Year**	**State/ Country**
Taylor Kidd Solar	10			X	Canadian Solar	Canadian Solar	2014	Canada
Newboro 1 Solar	10			X	SunEdison	SunEdison	2014	Canada
Newboro 4 Solar	10			X	SunEdison	SunEdison	2014	Canada
Mighty Solar	10			X	Canadian Solar	Canadian Solar	2014	Canada
Battery Utility of Ohio Energy Storage	4		X	X	Lithium Iron Phosphate	RES Americas	2014	OH
Amphora Ontario Energy Storage	4		X	X	Lithium Iron Phosphate	RES Americas	2014	Canada
Origin Wind	150		X	X	Vestas	Enel Green Power	2014	OK
Tucannon River Wind	267		X	X	Siemens	PGE	2014	WA
Keechi Wind	110		X	X	Vestas	Enbridge	2015	TX
GoldLight Solar	10			X	Canadian Solar	Canadian Solar	2015	Canada
Longhorn Wind	200		X	X	Vestas	EDF	2015	TX
Pleasant Valley Wind*	200		X	X	Vestas	Xcel Energy	2015	MN
Border Winds*	150		X	X	Vestas	Xcel Energy	2015	ND
Glacier Battery Storage Project*	2	X			Lithium ion	Puget Sound Energy	2015	WA
Goodwell Wind*	200			X	Vestas V100 and V110	Enel Green Power	2015	OK
Jake Energy Storage	19.8	X			Lithium ion	RES Americas	2015	IL
Elwood Energy Storage Center	19.8	X			Lithium ion	RES Americas	2015	IL
Grand Valley 3 Wind*	39.7			X	Siemens	Grand Valley 2 Limited Partnership	2015	Canada
Little Elk Wind*	74			X	Vestas V110	Enel Green Power	2015	OK
Willey Battery Storage Center*	6			X	Lithium Ion (Toshiba)		2015	OH
McHenry Battery Storage*	19.8	X			Lithium Iron Phosphate	Puget Sound Energy	2016	IL
Arbuckle Mountain (Rose Rock) Wind*	100			X	Vestas V110	Arbuckle Mountain Wind Farm LLC	2016	OK
Comanche Solar*	120			X	Trina	SunEdison	2016	CO
* Under Construction								

RES offers a robust and wide range of engineering, construction, and management services. To deliver these services, RES deploys proven field teams with an extensive background in successfully completing complex projects in diverse regions under the most challenging geophysical and climatological conditions. The ability to deliver such projects on time and within budget is a core strength of the company.

RES in North America has utilized these capabilities to create a portfolio of utility-scale wind, solar, energy storage, and transmission line projects that exceeds 8,000 MW, includes over 80 projects, and over 650 miles of collection and transmission lines. The company's efforts are responsible for approximately 10% of the operational output of wind farms in the United States.

System Design Experience

RES Integrated Services
RES and affiliates have dedicated professionals that offer in-house expertise ensuring our projects are engineered for maximum efficiency, transition smoothly from one phase to the next, and are completed on time and within budget. We specialize in the following services.

Development Services
We offer a fully integrated set of development capabilities to ensure the success of any wind, solar, energy storage, or transmission project from greenfield development to operations. Our in-house expertise spans resource analysis, assistance with all aspects of land acquisition/permitting, site design, engineering, procurement, and construction.

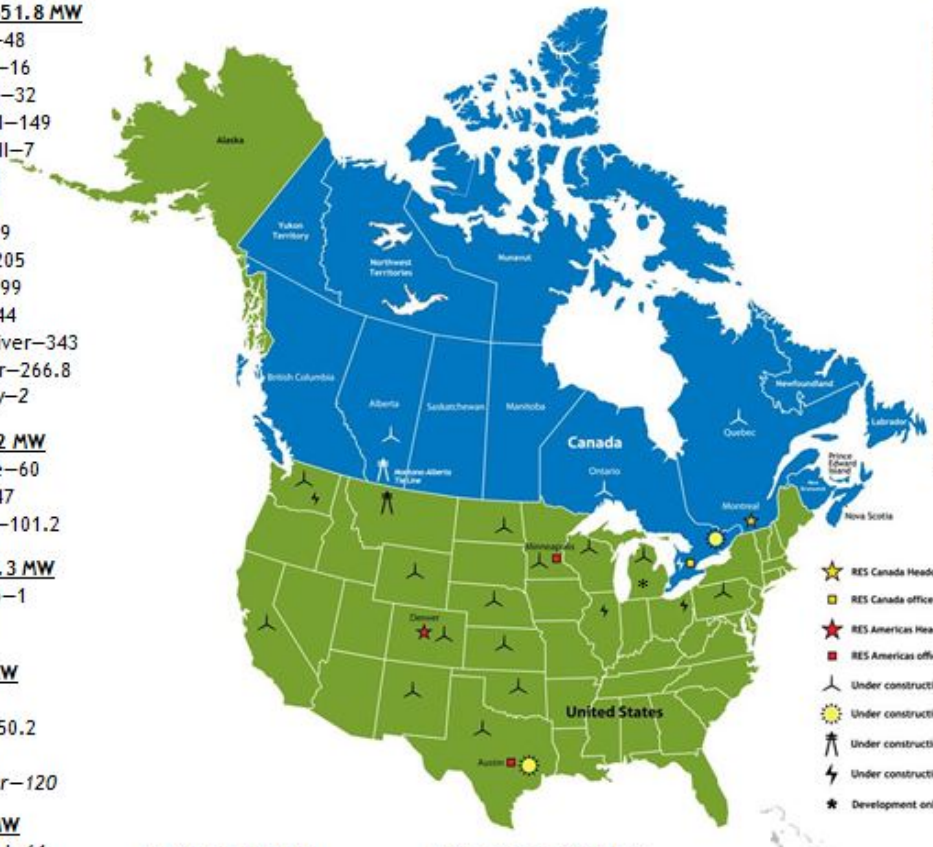
Engineering Services
RES projects are engineered and constructed to last. Our experienced civil, electrical, and mechanical engineering teams offer the benefits of comprehensive expertise. Close coordination across teams allows us to work on engineering and construction concurrently so projects are up and running quickly and function smoothly. Our engineering capabilities include foundation design, geotechnical engineering, civil work, and electrical collection and grounding system design.

Construction Services
RES is expert in renewable energy, energy storage, and transmission line construction. Our in-house resources enable us to cost-effectively manage all aspects of a project from establishing a budget and schedule to final testing and commissioning. We also self-perform several processes including civil works, medium voltage (MV) collector system construction, wind turbine erection and solar pv facility installation. RES has constructed 74 renewable energy projects.

Operations and Maintenance Services
RES operations and maintenance (O&M) services use fleet-wide performance monitoring as well as central engineering and design teams to maximize availability, minimize lost production, and ensure safety and environmental compliance.

RES and affiliates operate in the renewable energy market, primarily in North America. Our staff collaborates to manage all aspects of development, construction, and maintenance of utility-scale wind, solar, energy storage, and transmission line projects. RES also manages engagements with utilities, municipalities, and landowners, as required.

The project map below includes a complete list of RES technology projects and locations.
RES Project Map



Washington—1,651.8 MW
- Nine Canyon I—48
- Nine Canyon II—16
- Nine Canyon III—32
- Hopkins Ridge I—149
- Hopkins Ridge II—7
- Marengo I—140
- Marengo II—71
- Wild Horse—229
- White Creek—205
- Harvest Wind—99
- Wild Horse II—44
- Lower Snake River—343
- Tucannon River—266.8
- *Glacier Battery—2*

California—208.2 MW
- Cameron Ridge—60
- Pacific Crest—47
- Hatchet Ridge—101.2

New Mexico—28.3 MW
- Llano Estacado—1
- Wildcat—27.3

Colorado—376 MW
- NREL—3.8
- Cedar Point—250.2
- NREL II—2
- *Comanche Solar—120*

Wyoming—380 MW
- Mountain Wind I—61
- Mountain Wind II—80
- High Plains—99
- McFadden Ridge I—29
- Dunlap—111

Montana—214 miles OHL
- MATL—214 miles

Nebraska—119 MW
- Ainsworth—59
- Flat Water—60

Kansas—349 MW
- Central Plains—99
- Buffalo Dunes—250

Oklahoma- 850.5
- Crossroads—227.5
- Blue Canyon VI—99
- Origin—150
- *Goodwell—200*
- *Little Elk—74*
- *Arbuckle Mountain—100*

Texas—2,469 MW
- Woodward Mountain—160
- King Mountain—278
- Sweetwater II—92
- Sweetwater IV(b)—106
- Sweetwater V—81
- Whirlwind—60
- Lone Star—400
- Hackberry—166
- South Trent Mesa—101
- Buffalo Gap III—170
- Bull Creek—180
- Gulf Wind—283
- Webberville Solar—30
- Harbor Wind—9
- Gaines Cavern—2
- Alamo I Solar—41
- Keechi—110
- Longhorn—200

North Dakota—150 MW
- *Border Winds—150*

Minnesota—200 MW
- *Pleasant Valley—200*

Wisconsin — 54 MW
- Butler Ridge—54

Ohio — 10 MW
- Ohio Battery—4 (storage)
- *Willey—6 (storage)*

Pennsylvania — 381.2 MW
- Armenia Mountain—101
- Mehoopany—140.8
- Twin Ridges—139.4

Illinois—59.4 MW
- *Jake (storage)—19.8*
- *Elwood (storage)—19.8*
- *Energy Storage Project—19.8*

Canada-755.2 MW
- SNEEC—4.1
- Talbot—99
- Greenwich—99
- Halkirk I—149.4
- Rutley Solar—10
- Brooke-Alvinston—10
- Norfolk Solar—10
- South Kent—270
- Demorestville Solar—10
- Amphora—4 (storage)
- Mighty Solar—10
- Taylor Kidd Solar—10
- Newboro 1 Solar—10
- Newboro 4 Solar—10
- GoldLight Solar—10
- *Grand Valley 3—39.7*

Jamaica—21 MW
- Wigton—21

res powering change®

Projects under Construction are *italicized*

Project Financing Experience

RES proposes to finance the Project with a combination of debt, tax equity, and sponsor equity capital, in order to minimize total capital costs. As with all its previous projects, RES has the means to internally fund 100% of all costs to achieve a financial closing/construction notice-to-proceed date, and will not seek third party financing during the development stage. However, in order to fully utilize available tax incentives we plan to seek third-party debt and equity funding for project construction and operations, and the pricing presented herein assumes the participation of such third-party finance participation at reasonable market rates.

RES has demonstrated over the years that it has the financial resources to complete 5 GW of successful projects through a combination of internal and external financing (see Table 4).

Table 4: RES Americas Contracts with Utilities and C&Is

Company	Project	MW	RES Role
Southern California Edison	Cameron Ridge	60	Developer and BOP Constructor
Public Service Company of Colorado (PSCo), an Xcel Energy	Cedar Point	250.2	Developer & EPC Contractor
Hydro One	Greenwich	99	Developer & EPC Contractor
Austin Energy	Hackberry	166	Developer, EPC Contractor & Owner
Reliant Energy, Austin Energy & TNMP	King Mountain	278	Developer & EPC Contractor
TXU Energy	Lone Star - Mesquite	200	Developer and BOP Constructor
TXU Energy	Lone Star - Post Oak	200	Developer and BOP Constructor
Hydro One	Talbot	99	Developer & EPC Contractor
Austin Energy	Whirlwind	60	Developer, EPC Contractor & Owner
TXU Energy	Woodward Mountain	160	Developer and BOP Constructor
Arkansas Electric Co-op	Origin Wind	150	Developer, BOP Contractor
Wolverine Power Cooperative	Deerfield Wind	149	Developer
Microsoft	Keechi Wind	110	Developer, EPC Contractor

RES Americas has extensive experience developing and constructing projects which utilize tax and cash equity funding structures. RES developed and presently owns and operates multiple projects which utilize this type of financing structure. The following list identifies examples:

Hackberry Wind Farm in Albany, Texas is comprised of 166 MW of wind power. Hackberry Wind Farm was constructed January through December of 2008. The project is structured as a levered tax equity structure, whereby there are project finance lenders, tax equity, and cash equity (RES).
Whirlwind Energy Center in Floydada, Texas is comprised of 60 MW of wind power. Whirlwind Energy Center was constructed March through December of 2007. The project is structured as a levered tax equity structure, whereby there are project finance lenders, tax equity, and cash equity (RES).

Webberville Solar, Webberville, TX is a 30 MWAC Photovoltaic project. Webberville Solar was constructed May 2011 to December 2011. Project was constructed under an EPC contract with the project owner. RES is also providing five years of O&M services for the project. As the EPC contractor, RES' reputation and creditworthiness allowed the project owner to secure financing on favorable terms.

Power Purchase Agreement Experience
A large percentage of RES' more than 3,300 MWs of self-developed projects are operating under power purchase agreements (PPAs). Customers under these PPAs include conventional utilities and power cooperatives, as well as commercial and industrial counterparties.

As shown by the table of projects above, RES has been successful in developing, financing, and constructing many projects. RES has approximately $550 million in net assets and over $1 billion in total assets. These resources coupled with RES' project finance experience provide the security to ensure the Project has access to the resources required to assure successful financing, construction, and operation of the Project.

Operations and Maintenance Experience
RES Americas' operations team provides asset management and O&M services for utility scale solar, wind, and energy storage facilities. Operations are managed by an on-site O&M team and an off-site management team at RES' headquarters in Broomfield, CO. RES' in-house management team develops performance tools, databases, and software capabilities to efficiently manage the site.

These resources help RES proactively plan for scheduled and unscheduled maintenance. When unexpected events arise, the three teams work together towards a quick resolution. The daily, weekly, and monthly reporting infrastructure is well developed and allows for consistent insight into site operations.

RES's management focuses on improving key metrics such as time and energy availability resulting in a measurable increase in site production.

Goals of the O&M team include:

- Maximize facility availability
- Minimize lost production
- Operate the project without causing harm or injury to anyone and in full compliance with all relevant health and safety regulations
- Operate the solar farm in compliance with environmental standards
- Manage construction, commissioning, interconnect, and COD process
- Manage operating costs within the approved budget while ensuring maximum value for the money

RES has 225 total months (21.25 years) of O&M experience (see Table 5):

Table 5: Operations & Maintenance Experience			
Plant	**MW**	**Type**	**Months of Operation**
Webberville Solar	30	PV	46
Cedar Point	250	Wind	26
Hackberry	166	Wind	72
Whirlwind	60	Wind	84
Greenwich	99	Wind	12
Talbot*	99	Wind	15
Total	**704**		**255**
**RES no longer operates Talbot*			

RES has maintained and exceeded contractual expectations reaching availability percentages above 99%. RES has developed a robust supervisory control and data acquisition (SCADA) communications and control platform which has been used at our renewable energy projects in the U.S., Canada, and Europe. It is currently deployed **on** wind, solar, and energy storage projects. The RES SCADA platform allows us to monitor remotely all aspects of system performance and troubleshoot O&M issues.

B.2. Property Owner Information

The lease agreements between the Applicant and each landowner provide the permission necessary for the Applicant to, among other things, apply for the necessary permits and approvals for the Ball Hill Wind Energy Project. Copies of all Memoranda of Lease ("MOLs") between the Applicant and landowners relevant to the placement of WECS, access roads or other wind energy facilities or to allow for compliance with setback requirements are enclosed electronically as part of Appendix B. There are no WECS located within 1200' of any residence in this Amended Application.

Table 6 includes the name and address of each landowner.

Table 6: Property Owner Information

Tax ID	Property Owner	Mailing Address				Property Location		Status
		Street Address	City	State	Zip Code	Road	Town	
100.00-1-27	Carol Gage c/o Patricia Hawkins Charles Gage Cathey Bock Nancy Smith Robert Gage	4990 Van Buren Rd 675 Route 39 10123 Hanover Rd 16 Parkside St. 1065 Butcher Rd	Dunkirk Forestville Forestville Mayville South Dayton	NY	14048 14062 14062 14757 14138	Route 39	Hanover	MOL
100.00-1-39	Kenneth & Audrey Van Volkenburg	124 Chestnut Lane	Angola	NY	14006	Route 39	Hanover	MOOA
100.00-1-65.1	Randall L. and Denise L. Feinen	1265 Route 39	Forestville	NY	14062	Route 39	Hanover	MOL
100.00-1-69	Steven J Bowman	10349 Empire Rd	Forestville	NY	14062	Empire Rd	Hanover	MOL
100.00-1-8	Michael B. & Amy L. Johnson	1266 Hopper Road	Forestville	NY	14062	Hopper Rd	Hanover	Negotiating
117.00-2-10	Brett Pedrico c/o Loretta Pedrico	25232 Poderio Dr	Ramona	CA	92065	Empire Rd	Hanover	MOL
117.00-2-44	James Jr. & Shelly Brennan	10329 Empire Rd	Forestville	NY	14062	Empire Rd	Hanover	MOL
117.00-2-45	Frederick & Joyce Herold	PO Box 171	Angola	NY	14006	Empire Rd	Hanover	Negotiating
117.00-2-6	Reid Valentine	917 Route 39	Forestville	NY	14062	Route 39	Hanover	MOL
118.00-1-1	David & Lois Valentine	917 Route 39	Forestville	NY	14062	Route 39	Hanover	MOL
118.00-1-10	Charles Gage Cathey Bock Nancy Smith Robert Gage	675 Route 39 10123 Hanover Rd 16 Parkside St. 1065 Butcher Rd	Forestville Forestville Mayville South Dayton	NY	14062 14062 14757 14138	Route 39	Hanover	MOL
118.00-1-11	Carol Gage c/o Patricia Hawkins Charles Gage Cathey Bock Nancy Smith Robert Gage	4990 Van Buren Rd 675 Route 39 10123 Hanover Rd 16 Parkside St. 1065 Butcher Rd	Dunkirk Forestville Forestville Mayville South Dayton	NY	14048 14062 14062 14757 14138	Route 39	Hanover	MOL
118.00-1-12	Richard Brunea c/o Jeffery Brunea	515 Route 39	Forestville	NY	14062	Route 39	Hanover	Negotiating
118.00-1-24	James M. Bock	10123 Hanover Rd	Forestville	NY	14062	Hanover Rd	Hanover	MOL
118.00-1-3	Michael and Becky Weaver	855 Route 39	Forestville	NY	14062	Route 39	Hanover	MOL Processing
118.00-1-32	James M. Bock	10123 Hanover Rd	Forestville	NY	14062	Hanover Rd	Hanover	MOL
Tax ID	**Property Owner**	**Mailing Address**				**Property Location**		**Status**

Table 6: Property Owner Information

Tax ID	Property Owner	Mailing Address				Property Location		Status
		Street Address	City	State	Zip Code	Road	Town	
118.00-1-37	Richard Brunea c/o Jeffery Brunea	515 Route 39	Forestville	NY	14062	Route 39	Hanover	Negotiating
118.00-1-38	Richard Brunea c/o Jeffery Brunea	515 Route 39	Forestville	NY	14062	Route 39	Hanover	Negotiating
118.00-1-39	Douglas & Barbara Bunker	775 Hurlbert Rd	Forestville	NY	14062	Hurlbert Rd	Hanover	MOL
118.00-1-4	Larry Owczarczak Jere Hoisington	8260 West Point Dr PO Box 28	Amherst Farnham	NY	14051 14061	Route 39	Hanover	MOL
118.00-1-40	Douglas & Barbara Bunker	775 Hurlbert Rd	Forestville	NY	14062	Hurlbert Rd	Hanover	MOL
118.00-1-41	Douglas & Barbara Bunker	775 Hurlbert Rd	Forestville	NY	14062	Hurlbert Rd	Hanover	MOL
118.00-1-42	Douglas & Barbara Bunker	775 Hurlbert Rd	Forestville	NY	14062	Hurlbert Rd	Hanover	MOL
118.00-1-44	Douglas & Barbara Bunker	775 Hurlbert Rd	Forestville	NY	14062	Hurlbert Rd	Hanover	MOL
118.00-1-45	Douglas & Barbara Bunker	775 Hurlbert Rd	Forestville	NY	14062	Hurlbert Rd	Hanover	MOL
118.00-1-46	Douglas & Barbara Bunker	775 Hurlbert Rd	Forestville	NY	14062	Hurlbert Rd	Hanover	MOL
118.00-1-47	Douglas & Barbara Bunker	775 Hurlbert Rd	Forestville	NY	14062	Hurlbert Rd	Hanover	MOL
118.00-1-51	Douglas & Barbara Bunker	775 Hurlbert Rd	Forestville	NY	14062	Hurlbert Rd	Hanover	MOL
118.00-1-52	Douglas & Barbara Bunker	775 Hurlbert Rd	Forestville	NY	14062	Hurlbert Rd	Hanover	MOL
118.00-1-53	David & Lois Valentine	917 Route 39	Forestville	NY	14062	Route 39	Hanover	MOL
118.00-1-54	Michael T Perry	10169 Empire Rd	Forestville	NY	14062	Hurlbert Rd	Hanover	MOL Processing
118.00-1-55	Ball Hill Camp Corporation Attn: Harry Watkins	72 North Lane	Angola	NY	14006	Hurlbert Rd	Hanover	Negotiating
118.00-1-8	Gregory Golembieski Frederick N. Golembieski	PO Box 885 16 Hanover Street	Wilmington Silver Creek	NC NY	28402 14136	Fredonia Rd	Hanover	Negotiating
118.00-1-9	Carol Gage c/o Patricia Hawkins	4990 Van Buren Rd	Dunkirk	NY	14048	Route 39	Hanover	MOL
135.00-2-2	Benjamin & Heather Westlund	12601 Wardtown Rd	Perrysburg	NY	14129	Dye Rd	Hanover	MOL
135.00-2-47	Benjamin & Heather Westlund	12601 Wardtown Rd	Perrysburg	NY	14129	Dye Rd	Hanover	MOL
66.00-2-12	Edward & Patricia Einhouse	5552-3 Center Pointe Blvd	Canandaiqua	NY	14424	Stebbins Rd	Hanover	MOL
66.00-2-13	Harold & Patricia Johnson	1358 Stebbins Rd	Silver Creek	NY	14136	Stebbins Rd	Hanover	MOL
66.00-2-14	Fred W. Bistrisky	1349 Stebbins Road	Silver Creek	NY	14136	Stebbins Rd	Hanover	Negotiating
66.00-2-44	Merritt T Moore II	11419 Dennison Rd	Silver Creek	NY	14136	Dennison Rd	Hanover	Negotiating

Table 6: Property Owner Information

Tax ID	Property Owner	Mailing Address				Property Location		Status
		Street Address	City	State	Zip Code	Road	Town	
66.00-2-45.1	Miles Sr. & Susan Anthony	11515 Dennison Rd	Silver Creek	NY	14136	Dennison Rd	Hanover	MOL
66.00-2-9	Robert Thompson	PO Box 302	Silver Creek	NY	14136	Bennett State Rd	Hanover	Negotiating
83.00-1-31.1	Double A Vineyards Land Holdings LLC Attn: Dennis Rak	10277 Christy Rd	Fredonia	NY	14063	King Rd	Hanover	MOL
83.00-3-14.1	Quinn Eddy-Kaye	10966 Dennison Rd	Forestville	NY	14062	Dennison Rd	Hanover	MOL
83.00-3-4	Double A Vineyards Land Holdings LLC Attn: Dennis Rak	10277 Christy Rd	Fredonia	NY	14063	King Rd	Hanover	MOL
83.00-3-5	National Fuel	6363 Main St.	Williamsville	NY	14221	Dennison Rd	Hanover	Negotiating
83.00-4-1	Sharon Lord	1468 Route 39	Forestville	NY	14062	Dennison Rd	Hanover	MOL
83.00-4-12	Valerie Robinson Jacquelyn Kerstetter	1273 Overhiser Rd 1275 Overhiser Rd	Forestville	NY	14062	Overhiser Rd	Hanover	MOL
84.00-1-55.2	Olsen & Sons Contractors, Inc.	1275 Overhiser Rd	Forestville	NY	14062	Overhiser Rd	Hanover	Negotiating

C. Property Owners within 1,500 feet of the Property Lines where Development is Proposed

Table 7, presented on the follow page, identifies the name and mailing address of all owners of record either within the proposed Wind Overlay Zoning District, abutting the district or within fifteen hundred (1,500) feet of the district.

In addition, the Applicant submits the attached Agricultural Data Statement (see Appendix C) as the Project is located in two Chautauqua County Agricultural Districts: District 5 (CHAT005) and District 10 (CHAT010). The Applicant will provide a copy of the agricultural data statement to all property owners in the Project Area who are located within one of these agricultural districts and/or within 500 feet of one of the agricultural districts together with the required notices for the public hearing to be held on the Amended Application.

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	LastName	FirstName	Address No	AddressStr	Street Type	Address Mun	Address State	Address Zip
83.00-3-28	Abram	Matthew	11032	Bennett St	Rd	Forestville	NY	14062
100.00-1-6	Aguglia	Brenda	10928	Dennison	Rd	Forestville	NY	14062
66.00-2-40; 66.00-2-50; 66.00-2-45.1	Anthony	Miles	11515	Dennison	Rd	Silver Creek	NY	14136
83.00-1-29.2; 83.00-1-30.2	Askin	R	1396	King	Rd	Silver Creek	NY	14136
100.05-1-27	Audrey P Spencer Living Trust		7	Swan	St	Forestville	NY	14062
66.00-2-17	Babcock	John	1329	Stebbins	Rd	Silver Creek	NY	14136
83.00-2-29.1; 83.00-3-21; 100.05-2-9.1	Bailey	Sherman	11	Third	St	Forestville	NY	14062
83.00-2-27	Bailey Manufacturing Co LLC		10987	Bennett State	Rd	Forestville	NY	14062
66.00-1-50	Bain	Steven	1524	Stebbins	Rd	Silver Creek	NY	14136
83.00-1-17	Baker	Nancy	11416	Bennett State	Rd	Silver Creek	Ny	14136
83.00-3-35	Ball	David	11084	Bennett St	Rd	Forestville	NY	14062
118.00-1-55	Ball Hill Camp Corp		72	North	Ln	Angola	NY	14006
117.00-2-2; 117.00-2-3	Barney	Marshall	927	Rt 39		Forestville	NY	14062
66.00-2-65	Barylski	Richard	11448	Bennett State	Rd	Silver Creek	NY	14136
83.00-3-32; 83.00-3-30	Battaglia	Michael	11052	Bennett State	Rd	Forestville	NY	14062
67.00-2-62	Beaman	Paul	889	King	Rd	Forestville	NY	14062
83.00-1-54	Becker	John	12486	Cole	Rd	Perrysburg	NY	14129
83.00-2-6	Bell	Lucas	5	Burgess	St	Silver Creek	NY	14136
66.00-2-70.3; 66.00-2-68	Benchley Contracting & Rental Corp.		11437	Bennett State	Rd	Forestville	NY	14062
118.00-1-18.2	Bennett	Alan	469	Route 39		Forestville	NY	14062

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	LastName	FirstName	Address No	AddressStr	Street Type	Address Mun	Address State	Address Zip
118.00-1-18; 118.00-1-17	Bennett	Dana	469	Rt 39		Forestville	NY	14062
83.00-1-35	Bentzoni	Lois	11408	Dennison	Rd	Silver Creek	NY	14136
66.00-2-56	Bertsch	Wilma	11496	Bennett St	Rd	Silver Creek	NY	14136
66.00-2-41	Bifaro	Diana	950	King	Rd	Forestville	NY	14062
66.00-2-15; 66.00-2-16	Birdsey	Stephen	1339	Stebbins	Rd	Silver Creek	NY	14136
66.00-2-57; 66.00-2-58	Birner	Gregory	11494	Bennett State	Rd	Silver Creek	NY	14136
100.05-2-63	Bishoff	David	52	Pearl	St	Forestville	NY	14062
66.00-2-14	Bistrisky	Fred	1349	Stebbins	Rd	Silver Creek	NY	14136
101.00-2-25.1	Blocho	Garrett	10571	Hanover	Rd	Forestville	NY	14062
118.00-1-31; 118.00-1-32; 188.00-1-24; 118.00-1-26	Bock	James	10123	Hanover	Rd	Forestville	NY	14062
117.00-2-32	Borden	Donald	184	Fairmont	Ave	Lakewood	NY	14750
83.00-2-30; 117.00-2-19; 117.00-2-18	Botticello	Eric	10963	Bennett State	Rd	Forestville	NY	14062
100.00-1-69	Bowman	Steven	10349	Empire	Rd	Forestville	NY	14062
100.05-2-65	Bradigan	Benjamin	56	Pearl	St	Forestville	NY	14062
117.00-2-44	Brennan	James	10329	Empire	Rd	Forestville	NY	14062
100.00-1-14	Brightman	Kirk	1176	Hopper	Rd	Forestville	NY	14062
66.00-2-72	Brown	Kevin	11495	Bennett State	Rd	Silver Creek	NY	14136
83.00-1-11.1	Brozewich	Estate	9658	Prospect	Rd	Forestville	NY	14062
118.00-1-13	Brunea	Jeffrey	515	Rt 39		Forestville	NY	14062
118.00-1-37; 118.00-1-12;118.00-1-38	Brunea	Richard	515	Rt 39		Forestville	NY	14062
83.00-1-11.4	Buckreis	Catherine	11312	Bennett State	Rd	Silver Creek	NY	14136

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	LastName	FirstName	Address No	AddressStr	Street Type	Address Mun	Address State	Address Zip
118.00-1-45; 118.00-1-46; 118.00-1-47; 118.00-1-44; 118.00-1-42; 118.00-1-40; 118.00-1-41; 118.00-1-39; 118.001-51; 118.00-1-52	Bunker	Douglas	783	Hurlburt	Rd	Forestville	NY	14062
83.00-3-9	Bush	Douglas	11087	Dennison	Rd	Forestville	NY	14062
101.00-2-30	Carias	Randy	8641	Southwestern	Blvd	Angola	NY	14006
100.05-2-17	Carroll	David	61	Pearl	St	Forestville	NY	14062
100.00-1-22	Case	Derek	1121	Hopper	Rd	Forestville	NY	14062
66.00-2-75	Castle	Albert	10	Lake	Ave	Silver Creek	NY	14136
83.00-2-8	Catalano	Dominick	11171	Bennett State	Rd	Forestville	NY	14062
100.05-2-68	Catalano	Mark	3	Third	St	Forestville	NY	14062
66.00-1-32	Chew	Shannon	1306	Stebbins	Rd	Silver Creek	NY	14136
118.00-1-25	Cicero	Carla	854	Colvin	Blvd	Kenmore	NY	14217
117.00-2-26	Cinelli	Ronald	1171	Hurlbert	Rd	Forestville	NY	14062
83.00-1-19	Como	Rosario	11378	Bennett State	Rd	Silver Creek	NY	14136
83.00-2-28	Cornell	Kimberly	10979	Bennett State	Rd	Forestville	NY	14062
66.00-2-18	Corsaro	Michael	1317	Stebbins	Rd	Silver Creek	NY	14136
83.00-1-37	Costello	Alexander	4961	Brenner	Rd	Hamburg	NY	14075
83.00-1-11.2	Cotter	Donald	1186	Scarlata	Dr	Silver Creek	NY	14136
118.00-1-49	Cronkhite	Kevin	911	Hurlburt	RD	Forestville	NY	14062
117.00-2-39	Crowell	Elmer	10218	Prospect	Rd	Forestville	NY	14062
83.00-4-14	Cybulski	John	11027	Quarry	Dr	Forestville	NY	14062
100.00-1-33	Dailey	Forrest	10572	Empire	Rd	Forestville	NY	14262
83.00-1-53.2.2; 83.00-1-57	Daugherty	Maureen	1075	King	Rd	Forestville	NY	14062
117.00-2-50.2	Dayton	Scott	209	Robanna	DR	Seaford	VA	23696
66.00-1-37	Depasquale	Loreto	1390	Stebbins	Rd	Silver Creek	NY	14136

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	LastName	FirstName	Address No	AddressStr	Street Type	Address Mun	Address State	Address Zip
118.00-1-28	DiBiase Irrevocable Living Trust		9033	Reindeer Lake	St	Las Vegas	NV	89143
66.00-2-11; 66.00-2-10	Diefenbach	David	1373	Stebbins	Rd	Silver Creek	NY	14136
100.00-1-45	DiLorenzo	Elmer	1292	Hopper	Rd	Forestville	NY	14062
83.00-2-25.2; 83.00-2-26	Dolce	Jason	11003	Bennett State	Rd	Forestville	NY	14062
83.00-2-24; 100.05-2-10; 100.05-2-5; 83.00-3-25; 100.00-1-67; 83.00-3-26.1; 83.00-3-23; 83.00-2-25.1	Dolce	Joseph	11024	Bennett St	Rd	Forestville	NY	14062
83.00-1-53.2.1	Domenico	Edward	1069	King	Rd	Forestville	NY	14062
66.00-2-6	Doty Cemetery		1563	Stebbins	Rd	Forestville	NY	14062
66.00-1-56.1; 83.00-3-4; 83.11-1-31.1	Double A Vineyards Land Holdings LLC		10277	Christy	Rd	Fredonia	NY	14063
100.05-1-21	Dresser	Charles	10	Swan	St	Forestville	NY	14062
117.00-1-23	Duck	Paul	10035	Prospect	Rd	Forestville	NY	14062
100.00-1-10	Dugan	Jack	10659	Alleghany	Rd	Forestville	NY	14062
118.00-1-43	Duman	Richard	3038	Lakeview	Rd	Hamburg	NY	14075
84.00-1-1.1	Duran	Richard	6805	Tuscany	Ln	East Amherst	NY	14051
117.00-2-52	E.I. Holdings, Inc.		2413	Route 39		Forestville	NY	14062
83.00-1-43	Eacker	Richard	11392	Dennison	Rd	Silver Creek	NY	14136
118.00-1-29; 118.00-1-30	Eagan	Daniel	783	Hurlbert	Rd	Forestville	NY	14062
67.00-2-61	Ecker	Todd	865	King	Rd	Forestville	NY	14062
66.00-2-22	Einhouse	Beula	11615	Dennison	Rd	Silver Creek	NY	14136
83.00-1-52	Einhouse	Donald	11615	Dennison	Rd	Silver Creek	NY	14136
66.00-2-21; 66.00-2-20; 66.00-2-19; 66.00-2-12; 66.00-2-54	Einhouse	Edward	1297	Stebbins	Rd	Silver Creek	NY	14136

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	LastName	FirstName	Address No	AddressStr	Street Type	Address Mun	Address State	Address Zip
119.00-1-48; 118.00-1-21	Emke	Dwayne	351	Rt 39		Forestville	NY	14062
66.00-1-30	Engel	Louis	1290	Stebbins	Rd	Silver Creek	NY	14136
83.00-1-51	Erdle	Colin	11344	Dennison	Rd	Silver Creek	NY	14136
100.00-1-37.2	Ervolina	Michael	10513	Empire	Rd	Forestville	NY	14062
83.00-3-1	Esperson	Paul	11204	Bennet State	Rd	Forestville	NY	14062
83.00-4-25; 83.00-4-24; 83.00-4-23	Everhart	Todd	12466	Williston	Rd	Alden	NY	14004
83.00-3-3; 83.00-2-20; 83.00-2-17; 83.00-1-50.2; 83.00-28.1; 83.00-2-41; 83.00-2-39	Falcone Farms Inc		1804	King	Rd	Forestville	NY	14062
100.00-1-66	Faraci	Robert	1217	Route 39		Forestville	NY	14062
100.00-1-65.1	Feinen	Randall	1265	Rt 39		Forestville	NY	14062
100.00-1-30; 100.00-1-31;100.00-1-32	Ferneza	Michael	10508	Empire	Rd	Forestville	NY	14062
117.00-2-27	Ferry	Ronald	1199	Hurlburt	Rd	Forestville	NY	14062
118.00-1-7; 118.00-1-6	Fickelsherer	Paul	791	Rt 39		Forestville	NY	14062
66.00-1-33; 66.00-1-34	Fitzgibbons	William	1320	Stebbins	Rd	Silver Creek	NY	14136
83.00-1-24; 83.00-1-11.3	Frank	Lori	11318	Bennett State	Rd	Silver Creek	NY	14136
83.00-3-43	Franklin	Gerald	11144	Bennett St	Rd	Forestville	NY	14062
83.00-3-42	Franklin	John	55	Washington	St	Fredonia	NY	14063
83.00-4-26	Franklin	Leroy	11090	Dennison	Rd	Forestville	NY	14062
100.00-1-19.1	Frederickson	Elaine	45	Point Drive		Dunkirk	NY	14048
101.00-2-14	Frederickson	Keith	12249	Hanover	Rd	Silver Creek	NY	14136
100.05-2-7; 100.05-1-23	Frontuto	Paul	8	Third	St	Forestville	NY	14062
100.05-2-62	Frontuto	Robert	1	Third	St	Forestville	NY	14062
101.00-2-15	Frost	Jack	472	Rt 39		Forestville	NY	14062
118.00-1-11; 118.00-1-10; 100.00-1-27	Gage	Charles	10123	Hanover	Rd	Forestville	NY	14062

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	LastName	FirstName	Address No	AddressStr	Street Type	Address Mun	Address State	Address Zip
66.00-1-40; 66.00-1-39; 66.00-1-38	Gage	Donald	11810	Old Main	Rd	Silver Creek	NY	14136
118.00-1-9	Gage	Herbert	723	Rt 39		Forestville	NY	14062
100.00-1-71	Gajewski	Stephen	1443	Rt 39		East Amherst	NY	14051
83.00-4-5	Gardner	Debora	5280	William	St	Lancaster	NY	14086
83.00-1-25	Gaul	Kenneth	1456	King	Rd	Silver Creek	NY	14136
66.00-2-46; 66.00-2-47	Gens	Robert	2718	S Patton	Ct	Denver	CO	80236
83.00-1-47.2	Giardina	Donald	14	Grace	St	Buffalo	NY	14207
101.00-1-23.2	Gibson	Peter		PO Box 253		Irving	NY	14081
83.00-3-44.2	Gier	Louisa	11156	Bennett State	Rd	Forestville	NY	14062
118.00-1-8	Golembieski	Gregory	763	Rt 39		Hanover	NY	104062
118.00-1-23	Gould	Alan	10192	Hanover	Rd	Forestville	NY	14062
83.00-1-36	Gould	Brian	9	Elmleaf	Dr	Cheektowaga	NY	14227
83.00-1-38	Gould	Robert	S4224	Seabreeze	Ave	Hamburg	NY	14075
118.00-1-50	Graves	Jess	916	Hurlbert	Rd	Forestville	NY	14062
118.00-1-34	Gray	Charles	10355	Hanover Rd		Forestville	NY	14062
100.00-1-65.2	Griewisch	Erick	12	Madison	Ave	Silver Creek	NY	14136
100.00-1-49.1	Grisanti	Anthony	1413	Rt 39		Forestville	NY	14062
100.00-1-63; 100.00-1-49.3	Grisanti	Gary	1403	Rt 39		Forestville	NY	14062
100.00-1-48	Grisanti	Joann	1392	Hopper	Rd	Forestville	NY	14062
101.00-1-22.1; 101.00-1-21	Groll	David	808	Rt 39		Forestville	NY	14062
100.05-2-15	Grubb	Heather	58	Pearl	St	Forestville	NY	14062
119.00-1-42	Gruber	Michael	156	Rt 39		Forestville	NY	14062
118.00-1-36; 118.00-1-15	Gruber	Steven	10315	Alleghany	Rd	South Dayton	NY	14138
100.00-1-24; 100.00-1-23	Gutowski	James	287	Smith	St	Buffalo	NY	14210
100.00-1-68	Hadley	Shawn	10339	Empire	Rd	Forestville	NY	14062
100.05-2-66	Hadley	Susan	63	State	St	Seneca Falls	NY	13148

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	LastName	FirstName	Address No	AddressStr	Street Type	Address Mun	Address State	Address Zip
117.00-2-31; 117.00-2-30	Hagmier	Bruce	10056	Prospect	Rd	Forestville	NY	14062
117.00-2-13; 117.00-2-14; 117.00-2-46	Hahn	Jeffrey	10271	Empire	Rd	Hanover	NY	14126
83.00-1-13; 83.00-1-29.1; 83.00-1-30.1	Hall	Philip	11363	Bennett State	Rd	Silver Creek	NY	14136
100.00-1-25	Hamm	William	306	E Sterling	Ave	Angola	NY	14006
83.00-2-9	Hannah	William	11151	Bennett	Rd	Forestville	NY	14062
117.00-2-42	Hardy	Kenneth	10276	Prospect	Rd	Forestville	NY	14062
83.00-3-34	Hatt	Michael	11064	Bennett State	Rd	Forestville	NY	14062
117.00-2-45	Herold	Frederick		PO Box171		Angola	NY	14006
83.00-1-23	Hill	Donald	11334	Bennett State	RD	Silver Creek	NY	14136
101.00-1-19	Hodkin	Ian	27	Cedar	St	Forestville	NY	14062
118.00-1-4	Hoisington	Jere	570	Commercial	St	Farnham	NY	14061
66.00-2-53	Howard	Arthur	11575	Dennison	Rd	Silver Creek	NY	14136
100.00-1-41	Huch	David	1319	Hopper	Rd	Forestville	NY	14062
117.00-2-21	Imhoff LLC		1156	Hurlburt	Rd	Parsippany	NJ	07054
66.00-1-35; 66.00-1-36; 66.00-2-13	Johnson	Harold	1358	Stebbins	Rd	Silver Creek	NY	14136
100.09-2-18	Johnson	Jodi	63	Pearl	St	Forestville	NY	14062
100.00-1-8	Johnson	Michael	1266	Hopper	Rd	Hanover	NY	14062
83.00-1-18	Jopek	Leonard	11406	Bennett St	Rd	Silver Creek	NY	14136
101.00-1-22.2	Jung	Jacob	832	Rt 39		Forestville	NY	14062
100.00-1-15; 100.00-1-18	Kaczmarek	Edmund	1180	Hopper	Rd	Forestville	NY	14062
100.00-1-2; 100.00-1-3	Kaliko	Suzanne		PO Box 391		Forestville	NY	14062
83.00-4-15	Kaszuba	Leonard	333	Weimar	St	Buffalo	NY	14206
83.00-3-15; 83.00-3-14.1	Kaye	Quinn	10966	Dennison	Rd	Forestville	NY	14062
100.00-1-44	Keppel	Marjorie	1280	Hopper	Rd	Forestville	NY	14062
83.00-4-3	Kerstetter	Jacquelyn	1251	Overhiser	Rd	Forestville	NY	14062
83.00-4-12	Kerstetter	Jacquelyn	1275	Overhiser	Rd	Forestville	NY	14062
83.00-1-21; 83.00-1-22; 83.00-1-20	Kestler	Robert	11348	Bennett St	Rd	Silver Creek	NY	14136

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	LastName	FirstName	Address No	AddressStr	Street Type	Address Mun	Address State	Address Zip
66.00-2-37	Kibelsbeck	Frank	11626	Dennison	Rd	Silver Creek	NY	14136
66.00-2-49; 66.00-2-48	Kingsley	Richard	11511	Dennison	Rd	Silver Creek	NY	14136
84.00-2-1	Kirkland	Mark	11108	Quarry	Rd	Forestville	NY	14062
84.00-2-2.1; 83.00-4-6.1	Kirkland	Patricia	11115	Quarry	Rd	Forestville	NY	14062
66.00-2-52	Kleinfelder	Keith	11567	Dennison	Rd	Silver Creek	NY	14136
100.05-2-64	Kohler	Harlan	54	Pearl	St	Forestville	NY	14062
83.00-3-7.2; 83.00-3-8; 83.00-3-7.1	Kopin	Robert	11095	Dennison	Rd	Forestville	NY	14062
117.00-1-24	Kreger	Roger	10023	Prospect	Rd	Forestville	NY	14062
100.00-1-35	Kuziora	John	10565	Empire	Rd	Forestville	NY	14062
66.00-2-73; 66.00-2-74	Lahnen	Thomas	11507	Bennett St	Rd	Silver Creek	NY	14136
100.00-1-4	Leone	Cheryl	10908	Dennison Rd		Forestville	NY	14062
118.00-1-27	Leone	David	765	Concord	Ave	Drexel Hill	PA	19026
100.00-1-21	Lewellyn	Kathleen	1169	Hopper	Rd	Forestville	NY	14062
83.00-1-28.2; 83.00-1-26; 83.00-1-27	Lillie	David	1444	King	RD	Forestville	NY	14062
66.00-2-38	Lonski	Bryan	11560	Dennison	Rd	Hanover	NY	14136
100.00-1-50; 100.00-1-7; 83.00-4-1	Lord	Sharon	1468	Route 39		Forestville	NY	14062
101.00-2-29; 101.00-2-28	Lotz	Michael	640	Rt 39		Forestville	NY	14062
83.00-2-19	Lyndsley	Duane	11051	Bennett State	Rd	Forestville	NY	14062
66.00-2-7	Mays	Bradley	1531	Stebbins	Rd	Silver Creek	NY	14136
66.00-1-49	McDaneld	James	11731	Bennett	Rd	Silver Creek	NY	14136
119.00-1-41	Mescall	Benjamin	10151	Alleghany	Rd	South Dayton	NY	14138
100.00-1-37.1	Michalski	William	4	Castile	Dr	Fredonia	NY	14063
118.00-1-35	Miller	Benjamin	10425	Hanover	Rd	Forestville	NY	14062
66.00-1-51	Mohney	Kenneth	1540	Stebbins	Rd	Silver Creek	NY	14136

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	LastName	FirstName	Address No	AddressStr	Street Type	Address Mun	Address State	Address Zip
101.00-2-31	Monotropa Tree Farm Inc		523	Old Portland	Rd	Portland	ME	04101
66.00-2-43; 83.00-1-49; 83.00-1-33; 83.00-1-34; 66.00-2-44	Moore	Merritt	11419	Dennison	Rd	Silver Creek	NY	14136
66.00-2-60; 66.00-2-61.2	Morrison	John	2	Creekwood	Dr	Lancaster	NY	14086
117.00-2-12; 117.00-2-11	Morrison	Timothy	10284	Empire	Rd	Forestville	NY	14062
119.00-1-40; 119.00-1-38	Moss	William	177	Cottage	Rd	South Dayton	NY	14138
66.00-2-39	Nadeau	Rosemary	135	Wilton	Ave	Jamestown	NY	14701
49.00-1-7	National Grid		300	Erie	Blvd	Syracuse	NY	13202
83.00-3-5	Natl Fuel Gas Supply Corp		6363	Main	St	Williamsville	NY	14221
66.00-2-55	Nearhoof	Janet	12330	Hanford	Rd	Silver Creek	NY	14136
117.00-2-9.2;117.00-2-9.1	Nearhoof	Timothy	10336	Empire	Rd	Forestville	NY	14062
84.00-1-55.1	New York Lake Erie RR					Gowanda	NY	14070
83.00-4-27	Newton	Dean	11116	Dennison	Rd	Forestville	NY	14062
84.00-2-18	Norton	Kim	11036	Quarry	Rd	Forestville	NY	14062
83.00-4-8	Nowocien	Dennis				Silver Creek	NY	14136
66.00-1-42	NYS Thruway Authority					Albany	NY	12201
100.05-2-6	NYSEG		70	Farm View	Dr	New Gloucester	ME	04260
117.00-2-48	O Connor	Shamus	10206	Prospect	Rd	Forestville	NY	14062
100.00-1-40	Odebralski	William	1327	Hopper	Rd	Forestville	NY	14062
83.00-3-16	Offen	Judith	3443	Brown	Rd	Caledonia	NY	14423
83.00-4-4; 83.00-3-6.2; 83.00-3-6.1; 83.00-3-40; 83.00-2-12	Olsen	Garry	11135	Dennison	Rd	Forestville	NY	14062
84.00-1-55.2	Olsen & Sons Contractors	Inc.	1275	Overhiser	Rd	Forestville	NY	14062
100.00-1-42; 100.00-1-43	Opeil	Philip	1303	Hopper	Rd	Forestville	NY	14062

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	LastName	FirstName	Address No	AddressStr	Street Type	Address Mun	Address State	Address Zip
100.05-2-12; 83.00-3-20	Overmyer	Angela	10903	Dennison	St	Forestville	NY	14062
101.00-2-34.1	Palmer	Deborah		Po Box 346		North Boston	NY	14110
100.00-1-13	Patanella	Joseph	1172	Hopper	Rd	Forestville	NY	14062
83.00-3-11	Patterson	Janet	11055	Dennison	Rd	Forestville	NY	14062
117.00-2-10	Pedrico; ATTN Loretta Lee Pedrico	Brett	25232	Poderio Drattn		Ramona	CA	92065
66.00-2-51	Pelletter	Peter	11535	Dennison	Rd	Silver Creek	NY	14136
66.00-2-71; 66.00-2-76	Pelz	Keith	11479	Bennett State	Rd	Silver Creek	NY	14136
100.00-1-64; 100.00-1-70	Perry	Michael	378	St Joseph	Dr	North Tonawanda	NY	14120
118.00-1-54	Perry	Michael	10169	Empire	Rd	Forestville	NY	14062
117.00-2-20	Perry	Thomas	10131	Empire	Rd	Forestville	NY	14062
100.00-1-20; 100.00-1-19.2	Perryman	Craig	1169	Hopper	Rd	Forestville	NY	14062
118.00-1-48.3; 118.00-1-48.1	Pfahl	Gary	883	Hurlburt	Rd	Forestville	NY	14062
83.00-1-48; 83.00-1-44	Pfleuger	Donn	1018	King	Rd	Forestville	NY	14062
100.05-2-13	Pfleuger	Shari	60	Pearl	St	Forestville	NY	14062
83.00-4-9	Pierce	Carol	11043	Quarry	Rd	Forestville	NY	14062
83.00-2-21	Pioneer Cemetery		11023	Bennett St	Rd	Forestville	NY	14062
100.05-2-71	Pisa	Derrick	9	Third	St	Forestville	NY	14062
100.00-1-49.2	Pleszewski	James	1338	Hopper	Rd	Forestville	NY	14062
100.05-2-16; 100.00-1-1	Polvino	Anthony	65	Pearl	St	Forestville	NY	14062
66.00-2-8	Price	Gerald	11684	Bennett State	Rd	Silver Creek	NY	14136
67.00-2-63	Priest	Cheryl	878	King	Rd	Forestville	NY	14062
118.00-1-5; 117.00-1-25	Raag	Mihkel	9981	Prospect	Rd	Forestville	NY	14062
117.00-2-51	Rennie	John	11711	Cedar Gully	Rd	Beach City	TX	77523
100.00-1-38	Rhodes	Jason	721	Overhiser	Rd	Forestville	NY	14062
83.00-3-31; 83.00-3-27	Richter	Eugene	10390	Creek	Rd	Forestville	NY	14062

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	LastName	FirstName	Address No	AddressStr	Street Type	Address Mun	Address State	Address Zip
117.00-2-23	Richter	Harold	1159	Hurlburt	Rd	Forestville	NY	14062
117.00-2-25; 117.00-2-24	Richter	Randy	1165	Hurlburt	Rd	Forestville	NY	14062
100.05-2-70	Rizzo	Angeline	7	3rd	St	Forestville	NY	14062
83.00-4-2	Robinson	Valerie	1273	Overhiser	Rd	Forestville	NY	14062
117.00-2-22	Rocque	David	1125	Hurlburt	Rd	Forestville	NY	14062
83.00-1-32; 83.00-1-53.1; 83.00-1-31.2	Rodney	Joseph	1344	King	Rd	Silver Creek	NY	14136
100.00-1-36	Rogers	Rodney	10533	Empire	Rd	Forestville	NY	14062
100.00-1-34	Sauriol	Jennine	10584	Empire	Rd	Forestville	NY	14062
100.00-1-9.1	Schneider	Dorothy	1237	Hopper	Rd	Forestville	NY	14062
83.00-4-6.2; 83.00-4-7	Schneider	Frank	11125	Quarry	Rd	Forestville	NY	14062
100.00-1-16	Schneider	Milton	1214	Hopper	Rd	Forestville	NY	14062
83.00-3-29	Schulze	Robert	11036	Bennett State	Rd	Forestville	NY	14062
117.00-2-15; 117.00-2-16	Schunk	Beth	10260	Empire rd	Rd	Forestville	NY	14062
117.00-2-49	Scott	Eric	4268	Osborne	St	Fredonia	NY	14063
117.00-2-1	Scritchfield	Jeffrey	10360	Empire	Rd	Forestville	NY	14062
118.00-1-48.4	Seeley	Jessie	841	Hurlburt	Rd	Forestville	NY	14062
66.00-2-42	Serio	Sandra	11464	Dennison	Rd	Silver Creek	NY	14136
100.05-2-67; 100.05-2-69	Shambo	Nicole	5	Third	St	Forestville	NY	14062
100.00-1-29	Sharp	Susan	920	Rt 39		Forestville	NY	14062
66.00-2-70.2	Shaw	Matthew	11469	Bennett State Rd	Rd	Silver Creek	NY	14136
66.00-1-55; 66.00-1-87	Shields	Marvin	1534	Stebbins	Rd	Silver Creek	NY	14136
83.00-2-7; 83.00-3-2; 83.00-1-9.1	SJF Farms, Inc.		1804	King	Rd	Forestville	NY	14062
83.00-1-10	Skelly	Charles	1554	King	Rd	Forestville	NY	14062
83.00-3-41	Slawson	Richard	11120	Bennett State	Rd	Forestville	NY	14062
84.00-2-2.2	Smith	Robert	775	Hopper	Rd	Forestville	NY	14062
118.00-1-33	Smith	Wesley	152	Milnor	Ave	Lackawanna	NY	14218
83.00-3-19	Snyder	Richard	10913	Dennison	Rd	Forestville	NY	14062
101.00-1-20	Sommer	Harold	796	Rt 39		Forestville	NY	14062
100.00-1-28	Sommers	Karen	912	Rt 39		Forestville	NY	14062

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	LastName	FirstName	Address No	AddressStr	Street Type	Address Mun	Address State	Address Zip
118.00-1-16	Sowers	Hugh	483	Rt 39		Forestville	NY	14062
100.00-1-46	Spears	Bradley	2659	Five Mile	Rd	Alleghany	NY	14706
83.00-1-9.2	Spengler	Gary	1586	King	DR	Silver Creek	NY	14136
83.00-1-42	Spinler	Joshua	992	King	Rd	Forestville	NY	14062
67.00-2-65	Steiger	Milton	836	King	Rd	Forestville	NY	14062
83.00-3-44.1	Stevens	Harold	11168	Bennet State	Rd	Forestville	NY	14062
101.00-1-24	Stockmeyer	Mario	1065	Hopper	Rd	Forestville	NY	14062
100.05-2-8.2	Stott	Kimberly	11	Third	St	Forestville	NY	14062
119.00-1-47	Strenk	Robert	40	Ironton	St	North Tonawanda	NY	14120
66.00-2-59	Suraf	Jeffrey	11492	Bennett State	Rd	Silver Creek	NY	14136
66.00-2-45.2	Szymanski	Jennifer	11492	Dennison	Rd	Silver Creek	NY	14136
66.00-1-43; 66.00-1-44	Taylor	Billy	11776	Bennett State	Rd	Silver Creek	NY	14136
117.00-2-17	Taylor	Marcia	10228	Empire	Rd	Forestville	NY	14062
83.00-4-6.3	The Commodore Corporation		1423	Lincolnway		Goshen	IN	46526
83.00-2-29.2	Thomas	Tricia	10983	Bennet State	Rd	Forestville	NY	14062
100.00-1-47	Thompson	Christopher	1318	Hopper	Rd	Forestville	NY	14062
66.00-2-5; 66.00-2-9; 66.00-2-36; 66.00-1-29	Thompson	Robert	1268	Stebbins	Rd	Silver Creek	NY	14136
83.00-1-56.2	Thompson	Scott	11284	Dennison	Rd	Forestville	NY	14062
83.00-1-56.1; 83.00-1-55.1	Thompson	Stanley	1234	Overhiser	Rd	Forestville	NY	14062
83.00-3-26.2	TLC Health Network		12644	Seneca	Rd	Irving	NY	14081
101.00-2-25.2; 101.00-2-26	Tri County Holding Corp		540	Rt 39		Forestville	NY	14062
117.00-2-29; 117.00-2-28	Trudnowski	Michael	10012	Prospect	Rd	Forestville	NY	14062
66.00-1-31	Tulipane	Michael	1314	Stebbins	Rd	Silver Creek	NY	14136
83.00-2-11	Valentine	Alice	11131	Bennett State	Rd	Forestville	NY	14062

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	LastName	FirstName	Address No	AddressStr	Street Type	Address Mun	Address State	Address Zip
118.00-1-1; 118.00-1-53; 117.00-2-6	Valentine	David	917	Rt 39		Forestville	NY	14062
100.00-1-39	Van Volkenburg	Kenneth	2812	Grasmere View	Pkwy	Kissimmee	FL	34746
83.00-4-16	Van Zile	Mark	11001	Quarry	Rd	Forestville	NY	14062
83.00-3-17	VanBuskirk	Valorie	10925	Dennison	Rd	Forestville	NY	14062
83.00-3-23; 100.05-2-9.2; 83.00-3-14.2	Village of Forestville		18	Chestnut	St	Forestville	NY	14062
101.00-2-12	Village Of Silver Creek		172	Central	Ave	Silver Creek	NY	14136
118.00-1-14	Wagner	William	503	Rt 39		Forestville	NY	14062
83.00-3-18	Walker	Richard	2858	Route 39		Forestville	NY	14062
83.00-2-13	Wasiela	Peter	11974	Angell	Rd	Silver Creek	NY	14136
101.00-1-18	Waterhouse	Jeffrey	760	Rt 39		Forestville	NY	14062
83.00-4-13.2	Waterman	Jason	11035	Quarry	Rd	Forestville	NY	14062
84.00-2-3; 83.00-4-20; 83.00-4-19	Waterman	Kevin	10873	Quarry	Rd	Forestville	NY	14062
118.00-1-2; 118.00-1-3	Weaver	Michael	855	Rt 39		Forestville	NY	14062
100.05-2-14	Webb	Richard	10	Fourth	St	Forestville	NY	14062
101.00-2-17; 101.00-2-21	White	David	10545	Hanover	Rd	Forestville	NY	14062
100.00-1-72.1	White	Thomas	11274	Walnut	Rd	Forestville	NY	14062
66.00-2-61.1	Wicks	Jonathan	11478	Bennett State Rd	Rd	Silver Creek	NY	14136
117.00-2-40	Wilcox	Susan	50	Main	St	Forestville	NY	14062
117.00-2-43	Wilcox	Ward	50	Main	St	Forestville	NY	14062
83.00-3-10	Williams	Kenny	11075	Dennison	Rd	Forestville	NY	14062
83.00-4-10.1	Wilson	Nancy	11039	Quarry	Rd	Forestville	NY	14062
117.00-1-26	Wilson	Tiina	183	East Main	St	Fredonia	NY	14063
118.00-1-22.2; 118.00-1-19	Wisley	Chester	10420	Hanover	Rd	Forestville	NY	14062
66.00-2-63	Wisniewski	Gregory	11456	Bennett State	Rd	Silver Creek	NY	14136
100.05-2-4	Wojtkowiak	Michael	39	Center	St	Forestville	NY	14062
118.00-1-48.2	Woleben	Catherine	2446	Srearns	Rd	Lawtons	NY	14091

Table 7: Property Owners within 1,500 feet of Wind Overlay Zoning District								
Parcel ID(s)	**LastName**	**FirstName**	**Address No**	**AddressStr**	**Street Type**	**Address Mun**	**Address State**	**Address Zip**
117.00-2-47; 117.00-2-50.1	Wolfe	Warren	10249	Empire	Rd	Forestville	NY	14062
117.00-2-50.1	Wolfe	Warren	10249	Empire	Rd	Forestville	NY	14062
101.00-2-27	Youngberg	Donald	624	Rt 39		Forestville	NY	14062

D. Plot Plan

Figures 3 and 4 identify the location of the WECS with setback requirements and illustrate the boundary of the proposed Wind Overlay Zoning District as well as existing lot lines and all wind energy facilities associated with the Project. Figure 5 identifies all utilities in the vicinity of the Project. The plot plans (Figures 3 and 4) were created by the Applicant as a visual representation of the Project plans. Turbine and access roads for the Project were designed and developed by, Fisher Associates, a licensed engineer in the State of New York.

Fencing will be placed around the substations located in the Town of Hanover. Fencing will be a non-corrosive and metallic, 8 feet high rigid chain link perimeter fence. No open gap of more than 4 inches anywhere along the fence (gates, bottom, between panels, etc.) shall be allowed. The fence shall exceed minimum NESC clearances and allow for adequate drive path around substation equipment. The fence is to be fitted with a high level outward facing, crank fitted with 3 strands of barbed wire – cranks shall be able to support 250 lbs. downward force at the outermost end of the arm. The fence shall have lockable gates to enable the compound to be secured and to allow separate access for pedestrians and service vehicles. All gates shall be grounded per IEEE 80 – "Guide for Safety in AC Substation Grounding". Vehicle gates shall be a minimum of 20 feet wide - all vehicle gates shall include a man gate. All gates shall open to the inside of the fence, unless grounding provisions are made to ensure that the ground grid is always a minimum of 40 inches beyond the swing of the gate to allow for save touch potentials when the gates are swung open.

The fence shall be fitted with normalized bilingual (English & Spanish) warning signs with the inscription "DANGER – HIGH VOLTAGE" and a contact telephone number. An isolation fence shall be installed between any contiguous neighboring fences. This is necessary to avoid energizing neighboring fences during fault conditions on the substation grid. All fence materials or sections not installed according to this specification shall be removed and replaced.

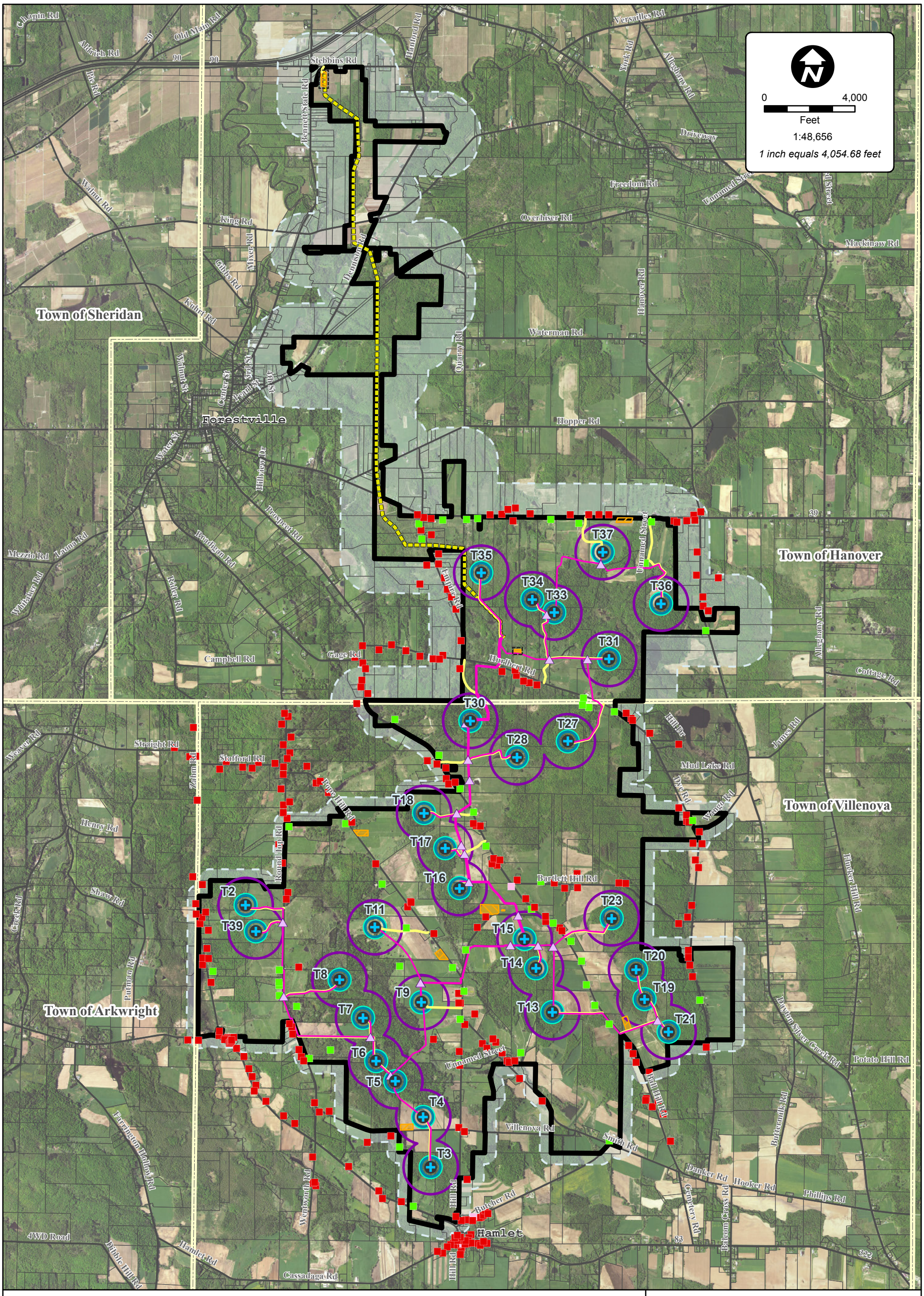


Figure 3: Ball Hill Wind Project

- Wind Overlay District
- Wind Overlay District Buffer
- 1.5 Tower Height Radius (428ft)
- 1200' Radius
- 500' Radius
- Town Boundary

Structure:
- Participating Residence
- Non-participating Residence
- Non-residential Structure

Proposed Infrastructure:
- Turbine (87m hub height)
- Junction Box
- Transmission Line
- Access Road
- Collection
- Substation/Switchyard Proposed to be Fenced
- Laydown Area
- O & M Building/Laydown

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res powering change®

11101 W. 120th Ave., Suite 400
Broomfield, CO, 80021
Phone: (303) 429-4200 Fax: (303) 429-4299

COORDINATE SYSTEM: NY West Zone, NAD83
LAYOUT NUMBER: DRAWING NO.: 23105D6916-01
DRAWN BY: AP DATE: 06/09/2016

0 3,000
Feet
1:36,000
1 inch equals 3,000 feet

Town of Sheridan
Town of Hanover
Town of Arkwright
Town of Villenova
Forestville

T31 T33 T34 T35 T36 T37

Figure 4: Ball Hill Wind Project
Town of Hanover

- Wind Overlay District
- Wind Overlay District Buffer
- 1.5 Tower Height Radius (428ft)
- 1200' Radius
- 500' Radius
- Town Boundary

Structure:
- Participating Residence
- Non-participating Residence
- Non-residential Structure

Proposed Infrastructure:
- Turbine (87m hub height)
- Junction Box
- Transmission Line
- Access Road
- Collection
- Substation/Switchyard Proposed to be Fenced
- Laydown Area
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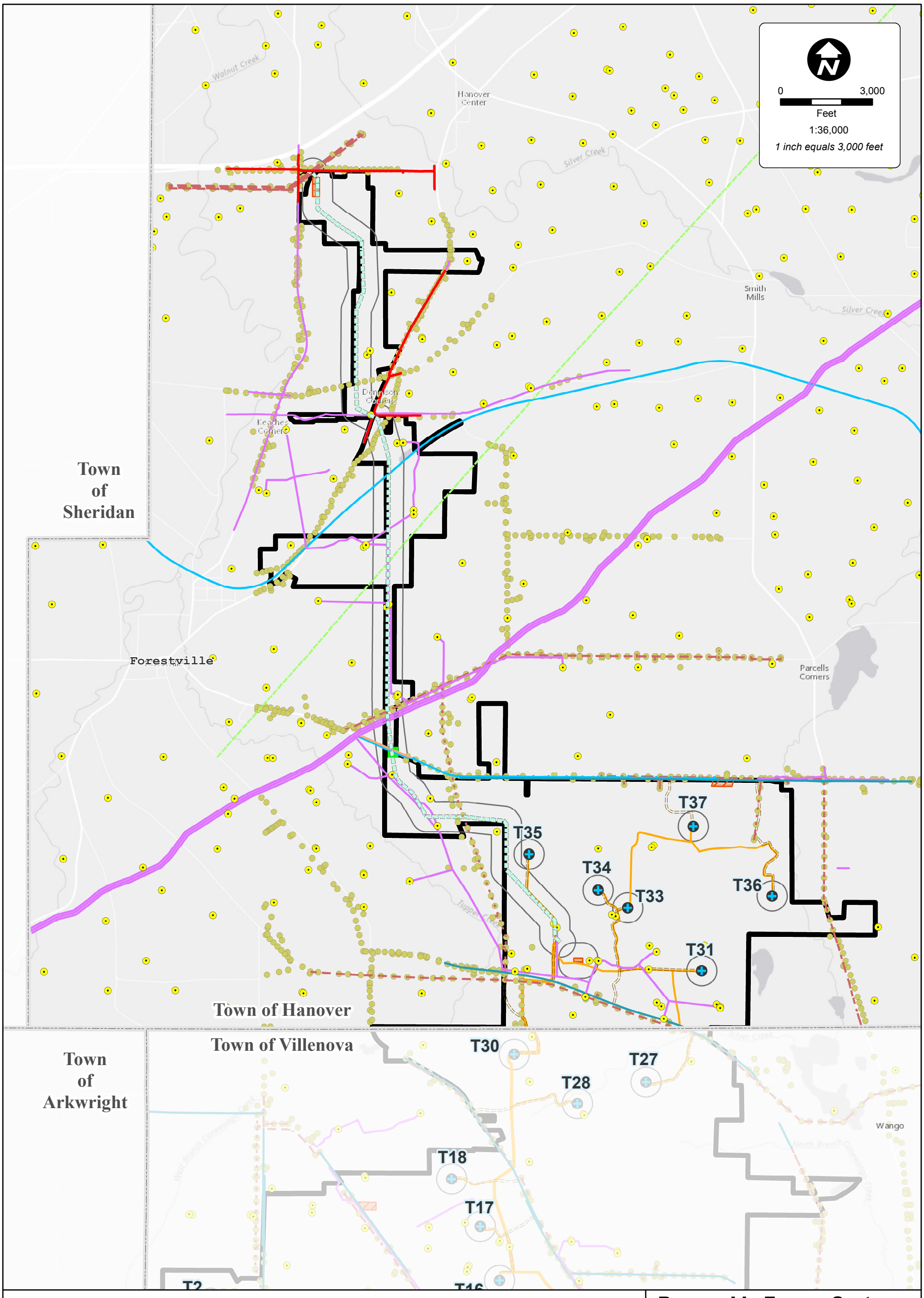
COORDINATE SYSTEM: NY West Zone, NAD83
LAYOUT NUMBER: DRAWING NO.: 23105D6919-01
DRAWN BY: AP DATE: 06/09/2016



Utilities:

- Utility Pole
- Fiber Level 3 Comm
- Gas Well
- Gas
- National Fuel Distribution Lines
- Telephone
- CAT 5
- Fiber Level 3 Comm
- Overhead
- Underground (Verizon)

Figure 5: Utilities, Ball Hill Wind Project

Town of Hanover

- Wind Overlay District
- 492' Buffer
- Town Boundary

Proposed Infrastructure:

- Turbine (87m hub height)
- Access Road
- Collection
- Transmission Line
- Substation/Switchyard
- Laydown Area
- O & M Building/Laydown

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LAYOUT NUMBER: DRAWING NO.:23105D6917-01
DRAWN BY: AP DATE: 02/09/2016

E. Wind Overlay Zoning District

Please refer to Section D, Figure 3 and 4 which identifies the boundaries of the proposed Wind Overlay Zoning District. Zoning designations of the Project facilities in the Town of Hanover as set forth in the official zoning map are shown in Table 8.

Table 8: Zoning Designations of the Project – Components in Hanover

Wind Energy Facility	Town of Hanover Zoning Designation
T31	Ag & Residential (A-1)
T33	Ag & Residential (A-1)
T34	Ag & Residential (A-1)
T35	Ag & Residential (A-1)
T36	Ag & Residential (A-1)
T37	Ag & Residential (A-1)
Transmission Line	Ag & Residential (A-1)
Access Roads	Ag & Residential (A-1)
Collection Lines	Ag & Residential (A-1)
Switchyard	Ag & Residential (A-1)
Substation	Ag & Residential (A-1)
Laydown Areas	Ag & Residential (A-1)

F. Topography Map

Figure 6 shows existing topography with relation to the Project with 5-foot contours. This figure show an initial representation of the location and topography of the Project facilities. Construction drawings identifying grading limits and construction disturbance will be provide to the Town as an Appendix to the FEIS. Construction drawings will include contour lines and will be provided at scale of 1 inch to 1,500 feet.

0 4,000
Feet
1:48,000
1 inch equals 4,000 feet

Town of Sheridan
Town of Hanover
Town of Villenova
Town of Arkwright

T1 T2 T3 T4 T5 T6 T7 T8 T9 T10 T11 T12 T13 T14 T15 T16 T17 T18 T19 T20 T21 T22 T23 T24 T25 T26 T27 T28 T29 T30 T31 T32 T33 T34 T35 T36 T37 T38 T39

Figure 6: Contours, Ball Hill Wind Project

Wind Overlay District
Town Boundary
Contour (5ft interval)*

Proposed Infrastructure:
Turbine (87m hub height)
Junction Box
Transmission Line
Access Road
Collection
Substation/Switchyard
Laydown Area
O & M Building/Laydown

*Contour data provided by the Chautauqua County Information Technology Services

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11101 W. 120th Ave., Suite 400
Broomfield, CO, 80021
Phone: (303) 429-4200 Fax: (303) 429-4299

COORDINATE SYSTEM: NY West Zone, NAD83
LAYOUT NUMBER: DRAWING NO.: 23105D6921-01
DRAWN BY: AP DATE: 26/08/2016

G. Landscaping Plan

The Applicant is not currently proposing a Landscaping Plan in the Town of Hanover. As set forth in the SDEIS, during construction of the Project a total of 330.1 acres of vegetation will be cleared within the 13,659 acres Project Area (124.0 acres in the Town of Hanover) and a total of 282.6 acres of soils will be disturbed within the 13,659 acres Project Area (approximately 63 acres in the Town of Hanover). The same methods, nature and extent of clearing around the wind energy facilities and the means of restoration of disturbed and cleared areas described in the SDEIS will be employed for the revised layout. Accordingly, the Applicant summarizes those methods below:

1. Due to the size and nature of the wind energy facilities, no plantings in the cleared areas for the wind turbines, substations or along transmission line are proposed in the Town of Hanover.

2. Natural Revegetation. Some cleared areas will be allowed to revegetate without limit. Existing seed banks and adjacent plant communities will encourage the re-establishment of naturally occurring native plants and allow the revegetated areas to recover to its pre-construction contour and conditions. These areas include access road construction rights-of-way, underground collection lines, and construction laydown and truck staging areas. Of note, within agricultural areas, landowners will be consulted so that the revegetation complements on-going farm operations.

3. Vegetation management. Some cleared areas will be allowed to revegetate in a limited fashion, subject to vegetative management plans designed to permit safe operation of Project facilities. As an example, the above-ground transmission line corridor will be cleared as described in the SDEIS and the right-of way maintained in partially revegetated state to prevent interference or damage to the transmission line and facilities. This right-of-way maintenance will be performed subject to a Vegetative Management Plan in accordance with the applicable NYSPSC regulations. A copy of the Vegetation Management Plan will be provided to the Town upon issuance of the Certificate of Public Convenience and Necessity (CPCN) by the NYSPSC.

4. Permanently Cleared. Some cleared areas such as those for permanent Project facilities will be maintained permanently cleared of natural vegetation. These areas include the radial clearances around turbine tower bases, permanent access roads, substations and the proposed operations and maintenance (O&M) building.

The following table summarizes these cleared areas by category and approximate acreage.

Table 9: Approximate Acreage Cleared by Landscape Category

Category	Approximate Acreage (Total/Town of Hanover)	Examples
Unlimited natural revegetation	180.1/23.1	Construction right-of-ways for access, underground collection lines, laydown and truck staging areas
Limited natural vegetation subject to NYSPSC approved ROW management plan	61.8/61.8	Above-ground transmission line corridor
Permanently cleared areas	88.1/39.1	Turbine tower/base radial clearance areas, substations, O&M building

Note: This Table provides a summary of the proposed clearing in the SDEIS. Updates to the acreages based on the proposed layout will be provided in the FEIS.

H. SEQRA

Environmental Assessment Form (EAF)
Noble submitted a full environmental assessment form ("Full EAF") as part of their initial application to the Lead Agency, a copy of which is attached hereto as Appendix D. By Resolution dated October 28, 2015 the Lead Agency resolved to continue the development of the Project, that Ball Hill Wind Energy, LLC shall be recognized as Applicant, and ordered preparation of a SDEIS addressing a range of impacts related to the implementation of new turbine technology, the modification of the prior project layout and the passage of time. A copy of the resolution is attached hereto as Appendix D.

I. Visual Resource Assessment (VRA)

The Visual Resource Assessment included as Appendix E has been revised and updated to address potential impacts to visual resources and includes an updated shadow flicker study. Photographic simulations were analyzed at four key receptors for the Town of Hanover, with a total of 14 photographs being taken in Hanover (see Figures A1 and A2 in Appendix E of this Amended Application for the locations of the key receptors, as well as Figures A4-a, A4-b, A5-a, A5- b, A5-c, A5-d, A5-e, A5-f, A5-g, A6-a, A-6b, A16-a, A-16-b, A16-c, A-16-d. and A-16e for the photographic simulations taken at the key receptors).

Summary: An updated Visual Resources Assessment (VRA) has been prepared to evaluate the visual impact of the Project at particular locations, including residences, and in the surrounding area, both on its own and cumulatively with other proposed wind energy projects. The VRA was prepared according to New York State Department of Environmental Conservation Program Policy "Assessing and Mitigating Visual Impacts" (NYSDEC 2000) (DEC Visual Policy) and State Environmental Quality Review SEQRA criteria to minimize impacts on visual resources.

The VRA includes shadow flicker analysis, in addition to viewshed mapping, photographic simulations, and other visual impact analysis. Evidence from operational turbines suggests that the intensity of shadow flicker is only an issue at short distances. Shadow flicker is typically not found to occur at distances greater than ten rotor diameters from a wind turbine. Beyond ten rotor diameters, a person should not perceive a wind turbine to be chopping through sunlight, but rather as an object with the sun behind it. The analysis identified 241 receptors within 4,134-feet (or approximately ten rotor diameters) of any turbines, and calculated the number of hours per year each inventoried structure would theoretically fall within the shadow zone of one or more proposed turbines:

- 57 (23.6%) will theoretically not be impacted;
- 18 (7.5%) will theoretically be impacted 0-2 hrs/yr;
- 69 (28.6%) will theoretically be impacted 2-10 hrs/yr;
- 43 (17.8%) will theoretically be impacted 10-20 hrs/yr;
- 32 (13.3%) will theoretically be impacted 20-30 hrs/yr;
- 17 (7.1%) will theoretically be impacted 30-40 hrs/yr; and
- 5 (2.1%) will theoretically be impacted 40+ hrs/yr.

As described in a memo included with this Amended Application, Saratoga revisited the shadow flicker analysis after the locations of two turbines were moved. It was found that the micrositing of the two turbines would have only a minor impact on shadow flicker hours at up to 6 receptors; no significant increases would occur at any receptors.

There are no regulations or guidelines that establish an acceptable degree of shadow flicker impact on a potential receptor. Industry standard utilizes a 30-hour per year threshold that identifies residences where mitigation may be appropriate. The number of receptors theoretically impacted for 30 hours or more has increased from 8 receptors based on the project layout presented in the SDEIS to 22 receptors under the revised layout.

J. Proposed Intent and Capacity of Energy Generation; Height Justification

The Project is proposing to install Vestas V126 3.45MW wind turbines, on 87-meter towers system, wind turbine generators. The V126 turbine is a three-bladed, upwind, horizontal-axis wind turbine with a rotor diameter of ±413 feet (126 meters). The blades will be approximately 79 feet (24 meters) from the ground at its nearest point. The nacelle is located at the top of each tower and contains the electrical generating equipment. The maximum height for the turbine is ±492 feet (150 meters) when a rotor blade is at the top of its rotation. Once installed, each wind turbine will occupy a round, slightly exposed base approximately 18 feet (5.5 meters) in diameter. Once constructed, the Project will consist of 29 wind turbines (23 of which will be located in Villenova and 6 of which will be located in Hanover). The height of the towers was selected to maximize energy production in the local wind energy resource subject to constraints such as cost, transportation, and environmental impacts. As such, the Applicant requests herein that the Hanover Town Board amend Section 1608(E)(3) of the Zoning Law to increase the maximum total height of a WECS to 495'. If granted, Section 1608(E)(3) shall be amended to read:

3. WECS shall not exceed a total height of 495 feet including the turbine and blades.

The following report is the Type Certification for the proposed WECS. The product brochure for the proposed WECS is attached as Appendix A.

PUBLIC

DNV·GL

TYPE CERTIFICATE

Certificate No.:	Issued:	Valid until:
TC-DNV-DSS-904-00337-0 (TC-230906-A-3)	2015-09-17	2019-10-30

Issued for:

Vestas V126-3.3 MW / V126-3.45 MW

Specified in Annex 1

Issued to:

Vestas Wind Systems A/S

Hedeager 42
8200 Aarhus N
Denmark

According to:

IEC 61400-22:2010 Wind turbines – Part 22: Conformity Testing and Certification, BEK 73: 2013 "Bekendtgørelse om teknisk certificeringsordning for vindmøller" and DNV-DSS-904:2014-01 Type Certification of Wind Turbines

Based on the documents:

DB-DNV-DSS-904-00772-0 (DB-230906-A-3)	Design Basis Conformity Statement, dated 2015-09-17
DE-DNV-DSS-904-00774-0 (DE-230906-A-4)	Design Evaluation Conformity Statement, dated 2015-09-17
TT-DNV-DSS-904-00775-0 (TT-230906-A-3)	Type Test Conformity Statement, dated 2015-09-17
ME-DNV-DSS-904-00776-0 (MC-230906-A-3)	Manufacturing Evaluation Conformity Statement, dated 2015-09-17
TCM-DNV-DSS-904-00777-0 (TM-230906-A-3)	Type Characteristics Measurements Conformity Statement, dated 2015-09-17
FER-TC-DNV-DSS-904-00337-0 (PD-2309-18CGY6P-36, Rev 4)	Final Evaluation Report, dated 2015-09-17

Changes of the system design, the production and erection or the manufacturer's quality system are to be approved by DNV GL.

Hellerup, 2015-09-17

For the accredited certification body
Germanischer Lloyd Industrial Services GmbH

Christer Eriksson
Service Line Leader Type Certification

DAkkS Deutsche Akkreditierungsstelle D-ZE-11053-01-00

By DAkkS according DIN EN IEC/ISO 17065 accredited Certification Body for products. The accreditation is valid for the fields of certification listed in the certificate.

Hellerup, 2015-09-17

For the accredited certification body
Germanischer Lloyd Industrial Services GmbH

Niels Dam Lerke
Project Manager

The latest edition of the "General Terms & Conditions of Germanischer Lloyd Industrial Services GmbH" is applicable. German law applies.
Germanischer Lloyd Industrial Services GmbH, Brooktorkai 18, 20457 Hamburg, Germany

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Original Instruction: T05 0047-9868 VER 03

T05 0047-9868 Ver 03 - Approved - Exported from DMS: 2016-08-10 by PHDKN

PUBLIC

TYPE CERTIFICATE – ANNEX 1

Wind turbine type certification

Basic standard	IEC 61400-1 ed. 3 + A1
IEC WT class	IEC IIIA and IEC IIIB (except for temperature ranges) – V126-3.3 MW IEC S – V126-3.45 MW

General

Power regulation	pitch-controlled
Rotor orientation	upwind
Rotor tilt	6°
Cone angle	4°
Rated power	3300 kW / 3450 kW
Rated wind speed v_r	10.70 m/s
Rotor diameter	126m
Hub height(s)	117m (T3E160 – IEC IIIB/S) 137m (LDST – IEC IIIA/S) 87m (T3E155 – IEC IIIA/S)
Hub height operating wind speed range v_{in} - v_{out}	3 -22.5 m/s (117m and 137m) 3 -20 m/s (87m)
Design life time	20 years
Software version	13.08.56

Wind conditions

	IEC IIIA	IEC IIIB	IEC S
Mean turbulence intensity I_{ref} at v_{hub} = 15 m/s	0.16	0.14	0.16/0.14
Annual average wind speed at hub height v_{ave}	7.5 m/s	7.5 m/s	6.9 m/s
Reference wind speed v_{ref}	37.5 m/s	37.5 m/s	37.5 m/s
Mean flow inclination	8°	8°	8°

Electrical network conditions

Normal supply voltage and range	3 x 650 V 10.5-35 kV ± 10 %
Normal supply frequency and range	50 or 60 Hz ± 6 %
Voltage imbalance	IEC 61000-3-6 TR max 2 %
Maximum duration of electrical power network outages	Two 3 months periods
Number of electrical network outages	Max 52 per year

Other environmental conditions

Air density	1.225 / 1.325[i] kg/m^3 [i]To account for low temperature operation, Vestas has applied higher air density for the following load cases: 1.2, 2.1, 3.1, 4.1 and 5.1
Standard temperature range	Normal: -20 °C to +45 °C* Extreme: -40 °C to +50 °C
Low temperature range	Normal: -30 °C to +45 °C* Extreme: -40 °C to +50 °C (*de-rating strategy above +30 ºC for V126-3.3MW *de-rating strategy above +25 ºC for V126-3.45MW)
Relative humidity of the air	100% (max 40% of time) and 90% (rest of life time)
Solar radiation	1000 W/m^2
Salinity	ISO 9223: Airborne salinity S3

VESTAS PROPRIETARY NOTICE

Original Instruction: T05 0047-9868 VER 03

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TYPE CERTIFICATE – ANNEX 1

Description of lightning protection system

Designed acc. to IEC 61400-24, Protection Level 1 and IEC 61312-1

Major components

Blade	Type	Infused structural air foil shell
	Manufacturer	Vestas
	Material	Carbon fibres pultrusions, glass fibre fabrics, balsa and PET foam core
	Blade length	61.65 m
	Air brake	Full span blade feather
	Number of blades	3
	Drawing / Data sheet / Part no.	Drawing No : 0028-7875 Drawing No : 0046-1000 - V126 STE kit
Hub	Type	Cast ball shell hub
	Material	EN GJS-400-18U-LT
	Drawing / Data sheet / Part no.	085210
Blade bearing	Type	Double row four-point contact ball bearing
	Manufacturer	Laulagun
	Drawing / Data sheet / Part no.	F2840M00DST0125VW
Pitch System	Type	Hydraulic power unit
	Hydraulic/Electrical unit	PMC Technology A/S
	Actuators	LJM, Glual or Parker
Main shaft	Type	Cast hollow shaft
	Material	EN GJS-400-18U-LT
	Drawing / Data sheet / Part no.	085196 / 29024367
Main bearing	Type	Double-row spherical roller bearing
	Manufacturer	SKF
	Drawing / Data sheet / Part no.	240/950 CA/C3LW 33VQ113
	Manufacturer	FAG Schaeffler
	Drawing / Data sheet / Part no.	240/950 F-582562.PRL.WPOS
Gearbox	Type	2 Planetary stages and one helical stage
	Manufacturer	Winergy
	Gear Ratio	112.6
	Drawing / Data sheet / Part no.	PZAB3530.1
	Type	2 Planetary stages and one helical stage
	Manufacturer	ZF
	Gear Ratio	112.8
	Drawing / Data sheet / Part no.	EH921A
Couplings	Main shaft-Main gear	Shrink disc
	Manufacturer	Tollok
	Type	TLK622 990x1350

Original Instruction: T05 0047-9868 VER 03

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VESTAS PROPRIETARY NOTICE

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TYPE CERTIFICATE – ANNEX 1

	Main gear-Generator	Flexible composite coupling
	Manufacturer	KTR Kupplungstechnik GmbH
	Type	RADEX-N 2200kpl.m.Lamellenp
Machine foundation	Type	Cast
	Material	EN GJS-400-18U-LT
	Drawing / Data sheet / Part no.	29006988
Yaw system	Drive type	Nacelle mounted electrical driven plain bearing with external toothing
	Yaw bearing type	Friction bearing, permanently pre-tensioned
	Yaw drive type	Liebherr type DAT350/1492-4000 Comer type PG 1603 Bonfiglioli type 709T4U
	Yaw brake type	Electrical disc brake in yaw motors
	Yaw speed	0.46 °/s
Mechanical brakes	Manufacturer	Eurotubi / Vestas
	Type	Disc brake
	Location	High speed shaft of gearbox
	Brake torque	Min. 17.4 kNm (static)
Generator	Manufacturer	Siemens (not valid for V126-3.45MW)
	Type	Three phase induction generator with squirrel cage rotor - JGWA-560LM-06A
	Rated power	3500kW
	Voltage	750 V
	Nominal Speed	1450 rpm
	Insulation class	F
	Protection class (acc. to IEC 529)	IP54
	Manufacturer	Siemens
	Type	Three phase induction generator with squirrel cage rotor - JGWA-560LM-06A
	Rated voltage	750 V
	Rated power	3650 kW
	Rated current	3440 A
	Cos phi	0.82
	Rated speed	1450 rpm
	Protection class (acc. to IEC 529)	IP54
	Rated frequency	72.2 Hz
	Insulation class	F
	Manufacturer	VND
	Type	Three phase induction generator with squirrel cage rotor - DASG 560/6M
	Nominal power	3650 kW
	Voltage	750 V
	Nominal Speed	1450 rpm
	Insulation class	H
	Protection class (acc. to IEC 529)	IP54

Original Instruction: T05 0047-9868 VER 03

T05 0047-9868 Ver 03 - Approved - Exported from DMS: 2016-08-10 by PHDKN

VESTAS PROPRIETARY NOTICE

PUBLIC

TYPE CERTIFICATE – ANNEX 1

	Manufacturer	VND SFIG_V2
	Type	Three phase induction generator with squirrel cage rotor - DASG 560/6M
	Rated power	3650 kW
	Rated voltage	750 V
	Rated frequency	72.5 Hz
	Rated power factor (VFD) – Cos phi	0.87
	Insulation class stator	H
	Protection class (acc. to IEC 529)	IP54
	Rated speed	1450 rpm
	Rated stator current	3230 A
Transformer	Manufacturer	SGB / Siemens
	Type	Dry-type transformer
	Nominal power	3750 kVA
	Environmental Tests	E2 according to IEC 60076-11
	Climatic Tests	C2 according to IEC 60076-11
Protection system	Description	Configurable safety system based on safety relays
Tower	Type	Tubular steel tower
	Hub height	117m
	Drawing / Data sheet / Part no.	0038-9831.V01
	Type	Tubular steel tower
	Hub height	87m
	Drawing / Data sheet / Part no.	0050-2668.V00
	Type	Large diameter steel tower
	Hub height	137m
	Drawing / Data sheet / Part no.	0041-4092.V04
Control System	Manufacturer	Vestas
	Type	Vestas Multi Processor VMP Global
Lift	Manufacturer	Avanti
	Type	Avanti Dolphin service lift
Crane	Manufacturer	Star 071/95 Liftket
	Type	max 800 kg
Manuals	O&M manual	See list of manuals 0006-6955, Rev. 24
	Transport manual	See list of manuals 0040-6996, Rev. 8
	Installation / Commissioning manual	See list of manuals 0040-6996, Rev. 8

Original Instruction: T05 0047-9868 VER 03

T05 0047-9868 Ver 03 - Approved - Exported from DMS: 2016-08-10 by PHDKN

VESTAS PROPRIETARY NOTICE

K. Justification for Clearing

As described in the draft Environmental management Plan presented in the SDEIS, , clearing limits will be identified and visibly marked before construction activities with respect to protected lands, along Project boundaries, and near environmentally sensitive areas. Any activity or traffic outside the limits must be deemed necessary and approved by RES. In all cases, RES makes every effort to minimize construction activity impact. All regulated construction activities will be conducted with coordination and consultation with the regulatory agencies.

L. Preliminary Report proposed by the WECS Siting Agency

The following information is referred to in the supporting documents specified:

- Surrounding topography in relation to the capabilities for generation of electricity for wind was presented in the SDEIS and is summarized in Section N of this Amended Application.
- A preliminary transportation site survey was presented in the SDEIS. Vehicles and routes will be identified by the turbine manufacturer and presented in the FEIS. Figures 7 and 8 show potential off-site and on-site haul route roadways to be utilized during construction of the Project as shown in the SDEIS. In 2008, ESS Group conducted a Transportation Haul Route Study to identify potential routes for delivery of turbine components and construction materials as well as impacts to highway transportation and this report was included in the 2008 DEIS. Since the Project Area remains unchanged since 2008 (as does much of the road network to be utilized to deliver wind turbine components and construction materials and equipment to the various Project Sites), in 2015, a preliminary transportation site survey updating the 2008 ESS Group study was presented in the SDEIS (See SDEIS § 2.11 and Appendix D). In the SDEIS, the Applicant provided a preliminary site survey of the Project prepared by American Transport, Inc. to evaluate the transport of wind turbine components and construction materials to and within the Project Area. Again, since the Project Area remains unchanged, as does the road network studied and to be utilized, it is anticipated that the same delivery vehicles and routes (or substantially similar vehicles and routes) will be utilized for construction of the revised layout contained in this Amended Application as was presented in the SDEIS. Figures 7 and 8 show potential off-site and on-site haul route roadways to be utilized during construction of the Project as presented in the SDEIS.

  In the 2008 DEIS, the Transportation Haul Route Study included a detailed discussion of the particular delivery vehicles to be used to deliver the wind turbine components to the Project Area and various Project Sites. Tables 10 through 12 show the types of truck as presented in the 2008 DEIS (Appendix N). The turbine manufacturer under the current Project (Vestas) is in the process of developing a site-specific transportation plan. The turbines are slightly larger in size (87 meter hub height versus the 80 meter hub-height presented in the DEIS); however there are less turbines (29 versus 60 presented in the DEIS). It is anticipated that the tower will be delivered in three sections as studied in the DEIS. Therefore, this data is presented with the intention of providing a preliminary assessment of the types and sizes of trucks needed for construction of the Project. The vehicle configurations are illustrated on the attached pictures taken from the transportation study developed by Siemens from the 2012 Project layout (Figure 9). It is anticipated that similar vehicles will be utilized during construction of the Project and updated information will be provided to the Town in the FEIS as a site-specific transportation plan designed and produced by Vestas.
- Proposed mitigation measures for visual impacts of the tower facility are included as part of the VRA (see Section 4.0 Mitigation Program of Appendix E of this Amended Application).
- Proposed safety measures to mitigate wind energy-deriving tower failure were presented in the SDEIS (see Section 2.15 of the SDEIS. To date, Vestas has not had a catastrophic failure of the V126 and has nothing to report or share. In addition, Ball Hill imposes a conservative setback restriction of 500 meters (1,640 feet) to ensure safety of the public, residents and its workers, contractors and subcontractors.

Table 10: OS/OW Truck Configurations
[Table 1 from Appendix N of the 2008 DEIS)]

Wind Turbine Part	**Gross Wt (lbs.)**	**Transport Vehicle** (configurations may vary)	**Length**	**Height**	**Width**	**Turning Radius**
80m Tower Base	**212,000***	11-Axle Double Schnabel	158'9"	15"-0"	14'-2"	80'-5"
80m Tower Mid-Section	132,000	7-Axle Double Schnabel	128'-2"	15'-0"	n/a	80'-5"
80m Tower Top	112,000	6-Axle Expandable Flatbed	123'-7"	14'-6"	n/a	74'-6"
Nacelle	197,000	11-Axle Lowboy	112'-10"	14'-8"	n/a	111'-2"
37m Blade	<7,000	5-Axle Expandable Flatbed	143'-11"	13'-6"	n/a	120'-0"
Substation Transformer	165,960	19-Axle with jeep assembly	**192'-2"***	18'-5.5"**	12'-3"	80'-0"
Hub Assembly	75,000	5-Axle Double Drop	78'-0"	13'-8"	10'-5"	48'-4"

** SUPERLOAD (PERM12S required by NYSDOT for any vehicle or combination of vehicles which exceed 16 feet in width; or 16 feet in height or greater; or greater than 160 feet in length, or 200,000 lbs. or greater in GVW; or a combination of any of the above.

** Requires special adjustments to overhead utility lines.

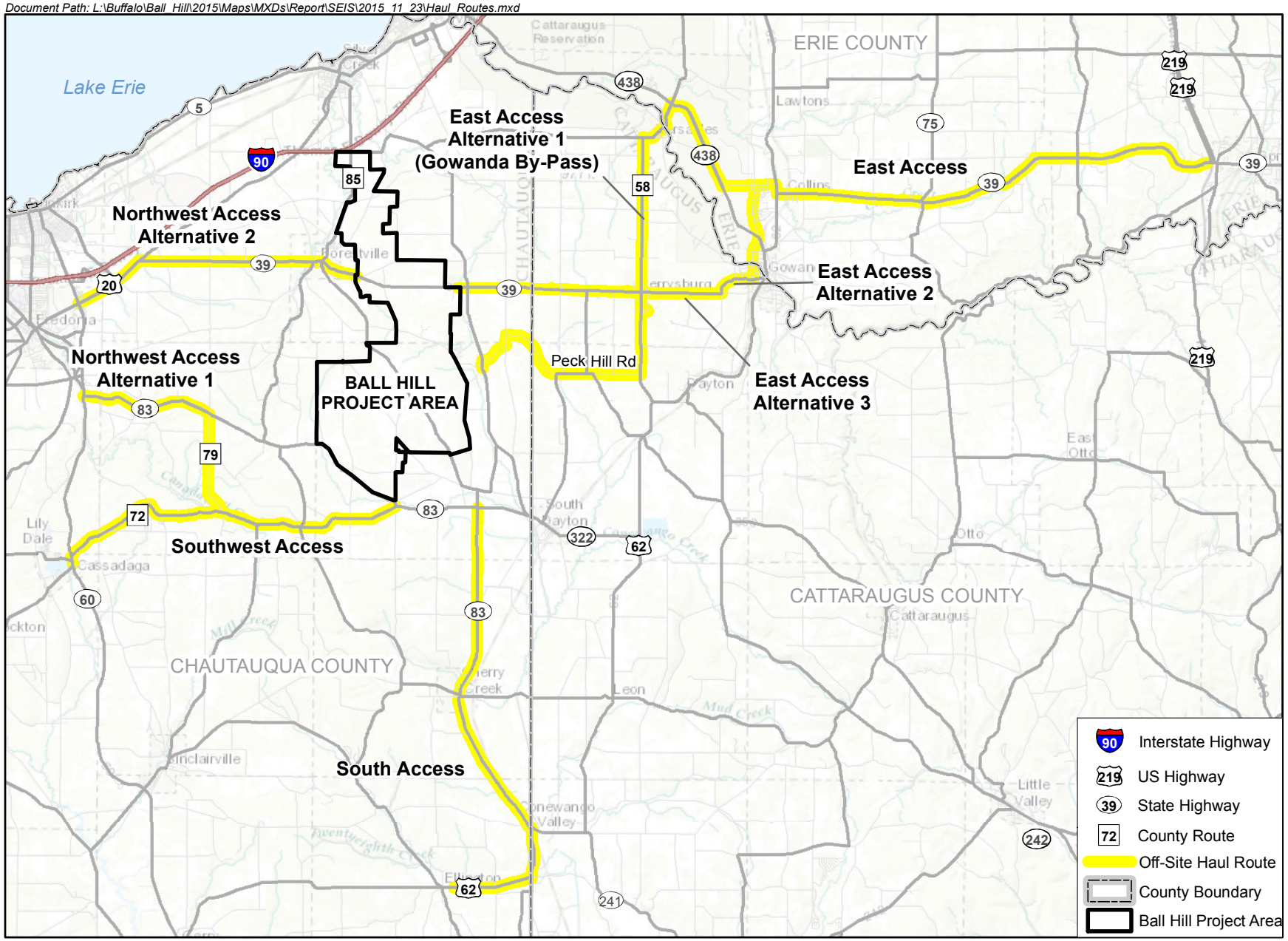
Table 11: Estimated Special Hauling Permit Vehicle Truck Trips [Table 3 from Appendix N of the 2008 DEIS]					
Wind Turbine Component	**No. each Turbine/Crane**	**Ball Hill Project**	**No. Vehicles Required**	**No. Single Trips**	**No. Round Trips***
80m Tower Base	1	60	60	60	120
80m Tower Mid-Section	1	60	60	60	120
80m Tower Top	1	60	60	60	120
Nacelle	1	60	60	60	120
37m Blade	3	180	90	90	180
Hub Assembly	1	60	60	60	120
Substation Transformer	2	2	2	2	4
500-ton Crane	1	1	19	19	38
TOTAL:	**11**	**483**	**411 (min.)**	**411 (min.)**	**822**

* All trucks on empty on the return trip except the crane trucks. Some trailer lengths can be shorted upon leaving the project area.

Table 12: Estimated Gravel & Cement Truck Trips
[Table 4 from Appendix N of the 2008 DEIS]

Proposed Construction Activity	Quantity	Total Volume (CY)	No. Vehicles Required (range)*	No. Single Trips **	No. Round Trips **
Gravel for temporary Turbine Access Roads (35' wide x 8" depth)	16.0 miles	76,700	5,478 – 6,391	6,391	12,782
Gravel removal for permanent Turbine Access Road (16' wide x 8" depth)	16.0 miles	37,650	2,700 – 3,750	3,750	7,500
Unsuitable soil Removal – Roads & Foundations (approx.)	Varies	5,000	358 – 417	417	834
Cement for Turbine Foundations (304 CY each)	60 foundations	18,240	1,520 – 1,824	1,824	3,648
	TOTAL:	**137,590**	**10,056 – 12,382**	**12,382**	**24,764**

* Range is 14 CY – 12 CY for each gravel load and 12 CY – 10 CY for each cement load.
** Trip estimates based on the higher range (i.e., small truck loads).



Service Layer Credits: Sources: Esri, HERE, DeLorme, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, MapmyIndia, © OpenStreetMap contributors, and the GIS User Community

Figure 7
Potential Off-Site Haul Route Roadways
To be Utilized During Construction
Chautauqua County, New York
Ball Hill Wind Energy, LLC

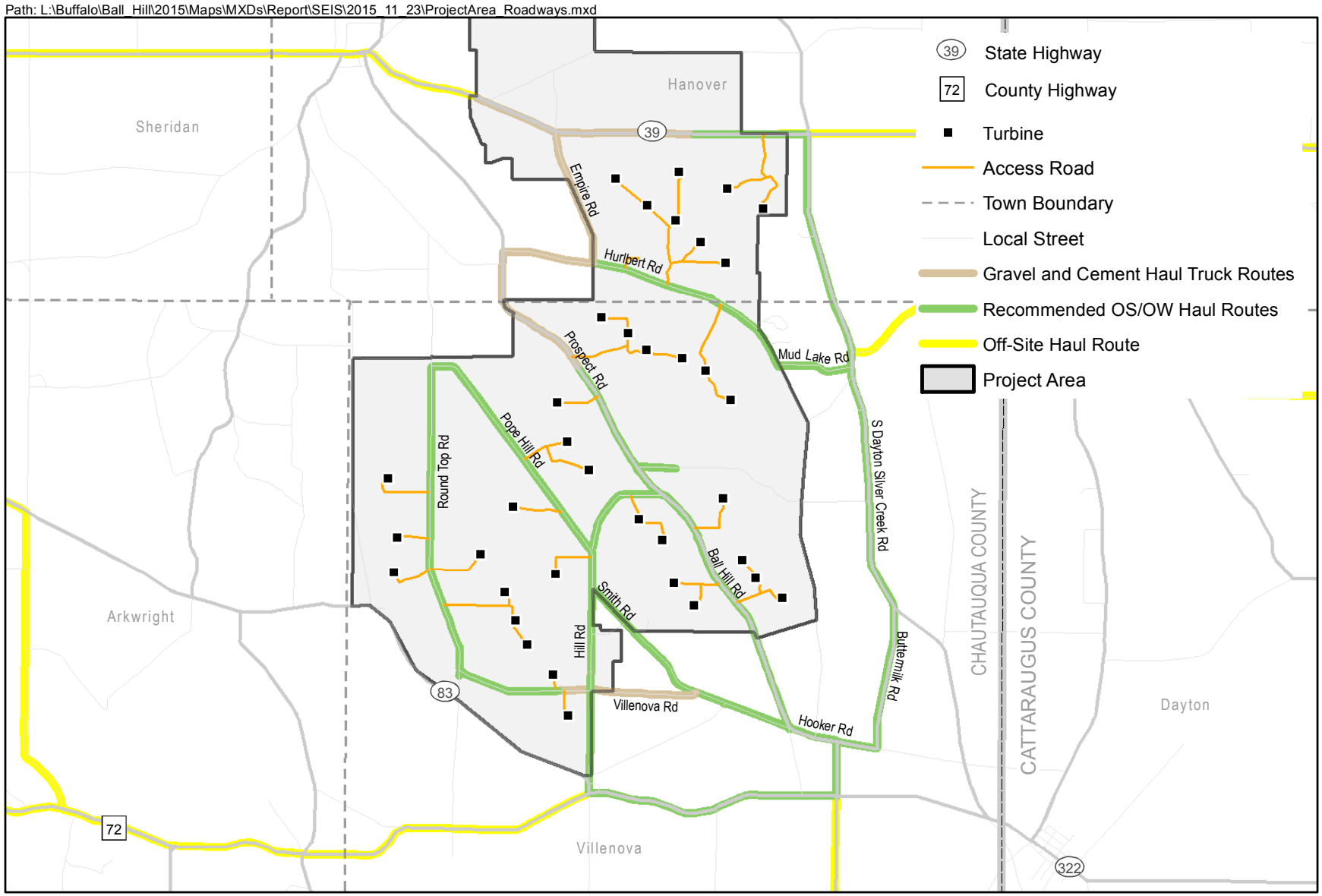


Figure 8
Potential Project Area Roadways to be Utlized during Construction
Ball Hill Wind Project
Chautauqua County, New York
Ball Hill Wind Energy, LLC

Figure 9: Representative Drawings for OS/OW Vehicles - Page 1 of 5

Nacelle Weights and Dimensions:

ATS SPECIALIZED, INC.

725 Opportunity Drive
St. Cloud, MN 56301
800-328-2316
Fax 320-258-2836

REQUEST FOR SPECIAL HAULING PERMIT

Commodity: NACELLE

Dimensions of Load

Length	36-6
Width	11-6
Height	12-4
Weight	193000

Overall Dimensions

Length	193-0
Width	11-11
Height	15-6
Weight	378000

Axle Spacings

1-2	17-0
2-3	5-1
3-4	5-1
4-5	16-3
5-6	5-0
6-7	5-0
7-8	14-8
8-9	5-0
9-10	5-0
10-11	53-0
11-12	5-0
12-13	5-0
13-14	14-7
14-15	5-0
15-16	5-0
16-17	14-8
17-18	5-0
18-19	5-0

Axle Weights

Axle 1	18
Axle 2	20
Axle 3	20
Axle 4	20
Axle 5	20
Axle 6	20
Axle 7	20
Axle 8	20
Axle 9	20
Axle 10	20
Axle 11	20
Axle 12	20
Axle 13	20
Axle 14	20
Axle 15	20
Axle 16	20
Axle 17	20
Axle 18	20
Axle 19	20

Tire Sizes
Steer Tires: 385/65R225
All Others: 275/70R225

Representative Drawings

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Figure 9: Representative Drawings for OS/OW Vehicles - Page 2 of 5

Base Weights and Dimensions:

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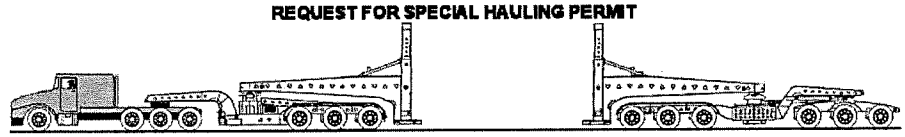

Commodity: BASE

Dimensions of Load

Length	54-2
Width	14-9
Height	13-0
Weight	127537

Overall Dimensions

Length	160-0
Width	14-10
Height	15-6
Weight	240000

Axle Spacings

1-2	14-6
2-3	4-6
3-4	4-6
4-5	15-4
5-6	5-0
6-7	5-0
7-8	67-8
8-9	5-0
9-10	5-0
10-11	14-7
11-12	5-0
12-13	5-0

Axle Weights

Axle 1	18
Axle 2	19
Axle 3	19
Axle 4	19
Axle 5	18
Axle 6	18
Axle 7	18
Axle 8	18
Axle 9	18
Axle 10	18
Axle 11	18
Axle 12	18
Axle 13	18

Tire Sizes
Steer Tires: 385/65R225
All Others: 295/75R22.5

Representative Drawings

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Figure 9: Representative Drawings for OS/OW Vehicles - Page 3 of 5

Mid Weights and Dimensions:

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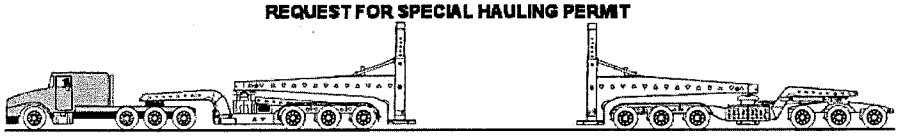

Commodity: MID

Dimensions of Load

Length	85-6
Width	13-0
Height	13-0
Weight	127207

Overall Dimensions

Length	190-0
Width	13-0
Height	14-6
Weight	243000

Axle Spacings

1-2	14-4
2-3	4-7
3-4	4-6
4-5	15-4
5-6	5-0
6-7	5-0
7-8	102-0
8-9	5-0
9-10	5-0
10-11	14-7
11-12	5-0
12-13	5-0

Axle Weights

Axle 1	17
Axle 2	19
Axle 3	19
Axle 4	19
Axle 5	19
Axle 6	19
Axle 7	19
Axle 8	18
Axle 9	18
Axle 10	18
Axle 11	18
Axle 12	18
Axle 13	18

Representative Drawings

Tire Sizes
Steer Tires: 38565R225
All Others: 29575R225

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Figure 9: Representative Drawings for OS/OW Vehicles - Page 4 of 5

Top Weights and Dimensions:

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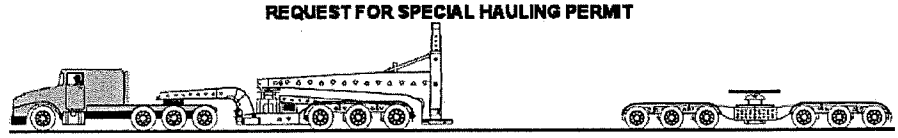

Commodity: TOP

Dimensions of Load

Length	118-1
Width	13-0
Height	7-10
Weight	106351

Overall Dimensions

Length	199-0
Width	13-0
Height	14-6
Weight	212000

Axle Spacings

1-2	14-4
2-3	4-7
3-4	4-6
4-5	15-4
5-6	5-0
6-7	5-0
7-8	103-0
8-9	5-0
9-10	5-0
10-11	14-7
11-12	5-0
12-13	5-0

Axle Weights

Axle 1	16
Axle 2	18
Axle 3	18
Axle 4	18
Axle 5	16
Axle 6	16
Axle 7	16
Axle 8	15
Axle 9	15
Axle 10	15
Axle 11	16
Axle 12	16
Axle 13	16

Tire Sizes
Steer Tires: 38565R225
All Others: 23575R17.5

Representative Drawings

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Figure 9: Representative Drawings for OS/OW Vehicles - Page 5 of 5

Blade Weights and Dimensions:

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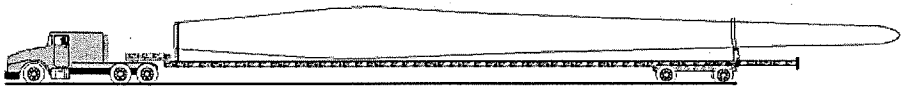

Commodity: B53 BLADE

Dimensions of Load

Length	172-7
Width	10-6
Height	11-1
Weight	25132

Overall Dimensions

Length	197-0
Width	10-10
Height	14-11
Weight	80000

Axle Spacings

1-2	20-5
2-3	4-4
3-4	112-3
4-5	10-1

Axle Weights

Axle 1	12
Axle 2	17
Axle 3	17
Axle 4	17
Axle 5	17

Representative Drawings

Tire Sizes
Steer Tires:
All Others:

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M. Elevation Map and Tower Design, Structural Compliance, and Energy Producing Abilities

Section F, Figure 6 shows the elevation contours with respect to the proposed WECS locations. In addition, Table 13 identifies the elevation at the base of the proposed WECS in the Town of Hanover and the elevation when the WECS blade is at the height of its rotation. The WECS structural compliance and energy producing abilities are outlined in Section J of this Application. In addition, Figure 10 below shows the vertical drawing of the proposed WECS. Energy resource analysis indicates that the V126 /3.45MW wind turbine on 87 meter towers will effectively generate up to 100.5MW at an estimated annual capacity factor between 25-35%.

Table 13: Existing and Total Elevation of Proposed WECS in the Town of Hanover:

Turbines ID	Existing Elevation (feet)	Total Elevation (when tip of blade at maximum height)
T31	1,510	2,002
T33	1,491	1,983
T34	1,492	1,984
T35	1,441	1,933
T36	1,373	1,865
T37	1,386	1,878

Figure 10: Vertical Drawing of Vestas V126 Wind Energy Turbine

Inset photograph of V126 Access Door

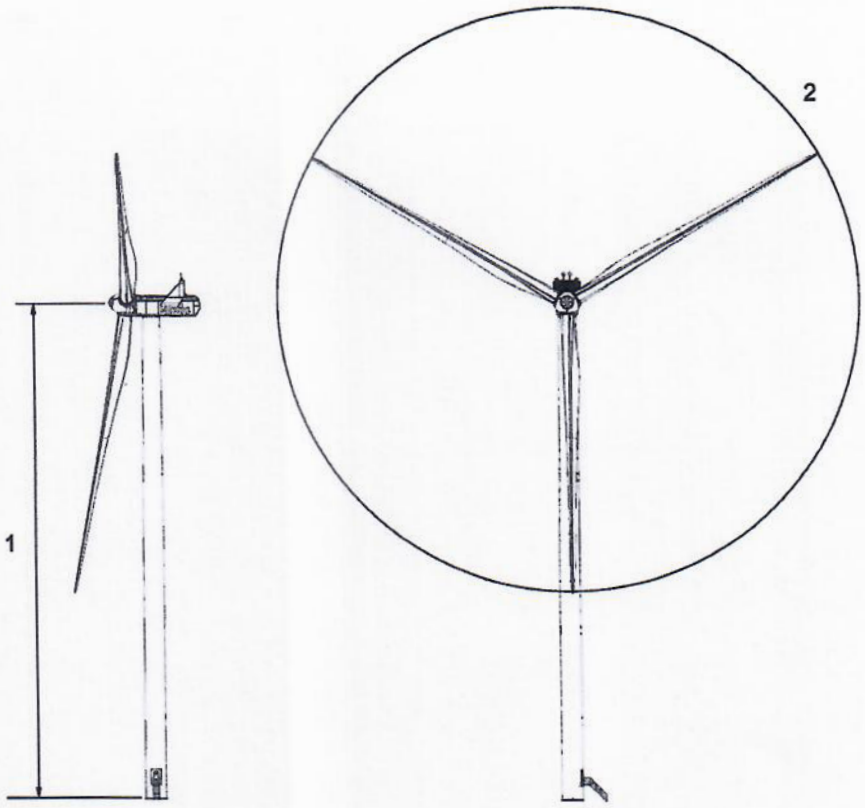


Figure 4-1: Illustration of outer dimensions – structure

1 Hub height 87/117/137 m **2** Diameter: 126 m

Vestas.

N. Geographic and Topographic Areas Acceptable for Wind Projects in Hanover

After extensive investigation of wind resource availability and potential impacts of wind energy facility construction and operation, the general geographic areas that would be acceptable for wind projects in the Town of Hanover has been determined to be that area depicted as the proposed location of wind energy facilities on Figures 3 and 4 (see Section D of this Amended Application).

The proposed wind energy overlay zone was identified based on a set of physical, environmental, and public support criteria. Preliminary analysis of the Project Area was conducted in 2006 to identify any environmental and land use constraints in the Project Area that might prevent Project development (i.e., a fatal flaw analysis). The specific issues addressed in the fatal flaw analysis included geology and soils, water resources, wetlands, threatened and endangered species, bird and bat issues, traffic and transportation, land use, environmental justice issues, cultural resources, and visual impacts. No fatal flaws were identified during this analysis. Once it was determined that the Project Area satisfied the preliminary screening criteria, the wind resources were further verified by Noble through the installation and operation of meteorological towers within the Project Area to collect site-specific data. These meteorological towers were later decommissioned. These data were compared with the New York State Wind Resource Map and modeled to predict electrical production from each potential turbine location.

In 2015, Ball Hill continued development of the Project in its original location and continued to obtain agreements with landowners within the Project Area that would allow for the construction of turbines, access roads, substation, switchyard, collection lines, and other Project facilities on their property.

As land rights acquisition was completed, internal "area constraints maps" were used to determine where turbines, access roads, substation, switchyard and collection system components, and other Project facilities could be located. Areas were eliminated as potential turbine locations if they were located on a NYSDEC- or National Wetland Inventory (NWI)-mapped wetland or in an area that appeared to be potentially regulated based on a review of soils mapping and/or a site investigation. Areas were also eliminated from consideration if they were located within setbacks or near communication or air transportation areas.

Meteorological data and computer modeling were used to create an efficient site design. Prospective turbine locations were then identified and field-verified to ensure that environmentally sensitive areas were avoided to the extent practicable, landowner concerns were addressed, and engineering constraints were minimized. Adjustments were made and computer modeling was repeated until preliminary turbine sites were optimized to balance potential environmental impacts and generation output. Once turbine locations were selected, access roads and collection lines were preliminarily sited to avoid and/or minimize impacts on wetlands and other sensitive environmental features, maximize use of existing road and transmission infrastructure, avoid engineering constraints, such as steep slopes, and to meet the approval of individual landowners. Access roads and other Project components must also meet the required geometrical and engineering specifications required by best engineering practices and by the turbine manufacturer for safe delivery and exit from the turbine sites.

During the process of field-verifying the proposed turbine locations, access roads, electrical collection, and transmission line placement were also considered. In the interest of minimizing impacts, every effort was made to minimize the number and length of access road/interconnection systems needed. Each system was designed, where possible, to be co-located with other project facilities, use previously disturbed areas such as farmlands and roads, and avoid or minimize stream and wetland crossings.

In addition, care was taken to choose a project design that would minimize impact on the use of active agricultural lands. In consultation with New York State Department of Agriculture and Markets

(NYSDAM) and NYSDAM's *Guidelines for Agricultural Mitigation for Windpower Projects* facilities continue to be carefully sited to minimize impacts on agricultural land. In addition, landowner concerns, current land use practices, and the towns' agricultural mitigation standards were considered and continue to be reflected in the proposed layout of facilities. In accordance with NYSDAM guidance, turbines and access roads located on active farms would be placed on the edge of agricultural fields to the greatest extent possible without increasing impacts on wetlands. This minimizes the loss of agricultural land and wooded areas. To the extent practical, roads and interconnects would be located on the edge of agricultural land to minimize impacts on agricultural operations, including reducing the incidence of crossing drain tiles.

The design and layout of the Project components has been continuously evaluated to avoid or minimize adverse environmental impacts while improving Project efficiency by examining various turbine totals and layouts. The Project layout, as currently proposed, has been engineered to capture the area's high wind energy resources while minimizing wake effects on downwind turbines as well as adverse environmental impacts.

O. Applicant's Long Range Market Plans and Facility Needs

The Applicant's long-range post-construction facility needs from the Town of Hanover will be limited to light road traffic for occasional operations and maintenance activities and, if ever called upon, occasional emergency response.

RES Americas, Inc. is an international renewable energy company and is pursuing renewable energy projects throughout the United States, including other development-stage projects in New York. However, RES does not have any plans underway for projects in Chautauqua County beyond the Ball Hill Wind Energy Project

P. Visibility Map

A visibility map is included as part of the Visual Resource Assessment (see Section I and Appendix E of this Amended Application).

Q. Soil and Storm Water Report

Soil profile analysis and stormwater calculations for disturbed areas were initially submitted to the Lead Agency as part of the SDEIS and distributed to the Town Board. These calculations will be updated with respect to the new layout of the Project and will be submitted to the Lead Agency as part of the Stormwater Pollution and Prevention Plan (SWPPP) or Spill Prevention, Control, and Countermeasure Plan (SPCC).

The Project would involve both temporary and permanent impacts on soil resources and agricultural productivity in the Project Area. Table 14 (Table 2.2-3 of the SDEIS) summarizes the anticipated construction impacts by Project component and soil characteristics that were calculated for the Project Layout presented in the SDEIS. Overall, the Project Layout presented in the SDEIS was predicted to result in the potential disturbance of soils on 282.6 acres of land (approximately 63 acres in the Town of Hanover), including the permanent conversion of 98.1 acres out of the 13,659 acres of the entire Project Area for Project facilities, such as turbine pedestals, access roads, O&M buildings, and the power substation and switchyard (approximately 38 acres in the Town of Hanover). Temporary construction-related impacts would have occurred on the remaining 184.5 acres of land. It is anticipated that the numbers of acres of soils permanently and temporarily impacted by the Project as presented in the FEIS will be lower, as a result of constructing 29 turbines rather than 36, six of which will be in the Town of Hanover.

Construction of the Project could result in indirect impacts on the quality of stormwater runoff as a result of increased surface runoff from disturbed areas and the possible release of pollutants or hazardous materials in the event of a spill during construction. These impacts are expected to be minor, short-term, and reversible, with the exception of a minor permanent increase in impervious surface area, which will be mitigated through compliance with the site-specific SWPPP.

No significant increase in impervious surface would result from the operation of the Project. Based on the Project Layout presented in the SDEIS, a total of 42.6 acres of impervious surface would have been added to the 13,659-acre Project Area from tower pedestals (0.2 acre); crane pads (4.9 acres); permanent access roads (37.40 acres); and the O&M facility (0.1 acre). These Project facilities will be designed for proper surface water flow and stormwater management, in compliance with the site-specific SWPPP. Therefore, no significant adverse impacts on stormwater runoff volumes or water quality are anticipated during operation of the Project.

Table 14 Potential Soil Impacts Based on Soil Attributes and Project Component[7]
[Table 2.2-3 of the SDEIS]

Project Component	Total Impact (Acres)[1]	High Erosion Potential[2]	High Compaction Potential	Poor Drainage[3]	Shallow Bedrock[4]	Slope >15%	Prime Farmland[5]	Statewide Importance
Construction Impacts								
Turbines (including staging area)	137.1	37.3	38.8	3.3	19.4	6.2	69.9	60.6
Collection System[6]	33.3	6.2	8.3	0.9	11.8	0.9	16.8	15.0
Access Roads[7]	67.7	11.0	20.1	2.3	18.3	1.4	32.4	33.6
Transmission[8]	18.4	0.7	10.4	1.1	2.6	0.3	14.0	4.0
Laydown Areas/O&M Facility	26.1	4.0	7.9	1.1	13.7	0.0	6.3	19.8
Total Acres of All Construction Impacts[12]	**282.6**	**59.2**	**85.5**	**8.7**	**65.8**	**17.6**	**139.4**	**133.0**
Operational (Permanent) Impacts								
Turbines[9]	53.6	14.2	15.1	0.8	7.0	2.6	28.0	22.9
Collection System[6]	1.2	0.0	0.0	0.0	0.0	0.0	1.2	0.0
Access Roads[7]	30.5	5.4	8.9	1.0	7.6	0.6	14.9	14.9
Transmission[8]	10.0	0.4	5.2	0.7	1.6	0.2	7.4	2.4
Laydown Areas/O&M Facility[11]	2.9	0.0	2.9	0.0	1.7	0.0	0.0	2.9
Total Acres for Operational Impacts[12]	**98.1**	**20.0**	**32.1**	**2.5**	**17.9**	**3.4**	**51.5**	**43.1**
Total Acres with Temporary Soil Impact[10,12]	**184.5**	**39.2**	**53.4**	**6.2**	**47.9**	**14.2**	**87.9**	**89.9**

Notes:
Note: This Table provides a summary of the proposed clearing in the SDEIS. Updates to the acreages based on the proposed layout will be provided in the FEIS.

[1] Total impact is the total soils impacted by each Project component and does not represent a sum of the types of soils presented in this table.
[2] Includes severe and very severe.
[3] Includes poorly drained and very poorly drained.
[4] Includes all bedrock less than 6 feet from the surface.
[5] Includes prime farmland and prime farmland if drained.
[6] Construction impacts include collection right of way (ROW) along existing road, new collection ROW, and the substation; operational impacts include the substation footprint.
[7] Construction impacts are based on access road construction ROW (in some cases including collocated collection lines); operational impacts are based on 18-foot permanent access roads.
[8] Construction and operational impacts based on a 20-foot (construction) and 12-foot (operational) access road ROW and impacts associated with the switchyard. Impacts from poles are considered negligible and are not included. There will be no impact on soils from the clearing of the 80-foot ROW.
[9] Operational impacts are based on the turbine site footprint (270 feet by 240 feet).
[10] Temporary impact on soils equals the construction impact minus the operational impacts. The construction impact includes all soil impacted during construction, which is inclusive of temporary and operational impacts.
[11] Construction impacts include impacts from the construction laydown areas. Operational impacts include the O&M building site and O&M building, which will be constructed on top of a construction laydown area.
[12] Individual values may not add up to totals due to rounding.

Key:
O&M = operation and maintenance

R. Water Pollution, Erosion, Run-Off, and Flooding Prevention Plan

Potential for pollution to surface and ground water, soil erosion, excessive run-off and flooding will be analyzed in full and submitted to the Lead Agency as part of the SWPPP or SPCC.

In a typical site development per the NYSDEC Stormwater Manual, the requirement is to maintain runoff at/below pre-development conditions resulting in no increase of runoff. For wind farms and other linear projects, NYSDEC has given some additional guidance that allows a slight increase of runoff, if the Project analyzes the change of runoff within site watersheds. The Applicant will consult with the NYSDEC throughout the development of the SWPPP in order to ensure all state regulations are met.

S. Migratory Bird Requirements

The Applicant is actively consulting with the USFWS and NYSDEC and preparing a bird and bat conservation strategy to avoid and/or minimize any potential impacts to migratory birds.

Potential impacts to migratory birds were analyzed in the SDEIS. Most species are expected to temporarily avoid immediate areas during active construction, and no significant adverse impacts on migratory bird populations, including raptors, passerines, and waterbirds, are expected during operation of the Project.

Raptors
There are no geographical or topographical features in the Project Area that would attract or concentrate migrating raptors. Relatively low numbers of migrant raptors are anticipated to occur in the Project Area, especially as compared to the known spring season concentrated flight path adjacent to Lake Erie.

Passerines
Nocturnal migrant passerine birds run the risk of colliding with all tall structures, including wind turbines. There are no geographical or topographical features within the Project Area that would attract or concentrate nocturnal migrant passerines. The Project Area is not immediately proximate to any large waterbodies or isolated habitat patches that large numbers of nocturnal migrants would use as stopover areas. Outside of such areas, passerine migration is typically diffuse over a broad front. Results of the 2008 nocturnal radar study conducted in the Project Area are generally consistent with this assessment.

Waterfowl/Waterbirds
The Project is not located in an area where there are large movements of migratory or local waterfowl/waterbirds. The potential risk for waterfowl/waterbird mortality resulting from the Project is anticipated to be very low.

T. FAA and FCC Compliance

FAA Compliance
For the WECS, the Project proposes to light 22 of the 29 WECS in accordance with the Federal Aviation Administration ("FAA") Advisory Circular 70/7460-1 L, Obstruction Marking and Lighting ("FAA Advisory Circular"), a copy of which is attached hereto as Appendix F. This plan calls for perimeter turbines to be lighted, as well as interior turbines, with a maximum gap between lit turbines of no more than 0.50 miles (2,640 feet). The lights to be used in this plan are synchronized red lights and are identified in the VRA (see Appendix E of this Amended Application). Five out of the six WECS in the Town of Hanover (all but T34) are currently proposed to be lit (see Figure 3 in Appendix E of this Amended Application). The VRA also illustrates the specific WECS which will receive lights during operation of the Project. Under FAA protocol, during construction all 29 WECS will be fitted with a temporary light.

When the Project layout is final (i.e., all permits and approvals having been received so that no material changes, additions, or removals will be made), the Applicant will request that FAA approve the lighting plan submitted herein. As the lighting plan follows the advisory circular lighting standards, it is anticipated that the lighting plan will be approved by the FAA and seven WECS (one in Hanover) will have lights removed accordingly. The Applicant will provide all updated FAA Determinations of No Hazard to the Town prior to the issuance of any building permits; current FAA Determinations of No Hazard are attached to this Amended Application as Appendix G.

Lighting in the substation will consist primarily of manually activated exterior lighting and temporary work lighting installed as needed. During normal operations the substation will not be lit except as required for site security and/or as required by federal, state, or local agencies. Routine maintenance work at the substation is expected to occur during daylight hours however nighttime work (requiring lighting) may be required in an emergency or for reliability reasons. Generally, there will not be any other lighting provided as part of the Project except minimal ground light fixtures to be operated manually for the bases of the turbines and the O&M facility.

FCC Compliance
Communication surveys with respect to AM and FM Radio, Off-Air TV Analysis, Licensed Microwave, and Land Mobile and Emergency Services were submitted to the Town of Villenova as Appendix P in the SDEIS for the Ball Hill Wind Project (January 2016). Below provides a summary of the impacts presented in the SDEIS. The communication surveys will be updated and provided in the FEIS. Impacts to communications are expected to be minimal and very similar to the results presented in the SDEIS.

Although construction cranes are roughly 75 feet higher than the tower hub height, they are considerably lower than the maximum tip height of the completed turbines. The construction cranes move around the Project Site during construction and do not remain in the same location for a long period of time and are typically only fully raised when installing a turbine at its permitted location. In the case of unexpected interference, any interference would be minimal and temporary. Therefore, impacts from construction of the Project would not result in significant adverse impacts on communication signals in the Project Area.

The full power digital stations (WNYB, WBBZ-TV, WKBW-TV, WIVB-TV, WGRZ, WNYO-TV, WUTV, WNLO, and WNED-TV) may have disruption in reception in and around the Project. The areas primarily affected would include TV service locations within 10 km of the Project and that have clear line-of-sight to a proposed wind turbine but not the respective station. Communities and homes located in these areas may have degraded reception of the following stations: WNYB, Channel 26. This is due to

the multipath interference caused by signal scattering as TV signals are reflected by the rotating wind turbine blade and mast. Mitigation of these potential impacts is discussed in Section 2.10.3, Mitigation.

There are 12 FM stations within 30 km of the center of the Project Area. All of the FM stations are located at distances greater than 9.01 km (5.59 miles) from the nearest turbine. At these distances, the wind turbine effects on the FM coverage for all of these stations will be very minimal to non-existent. No problems are expected for the coverage of the full-power and medium-power FM stations near the Project Area because the separation distances from the proposed wind turbines are so great. Audio signals from AM broadcast can interact with wind turbines at close range (1 to 3 km [0.62 to 1.86 miles]). However, the two AM transmitters (same station) were approximately 10 miles from the center of the Project Area.

The frequencies of operation of land-mobile radio repeaters are generally unaffected by the presence of wind turbines. Very little, if any, change in the coverage of the repeaters will occur when the wind turbines are installed. Each land-mobile radio/emergency service network is designed to operate reliably in a non-line-of-site environment. Many of the systems are designed with multiple base transmitter stations covering a large geographic area with overlap between the adjacent sites in order to provide handoff between cells. Any signal blockage caused by the Project does not materially degrade the reception because the end user is likely to receive signals from multiple transmitter locations. In addition, the frequencies of operation for these services have characteristics that allow the signal to propagate through the Project.

Telephone communications in the cellular and personal communication system (PCS) frequency bands are unaffected by the presence of wind turbines. This is not only because of the frequencies used, but because cell communications are designed to function as a system, passing the signal to a different cell if it is weakened at the first. Cellular and PCS frequency bands are unaffected by the presence of wind turbines because the blockage caused by wind turbines is not destructive to the propagation of signals in these frequency bands. Local obstacles are also generally not a limiting factor for cellular communication frequencies because other cellular sites provide an alternative signal.

U. Ice and Blade Throw Analysis

Based on best practice safety practices and RES's own enhanced setback requirements, the risk of impacts from blade throw and ice throw is minimal. Ice on turbine blades and towers can pose a safety risk for the general public depending on the site specific siting of each turbine in relation to publically accessible areas such as roads, residences, and other developed areas. To date, there have been no serious accidents caused by ice throw; however that is not to say there is no risk.

To mitigate and minimize the risk of ice throw, turbine locations are set back in accordance with setbacks in the Wind Law as well as internal RES best practice safety standards of 1.5 times tip height, or approximately 230 meters (754.6 feet). In addition, implementation of best practice safety procedures during operation of the wind farm can reduce the risk of ice throw, including but not limited to: visual inspections, de-icing and anti-icing systems, regular and routine maintenance by full-time turbine technicians assigned to wind farm operations, curtailment of turbines in hazardous conditions, educating staff/landowners on specific weather conditions and associated throw risks, standard safety protocols were icing is imminent, and public safety warning signs near public access areas and project boundaries. In short, the buildup of ice on the blades impacts the ability of the turbine to function as designed. The weather conditions and decreased turbine performance with be observed in the SCADA center and the identified turbine or turbines will be adjusted to avoid or minimize both ice throw and damage to the turbine itself.

Recent studies suggest the typical range (90% of events) of ice being thrown from a turbine is less than 190m from the turbine base, which falls within our standard turbine setbacks. Almost 50% of these events may occur within the length of the turbine blade (<63m). The maximum throw distance based on best practice formulas is approximately 320m, however these events are defined as the "exceptional range" as their impact probably is minimal. Studies also suggest threats to the public from blade fragments are negligible.

V. Catastrophic Tower Failure Report

The Vestas V126/3.45MW wind turbine is well-suited to the wind conditions of the proposed Project Site. This conclusion is supported by the data and findings contained in the V126 Type Certification, included in Section J of this Application. The turbine is classified as a Class IIB turbine which operates in 16% turbulence, an average of 19 miles per hour wind and a 50 year gust speed of 133 mph. Vestas completes a suitability analysis of every site where they install turbines to confirm the turbines are suitable for the Project Site. To date Vestas has not had a V126 have a catastrophic failure and has nothing to report or share.

W. Noise Analysis

The updated noise analysis for the Project is included as Appendix H.

Summary: A comprehensive sound level assessment conducted for the revised Project layout indicates that predicted sound level impacts from the 29 proposed Vestas V126-3.45 wind turbine generators and two proposed electrical transformers are expected to meet the Town of Hanover and Town of Villenova noise limit at each of the closest structures to the Project. Due to the nature of wind turbine noise and the relative background sound levels in the area, noise from the Project is likely to be audible at times at some of the closest residences, but the Project is anticipated to meet the suggested criteria recommended in the NYSDEC guidance document for avoiding the potential for adverse community noise impacts. No pure tones (such as whines, screeches, or hums) were identified at the closest structure for the turbine model under consideration. Low frequency sound levels at the closest structures to the Project are also predicted to be well below the recommended criteria to avoid disturbance, vibration, and rattle indoors.

Complaint Resolution:

To provide good relations between the Applicant and the community, a system will be implemented for receiving and processing any complaints from residents that might arise concerning compliance with permits or approvals of the agreements between the Applicant and the Towns, or the Applicant's construction and operation of the Project. The Applicant will use reasonable efforts to resolve any such complaint.

Prior to the commencement of construction, the Applicant will assign a Community Relations Coordinator to be responsible for resolving any complaints as described above.

In addition, the Applicant will undertake a mailing to all residents of the Town of Hanover notifying them of an email address, street address and local and toll-free telephone numbers where they can contact the Applicant with any complaints, questions or concerns. During non-business hours, the toll-free telephone number will be equipped with an automatic answering and time and date recording device.

The Applicant will make reasonable efforts to respond to all complaints within five (5) business days of receipt of any complaint. The Applicant will maintain records and provide periodic reports to the Town Board of any complaints received and responses, resolutions, and attempts to resolve such complaints for turbines or activities in the Town of Hanover.

If any complaint is not resolved within thirty (30) days of its receipt, to the reasonable satisfaction of the complaining resident, such complaint may be noticed at the next Town Board meeting for discussion and guidance as the Board may determine appropriate consistent with applicable laws and agreements.

Appendix A: Vestas 126, 3.45 MW Series Wind Turbine Brochure

Vestas®

3 MW PLATFORM

Wind. It means the world to us.™

Are you looking for the maximum return on **your investment** in wind energy?

Wind energy means the world to us. And we want it to mean the world to our customers, too, by maximising your profits and strengthening the certainty of your investment in wind power.

That's why, together with our partners, we always strive to deliver cost-effective wind technologies, high quality products and first class services throughout the entire value chain. And it's why we put so much emphasis on the reliability, consistency and predictability of our technology.

We have more than 35 years' experience in wind energy. During that time, we've delivered more than 70 GW of installed capacity in 75 countries. That is more than 15 per cent of total wind turbine capacity installed globally – and over 15 GW more than our closest competitor. We currently monitor over 28,000 wind turbines across the globe. All tangible proof that Vestas is the right partner to help you realise the full potential of your wind site.

What is the 3 MW Platform today?
The 3 MW platform was introduced in 2010 with the launch of the V112-3.0 MW®. Over 8 GW of the 3 MW platform has been installed all over the world onshore and offshore making it the obvious choice for customers looking for highly flexible and trustworthy turbines.

Since then the 3 MW platform was upgraded and new variants were introduced utilising untapped potential of the platform. All variants carry the same nacelle design and the hub design has been re-used to the largest extend possible. In addition, our engineers have increased the nominal power across the entire platform improving your energy production significantly.

With this expansion, the 3 MW platform covers all IEC wind classes with a variety of rotor sizes and a higher rated output power of 3.45 MW.

You can choose from the following turbines on the 3 MW platform:
- V105-3.45 MW™ – IEC IA
- V112-3.45 MW™ – IEC IA
- V117-3.45 MW™ – IEC IB/IEC IIA
- V126-3.45 MW™ – IEC IIB
- V126-3.45 MW™ – IEC IIA
- V136-3.45 MW™ – IEC IIIA

All variants of the 3 MW platform are based on the proven technology of the V112-3.0 MW® with a full-scale converter, providing you with superior grid performance.

Our 3 MW platform is designed for a broad range of wind and site conditions, enabling you to mix turbines across your site or portfolio of sites, delivering industry-leading reliability, serviceability and exceptional energy capture optimising your business case.

All turbine variants are equipped with the same ergonomically designed and very spacious nacelle which makes it easier for maintenance crews to gain access, so they can reduce the time spent on service while maximizing the uptime without compromising safety. All turbines can be installed and maintained using standard installation and servicing tools and equipment further reducing the operation and maintenance costs by minimising your stock level of spare parts.

+56,000

The V112-3.45 MW® and the other 3 MW variants advance the already proven technology powering over 56,000 installed Vestas turbines worldwide - more than any other supplier.

How does our technology generate **more energy?**

More power for every wind site
V112-3.45 MW™, V117-3.45 MW™, V126-3.45 MW™ and V136-3.45 MW™ are available with several noise modes to meet sound level restrictions with an optimised production. The power system enables superior grid support and it is capable of maintaining production across severe drops in grid voltage, while simultaneously minimising tower and foundation loads. It also allows rapid down-rating of production to 10 per cent nominal power.

Proven technologies - from the company that invented them
The 3 MW platform is a low-risk choice. It is based on the proven technologies that underpin more than 56,000 Vestas turbines installed around the world. Using the best features from across the range, as well as some of the industry's most stringently tested components and systems, the platform's reliable design minimises downtime – helping to give you the best possible return on your investment.

With an operating range that covers all wind classes, our 3 MW platform delivers unrivalled energy production. The proven blade technology from the V112-3.0 MW® is used on the V105-3.45 MW™, the V112-3.45 MW™ and on the V117-3.45 MW™. The industry known structural shell blades are used on the V126-3.45 MW™ and V136-3.45 MW™- a technology which is also used on the 2 MW V110-2.0 MW™ variant.

Reliable and robust
The Vestas Test Centre is unrivalled in the wind industry. We test most nacelle components using Highly Accelerated Life Testing (HALT) to ensure reliability. For critical components, HALT identifies potential failure modes and mechanisms. Specialised test rigs ensure strength and robustness for the gearbox, generator, yaw and pitch system, lubrication system and accumulators. Our quality-control system ensures that each component is manufactured to design specifications and performs at site. We systematically monitor measurement trends that are critical to quality, locating defects before they occur.

The 3 MW platform covers all wind segments enabling you to find the best turbine for your specific site.

WINDCLASSES - IEC

TURBINE TYPE	IEC III (6.0 - 7.5 m/s)	IEC II (7.5 - 8.5 m/s)	IEC I (8.5 - 10.0 m/s)
3 MW TURBINES			
V105-3.45 MW™ IEC IA			■
V112-3.45 MW™ IEC IA			■
V117-3.45 MW™ IEC IB/IEC IIA		■	■
V126-3.45 MW™ IEC IIA		■	■
V126-3.45 MW™ IEC IIB	■	■	
V136-3.45 MW™ IEC IIIA	■	■	

■ Standard IEC conditions ■ Site dependent

Options available for the 3 MW platform

An option is an extra feature that can be added to the turbine to suit a project's specific needs. By adding options to the standard turbine, we can enhance the performance and adaptability of the wind power project and facilitate a shorter permitting cycle at restricted sites. The options can even be a decisive factor in realising your specific project, and the business case certainty of the investment.

Here is a list of the options available for the 3 MW platform:

- Power Optimised Mode
- Condition Monitoring System
- Service Personnel Lift
- Vestas Ice Detection
- Vestas De-Icing
- Low Temperature Operation to - 30°C
- Fire Suppression
- Shadow detection
- Increased Cut-In
- Nacelle Hatch for Air Inlet
- Aviation Lights
- Aviation Markings on the Blades
- Obstacle Collision Avoidance System (OCAS™)

Life testing

The Vestas Test Centre has the unique ability to test complete nacelles using technologies like Highly Accelerated Life Testing (HALT). This rigorous testing of new components ensures the reliability of the 3 MW platform.

Is the 3 MW platform the optimal choice for **your specific site?**

One common nacelle – five different rotor sizes
The wind conditions on a wind project site are often not identical. The 3 MW platform features a range of turbines that cover all wind classes and combined across your site they can maximise the energy output of your wind power plant.

Tip-height restrictions and strict grid requirements
With a rotor size of 105 m, the V105-3.45 MW™ IEC IA is the turbine that fits the most severe wind conditions. It has an extremely robust design for tough site conditions and is especially suited for markets with tip-height restrictions and high grid requirements.

Like all the other 3 MW turbines, the V105-3.45 MW™ is equipped with a full-scale converter ensuring full compliance with the challenging grid codes in countries like the UK and Ireland.

Cold climates
The V112-3.45 MW™, V117-3.45 MW™ , V126-3.45MW™ and V136-3.45 MW™ can be combined with Vestas De-Icing and Vestas Ice Detection ensuring optimum production in cold climates.

The Vestas De-Icing System is fully SCADA integrated and can be triggered automatically or manually depending on your de-icing strategy. Automatic control protects your investment, optimising the trigger point so the turbine only stops to de-ice when there is an expected net power production gain.

High- and medium-wind sites
The V112-3.45 MW™ IEC IA is a high-wind turbine and has a very high capacity factor. Similar to the other 3 MW turbines, the V112-3.45 MW™ IEC IA turbine makes efficient use of its grid compatibility and is an optimal choice for sites with MW constraints.

On medium wind-sites the V117-3.45 MW™ IEC IB/IEC IIA, V126-3.45 MW™ IEC IIA and V126-3.45 MW™ IEC IIB are excellent turbine choices. A combination of the variants can optimise your site layout and improve your production significantly on complex sites.

Low-wind sites
Built on the same proven technology as the V112-3.0 MW®, the V136-3.45 MW™ IEC IIIA is our best performer on low-wind sites. The larger rotor enable greater wind capture, which in turn produces more energy to reduce levelised cost of energy (LCOE). The result is exceptional profitability in areas with low wind, and new frontiers for wind energy investment.

Large Diameter Steel Towers (LDST) support the added rotor size and rating of Vestas turbines to increase Annual Energy Production on low-wind sites.

LDST is specially designed with a larger diameter in the bottom section that allows for optimal strength at high hub heights.

Maximising old permits
Although the V136-3.45 MW™ is one of the highest producing low wind turbine available, some old permits may simply be too tight to accept it. Although the V117-3.45 MW™ and V126-3.45 MW™ are medium-wind turbines, they still deliver an excellent business case on low-wind sites.

Due to the similar electrical properties and nacelle design, it is easy to mix and match the turbines from the 3 MW platform to maximise production on heavily constrained sites.

Would you **benefit** from uninterrupted control of wind energy production?

Knowledge about wind project planning is key
Getting your wind energy project up and operating as quickly as possible is fundamental to its long-term success. One of the first and most important steps is to identify the most suitable location for your wind power plant. Vestas' SiteHunt® is an advanced analytical tool that examines a broad spectrum of wind and weather data to evaluate potential sites and establish which of them can provide optimum conditions for your project.

In addition, SiteDesign® optimises the layout of your wind power plant. SiteDesign® runs Computational Fluid Dynamics (CFD) software on our powerful in-house supercomputer Firestorm to perform simulations of the conditions on site and analyse their effects over the whole operating life of the plant. Put simply, it finds the optimal balance between the estimated ratio of annual revenue to operating costs over the lifetime of your plant, to determine your project's true potential and provide a firm basis for your investment decision.

The complexity and specific requirements of grid connections vary considerably across the globe, making the optimal design of electrical components for your wind power plant essential. By identifying grid codes early in the project phase and simulating extreme operating conditions, Electrical PreDesign provides you with an ideal way to build a grid compliant, productive and highly profitable wind power plant. It allows customised collector network cabling, substation protection and reactive power compensation, which boost the cost efficiency of your business.

Advanced monitoring and real-time plant control
All our wind turbines can benefit from VestasOnline® Business, the latest Supervisory Control and Data Acquisition (SCADA) system for modern wind power plants.

This flexible system includes an extensive range of monitoring and management functions to control your wind power plant. VestasOnline® Business enables you to optimise production levels,

+28,000

The Vestas Performance and Diagnostics Centre monitors more than 28,000 turbines worldwide. We use this information to continually develop and improve our products and services.

monitor performance and produce detailed, tailored reports from anywhere in the world. The VestasOnline® Power Plant Controller offers scalability and fast, reliable real-time control and features customisable configuration, allowing you to implement any control concept needed to meet local grid requirements.

Surveillance, maintenance and service

Operating a large wind power plant calls for efficient management strategies to ensure uninterrupted power production and to control operational expenses. We offer 24/7 monitoring, performance reporting and predictive maintenance systems to improve turbine performance and availability. Predicting faults in advance is essential, helping to avoid costly emergency repairs and unscheduled interruptions to energy production.

Our Condition Monitoring System (CMS) assesses the status of the turbines by analysing vibration signals. For example, by measuring the vibration of the drive train, it can detect faults at an early stage and monitor any damage. This information allows pre-emptive maintenance to be carried out before the component fails, reducing repair costs and production loss.

Additionally, our Active Output Management® (AOM) concept provides detailed plans and long term agreements for service and maintenance, online monitoring, optimisation and troubleshooting. It is possible to get a full scope contract, combining your turbines' state-of-the-art technology with guaranteed time or energy-based availability performance targets, thereby creating a solid base for your power plant investment. The Active Output Management® agreement provides you with long term and financial operational peace of mind for your business case.

V105-3.45 MW™ IEC IA

Facts & figures

POWER REGULATION	Pitch regulated with variable speed

OPERATING DATA

Rated power	3,450 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	25 m/s
Re cut-in wind speed	23 m/s
Wind class	IEC IA

Standard operating temperature range from -20°C* to +45°C with de-rating above 30°C

*subject to different temperature options

SOUND POWER

(Noise modes dependent on site and country)

ROTOR

Rotor diameter	105 m
Swept area	8,659 m²
Air brake	full blade feathering with 3 pitch cylinders

ELECTRICAL

Frequency	50/60 Hz
Converter	full scale

GEARBOX

Type	two planetary stages and one helical stage

TOWER

Hub height	72.5 m (IEC IA)

NACELLE DIMENSIONS

Height for transport	3.4 m
Height installed (incl. CoolerTop®)	6.9 m
Length	12.8 m
Width	4.2 m

HUB DIMENSIONS

Max. transport height	3.8 m
Max. transport width	3.8 m
Max. transport length	5.5 m

BLADE DIMENSIONS

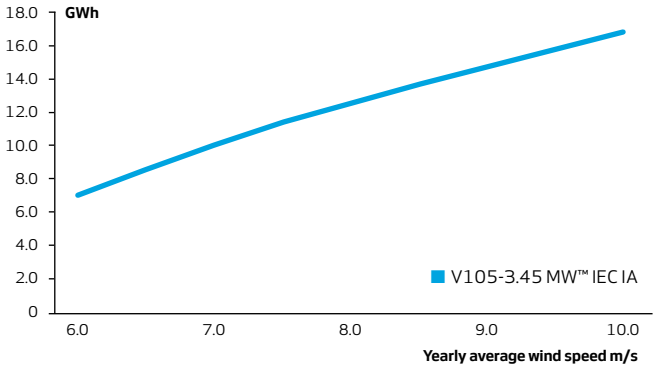
Length	51.2 m
Max. chord	4 m

Max. weight per unit for transportation	70 metric tonnes

TURBINE OPTIONS

- Power Optimised Mode
- Condition Monitoring System
- Service Personnel Lift
- Vestas Ice Detection
- Low Temperature Operation to -30°C
- Fire Suppression
- Shadow Detection
- Increased Cut-In
- Nacelle Hatch for Air Inlet
- Aviation Lights
- Aviation Markings on the Blades
- Obstacle Collision Avoidance System (OCAS™)

ANNUAL ENERGY PRODUCTION



Assumptions
One wind turbine, 100% availability, 0% losses, k factor =2, Standard air density = 1.225, wind speed at hub height

V112-3.45 MW™ IEC IA

Facts & figures

POWER REGULATION	Pitch regulated with variable speed

OPERATING DATA

Rated power	3,450 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	25 m/s
Re cut-in wind speed	23 m/s
Wind class	IEC IA

Standard operating temperature range from -20°C* to +45°C with de-rating above 30°C

*subject to different temperature options

SOUND POWER

(Noise modes dependent on site and country)

ROTOR

Rotor diameter	112 m
Swept area	9,852 m²
Air brake	full blade feathering with 3 pitch cylinders

ELECTRICAL

Frequency	50/60 Hz
Converter	full scale

GEARBOX

Type	two planetary stages and one helical stage

TOWER

Hub height	69 m (IEC IA) and 94 m (IEC IA)

NACELLE DIMENSIONS

Height for transport	3.4 m
Height installed (incl. CoolerTop®)	6.9 m
Length	12.8 m
Width	4.2 m

HUB DIMENSIONS

Max. transport height	3.8 m
Max. transport width	3.8 m
Max. transport length	5.5 m

BLADE DIMENSIONS

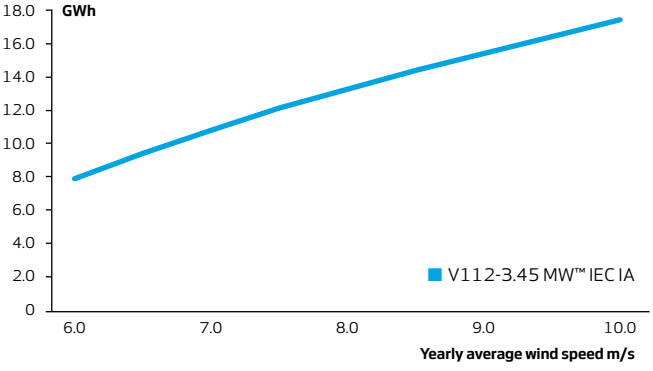
Length	54.7 m
Max. chord	4 m

Max. weight per unit for transportation	70 metric tonnes

TURBINE OPTIONS

- Power Optimised Mode
- Condition Monitoring System
- Service Personnel Lift
- Vestas Ice Detection
- Vestas De-Icing
- Low Temperature Operation to - 30°C
- Fire Suppression
- Shadow detection
- Increased Cut-In
- Nacelle Hatch for Air Inlet
- Aviation Lights
- Aviation Markings on the Blades
- Obstacle Collision Avoidance System (OCAS™)

ANNUAL ENERGY PRODUCTION



Assumptions
One wind turbine, 100% availability, 0% losses, k factor =2, Standard air density = 1.225, wind speed at hub height

V117-3.45 MW™ IEC IB/IEC IIA

Facts & figures

POWER REGULATION	Pitch regulated with variable speed

OPERATING DATA

Rated power	3,450 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	25 m/s
Re cut-in wind speed	23 m/s
Wind class	IEC IB/IEC IIA

Standard operating temperature range from -20°C* to +45°C with de-rating above 30°C

*subject to different temperature options

SOUND POWER

(Noise modes dependent on site and country)

ROTOR

Rotor diameter	117 m
Swept area	10,751 m²
Air brake	full blade feathering with 3 pitch cylinders

ELECTRICAL

Frequency	50/60 Hz
Converter	full scale

GEARBOX

Type	two planetary stages and one helical stage

TOWER

Hub heights	80 m (IEC IB), 91.5 m (IEC IB) and 116.5 m (IEC IB/IEC IIA/DIBtS)

NACELLE DIMENSIONS

Height for transport	3.4 m
Height installed (incl. CoolerTop®)	6.9 m
Length	12.8 m
Width	4.2 m

HUB DIMENSIONS

Max. transport height	3.8 m
Max. transport width	3.8 m
Max. transport length	5.5 m

BLADE DIMENSIONS

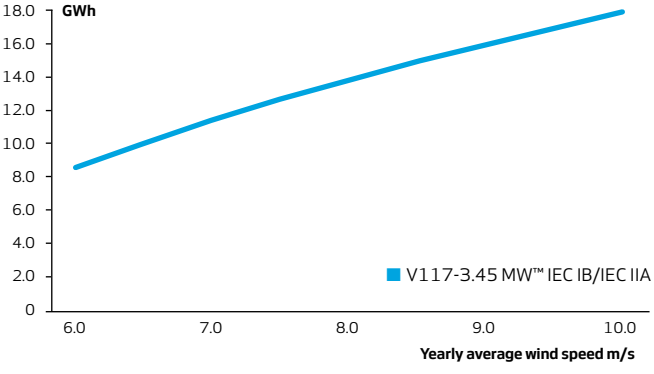
Length	57.2 m
Max. chord	4 m

Max. weight per unit for transportation	70 metric tonnes

TURBINE OPTIONS

- Power Optimised Mode
- Condition Monitoring System
- Service Personnel Lift
- Vestas Ice Detection
- Vestas De-Icing
- Low Temperature Operation to - 30°C
- Fire Suppression
- Shadow detection
- Increased Cut-In
- Nacelle Hatch for Air Inlet
- Aviation Lights
- Aviation Markings on the Blades
- Obstacle Collision Avoidance System (OCAS™)

ANNUAL ENERGY PRODUCTION



Assumptions
One wind turbine, 100% availability, 0% losses, k factor =2, Standard air density = 1.225, wind speed at hub height

V126-3.45 MW™ IEC IIB

Facts & figures

POWER REGULATION	Pitch regulated with variable speed

OPERATING DATA

Rated power	3,450 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	22.5 m/s
Re cut-in wind speed	20 m/s
Wind class	IEC IIB

Standard operating temperature range from -20°C* to +45°C with de-rating above 30°C

*subject to different temperature options

SOUND POWER

(Noise modes dependent on site and country)

ROTOR

Rotor diameter	126 m
Swept area	12,469 m²
Air brake	full blade feathering with 3 pitch cylinders

ELECTRICAL

Frequency	50/60 Hz
Converter	full scale

GEARBOX

Type	two planetary stages and one helical stage

TOWER

Hub heights	87 m (IEC IIB), 117 m (IEC IIB) and 137 m (IEC IIIA)

NACELLE DIMENSIONS

Height for transport	3.4 m
Height installed (incl. CoolerTop®)	6.9 m
Length	12.8 m
Width	4.2 m

HUB DIMENSIONS

Max. transport height	3.8 m
Max. transport width	3.8 m
Max. transport length	5.5 m

BLADE DIMENSIONS

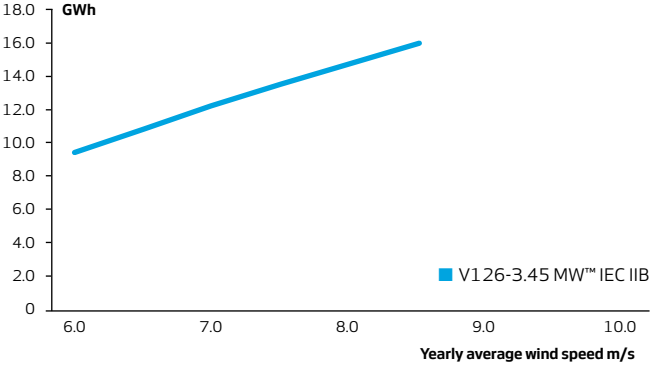
Length	61.7 m
Max. chord	4 m

Max. weight per unit for transportation	70 metric tonnes

TURBINE OPTIONS

- Power Optimised Mode
- Condition Monitoring System
- Service Personnel Lift
- Vestas Ice Detection
- Vestas De-Icing
- Low Temperature Operation to - 30°C
- Fire Suppression
- Shadow detection
- Increased Cut-In
- Nacelle Hatch for Air Inlet
- Aviation Lights
- Aviation Markings on the Blades
- Obstacle Collision Avoidance System (OCAS™)

ANNUAL ENERGY PRODUCTION



Assumptions
One wind turbine, 100% availability, 0% losses, k factor =2, Standard air density = 1.225, wind speed at hub height

V126-3.45 MW™ IEC IIA

Facts & figures

POWER REGULATION	Pitch regulated with variable speed

OPERATING DATA

Rated power	3,450 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	22.5 m/s
Re cut-in wind speed	20 m/s
Wind class	IEC IIA

Standard operating temperature range from -20°C* to +45°C with de-rating above 30°C

*subject to different temperature options

SOUND POWER

(Noise modes dependent on site and country)

ROTOR

Rotor diameter	126 m
Swept area	12,469 m²
Air brake	full blade feathering with 3 pitch cylinders

ELECTRICAL

Frequency	50/60 Hz
Converter	full scale

GEARBOX

Type	two planetary stages and one helical stage

TOWER

Hub heights	87 m (IEC IIA), 117 m (IEC IIA/DIBtS), 137 m (IEC IIIA/DIBtS), 147 m (IEC IIIA), 149 m (DIBtS) and 166 m (DIBtS)

NACELLE DIMENSIONS

Height for transport	3.4 m
Height installed (incl. CoolerTop®)	6.9 m
Length	12.8 m
Width	4.2 m

HUB DIMENSIONS

Max. transport height	3.8 m
Max. transport width	3.8 m
Max. transport length	5.5 m

BLADE DIMENSIONS

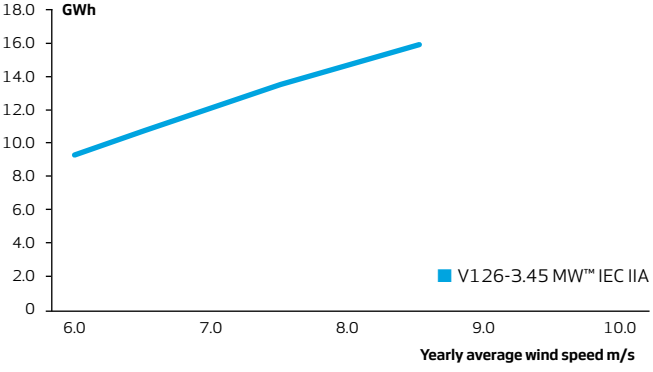
Length	61.7 m
Max. chord	4 m

Max. weight per unit for transportation	70 metric tonnes

TURBINE OPTIONS

- Power Optimised Mode
- Condition Monitoring System
- Service Personnel Lift
- Vestas Ice Detection
- Vestas De-Icing
- Low Temperature Operation to - 30°C
- Fire Suppression
- Shadow detection
- Increased Cut-In
- Nacelle Hatch for Air Inlet
- Aviation Lights
- Aviation Markings on the Blades
- Obstacle Collision Avoidance System (OCAS™)

ANNUAL ENERGY PRODUCTION



Assumptions
One wind turbine, 100% availability, 0% losses, k factor =2, Standard air density = 1.225, wind speed at hub height

V136-3.45 MW™ IEC IIIA

Facts & figures

POWER REGULATION — Pitch regulated with variable speed

OPERATING DATA

Rated power	3,450 kW
Cut-in wind speed	3 m/s
Cut-out wind speed	22.5 m/s
Re cut-in wind speed	20 m/s
Wind class	IEC IIIA

Standard operating temperature range from -20°C* to +45°C with de-rating above 30°C

*subject to different temperature options

SOUND POWER

(Noise modes dependent on site and country)

ROTOR

Rotor diameter	136 m
Swept area	14,527 m²
Air brake	full blade feathering with 3 pitch cylinders

ELECTRICAL

Frequency	50/60 Hz
Converter	full scale

GEARBOX

Type	two planetary stages and one helical stage

TOWER

Hub heights	82 m (IEC IIIA), 112 m (IEC IIIA), 132 m (IEC IIIA/DIBt2) and 149 m (DIBtS)

NACELLE DIMENSIONS

Height for transport	3.4 m
Height installed (incl. CoolerTop®)	6.9 m
Length	12.8 m
Width	4.2 m

HUB DIMENSIONS

Max. transport height	3.8 m
Max. transport width	3.8 m
Max. transport length	5.5 m

BLADE DIMENSIONS

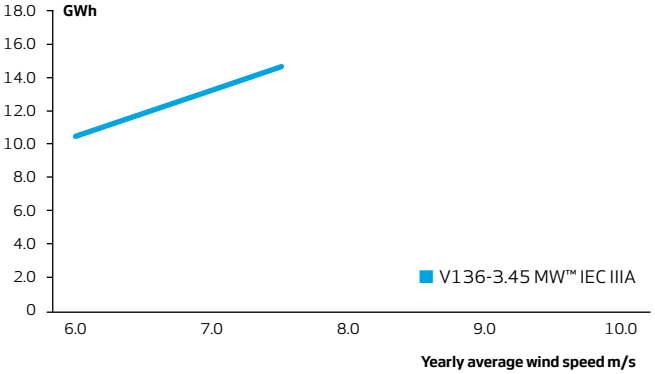
Length	66.7 m
Max. chord	4.1 m

Max. weight per unit for transportation	70 metric tonnes

TURBINE OPTIONS

- Condition Monitoring System
- Service Personnel Lift
- Vestas Ice Detection
- Vestas De-Icing
- Low Temperature Operation to - 30°C
- Fire Suppression
- Shadow detection
- Increased Cut-In
- Nacelle Hatch for Air Inlet
- Aviation Lights
- Aviation Markings on the Blades
- Obstacle Collision Avoidance System (OCAS™)

ANNUAL ENERGY PRODUCTION



Assumptions
One wind turbine, 100% availability, 0% losses, k factor =2, Standard air density = 1.225, wind speed at hub height

Vestas Wind Systems A/S
Hedeager 42 . 8200 Aarhus N . Denmark
Tel: +45 9730 0000 . Fax: +45 9730 0001
vestas@vestas.com . **vestas.com**

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10/2015-EN

Appendix B: Memoranda of Lease

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

MEMORANDUM OF OPTION AGREEMENT

THIS MEMORANDUM OF OPTION AGREEMENT (this "***Memorandum***") is made and entered into to be effective as of March 17, 2016, by and between Kenneth M. Van Volkenburg and Audrey C. Van Volkenburg, as husband and wife, ("***Seller***"), and Ball Hill Wind Energy, LLC ("***Buyer***").

1. **Agreement**. For the term of and upon the provisions set forth in that Option Agreement of even date herewith between Seller and Buyer (the " ***Option Agreement***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Seller hereby grants to Buyer the option to purchase the Premises, lying and being in Hanover, Chautauqua County, New York, described in **Exhibit A**, attached hereto (the "***Premises***"), and Buyer and Seller desire to give notice to third parties of the Option Agreement.

2. **Term**. The initial term of the Option Agreement is seven (7) years, and may be extended for up to two (2) additional two (2) year periods at Buyer's option.

3. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Option Agreement and in no way modifies the express provisions of the Option Agreement. This Memorandum shall continue to constitute notice of the Option Agreement, even if the Option Agreement is subsequently amended.

4. **Successors and Assigns**. Seller and Buyer intend that the covenants, conditions and restrictions contained in the Option Agreement shall be both personal to Seller and Buyer and binding on their successors and assigns during the Option Term. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

5. **Counterparts**. This Memorandum may be executed in any number of counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same instrument. This Memorandum may be transmitted via facsimile or other similar electronic means and a signature of the undersigned transmitted via such means shall be

deemed an original signature for all purposes and have the same force and effect as a manually-signed original.

[Remainder of Page Intentionally Left Blank]

IN WITNESS WHEREOF this Memorandum of Option Agreement has been executed to be effective as of the date first written above.

WITNESSES: Print Name: Andrew Hawkes Print Name: Andrew Hawkes	SELLER: Kenneth M. Van Volkenburg Audrey C. Van Volkenburg
WITNESSES: Print Name: Stephanie Bullock Print Name: MARIA M. RICH	BUYER: Ball Hill Wind Energy, LLC, a Delaware limited liability company By: RES America Developments Inc., its Manager By: _____ Name: Brian Evans Title: President

NOTARY ACKNOWLEDGEMENTS

STATE OF Florida)
)
COUNTY OF Osceola)

On the 18th day of May in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Kenneth M. Van Volkenburg, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

ANDREW HAWKES
Notary Public, State of Florida
Commission # FF 22768
My comm. expires May 30, 2017

STATE OF Florida)
)
COUNTY OF Osceola)

On the 18th day of May in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Audrey C. Van Volkenburg, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

ANDREW HAWKES
Notary Public, State of Florida
Commission # FF 22768
My comm. expires May 30, 2017

STATE OF COLORADO)
)
COUNTY OF BROOMFIELD)

On the 4 day of April in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Brian Evans, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

NICOLE A. BLACKSTAD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154000318
MY COMMISSION EXPIRES JANUARY 5, 2019

EXHIBIT A TO MEMORANDUM OF OPTION AGREEMENT

(Legal Description of the Property)

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York, being part of Lot No. 42, Township 6, Range 10 of the Holland Land Company's survey, bounded and described as follows:

Beginning in the centerline of New York State Route 39 (also known as Lodi Street) as now laid out and occupied (66 feet wide) at the point located 1900.5 feet northwesterly along said centerline of Route 39 from the intersection thereof with the centerline of Empire Road (49.5 feet wide) as now laid out and occupied; thence continuing northwesterly a distance of 377.4 feet along said centerline of Route 39 to the intersection thereof with the west line of Lot 42; thence northerly at an interior angle of 113°-04' a distance of 1142.6 feet along said west line of Lot 42 to a point in the centerline of existing pavement in Hopper Road, and passing through an iron pin located 35.9 feet northerly along the last described course from said centerline of Route 39, and passing through an existing iron pin located 26.3 feet southerly along the last described course from said centerline of Hopper Road; thence easterly at an interior angle of 89°-37' a distance of 352.5 feet along said northerly line of lands conveyed to Kreitner by deed recorded in Liber 1418 of Deeds at Page 325 in the office of the Chautauqua County Clerk to an iron pin, and passing through an iron pin located 57.5 feet easterly along the last described course from said centerline of Hopper road; thence southerly at an interior angle of 90°-09' a distance of 1288.1 feet through said Kreitner lands to the point or place of beginning, and passing through an iron pin located 35.8 feet northerly along the last described course from said centerline of Route 39, and containing 9.8 acres of land more or less.

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
Attn: Legal Department
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of July 29, 2016, by and between Michael E. Weaver and Becky A. Weaver ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on JULY 29, 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

[*Signatures appear on following page*]

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: _____

Name: Michael E. Weaver

By: _____

Name: Becky A. Weaver

TENANT:

Ball Hill Wind Energy, LLC,
a Delaware limited liability company

By: RES America Developments Inc.,
a Delaware corporation,
its Manager

By: _____

Name: PETER ROOD

Title: REGIONAL VICE PRESIDENT

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 26th day of July in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Michael E. Weaver, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy
Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 26th day of July in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Becky A. Weaver, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy
Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF MINNESOTA)
)
COUNTY OF HENNEPIN)

On the 29th day of JULY in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared PETER ROOD, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

H. Granger
Notary Public

Heather Virgene Granger
Notary Public
Minnesota
My Commission Expires
01.31.21

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

All that Tract or Parcel of Land,

situate in the Town of Hanover, County of Chautauqua and State of New York, being part of Lot No.33 in the 6th township and 10th range of the Holland Land Company's Survey, bounded as follows:

COMMENCING in the center of the highway leading from Forestville to Nashville at the northeast corner of a parcel of land formerly owned by Altherton Rockwell; thence east along the center of said road 16 rods; thence south bounded by land owned by Charles Rockwell 200 rods; thence west 16 rods; thence north parallel to the east line of same, 200 rods to the place of beginning, containing 20 acres more or less.

ALSO, ALL THAT OTHER TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York, being part of Lot No. 33, town 6, range 10 of the Holland Land Company's Survey, commencing at the northeast corner of the premises conveyed above, thence easterly and along the center line of the Forestville-Nashville Road 61.0 feet; thence south at an interior angle of 90 degrees, 580 feet to a point; thence west at an interior angle of 90 degrees, 61.0 feet to a point; thence north 580.0 feet to the point or place of beginning of the reserved parcel.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016001696

Receipt#: 201606152109
Clerk: AH
Rec Date: 02/23/2016 01:46:22 PM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 6
Rec'd Frm: RES AMERICA DEVELOPMENTS INC

Party1: ANTHONY MILES E SR
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	45.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	75.00

Transfer Tax

Transfer Tax	4.00
Sub Total:	4.00
Total:	79.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016002606
Consideration: 580.00

Transfer Tax	4.00
Total:	4.00

Record and Return To:

RES AMERCIAS INC
11101 W 120TH AVE SUITE 400
BROOMFIELD CO 88021

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of December 8, 2015, by and between Miles E. Anthony Sr. and Susan Anthony, as husband and wife ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for

a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on December 8, 2015, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: Miles E. Anthony Sr.
Name: Miles E. Anthony Sr.

By: Susan Anthony
Name: Susan Anthony

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments Inc.
its Manager

By: _____
Name: Rob Morelli
Title: Chief Strategy Officer

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 29th day of November in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Miles E. Anthony Sr., personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 29th day of November in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Susan Anthony, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF COLORADO)
)
COUNTY OF BROOMFIELD)

On the 8TH day of December in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared ~~Brian~~ Rob Morgan, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York, known as part of Lot No. 46, in the 6th Township and 10th Range according to the Holland Land Company's Survey and bounded and described as follows: Beginning at a point in the west line of said Lot No. 46 at the distance of 9 chains 75 links north from the southwest corner of said lot; thence north along the west line of said lot, about 10 chains 42 links to a stake in said west bounds of said lot; thence south 86° east 44 chains 85 links to a stake; thence south 21° west 1 chain to a stake; thence south 74° 30' east 4 chains 73 links to a stake set on top of the bank of the Gulf; thence south 74° 30' east to the creek in the Gulf; thence southerly and along the creek in the Gulf to a point which is perpendicularly north 9 chains 75 links from the south line of Lot No. 46; thence west and parallel with the south line of said lot, 44 chains to the place of beginning, containing 43 ½ acres of land.

ALSO ALL THAT OTHER TRACT OR PARCEL OF LAND, situate in the Town, County and State aforesaid and being part of Lot 54 in the 6th Township and 10th Range of the Holland Land Company's Survey, bounded and described as follows: Commencing at the southwest corner of land owned by Stephen L. Mead and running west 13 chains 11 links; thence north 13 chains; thence east 13 chains 11 links; thence south 13 chains to the place of beginning, containing 17 acres and 6 rods, be the same more or less.
Being the same premises conveyed by Stephen L. Mead to Phillip H. Mead by warranty deed dated April 11, 1913, and recorded in the office of the County Clerk of Chautauqua on October 6, 1913, in Liber 393 of Deeds at page 420.

EXCEPTING AND RESERVING

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York, being part of Lot 46 in Township 6 and Range 10 of the Holland Land Company's survey, and more particularly described as follows:

BEGINNING in the centerline of Dennison Road (66 feet wide) as now laid out and occupied at the point located 1063.9 feet northeasterly along said centerline of Dennison Road from the intersection thereof with the south line of Lot 46; thence continuing northeasterly along said centerline of Dennison Road following a regular curve to the left a chord distance of 150 feet to a point; thence easterly at an interior angle of 102 degrees 54 minutes when measured from said chord a distance of 580 feet through lands conveyed from Scott to Mead by deed recorded in Liber 115 of Deeds at Page 306 in the office of the Chautauqua County Clerk to an iron pin, and passing through an iron pin located 33.4 feet easterly along the last described course from said centerline of Dennison Road; thence southerly at an interior angle of 90 degrees 00 minutes a distance of 146.2 feet through said Mead lands to an iron pin; thence westerly at an interior angle of 90 degrees 00 minutes a distance of 613.5 feet through said Mead lands to the point or place of beginning, and passing through an iron pin located 34.5 feet easterly along the last described course from said centerline of Dennison Road, and containing 2 acres of land more or less.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2015006563

Receipt#: 201506145520
Clerk: AH
Rec Date: 11/12/2015 10:21:02 AM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 6
Rec'd Frm: RES AMERICA DEVELOPMENTS INC

Party1: BOCK JAMES M
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	45.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	75.00
Transfer Tax	
Transfer Tax	4.00
Sub Total:	4.00
Total:	79.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016001444
Consideration: 940.00

Transfer Tax	4.00
Total:	4.00

Record and Return To:

RES AMERCIAS INC
11101 W 120TH AVE SUITE 400
BROOMFIELD CO 80021

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of October 13, 2015, by and between James M. Bock ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for a distance from each Turbine to the boundaries of the Premises, together vertically

through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on October 15, 2015, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: _____
Name: James M. Bock

SPOUSAL CONSENT:

By: _____
Name: Cathey M. Bock

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments Inc.
its Manager

By: _____
Name: BRIAN EVANS
Title: PRESIDENT

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 4th day of October in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared James M. Bock, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 4th day of October in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Cathey M. Bock, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF COLORADO)
)
COUNTY OF BROOMFIELD)

On the 13th day of October in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Brian Evans, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

NICOLE A. BLACKSTAD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154000318
MY COMMISSION EXPIRES JANUARY 5, 2019

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

and assigns forever, all THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York, being part of Lot 17, Township 6 and Range 10 of the Holland Land Company's Survey and more particularly bounded and described as follows: BEGINNING at a point in the northwest corner of said Lot No. 17; thence easterly along the north line of said Lot No. 17, 62 chains and 4 links to the northeast corner of said Lot No. 17; thence south along the east bounds of said Lot No. 17, 16 chains and 15 links to the southeast corner of land conveyed to Albert Heier and May Heier, his wife, by Milton W. Smith and Addie B. Smith, his wife, by warranty deed dated April 1, 1919 and recorded in the Chautauqua County Clerk's Office in liber 452 of deeds at page 177; thence west along the south bounds of land so conveyed to Albert Heier and May Heier, his wife, by the deed hereinabove referred to, 62 chains and 13 links to the west bounds of said Lot No. 17 and being the southwest corner of land so conveyed to Albert Heier and May Heier, his wife, by the deed hereinabove referred to; thence north along the west bounds of said Lto No. 17, 16 chains and 12 links to the place of beginning, containing 100 acres of land be the same more or less. Being the same premises conveyed by 2 separate deeds, namely as follows: Warranty Deed dated March 17, 1910 made and executed by Milton W. Smith and Addie B. Smith to Albert H. Heier and recorded in the Chautauqua County Clerk's Office in liber 257 of deeds at page 118 and Warranty Deed dated April 1, 1919 made and executed by Milton W. Smith and Addie B. Smith, his wife, to Albert Heier and May Heier, his wife, and recorded in the Chautauqua County Clerk's Office in liber 452 of deeds at page 177. The said Albert H. Heier one of the grantors herein being the same person named as grantee in the deed first hereinabove referred to and also one of the grantees in the deed second hereinabove referred to.

EXCEPTING AND RESERVING, ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York, being part of Lot No. 17, Township 6, Range 10 of the Holland Land Company's survey, bounded and described as follows: BEGINNING at a point in the center line of Hanover Road in the north line of Lot No. 17; thence southeasterly along the center line of Hanover Road a distance of 541.20 feet; thence east on a line parallel with the north line of Lot No. 17 a distance of 415.00 feet to a stake; thence northeasterly on a line making an interior angle with the last described line of 93°19' a distance of 518.70 feet to a stake on the north line of Lot No. 17; thence west along the north line of Lot No. 17, a distance of 603.35 feet to the center line of Hanover Road at the place of beginning, containing 6.05 acres of land, be the same more or less.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016003131

Receipt#: 201606158303
Clerk: AH
Rec Date: 05/19/2016 08:47:59 AM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 6
Rec'd Frm: RES AMERICA

Party1: BOWMAN STEVEN J
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	45.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	75.00
Transfer Tax	
Transfer Tax	28.00
Sub Total:	28.00
Total:	103.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016003681
Consideration: 7000.00

Transfer Tax	28.00
Total:	28.00

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

Record and Return To:

RES AMERICA DEVELOPMENTS INC
11101 W 120TH AVE SUITE 400
BROOMFIELD CO 80021

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of March 28, 2016, by and between Steven J. Bowman ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for a distance from each Turbine to the boundaries of the Premises, together vertically

through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on March 28 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

[*Signatures appear on following page*]

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: _____
Name: Steven J. Bowman

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments, Inc.
a Delaware corporation
Its Manager

By: _____
Name: Peter Rood
Title: Regional Vice President

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 16th day of March in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Steven J. Bowman, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy
Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF ~~COLORADO~~ MINNESOTA)

COUNTY OF ~~BROOMFIELD~~ HENNEPIN)

On the 28 day of March in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Peter Rood, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

MELISSA M PYKA
NOTARY PUBLIC - MINNESOTA
MY COMMISSION EXPIRES 01/31/19

Melissa M. Pyka
Notary Public

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

X All that Tract or Parcel of Land, situate in the Town of Hanover, County of Chautauqua and State of New York, being a part of the north part of lot #41 in the 6th Township and 10 th Range according to the Holland Land Company's Survey more particularly described as follows:

Commencing at the Northwest corner of lot No. 41, running South 33 chains and 65 links, thence East 41 chains and 13 links to the center of the highway; thence along the center of the highway North $21\frac{1}{2}^{\circ}$ West, 18 chains and 50 links; thence still along the center of the said North 9° West, 17 chains and 12 links to the North side of said lot; thence West 31 chains and 16 links to the place of beginning, containing 118 and 82/100 of an acre be the same more or less. X

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016003008

Receipt#: 201606157881
Clerk: AH
Rec Date: 05/12/2016 12:47:38 PM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 7
Rec'd Frm: RES AMERICA

Party1: BRENNAN JAMES A
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	50.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	80.00
Transfer Tax	
Transfer Tax	40.00
Sub Total:	40.00
Total:	120.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016003584
Consideration: 10000.00

Transfer Tax	40.00
Total:	40.00

Record and Return To:

RES AMERICAS INC
330 SECOND AVE S
SUITE 820
MINNEAPOLIS MN 55401

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of February 29th, 2016, by and between James A. Brennan and Shelly R. Brennan, as husband and wife, ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited

throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on February 29 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

[Signatures appear on following page]

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: _____
Name: James A. Brennan

By: _____
Name: Shelly R. Brennan

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments, Inc.
a Delaware corporation
Its Manager

By: _____
Name: Peter Rood
Title: Regional Vice President
Date: February 29, 2016

CALIFORNIA ALL-PURPOSE CERTIFICATE OF ACKNOWLEDGMENT

State of California

County of San Diego

On Feb. 15, 2016 before me, Peggy McCaul-Ames,
(Here insert name and title of the officer)

personally appeared James A. Brennan,

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

Peggy McCaul-Ames
Signature of Notary Public

(Notary Seal)

PEGGY MCCAUL-AMES
Commission # 2043364
Notary Public - California
San Diego County
My Comm. Expires Sep 29, 2017

ADDITIONAL OPTIONAL INFORMATION

DESCRIPTION OF THE ATTACHED DOCUMENT

Memorandum of Lease
(Title or description of attached document)

(Title or description of attached document continued)

Number of Pages 5 Document Date

(Additional information)

CAPACITY CLAIMED BY THE SIGNER

- ☐ Individual (s)
- ☐ Corporate Officer

(Title)

- ☐ Partner(s)
- ☐ Attorney-in-Fact
- ☐ Trustee(s)
- ☐ Other

INSTRUCTIONS FOR COMPLETING THIS FORM

Any acknowledgment completed in California must contain verbiage exactly as appears above in the notary section or a separate acknowledgment form must be properly completed and attached to that document. The only exception is if a document is to be recorded outside of California. In such instances, any alternative acknowledgment verbiage as may be printed on such a document so long as the verbiage does not require the notary to do something that is illegal for a notary in California (i.e. certifying the authorized capacity of the signer). Please check the document carefully for proper notarial wording and attach this form if required.

- State and County information must be the State and County where the document signer(s) personally appeared before the notary public for acknowledgment.
- Date of notarization must be the date that the signer(s) personally appeared which must also be the same date the acknowledgment is completed.
- The notary public must print his or her name as it appears within his or her commission followed by a comma and then your title (notary public).
- Print the name(s) of document signer(s) who personally appear at the time of notarization.
- Indicate the correct singular or plural forms by crossing off incorrect forms (i.e. ~~he~~/she/~~they,~~ is /~~are~~) or circling the correct forms. Failure to correctly indicate this information may lead to rejection of document recording.
- The notary seal impression must be clear and photographically reproducible. Impression must not cover text or lines. If seal impression smudges, re-seal if a sufficient area permits, otherwise complete a different acknowledgment form.
- Signature of the notary public must match the signature on file with the office of the county clerk.
  - Additional information is not required but could help to ensure this acknowledgment is not misused or attached to a different document.
  - Indicate title or type of attached document, number of pages and date.
  - Indicate the capacity claimed by the signer. If the claimed capacity is a corporate officer, indicate the title (i.e. CEO, CFO, Secretary).
- Securely attach this document to the signed document

STATE OF California)
)
COUNTY OF San Diego)

On the 5th day of Feb. in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared James A. Brennan, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 30th day of January in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Shelly R. Brennan, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF ~~COLORADO~~ MINNESOTA)

COUNTY OF ~~BROOMFIELD~~ HENNEPIN)

On the 29 day of February in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Peter Rood, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

MELISSA M PYKA
NOTARY PUBLIC - MINNESOTA
MY COMMISSION EXPIRES 01/31/19

Notary Public

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

All that tract of parcel of land situate in the Town of Hanover, County of Chautauqua and State of New York, being part of Lot 41, Township 6, Range 10 of the Holland Land Company's Survey, bounded and described as follows:

Beginning at a point in the center line of Empire Road 706 feet southerly from its intersection with the north line of Lot 41; then westerly, at an interior angle of 90° 314.75 feet to a point; then continuing westerly at an interior angle of 191° 03', 1885.20 feet to a point in the west line of Lot 41; then running southerly and along said west line of Lot 41 for 477.90 feet; then running easterly at an interior angle of 89° 34' for 2318.17 feet to a point in the said center line of Empire Road; then running Northwesterly and along said center line of Empire Road 553 feet to the point or place of beginning, containing 25.03 acres of land, more or less.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016001935

Receipt#: 201606153010
Clerk: AH
Rec Date: 03/08/2016 10:42:20 AM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 11
Rec'd Frm: RES AMERICA DEV INC

Party1: BUNKER DOUGLAS R
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	70.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	100.00

Transfer Tax

Transfer Tax	22.00
Sub Total:	22.00
Total:	122.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016002784
Consideration: 5400.00

Transfer Tax	22.00
Total:	22.00

Record and Return To:

RES AMERCIAS INC
11101 W 120TH AVE SUITE 400
BROOMFIELD CO 80021

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

EXHIBIT D TO WIND ENERGY GROUND LEASE

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of December 8, 2015, by and between Douglas R. Bunker ("***Landlord***") andBall Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on December 8 2015, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: _____
Name: Douglas R. Bunker

Spousal Consent:

By: _____
Name: Barbara B. Bunker

By: _____
Name: _____
Title: _____

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments, Inc.
a Delaware corporation
Its General Partner

By: RES America Developments Inc.,
its Manager

By: _____
Name: BRIAN EVANS
Title: PRESIDENT

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 23rd day of ~~October in~~ November the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Douglas R. Bunker, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy
Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 23rd day of ~~October~~ November in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Barbara B. Bunker, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin McCarthy
Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF COLORADO)
)
COUNTY OF BROOMFIELD)

On the 8th day of ~~October~~ December in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Brian Evans, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

NICOLE A. BLACKSTAD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154000318
MY COMMISSION EXPIRES JANUARY 5, 2019

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

Town of Hanover

118.00-1-40	(17-1-13.1)
118.00-1-39	(17-1-13.2)
118.00-1-41	(17-1-14)
118.00-1-45	(17-1-17.1)
118.00-1-46	(17-1-18.1)
118.00-1-51	(17-1-19.2)
118.00-1-52	(17-1-20)

Town of Villenova

135.00-2-1 (2-1-7.

SCHEDULE A

ALL THAT TRACT OR PARCEL OF LAND situate in the Town of Hanover, County of Chautauqua and State of New York, being part of Lot 32 in Township 6, Range 10 of the Holland Land Company's Survey, bounded and described as follows:

BEGINNING at a point in the center of Hurlburt Road at a distance of 23 chains and 93½ links east (measured along a line parallel with the north line of said Lot 32) from the west line of said Lot 32, said point of beginning being the southwest corner of the lands deeded by Daniel Hulse to Sherman Shadle by deed dated September 25, 1961 recorded on September 29, 1961 in the Chautauqua County Clerk's Office in Liber 1178 of Deeds at page 557; running thence northerly parallel with the west line of said Lot 32 and along the west line of the land conveyed by aforesaid deed 39 chains and 50 links to the north line of said Lot 32; thence easterly and along the north line of said Lot 32 to the northeast corner of said Lot 32; thence southerly and along the east line of said Lot 32 (being also the west line of Lot 24 situate in said Town of Hanover in said 6th Township and 10th Range) 52 chains and 75 links to said center line of said Hurlburt Road; thence westerly along said center line of Hurlburt Road to said point or place of beginning.

EXCEPTING from the above described parcel of land both of the following described parcels of land, to wit:-

(1) Beginning in the center of said Hurlburt Road at the southeasterly corner of the land conveyed by said deed recorded in said Clerk's Office in Liber 1178 of Deeds at page 557; running thence northerly parallel with the west line of said Lot 32 two hundred sixty-three (263) feet; thence easterly 256 feet to a point in the center of a ravine running generally in a northerly and southerly direction, which point is 263 feet from the center of said Hurlburt Road (measured in the center of said ravine); thence southerly in the center of said ravine 263 feet to the center of the existing pavement of said Hurlburt Road; thence westerly in the center of said Hurlburt Road 173 feet to the point of beginning; and (2) all that tract or parcel of land conveyed by said parties of the first part Sidney Potmesil and Lois Potmesil to Reinhold Rost and Virginia Frances Rost, his wife, by deed dated April 25, 1975 and recorded on June 24, 1975 in said Clerk's Office in Liber 1157 of Deeds at page 11[illegible].

ALSO all that other tract or parcel of land situate in the Town of Hanover, County of Chautauqua and State of New York being a part of Lot No.24 in the 6th Township and 10th Range of the Holland Land Company's Survey and bounded as follows: Beginning at the southwest corner of said Lot No. 24 and runs thence north on the line between said lot and Lot No.32, 62 chains 36 links to the northwest corner of said Lot No.24; thence east on the north line of said lot, 9 chains 63 links; thence south on a line parallel to the west line of said Lot No. 24, 62 chains and 24 links to the south line of said lot; thence west on the line between the 5th and 6th Townships, 9 chains 63 links to the place of beginning. Containing 60 acres more or less.

ALSO all that tract or parcel of land situate in the Town of Hanover, and described as being part of Lot No. 24, bounded and described as follows: Beginning at a point which stands 9 chains 66 links east from the southwest corner of said Lot No. 24; running thence north 20 chains 88 links to the southwest corner of lands deeded to Lucius Jones by Marshall Case; thence east 4 chains 79 links; thence south parallel with the line first above named 20 chains 88 links to the south line of said lot; thence west 4 chains 79 links to the place of beginning, containing 10 acres of land more or less.

ALSO all that tract or parcel of land situate in the Town of Hanover, County and State aforesaid and described as being a part of Lot No. 24 in the 6th Township and 10th Range of the Holland Land Company's Survey and bounded as follows: Commencing at a point uhtch is 20 chains and 88 links from the south line of said Lot No. 24, 9 chains and 66 links from the west line of said Lot 24; running thence east parallel to the south line of said Lot 24, 14 chains and 14 links; thence north parallel with the west line of said Lot No. 24,26chains and 50 links; thence west 14 chains and 14 links to land formerly owned by Charles Moore; thence south 26 chains 50 links to the place of beginning, containing 37 and 48/100 acres more or less.

EXCEPTING and reserving from the 60 acre parcel above described a small parcel situate in the southwest corner of Lot No.24 described in a deed dated April 1, 1875 and recorded in Chautauqua County Clerk's Office in Liber 145 of deeds at page 559.

Town of Hanover

118.00-1-40	(17-1-13.1)
118.00-1-39	(17-1-13.2)
118.00-1-41	(17-1-14)
118.00-1-45	(17-1-17.1)
118.00-1-46	(17-1-18.1)
118.00-1-51	(17-1-19.2)
118.00-1-52	(17-1-20)

Town of Villenova

135.00-2-1 (2-1-7.

ALSO all that tract or parcel of land situate in the Town of Villenova, County of Chautauqua and State of New York bounded as follows: Beginning on the north line of Lot No. 32 in the 5th Township and 10th Range and at the northwest corner of lands heretofore owned by Luther Pierce; thence south on said Pierce's west line 63 chains and 25 links to the south bounds of said Lot; thence west on said south line 8 chains and thence north 58 chains and 35 links; thence north 33 1/4° east to the center of the highway; thence in a southeasterly direction following the center of the highway until it intersects the west line of land heretofore owned by the above mentioned Pierce and containing 47 and 3/4 acres of land be the same more or less.

ALSO all that other piece or parcel of land situate in the Town of Villenova Chautauqua County, New York bounded as follows: Beginning in the north line of Lot No. 32 in the 5th Township and 10th Range 4 chains and 88 links west of the northwest corner of land owned by Luther Pierce in the year 1851; thence west on the north line of said Lot 11 chains and 12 links; thence south 63 chains and 25 links to the south bounds of said lot; thence east 8 chains; thence north 58 chains and 35 links; thence north 33 and 1/4° east 5 chains and 03 links to the place of beginning, containing 50 and 3/4 acres of land be the same more or less,

ALSO all that other piece or parcel of land situate in the Town of Hanover, County of Chautauqua and State of New York and being a part of Lot No. 24 in the 6th Township and 10th Range of the Holland Land Company's land bounded as follows: South by the south line of said Township; west by a line running due north from the northwest corner of land heretofore deeded by Luther Pierce, and owned by Ira Meritt, in the year 1874; north by land deeded to Lucius Jones, and east by the east line of said lot numbered 24, containing 47 and 3/10 acres, more or less.

ALSO another piece of land adjoining the above, a part on the same lot and the balance on Lot No. 32 in the 5th Township and 10th Range in Villenova in said County, bounded as follows: Commencing in the center of the highway on the west line of land owned by Ira Merritt, in 1874; thence north bounded by lands of said Ira Merritt about 23 rods to a stake and stones on Lot No. 24; thence southwesterly about 4 1/2 rods to a stake; thence south to the center of said highway; thence southeasterly along the center of said highway to the place of beginning, containing about 1/2 of an acre of land more or less.

ALSO all that other piece or parcel of land situate in the Town of Hanover, Chautauqua County, New York and bounded as follows: Being a part and parcel of Lot No. 24 in the 6th Township and 10th Range of the Holland Land Company's land, beginning at a post which stands 9 chains and 66 links east from the south west corner of said Lot No. 24; running thence north 20 chains and 88 links to the southwest corner of lands deeded to Lucius Jones by Marshall Cass; thence east parallel to the south line of said Lot No. 24 to the northeast corner of lands heretofore deeded to William Pierce; thence south along said Pierce's land to the south line of said Lot No. 24; thence west along said line to the place of beginning, supposed to contain about 55 acres and 33/100 of an acre more or less. The 10 acres excepted from the 55 acres and 33/100 acres parcel is intended to be descriptive only; the said 10 acres is contained elsewhere in the deed and is included in the conveyance.

EXCEPTING from the above about 10 acres of land from off the west end of same sold to Charles Moore by deed dated January 30th, 1863 and recorded in the Clerk's Office at Mayville, New York on the 30th day of September 1880 in liber 153 at page 467, said piece of land being 4 chains and 70 links wide and extending across the entire west end of said piece of land above described.

ALSO all that other piece or parcel of land situate in the Town of Villenova, County of Chautauqua and State of New York and bounded and described as follows: Being the west part of Lot No. 32 in the 5th Township and 10th Range of the Holland Land Company's Survey bounded south by Lot No. 31, 19 chains and 22 links; west by lot No. 40, 62 chains and 30 links; north by township No. 6 in said 10th Range 19 chains and 22 links; and east by a line parallel to the west bounds of said Lot No. 32.

EXCEPTING from the above the land sold and deeded to Robert Foggan by deed dated December First, 1875 and recorded in liber 145 of deeds at page 587, and which said deed conveys the most of said land to Robert Foggan leaving only 12 or 14 acres be the same more or less; and the same being a three cornered piece in the northeast corner of the above described premises.

Town of Hanover

118.00-1-40	(17-1-13.1)
118.00-1-39	(17-1-13.2)
118.00-1-41	(17-1-14)
118.00-1-45	(17-1-17.1)
118.00-1-46	(17-1-18.1)
118.00-1-51	(17-1-19.2)
118.00-1-52	(17-1-20)

Town of Villenova

135.00-2-1	(2-1-7.

ALSO excepting and reserving all that tract or parcel of land situate in the Town of Villenova, County of Chautauqua and State of New York being a part of Lot No. 32 in the 5th Township and 10th Range of the Holland Land Company Survey and being part of the southerly portion of lands conveyed by Herbert L. Howard and Irene M. Howard to Sherman Shadle by deed recorded in liber 972 of deeds at page 544 on November 20, 1953 bounded as follows: Commencing at the southwest corner of said premises conveyed by Howard to Shadle; thence northerly on the westerly bounds of said lands, approximately twenty-three hundred (2300) feet to a fence; thence easterly along the line of said fence and an extension easterly from said fence in a straight line to the easterly bounds of said lands conveyed by Howard to Shadle; thence southerly along the easterly bounds of lands approximately twenty-three hundred (2300) feet to the southeasterly corner of said lands; thence westerly on the southerly bounds of said lands conveyed by Howard to Shadle to the point or place of beginning; it being understood and agreed that the northerly bounds of said lands herein intended to be described shall not include any open lands.

Town of Hanover

118.00-1-44 (17-1-17.2)

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua, and State of New York, being a part of Lot 32, Town 6, and Range 10 of the Holland Land Company's Survey and bounded as follows:

BEGINNING at a point distant 3069.39 feet as measured along the center line of Hurlburt Road from the west bounds of Lot 32 at the intersection of the center line of Empire Road and the center line of Hurlburt Road; THENCE northerly at right angles to the center line of Hurlburt Road, a distance of 382.78 feet to an iron; THENCE easterly turning an interior angle of 110° 33' a distance of 356.28 feet to a stake; THENCE southerly turning an interior angle of 69° 27' on a line perpendicular to the center line of Hurlburt Road, a distance of 507.9 feet to the center line of Hurlburt Road; THENCE westerly turning an interior angle of 90° and along the center line of Hurlburt Road, a distance of 333.6 feet to the place of beginning, containing 3.43 acres, being the same more or less.

Being the same premises transferred from Charles McKinivan and Delores McKinivan to Rodney Stewart and Linda Stewart by Warranty Deed dated and acknowledged August 31, 1986, and recorded in Chautauqua County Clerk's Office in Liber 2183 of Deeds at Page 223 on February 7, 1989.

This conveyance is subject to all leases, easements and rights of ways of record and assigns or rights therein described.

Town of Villenova:	135.00-1-3	(2-1-4.1)
Town of Hanover	118.00-1-42	(17-1-15)

All that Tract or Parcel of Land, situate in the Town of Hanover County of Chautauqua, State of New York and being a part of Lot 24, Town 6, Range 10 of the Holland Land Company's Survey, bounded and described as follows:

BEGINNING at a point on the existing centerline of Hurlburt Road at its intersection with the division line between Lot 24 and Lot 32; THENCE S 71-52-12 E along said Hurlburt Road centerline 330.00 feet to a point; THENCE S 01-36-18 W along the lands now or formerly owned by Douglas R. Bunker described in Liber 2180 of deeds at Page 345, 26.27 feet to an iron stake; THENCE continuing along the same line 487.91 feet to an existing iron stake on the division line between the Town of Hanover and the Town of Villenova; THENCE N 88-12-15 W along the said Town Line 269.91 feet to an exsiting iron stake at the Southwest corner of said Lot 24; THENCE N 02-46-16 W along the said division line between Lot 24 and Lot 32, 581.96 feet to an existing iron stake; THENCE continuing along the same line 26.95 feet to the point or place of beginning containing 3.748 acres.

ALSO ALL THAT TRACT OR PARCEL OF LAND situate in the Town of Villenova, County of Chautauqua, State of New York and being a part of Lot 32 and Lot 40, Town 5, Range 10 of the Holland Land Company's Survey, bounded and described as follows:

BEGINNING at an existing iron stakte on the division line between the Town of Hanover and the town of Villenova, said iron stake also being at the Northwesterly corner of Lot 32; THENCE S 88-12-15 E along the said Town Line 269.91 feet to an existing iron stake; THENCE continuing along the same line 326.40 feet to an iron stake; THENCE S 01-33-47 E along the lands now or formerly owned by Douglas R. Bunker described in Liber 2180 of deeds at Page 345, 510.75 feet to an iron stake; THENCE S 41-49-45 E along the said lands of Bunker 915.83 feet to an iron stake; THENCE S 01-14-31 W along the said lands of Bunker and along the lands now or formerly owned by Glenn R. Phillips described in Liber 1834 of deeds at Page 486, 881.87 feet to an iron stake; THENCE N 88-29-05 W through the lands now or formerly owned by Mary Jane Waligora described in Liber 2143 of deeds at Page 544, 2487.96 feet to an iron stake; THENCE N 00-49-52 E along the lands now or formerly owned by Stephen Duman described in Liber 2189 of deeds at Page 456, 583.64 feet to an existing iron stake; THENCE continuing along the same line and along the lands now or formerly owned by said Duman described in Liber 1412 of deeds at Page 505, 1466.43 feet to an iron stake on the said Town Line; THENCE S 88-58-56 E along the said Town Line, 1255.94 feet to the point or place of beginning containing 105.584 acres according to a survey made by Donald R. Long, Land Surveyor dated January 26, 1990.

This conveyance is subject to an assignment of lease to Universal Resources Holding, Inc. recorded in the Chautauqua County Clerk's Office on December 5, 1983 at Liber 1990 of Deeds at Page 277 and conveys all right, title and interest as it effects premises conveyed to Grantor.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016001700

Receipt#: 201606152109
Clerk: AH
Rec Date: 02/23/2016 01:46:23 PM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 6
Rec'd Frm: RES AMERICA DEVELOPMENTS INC

Party1: EINHOUSE EDWARD E
Party2: RES NORTH AMERICA LEASING LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	47.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	77.00

Transfer Tax

Transfer Tax	0.00
Sub Total:	0.00
Total:	77.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016002610
Consideration: 500.00

Total: 0.00

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

Record and Return To:

RES AMERCIAS INC
11101 W 120TH AVE SUITE 400
BROOMFIELD CO 88021

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

RES North America Leasing, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of January 25, 2016, by and between Edward E. Einhouse and Patricia J. Einhouse as husband and wife ("***Landlord***") and RES North America Leasing, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for

a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on January 25, 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: _____
Name: Edward E. Einhouse

By: _____
Name: Patricia J. Einhouse

By: _____
Name: _____
Title: _____

TENANT:

RES North America Leasing, LLC
a Delaware limited liability company

By: RES America Developments Inc.
its Manager

By: _____
Name: BRIAN EVANS
Title: PRESIDENT

STATE OF NEW YORK)
Ontario)
COUNTY OF ~~CHAUTAUQUA~~)

On the 15 day of ~~September~~ January in the year ~~2015~~ 2016 before me, the undersigned, a notary public in and for said state, personally appeared Edward E. Einhouse, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kathryn A. Carson
Notary Public

KATHRYN A. CARSON
Notary Public, State of New York
Ontario County Reg. #01CA6229708
Commission Expires 10/18/20 18

STATE OF NEW YORK)
Ontario)
COUNTY OF ~~CHAUTAUQUA~~)

On the 15 day of ~~September~~ January in the year ~~2015~~ 2016 before me, the undersigned, a notary public in and for said state, personally appeared Patricia J. Einhouse, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kathryn A. Carson

KATHRYN A. CARSON
Notary Public, State of New York
Ontario County Reg. #01CA6229708
Commission Expires 10/18/20 18

STATE OF COLORADO)
)
COUNTY OF BROOMFIELD)

On the 25TH day of ~~September~~ January in the year ~~2015~~ 2016 before me, the undersigned, a notary public in and for said state, personally appeared BRIAN EVANS, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

NICOLE A. BLACKSTAD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154000318
MY COMMISSION EXPIRES JANUARY 5, 2019

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York, being a part of Lot No. 54, Township 6 and Range 10 of the Holland Land Company's Survey and more particularly bounded and described as follows:

BEGINNING at a point in the centerline of the Stebbins Road and on the northerly line of said Lot No. 54 and which point is located North 81° 56' West, 1119.80 feet from the northeasterly corner of said Lot No. 54; thence South 8° 09' West and parallel to the easterly line of said Lot No. 54, 2424.45 feet to an iron pipe on the southerly line of lands formerly conveyed to Leland E. and Winifred P. Birdsey by deed dated August 29, 1974, and recorded in the Chautauqua County Clerk's Office in Liber 1521 of Deeds at page 190 and passing through an iron pipe located 24.75 feet from said centerline; thence North 82° 03' 30" West along Birdsey's southerly line, 426.71 feet to an iron pipe at the southwesterly corner thereof; thence North 8° 05' 20" East along the westerly line said Birdsey's land, 2214.45 feet to an existing iron stake at the southwest corner of lands formerly conveyed to David A. and Marion G. Diffenbach by Deed dated May 11, 1963 and recorded in the Chautauqua County Clerk's Office in Liber 1217 of Deeds at page 506; thence south 82° 00' East along said Diffenbach's southerly line, 208.99 feet to an iron stake; thence North 8° 47' East along Diffenbach's easterly line, 210.70 feet to the centerline of said Stebbins Road and passing through an existing iron stake located 26.82 feet from said centerline; thence South 81° 56' East along the centerline of said Stebbins Road, 217.70 feet to the point or place of beginning and containing 22.81 acres of land according to a survey made by James E. Pacanowski, Licensed Land Surveyor dated 10 June 1995; revised 17 July 1995 and known as Job No. 95-01.

Together with, and subject to, the rights of others in and to the southerly one-half of Stebbins Road.

The grantor is the surviving spouse of Leland E. Birdsey, who died May 23, 1992. This conveyance is made for full and adequate consideration to a bona fide purchaser for value.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016001945

Receipt#: 201606153115
Clerk: AH
Rec Date: 03/09/2016 11:03:31 AM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 6
Rec'd Frm: RES AMERICA DEVELOPMENTS INC

Party1: FEINEN RANDALL L
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	45.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	75.00

Transfer Tax

Transfer Tax	20.00
Sub Total:	20.00
Total:	95.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016002791
Consideration: 5000.00

Transfer Tax	20.00
Total:	20.00

Record and Return To:

RES AMERCIAS INC
11101 CW 120TH AVE SUITE 400
BROOMFIELD CO 80021

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 19th day of January in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Randall L. Feinen, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 19th day of January in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Denise L. Feinen, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF COLORADO)
Landlord
COUNTY OF BROOMFIELD)

On the 29 day of January in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Rob Morgan, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

NICOLE A. BLACKSTAD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154000318
MY COMMISSION EXPIRES JANUARY 5, 2019

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of January 29, 2016, by and between Randall L. Feinen and Denise L. Feinen, as husband and wife, ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on January 29, 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: _____
Name: Randall L. Feinen

By: _____
Name: Denise L. Feinen

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments, Inc.
a Delaware corporation
Its Manager

By: _____
Name: Rob Murray
Title: Chief Strategy Officer

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

(X) ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York, being a part of Lots Nos. 42, 49 and 50 in the 6th Township and 10th Range of the Holland Land Company's land, bounded as follows: Commencing at a post in the southeast corner of Lot No. 50, same being a corner of all of said lots; thence north on the east line of Lot No. 50, fourteen chains and sixty-six links to the center of the Lodi Road; thence north 67 degrees west along the center of said road, twenty-two chains forty-two links; thence south 7½ degrees west, five chains eighty-five links; thence west, ten chains and twenty-five links; thence south eight chains twenty-one links; thence south 20 degrees east, twenty-one chains and sixteen links to a stake; thence east, two chains and sixty links; thence south twelve chains sixty-five links; thence east five chains; thence north 71 degrees east, six chains and eighty-eight links; thence east eight chains and eighty links to the east line of Lot No. 49; thence north along said line, nineteen chains forty-one links to the northwest corner of Lot No. 41; thence east on the north line of lot No. 41, thirty-one chains sixty-two links; thence north parallel to the west line of Lot No. 42, thirty-one chains sixty-two links; thence west parallel to the south line of said lot, thirty-one chains and sixty-two links to the west line of said lot; thence south on said line, thirty-one chains sixty-two links to the place of beginning,

EXCEPTING and RESERVING therefrom about five one-hundredths of an acre more or less conveyed to the County of Chautauqua by Cosimo, Lena, Martin and Frances Polisoto by warranty deed dated December 31, 1929, recorded in Liber 541 of Deeds, page 457 of the Chautauqua County Clerk's records.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016003009

Receipt#: 201606157881
Clerk: AH
Rec Date: 05/12/2016 12:47:39 PM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 7
Rec'd Frm: RES AMERICA

Party1: GAGE CAROL A
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	50.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	80.00
Transfer Tax	
Transfer Tax	4.00
Sub Total:	4.00
Total:	84.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016003585
Consideration: 730.00

Transfer Tax	4.00
Total:	4.00

Record and Return To:

RES AMERICAS INC
330 SECOND AVE S
SUITE 820
MINNEAPOLIS MN 55401

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of March 28 ✓, 2016, by and between Carol A. Gage, ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for a distance from each Turbine to the boundaries of the Premises, together vertically

through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on March 28, 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

[*Signatures appear on following page*]

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

Carol A. Gage

Patricia Hawkins
Attorney-in-fact for Carol A. Gage

Karen Sommers
Executor for the Estate of Herbert Gage

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments, Inc.
a Delaware corporation
Its Manager

By: _____
Name: Peter Rood
Title: Regional Vice President

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 19th day of March in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Carol A. Gage, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 19th day of March in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Patricia Hawkins, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 19th day of March in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Karen Sommers, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

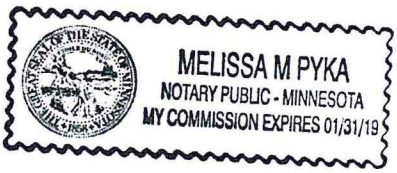
Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF ~~COLORADO~~ MINNESOTA)

COUNTY OF ~~BROOMFIELD~~ HENNEPIN)

On the 28 day of March in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Peter Rood, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.



Melissa M. Pyka
Notary Public

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

THAT PIECE OR PARCEL OF LAND, situate in the Town of Hanover, in the County of Chautauqua and State of New York, distinguished by being a part of Lot number Thirty-Three in Township number Six in the Tenth Range of Townships of the Holland Land Company's Survey, bounded as follows: West by land deeded to James R. Black sixty chains and thirteen links, north by Lot No. 34, twelve chains and twenty-two links, East by Lot No. 25 sixty chains ten links & South by Lot No. 32, twelve chains and seventeen links. Containing seventy-three acres be the same more or less, being the same premises deeded to Bowen Cole by Sarah Cole by deed dated September 16, 1839.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE
THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016003014

Receipt#: 201606157881
Clerk: AH
Rec Date: 05/12/2016 12:47:40 PM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 8
Rec'd Frm: RES AMERICA

Party1: GAGE CHARLES
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	55.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	85.00
Transfer Tax	
Transfer Tax	8.00
Sub Total:	8.00
Total:	93.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016003590
Consideration: 1980.00

Transfer Tax	8.00
Total:	8.00

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

Record and Return To:

RES AMERICAS INC
330 SECOND AVE S
SUITE 820
MINNEAPOLIS MN 55401

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of April 08, 2016, by and between Charles Gage, Nancy J. Smith, Robert Gage, Cathey M. Bock and Carol A. Gage, ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for

a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on April 08, 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

[Signatures appear on following page]

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: Charles Gage
Name: Charles Gage

By: Nancy J Smith
Name: Nancy J. Smith

By: Robert Gage
Name: Robert Gage

By: Cathey M Bock
Name: Cathey M. Bock

By: Carol Gage per
Name: Carol Gage

By: Patricia Hawkins
Name: Patricia Hawkins POA for Carol Gage

By: Karen Sommers
Name: Karen Sommers
Executor for the Estate of Herbert Gage

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments, Inc.
a Delaware corporation
Its Manager

By:
Name: Peter Rood
Title: Regional Vice President

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 30th day of January in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Charles Gage, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 21st day of March in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Nancy J. Smith, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

JULIE A. GORNIKIEWICZ #01GO5009195
Notary Public, State of New York
Qualified in Chautauqua County
My Commission Expires March 8, 2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 30th day of January in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Robert Gage, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 30th day of January in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Cathey M. Bock, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 19th day of March in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Carol A. Gage, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 19th day of March in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Patricia Hawkins, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public
KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 19th day of March in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Karen Sommers, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy
Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-3-2019

STATE OF ~~COLORADO~~ Minnesota)
COUNTY OF ~~BROOMFIELD~~ Hennepin)

On the 08th day of April in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Peter Read, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Melissa M. Pyka
Notary Public

MELISSA M PYKA
NOTARY PUBLIC - MINNESOTA
MY COMMISSION EXPIRES 01/31/19

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York, and being part of Lot forty-two (42), Township No. 6, Range No. 10 of Holland Land Company's Survey, and bounded and described as follows,

COMMENCING at the Southeast corner of said lot in the center of the highway;

THENCE North along the East line of said Lot No. 42, thirty-six (36) chains and seventy-two and one-half (72 ½) links;

THENCE West, parallel to the South line of said lot, thirteen (13) chains, seventy-five (75) links to a stake;

THENCE South, parallel to the East line of lot No. 42, to a point three (3) chains and fifty (50) links North of the South bounds of said lot and of the center of the highway;

THENCE East parallel to the South bounds of said lot No. 42, two (2) chains and sixty-seven and one-half (67 ½) links;

THENCE South, parallel to the East line of said lot, three (3) chains and fifty (50) links to the south bounds of said lot, being the center of the highway;

THENCE East along the center of the highway, eleven (11) chains seven and one-half (7½) links to the place of beginning.

Excepting so much of the premises as was conveyed by deed recorded on 6/25/1996 in Liber 2349 of Deeds, at Page 887 (SBL 14-1-26.1).

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover County of Chautauqua and State of New York. Assessed on tax roll of said Town in the year 1959, tax levied in 1958 to Willis True Est and bounded and described on such tax roll as follows:

137 Acres in Lot 25, Town 6, Range 10, bounded North by Fredonia Road; East by Smith, South by Smith; and West by Gage.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE
THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016003013

Receipt#: 201606157881
Clerk: AH
Rec Date: 05/12/2016 12:47:39 PM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 7
Rec'd Frm: RES AMERICA

Party1: GAGE CHARLES
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	50.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	80.00
Transfer Tax	
Transfer Tax	6.00
Sub Total:	6.00
Total:	86.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016003589
Consideration: 1030.00

Transfer Tax	6.00
Total:	6.00

Record and Return To:

RES AMERICAS INC
330 SECOND AVE S
SUITE 820
MINNEAPOLIS MN 55401

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of February 29, 2016, by and between Charles Gage, Nancy J. Smith, Robert Gage and Cathey M. Bock, ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for

a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on Feb 29 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

[*Signatures appear on following page*]

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: Charles Gage
Name: Charles Gage

By: Nancy J. Smith
Name: Nancy J. Smith

By: Robert Gage
Name: Robert Gage

By: Cathey M Bock
Name: Cathey M. Bock

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments, Inc.
a Delaware corporation
Its Manager

By:
Name: Peter Rood
Title: Regional Vice President

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 30th day of January in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Charles Gage, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 10th day of February in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Nancy J. Smith, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Janet M. McCanna

Notary Public

JANET M. McCANNA #01MC4846771
Notary Public, State of New York
Qualified in Chautauqua County
My Commission Expires May 31, 2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 30th day of January in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Robert Gage, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 30th day of January in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Cathey M. Bock, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy
Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF ~~COLORADO~~ MINNESOTA)
COUNTY OF ~~BROOMFIELD~~ HENNEPIN)

On the 29 day of February in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Peter Rood, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Melissa M. Pyka
Notary Public

MELISSA M PYKA
NOTARY PUBLIC - MINNESOTA
MY COMMISSION EXPIRES 01/31/19

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

ALL THAT TRACT OR PARCEL OF LAND, situate in the town of Hanover, County of Chautauqua and State of New York, distinguished of the northwest part of Lot No. 25, Township 6, Range 10, bounded as follows:

Commencing in the center of the highway on the lot line at the northwest corner of land owned and formerly owned by Thomas Bagley at a distance of 22 chains 12 links easterly from the west line of Lot No. 25;

RUNNING THENCE southerly on a line parallel with the west bounds of said lot 46 chains 31 links;

THENCE westerly 22 chains 12 links to the westerly line of said lot No. 25;

THENCE northerly along said lot line 46 chains 26 links to the northwest corner of said lot;

RUNNING THENCE easterly along the northerly line of said lot and center of the highway 22 chains 12 links to the place of BEGINNING.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016001532

Receipt#: 201606151235
Clerk: AH
Rec Date: 02/09/2016 11:44:15 AM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 6
Rec'd Frm: RES AMERICA DEVELOPMENTS INC

Party1: HOISINGTON JERE
Party2: RES NORTH AMERICA LEASING LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	45.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	75.00
Transfer Tax	
Transfer Tax	4.00
Sub Total:	4.00
Total:	79.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016002482
Consideration: 592.00

Transfer Tax	4.00
Total:	4.00

Record and Return To:

RES AMERICA INC
11101 W 120TH AVENUE SUITE 400
BROOMFIELD CO 80021

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

RES North America Leasing, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

November ~~June~~ 24, THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of 2015, by and between Jere Hoisington and Lawrence J. Owczarczak ("***Landlord***") and RES North America Leasing, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for a distance from each Turbine to the boundaries of the Premises, together vertically

through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on ~~June~~ November 24, 2015, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: _____
Name: Jere Hoisington

By: _____
Name: Lawrence J. Owczarczak

By: _____
Name: _____
Title: _____

TENANT:

RES North America Leasing, LLC
a Delaware limited liability company

By: RES America Developments, Inc.
a Delaware corporation
Its Manager

By: _____
Name: BRIAN EVANS
Title: PRESIDENT

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 27th day of ~~June~~ October in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Jere Hoisington, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 19th day of June in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Lawrence J. Owczarczak, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public
Kristin M. McCarthy
Notary Public State of New York
Erie County
Commission Expires 2-2-2019

STATE OF COLORADO)
)
COUNTY OF BROOMFIELD)

On the 24th day of ~~June~~ November in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared BRIAN EVANS, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

NICOLE A. BLACKSTAD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154000318
MY COMMISSION EXPIRES JANUARY 5, 2019

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, Chautauqua County, State of New York, being a part of Lot No. 33, Township 6, Range 10 of the Holland Land Company's Survey and bounded west by a line parallel to the west bounds of said lot at the distance of 10 chains east therefrom 60 chains and 20 links north by lot No. 34, 10 chains, east by a line parallel to the west bounds of the lands hereby conveyed 60 chains 20 links; and south by lot No. 32, 10 chains containing 60 acres of land more or less.

SUBJECT TO AND TOGETHER WITH leases and easements of record including oil and gas lease to National Fuel Gas Supply Corporation recorded in Chautauqua County Clerk's Office in Liber 1836 of Deeds at page 361.

EXCEPTING AND RESERVING a parcel commencing at the northwest corner of the aforesaid piece or parcel, then easterly and along the center line of the Forestville-Nashville Road 61.0 feet; then south at an interior angle of 90°, 580 feet to a point; then west at an interior angle of 90°, 61.0 feet to a point; then north 580.0 feet to the point or place of beginning of the reserved parcel.

Liens and Encumbrances

1. Lease to Iroquois Gas Corporation recorded June 19, 159 in Liber 1128 of Deeds at page 12.

2. Right of Way to New York Telephone Company recorded March 17, 1966 in Liber 1287 of Deeds at page 216.

3. Lease to National Fuel Gas Supply Corporation recorded July 13, 1979 in Liber 1836 of Deeds at page 361.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016001698

Receipt#: 201606152109
Clerk: AH
Rec Date: 02/23/2016 01:46:22 PM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 6
Rec'd Frm: RES AMERICA DEVELOPMENTS INC

Party1: JOHNSON HAROLD F
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	47.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	77.00
Transfer Tax	
Transfer Tax	0.00
Sub Total:	0.00
Total:	77.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016002608
Consideration: 500.00

Total: 0.00

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

Record and Return To:

RES AMERCIAS INC
11101 W 120TH AVE SUITE 400
BROOMFIELD CO 88021

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of ~~November~~ December 8, 2015, by and between Harold F. Johnson and Patricia A. Johnson, as husband and wife ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for

a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on ~~November~~ December 8, 2015, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: Harold F Johnson
Name: Harold F. Johnson

By: Patricia A Johnson
Name: Patricia A. Johnson

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments Inc.
its Manager

By: _____
Name: Rob Morgan
Title: Chief Strategy Officer

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 29th day of November in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Harold F. Johnson, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public
Kristin M. McCarthy
State of New York Public Notary
Erie County
Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 29th day of November in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Patricia A. Johnson, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public
Kristin M. McCarthy
State of New York Public Notary
Erie County
Commission Expires 2-2-2019

STATE OF COLORADO)
)
COUNTY OF BROOMFIELD)

On the 8th day of ~~November~~ December in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Rob Mazur, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

NICOLE A. BLACKSTAD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154000318
MY COMMISSION EXPIRES JANUARY 5, 2019

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York, being a part of Lot No. 54, Township 6 and Range 10 of the Holland Land Company's Survey and more particularly bounded and described as follows:

BEGINNING at a point in the centerline of the Stebbins Road and on the northerly line of said Lot No. 54 and which point is located North 81° 56' West, 745.90 feet from the northeasterly corner of said Lot No. 54; thence South 8° 09' West and parallel to the easterly line of said Lot No. 54, 2423.43 feet to an iron pipe on the southerly line of lands formerly conveyed to Leland E. and Winifred F. Birdsey by deed dated August 29, 1974, and recorded in the Chautauqua County Clerk's Office in Liber 1521 of Deeds at page 190 and passing through an iron pipe located 24.75 feet from said centerline; thence North 82° 09' 30" West along Birdsey's southerly line, 374.00 feet to an iron pipe at the southeast corner of lands simultaneously conveyed to Edward E. Einhouse and Patricia J. Einhouse; thence North 8° 09' West along the easterly line of said lands simultaneously conveyed this date, 2424.43 feet to the centerline of said Stebbins Road and passing through an iron pipe located 24.75 feet from said centerline; thence South 81° 56' East along the centerline of said Stebbins Road, 374.00 feet to the point or place of beginning and containing 20.81 acres of land according to a survey made by James E. Pracanowski, Licensed Land Surveyor dated 10 June 1995; revised 17 July 1995 and known as Job No. 95-02.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016004267

Receipt#: 201606162315
Clerk: AH
Rec Date: 07/13/2016 12:36:58 PM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 13
Rec'd Frm: RES AMERICA

Party1: KAYE QUINN A
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	80.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	110.00
Transfer Tax	
Transfer Tax	20.00
Sub Total:	20.00
Total:	130.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016004543
Consideration: 5000.00

Transfer Tax	20.00
Total:	20.00

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

Record and Return To:

RES AMERICAS INC
330 SECOND AVE S
SUITE 820
MINNEAPOLIS MN 55401

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of May 09, 2016, by and between Quinn A. Kaye ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on May 09, 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

[Signature page follows]

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: Quinn A. Kaye
Name: Quinn A. Kaye

SPOUSAL CONSENT:

By: _____
Name: Joseph J. Kaye

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments, Inc.
a Delaware corporation
Its Manager

By: _____
Name: Peter Rood
Title: Regional Vice President

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 25th day of April in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Quinn A. Kaye, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 25th day of April in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Joseph J. Kaye, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public
KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF ~~COLORADO~~ Minnesota)
)
COUNTY OF ~~BROOMFIELD~~ Hennepin)

On the 09 day of May in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Peter Rood, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

MELISSA M PYKA
NOTARY PUBLIC - MINNESOTA
MY COMMISSION EXPIRES 01/31/19

Melissa M. Pyka

Notary Public

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

PARCEL 1:

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York being a part of Lot Number 51 in the Sixth Township and Tenth Range of the Holland Land Company's Survey bounded as follows: COMMENCING on the north line of Lot Number 51 at the northeast corner of a piece of land heretofore and on the 12th day of August, 1880 deeded by Abiah Johnson and Ruby Tackett to Mary A. Avery and which said corner is 7 chains and 35 links east from the northwest corner of said Lot Number 51; thence East on the North line of said Lot Number 51, fifty-three chains 81 links to the northeast corner of said Lot Number 51; thence South on the east line of said Lot Number 51 six chains 42 links to a stake; thence west on a line parallel with the north line of said Lot Number 51, fifty-three chains 81 links to the southeast corner of said Mary A. Avery land before mentioned; thence north along said Avery line 6 chains 42 links to the place of beginning. Containing thirty-four acres and 54/100 more or less.

EXCEPTING AND RESERVING herefrom so much of said land as was heretofore deeded to the Erie Railroad Company, being about one acre of land more or less.

ALSO EXCEPTING AND RESERVING therefrom all that portion of said premises lying on the westerly side of the highway running from Forestville to Dennisons Corners, through said property.

SUBJECT to all oil and gas leases of record.

Without restricting the conveyance herein and for information only it is intended hereby to convey the premises or a portion thereof as described in a deed recorded in the County Clerk's office in Liber 1309 of Deeds at Page 21.

PARCEL 2:

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York being a part of Lots Nos. 51 and 59, Township 6, Range 10 of the Holland Land Company's Survey, bounded as follows: COMMENCING in the center line of Dennison Road at a point 250 feet northeasterly, measured along the center line of the road from the southwest corner of the lands of Becker, or formerly; thence northwesterly, at right angles to the road, to a point in the northerly boundary of the lands of the Erie Railroad; thence southwesterly along the north bounds of the Erie Railroad Company's land to the west bounds of the lands of Becker, or formerly; thence north 5 ¾ degrees west 6 chains 81 links to lands formerly owned by J.G. Record; thence south 88 feet east along said lands formerly owned by Record 4 chains 65 ½ links to the west line of said Lot No. 51; thence south 42° east 8 chains, 68 links to the center of the aforesaid highway; thence southwest along the center line of said highway to the place of beginning. Containing more or less.

Without restricting the conveyance herein and for information only, it is intended hereby to convey the premises or a portion thereof as described in a deed recorded in the County Clerk's Office in Liber 1310 of Deeds at Page 18.

PARCEL 3:

ALL THAT TRACT OR PARCEL OF LAND, situate in the town of Hanover, County of Chautauqua and State of New York, being part of a certain Township No. 6 in the Tenth Range of said townships, and which tract or land on a certain other map or survey of part of said townships into lots, made by Joseph Ellicott is distinguished by the north part of Lot No. 51, in said township bounded west by a part of Lot No. 59, 24 chains 51 links; north by Lot No. 52, 61 chains 16 links; east by a part of Lot No. 43, 24 chains 51 links; and south by a line parallel with the north bounds of said Lot No. 51, 61 chains, 24 links, containing 150 acres of land more or less.

EXCEPTING therefrom two acres, constituting the southwest corner of the premises above described which were deeded prior to February 26, 1890.

ALSO EXCEPTING therefrom, approximately four and 72/100 acres, constituting the northwest corner of the premises above described, and described in a deed from Ruby Tackett and Abiah Johnson to Mary A. Avery, by deed dated August 12, 1880 and recorded in Liber 165, page 371.

ALSO EXCEPTING AND RESERVING premises deeded by Franklin M. Calhoun, et al, to Dee B. Terry by deed dated December 14, 1921 and recorded December 21, 1921 in Liber 478 of Deeds at Page 405.

ALSO EXCEPTING AND RESERVING premise conveyed to New York and Erie Railway.

ALSO EXCEPTING AND RESERVING portions conveyed to Chautauqua County for highway purposes.

PARCEL 4:

ALSO, ALL THAT TRACT OR PARCEL OF LAND, situate in the town of Hanover, County of Chautauqua and State of New York, being a part of Lot No. 43 in the Sixth Township and Tenth Range of the Holland Land Company's Survey bounded as follows: COMMENCING at the northwest corner of said lot; thence east on said north line 12 chains 12 links; thence south on a line parallel with the west line, said lot 24 chains 83 links; thence west 12 chains 12 links to the west line of said lot; thence north on said west line 24 chains 83 links to the place of beginning, containing 29 acres more or less;

SUBJECT to all easements, rights of way and leases of record.

Without restricting the conveyance herein and for information only it is intended hereby to convey the premises or a portion thereof as described in a deed recorded in the County Clerk's Office in Liber 1187 of Deeds at Page 53.

PARCEL 5:

ALL THAT TRACT OR PARCEL OF LAND, situate in Lot No. 51, township No. 6, Range No. 10 of the Holland Land Company's Survey, Town of Hanover, County of Chautauqua, State of New York, and described as follows: BEGINNING at a point on the north line of Lot No. 51 at its intersection with the existing southeasterly railroad right-of-way line of the New York & Lake Erie Railway Company, said point also being 220+ feet distant southeasterly measured radially from Station 54 + 69+ of the hereinafter described centerline of improvement for the reconstruction and realignment of a portion of Dennison Road Co. Rd. 123; thence S. 54° 06' 00" W., along said railroad right-of-way 825+ feet to the point of beginning, said point being the intersection point of the said railroad right-of-way line and the northwesterly highway boundary of the said existing co. Rd. 123, said point also being 35+ feet distant northwesterly, measured radially from Station 46+ 78+ of the said centerline; thence continuing S. 54° 06' 00" W., along said railroad right-of-way line, 301 + feet to a point being 92+ feet distant northwesterly measured radially from Station 43 + 75+ of the said centerline; thence S. 43° 41' 58" E., 41+ feet to a point being on the said highway boundary, said point being 51+ feet distant northwesterly measured radially from station 43 + 75+ of the said centerline; thence northeasterly 298+ feet to the point of beginning, being 5,700+ square feet or 0.131+ acre more or less, also

ALL THAT TRACT OR PARCEL OF LAND, situate in Lot No. 51, Township No. 6, Range No. 10 of the Holland Land Company's Survey, Town of Hanover, County of Chautauqua, State of New York and described as follows:

BEGINNING at a point on the existing Southeasterly highway boundary of Dennison Road, Co. Rd. 123, said point being 50+ feet distant southeasterly measured radially from Station 44+ 25+ of the hereinafter described centerline of improvement of a portion of Dennison Rd., Co. Rd.. 123; thence N. 42° 45' 53" E., 177+ feet to a point being 40+ feet distant southeasterly measured radially from Station 46+ 0+ of said centerline; thence Northeasterly along a 3040' Radius Curve to the left and parallel to said centerline a distance of 332+ feet to a point, said point being 40+ feet distant southeasterly measured radially from Station 49+ 27+ of said centerline, said point also being on the existing southeasterly highway boundary acquired by Parcel No. 1 as described in Deed dated April 29, 1952, and recorded in Liber 940, Page 260 in the Chautauqua County Clerk's Office, Mayville, New York; thence easterly along said existing highway boundary 20+ feet to a point said point being 59 feet distant southeasterly measured radially from Station 49+ 37+ of said centerline, said point also being on the existing railroad right of way; thence southeasterly along said existing highway boundary 93+ feet to a point, said point being 112+ feet distant southeasterly measured radially from Station 48+ 61+ of said centerline; thence southwesterly along said highway boundary 78+ feet to a point, said point being 110+ feet distant southeasterly measured radially from Station 47+ 86+ of said centerline; thence southwesterly along said highway boundary of Dennison Rd., Co. Rd. 123, 373+ feet to the point of beginning, being 20,700+ square feet or 0.475 acre more or less.

The above parcel being the same premises conveyed by the County of Chautauqua to Arthur P. Becker and Mildred L. Becker by Quit Claim Deed dated April 1, 1987 and recorded in the Chautauqua County Clerk's Office in Liber 2130 of Deeds at Page 54 on July 28, 1987 and, the Arthur P. Becker and Mildred L. Becker to Arthur P. Becker and Mildred L. Becker, as Trustees of the Arthur P. Becker and Mildred L. Becker Family Trust I dated November 6, 1996 by deed dated May 18, 1998 and recorded in the Chautauqua County Clerk's Office in Liber 2388 of Deeds at Page 34 on May 27, 1998.

EXCEPTING AND NOT CONVEYING the following described parcel: ALL THAT TRACT OR PARCEL OF LAND, situate in the town of Hanover, County of Chautauqua and State of New York, being part of a certain Township 6 in the 10th Range of said Townships, and which is more particularly described as follows: BEGINNING in the southerly line of lands conveyed from Becker to Becker by deed recorded in Liber 1187of Deeds at Page 53 in the office of the Chautauqua County Clerk at the intersection thereof with the centerline of Dennison Road (66 feet wide) as now laid out and occupied, said point of beginning also being located 24 chains 51 links southerly from the north line of Lot 51; thence easterly a distance of 680.8 feet along said southerly line of Becker lands to an iron pin, and passing through an iron pin located 70.1 feet easterly along the last described course from said centerline of Dennison Road; thence northerly at an interior angle of 90° 00' a distance of 80.4 feet through said Becker lands to an iron pin; thence northwesterly at an interior angle of 116° 07' a distance of 354.5 feet through said Becker lands to a point in said centerline of Dennison Road, and passing through an iron pin located 35.7 feet southeasterly along the last described course from said centerline of Dennison Road; thence southwesterly along a regular curve to the right an interior angle of 112° 16' to a tangent and a distance of 162.2 feet along a tangent to a point of intersection of tangents; thence continuing southwesterly along a regular curve to the right at an interior angle of 193° 32' between tangents and a distance of 273.5 feet along a tangent to the point or place of beginning, and containing 2 acres of land more or less according to a survey prepared by Woodbury Surveying dated April 9, 1998.

The above being the same premises conveyed by Arthur P. Becker and Mildred L. Becker as Trustees of the Arthur P. Becker and Mildred L. Becker Family Trust I, dated May 18, 1998 and recorded in the Chautauqua County Clerk's Office in Liber 2388 of Deeds at Page 38 on May 27, 1998.

ALSO EXCEPTING AND NOT CONVEYING, the following parcel: ALL THAT TRACT OR PARCEL OF LAND, situate in Lot No. 51, Township No. 6, Range No. 10 of the Holland Land Company's Survey, Town of Hanover, County of Chautauqua, State of New York, and described as follows: BEGINNING in the centerline of Dennison Road (66 feet wide) as now laid out and occupied at the point located 435.7 feet northeasterly along said centerline of Dennison Road from the intersection thereof with the southerly line of lands conveyed from Becker to Becker by deed recorded in Liber 1187 of Deeds at Page 53 in the office of the Chautauqua County Clerk, said southerly line of Becker to Becker lands also being located 24 chains 51 links southerly from the north line of Lot 51; thence southeasterly at an interior angle of 70°- 42' a distance of 354.5 feet along the northeasterly line of lands to be retained by Becker to an existing iron pin at the northeasterly corner thereof, and passing through an existing iron pin located 35.7 feet southeasterly along the last described course from said centerline of Dennison Road; thence southerly at an interior angle of 243°- 53' a distance of 80.4 feet along the easterly line of said lands to be retained by Becker to an iron pin in said southerly line of Becker to Becker lands; thence easterly at an inteior angle of 90°- 00' a distance of 55.2 feet along said southerly line of Becker to Becker lands to an iron pin; thence northeasterly at an interior angle of 105°- 27' a distance of 279.4 feet through said Becker to Becker lands to an iron pin; thence northwesterly at an interior angle of 100°-40' a distance of 308.3 feet through said Becker to Becker lands to a point in said centerline of Dennison Road and passing through an iron pin located 34.6 feet southeasterly along the last described course from said centerline of Dennison Road; thence southwesterly at an interior angle of 109°- 18' a distance of 240 feet along said centerline of Dennison Road to the point or place of beginning, and containing 2 acres of land more or less. Subject to right of others in Dennison Road.

The above-described premises being he same premises conveyed by Arthur P. Becker and Mildred L. Becker as Trustees of the Arthur P. Becker and Mildred L. Becker Family Trust, dated November 6, 1996 to Paul Spitale and Quinn Eddy-Spitale by a separate deed recorded in the Chautauqua County Clerk's Office in Liber 2362 at Page 517 on March 17, 1997.

PARCEL 6:

ALL THAT TRACT OR PARCEL OF LAND, situate in Lot No. 51, Township No. 6, Range No. 10 of the Holland Land Company's Survey, Town of Hanover, County of Chautauqua, State of New York, and described as follows:

BEGINNING at a point on the existing northwesterly highway boundary of Dennison Road, Co. Rd. 123 at its intersection with the existing New York and Lake Eire R. R. R. O. W. said point being 66± feet distant northwesterly measured radially from Station 49 + 34± feet of the hereinafter described Centerline of Improvement of a portion of Dennison Road, Co. Rd., 123; thence N. 54° 06' 00" E. and along the existing New York & Lake Erie Railroad right-of-way 84± feet to a point being 38± feet northwesterly measured at right angles from point of Tangency (p.t.) Station 50 + 13.26; thence N. 34° 06' 35" E., 126.85 feet to a point being 38± feet distant Northwesterly measured at right angles from Point of Curvature (p.c.) Station 51 + 40.11; thence northeasterly along a 6038 foot radius curve to the right and parallel to said centerline of Dennison Rd., Co. Rd. 123, 145 feet to a point being 38± feet northwesterly measured radially from Station 52 + 84± feet of said centerline; thence N. 55° 59' 05" W., 28± feet to a point being 66± feet Northwesterly measured radially from Station 52 + 83± feet of said centerline, said point also being on the existing Northwesterly highway boundary acquired by Parcel No. 2 as described in Deed dated April 29, 1952, and recorded in Liber 940, Page 257 in the Chautauqua County Clerk's Office, Mayville, N.Y. , said point also being the south corner of Parcel 9-82 as described in Permanent Easement dated November 15, 1984, and recorded in Liber 2034, Page 211 in the Chautauqua County Clerk's Office, Mayville, N.Y.; thence southwesterly along said existing northwesterly highway boundary 265± to a point, said point being 125± feet distant North-westerly measured at right angles from Station 50 + 27± feet of said centerline of Dennison Rd., Co. Rd. 123; thence southerly along said existing northwesterly highway boundary 107± feet to the point of beginning; being 18.800± square feet or 0.432 acre more or less.

EXCEPTING AND RESERVING 6.5 acres owned by the Village of Forestville as described below:

Beginning in the centerline of Dennison Road as now laid out and occupied at the southerly corner of Parcel 2 described in Liber 2459 of Deeds at Page 360 in the office of the Chautauqua County Clerk; thence northwesterly at an interior angle of 91 degrees 52 minutes a distance of 141.5 feet along the southwesterly line of said Parcel 2 to the existing iron pin at the intersection thereof with the southeasterly line of the right of way of the New York and Lake Erie Railroad (now or formerly), and passing through an existing iron pin located 35 feet northwesterly along the last described course from said centerline of Dennison Road; thence southwesterly at an interior angle of 265 degrees 36 minutes a distance of 224 feet along said southeasterly line of the Railroad right of way to a point of curve therein; thence continuing southwesterly along said southeasterly line of the Railroad right of way following a regular curve to the right having a radius of 1075 feet and an arc distance of 253.5 feet to an existing iron pin at the southeasterly corner of lands conveyed to the New York and Lake Erie Railroad to Stott and Bailey by deed recorded in Liber 2635 of Deeds at Page 126 in the office of the Chautauqua County Clerk; thence northerly a distance of 511.9 feet along said easterly line of last mentioned Stott and Bailey lands and along the easterly line of lands conveyed from Guadagno to Stott and Bailey by deed recorded in 2634 of Deeds at Page 608 in the office of the Chautauqua County Clerk to an existing iron pin at the northeasterly corner thereof, said last mentioned iron pin also being located in the easterly extension of the northerly line of the Village of Forestville at the point located 472.7 feet easterly along said northerly line of the Village of Forestville and along the easterly extension thereof from the northerly extension of the easterly line of unopened Fourth Street (66 feet wide); thence easterly at an interior angle of 81 degrees 29 minutes a distance of 302.4 feet along said easterly extension of the northerly line of the Village of Forestville to an existing iron pin in the east line of Lot 59; thence northerly at an interior angle of 268 degrees 42 minutes a distance of 56.4 feet along said east line of Lot 59 to an iron pin; thence easterly at an interior angle of 91 degrees 18 minutes a distance of 353.1 feet through lands of Eddy to an iron pin; thence southerly at an interior angle of 89 degrees 42 minutes a distance of 234.3 feet through said Eddy lands to iron pin in the northwesterly line of said Railroad right of way; thence southwesterly at an interior angle of 155 degrees 15 minutes a distance of 149.7 feet through said Railroad right of way to an iron pin in said southeasterly line thereof; thence southeasterly at an interior angle of 233 degrees 00 minutes a distance of 138.1 feet through said Eddy lands to a point in said centerline of Dennison Road, and passing through an iron pin located 35 feet northwesterly along the last described course from said centerline of Dennison Road; thence southwesterly at an interior angle of 88 degrees 08 minutes a distance of 75 feet along said centerline of Dennison Road to the point or place of beginning, and containing 6.5 acres of land more or less.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE
THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016004266

Receipt#: 201606162315
Clerk: AH
Rec Date: 07/13/2016 12:36:57 PM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 6
Rec'd Frm: RES AMERICA

Party1: LORD SHARON A
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	45.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	75.00
Transfer Tax	
Transfer Tax	20.00
Sub Total:	20.00
Total:	95.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016004542
Consideration: 5000.00

Transfer Tax	20.00
Total:	20.00

Record and Return To:

RES AMERICAS INC
330 SECOND AVE S
SUITE 820
MINNEAPOLIS MN 55401

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of May 09, 2016, by and between Sharon A. Lord ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for a distance from each Turbine to the boundaries of the Premises, together vertically

through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on May 09, 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

[*Signatures appear on following page*]

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: Sharon A. Lord
Name: Sharon A. Lord

SPOUSAL CONSENT:

By: M. Lord
Name: Michael Lord

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments, Inc.
a Delaware corporation
Its Manager

By:
Name: Peter Rood
Title: Regional Vice President

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 25th day of April in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Sharon A. Lord, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 25th day of April in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Michael Lord, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF ~~COLORADO~~ MINNESOTA)
)
COUNTY OF ~~BROOMFIELD~~ HENNEPIN)

On the 09 day of May in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Peter Rood, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

MELISSA M PYKA
NOTARY PUBLIC - MINNESOTA
MY COMMISSION EXPIRES 01/31/19

Notary Public

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

(X) ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua, and State of New York, being a part of Town 6, Range 10, and Lot No. 52 of the Holland Land Company's survey, bounded north by Lot No. 53, 60 chains 3 links; east by part of Lot No. 45, 39 chains 26 links; south by a line parallel with the north line of said Lot No. 52, 61 chains 2 links; and west by part of Lot No. 60, 39 chains 76 links, containing 242 acres of land, more or less, and being the same land conveyed by deed dated the 12th day of September, 1815 by Joseph Ellicott, Atty. to Samuel J. Smith and recorded in Liber 2 of Deeds at page 55, Chautauqua County.

EXCEPTING AND RESERVING from the above tract of land the several pieces sold to the following persons: One hundred acres to Alban Smith, from the south side of said tract to Caleb Burton 2 acres near the southwest corner; 5 acres now or formerly occupied by one Brown on the northwest corner; and ten acres now or formerly occupied by James Ross; and 20 acres sold by Samuel J. Smith to James Berry; leaving 105 acres of land.

EXCEPTING AND RESERVING therefrom all of said property lying and being situate west of the Dennison Road, so-called.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016001699

Receipt#: 201606152109
Clerk: AH
Rec Date: 02/23/2016 01:46:23 PM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 7
Rec'd Frm: RES AMERICA DEVELOPMENTS INC

Party1: PEDRICO BRETT MITCHELL
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	52.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	82.00

Transfer Tax

Transfer Tax	0.00
Sub Total:	0.00
Total:	82.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016002609
Consideration: 500.00

Total: 0.00

Record and Return To:

RES AMERCIAS INC
11101 W 120TH AVE SUITE 400
BROOMFIELD CO 88021

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

EXHIBIT D TO WIND ENERGY GROUND LEASE

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of December 23, 2015, by and between Brett Mitchell Pedrico ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on Dec 14, 2015 ~~2015~~, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

Loretta L. Pedrico

Brett Mitchell Pedrico
By: Loretta L. Pedrico, his attorney-in-fact

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments, Inc.
its Manager

By: _____
Name: Ross Workman
Title: Chief Strategy Officer

STATE OF)
)
COUNTY OF)

On the ____ day of _____ in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Loretta L. Pedrico, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

SEE ATTACHED FOR OFFICIAL NOTARIZATION

_____
Notary Public

STATE OF COLORADO)
)
COUNTY OF BROOMFIELD)

On the 23rd day of ~~November~~ December 2016 in the year 2015 before me, the undersigned, a notary public in and for said state, personally appeared Ross Moreno, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Nicole A. Blackstad
Notary Public

NICOLE A. BLACKSTAD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154000318
MY COMMISSION EXPIRES JANUARY 5, 2019

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT **CIVIL CODE § 1189**

A notary public or other officer completing this certificate verifies only the identity of the individual who signed the document to which this certificate is attached, and not the truthfulness, accuracy, or validity of that document.

State of California)
County of San Diego)

On December 14, 2015 before me, Athena Wolfe, Notary Public
Date *Here Insert Name and Title of the Officer*

personally appeared Loretta L. Pedrico
Name(s) of Signer(s)

who proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my hand and official seal.

ATHENA WOLFE
Commission No. 1967474
NOTARY PUBLIC - CALIFORNIA
SAN DIEGO COUNTY
Commission Expires February 22, 2016

Signature _____
Signature of Notary Public

Place Notary Seal Above

OPTIONAL

Though this section is optional, completing this information can deter alteration of the document or fraudulent reattachment of this form to an unintended document.

Description of Attached Document
Title or Type of Document: Memorandum Lease Document Date: 14 Dec 2015
Number of Pages: 5 Signer(s) Other Than Named Above: NONE

Capacity(ies) Claimed by Signer(s)

Signer's Name: Loretta L. Pedrico	Signer's Name: _____
☐ Corporate Officer — Title(s): _____	☐ Corporate Officer — Title(s): _____
☐ Partner — ☐ Limited ☐ General	☐ Partner — ☐ Limited ☐ General
☐ Individual ☒ Attorney in Fact	☐ Individual ☐ Attorney in Fact
☐ Trustee ☐ Guardian or Conservator	☐ Trustee ☐ Guardian or Conservator
☐ Other: _____	☐ Other: _____
Signer Is Representing: _____	Signer Is Representing: _____

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EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

All that Tract or Parcel of Land, situate in the Town of Hanover, county of Chautauqua and State of New York, being part of Lot 41, Township 6, Range 10, of the Holland Land Company's Survey, bounded as follows: BEGINNING at a point in the centerline of Empire Road, 966.15 feet southerly from its point of intersection with the north line of said Lot 41; thence running southwesterly, and along the said centerline of Empire Road, at an interior angle of 32° 57', 107.85 feet to a point; then, and still continuing southwesterly along the said centerline of Empire Road, at an interior angle of 180° 13', 404 feet to a point; then running westerly, at an interior angle of 111° 32', on a line parallel to the south line of said Lot 41, 638.72 feet to a point in the westerly line of lands previously deeded by the grantor herein to Valentine by Warranty Deed dated October 10, 1975 and recorded in Chautauqua County Clerk's Office in Liber 1588 of Deeds at Page 198 on the 20th day of October 1975; then running northerly, at an interior angle of 90° 26', and along the said westerly line of Valentine, 575.20 feet to a point which is 942.24 feet, southerly from a point in the center line of Route 39 and the north line of said Lot No. 41; running then westerly at an interior angle of 89° 50', 837.80 feet on a line parallel to the north line of said lot 41 to the point or place of beginning being 10 acres of land be the same more or less.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016004263

Receipt#: 201606162315
Clerk: AH
Rec Date: 07/13/2016 12:36:57 PM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 7
Rec'd Frm: RES AMERICA

Party1: ROBINSON VALERIE A
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	50.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	80.00
Transfer Tax	
Transfer Tax	8.00
Sub Total:	8.00
Total:	88.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016004539
Consideration: 1719.00

Transfer Tax	8.00
Total:	8.00

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

Record and Return To:

RES AMERICAS INC
330 SECOND AVE S
SUITE 820
MINNEAPOLIS MN 55401

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
Attn: Legal Department
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of May 31, 2016, by and between Valerie A. Robinson and Jacquelyn M. Kerstetter, as Joint Tenants and Not Tenants in Common ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on MAY 31 ___ 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

[*Signatures appear on following page*]

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: Valerie A Robinson

Name: Valerie A Robinson

By: Jacquelyn M. Kerstetter

Name: Jacquelyn M. Kerstetter

TENANT:

Ball Hill Wind Energy, LLC,
a Delaware limited liability company

By: RES America Developments Inc.,
a Delaware corporation,
its Manager

By: _____

Name: PETER ROOD

Title: VICE PRESIDENT

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 19th day of May in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Valerie A. Robinson, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 19th day of May in the year 201_ before me, the undersigned, a notary public in and for said state, personally appeared Jacquelyn M. Kerstetter, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF MINNESOTA)
)
COUNTY OF HENNEPIN)

On the 31st day of MAY in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared PETER ROOD, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

Heather Virgene Granger
Notary Public
Minnesota
My Commission Expires
01.31.21

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York, being a part of a certain township, which on a map or survey of divers tract or townships of land of the Holland Land Company, made by Joseph Ellicott is distinguished by the Northwest part of Lot 44 in the 6th township, bounded West by Lot Number Fifty-Two, 30 chains 5 links North by Lot Number 45, 16 chains 64 links, East by a line parallel to the West bounds of said Lot No. 44, 30 chains, 5 links and South by land heretofore deeded to Polly Bentley 16 chains, 64 links.

ALSO, ALL THAT TRACT OR PARCEL OF LAND, situate in the Town, County and State aforesaid being the Southwest part of Lot Number 44, Town 6, range Ten of the Holland Land Company's bounded North by a line parallel to the North bounds of said Lot Number 44, at the distance of 30 chains Five links South therefrom, 16 chains, 64 links, East by a line parallel to the West bounds of said Lot Number 44, 29 chains 94 links, South by Lot No. 43, 16 chains, 64 links and West by Lot Number 52, 29 chains 90 links.

ALSO, ALL THAT TRACT OR PARCEL OF LAND, situate in the Town, County and State aforesaid, being a part of Lot 44, Town 6, range Ten of the Holland Land Company's survey bounded as follows:

BEGINNING 16 chains 64 links East of the Southwest corner of Lot 44;

THENCE North, 21 chains 67 links;

THENCE East, 12 chains 64 links;

THENCE South, 21 chains 67 links to the South line of Lot 44;

THENCE West, 12 chains 46 links to the place of BEGINNING. Bounded on the West by land deeded by Dennison to Chandler Scott, on the North by Dennison's Road, on the East by land owned by Dennison and on the South by the South line of the lot.

ALSO, ALL THAT OTHER TRACT OF LAND, situate in the Town, County and State aforesaid, being a part of Lot 44, bounded South by land deeded by the Holland Land Company to Joseph Dennison, 26 chains 15 links, Westerly by land conveyed by said Company to Polly Bentley 19 chains 3 links, North by a line parallel to the first mentioned line 26 chains 41 links and East by a line parallel to the East bounds of said Lot 44, at the distance of 16 chains 66 links West therefrom 19 chains 3 links.

ALL THAT OTHER TRACT OF LAND, situate in the Town, County and State aforesaid, being a part of Lot 44, Town 6, range Ten of the Holland Land Company's Survey, bounded as follows:

BEGINNING at a point, 16 chains 64 links East and 21 chains 45 links North from the Southwest corner of said lot;

THENCE East bounded by land of David Bentley, 12 chains 64 links;

THENCE North, 70 links;

THENCE West parallel to the South line, 12 chains 64 links;

THENCE South, 70 links to the place of BEGINNING.

TOGETHER with the right of way to and from said premises over a certain private road known and distinguished as a private road for Joseph Dennison, laid out by the Commissioners of Highway of the Town of Hanover on the 13th day of September, being 16 chains 64 links East of the Northwest corner of said Lot 44;

THENCE South on Bentley's East line, 24 chains 54 links to a maple tree at the foot of the hill;

THENCE South 14 ½ degrees West, 2 chains 54 links to a stake at the top of the hill;

THENCE South 14 degrees East, 2 chains 17 links;

THENCE South, 9 chains 50 links to the North line of land owned by J. Dennison the same being Ten rods wide.

EXCEPTING therefrom land deeded by Polly Osborne formerly Polly Bentley to the New York and Erie Railroad Company by deed recorded November 2, 1850 in Liber 50 of Deeds at Page 303, also lands deeded by Polly Osborne to Mary Ann Drake by deed recorded May 16, 1865 in Liber 105 of Deeds at Page 275 and lands deeded by Francis Drake and others to Adams M. Paul by deed recorded April 3, 1868 in Liber 120 of Deeds at Page 567.

EXCEPTING AND RESERVING therefrom land deeded from Margaret Olsen Individually and as Sole Survivor of Harry Olsen to Valerie A. Robinson by Deed dated April 12, 2000 and recorded in the Chautauqua County Clerk's Office on June 16, 2000 in Liber 2443 of Deeds at Page 768.

ALSO EXCEPTING AND RESERVING therefrom land deeded from Margaret Olsen, Individually and as Sole Survivor of Harry Olsen to Jacquelyn Kerstetter by deed dated April 12, 2000 and recorded in the Chautauqua County Clerk's Office on June 19, 2000 in Liber 2443 of Deeds at Page 950.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE
THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016001946

Receipt#: 201606153115
Clerk: AH
Rec Date: 03/09/2016 11:03:31 AM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 7
Rec'd Frm: RES AMERICA DEVELOPMENTS INC

Party1: VALENTINE DAVID N
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	52.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	82.00

Transfer Tax

Transfer Tax	0.00
Sub Total:	0.00
Total:	82.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016002792
Consideration: 500.00

Total: 0.00

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

Record and Return To:

RES AMERCIAS INC
11101 CW 120TH AVE SUITE 400
BROOMFIELD CO 80021

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of February 9, 2016, by and among David N. Valentine and Lois F. Valentine, as to a life estate, and Reid Valentine, as to the remainder ("***Landlord***"), and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for

a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on February 9, 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: Reid Valentine
Name: Reid Valentine

By: David N Valentine
Name: David N. Valentine

By: Lois F. Valentine
Name: Lois F. Valentine

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments Inc.
its Manager

By:
Name: ROB MURCIAN

Title: CHIEF STRATEGY OFFICER

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 9th day of February in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Reid Valentine, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 9th day of February in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared David N. Valentine, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 9th day of February in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Lois F. Valentine, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF COLORADO)
)
COUNTY OF BROOMFIELD)

On the 8th day of February in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Rob Morgan, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

NICOLE A. BLACKSTAD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154000318
MY COMMISSION EXPIRES JANUARY 5, 2019

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

All That Tract or Parcel of Land, *situate in the Town of Hanover, County of Chautauqua and State of New York, being part of Lot 41, Township 6 and Range 10 of the Holland Land Company's Survey, bounded and described as follows:*

Beginning *at a point in the north line of Lot 41, which is also the centerline of Route 39, which is 865.0 feet westerly from its point of intersection with the east line of lot 41; running then southerly on a line parallel with the east line of Lot 41, 543.65 feet to a point; then westerly on a line parallel to the north line of Lot 41, 480.78 feet; then northerly on a line parallel with the east line of Lot 41 and the first course herein mentioned 543.65 feet to a point in the north line of Lot 41; then easterly along said north line 480.78 feet to the point or place of beginning, being 6.0 acres more or less.*

BEING INTENDED *to describe the same premises conveyed in a deed dated December 28, 1990 and recorded in the Chautauqua County Clerk's Office on January 3, 1991 at Liber 2239 of Deeds at page 542*

Also All That Tract or Parcel of Land, *situate in the Town of Hanover, County of Chautauqua and State of New York, being a part of Lot 41, Township 6, Range 10 of the Holland Land Company's Survey, bounded and described as follows:*

Beginning *at a point in the centerline of Route 39 where the same intersects the east line of Lot 41; running then southerly, at an interior angle of 89 degrees, 50 minutes along the said east line of Lot 41 and also lands of Loren Valentine, 1514.10 feet to a point which is 1503.72 feet easterly from a point in the centerline of Empire Road; running then westerly at an interior angle of 90 degrees, 26 minutes, 865 feet to a point; running then northeasterly at an interior angle of 89 degrees, 34 minutes, 1518.20 feet to a point in the said centerline of Route 39; running then easterly at an interior angle of 90 degrees, 10 minutes and along the said centerline of Route 39, 865 feet to the point or place of beginning, being 30.03 acres be the same more or less according to survey made by George B. Brown, L.S. dated October 2, 1975.*

BEING INTENDED *to describe the same premises conveyed in a deed dated October 10, 1975 and recorded in the Chautauqua County Clerk's Office on October 20, 1975 at Liber 1588 of Deeds at page 198.*

Premises: *917 Route 39, Forestville, NY 14062*
SBL: *117.00-2-4, 5, 6, 7 & 8*

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016001947

Receipt#: 201606153115
Clerk: AH
Rec Date: 03/09/2016 11:03:31 AM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 6
Rec'd Frm: RES AMERICA DEVELOPMENTS INC

Party1: VALENTINE DAVID N
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	47.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	77.00
Transfer Tax	
Transfer Tax	0.00
Sub Total:	0.00
Total:	77.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016002793
Consideration: 500.00

Total: 0.00

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

Record and Return To:

RES AMERCIAS INC
11101 CW 120TH AVE SUITE 400
BROOMFIELD CO 80021

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of February 9, 2016, by and between David N. Valentine and Lois F. Valentine, as husband and wife ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for

a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on February 9, 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

By: David N Valentine
Name: David N. Valentine

By: Lois F. Valentine
Name: Lois F. Valentine

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments Inc.
its Manager

By:
Name: ROB LUCKETT

Title: CHIEF STRATEGY OFFICER

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 9th day of February in the year 201_ before me, the undersigned, a notary public in and for said state, personally appeared David N. Valentine, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 9th day of February in the year 201_ before me, the undersigned, a notary public in and for said state, personally appeared Lois F. Valentine, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kristin M. McCarthy

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF COLORADO)
)
COUNTY OF BROOMFIELD)

On the 8th day of February in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Rob Runyan, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Nicole A. Blackstad

Notary Public

NICOLE A. BLACKSTAD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154000318
MY COMMISSION EXPIRES JANUARY 5, 2019

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

THAT TRACT OR PARCEL OF LAND situate in the Town of Hanover, County of Chautauqua and State of New York being part of Lot 33, Township 6 and Range 10 of the Holland Land Company's Survey, and more particularly described as follows: Beginning on the centerline of New York State Route 39 at the northwesterly corner of Lot No. 33 of the Holland Land Company's Survey; thence easterly a distance of 396 feet along said centerline to a point; thence southerly at an exterior angle of 90 degrees 04 minutes a distance of 3300 feet to a point; thence easterly at an exterior angle of 89 degrees 56 minutes a distance of 264 feet to a point; thence southerly at an interior angle of 89 degrees 56 minutes a distance of 702.8 feet to an iron pin on the southerly line of said Lot No. 33; thence westerly at an interior angle of 88 degrees 50 minutes a distance of 660 feet along said southerly line of Lot No. 33 to the iron pin on the southwesterly corner thereof; thence northerly at an interior angle of 91 degrees 10 minutes a distance of 3988.6 feet along the westerly line of said Lot No. 33 to the point or place of beginning, and passing through an existing iron pin located a distance of 33 feet southerly along the last described course from said centerline of New York State Route 39, and containing 40.5 acres of land more or less.

THAT TRACT OR PARCEL OF LAND situate in the Town of Hanover, County of Chautauqua and State of New York being part of Lot 33, Township 6 and Range 10 of the Holland Land Company's Survey, and more particularly described as follows: Beginning on the centerline of New York State Route 39 at the northwesterly corner of Lot 33 of the Holland Land Company's Survey; thence easterly a distance of 158.8 feet along said centerline to a point; thence southerly at an exterior angle of 91 degrees 43 minutes a distance of 170.7 feet to an iron pin, and passing through an iron pin located a distance of 33 feet southerly along the last described course from said centerline of New York State Route 39; thence southwesterly at an exterior angle of 247 degrees 12 minutes a distance of 58 feet to an iron pin; thence southerly at an exterior angle of 111 degrees 09 minutes a distance of 141.5 feet to an iron pin; thence westerly at an interior angle of 90 degrees 04 minutes a distance of 99.8 feet to an iron pin on the westerly line of said Lot 33; thence northerly at an interior angle of 89 degrees 56 minutes a distance of 333 feet along the westerly line of said Lot 33 to the point or place of beginning, passing through an iron pin located a distance of 33 feet southerly along the last described course from said centerline of New York State Route 39, and containing 1 acre of land more or less.

CHAUTAUQUA COUNTY – STATE OF NEW YORK

LARRY BARMORE, COUNTY CLERK
1 North Erie St, PO Box 170
Mayville, New York 14757

COUNTY CLERK'S RECORDING PAGE

THIS PAGE IS PART OF THE DOCUMENT – DO NOT DETACH

INSTRUMENT #: DE2016002427

Receipt#: 201606155333
Clerk: AH
Rec Date: 04/07/2016 01:41:09 PM
Doc Grp: D
Descrip: MEMO OF LEASE
Num Pgs: 6
Rec'd Frm: RES AMERICA

Party1: DOUBLE A VINEYARDS LAND HOLDINGS LLC
Party2: BALL HILL WIND ENERGY LLC
Town: HANOVER

Recording:

Cover Page	5.00
Recording Fee	45.00
Cultural Ed	14.25
Records Management - Coun	1.00
Records Management - Stat	4.75
TP584	5.00
Sub Total:	75.00
Transfer Tax	
Transfer Tax	6.00
Sub Total:	6.00
Total:	81.00

**** NOTICE: THIS IS NOT A BILL ****

***** Transfer Tax *****
Transfer Tax #: TT2016003144
Consideration: 1057.00

Transfer Tax	6.00
Total:	6.00

Record and Return To:

RES AMERICAS INC
11101 W 120TH AVE SUITE 400
BROOMFIELD CO 80021

WARNING***
I hereby certify that the within and foregoing was recorded in the Chautauqua County Clerk's Office, State of New York.
This sheet constitutes the Clerks endorsement required by Section 316 of the Real Property Law of the State of New York.

Larry Barmore
Chautauqua County Clerk

MEMORANDUM OF LEASE

RECORDING REQUESTED BY AND
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC
11101 W. 120th Ave., Suite 400
Broomfield, Colorado 80021

(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF LEASE ("***Memorandum***") is made and entered into as of March 2, 2016, by and between Double A Vineyards Land Holdings LLC ("***Landlord***") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("***Tenant***").

1. **Lease**. For the term and upon the provisions set forth in that Wind Energy Ground Lease of even date herewith between Landlord and Tenant (the "***Lease***"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Landlord hereby leases to Tenant, and Tenant hereby leases from Landlord, that certain real property (the "***Premises***") located in the County of Chautauqua, State of New York, as more particularly described in Exhibit "A" attached hereto, together with all rights of ingress and egress and all other rights appurtenant to the Premises, as more particularly described in the Lease.

2. **Easements**. The Lease also includes Access, Operations and Transmission Easements and waivers of any setbacks, noise or shadow flicker standards, requirements or restrictions.

3. **Setbacks**. Without the prior written consent of Tenant, Landlord will not construct or install (or allow to be constructed or installed) on the Premises any structure, building, towers, fences, poles, wires, cables or any other above-ground or below-ground improvements of any kind or character within the following setback areas:

(i) Turbines and Meteorological Towers: 500 feet;

(ii) Transmission Facilities (overhead lines and poles and buried lines): 100 feet;

(iii) Substations and Operations and Maintenance Buildings: 100 feet; and

(iv) Roads: 50 feet.

(v) Following construction of the Turbine(s), any obstruction to the free flow of the wind above thirty feet (30') from the surface of the Premises is prohibited throughout the entire area of the Premises, which shall exist horizontally three hundred and sixty degrees (360°) from any point where any Turbine is located at any time and for a distance from each Turbine to the boundaries of the Premises, together vertically through all space located above the surface of the Premises, that is, one hundred eighty degrees (180°) or such greater number or numbers of degrees as may be necessary to extend from each point on and along a line drawn along the surface from each point along the exterior boundary of the Premises through each Turbine to each point and on and along such line to the opposite exterior boundary of the Premises.

4. **Term**. The Development Term of the Lease is seven (7) years, commencing on March 2, 2016, which Tenant has the option to extend for one (1) additional period of two (2) year(s) each (and possibly a longer period to complete construction of Windpower Facilities as set forth in the Lease). After the Development Term and subject to certain conditions, the Lease may be extended for an additional term of thirty (30) years, which Tenant has the additional option to further extend for three (3) additional periods of ten (10) year(s) each.

5. **Notice**. This Memorandum is prepared for the purpose of giving notice of the Lease and in no way modifies the express provisions of the Lease. This Memorandum shall continue to constitute notice of the Lease, even if the Lease is subsequently amended.

6. **Successors and Assigns**. Landlord and Tenant intend that the covenants, conditions and restrictions contained in the Lease shall be both personal to Landlord and Tenant and binding on their successors and assigns. Each successive owner of the Premises or of any portion thereof, and each person having any interest therein derived through any owner thereof, shall be bound by such covenants, conditions and restrictions for the benefit of the Premises.

7. **Counterparts**. This Memorandum may be executed in one or more counterparts, each of which shall be an original instrument, but all of which, when taken together, shall constitute one and the same instrument.

IN WITNESS WHEREOF, this Memorandum of Lease has been executed as of the date first written above.

LANDLORD:

Double A Vineyards Land Holdings LLC

By: _____
Name: Dennis J. Rak
Title: President

TENANT:

Ball Hill Wind Energy, LLC
a Delaware limited liability company

By: RES America Developments, Inc.
its Manager

By: _____

Name: BRIAN EVANS

Title: PRESIDENT

STATE OF NEW YORK)
)
COUNTY OF CHAUTAUQUA)

On the 2nd day of March in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Dennis J. Rak, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

KRISTIN M McCARTHY
Notary Public, State of New York
No. 01MC6318749
Qualified in Erie County
My Commission Expires 2-2-2019

STATE OF COLORADO)
)
COUNTY OF BROOMFIELD)

On the 1st day of MARCH in the year 2016 before me, the undersigned, a notary public in and for said state, personally appeared Brian Evans, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within instrument and acknowledged to me that he\she\they executed the same in his\her\their capacity(ies), and that by his\her\their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public

NICOLE A. BLACKSTAD
NOTARY PUBLIC
STATE OF COLORADO
NOTARY ID 20154000318
MY COMMISSION EXPIRES JANUARY 5, 2019

EXHIBIT A TO MEMORANDUM OF LEASE

LEGAL DESCRIPTION OF PREMISES

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York, being the east part of Lot 53 and part of Lot 45, in the Sixth Township and Tenth Range of Townships of the Holland Land Company's Survey by Joseph Ellicott; bounded and described as follows:

COMMENCING six chains and seventy-four links west of the southeast corner of Lot No. 53, at the cente of the highway leading from Forestville to Irving; thence along the center of the highway north 24 degrees eas to land owned by Parley Griswold; thence west eight chains and nine links to the east line of said lot 53; thence north twenty-six chains and eighty eight links to the northeast corner of said lot 53; thence west sixtee chains and eight links along the north line of said lot; thence south sixty chains and thirty-seven links on a line parallel to the east line of said lot, to the south line of said lot; thence east nine chains and thirty-four links to the place of beginning, containing about one hundred acres be the same more or less.

EXCEPTING AND RESERVING THEREFROM, All that piece or parcel of property conveyed by deed fron Anthony Domenico to Chautauqua County recorded in Liber 900 of Deeds at Page 402, Liber 900 of Deeds at page 405 and Liber 900 of Deeds at page Page 408. ALSO EXCEPTING all that tract or parcel of land, situate in the Town of Hanover, County of Chautauqua and State of New York, being the east part of Lot 53 and part of Lot 45, in the 6th Township and 10th Range of Townships of the Holland Land Company's Survey by Joseph Ellicott, bounded and described as follows:

Commencing at the intersection of the center line of King Road and Dennison Road a distance of 205.5 feet to a point; thence westerly at an interor angle of 54 degrees 40' through an iron pin located in the west bounds of Dennison Road 393.7 feet to an iron pin; thence southerly at an interior angle of 90 degrees 00' a distance of 169.8 feet and passing through an iron pin to the center line of said King Road; thence easterly at an interior angle of 89° 30' along the center line of King Road, a distance of 274.7 feet to the point or place of beginning.

ALL THAT TRACT OR PARCEL OF LAND,, situate in the Town of Hanover, County of Chautauqua and State of New York, being part of Lot 53 in the 6th Township and 10th Range according to a survey of the Holland Land Company's lands and more particularly described as follows:

BEGINNING at the iron pin in the southerly line of Lot 53, said iron pin being located 1061.28 feet westerly along said southerly line from the southeasterly corner of Lot 53; thence continuing westerly along said southerly line 273.57 feet to an iron pin; thence northerly at an angle of 91 degrees 18' when measured in the northeasterly quadrant 956.56 feet to a point in the center line of King Road as now laid out and occupied, and passing through an iron pin located 24.75 feet southeasterly rectangular measurement from said centerline; thence northeasterly at an angle of 101 degrees 31' when measured in the southeasterly quadrant 279.15 feet along said centerline to a point; thence southerly parallel to the second described course 1018.5 feet to the point or place of beginning, and passing through an iron pin located 24.75 feet southeasterly by rectangular measurement from said centerline of King Road.

AND FURTHER EXCEPTING THEREFROM All that piece or parcel of land conveyed to the County of Chautauqua by deed recorded June 22, 1994 in Liber 2313 of Deeds at Page 407.

Appendix C: Agricultural Data Statement

TOWN VILLAGE CITY OF _____ Application #_____
(circle one)

Agricultural Data Statement

Date _____

Instructions: This form must be completed for any application for a special use permit, site plan approval, use variance or a subdivision approval requiring municipal review that would occur on property within 500 feet of a farm operation located in a NYS Dept. of Ag & Markets certified Agricultural District.

Applicant	Owner if Different from Applicant
Name: _____ Address: _____ _____	Name: _____ Address: _____ _____

1. Type of Application: ☐Special Use Permit; ☐Site Plan Approval ; ☐Use Variance;
   (circle one or more) ☐Subdivision Approval

2. Description of proposed project:_____
_____
_____
_____

3. Location of project: Address: _____
   Tax Map Number (TMP) _____

4. Is this parcel within an Agricultural District? ☐NO ☐YES (Check with your local assessor if
5. If YES, Agricultural District Number_____ you do not know)
6. Is this parcel actively farmed? ☐NO ☐YES
7. List all farm operations within 500 feet of your parcel. Attach additional sheets if necessary.

Name: _____ Address: _____ _____ Is this parcel actively farmed? ☐NO ☐YES	Name: _____ Address: _____ _____ Is this parcel actively farmed? ☐NO ☐YES
Name: _____ Address: _____ _____ Is this parcel actively farmed? ☐NO ☐YES	Name: _____ Address: _____ _____ Is this parcel actively farmed? ☐NO ☐YES

_____ _____
Signature of Applicant Signature of Owner (if other than applicant)

Reviewed by: _____ _____
Signature of Municipal Official Date

NOTE TO REFERRAL AGENCY: County Planning Board review is required. A copy of the Agricultural Data Statement must be submitted along with the referral to the County Planning Department.

Appendix D: 2008 Environmental Assessment Form and Town of Villenova 2015 Board Resolution

617.20
Appendix A
State Environmental Quality Review
FULL ENVIRONMENTAL ASSESSMENT FORM

Purpose: The full EAF is designed to help applicants and agencies determine, in an orderly manner, whether a project or action may be significant. The question of whether an action may be significant is not always easy to answer. Frequently, there are aspects of a project that are subjective or unmeasureable. It is also understood that those who determine significance may have little or no formal knowledge of the environment or may not be aware of the broader concerns affecting the question of significance.

The full EAF is intended to provide a method whereby applicants can be assured that the determination process has been orderly, comprehensive in nature, yet flexible enough to allow introduction of information to fit a project or action.

Full EAF Components: The full EAF is comprised of three parts:

Part 1: Provides objective data and information about a given project and its site. By identifying basic project data, it assists a reviewer in the analysis that takes place in Parts 2 and 3.

Part 2: Focuses on identifying the range of possible impacts that may occur from a project or action. It provides guidance as to whether an impact is likely to be considered small to moderate or whether it is a potentially-large impact. The form also identifies whether an impact can be mitigated or reduced.

Part 3: If any impact in Part 2 is identified as potentially-large, then Part 3 is used to evaluate whether or not the impact is actually important.

DETERMINATION OF SIGNIFICANCE – Type 1 and Unlisted Actions

Identify the Portions of EAF completed for this project: ☒ Part 1 ☐ Part 2 ☐ Part 3

Upon review of the information recorded on this EAF (Parts 1 and 2 and 3 if appropriate), and any other supporting information, and considering both the magnitude and importance of each impact, it is reasonably determined by the lead agency that:

☐ A. The project will not result in any large and important impact (s) and, therefore, is one which **will not** have a significant impact on the environment, therefore a **negative declaration will be prepared)**.

☐ B. Although the project could have a significant effect on the environment, there will not be a significant effect for the Unlisted Action because the mitigation measures described in PART 3 have been required, therefore a CONDITIONED negative declaration will be prepared.*

☒ C. The project may result in one or more large important impacts that may have significant impact on the environment, therefore a positive declaration will be prepared.

*A Conditioned Negative Declaration is only valid for Unlisted Actions

Noble Ball Hill Windpark
Name of Action

Name of Lead Agency

Print or Type Name of Responsible Officer in Lead Agency | Title of Responsible Officer

Signature of Responsible Officer in Lead Agency | Signature of Preparer (If different from responsible officer)

May 2008
Date

PART 1 – PROJECT INFORMATION

Prepared by Project Sponsor

NOTICE: This document is designed to assist in determining whether the action proposed may have a significant effect on the environment. Please complete the entire form, Parts A through E. Answers to these questions will be considered as part of the application for approval and may be subject to further verification and public review. Provide any additional information you believe will be needed to complete Parts 2 and 3.

It is expected that completion of the full EAF will be dependent on information currently available and will not involve new studies, research or investigation. If information requiring such additional work is unavailable, so indicate and specify each instance.

NAME OF ACTION **Noble Ball Hill Windpark**		
LOCATION OF ACTION (Include Street Address, Municipality and County) **Towns of Villenova and Hanover, Chautauqua County**		
NAME OF APPLICANT/SPONSOR **Noble Ball Hill Windpark, LLC**	BUSINESS TELEPHONE **(585) 322-7675**	
ADDRESS **7294 Centerville Road**		
CITY/PO **PO Box 72, Bliss**	STATE **NY**	ZIP CODE **14024**
NAME OF OWNER (If different) **N/A**	BUSINESS TELEPHONE ( )	
ADDRESS		
CITY/PO	STATE	ZIP CODE

DESCRIPTION OF ACTION

Noble Ball Hill Windpark, LLC (Noble) is proposing to construct and operate an approximately 94.5 megawatt (MW) wind energy facility (the Project) in the towns of Villenova and Hanover, Chautauqua County. The wind energy generation component of the Project will be located in both Villenova and Hanover. The transmission component of the Project will be located in Hanover only. The Project consists of the following:

1) Installation and operation of 63 wind turbines (52 turbines in Villenova and 11 turbines in Hanover);
2) Construction and use of approximately 17 miles of access roads (13 miles in Villenova and 4 miles in Hanover). During construction, 35-foot wide temporary roads located within a 60-foot wide construction corridor will connect to each wind turbine to allow vehicle access to the facilities. After construction, the roads will be scaled back to 16 feet allowing Noble to use the existing roadway for maintenance and operational purposes; and
3) Construction and use of an electrical collection system (approximately 23 miles [18 miles in Villenova and 5 miles in Hanover]) that will allow delivery of electricity to the power grid. Where practicable, the electrical collection system will be installed along the same right-of-way corridor as the access roads.
4) Construction and use of a new substation in the Town of Hanover that will tie into a new 115-kilovolt (kV) transmission line. The substation footprint will be approximately 200 by 300 feet;
5) Construction and use of a new switchyard in the Town of Hanover. The switchyard footprint will be approximately 300 by 500 feet;
6) Construction and use of an approximately 6-mile overhead 115-kV transmission line, located entirely in the Town of Hanover to transfer the energy to the proposed switchyard to provide access to an existing National Grid transmission line in Hanover.

Each turbine will consist of an enclosed monopole support tower, a nacelle atop each tower containing the electrical generating equipment, and a three-blade rotor attached to the nacelle. Each wind turbine will have a maximum generating capacity of approximately 1.5 MW.

Please Complete Each Question – Indicate N.A. if not applicable

A. Site Description

Physical setting of overall project, both developed and undeveloped areas.

1. Present land use: ☐Urban ☐Industrial ☐Commercial ☐Residential (suburban) ☒Rural (non-farm) ☒Forest ☒Agriculture ☐Other_____
2. Total acreage of project area: **approx. 13,101** acres Includes all acreage within Project Area/Wind Overlay District boundary as shown in attachment C

APPROXIMATE ACREAGE	PRESENTLY	AFTER COMPLETION
Meadow or Brushland (Non-agricultural)	**383** acres	**376** acres
Forested	**7,044** acres	**6,925** acres
Agricultural (Includes orchards, cropland, pasture, etc.)	**5,202** acres	**5,054** acres
Wetland (Freshwater of tidal as per Articles 24, 25 of ECL	**98** acres	**97** acres
Water Surface Area	**4** acres	**4** acres
Unvegetated (Rock, earth or fill)	**0** acres	**0** acres
Roads, buildings and other paved surfaces	**17** acres	**17** acres
Other (Indicate type) Developed, Open Space	**354** acres	**629** acres

3. What is predominant soil type(s) on project site? **Busti silt loam 3-8% and 8-15% slopes, Chautauqua silt loam 3-8% and 8-15% slopes, Fremont silt loam 3-8 % slopes and 0-3% slopes, Erie silt loam, 3-8% slopes**
   a. Soil drainage: ☒Well drained **18**% of site ☒Moderately well drained **26**% of site ☒Poorly drained **56**% of site
   b. If any agricultural land is involved, how many acres of soil are classified within soil group 1 through 4 of the NYS Land Classification System? **7,800** acres. (See 1 NYCRR 370)
4. Are there bedrock outcroppings on project site? ☐Yes ☒No
   a. What is the depth to bedrock? **N/A** (in feet)
5. Approximate percentage of proposed project site with slopes: ☒0-10% **75%** ☒10-15 % **16%** ☒15% or greater **9%**
6. Is project substantially contiguous to, or contain a building, site, or district, listed on the State or National Registers of Historic Places? ☐Yes ☒No **New York SHPO GIS Database**
7. Is project substantially contiguous to a site listed on the Register of National Natural Landmarks? ☐Yes ☒No
8. What is the depth of the water table? **Variable; at the surface to 137 feet** (in feet)
9. Is site located over a primary, principal, or sole source aquifer? ☐Yes ☒No
10. Do hunting, fishing or shell fishing opportunities presently exist in the project area? ☒Yes ☐No **Hunting and fishing.**
11. Does project site contain any species of plant or animal life that is identified as threatened or endangered? ☒Yes ☐No According to **NYSDEC, the Henslow's sparrow, short-eared owl, sedge wren, and bald eagle are known to occur within 10 miles of the project area. According to USFWS, the clubshell is known to occur in Chautauqua County. See Attachment A.**
    Identify each species
12. Are there any unique or unusual land forms on the project site? (i.e., cliffs, dunes, other geological formations) ☐Yes ☒No Describe
13. Is the project site presently used by the community or neighborhood as an open space or recreation area? ☐Yes ☒No If yes, explain
14. Does the present site include scenic views known to be important to the community? ☐Yes ☒No **A Visual Impact Assessment will be conducted as part of the DEIS. See Attachment D.**
15. Streams within or contiguous to project area: **Unnamed tributaries to Tupper Creek; Unnamed tributaries to North Branch Conewango Creek; and Unnamed tributaries to West Branch Conewango Creek.**
    a. Name of Stream and name of River to which it is tributary **North and West Branches to Conewango Creek drain to Conewango Creek, which drains to the Allegheny River in Pennsylvania; Tupper Creek drains to Walnut Creek, which drains to Lake Erie.**
16. Lakes, ponds, wetland areas within or contiguous to project area:
    a. Name **The Project Area contains 6 NYSDEC mapped wetlands and 86 NWI Mapped wetlands**
    b. Size (in acres) **NYSDEC mapped wetlands: 238.32 acres. NWI Mapped wetlands: 210.58 acres. Wetland acreage to be further delineated in the wetland application that will be submitted to NYSDEC and USACE.**
17. Is the site served by existing public utilities? ☒Yes ☐No
    a) If Yes, does sufficient capacity exist to allow connection? ☒Yes ☐No
    b) If Yes, will improvements be necessary to allow connection? ☒Yes ☐No

18. Is the site located in an agricultural district certified pursuant to Agriculture and Markets Law, Article 25-AA, Section 303 and 304? ☒Yes ☐No **Districts 0, 5, and 10**
19. Is the site located in or substantially contiguous to a Critical Environmental Area designated pursuant to Article 8 of the ECL, and 6 NYCRR 617? ☐Yes ☒No
20. Has the site ever been used for the disposal of solid or hazardous wastes? ☐Yes ☒No

B. Project Description

1. Physical dimensions and scale of project (fill in dimensions as appropriate)
   a. Total contiguous acreage owned or controlled by project sponsor **Approx. 13,101** acres.
   b. Project acreage to be developed **Approximately 323 acres** acres initially; **Approx. 300** acres ultimately.
   c. Project acreage to remain undeveloped **12,778** acres.
   d. Length of project, in miles **N/A** (If appropriate)
   e. If the project is an expansion, indicate percentage of expansion proposed **N/A%**
   f. Number of off-street parking spaces existing **None**; proposed **None.**
   g. Maximum vehicular trips generated per hour **15 (construction)** (upon completion of project)? **None**
   h. If residential: Number and type of housing units: **N/A**

	One Family	Two Family	Multiple Family	Condominium
Initially	**N/A**	**N/A**	**N/A**	**N/A**
Ultimately	**N/A**	**N/A**	**N/A**	**N/A**

   i. Dimensions (in feet) of largest proposed structure **118.5 meters (389 ft)** height; **77.2 meters (253)** width, **N/A**length
   j. Linear feet of frontage along a public thoroughfare project will occupy is? **Approx. 11,282** ft.
2. How much natural material (i.e., rock, earth, etc.) will be removed from the site? **Approximately 140,000 CY** tons/cubic yards **40% of material will likely be topsoil that will be distributed on the associated access roads/turbine site. The remaining 60% will either be used in construction of the access roads throughout the project or sent to licensed facilities.**
3. Will disturbed areas be reclaimed? ☒Yes ☐No ☐N/A
   a. If yes, for what intended purpose is the site being reclaimed? **Agriculture; wetlands.**
   b. Will topsoil be stockpiled for reclamation? ☒Yes ☐No
   c. Will upper subsoil be stockpiled for reclamation? ☒Yes ☐No
4. How many acres of vegetation (trees, shrubs, ground covers) will be removed from site? **Approx. 126** acres.
5. Will any mature forest (over 100 years old) or other locally-important vegetation be removed by this project? ☐Yes ☒No
6. If single phase project: Anticipated period of construction **12** months, (including demolition).
7. If multi-phased: **NA**
   a. Total number of phases anticipated **N/A** (number),
   b. Anticipated date of commencement phase 1 **N/A** month **N/A** year, (including demolition).
   c. Approximate complete date of final phase **N/A** month **N/A** year.
   d. Is phase 1 functionally dependent on subsequent phases? ☐Yes ☒No
8. Will blasting occur during construction? ☐Yes ☒No
9. Number of jobs generated during construction **Approximately 185**; after project is complete **Approximately 7. 1 Plant Manager, 1 Administrative, 5 Technical.**
10. Number of jobs eliminated by this project **None**.
11. Will project require relocation of any projects or facilities? ☐Yes ☒No If yes, explain
12. Is surface liquid waste disposal involved? ☐Yes ☒No
    a. If yes, indicate type of waste (sewage, industrial, etc.) and amount **N/A**
    b. Name of water body into which effluent will be discharged **N/A**
13. Is subsurface liquid waste disposal involved? ☐Yes ☒No Type
14. Will surface area of an existing water body increase or decrease by proposal? ☐Yes ☒No Explain
15. Is project or any portion of project located in a 100 year flood plain? ☒Yes ☐No
16. Will the project generate solid waste? ☒Yes ☐No
    a. If yes, what is the amount per month **approximately 10** tons **during 6 months of construction. Waste generation will be negligible during operations.**
    b. If yes, will an existing waste facility be used? ☒Yes ☐No
    c. If yes, give name **TBD. Due to materials identification and classification, multiple sites may be used.**
    d. Will any wastes not go into a sewage disposal system or into a sanitary landfill? ☐Yes ☒No
    e. If yes, explain **N/A**
17. Will the project involve the disposal of solid waste? ☐Yes ☒No

a. If yes, what is the anticipated rate of disposal? **N/A** tons/month.
b. If yes, what is the anticipated site life: **N/A** years.

18. Will project use herbicides or pesticides: ☒Yes ☐No
19. Will project routinely produce odors (more than one hour per day)? ☐Yes ☒No
20. Will project produce operating noise exceeding the local ambient noise levels? ☒Yes ☐No **Noise analysis will be conducted in the DEIS.**
21. Will project result in an increase in energy use? ☐Yes ☒No
    If yes, indicate type(s)
22. If water supply is from wells, indicate pumping capacity **N/A** gallons/minute. **N/A**
23. Total anticipated water usage per day **N/A** gallons/minute. N/A
24. Does project involve Local, State or Federal funding? ☐Yes ☒No
    If yes, explain
25. **Approvals Required:**

			Type	Submittal Date
City, Town, Village Board	☒Yes	☐No	**See Attachment B**	
City, Town, Village Planning Board	☒Yes	☐No		
City, Town Zoning Board	☒Yes	☐No		
City, County Health Department	☒Yes	☐No		
Other Local Agencies	☐Yes	☒No		
Other Regional Agencies	☐Yes	☒No		
State Agencies	☒Yes	☐No		
Federal Agencies	☒Yes	☐No		

C. Zoning and Planning Information

1. Does proposed action involve a planning or zoning decision? ☒Yes ☐No
   If yes, indicate decision required:
   ☐zoning amendment ☒zoning variance ☒special use permit ☐subdivision ☒site plan
   ☐new/revision of master plan ☐resource management plan ☒other
2. What is the zoning classification(s) of the site? **Portions of the Project Area in Villenova are classified as Transition (T) District. The Project Area within the Town of Hanover is entirely within the Agriculture and Residential (A1) district.**
3. What is the maximum potential development of the site if developed as permitted by the present zoning? **N/A**
4. What is the proposed zoning of the site? **Wind Overlay District**
5. What is the maximum potential development of the site if developed as permitted by the proposed zoning?**N/A**
6. Is the proposed action consistent with the recommended uses in adopted local land use plans? ☒Yes ☐No **Project will allow continued use of land for agricultural purposes. The Town of Villenova and Town of Hanover have adopted a Wind Energy Facilities Law that regulates the placement of Wind Energy Conversion Devices/Farms. The action is consistent with the requirements set forth in these laws except for height restriction in the Town of Hanover for which area variances will be sought from the Hanover Zoning Board of Appeals.**
7. What are the predominant land use(s) and zoning classifications within a ¼ mile radius of proposed action? **Agriculture and forested.**
8. Is the proposed action compatible with adjoining/surrounding land uses within a ¼ mile: ☒ Yes ☐No **See item 6.**
9. If the proposed action is the subdivision of land, how many lots are proposed? **N/A**
   a. What is the minimum lot size proposed? **N/A**
10. Will proposed action require and authorization(s) for the formation of sewer or water districts? ☐Yes ☒No
11. Will the proposed action create a demand for any community provided services (recreation, education, police, fire protection)? ☒Yes ☐No **Small potential increase in demand for police and fire protection.**
    a. If yes, is existing capacity sufficient to handle projected demand? ☒Yes ☐No
12. Will the proposed action result in the generation of traffic significantly above present levels? ☒Yes ☐No **Temporarily during construction. During operation traffic will resume to present levels. Traffic analysis will be conducted as part of the DEIS.**
    a. If yes, is the existing road network adequate to handle the additional traffic? ☒Yes ☒No **Noble will enter into a Road Use Agreement with the Towns of Villenova and Hanover and Chautauqua County in order to mitigate and/or repair any damages to the local roads. A haul route study will be provided in the DEIS that will identify any nessessary roadway improvements.**

D. Informational Details

Attach any additional information as may be needed to clarify your project. If there are or may be any adverse impacts associated with your proposal, please discuss such impacts and the measures which you propose to mitigate or avoid them.

E. Verification

I certify that the information provided above is true to the best of my knowledge.

Applicant/Sponsor Name

Date May 16TH 2008

Signature _____ JOHN M DWIRKE Title E.V.P. DEVELOPMENT

If the action is in the Coastal Area, and you are a state agency, complete the Coastal Assessment Form before proceeding with this assessment.

PART 2 – PROJECT IMPACTS AND THEIR MAGNITUDE

Responsibility of Lead Agency

General Information (Read Carefully)

- In completing the form the reviewer should be guided by the question: Have my responses and determinations been **reasonable?** The reviewer is not expected to be an expert environmental analyst.
- The **Examples** provided are to assist the reviewer by showing types of impacts and wherever possible the threshold of magnitude that would trigger a response in column 2. The examples are generally applicable throughout the State and for most situations. But, for any specific project or site other examples and/or lower thresholds may be appropriate for a Potential Large Impact response, thus requiring evaluation in Part 3.
- The impacts of each project, on each site, in each locality, will vary. Therefore, the examples are illustrative and have been offered as guidance. They do not constitute an exhaustive list of impacts and thresholds to answer each question.
- The number of examples per question does not indicate the importance of each question.
- In identifying impacts, consider long term, short term and cumulative effects.

Instructions (Read carefully)

a. Answer each of the 20 questions in PART 2. Answer **Yes** if there will be **any** impact.
b. **Maybe** answers should be considered as **Yes** answers.
c. If answering **No** to a question then check the appropriate box (column 1 or 2) to indicate the potential size of the impact. If impact threshold equals or exceeds any example provided, check column 2. If impact will occur but threshold is lower than example, check column 1.
d. Identifying that an impact will be potentially large (column 2) does not mean that it is also necessarily **significant**. Any large impact must be evaluated in PART 3 to determine significance. Identifying an impact in column 2 simply asks that it be looked at further.
e. If reviewer has doubt about size of the impact then consider the impact as potentially large and proceed to PART 3.
f. If a potentially large impact checked in column 2 can be mitigated by change(s) in the project to a small to moderate impact, also check the **Yes** box in column 3. A **No** response indicates that such a reduction is not possible. This must be explained in Part 3.

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated By Project Change	
IMPACT ON LAND				
1. Will the proposed action result in a physical change to the project site? ☐NO ☐YES				
Examples that would apply to column 2				
• Any construction on slopes of 15% or greater, (15 foot rise per 100 foot of length), or where the general slopes in the project area exceed 10%.	☐	☐	☐Yes	☐No
• Construction on land where the depth to the water table is less than 3 feet.	☐	☐	☐Yes	☐No
• Construction of paved parking area for 1,000 or more vehicles.	☐	☐	☐Yes	☐No
• Construction on land where bedrock is exposed or generally within 3 feet of existing ground surface.	☐	☐	☐Yes	☐No
• Construction that will continue for more than 1 year or involve more than one phase or stage.	☐	☐	☐Yes	☐No
• Excavation for mining purposes that would remove more than 1,000 tons of natural material (i.e., rock or soil) per year.	☐	☐	☐Yes	☐No
• Construction or expansion of a sanitary landfill.	☐	☐	☐Yes	☐No
• Construction in a designated floodway.	☐	☐	☐Yes	☐No
• Other impacts	☐	☐	☐Yes	☐No
2. Will there be an effect to any unique or unusual land forms found on the site? (i.e., cliffs, dunes, geological formations, etc) ☐NO ☐YES				
• Specific land forms:	☐	☐	☐Yes	☐No

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated By Project Change	
IMPACT ON WATER				
3. Will proposed action affect any water body designated as protected? (Under Articles 15, 24, 25 of the Environmental Conservation Law, ECL)				
☐NO ☐YES				
Examples that would apply to column 2				
• Developable area of site contains a protected water body.	☐	☐	☐Yes	☐No
• Dredging more than 100 cubic yards of material from channel of a protected stream.	☐	☐	☐Yes	☐No
• Extension of utility distribution facilities through a protected water body.	☐	☐	☐Yes	☐No
• Construction in a designated freshwater or tidal wetland.	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No
4. Will proposed action affect any non-protected existing or new body of water?				
☐NO ☐YES				
Examples that would apply to column 2				
• A 10% increase or decrease in the surface area of any body of water or more than a 10 acre increase or decrease.	☐	☐	☐Yes	☐No
• Construction of a body or water that exceeds 10 acres of surface area.	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No
5. Will Proposed Action affect surface or groundwater quality or quantity?				
☐NO ☐YES				
Examples that would apply to column 2				
• Proposed Action will Require a discharge permit.	☐	☐	☐Yes	☐No
• Proposed Action requires use of a source of water that does not have approval to serve proposed (project) action.	☐	☐	☐Yes	☐No
• Proposed Action requires water supply from wells with greater than 45 gallons per minute pumping capacity.	☐	☐	☐Yes	☐No
• Construction or operation causing any contamination of a water supply system.	☐	☐	☐Yes	☐No
• Proposed Action will adversely affect groundwater.	☐	☐	☐Yes	☐No
• Liquid effluent will be conveyed off the site to facilities which presently do not exist or have inadequate capacity.	☐	☐	☐Yes	☐No
• Proposed Action would use water in excess of 20,000 gallons per day.	☐	☐	☐Yes	☐No
• Proposed Action will likely cause siltation or other discharge into an existing body of water to the extent that there will be an obvious visual contrast to natural conditions.	☐	☐	☐Yes	☐No
• Proposed Action will require the storage of petroleum or chemical products greater than 1,100 gallons.	☐	☐	☐Yes	☐No
• Proposed Action will allow residential uses in areas without water and/or sewer services.	☐	☐	☐Yes	☐No
• Proposed Action locates commercial and/or industrial uses which may require new or expansion of existing waste treatment and/or storage facilities.	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated By Project Change	
6. Will proposed action alter drainage flow or patterns, or surface water runoff? ☐NO ☐YES				
Examples that would apply to column 2				
• Proposed Action would change flood water flows.	☐	☐	☐Yes	☐No
• Proposed Action may cause substantial erosion.	☐	☐	☐Yes	☐No
• Proposed Action is incompatible with existing drainage patterns.	☐	☐	☐Yes	☐No
• Proposed Action will allow development in a designated floodway.	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No
IMPACT ON AIR				
7. Will proposed action affect air quality? ☐NO ☐YES				
Examples that would apply to column 2				
• Proposed Action will induce 1,000 or more vehicle trips in any given hour.	☐	☐	☐Yes	☐No
• Proposed Action will result in the incineration of more than 1 tone of refuse per hour.	☐	☐	☐Yes	☐No
• Emission rate of total contaminants will exceed 5 lbs. per hour or a heat source producing more than 10 million BTU's per hour.	☐	☐	☐Yes	☐No
• Proposed action will allow an increase in the amount of land committed to industrial use.	☐	☐	☐Yes	☐No
• Proposed action will allow an increase in the density of industrial development within existing industrial areas.	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No
IMPACT ON PLANTS AND ANIMALS				
8. Will Proposed Action affect any threatened or endangered species? ☐NO ☐YES				
Examples that would apply to column 2				
• Reduction of one or more species listed on the New York or Federal list, using the site, over or near site or found on the site.	☐	☐	☐Yes	☐No
• Removal of any portion of a critical or significant wildlife habitat.	☐	☐	☐Yes	☐No
• Application of pesticide or herbicide more than twice a year, other than for agricultural purposes.	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No
9. Will Proposed Action substantially affect non-threatened or non-endangered species? ☐NO ☐YES				
Examples that would apply to column 2				
• Proposed Action would substantially interfere with any resident or migratory fish, shellfish or wildlife species.	☐	☐	☐Yes	☐No
• Proposed Action requires the removal of more than 10 acres of mature forest (over 100 years of age) or other locally important vegetation.	☐	☐	☐Yes	☐No

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated By Project Change	
IMPACT ON AGRICULTURAL LAND RESOURCES				
10. Will the Proposed Action affect agricultural land resources? ☐NO ☐YES				
Examples that would apply to column 2				
• The proposed action would sever, cross or limit access to agricultural land (includes cropland, hayfields, pasture, vineyard, orchard, etc.)	☐	☐	☐Yes	☐No
• Construction activity would excavate or compact the soil profile of agricultural land.	☐	☐	☐Yes	☐No
• The proposed action would irreversibly convert more than 10 acres of agricultural land or, if located in an Agricultural District, more than 2.5 acres of agricultural land. I	☐	☐	☐Yes	☐No
• The proposed action would disrupt or prevent installation of agricultural land management systems (e.g., subsurface drain lines, outlet ditches, strip cropping); or create a need for such measures (e.g., cause a farm field to drain poorly due to increased runoff)	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No
IMPACT ON AESTHETIC RESOURCES				
11. Will proposed action affect aesthetic resources? ☐NO ☒YES (If necessary, use the Visual EAF Addendum in Section 617.20, Appendix B.)				
Examples that would apply to column 2				
• Proposed land uses, or project components obviously different from or in sharp contrast to current surrounding land use patterns, whether man-made or natural.	☐	☐	☐Yes	☐No
• Proposed land uses, or project components visible to users of aesthetic resources which will eliminate or significantly reduce their enjoyment of the aesthetic qualities of that resource.	☐	☐	☐Yes	☐No
• Project components that will result in the elimination or significant screening of scenic views known to be important to the area.	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No
IMPACT ON HISTORIC AND ARCHAEOLOGICAL RESOURCES				
12. Will Proposed Action impact any site or structure of historic, prehistoric or paleontological importance? ☐NO ☐YES				
Examples that would apply to column 2				
• Proposed Action occurring wholly or partially within or substantially contiguous to any facility or site listed on the State or National Register of historic places.	☐	☐	☐Yes	☐No
• Any impact to an archaeological site or fossil bed located within the project site.	☐	☐	☐Yes	☐No
• Proposed Action will occur in an area designated as sensitive for archaeological sites on the NYS Site Inventory.	☐	☐	☐Yes	☐No
• Other impacts:				

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated By Project Change	
IMPACT ON OPEN SPACE AND RECREATION				
13. Will Proposed Action affect the quantity or quality of existing or future open spaces or recreational opportunities?				
☐NO ☐YES				
Examples that would apply to column 2				
• The permanent foreclosure of a future recreational opportunity.	☐	☐	☐Yes	☐No
• A major reduction of an open space important to the community.	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No
IMPACT ON CRITICAL ENVIRONMENTAL AREAS				
14. Will Proposed Action impact the exceptional or unique characteristics of a critical environmental area (CEA) established pursuant to subdivision 6 NYCRR 617.14(g)?				
☐NO ☐YES				
Examples that would apply to column 2				
• Proposed Action to locate within the CEA?	☐	☐	☐Yes	☐No
• Proposed Action will result in a reduction in the quantity of the resource?	☐	☐	☐Yes	☐No
• Proposed Action will result in a reduction of the quality of the resource?	☐	☐	☐Yes	☐No
• Proposed Action will impact the use, function or enjoyment of the resource?	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No
IMPACT ON TRANSPORTATION				
15. Will there be an effect to existing transportation systems?				
☐NO ☐YES				
Examples that would apply to column 2				
• Alteration of present patterns of movement of people and/or goods.	☐	☐	☐Yes	☐No
• Proposed Action will result in major traffic problems.	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No
IMPACT ON ENERGY				
16. Will proposed action affect the community's sources of fuel or energy supply?				
☐NO ☐YES				
Examples that would apply to column 2				
• Proposed Action will cause a greater than 5% increase in the use of any form of energy in the municipality.	☐	☐	☐Yes	☐No
• Proposed Action will require the creation or extension of an energy transmission or supply system to serve more than 50 single or two family residences or to sere a major commercial or industrial use.	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No

	1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated By Project Change	
NOISE AND ODOR IMPACTS				
17. Will there be objectionable odors, noise, or vibration as a result of the Proposed Action? ☐NO ☐YES				
Examples that would apply to column 2				
• Blasting within 1,500 feet of a hospital, school or other sensitive facility.	☐	☐	☐Yes	☐No
• Odors will occur routinely (more than one hour per day).	☐	☐	☐Yes	☐No
• Proposed Action will produce operating noise exceeding the local ambient noise levels for noise outside of structures.	☐	☐	☐Yes	☐No
• Proposed Action will remove natural barriers that would act as a noise screen.	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No
IMPACT ON PUBLIC HEALTH				
18. Will Proposed Action affect public health and safety? ☐NO ☐YES				
Examples that would apply to column 2				
• Proposed Action may cause a risk of explosion or release of hazardous substances (i.e., oil, pesticides, chemicals, radiation, etc.) in the event of accident or upset conditions, or there may be a chronic low level discharge or emission.	☐	☐	☐Yes	☐No
• Proposed Action may result in the burial of "hazardous wastes" in any form (i.e., toxic, poisonous, highly reactive, radioactive, irritating, infectious, etc.)	☐	☐	☐Yes	☐No
• Storage facilities for one million or more gallons of liquified natural gas or other flammable liquids.	☐	☐	☐Yes	☐No
• Proposed action may result in the excavation or other disturbance within 2,000 feet of a site used for the disposal of solid or hazardous waste.	☐	☐	☐Yes	☐No
• Other impacts:	☐	☐	☐Yes	☐No
IMPACT ON GROWTH AND CHARACTER OF COMMUNITY OR NEIGHBORHOOD				
19. Will proposed action affect the character of the existing community? ☐NO ☐YES				
Examples that would apply to column 2				
• The permanent population of the city, town or village in which the project is located is likely to grow by more than 5%.	☐	☐	☐Yes	☐No
• The municipal budget for capital expenditures or operating services will increase by more than 5% per year as a result of this project.	☐	☐	☐Yes	☐No
• Proposed action will conflict with officially adopted plans or goals.	☐	☐	☐Yes	☐No
• Proposed action will cause a change in the density of land use.	☐	☐	☐Yes	☐No
• Proposed action will replace or eliminate existing facilities, structures or areas of historic importance to the community.	☐	☐	☐Yes	☐No
• Development will create a demand for additional community services (e.g., schools, police and fire, etc.)	☐	☐	☐Yes	☐No
• Proposed Action will set an important precedent for future projects.	☐	☐	☐Yes	☐No
• Proposed Action will create or eliminate employment.	☐	☐	☐Yes	☐No

1 Small to Moderate Impact	2 Potential Large Impact	3 Can Impact Be Mitigated By Project Change	
☐	☐	☐Yes	☐No

- Other impacts:

20. Is there, or is there likely to be, public controversy related to potential adverse environmental impacts?

☐NO ☐YES

If any action in Part 2 is identified as a potential large impact or if you cannot determine the magnitude of impact, proceed to Part 3.

PART 3 – EVALUATION OF THE IMPORTANCE OF IMPACTS

Responsibility of Lead Agency

Part 3 must be prepared if one or more impact(s) is considered to be potentially large, even if the impact(s) may be mitigated.

Instructions
Discuss the following for each impact identified in Column 2 of Part 2:

1. Briefly describe the impact.

2. Describe (if applicable) how the impact could be mitigated or reduced to a small to moderate impact by project change(s).

3. Base on the information available, decide if it is reasonable to conclude that this impact is **important.**

   To answer the question of importance, consider:
   - The probability of the impact occurring
   - The duration of the impact
   - Its irreversibility, including permanently lost resources of value
   - Whether the impact can or will be controlled
   - The regional consequence of the impact
   - Its potential divergence from local needs and goals
   - Whether known objections to the project relate to this impact.

(Continue on attachments)

Attachment A

Ball Hill Windpark
United States Fish and Wildlife Service Correspondence
New York Natural Heritage Program Correspondence
(Part 1A-11)

ecology and environment, inc.
International Specialists in the Environment

BUFFALO CORPORATE CENTER
368 Pleasant View Drive, Lancaster, New York 14086
Tel: 716/684-8060, Fax: 716/684-0844

September 18, 2006

Ms. Jean Pietrusiak
Information Services; New York Natural Heritage Program
New York State Department of Environmental Conservation
625 Broadway, 5th Floor
Albany, New York 12233-4757

Re: Noble Environmental Power LLC
Towns of Villenova and Hanover
Chautauqua County, NY

Dear Ms. Pietrusiak:

Ecology & Environment, Inc. (E & E), on behalf of Noble Environmental Power LLC (Noble), is preparing a feasibility study for a potential wind energy facility in the Towns of Villenova and Hanover, Chautauqua County, NY. Prior analyses of meteorological conditions in the vicinity of this area have identified the presence of a favorable wind resource. The project, if implemented, would create a renewable energy supply, with the electricity generated from the facility to be supplied to the regional electric supply grid. This project would be specifically designed to meet the needs of the Governor's initiative to increase the percentage of New York State's electric supply from renewable sources to 25% by 2013.

The proposed Ball Hill project area is shown in the enclosed figure. The figure is a composite of the Cherry Creek (1990), Forestville (1990), Perrysburg (1990), and Hamlet (1990) 7.5 minute USGS topographic quadrangle maps.

We are currently analyzing the potential issues involved with the siting of a wind energy facility in the identified area; therefore, no specific layout of facilities or infrastructure is available. Rather, based our preliminary evaluation of existing resources, Noble would design the facility to minimize impacts to the extent possible. E & E is seeking your assistance in identifying state-listed threatened or endangered species, significant or critical habitats, natural areas, or other wildlife or fisheries features that may occur within the identified project area boundary.

recycled paper

If you have any questions regarding this data request or require additional project information, please do not hesitate to call me at 716-684-8060. Thank you very much for your attention to this request. We look forward to receiving your input on this project.

Sincerely,
ECOLOGY & ENVIRONMENT, INC.

Christine Sousa
Biologist

Enc.: (1)

cc: Sandy Sayyeau (Noble)
Christina Presnell (Noble)
Mike Morgante (E & E)

© Ecology & Environment, Inc. GIS Department Project #00227.NP20.02.02
\\BUFSDL4\GIS\Buffalo\Noble Wind\2008 NOBLE SITES\Maps\Villenova\MXDs\Avian Study\Villenova 24K topo.mxd 8/30/2006

Source: USGS Cherry Creek Quad, 1990; USGS Forestville Quad, 1990; USGS Perrysburg Quad, 1990; USGS Hamlet Quad, 1990.

Ball Hill Project Area
USGS1:24,000 Quadrangle

0 0.5 1 2
Miles

New York State Department of Environmental Conservation
Division of Fish, Wildlife & Marine Resources
New York Natural Heritage Program
625 Broadway, 5th floor, Albany, New York 12233-4757
Phone: (518) 402-8935 • **FAX:** (518) 402-8925
Website: www.dec.state.ny.

Denise M. Sheehan
Commissioner

October 17, 2006

Christine Sousa
Ecology and Environment, Inc
Buffalo Corporate Ctr, 368 Pleasant View Dr.
Lancaster, NY 14086

Dear. Ms. Sousa:

In response to your recent request, we have reviewed the New York Natural Heritage Program database with respect to an Environmental Assessment for the proposed Noble Environmental Power Wind Energy Facility, area as indicated on the map you provided, located in the Towns of Villenova and Hanover, Chautauqua County.

Enclosed is a report of rare or state-listed animals and plants, significant natural communities, and other significant habitats, which our databases indicate occur, or may occur, on your site or in the immediate vicinity of your site. The information contained in this report is considered sensitive and may not be released to the public without permission from the New York Natural Heritage Program.

PLEASE NOTE: For Windpower Projects, we report all records found within the project boundary, and any avian records that may be located within a 10-mile buffer of the project boundary. We also report Indiana bat hibernaculum that may be located within a 40-mile buffer of the project boundary.

The presence of rare species may result in this project requiring additional permits, permit conditions, or review. For further guidance, and for information regarding other permits that may be required under state law for regulated areas or activities (e.g., regulated wetlands), please contact the appropriate NYS DEC Regional Office, Division of Environmental Permits, at the enclosed address.

For most sites, comprehensive field surveys have not been conducted; the enclosed report only includes records from our databases. We cannot provide a definitive statement on presence or absence of all rare or state-listed species or significant natural communities. This information should not be substituted for on-site surveys that may be required for environmental impact assessment.

Our databases are continually growing as records are added and updated. If this proposed project is still under development one year from now, we recommend that you contact us again so that we may update this response with the most current information.

Sincerely,

Tara Seoane

Tara Seoane, Information Services
NY Natural Heritage Program

Enc.

cc: Reg. 9, Wildlife Mgr
Jack Nasca, Environmental Permits, Albany
Mark Wothal, Bureau of Habitat, Albany

Natural Heritage Report on Rare Species and Ecological Communities

NY Natural Heritage Program, NYS DEC, 625 Broadway, 5th Floor, Albany, NY
12233-4757
(518) 402-8935

These occurrences are within 10-miles of the project site.

~This report contains **SENSITIVE** information that may not be released to the public without permission from the NY Natural Heritage Program.
~Refer to the User's Guide for explanations of codes, ranks and fields.
~Location maps for certain species and communities may not be provided if 1) the species is vulnerable to disturbance, 2) the location and/or extent is not precisely known, and/or 3) the location and/or extent is too large to display.

Natural Heritage Report on Rare Species and Ecological Communities

BIRDS

Ammodramus henslowii

Henslow's Sparrow

Office Use 11071

NY Legal Status:	Threatened	**NYS Rank:**	S3B; Vulnerable
Federal Listing:		**Global Rank:**	G4; Apparently secure
Last Report:	**	**EO Rank:**	**
County:	Chautauqua		
Town:	Arkwright		
Location:	Brainard Road Fields		
Directions:	From Cowdens Corner, follow Skinner Miller Road south to Brainard Road. Turn west on Brainard Road. The birds were found in fields on the south side of the road.		
General Quality and Habitat:	**For information on the population at this location and management considerations, please contact the NYS DEC Regional Wildlife Manager or NYS DEC Endangered Species Unit at 518-402-8859.		

ESU

Ardea herodias

Great Blue Heron

Office Use 4800

NY Legal Status:	Protected	**NYS Rank:**	S5; Demonstrably secure
Federal Listing:		**Global Rank:**	G5; Demonstrably secure
Last Report:	1995-04-03	**EO Rank:**	Good or Fair
County:	Chautauqua		
Town:	Arkwright		
Location:	Dibble Hill, Farrington Hollow		
Directions:	The rookery is located about 0.8 mi northwest of Town Corners and 2000 feet northwest of the junction of Farrington Hollow Road and Hamlet Road.		
General Quality and Habitat:	Usually more than 50 nests/year, but some years less. Ridgetop with mature northern hardwoods-beech, maple, hemlock. Nests mostly in beech trees.		

SL

Asio flammeus

Short-eared Owl

Office Use 11085

NY Legal Status:	Endangered	**NYS Rank:**	S2; Imperiled
Federal Listing:		**Global Rank:**	G5; Demonstrably secure
Last Report:	**	**EO Rank:**	**
County:	Chautauqua		
Town:	Sheridan		
Location:	Dunkirk Airport Sheridan		
Directions:	The birds were observed in the fields bounded by Middle Road to the south, Newell Road to the east, Harrington Road to the west, and a railroad to the north, in the town of Sheridan.		
General Quality and Habitat:	**For information on the population at this location and management considerations, please contact the NYS DEC Regional Wildlife Manager or NYS DEC Endangered Species Unit at 518-402-8859.		

ESU

Cistothorus platensis

Sedge Wren

Office Use 10681

NY Legal Status:	Threatened	**NYS Rank:**	S3B; Vulnerable
Federal Listing:		**Global Rank:**	G5; Demonstrably secure
Last Report:	**	**EO Rank:**	**
County:	Chautauqua		
Town:	Sheridan		
Location:	Middle Road Field Sheridan		
Directions:	From Sheridan, follow Center Road north to Route 121 (Middle Road). Turn west on Route 121 (Middle Road). Look for a stone driveway on the north side of the road (mailbox #2897). The birds were observed in the field in front of the willow plantation.		
General Quality and Habitat:	**For information on the population at this location and management considerations, please contact the NYS DEC Regional Wildlife Manager or NYS DEC Endangered Species Unit at 518-402-8859.		

Cistothorus platensis

Sedge Wren

Office Use 10686

NY Legal Status:	Threatened	**NYS Rank:**	S3B; Vulnerable
Federal Listing:		**Global Rank:**	G5; Demonstrably secure
Last Report:	**	**EO Rank:**	**
County:	Chautauqua		
Town:	Pomfret		
Location:	Sage Road Field Nortons Switch		
Directions:	From Fredonia, follow Route 20 west to Adams Road. Turn south on Adams Road and follow it to Webster Road. Turn west on Webster Road then turn south on Sage Road. The birds were seen and heard on both sides of the road.		
General Quality and Habitat:	**For information on the population at this location and management considerations, please contact the NYS DEC Regional Wildlife Manager or NYS DEC Endangered Species Unit at 518-402-8859.		

Haliaeetus leucocephalus

Bald Eagle

Office Use 9672

NY Legal Status:	Threatened	**NYS Rank:**	S2S3B,S2N; Imperiled
Federal Listing:	Threatened	**Global Rank:**	G5; Demonstrably secure
Last Report:	**	**EO Rank:**	**
County:	Cattaraugus, Chautauqua		
Town:	Cattaraugus Indian Reservation, Cattaraugus Indian Reservation		
Location:	Cattaraugus Creek Indian Reservation		
Directions:	There are five nests on the south side of Cattaraugus Creek about 5 kilometers upstream (east) of the New York State Thruway crossing. The location of Nest D has not been GPSed, but it is right next to Nest E. Access is only through the Reservation of Seneca Nation.		
General Quality and Habitat:	**For information on the population at this location and management considerations, please contact the NYS DEC Regional Wildlife Manager or NYS DEC Endangered Species Unit at 518-402-8859.		

Haliaeetus leucocephalus

Bald Eagle

Office Use 11638

NY Legal Status:	Threatened	**NYS Rank:**	S2S3B,S2N; Imperiled
Federal Listing:	Threatened	**Global Rank:**	G5; Demonstrably secure
Last Report:	**	**EO Rank:**	**
County:	Cattaraugus		
Town:	Dayton		
Location:	Conewango Swamp		
Directions:	The bald eagles are nesting east of Dexter Corners and west of Wolf Road. One nest is in Conewango Swamp and the other is just southwest near a tributary associated with the swamp.		
General Quality and Habitat:	**For information on the population at this location and management considerations, please contact the NYS DEC Regional Wildlife Manager or NYS DEC Endangered Species Unit at 518-402-8859.		

Records Processed

These occurrences are within the project site or in close proximity.

NY Natural Heritage Program, NYS DEC, 625 Broadway, 5th Floor, Albany, NY
12233-4757
(518) 402-8935

~This report contains **SENSITIVE** information that may not be released to the public without permission from the NY Natural Heritage Program.
~Refer to the User's Guide for explanations of codes, ranks and fields.
~Location maps for certain species and communities may not be provided if 1) the species is vulnerable to disturbance, 2) the location and/or extent is not precisely known, and/or 3) the location and/or extent is too large to display.

Natural Heritage Report on Rare Species and Ecological Communities

COMMUNITIES

Rich hemlock-hardwood peat swamp

This occurrence of Rich Hemlock-Hardwood Peat Swamp is considered significant from a statewide perspective by the NY Natural Heritage Program. It is either an occurrence of a community type that is rare in the state or a high quality example of a more common community type. By meeting specific, documented significance criteria, the NY Natural Heritage Program considers this occurrence to have high ecological and conservation value. Office Use

NY Legal Status:	Unlisted	**NYS Rank:**	S2S3;	961
Federal Listing:		**Global Rank:**	G3G4;	SL
Last Report:	1992-08-28	**EO Rank:**		
County:	Chautauqua			
Town:	Arkwright, Villenova			
Location:	West Mud Lake Swamp			
Directions:	From Black Corners (junction of Route 83 and Farrington Hollow Road), go east on Route 83 about 1.0 mi to West Mud Lake (easily seen to the north of Route 83). The swamp is along the west edge of West Mud Lake. The swamp continues south of Route 83 along the west side of West Branch Conewango Creek.			
General Quality and Habitat:	Excellent quality, with history of some selective logging followed by very good recovery. Community is well-buffered. Minimal disturbance and good size. A mixed conifer and hardwood swamp along the west side of west Mud Lake, a eutrophic pond. The wetland continues to the south of Route 83. To the north and west of wetland are agricultural fields. The swamp extends south of Route 83 west of West Branch Conewango Creek. The southern portion of the swamp is more disturbed by selective logging than the north end (west of the lake). The north end is pristine.			

Shrub swamp

This occurrence of Shrub Swamp is considered significant from a statewide perspective by the NY Natural Heritage Program. It is either an occurrence of a community type that is rare in the state or a high quality example of a more common community type. By meeting specific, documented significance criteria, the NY Natural Heritage Program considers this occurrence to have high ecological and conservation value. Office Use

NY Legal Status:	Unlisted	**NYS Rank:**	S5;	3633
Federal Listing:		**Global Rank:**	G5;	
Last Report:	1990-08-15	**EO Rank:**		
County:	Chautauqua			
Town:	Hanover, Villenova			
Location:	East Mud Lake			
Directions:	From the junction of Route 93 and Route 39 in Parcells Corners, travel south on Route 93 (Hanover Road) 1.75 miles. Mud Lake and the swamp are on the right (west) side of the road. Ask permission for access to the site.			
General Quality and Habitat:	Of good size and biologically diverse, with some cottages on the lake shore. Uplands around the wetlands are primarily farm fields. There were no exotics observed. A lake and small pond surrounded by a very dense shrub swamp thicket. Further upland, the shrub swamp gradually transitions into a red maple swamp which eventually merges with a hemlock-northern hardwood forest. East Mud Lake is bordered on the west side by homes and cottages. Much of the surrounding landscape is farm fields.			

SH

Ichthyomyzon greeleyi

Office Use 11520

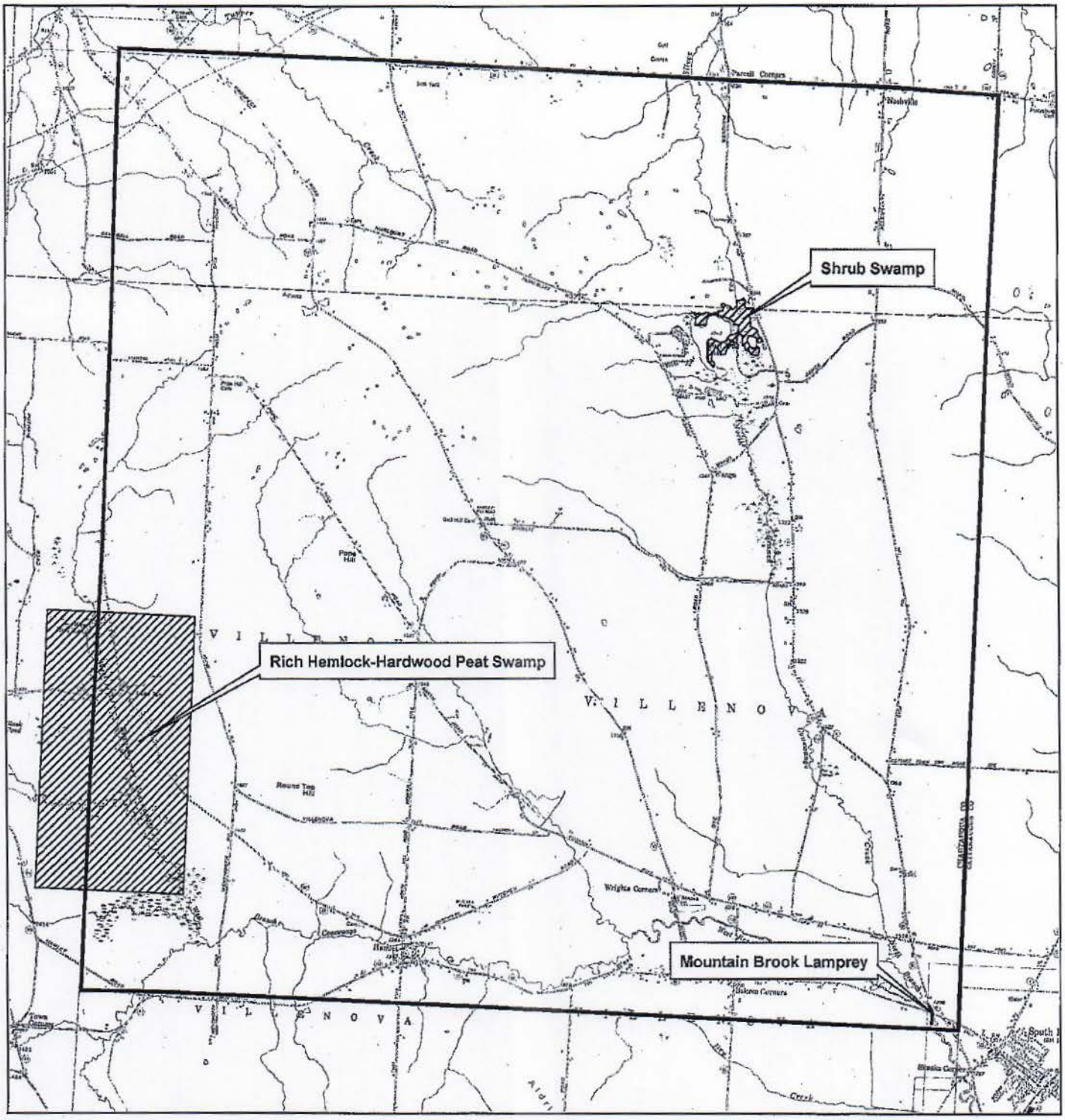
Mountain Brook Lamprey

NY Legal Status:	Special Concern	**NYS Rank:**	S1; Critically Imperiled
Federal Listing:		**Global Rank:**	G3G4; Vulnerable
Last Report:	2001-05-04	**EO Rank:**	Extant
County:	Chautauqua		
Town:	Villenova		
Location:	West Branch Conewango Creek		
Directions:	The lampreys were found in West Branch Conewango Creek at Route 322.		
General Quality and Habitat:	The lampreys were found in a creek.		

3 Records Processed

Natural Heritage Map of Rare Species and Ecological Communities

Prepared October 13, 2006 by NY Natural Heritage Program, NYS DEC, Albany, NY



Legend

Project Site

NY Natural Heritage Program Database Records*

Animal

Community

1:60,000

0 0.4 0.8 1.6 2.4 Miles

*The locations that are displayed are considered sensitive and cannot be released to the public without permission. We do not provide map locations for all records. Please see report for details.

N W E S

ecology and environment, inc.
International Specialists in the Environment

BUFFALO CORPORATE CENTER
368 Pleasant View Drive, Lancaster, New York 14086
Tel: 716/684-8060, Fax: 716/684-0844

September 18, 2006

Mr. David Stilwell
United States Fish and Wildlife Service
3817 Luker Road
Cortland, New York 13045

Re: Noble Environmental Power LLC
Towns of Villenova and Hanover
Chautauqua County, NY

Dear Mr. Stilwell:

Ecology & Environment, Inc. (E & E), on behalf of Noble Environmental Power LLC (Noble), is preparing a feasibility study for a potential wind energy facility in the Towns of Villenova and Hanover, Chautauqua County, NY. Prior analyses of meteorological conditions in the vicinity of this area have identified the presence of a favorable wind resource. The project, if implemented, would create a renewable energy supply, with the electricity generated from the facility to be supplied to the regional electric supply grid. This project would be specifically designed to meet the needs of the Governor's initiative to increase the percentage of New York State's electric supply from renewable sources to 25% by 2013.

The proposed Ball Hill project area is shown in the enclosed figure. The figure is a composite of the Cherry Creek (1990), Forestville (1990), Perrysburg (1990), and Hamlet (1990) 7.5 minute USGS topographic quadrangle maps.

We are currently analyzing the potential issues involved with the siting of a wind energy facility in the identified area; therefore, no specific layout of facilities or infrastructure is available. Rather, based our preliminary evaluation of existing resources, Noble would design the facility to minimize impacts to the extent possible. E & E is seeking your assistance in identifying federally-listed threatened or endangered species, significant or critical habitats, natural areas, or other wildlife or fisheries features that may occur within the identified project area boundary.

A preliminary analysis of available wetland and hydric soils mapping has been completed for the project area. Based on our review, we realize that several state and federal jurisdictional wetlands likely occur within the project area. Field delineations and evaluations of these areas will be necessary and would be conducted in later stages of facility siting, assuming that the site is ultimately considered feasible for siting a wind farm.

recycled paper

If you have any questions regarding this data request, or require additional project information, please do not hesitate to call me at 716-684-8060. Thank you very much for your attention to this request. We look forward to receiving your input on this project.

Sincerely,
ECOLOGY & ENVIRONMENT, INC.

Christine Sousa
Biologist

Enc.: (1)

cc: Sandy Sayyeau (Noble)
Christina Presnell (Noble)
Mike Morgante (E & E)

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\\BUFSDLA\GIS\Buffalo\Noble Wind\2008 NOBLE SITES\Maps\Villenova\MXDs\Avian Study\Villenova 24K topo.mxd 8/30/2006

Source: USGS Cherry Creek Quad, 1990; USGS Forestville Quad, 1990; USGS Perrysburg Quad, 1990; USGS Hamlet Quad, 1990.

Ball Hill Project Area
USGS1:24,000 Quadrangle

0 0.5 1 2
Miles

Chautauqua County

Federally Listed Endangered and Threatened Species and Candidate Species

This list represents the best available information regarding known or likely County occurrences of Federally-listed and candidate species and is subject to change as new information becomes available.

Common Name	Scientific Name	Status
Bald eagle[1]	*Haliaeetus leucocephalus*	D
Clubshell	*Pleurobema clava*	E
Rayed bean	*Villosa fabalis*	C

Status Codes: E=Endangered T=Threatened P=Proposed C=Candidate D=Delisted

[1] The bald eagle was delisted on August 8, 2007. While there are no ESA requirements for bald eagles after this date, the eagles continue to receive protection under the Bald and Golden Eagle Protection Act (BGEPA). Please follow the Service's May 2007 Bald Eagle Management Guidelines to determine whether you can avoid impacts under the BGEPA for your projects. If you have any questions, please contact the endangered species branch in our office.

Information current as of: 5/15/2008

Attachment B

Ball Hill Windpark
Approvals Required
(Part 1B-25)

Approvals Required

- Corresponds to EAF Section B, #25

Permit or Consultation Required	Agency
Acceptance of DEIS, FEIS and issuance of findings	SEQRA Lead Agency
Zoning Amendment to Create a Wind Overlay District	Town of Villenova Town Board
Special Use Permit	Town of Villenova Town Board
	Town of Hanover Town Board
Area Variances for WECS height	Town of Hanover Zoning Board of Appeals
Special Use Permit/Site Plan Recommendation	Town of Hanover Planning Board
Section 404: Waters of the US Jurisdictional Determination	United States Army Corps of Engineers
GML § 239-m referral	Chautauqua County Planning Board
Article 15 – Stream Disturbance Permit	New York State Department of Environmental Conservation
Article 24 – Freshwater Wetlands Permit	New York State Department of Environmental Conservation
Sect. 401: Water Quality Certification	New York State Department of Environmental Conservation
Article 17 - SPDES– General Permit for Stormwater Discharges from Construction Activity	New York State Department of Environmental Conservation
No Hazard to Aviation Determinations	Federal Aviation Administration
Highway Work/Utility/Non-Utility Permits	NYS Department of Transportation
Chautauqua County Road Use Agreement	Chautauqua County Highway Superintendent
Road Use Agreements	Town Boards of Villenova and Hanover
Host Community Agreements	Town Boards of Villenova and Hanover
Consultation	US Fish and Wildlife Service
Consultation	NYS Office of Parks, Recreation and Historic Preservation
Pub. Svc. Law Sect. 68 Certificate of Public Convenience and Necessity	NYS Public Service Commission
Building Permits	Town of Villenova Code Enforcement Officer of Consultant
	Town of Hanover Code Enforcement Officer or Consultant
Zoning Permit	Town of Villenova Code Enforcement Officer
PILOT Agreement Approval	Chautauqua County Industrial Development Agency

Attachment C

Ball Hill Windpark
Project Area Figure

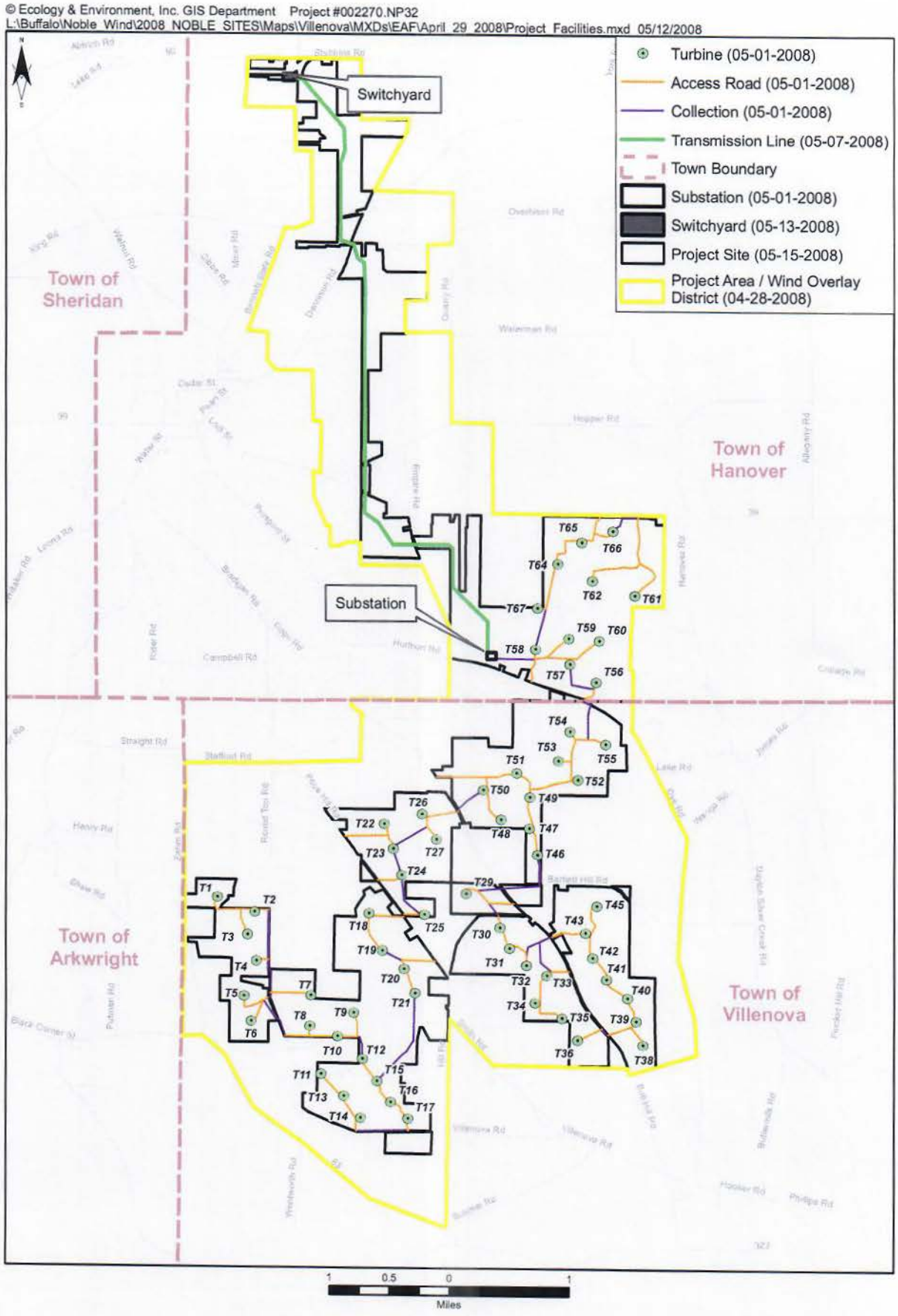

Figure 1: Noble Ball Hill Project Facilities

Attachment D

Ball Hill Windpark
Visual EAF Addendum

617.20
Appendix B
State Environmental Quality Review
VISUAL EAF ADDENDUM

This form may be used to provide additional information relating to Question 11 of Part 2 of the Full EAF.

(To be completed by Lead Agency) ** = No resources found in close proximity

Visibility

		Distance Between Project and Resource (in Miles)				
1.	Would the project be visible from:	0 - ¼	¼ - ½	½ - 3	3 - 5	5+
!	*A parcel of land which is dedicated to and available to the public for the use, enjoyment and appreciation of natural or man-made scenic qualities?*	☐	☐	☐	☐	☑
!	*An overlook or parcel of land dedicated to public observation, enjoyment and appreciation of natural or man-made scenic qualities?*	☐	☐	☐	☐	☑
!	*A site or structure listed on the National or State Registers of Historic Places?*	☐	☐	☐	☐	☑
!	*State Parks? State WMA?*	☐	☐	☑	☐	☐
!	*The State Forest Preserve?*	☐	☐	☐	☑	☐
!	*National Wildlife Refuges and State Game Refuges?***	☐	☐	☐	☐	☐
!	*National Natural Landmarks and other outstanding natural features?***	☐	☐	☐	☐	☐
!	*National Park Service lands?***	☐	☐	☐	☐	☐
!	*Rivers designated as National or State Wild, Scenic or Recreational?***	☐	☐	☐	☐	☐
!	*Any transportation corridor of high exposure, such as part of the Interstate System, or Amtrak?*	☐	☐	☐	☑	☐
!	*A governmentally established or designated interstate or inter-county foot trail, or one formally proposed for establishment or designation?*	☐	☐	☑	☐	☐
!	*A site, area, lake, reservoir or highway designated as scenic?*	☐	☐	☐	☐	☑
!	*Municipal park, or designated open space?*	☐	☐	☑	☐	☐
!	*County road?*	☑	☐	☐	☐	☐
!	*State road?*	☑	☐	☐	☐	☐
!	*Local road?*	☑	☐	☐	☐	☐

2. *Is the visibility of the project seasonal? (i.e., screened by summer foliage, but visible during other seasons)*

☐ Yes ☑ No

3. *Are any of the resources checked in question 1 used by the public during the time of year during which the project will be visible?*

☑ Yes ☐ No

October 28, 2015

RESOLUTION OF THE
TOWN OF VILLENOVA TOWN BOARD
FOR ITS CONTINUING SEQRA REVIEW OF THE BALL
HILL WIND ENERGY PROJECT

WHEREAS, development of the Ball Hill Wind Energy Project began on or about May 23, 2008 with an application filed for a Special Use Permit and Wind Overlay Zoning District under Local Law No. 1 of 2007, the Wind Energy Facilities Law of the Town of Villenova (the Wind Energy Facilities Law), incorporating a proposal to build wind energy facilities in the Towns of Villenova and Hanover in Chautauqua County, New York including wind energy facilities producing approximately 100 MW of clean, renewable energy including without limitation, access roads, electrical collection system, laydown areas, operations and maintenance areas, electrical transmission system, a substation and switchyard and other utility related infrastructure ("Project"); and

WHEREAS, the Town Board of the Town of Villenova, acting as Lead Agency, pursuant to the State Environmental Quality Review Act (ECL Article 8 and its implementing regulations at 6 NYCRR Part 617) ("SEQRA") accepted the Project's application as complete and issued a Positive Declaration of Environmental Significance on June 23, 2008; and

WHEREAS, as a result a Draft Environmental Impact Statement ("DEIS") was prepared for the Project, which was reviewed by the Town Board and its engineering and legal consultants, which was accepted by the Town Board as complete for public review and comment on October 8, 2008; and

WHEREAS, written and oral comments were received on the DEIS and the Project from interested and involved Agencies and the public at a public hearing held on October 30, 2008 in the Town of Villenova; and

WHEREAS, the Project development continued at the same project location with layout and equipment changes that were included in an amended application under the Wind Energy Facilities Law for a Wind Overlay Zoning District and Special Use Permit, including a request to modify the maximum height restriction in §690.09 A.13 of the Wind Energy Facilities Law, filed with the Town Board on August 10, 2011; and

WHEREAS, the Town Board accepted the amended application as complete on February 8, 2012 and ordered that a Supplemental DEIS ("SDEIS") be prepared analyzing potential impacts as required under Wind Energy Facilities Law and SEQRA, and adopted a scope of impacts for said SDEIS; and

WHEREAS, development of the Project continued at the same location with a revised layout and new equipment that were included in a second amended application, including a request to modify the maximum height restriction under §690.09 A.13 of the Wind Energy Facilities Law, for the Project, filed with the Town Board on May 14, 2012; and

WHEREAS, the Town Board accepted the second amended application for the Project as complete on May 23, 2012; and

WHEREAS, the SDEIS, analyzing all impacts identified in the Town Board's resolution dated February 8, 2012 as well as any impacts resulting from the additional height necessary to accommodate the Project's technology as stated in its resolution dated May 23, 2012, was prepared and submitted for the Town Board's engineering and legal consultants' review; and

WHEREAS, the consideration of the aforementioned pending applications, development of the Project by the current sponsor Ball Hill Wind Energy, LLC , the finalization of the SDEIS, addressing any layout or equipment changes for the Project at the original Project location and the resulting potential environmental impacts, for acceptance by the Town Board as SEQRA Lead Agency, continues; and

WHEREAS the Town Board, to support its continued review of the aforementioned pending applications, on October 14, 2015, adopted a resolution confirming its retention of the Town's engineering and legal consultants for their continued assistance with the Town Board's review of the Project and re-authorizing the use of the Project escrow agreement to allow the consultants' continued review of the Project;

NOW, THEREFORE, be it hereby resolved by the Town Board of the Town of Villenova as follows:

1. The Town Board shall continue as Lead Agency under SEQRA for the review of the Project, the SDEIS and all subsequent submissions under SEQRA; and

2. That Ball Hill Wind Energy, LLC will continue the development of the Project and assume all rights and responsibilities of prior developers as related to the Project, applications under the Wind Energy Facilities Law and SEQRA, and shall be recognized by the Town Board as, Applicant for the Project from its inception; and

3. That the SDEIS for the Project shall be consistent with and address the scope of impacts identified by the Town Board in its February 8, 2012 resolution which directed that the SDEIS address and/or provide the following:

A. Updated shadow flicker modeling results for all residential structures located within 10 rotor diameters of a proposed WECS;

B. Updated visual simulations and renderings;

C. Updated viewshed analysis;

D. Updated noise analysis;

E. Updated evaluation of impacts to historic properties occurring within the viewshed of the Project;

F. Updated wetland delineation and wetland impact evaluation;

G. Updated evaluation of impacts to land uses, vegetative communities and wildlife and related habitat;

H. Updated evaluation of impacts to surface water resources and compliance with current storm water regulations and federal and state wetland regulations;

I. Updated evaluation of soil disturbance or other disturbance to topography or land resulting from the turbine changes or other Project changes;

J. Updated evaluation of potential communication interference;

K. Updated evaluation of potential adverse impacts to threatened and endangered species including bald and golden eagles; and

L. Updated cumulative impact.

4. That the SDEIS for the Project shall be consistent with and address the scope of impacts identified by the Town Board in its May 23, 2012 resolution which directed that the SDEIS address and/or provide the following:

A. Updated evaluation of any impacts associated with or resulting from the waiver of the maximum height restriction in the Wind Energy Facilities Law to accommodate the additional height of the wind turbine technology proposed for the Project.

5. This Resolution is effective immediately.

PASSED AND ADOPTED by the Town Board of the Town of Villenova on the 29 day of October, 2015

ROLL CALL	Yea	Nay	Abstain
Supervisor Park	✓		
Councilmember Graziano	✓		
Councilmember Tessey	A		
Councilmember Chase	✓		
Councilmamber Goodway	✓		

Appendix E: Final Visual Resource Assessment, Ball Hill Wind Project

SARATOGA ASSOCIATES

BALL HILL WIND PROJECT
FINAL VISUAL RESOURCE ASSESSMENT

Prepared for:
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Ball Hill Wind Project – Final Visual Resource Assessment

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1.0 INTRODUCTION

Ball Hill Wind Energy, LLC is proposing to develop a wind-powered electrical-generating facility consisting of up to 29 turbines with a maximum capacity of 100.5 megawatts (MW). The proposed Ball Hill Wind Project (also referred to as the "Project") will be located in the Towns of Villenova and Hanover, Chautauqua County, New York. An electrical substation, switchyard, and an approximately 5.8-mile 115 kV above ground transmission line will be located in the Town of Hanover.

Since the submission of the Ball Hill Windpark Draft Environmental Impact Statement (DEIS), the Project layout has been revised resulting in fewer yet taller turbines. Based on these changes, it was determined that a Supplemental Draft Environmental Impact Statement (SDEIS) would be needed. As part of the SDEIS being prepared for the permitting of this Project, Saratoga Associates, Landscape Architects, Architects, Engineers, and Planners, P.C. (Saratoga Associates) completed a Supplemental Visual Resource Assessment (SVRA) of the Project. This Final VRA (also referred to as "SVRA") presents an updated version of the *Noble Ball Hill Windpark Visual Resource Assessment* (Saratoga Associates, 2008). The original report completed in 2008 has been revised to reflect the changed layout and number of turbines, as well as address previous questions raised by the community and reviewing agencies.

1.1 METHODOLOGY

Consistent with Visual Resource Assessment (VRA) practice, this report evaluates the potential visibility of the proposed Project and objectively determines the difference between the visual characteristics of the landscape setting with and without the Project in place. The process follows basic New York State Department of Environmental Conservation Program Policy "Assessing and Mitigating Visual Impacts" (NYSDEC 2000) (DEC Visual Policy) and State Environmental Quality Review (SEQRA) criteria to minimize impacts on visual resources. This DEC Visual Policy requires a visual assessment when a proposed facility is potentially within the viewshed of a designated aesthetic resource.

There are no specific Federal rules, regulations, or policies governing the evaluation of visual resources. However, the methodology employed herein is based on standards and procedures used by the U.S. Department of Agriculture (National Forest Service, 1974, 1995), U.S. Department of the Interior, Bureau of Land Management (USDOI, 1980), U.S. Department of Transportation, Federal Highway Administration (USDOT, 1981), NYS Department of Transportation (NYSDOT, 1988), and the NYS Department of Environmental Conservation (NYSDEC, July 31, 2000).

The visual impact assessment includes the following steps:

- Define the existing landscape character/visual setting to establish the baseline visual condition from which visual change is evaluated;
- Conduct a visibility analysis (viewshed mapping and field investigations) to define the geographic area surrounding the proposed facility from which portions of the Project might be seen;

- Identify sensitive aesthetic resources to establish priority places from which further analysis of potential visual impact is conducted;
- Select key receptors from which detailed impact analysis is conducted;
- Depict the appearance of the facility upon completion of construction;
- Evaluate the aesthetic effects of the visual change (qualitative analysis) resulting from Project construction, completion and operation; and,
- Identify opportunities for effective mitigation.

Consistent with the DEC Visual Policy, the study area for this study generally extends to a five-mile radius from the outermost turbines (hereafter referred to as the "five-mile study area" or "study area"). Beyond this distance it is assumed that natural conditions of atmospheric and linear perspective will significantly mitigate most visual impacts. However, considering the scale of the proposed Project and recognizing the proposed wind turbines will, at times, be visible at distances greater than five (5) miles, site-specific consideration is given to resources of high cultural or scenic importance that are located beyond the typical five-mile radius.

1.2 Project Description

The Project area is located in Western New York, approximately 60 miles northeast of Erie, Pennsylvania, 50 miles southwest of Buffalo, and 25 miles north of Jamestown. The Project includes 29 energy-generating turbines located in the Towns of Villenova (23 turbines) and Hanover (6 turbines). Generally, the turbines are bounded by NYS Route 39 to the north, County Route (CR) 93 to the east, NYS Route 83 to the south, and Empire and Round Top Roads to the west. Turbines will be located on private land under lease agreement with property owners.

Each turbine will include a tall steel tower; a rotor consisting of three composite blades; and a nacelle, which houses the generator, gearbox, and power train. A transformer may be located in the rear of each nacelle, or adjacent to the base of the tower, to raise the voltage of the electricity produced by the turbine generator to the voltage level of the collection system (34.5 kV). The color of the blades, nacelle, and tower will be off-white. The towers will be a tapered tubular steel monopole tower.

Ball Hill Wind Energy, LLC proposes to install 29 Vestas V126-3.45 MW, with a maximum height of approximately 492 feet. These turbines will have a hub height of 285 feet (87 meters) and a rotor diameter of 413 feet (126 meters) resulting in an apex of blade rotation reaching approximately 492 feet. The rotor and nacelle will be mounted on a tapered tubular steel tower. The maximum operating rotational speed of the blades should not be greater than approximately 16.3 revolutions per minute (rpm) or about one revolution every four (4) seconds.

In addition to the wind turbines, the Project will involve the construction of gravel access roads, interconnection cables, a transmission line, an operation and maintenance facility, and an electrical substation and switchyard. It is anticipated that the interconnection cables (between the turbines) will be buried, unless engineering and environmental issues are encountered.

Prior to construction, multiple laydown areas will be placed in strategic locations throughout the Project area. These laydown areas will vary in size from two (2) to 10 acres, initially disturbing a total of 26.2 acres of land. The operations and maintenance (O&M) building with parking, construction storage/work area, and the associated driveway will occupy approximately 2.8 acres on North Hill Road in the Town of Villenova. This facility will provide a base of operations for the Project. The area where the O&M building will be sited is used for agricultural purposes and is currently planted with a field crop of hay. The area will be graded, graveled, and enclosed with a six-foot fence and entrance gate. Construction trailers will be placed in the area with temporary services including electrical power, telephone, and restroom facilities. The O&M building will be a metal construction, approximately 7,000 square feet, and include managerial offices, monitoring stations, and a storage area for parts and small equipment. At the conclusion of the project, approximately 23.4 acres of the laydown area will be reclaimed and reseeded, leaving only the O&M building and an area designated for parking.

Typical O&M Building and Side Yard

A proposed 5.8-mile overhead 115 kV transmission line will be constructed to connect the turbines with an existing National Grid 230 kV transmission line in the Town of Hanover. This connection will occur at a three-acre± switchyard located near the northern terminus of the overhead transmission line approximately 1,300 feet southeast of the intersection of Bennett State Road (CR 85) and Stebbins Road (CR 86) in the Town of Hanover. Also, an approximately 1.2 acre substation will be located at the southern terminus of the overhead transmission line approximately 800 feet north of Hurlbert Road in the Town of Hanover.

1.3 Aviation Obstruction Marking and Lighting

According to the Federal Aviation Administration (FAA), daytime lighting of wind turbines, in general, is not necessary. Turbines themselves, due to their solid construction, as well as their moving characteristics, provide sufficient warning to pilots during daytime conditions, and all document terrain and sky conditions. The FAA recommends that turbines be painted either bright white, or a slight shade from white, to provide maximum daytime conspicuity.

The FAA requires lighting of perimeter turbines, as well as interior turbines with a maximum gap between lit turbines of no more than ½ mile (2,640 feet). Based on these guidelines and the evaluated 29-turbine layout, approximately 22 of the proposed turbines may be illuminated at night for aviation safety.[1] One aviation obstruction light will be affixed to the rear portion of the nacelle on each turbine to be illuminated.

[1] The number of lit turbines is subject to change due to discussions with FAA.

Lighting may be L-864 red flashing lights, in the form of incandescent or rapid discharge (strobe). The FAA recommends red light emitting diode or rapid discharge style L-864 fixtures to minimize impacts on neighboring communities, as the fixtures' exposure time is minimal, thus creating less of a nuisance. All light fixtures within the Project must flash in unison, thus delineating the Project as one (1) large obstruction to pilots.[2] L-864 red flashing aviation obstruction lights are designed to emit light in an upward direction with maximum visibility for pilots. The L-864 unit is a low intensity light emitting 2,000 candelas[3] and is commonly used on turbines, communication towers, and other tall structures found throughout the study region.

[2] U.S. Department of Transportation, Federal Aviation Administration, "*Development of Obstruction Lighting Standards for Wind Turbine Farms*" (DOT/FAA/AR-TN05/50, November 2005).
[3] Candela is the unit of luminous intensity, equal to one lumen per steradian (lm/sr).

2.0 LANDSCAPE CHARACTER/VISUAL SETTING

Landscape character is defined by the basic pattern of landform, vegetation, water features, land use, and human development. This descriptive section offers an overview of the intrinsic visual condition of the study region and establishes the baseline condition from which to evaluate visual change.

2.1 TOPOGRAPHY

The proposed Project occupies a small portion of the northern edge of the Cattaraugus Highlands, which is a sub-region of the Allegheny Plateau, and the Erie-Ontario Plain, which is a sub-region of the Great Lakes Plain. The topography within the study area rises quickly from the gently sloping land bordering Lake Erie, to a series of undulating ridge tops with deeply cut generally north-south aligned ravines and valleys. Elevation throughout the study area averages 1,000 to 1,500 feet above sea level. The uplands are defined by relatively broad undulating plateaus, such as those around Boutwell Hill State Forest and Canadaway Creek Wildlife Management Area. Elevations in these areas generally range between 1,725 feet to 2,150 feet above sea level. Terrain throughout the study area consists largely of undulating hills, ridges and areas of smaller rounded hillocks, often bisected by ravines.

2.2 VEGETATION

Dominant tree species within the study area are representative of the northern hardwood zone found throughout much of the Western New York Region. Species include beech, maple, ash, elm, and hemlock. In addition to these deciduous climax species, isolated plantings of red and white pine are scattered throughout the study area. Coinciding with the mix of open field and woodlots is a significant amount of secondary growth edge habitat. For the most part, this secondary growth takes the form of hedgerows, wood borders, and old fields. Beyond the Project area, the landscape remains primarily rural agriculture, with the exceptions of the Villages of South Dayton and Forestville, which each feature greater housing and business density, as well as tree-lined streets.

Some of the highest vegetation density within the study area is found within the Boutwell Hill Management Unit, which is comprised of Canadaway Creek Wildlife Management Area to the north and Boutwell Hill State Forest to the south. The dominant tree species in the Unit is northern hardwood, with some Allegheny hardwoods as well. Ninety-four percent of the Boutwell Hill Management Unit is classified as commercial forest.

2.3 WATER FEATURES

Water features are not a major component of the visual landscape in the vicinity of the proposed wind farm. The most prominent water resources within the study area include Big Indian Creek, Blaisdell Creek, Canadaway Creek, North and West Branch of the Conewango Creek, Silver Creek, Slab City Creek, Walnut Creek and Tupper Creek. Additional notable resources include, but are not limited to, Black Pond, East and West Mud Lake, and the Silver Creek Reservoir. Numerous private farm ponds, scattered wetlands, and small streams are also found in the study area.

Is should also be noted, that the largest water feature in the area, Lake Erie, is approximately 7.0 miles from the nearest turbine.

2.4 TRANSPORTATION

NYS Routes 39, 83, and 322, are the primary transportation thoroughfares in the study area. These roads generally run west to east. NYS Route 39 enters the study area from the Town of Sheridan and exits the study area through the Village of Perrysburg. This road is located just north of the Project area with the closest turbine proposed to be located within 0.50 miles of the road. NYS Route 83 enters the study area in the Town of Arkwright and exits through the Town of Cherry Creek. NYS Route 322 begins in the Hamlet of Balcom in the Town of Cherry Creek, continuing eastward where NYS Route 322 breaks off to the south. In addition to these, the NYS Thruway (I-90) runs through the northernmost part of the study area in the Town of Hanover for a length of approximately two (2) miles.

A number of county routes are also located within the study area. Among these, CRs 72, 77, 85, 87, 88, 89, and 93 are within Chautauqua County, and CR 2 and 78 are within Cattaraugus County. The CRs within the study area connect numerous hamlets and Villages, and serve as the primary transportation routes outside the NYS Routes within the study area. Also, in select instances, those CR within the center of the Project area may be within 0.25 to 0.5 miles of a turbine.

2.5 POPULATION CENTERS

Community Centers – Within the study area are two (2) villages. These larger community centers include the Villages of Forestville and South Dayton and are located entirely within the study area.

Village of Forestville – The Village of Forestville is located in the Town of Hanover, approximately 2.5 miles northeast of the nearest turbine. The street pattern in this small Village exhibits an organic configuration with several County Roads intersecting the main street (NYS Route 39) at indirect angles. A central median divides NYS Route 39 in Forestville marking the village center. Commercial establishments (service facilities and offices) are generally clustered along NYS Route 39 (Main Street). The Forestville Elementary, Middle and High Schools are located south of Academy Street. Low to moderate density single-family housing is found within portions of the Village. Residential dwellings tend to be older and well maintained with mature vegetation lining many roadways. Development density drops sharply outside the Village center.

Village of Forestville – Village center. (photo credit – ESRI)

Activities within the Village of Forestville are generally related to small business, local shopping, and residential uses.

Village of South Dayton – The Village of South Dayton is located in the Town of Dayton, approximately 3.0 miles southeast of the nearest turbine. Roads in this Village exhibit a moderate grid-like pattern with several residential roads connecting back to Main Street or NYS Route 322 (Pine Street). A focal point of the community is a well defined "village green," (includes a gazebo, park benches, and informal picnicking area) that is bound by NYS 322 (Pine Street), Maple Street, Railroad Street, and Park Avenue. Commercial establishments (service facilities and offices) are generally clustered along NYS Route 322 (Pine Street) and adjacent to the "village green". Industrial uses are also evident within the southeastern portion of the Village, generally situated around the railroad tracks. Low to moderate density single-family housing is found throughout the Village. Residential dwellings tend to be older and well maintained with mature vegetation and sidewalks lining many roadways. Development density drops sharply outside the Village center.

Village of South Dayton – Village center. (photo credit – ESRI)

Activities within the Village of South Dayton are generally related to small business, local shopping, recreation, and residential uses.

Rural Residential Areas – Outside of those communities identified above, homes and agricultural support buildings are either clustered at crossroad hamlets (varying in size), such as Hamlet, Black Corners, and Balcom Corners, or are very sparsely located on individual properties. A mix of old and new residences, and accessory structures (barns, garages, etc.) are often found in roadside locations, however many are located on isolated lots out of view from local roads. Rural homes range in quality from well maintained single-family frame construction to older housing stock in need of repair. Mobile homes, of varying vintage, are also a common housing type and are generally located on isolated lots or within mobile home parks.

3.0 VISUAL IMPACT ASSESSMENT

3.1 VIEWSHED MAPPING (ZONE OF VISUAL INFLUENCE)

3.1.1 Viewshed Methodology

The first step in identifying potentially affected visual resources is to determine whether or not the Project would likely be visible from a given location. Viewshed maps are prepared for this purpose. Also known as defining the zone of visual influence, viewshed mapping identifies the geographic area within which there is a relatively high probability that some portion of the proposed Project would be visible.

Viewshed mapping identifies the geographic area within which there is a possibility that some portion of the Project would be visible from a given location. Control points were established at the turbine high points (492 feet) for each of the 29 turbines being evaluated. The resulting viewshed identifies the geographic area within the five-mile study area where some portion of the Project is theoretically visible. The primary purpose of this exercise is to provide a general understanding of a project's potential visibility and identify areas where further investigation is appropriate.

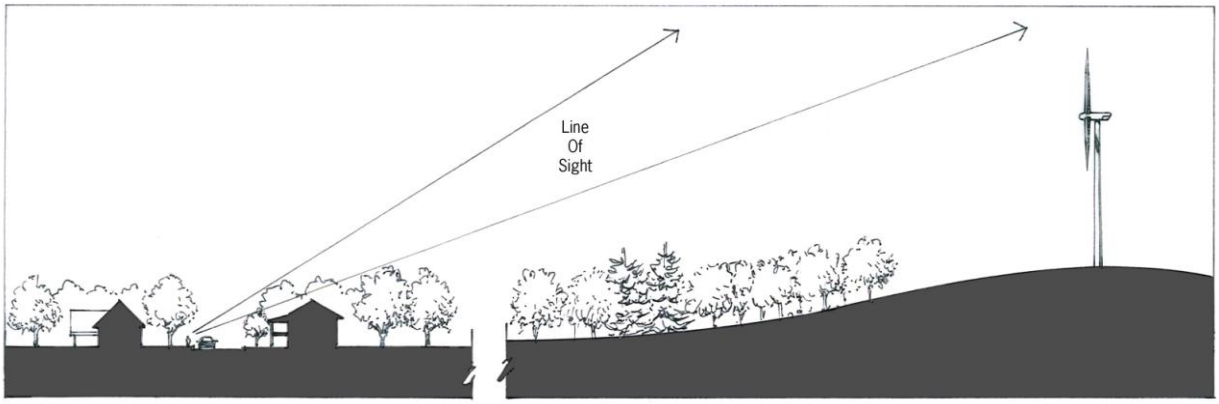
The first viewshed map was prepared defining the area within which there would be no visibility of the Project because of the screening effect caused by intervening topography (see Figure 1). This treeless condition analysis is used to identify the maximum potential geographic area within which further investigation is appropriate. A second map was prepared illustrating the probable screening effect of existing mature vegetation. This vegetated condition viewshed acceptably identifies the geographic area within which one would expect the Project to be screened by intervening forest vegetation (see Figure 2).

For this evaluation, ArcGIS and ArcGIS Spatial Analyst software were used to generate viewshed areas based on publicly available digital topographic and land cover datasets. Viewshed maps were created using a ten-meter resolution digital elevation model (DEM) of the study area. The computer then scanned from each control point to all cells within the DEM, distinguishing between grid cells that would be hidden from view and those that would be visible based solely on topography. All grid cells within the study area were coded based on the number of proposed turbines that would be visible to a theoretical observer whose eye height is conservatively estimated at two meters above ground level.

Vegetation data (land cover and canopy closure) was extracted from the National Land Cover Data Set (NLCD), which depicts cover types in a 30-meter resolution raster graphic. The screening effect of vegetation was incorporated by including an additional 40 feet (12.2 meters)[4] of height for those DEM grid cells that are forested (according to NLCD dataset) and then repeating the viewshed calculation procedure. Forested areas were then removed from the viewshed to account for areas located within a full forest canopy.

[4] A tree height of 40 feet is considered conservative, as most trees in forested portions of the study area appear to be taller than 40 feet.

The NLCD dataset does not depict small vegetation lots (i.e. landscape vegetation), hedgerows, or built structures and may therefore overestimate the potential visibility. This is a particularly important distinction in the populated areas such as the Village of Forestville, or other commercial and residential areas where structures are likely to provide significant screening of distant views. Conversely, recently cleared lots within the study area may not be reflected in the NLCD data.



Screening caused by structures and vegetation is often found in community centers. This causes a viewers "line of sight" to the turbine to be obstructed. Cross-section not to scale.

Identified viewshed areas are further quantified to illustrate the number of turbines that may be visible from any given area. This cumulative degree of visibility is summarized on each map using the following groupings:

- 1-5 turbines visible;
- 6- 10 turbines visible;
- 11-15 turbines visible;
- 16-20 turbines visible;
- 21-25 turbines visible; and
- 26-29 turbines visible.

By themselves, the viewshed maps do not determine how much of each structure is visible above intervening landform or vegetation (e.g., 100%, 50%, 10% etc. of total turbine height), but rather the area within which there is a relatively high probability (theoretical visibility) that the top of one or more turbines would be visible. Also, these maps do not account for the viewer's distance from each visible turbine or the aesthetic character of what may be seen. Their primary purpose is to assist in determining the potential visibility of the Project from the identified visual resources.

3.1.2 Nighttime Visibility

A viewshed map (see Figure 3) was also created to assist in the evaluation of potential nighttime visibility. The development of the this viewshed map used the same methodology as described above; however, the map was created using the approximate height (295 feet) of the FAA required lights as the control point for 22 selected turbines.

3.1.3 Verification of Viewshed Accuracy

Because the viewshed map identifies the geographic area within which one or more of the proposed turbines could theoretically be visible, but does not specify which of the 29 turbines evaluated would be within view, it is not readily feasible to field confirm viewshed accuracy. While it is common practice to field confirm viewshed maps prepared for a single study point through the use of balloon study or more intuitive means, the inability to field confirm viewshed accuracy is unique to analysis of multiple point projects covering a large geographic area, such as wind energy projects.

To help determine the accuracy of the vegetation data used for viewshed development, the NLCD data set was overlaid on color aerial images of the study area and reviewed for consistency. While minor inconsistencies were noted, including areas of recently cleared lands, areas of inactive/ abandoned agricultural land showing a degree of pioneer species growth, and areas of non-forest vegetative cover (e.g. Village of South Dayton), the vast majority of woodland areas visible on the satellite image were consistent with the NLCD overlay.

3.1.4 Viewshed Interpretation

Table 1 indicates the degree of theoretical visibility illustrated on the viewshed maps within the five-mile radius study area.

Table 1 Viewshed Coverage Summary

	Topography Only Viewshed (Figure 1 – Topographic Viewshed)		**Vegetation and Topography Viewshed** (Figure 2 - Vegetated Viewshed)	
	Acres	**Percentage of Study Area**	**Acres**	**Percentage of Study Area**
No Structures Visible	16,978	16.8%	68,387	67.7%
1-5 Structures Visible	8,183	8.1%	7,664	7.6%
6-10 Structures Visible	8,269	8.2%	6,119	6.1%
11-15 Structures Visible	8,359	8.3%	4,735	4.6%
16-20 Structures Visible	13,808	13.7%	5,350	5.3%
21-25 Structures Visible	14,683	14.5%	5,248	5.2%
26-29 Structures Visible	30,738	30.4%	3,515	3.5%
Total	101,017	100.0%	101,017	100.0%

*Table 1 and Figure 1 illustrate that one (1) or more structures are theoretically visible from approximately 83.2 percent of the five-mile study radius. However, as discussed above, this unrealistic treeless condition analysis is used only to identify the maximum potential geographic area within which further investigation is appropriate. The topography only viewshed is not representative of the anticipated geographic extent of visibility and is not intended for public interpretation. Acreage is rounded to the nearest whole number in Tables 1 and 2. Turbine numbers shown on the viewshed figures are out of sequence in order to reference those turbines retained from previous evaluations.

Based on the vegetated viewshed (Table 1 and Figure 2), one (1) or more of the proposed turbines will be theoretically visible from approximately 32.3 percent of the five-mile radius study area. Approximately 67.7 percent of the study area will likely have no visibility of any wind turbines. Visibility is most common in the agricultural uplands from cleared lands with vistas in the direction of turbine groupings.

The vegetated viewshed map shows that the Project will be visible within portions of the Villages of Forestville and South Dayton. Most of the visibility shown within these villages will be further

screened by structures and localized vegetation. From the downtown sections of both villages, potential Project visibility appears to be minimal, when present at all. Within the Village of Forestville, potential for visibility is greatest along NYS Route 39 just west of the village center and filtered views are possible along short segments of Ceder and Chestnut Roads. Potential visibility, within the Village of South Dayton, generally occurs south of NYS Route 322. Views of the Project were noted along sections of 1st Avenue, 2nd Avenue and Main Street. Direct and, in some cases, open views are more prevalent on the outskirts of these community centers where localized residential and commercial structures, street trees and site landscaping are less likely to provide a visual barrier. Visibility of the Project may also be available within the hamlets scattered throughout the study area.

Open views of the Project will be available from many roadways where roadside vegetation is lacking. These roadways would include, but are not limited to, the NYS Thruway, NYS Routes 39, 83, and 322, County Routes 93, Prospect/Ball Hill Road, North and South Hill Road, Pope Hill Road, Round Top Road, Aldrich Hill Road, Hanover Road, and Flucker Hill Road. Many of these views may be long distant (background view), fleeting as viewers pass in vehicles, or short in duration. Visibility along roads that intersect the immediate project area is generally greater than visibility from roads farther away. The portion of Prospect/Ball Hill Road that bisects the Project area from southeast to northwest has the greatest visibility of any road immediate to the Project area. Turbines will be visible on both sides of Prospect/Ball Hill Road, as well as Bartlett Hill Road, North Hill Road, Smith Road, Dye Road, Pope Hill Road, and Round Top Road. In these locations, it is anticipated that 360-degree views of the Project may be visible. Open views of the Project will also occur in the agricultural uplands from cleared lands with down-slope vistas in the direction of the proposed Project (e.g. lands south of NYS Route 322).

No views, or limited views will occur on the backside of the many hills and within ravines found throughout the five-mile study area. Where topography is oriented toward the turbines, dense forest cover commonly prevents distant views.

Table 2 FAA Viewshed Coverage Summary

	Vegetation and Topography Viewshed (Figure 3 – FAA Navigation Light Vegetated Viewshed)	
	Acres	**Percent cover**
No Structures Visible	72,634	71.9%
1-5 Structures Visible	11,889	11.8%
6-10 Structures Visible	8,069	8.0%
11-15 Structures Visible	5,719	5.7%
16-20 Structures Visible	2,260	2.2%
21-22 Structures Visible	445	0.4%
Total	101,017	100.0%

As illustrated in Table 2 and Figure 3, the viewshed map indicates that one (1) or more of the 22 FAA required light sources will theoretically be visible from approximately 28.1 percent of the five-mile radius study area. Approximately 71.9 percent of the study area will likely have no visibility of any proposed light sources. Views of the lit proposed turbines would be possible from sections of the Villages of Forestville and South Dayton, and Hamlets such as Hamlet, Balcom, Balcom Corners and Skunks Corner. However, visibility will be most evident in the agricultural uplands from cleared lands with down-slope vistas in the direction of the proposed Project, and participating Project properties with lit turbines. In addition, views of the lit turbines are prominent from a number of roadway segments in

the study area, including the NYS Thruway, NYS Routes 39, 83, and 322, County Routes 93 and 87, North and South Hill Road, Pope Hill Road, Farrington Hollow Road, Round Top Road, and Flucker Hill Road.

TOPOGRAPHIC VIEWSHED

Ball Hill Wind Project

Figure 1
July 2016

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect June 2, 2016 layout.

KEY

- Proposed Wind Turbine
- Sensitive Resource
- Earl Cardot Eastside Overland Trail
- Equestrian Trail
- Snowmobile Trail
- County Boundary
- Municipal Boundary
- Cattaraugus Indian Reservation
- Water Body
- State Forest
- Wildlife Management Area

Number of Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 29

PROJECT # 2015 - 15039.10
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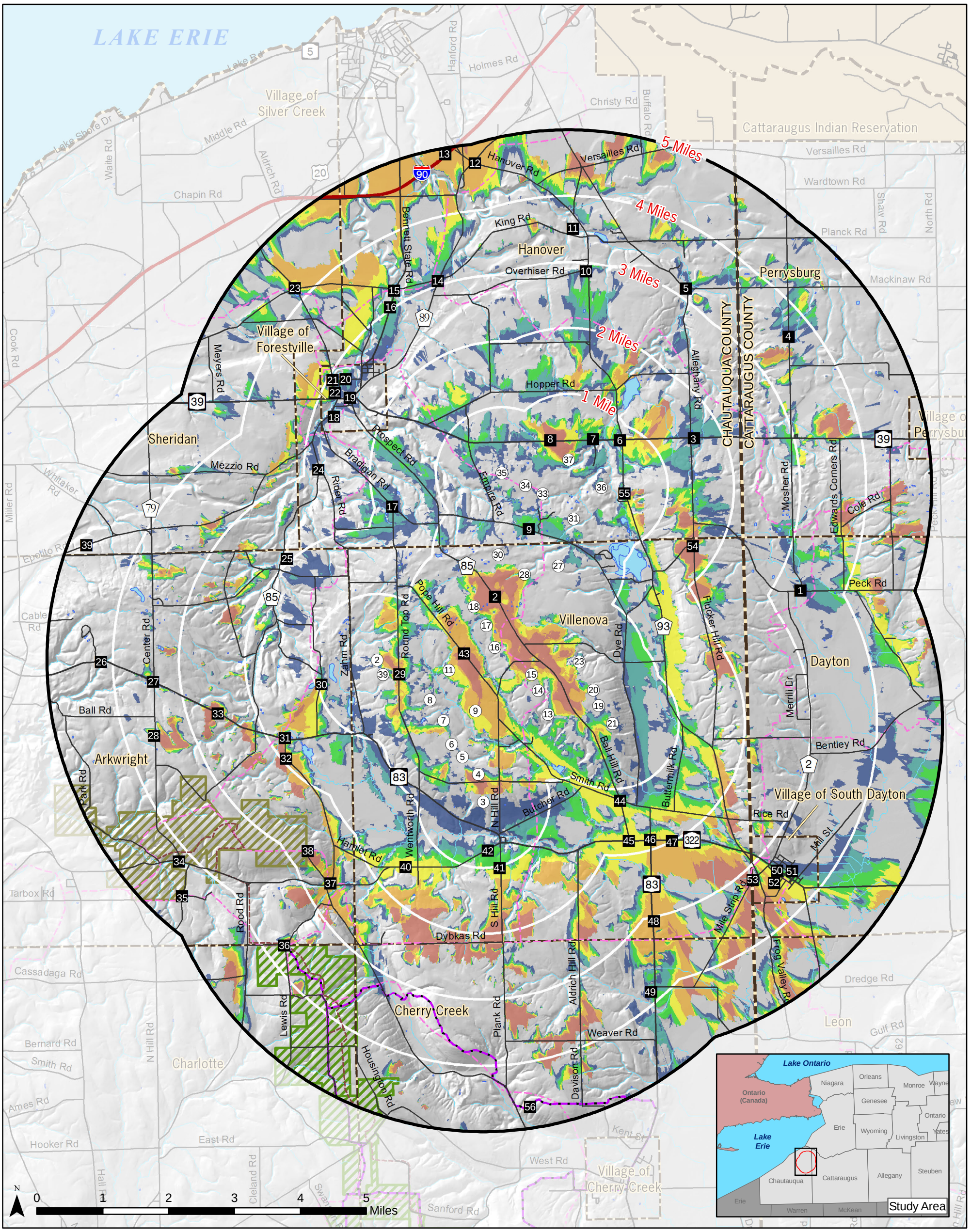

VEGETATED VIEWSHED*

Ball Hill Wind Project

*Assumes 40 foot (12.192 m) vegetation height in areas considered forested by the 2011 National Land Cover Dataset

Figure 2
July 2016

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect June 2, 2016 layout.

KEY

- ① Proposed Wind Turbine
- 1 Sensitive Resource
- Earl Cardot Eastside Overland Trail
- Equestrian Trail
- Snowmobile Trail
- County Boundary
- Municipal Boundary
- Cattaraugus Indian Reservation
- Water Body
- State Forest
- Wildlife Management Area

Number of Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 29

PROJECT # 2015 - 15039.10

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FAA NAVIGATION LIGHT VEGETATED VIEWSHED*

Ball Hill Wind Project

*Assumes 40 foot (12.192 m) vegetation height in areas considered forested by the 2011 National Land Cover Dataset

Figure 3

July 2016

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect June 2, 2016 layout.

KEY

- Proposed Wind Turbine
- Proposed Wind Turbine with FAA Navigation Light
- Sensitive Resource
- Earl Cardot Eastside Overland Trail
- Equestrian Trail
- Snowmobile Trail
- County Boundary
- Municipal Boundary
- Cattaraugus Indian Reservation
- Water Body
- State Forest
- Wildlife Management Area

Number of Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 22

PROJECT # 2015 - 15039.18
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3.2 Inventory of Visually Sensitive Resources

3.2.1 Inventory Criteria

Because it is not practical to evaluate every conceivable location where the proposed Project might be visible, it is accepted visual assessment practice to limit detailed evaluation of aesthetic impact to locations generally considered by society, through regulatory designation or policy, to be of cultural and/or aesthetic importance. In rural areas where few resources of statewide significance are likely to be found, it is common practice to expand inventory criteria to include places of local sensitivity or high intensity of use.

Resources of Statewide Significance – The DEC Visual Policy requires that all aesthetic resources of statewide significance be identified along with any potential adverse effects on those resources resulting from the proposed Project. Aesthetic resources of statewide significance may be derived from one or more of the following categories:

- A property on or eligible for inclusion in the National or State Register of Historic Places [16 U.S.C. § 470a et seq., Parks, Recreation, and Historic Preservation Law Section 14.07];
- State Parks [Parks, Recreation, and Historic Preservation Law Section 3.09];
- Urban Cultural Parks [Parks, Recreation, and Historic Preservation Law Section 35.15];
- The State Forest Preserve [NYS Constitution Article XIV], Adirondack and Catskill Parks;
- National Wildlife Refuges [16 U.S.C. 668dd], State Game Refuges, and State Wildlife Management Areas [ECL 11-2105];
- National Natural Landmarks [36 CFR Part 62];
- The National Park System, Recreation Areas, Seashores, and Forests [16 U.S.C. 1c];
- Rivers designated as National or State Wild, Scenic, or Recreational [16 U.S.C. Chapter 28, ECL 15-2701 et seq.];
- A site, area, lake, reservoir, or highway designated or eligible for designation as scenic [ECL Article 49 or NYDOT equivalent and Adirondack Park Agency], designated State Highway Roadside;
- Scenic Areas of Statewide Significance [of Article 42 of Executive Law];
- A State or federally designated trail, or one proposed for designation [16 U.S.C. Chapter 27 or equivalent];
- Adirondack Park Scenic Vistas [Adirondack Park Land Use and Development Map];
- State Nature and Historic Preserve Areas [Section 4 of Article XIV of the State Constitution];
- Palisades Park [Palisades Interstate Park Commission]; and
- Bond Act Properties purchased under Exceptional Scenic Beauty or Open Space category.

Resources of Local Interest – Places of local sensitivity or high intensity of use (based on local context) were also inventoried, even though they may not meet the broader statewide threshold. Aesthetic resources of local interest were generally derived from the following general categories:

- Recreation areas including playgrounds, athletic fields, boat launches, fishing access, campgrounds, picnic areas, ski centers, and other recreational facilities/attractions;
- Areas devoted to the conservation or the preservation of natural environmental features (e.g., reforestation areas/forest preserves, wildlife management areas, open space preserves);
- A bicycling, hiking, ski touring, or snowmobiling trail designated as such by a governmental agency;
- Architectural structures and sites of traditional importance as designated by a governmental agency;
- Parkways, highways, or scenic overlooks and vistas designated as such by a governmental agency;
- Important urban landscape including visual corridors, monuments, sculptures, landscape plantings, and urban green space;
- Important architectural elements and structures representing community style and neighborhood character;
- An interstate highway or other high volume (relative to local conditions) road of regional importance;
- A passenger railroad or other mass transit route; and
- A residential area greater than 50 contiguous acres and with a density of more than one dwelling unit per acre.

Other Places for Analysis – Given the rural character of much of the study area, the inventory of aesthetic resources has been further expanded to be conservatively over-inclusive. In several cases, locations not rising to the threshold of statewide significance or local interest have been included to represent visibility along sparsely populated rural roadways; most were selected based on field observation of open vistas. Although possibly of interest to local residents, such locations are not considered representative of any aesthetically significant place.

Resources of statewide significance, resources of local interest and other places for analysis were identified though a review of published maps and other paper documents, online research, and windshield survey of publicly accessible locations.

3.2.2 Summary Characteristics of Inventoried Resources

Overall Population and Density of Development – This portion of New York State is quite rural with a very small population. Based on the 2010 census, the population of Town of Villenova is just 1,110 with a population density of just 32 persons per square mile. This compares with a population density of 127 persons per square mile for Chautauqua County and 411 persons per square mile for New York State as a whole. The population of the Town of Hanover is 7,127 including 697 residing in the Village of Westfield. The population density of the Town (excluding the Village) is 149 persons per square mile. Table 3 summarizes these demographics for other municipalities within the study area.

Table 3 Demographic Summary of Study Area Municipalities *

Municipality	Year Round Population	Population Density[5]	Total Housing Units
New York State	*19,378,102*	*411*	
Cattaraugus County	80,317	*61*	*41,111*
Town of Perrysburg	1,626	62	736
Village of Perrysburg	401	406	152
Town of Sheridan	*2,673*	72	1,169
Town of Dayton	1,886	54	836
Village of South Dayton	620	616	271
Town of Leon	1,365	38	485
Chautauqua County	*134,905*	*127*	*66,920*
Town of Villenova	1,110	32	531
Town of Cherry Creek	1,118	31	586
Town of Charlotte	1,729	47	802
Town of Hanover	7,127	149	3,529
Village of Forestville	697	713	315
Town of Arkwright	1,061	31	539

Highway Corridors – Due predominately to the sparse population of the study area, many of the roadways are relatively lightly traveled with a few exceptions (e.g. NYS Thruway I-90). The primary roadways within the study area are NYS Route 39, NYS Route 83, CR85, CR87, CR93, CR322, and NYS Thruway (I-90).

NYS Route 39 is a west-east route that enters the study area west of Forestville and exits the study area in the Village of Perrysburg. According to the NYS DOT, with the exception of the CR 141/Pearl Street to US Route 20 section that sees an AADT of 3,233, approximately 2,000 cars per day travel NYS Route 39 through the study area.

NYS Route 83 crosses the study area from west to east, entering from the Town of Arkwright and turning south upon its intersection with CR 322 and exiting the study area from the Town of Cherry Creek. Approximately 1,800 cars per day travel NYS Route 83 through the study area.

The NYS Thruway (I-90) receives more traffic than any other road within the study area. Roughly two (2) miles of I-90 cross through the study area within the Town of Sheridan. Approximately 24,285 vehicles travel on this stretch of road each day.

Table 4 summarizes the average annual daily traffic (AADT) for state highways within the study area. In addition to a number of NYS Routes and I-90, numerous county and local roads traverse the study area. Generally, these roads are lightly traveled.

[5] Population density is calculated by residents per square mile and is rounded to the nearest whole number.

Table 4 Annual Average Daily Traffic Volumes for Study Area Highways [6]

Route	Section	AADT
NYS Route 39	Cattaraugus County Line to CR 141/Pearl Street	1,914
NYS Route 39	CR 141/Pearl Street to US Route 20	3,233
NYS Route 39	Cattaraugus County Line to North Road	1,840
NYS Route 83	Between CR70/Southside Ave East and NYS Route 322	1,778
NYS Route 83	NYS Route 322 and CR312/Cassadaga Road	1,445
NYS Route 83	CR 312/Cassadaga Road and CR307/Creek Road	1,116
NYS Route 83	CR 307 Creek Road and NYS Route 60 Laona (end NYS Route 83)	1,509
NYS Route 322	CR83 to Cattaraugus County Line	1,704
NYS Route 322	Cattaraugus County Line to CR2/Main Street	2,005
NYS Route 322	CR2/Main Street to US Route 62 (end of NYS Route 322)	1,126
CR85	NYS Route 83 to Henry Road	376
CR85	Henry Road to Sheridan Town Line	404
CR85	Sheridan Town Line to Rider Road	596
CR85	Rider Road to Bradigan Street	1,048
CR85	Bradigan Street to NYS Route 39	1,626
CR85	Pear Street to Forrestville Village Line	1,007
CR85	Forrestville Village Line to CR84/King Road	636
CR85	CR84/King Road to CR86/Stebbins Road	690
CR85	CR29/CR68 to Plank Road (0.17 miles south)	480
CR85	Plank Road to Cherry Creek	497
CR85	Cherry Creek to Cassadaga Road	506
CR85	Cassadaga Road to NYS Route 83	485
NYS Thruway (I-90)	Between Exit 59 and Exit 58	24,285

Park, Recreation and Open Space Resources – Visitors traveling to this area may enjoy numerous outdoor recreational activities including hiking, biking, hunting, and fishing during the warmer months. Cross-country skiing and snowmobile riding are popular during the winter months. Other passive outdoor pursuits, such as bird watching or a leisurely drive through the county's wine country are also common. The Boutwell Hill Management Unit provides various recreational opportunities, as do a number of municipal parks. Some of the more prominent recreational facilities are discussed below.

Approximately seventy percent of the Boutwell Hill Management Unit, which is comprised of the Boutwell Hill State Forest and the Canadaway Creek Wildlife Management Area, are within the study area. The 5,124-acre Unit is a source of numerous types of outdoor activities including hunting, hiking, biking, horseback riding, and snowmobiling. Between Canadaway Creek WMA and Boutwell Hill State Forest, there are 6.2 miles of snowmobile and horse trails in winter and summer respectively. The Unit also includes 8.5 miles of the Earl Cardot Eastside Overland Trail.

- The Boutwell Hill State Forest consists of 2,964 acres of protected forest with numerous multi-use trails, wildlife viewing opportunities, and it serves as a significant resource for deer hunters. In addition to its recreational offerings, the Forest also provides raw materials for New York's timber industry. Roughly half of the Boutwell Hill State Forest is within the study area.
- The Canadaway Creek Wildlife Management Area, just south of the Town of Arkwright and north of the Boutwell Hill State Forest, is home to 2,160 acres of forest and its main purpose is to provide prime habitat for ruffed grouse. In addition to preservation efforts, the forest serves to provide numerous recreational opportunities including hiking, snowmobiling and

[6] http://gis3.dot.ny.gov/html5viewer/ (website last accessed 11/6/15). AADT based on 2013 actual or forecasted numbers.

bicycling. The majority of the Canadaway Creek Wildlife Management Area is within the study area.

The Earl Cardot Eastside Overland Trail offers hiking and biking opportunities to users. The trail is comprised of 19 miles extending from Twenty-Eighth Road in the Town of Gerry at the southernmost end and terminates in the Town of Arkwright to the north. Of the 19 miles, roughly seven and three quarters (7.75) miles are within the study area. This trail is maintained by Chautauqua County's Department of Public Works, Parks Division and County Park Commission.

Snowmobile trails may be found throughout the study area whether on public/private land or along roadways/seasonal roads. Snowmobiling is a popular activity throughout many sections of western New York and is likely enjoyed by large numbers of participants within the study area during the winter months. State snowmobile trails that bisect the area include, but are not limited to C1, C1A, C1B and C4. A number of these trails have significant portions that go through the different parcels of the Boutwell Hill Management Unit. The trails are generally funded by the State, but maintained by local snowmobile groups such as the Cherry Creek Snowmobile Club.

The Chautauqua County Equestrian Trail is a proposed 23.8 mile trail system. Phase 1 of the trail is under development and is located in the southern portion of the study area. The trail starts at the intersection of Ruttenbur and Lewis Roads, along the northern boundary of the Boutwell Hill State Forest. From this location it heads in a southerly direction along the Earl Cardot Eastside Overland Trail and Arab Hill Road which also coincides with an existing snowmobile trail. Ultimately, the portion of the trail that follows Arab Hill Road is anticipated to be relocated west of the current alignment. A future connection (Phase 4) will link Arab Hill Road and the Village of Cherry Creek. This connection appears to be made utilizing existing snowmobile trails. Of the 23.8 miles, roughly eight and three quarters (8.75) miles are within the study area.

Tourism – This section of Chautauqua County draws visitors year-round, as it is ideal for a range of activities including hiking, snowmobiling, cross-country skiing, and sightseeing.

Cultural Resources – The State and National Register of Historic Places do not list any properties (within the study area) in the Towns of Villenova, Hanover, Perrysburg, Dayton, Cherry Creek, Arkwright, and Sheridan. Historically significant properties within the study area are being identified as part of the studies being prepared for the State Historic Preservation Office.

3.2.3 Visibility Evaluation of Inventoried Resources

Each inventoried visual resource was evaluated to determine whether a visual impact might exist. Generally, this consisted of reviewing viewshed maps, aerial photos, and field observations to determine whether or not individual resources would have a view of the Project.

Table 5 lists 56 visual resources located within the five-mile study area and identifies potential Project visibility. The location of these visual resources is referenced by numeric code within Figures 1 and 2. Of the 56 visual resources inventoried, 12 would likely be screened from the Project by either intervening landform or vegetation and are thus eliminated from further study.

Table 5 Visual Resource Visibility Summary

Key

● *Visibility Indicated*

○ *No Visibility Indicated*

◘ *Filtered view through trees or limited view through structures possible*

Map ID	Receptor Name	Municipality	Inventory Type	Potential Visibility		
				Theoretical View Indicated by Viewshed - Excluding Existing Vegetation (See Figure 1)	Theoretical View Indicated by Viewshed - Including Existing Vegetation (See Figure 2)	Potential View
Recreational and Tourist Resources						
25	Hill Side Acres (Western NY Land Conservancy)	Town of Arkwright	Local Importance	●	○	○
26	Arkwright Hills Campground	Town of Arkwright	Local Importance	○	○	○
35	Woodside Country Campground	Town of Arkwright	Local Importance	○	○	○
36	Boutwell Hill State Forest and Overland Trail	Town of Arkwright	Statewide Significance	●	●	●
38	Canadaway Creek WMA	Town of Arkwright	Statewide Significance	●	●	●
20	American Legion Post 953 Ball Fields	Village of Forestville	Local Importance	●	●	◘
21	Village of Forestville Park	Village of Forestville	Local Importance	●	○	◘
22	Walnut Falls	Village of Forestville	Other Places for Analysis	●	○	◘
7	Tri-County Country Club	Town of Hanover	Local Importance	●	●	●
11	Town of Hanover Park	Town of Hanover	Local Importance	○	○	○
51	Village of South Dayton Park	Village of South Dayton	Local Importance	●	●	◘
56	Chautauqua County Equestrian Trail	Towns of Charlotte and Cherry Creek	Local Importance	●	●	●
Highway Corridors/Roadside Receptors						
28	Center Road	Town of Arkwright	Other Places for Analysis	●	●	●
29	Round Top Road	Town of Villenova	Other Places for Analysis	●	●	●
30	Putnam Road	Town of Arkwright	Other Places for Analysis	●	●	●
32	Farrington Hollow Road	Town of Arkwright	Other Places for Analysis	●	●	●
33	NYS Route 83	Town of Arkwright	Local Importance	●	●	●
8	NYS Route 39	Town of Hanover	Local Importance	●	●	●
9	Hurlbert Road	Town of Hanover	Other Places for Analysis	●	●	●
12	Hanover Road	Town of Hanover	Other Places for Analysis	●	●	●
13	NYS Thruway (I-90)	Town of Hanover	Local Importance	●	●	●
16	Bennett State Road	Town of Hanover	Other Places for Analysis	●	●	●
17	Bradigan Road	Town of Hanover	Other Places for Analysis	●	●	●

Table 5 Visual Resource Visibility Summary

Key

● *Visibility Indicated*

○ *No Visibility Indicated*

◘ *Filtered view through trees or limited view through structures possible*

Map ID	Receptor Name	Municipality	Inventory Type	Potential Visibility: Theoretical View Indicated by Viewshed - Excluding Existing Vegetation (See Figure 1)	Potential Visibility: Theoretical View Indicated by Viewshed - Including Existing Vegetation (See Figure 2)	Potential Visibility: Potential View
24	Creek Road	Town of Hanover	Other Places for Analysis	●	●	●
55	County Route 93	Town of Hanover	Other Places for Analysis	●	●	●
39	Epolito Road	Town of Sheridan	Other Places for Analysis	●	○	◘
2	Prospect Road	Town of Villenova	Other Places for Analysis	●	●	●
40	County Route 72	Town of Villenova	Other Places for Analysis	●	●	●
41	South Hill Road	Town of Villenova	Other Places for Analysis	●	●	●
43	Pope Hill Road	Town of Villenova	Other Places for Analysis	●	●	●
47	NYS Route 322	Town of Villenova	Other Places for Analysis	●	●	●
48	NYS Route 83	Town of Villenova	Local Importance	●	●	●
54	Flucker Hill Road	Town of Villenova	Other Places for Analysis	●	●	●
Residential/Community Resources						
27	Hamlet of Arkwright	Town of Arkwright	Local Importance	●	○	○
31	Hamlet of Black Corners	Town of Arkwright	Local Importance	●	●	●
34	Hamlet of Griswold	Town of Arkwright	Local Importance	○	○	○
37	Hamlet of Town Corners	Town of Arkwright	Local Importance	●	●	●
49	Pine Valley Central Schools	Town of Cherry Creek	Local Importance	●	●	●
1	Hamlet of Cottage	Town of Dayton	Local Importance	●	●	◘
3	Hamlet of Nashville	Town of Hanover	Local Importance	●	●	●
5	Hamlet of Balltown	Town of Hanover	Local Importance	●	○	◘
6	Hamlet of Parcells Corners	Town of Hanover	Local Importance	●	●	●
10	Hamlet of Smiths Mills	Town of Hanover	Local Importance	●	●	●
14	Hamlet of Dennison Corners	Town of Hanover	Local Importance	●	●	◘
15	Hamlet of Keaches Corners	Town of Hanover	Local Importance	●	○	◘
4	Hamlet of West Perrysburg	Town of Perrysburg	Local Importance	●	●	●
23	Hawkins Corner	Town of Sheridan	Local Importance	●	●	●

Table 5 Visual Resource Visibility Summary

Key

● *Visibility Indicated*

○ *No Visibility Indicated*

◘ *Filtered view through trees or limited view through structures possible*

Map ID	Receptor Name	Municipality	Inventory Type	Potential Visibility: Theoretical View Indicated by Viewshed - Excluding Existing Vegetation (See Figure 1)	Potential Visibility: Theoretical View Indicated by Viewshed - Including Existing Vegetation (See Figure 2)	Potential Visibility: Potential View
42	Hamlet of Hamlet	Town of Villenova	Local Importance	●	●	●
44	Hamlet of Wrights Corners	Town of Villenova	Local Importance	●	●	●
45	Hamlet of Balcom	Town of Villenova	Local Importance	●	●	●
46	Balcom Corners	Town of Villenova	Local Importance	●	●	●
18	Forestville School Complex	Village of Forestville	Local Importance	●	○	○
19	Village of Forestville	Village of Forestville	Local Importance	●	●	●
50	Village of South Dayton - Downtown	Village of South Dayton	Local Importance	●	●	◘
52	Village of South Dayton - Residential	Village of South Dayton	Local Importance	●	●	●
53	Village of South Dayton/Hamlet of Skunks Corner	Village of South Dayton	Local Importance	●	●	●

3.2.4 Select Resources Beyond Five Miles

Considering the scale of the proposed Project and recognizing the turbines will, at times, be visible at distances greater than five (5) miles, Saratoga Associates completed a vegetated viewshed map to 7.5 miles around the outermost turbines (Appendix A – Figure A1). In addition, supplemental resources were identified outside the five-mile study area during the research completed for this study. Although not all-inclusive, the following resources were identified:

> Hatch Creek State Forest (Towns of Gerry and Ellington; located approximately 9.2 miles from the closest proposed turbine) – Hatch Creek is a 1,280 State Forest with several miles of snowmobile trails and forest roads, which can be utilized as hiking trails, traversing the forest from north to south. Hunting is a popular activity within Hatch Creek.

> Harris Hill State Forest (Towns of Gerry and Ellington; located approximately 9.2 miles from the closest proposed turbine) – The Harris Hill State Forest is 3,554 acres of hardwood and conifer forests make up Harris Hill State Forest. Hiking is a common activity at Harris Hill, and the Earl Cardot Eastside Overland Trail traverses roughly four (4) miles of the forest.

> Zoar Valley Multiple Use Area (Towns of Collins, Persia and Otto; located approximately 9.6 miles from the closest proposed turbine) – Zoar Valley is a 2,540-acre Multiple Use Area consisting of one of New York State's last remaining old growth forests, and a steep canyon. Patron use of the Area is restricted to minimal-impact activities.

> Evangola State Park (Town of Brant; located approximately 10.1 miles from the closest proposed turbine) – Evangola State Park has 733 acres of lakeshore, woodlands, wetlands and an abundance of wildlife, including deer, wild turkey and red-tailed hawks. The park offers facilities for a variety of recreational activities, including picnicking, swimming, camping, tennis, volleyball and baseball. A large beachfront banquet is also available for rental.

> Seaway Trail (located approximately 6.7 miles from the closest proposed turbine) – The New York State Seaway Trail runs for 454 miles along Lake Erie, Lake Ontario, the Niagara River and the St. Lawrence Seaway, and has been recognized by the US Department of Transportation as one of America's Scenic Byway Trails. The Trail coincides with NYS Route 5 through the City of Dunkirk, and passes several historic markers for the War of 1812.

> Lake Erie (located approximately 7.0 miles from the closest proposed turbine to the nearest shoreline point) – The Lake has the fourth largest surface area of the Great Lakes and averages 571 feet above sea level. The Lake and its shoreline are a popular seasonal destination due to its abundant opportunities for water recreation (e.g. boating fishing, swimming), scenic vistas from the shoreline, shoreline parks (including State and local parks), and shopping.

3.3 Factors Affecting Visual Impact

To bring order to the consideration of visual resources, the inventory of visual resources is organized into several recognizable elements, as follows:

3.3.1 Landscape Units

Landscape units are areas with common characteristics of landform, water resources, vegetation, land use, and land use intensity. While a regional landscape may possess diverse features and characteristics, a landscape unit is a relatively homogenous, unified landscape of visual character. Landscape units are established to provide a framework for comparing and prioritizing the differing visual quality and sensitivity of visual resources in the study area. Discrete landscape units were identified through field inventory and air photo interpretation, and divide the study area into zones of unique patterns and visual composition. Within the visual resources study area, four distinctive landscape units were defined. These landscape units, their general landscape character, and use are as follows:

Village Center – The study area contains the Villages of South Dayton and Forestville, and a very small portion of the Village of Perrysburg. These villages are primarily residential and commercial community centers with built structures and tree-lined streets dominating the visual landscape. Each village includes a small downtown area based around a main thoroughfare.

Village Characteristics

Most buildings are one (1) to three (3) stories tall, including brick and wood frame structures. Buildings are a mix of older architectural styles (e.g. predominately Federal and Late Victorian) interspersed with conventional, more modern, mid- to late-20th century residences. Some of the older buildings are very well maintained or restored while others are in various states of disrepair or alteration. Views are generally short distance and focused along streets (which are typically arranged in a grid/block pattern). Structures and trees generally block most distant views, however, filtered or framed views are possible through foreground vegetation and buildings from the perimeter of the villages. Development density drops sharply as one moves away from the central business district as the Village Center landscape unit transitions to the Rural Agricultural Landscape Unit.

Village Characteristics

Views within the Village Center landscape unit may be considered to be of moderate visual quality depending on the character and composition of built and natural features within view.

Rural Hamlet – Rural hamlets are characterized by low to medium density clusters of older residential dwellings and very limited to no retail or commercial services. Buildings are typically one (1) to two (2) stories tall, and include brick commercial blocks and wood frame structures. Buildings styles are an interesting mix of older architectural styles (e.g. Federal, Late Victorian, Italianate) interspersed with more modern, utilitarian styles as well as pre-manufactured homes.

Hamlet Characteristics

A number of rural crossroad hamlets exist within the study area. These areas vary in size but are generally typified by a small group of houses in an otherwise rural area. Residences (a mix of old and new and of varying maintenance) and accessory structures (barns, garages, etc.) are a main feature of rural hamlets. Places of worship, community buildings and general stores are also common.

Roadside residences and street trees often reinforce axial views along the roadway. As a result, views are typically short distance and directed towards the main thoroughfare and adjacent structures. While structures and trees generally block most views, filtered or framed views beyond the hamlet may exist through foreground vegetation. Development density drops almost immediately as one travels away from the hamlet center; transitioning quickly to the character of the surrounding Rural Agricultural Landscape Unit.

The study area includes 16 definitive hamlets. The hamlets of Hamlet, Laona, Cottage, Griswold, Black Corners, and Balcom are representative of this landscape unit.

Views found within the Rural Hamlet landscape unit may be considered to be of moderate visual quality depending on the character and composition of built and natural features within view.

Rural Agricultural – This landscape unit is predominantly a patchwork of open land, including working cropland/pastures and a succession of old-fields transected by property-line hedgerows, occasionally interspersed with woodlots. The terrain itself consists of relatively level topography with gentle low-lying hills and small rounded hillocks primarily under a thousand feet high, but including a few that are up to roughly 1,800 feet. Within this unit, population densities are very low and structures are sparsely located. Uses are predominantly agricultural and very low-density residential. Minor areas of commercial use are occasionally found along the roadside. Building stock consists primarily of permanent homes and manufactured housing, along with accessory structures (barns, garages, sheds, etc.). Structures are of varying vintage and quality. Poorly maintained or dilapidated structures and properties are not uncommon sights.

Characteristics of Agricultural Land

Views within the Rural Agricultural landscape unit are often short distance, contained by foreground vegetation and surrounding mountains. However, distant vistas are common from higher elevations across down-slope agricultural lands. Narrow and curving roads often provide an interesting series of short views of the rural landscape, but also force drivers to direct their attention to the road rather than the adjacent scenery. Some local residents and visitors may regard the aesthetic character of this landscape unit as an attractive and pastoral setting; others may view it as a working landscape, similar in character with much of rural western New York.

Views within the Rural Agricultural landscape unit may be considered of moderate visual quality.

Forest Land – Forest cover dominates large areas of land throughout the study area. In addition to privately owned forested land, the study area contains the Boutwell Hill State Forest and the Canadaway Creek Wildlife Management Area. Vegetation is predominantly mature second growth deciduous woodland with occasional stands of evergreen cover. The State owned property may include paved and unimproved roads and trails that are commonly used for hiking, snowshoeing, nature viewing, snowmobiling, horseback riding, and in some instances may be used for cross-country skiing.[7] Hunting is also permitted on designated sections of State owned property.

Characteristics of Forest Land

Within this landscape unit, dense forest typically prevents distant vistas. However, views beyond the immediate foreground may occur in discrete hillside locations where openings in the forest cover permit. Filtered views through woodland vegetation may also be available during leaf-off seasons.

Views found within the Forest Land landscape unit may be considered to be of moderate to high visual quality depending on the character and composition of built and natural features within view

3.3.2 Viewer/User Groups

Viewers engaged in different activities, while in the same landscape unit, are likely to perceive their surroundings differently. The description of viewer groups is provided to assist in understanding the sensitivity and probable reaction of potential observers to visual change resulting from the proposed Project.

Local Residents – These individuals would view the Project from homes, businesses, and local roads. Except when involved in local travel, such viewers are likely to be stationary and could have frequent and/or prolonged views of the Project. They know the local landscape and may be sensitive to changes in particular views that are important to them. Conversely, the sensitivity of an individual observer to a specific view may be diminished over time due to repeated exposure.

[7] Activities may vary depending on resource.

Local Workers – Local workers are those who work within the study area. It is expected that the workers would generally be indoors and would not experience the surrounding landscape and will therefore not be affected by a change in the surroundings. For the time any workers may be outdoors, sensitivity may vary, however, most workers will primarily be focused on their job responsibilities and give minimal consideration to the surrounding landscape.

Through Travelers – Commuters and through travelers would view the Project from highways. These viewers are typically moving and focusing on the road in front of them. Consequently, their views of the proposed turbines may be peripheral, intermittent, and/or of relatively brief duration. Given a general unfamiliarity or infrequent exposure to the regional or local landscape, travelers are likely to have a lower degree of sensitivity to visual change than would local residents and workers.

Recreational Users and Tourists – This group generally includes all local residents involved in outdoor recreational activities, as well as visitors who come to the area specifically to enjoy the cultural, recreational, scenic resources, and open spaces of the area.

The sensitivity of recreational users to visual quality is variable; but to many, visual quality is an important and integral part of the recreational experience. The presence of wind turbines may diminish the aesthetic experience for those that believe the rural landscape should be preserved for agricultural, rural residential, open space and similar uses. Such viewers will likely have high sensitivity to the visual quality and landscape character, regardless of the frequency of duration of their exposure to the Project. For those with strong utilitarian beliefs, the presence of the turbines will have little aesthetic impact on their recreational experience.

While the scenic quality of the local landscape is an important aspect of the recreational experience for most visitors, viewers will also be cognizant of various foreground details, developments and other visually proximate activities. Visitors and recreational users currently view the existing working landscape, low to moderate-density roadside residential and commercial uses of varying aesthetic quality, as well as utility infrastructure and occasional hilltop communications towers.

A greater number of recreational users will be present in the region when the weather is clear and warm as compared to overcast, rainy or cold days. In addition, more recreational users will be present on weekends and holidays than on weekdays.

It is important to note that Lake Erie, a tourist attraction to the region, is not within the study area. The lakefront provides numerous activities for boating, fishing, sightseeing and shopping.

3.3.3 Distance Zones

Distance affects the apparent size and degree of contrast between an object and its surroundings. Distance can be discussed in terms of distance zones, which was established by the U.S. Forest Service and reiterated by the NYSDEC Visual Policy. A description of each distance zone is provided below to assist in understanding the effect of distance on potential visual impacts.

Foreground (0-½ mile) – At a foreground distance, viewers typically have a very high recognition of detail. Cognitively, in the foreground zone, human scale is an important factor in judging spatial

relationships and the relative size of objects. From this distance, the sense of form, line, color and textural contrast with the surrounding landscape is highest. The visual impact is likely to be considered the greatest at a foreground distance.

Middleground (½ mile to 3 miles) – This is the distance where elements begin to visually merge or join. Colors and textures become somewhat muted by distance, but are still identifiable. Visual detail is reduced, although distinct patterns may still be evident. Viewers from middleground distances characteristically recognize surface features such as tree stands, building clusters and small landforms. Scale is perceived in terms of identifiable features of development patterns. From this distance, the contrast of color and texture are identified more in terms of the regional context than by the immediate surroundings.

Background (3-5 miles to horizon) – At this distance, landscape elements lose detail and become less distinct. Atmospheric perspective[8] changes colors to blue-grays, while surface characteristics are lost. Visual emphasis is on the outline or edge of one landmass or water resource against another with a strong skyline element.

3.3.4 Duration/Frequency/Circumstances of View

The analysis of a viewer's experience must include the distinction between stationary and moving observers. The length of time and the circumstances under which a view is encountered is influential in characterizing the importance of a particular view.

Stationary Views – Stationary views are experienced from fixed viewpoints. Fixed viewpoints include residential neighborhoods, recreational facilities, historic resources and other culturally important locations. Characteristically, stationary views offer sufficient time, either from a single observation or repeated exposure, to interpret and understand the physical surroundings. For this reason, stationary viewers have a higher potential for understanding the elements of a view than do moving viewers.

Stationary views can be further divided to consider the effect of short-term and long-term exposure. Sites of long-term exposure include any location where a stationary observer is likely to be visually impacted on a regular basis, such as from a place of residence. Sites of short-term exposure include locations where a stationary observer is only visiting, such as recreational facilities. Although the duration of visual impact remains at the discretion of the individual observer, short-term impacts are less likely to be repeated for a single observer on a regular basis.

Moving Views – Moving views are those experienced in passing, such as from moving vehicles, where the time available for a viewer to cognitively experience a particular view is limited. Such viewers are typically proceeding along a defined path through highly complex stimuli. As the tendency of automobile occupants is to focus down the road, the actual time a viewer is able to focus

[8] Atmospheric Perspective: Even on the clearest of days, the sky is not entirely transparent because of the presence of atmospheric particulate matter. The light scattering effect of these particles causes a reduction in the intensity of colors and the contrast between light and dark as the distance of objects from the observer increases. Contrast depends upon the position of the sun and the reflectance of the object, among other items. The net effect is that objects appear "washed out" over great distances.

on individual elements of the surrounding landscape may be a fraction of the total available view time. Obviously, a driver is most affected by driving requirements.

Conversely, the greater the contrast of an element within the existing landscape, the greater the potential for viewer attention, even if viewed for only a moment by a moving viewer. Billboards along a rural highway, designed to attract attention and recognition, are an example of this condition. Furthermore, an element is more likely to be perceived in greater detail by local residents to whom it is experienced on a daily basis than it is to passers-by.

3.3.5 Summary of Affected Resources

As listed in Table 5, of the original 56 inventoried visual resources, 12 would likely be screened from the proposed Project by either intervening landform or vegetation and are thus eliminated from further study. Table 6 summarizes the factors affecting visual impact (landscape unit, viewer group, distance zone and duration/frequency/circumstances of view) described above for each visual resource determined to have a potential view of the Project.

Table 6 Visual Resource Impact Summary

Map ID	Receptor Name	Municipality	Inventory Type	Approximate Number of Turbines Visible (see Figure 2)	Factors Affecting Visual Impact: Landscape Unit	Viewer/User Group(s)	Distance (miles) /Distance Zone (nearest turbine)[9]	Moving/ Stationary
1	Hamlet of Cottage	Town of Dayton	Local Importance	1	Rural Hamlet	Travelers, Local residents/workers	3.4/Background	Stationary
2	Prospect Road	Town of Villenova	Other Places for Analysis	29	Rural Agricultural	Local residents/workers	0.3/Foreground	Moving
3	Hamlet of Nashville	Town of Hanover	Local Importance	4	Rural Hamlet	Travelers, Local residents/workers	1.6/Middleground	Stationary
4	Hamlet of West Perrysburg	Town of Perrysburg	Local Importance	3	Rural Hamlet	Travelers, Local residents/workers	3.6/Background	Stationary
5	Hamlet of Balltown	Town of Hanover	Local Importance	0	Rural Hamlet	Travelers, Local residents/workers	3.2/Background	Stationary
6	Hamlet of Parcells Corners	Town of Hanover	Local Importance	18	Rural Hamlet	Travelers, Local residents/workers	0.8/Middleground	Stationary
7	Tri-County Country Club	Town of Hanover	Local Importance	8	Rural Agricultural	Recreational	0.5/Foreground	Stationary
8	NYS Route 39	Town of Hanover	Local Importance	28	Rural Agricultural	Travelers, Local residents/workers	0.3/Foreground	Moving
9	Hurlbert Road	Town of Hanover	Other Places for Analysis	12	Rural Agricultural	Local residents/workers	0.4/Foreground	Moving
10	Hamlet of Smiths Mills	Town of Hanover	Local Importance	11	Rural Hamlet	Travelers, Local residents/workers	2.9/Background	Stationary
11	Town of Hanover Park	Town of Hanover	Local Importance	0	Rural Agricultural	Recreational	3.5/Background	Stationary
12	Hanover Road	Town of Hanover	Other Places for Analysis	25	Rural Agricultural	Local residents/workers	0.3/Foreground	Moving
13	NYS Thruway (I-90)	Town of Hanover	Local Importance	25	Rural Agricultural	Travelers, Local residents/workers	4.6/Background	Moving
14	Hamlet of Dennison Corners	Town of Hanover	Local Importance	1	Rural Hamlet	Travelers, Local residents/workers	3.1/Background	Stationary
15	Hamlet of Keaches Corners	Town of Hanover	Local Importance	0	Rural Hamlet	Travelers, Local residents/workers	3.2/Background	Stationary
16	Bennett State Road	Town of Hanover	Other Places for Analysis	24	Rural Agricultural	Local residents/workers	2.6/Middleground	Moving
17	Bradigan Road	Town of Hanover	Other Places for Analysis	10	Rural Agricultural	Local residents/workers	1.5/Middleground	Moving
18	Forestville School Complex	Village of Forestville	Local Importance	0	Village Center	Local residents/workers	2.7/Middleground	Stationary
19	Village of Forestville	Village of Forestville	Local Importance	19	Village Center	Travelers, Local residents/workers	1.9/Middleground	Stationary
20	American Legion Post 953 Ball Fields	Village of Forestville	Local Importance	10	Village Center	Recreational	2.8/Middleground	Stationary
21	Village of Forestville Park	Village of Forestville	Local Importance	0	Village Center	Recreational	2.9/Background	Stationary
22	Walnut Falls	Village of Forestville	Other Places for Analysis	0	Village Center	Recreational	2.8/Middleground	Stationary
23	Hawkins Corner	Town of Sheridan	Local Importance	20	Rural Hamlet	Travelers, Local	4.2/Background	Stationary

[9] Potential visibility of nearest turbine is not considered when determining distance.

Table 6 Visual Resource Impact Summary

Map ID	Receptor Name	Municipality	Inventory Type	Approximate Number of Turbines Visible (see Figure 2)	Factors Affecting Visual Impact: Landscape Unit	Viewer/User Group(s)	Distance (miles) /Distance Zone (nearest turbine)[9]	Moving/ Stationary
						residents/workers		
24	Creek Road	Town of Hanover	Other Places for Analysis	10	Rural Agricultural	Local residents/workers	1.6/Middleground	Moving
25	Hill Side Acres (Western NY Land Conservancy)	Town of Arkwright	Local Importance	0	Rural Agricultural	Recreational	2.1/Middleground	Stationary
26	Arkwright Hills Campground	Town of Arkwright	Local Importance	0	Rural Agricultural	Recreational	4.2/Background	Stationary
27	Hamlet of Arkwright	Town of Arkwright	Local Importance	0	Rural Hamlet	Travelers, Local residents/workers	3.4/Background	Stationary
28	Center Road	Town of Arkwright	Other Places for Analysis	29	Rural Agricultural	Local residents/workers	3.4/Background	Moving
29	Round Top Road	Town of Villenova	Other Places for Analysis	25	Rural Agricultural	Local residents/workers	0.3/Foreground	Moving
30	Putnam Road	Town of Arkwright	Other Places for Analysis	21	Rural Agricultural	Local residents/workers	0.9/Middleground	Moving
31	Hamlet of Black Corners	Town of Arkwright	Local Importance	10	Rural Hamlet	Travelers, Local residents/workers	1.8/Middleground	Stationary
32	Farrington Hollow Road	Town of Arkwright	Other Places for Analysis	26	Rural Agricultural	Local residents/workers	1.8/Middleground	Moving
33	NYS Route 83	Town of Arkwright	Local Importance	29	Rural Agricultural	Travelers, Local residents/workers	1.0/Middleground	Moving
34	Hamlet of Griswold	Town of Arkwright	Local Importance	0	Rural Hamlet	Travelers, Local residents/workers	4.2/Background	Stationary
35	Woodside Country Campground	Town of Arkwright	Local Importance	0	Forest Land	Recreational	4.5/Background	Stationary
36	Boutwell Hill State Forest and Overland Trail	Town of Arkwright	Statewide Significance	29	Forest Land	Recreational	3.1/Background	Stationary
37	Hamlet of Town Corners	Town of Arkwright	Local Importance	24	Rural Hamlet	Travelers, Local residents/workers	2.6/Middleground	Stationary
38	Canadaway Creek WMA	Town of Arkwright	Statewide Significance	29	Forest Land	Recreational	2.5/Middleground	Stationary
39	Epolito Road	Town of Sheridan	Other Places for Analysis	0	Rural Agricultural	Local residents/workers	4.4/Background	Moving
40	County Route 72	Town of Villenova	Other Places for Analysis	28	Rural Agricultural	Local residents/workers	0.7/Middleground	Moving
41	South Hill Road	Town of Villenova	Other Places for Analysis	28	Rural Agricultural	Local residents/workers	0.7/Middleground	Moving
42	Hamlet of Hamlet	Town of Villenova	Local Importance	14	Rural Hamlet	Travelers, Local residents/workers	0.7/Middleground	Stationary
43	Pope Hill Road	Town of Villenova	Other Places for Analysis	29	Rural Agricultural	Local residents/workers	0.3/Foreground	Moving
44	Hamlet of Wrights Corners	Town of Villenova	Local Importance	15	Rural Hamlet	Travelers, Local residents/workers	1.2/Middleground	Stationary
45	Hamlet of Balcom	Town of Villenova	Local Importance	20	Rural Hamlet	Travelers, Local residents/workers	1.8/Middleground	Stationary
46	Balcom Corners	Town of Villenova	Local Importance	20	Rural Hamlet	Travelers, Local residents/workers	1.9/Middleground	Stationary

Table 6 Visual Resource Impact Summary

Map ID	Receptor Name	Municipality	Inventory Type	Approximate Number of Turbines Visible (see Figure 2)	Factors Affecting Visual Impact: Landscape Unit	Viewer/User Group(s)	Distance (miles) /Distance Zone (nearest turbine)[9]	Moving/ Stationary
47	NYS Route 322	Town of Villenova	Local Importance	22	Rural Agricultural	Travelers, Local residents/workers	1.9/Middleground	Moving
48	NYS Route 83	Town of Villenova	Local Importance	24	Rural Agricultural	Travelers, Local residents/workers	0.4/Foreground	Moving
49	Pine Valley Central Schools	Town of Cherry Creek	Local Importance	11	Rural Agricultural	Local residents/workers	3.8/Background	Stationary
50	Village of South Dayton - Downtown	Village of South Dayton	Local Importance	13	Village Center	Travelers, Local residents/workers	3.4/Background	Stationary
51	Village of South Dayton Park	Village of South Dayton	Other Places for Analysis	8	Village Center	Recreational	3.5/Background	Stationary
52	Village of South Dayton - Residential	Village of South Dayton	Local Importance	22	Village Center	Local residents/workers	3.4/Background	Stationary
53	Village of South Dayton/Hamlet of Skunks Corner	Village of South Dayton	Local Importance	16	Village Center	Travelers, Local residents/workers	3.2/Background	Stationary
54	Flucker Hill Road	Town of Villenova	Other Places for Analysis	29	Rural Hamlet	Local residents/workers	1.5/Middleground	Moving
55	County Route 93	Town of Hanover	Other Places for Analysis	29	Rural Hamlet	Local residents/workers	1.4/Middleground	Moving
56	Chautauqua County Equestrian Trail	Towns of Charlotte and Cherry Creek	Local Importance	15	Forest Land[10]	Recreational	3.1/Background	Moving

[10] The trail may traverse different landscape units (e.g. Rural Agricultural), similarly to long linear corridors.

3.4 Degree of Project Visibility

3.4.1 Field Observation and Photography

On November 20, 2015 a field crew obtained photographs from many of the locations that were previously simulated[11] and contained in the original VRA. All photographs were taken to document the existing views from the selected resources using a 12.2-mega pixel digital camera with a lens setting of approximately 50mm[12] to simulate normal human eyesight relative to scale. Photographs were taken at various times of the day in order to illustrate how the turbines would be seen under different lighting conditions (e.g. backlit, etc). In doing so, the photographer made every attempt to minimize the effect of glare within the camera's field of view.

The precise coordinates of each photo location were recorded in the field using a handheld global positioning system (GPS) unit. To determine the direction of the Project from each photo location, the precise coordinates of all proposed turbines were pre-programmed into the GPS as a "waypoint."[13] The GPS waypoint direction indicator (arrow pointing along calculated bearing) was used to determine the appropriate bearing for the camera, so that a desired turbine, group of turbines, or Project would be generally centered in the field of view of each photograph.

3.4.2 Photo Simulations

Selection of Key Receptors for Photo Simulation – To illustrate how the turbines will appear within the study area from a variety of distances and locations, 14 representative photo simulations were prepared. These 14 locations are the same as those simulated in the original VRA and were initially chosen for their relevance to the factors affecting visual impact (viewer/user groups, landscape units, distance zones, and duration/frequency and circumstances of view discussed above).

Table 7 Key Receptors Selected for Photo Simulation

Map ID	Receptor Name	Municipality
2	Prospect Road	Town of Villenova
7	Tri-County Country Club	Town of Hanover
8	NYS Route 39	Town of Hanover
13	NYS Thruway (I-90)	Town of Hanover
33	NYS Route 83	Town of Arkwright
36	Boutwell Hill State Forest and Overland Trail	Town of Arkwright
38	Canadaway Creek WMA	Town of Arkwright
42	Hamlet of Hamlet	Town of Villenova
47	NYS Route 322	Town of Villenova
48	NYS Route 83	Town of Villenova
49	Pine Valley Central Schools	Town of Cherry Creek
53	Village of South Dayton/Hamlet of Skunks Corner	Village of South Dayton
54	Flucker Hill Road	Town of Villenova
55	County Route 93	Town of Hanover

Although the original VRA was submitted in 2008, the study area has seen little development (e.g. commercial, residential, etc.). As such, the photo or series of photos that were deemed most appropriate to illustrate the existing conditions was used for each simulated location. This also provided an opportunity to illustrate the Project over multiple seasons.

The locations of simulated views are presented in Appendix A.

[11] Photographs for simulated locations contained within the original VRA were obtained on April 30, 2008 or July 17, 2008.
[12] A Canon digital SLR with a 24-85 millimeter (mm) zoom lens was used for all Project photography. This digital camera, similar to most digital SLR cameras, has a sensor that is approximately 1.6 times smaller than a comparable full frame 35mm film camera. Recognizing this differential, the zoom lens used was set to approximately 31mm to achieve a field-of-view comparable to a 50mm lens on a full frame 35mm camera (31mm x 1.6 = 50mm).

Photo Simulation Methodology – A photo simulation of the Project was prepared from each key receptor location. Photo simulations were developed by superimposing a rendering of a three-dimensional computer model of the Project into the base photograph taken from each corresponding visual resource (see section 3.4.1). The three-dimensional computer model was developed in *Autodesk Civil 3D® and 3D Studio Max Design®* software (3D Studio Max).

Simulated perspectives (camera views) were then matched to the corresponding base photograph for each simulated view by replicating the precise coordinates of the field camera position (as recorded by GPS) and the focal length of the camera lens used (50mm). Precisely matching these parameters assures scale accuracy between the base photograph and the subsequent simulated view. The cameras elevation (Z) value is derived from Digital Elevation Model (DEM) data plus the cameras height above ground level. The camera's target position was set to match the bearing of the corresponding existing condition photograph. With the existing conditions photograph displayed as a "viewport background," and the viewport properties set to match the photograph pixel dimensions, minor camera adjustments were made (horizontal and vertical positioning, and camera roll) to align the horizon in the background photograph with the corresponding features of the 3D model.

The appearance of the turbines is based on the specifications of the turbine with a hub height of 285 feet (87 meters) and a rotor diameter of 413 feet (126 meters).[14] The turbine model was constructed so that the apex of the blade is 492 feet above ground elevation.

To verify the camera alignment, visible elements (e.g. structures, towers, roads) within the photograph are identified and digitized from digital orthophotos. Each element is assigned a Z value (elevation) based on DEM data and then imported to 3D Studio Max. A 3D terrain model is also created (using DEM data) to replicate the existing site topography. The digitized elements are then aligned with corresponding elements in the photograph by adjusting the camera target.

Once the camera alignment is verified, a to-scale 3D model of the Project is merged into the model space. The 3D model of the Project is intended to accurately convey the current design intent. To the extent practicable, and to the extent necessary to reveal impacts, design details of the proposed turbines were built into the 3D model and incorporated into the photo simulation. Consequently, the scale, alignment, elevations and location of the visible elements of the proposed facilities are true to the conceptual design.

With the model in place, a daylight system is created based on the date and time of the photograph. Regional inputs such as time zone and location are also applied to the daylight system. To accurately depict "reflected light" a ground plane utilizing the previously created mesh (based on DEM data) is placed in the scene. This ground plane also portrays any additional shadows cast by the proposed Project. The camera view is then rendered and saved.

The rendered view was then opened using *Adobe Photoshop* software for post-production editing (i.e., airbrush out portion of turbines that fall below foreground topography and vegetation).

[14] Blades will be 190 feet long.

Arms Length Rule – The photo simulations included in Appendix A have been printed using an 11"x17" page format. At this image size, the page should be held at approximately arms length[15] so that the scene will appear at the correct scale. Viewing the image closer would make the scene appear too large and viewing the image from greater distance would make the scene appear too small compared to what an observer would actually see in the field.

For viewing photo simulations at other page sizes (i.e., computer monitor, projected image or other hard copy output) the viewing distance/page width ratio is approximately 1.5/1. For example, if the simulation were viewed on a 42-inch wide poster size enlargement, the correct viewing distance would be approximately 63 inches, or 5 ¼ feet.

Field Viewing – The photo simulations present an accurate depiction of the appearance of proposed turbines suitable for general understanding of the degree and character of Project visibility. However, these images are a two-dimensional representation of a three-dimensional landscape. The human eye is capable of recognizing a greater level of detail than can be illustrated in a two-dimensional image. Agency decision-makers and interested parties may benefit from viewing the photo simulations in the field from any or all of the simulated vantage points. In this manner, observers can directly compare the level of detail visible in the base photograph with actual field observed conditions.

3.5 Character of Project Visibility

3.5.1 Compatibility with Regional Landscape Patterns

The visual character of a landscape is defined by the patterns, forms and scale relationships created by lines, colors, and textures. Some patterns dominate while others are subordinate. The qualitative impact of a Project is the effect the development has on these patterns, and by corollary on, the visual character of the regional landscape.

Existing Landscape – The visible patterns (form, line, color, and texture) found within the Project area can best be described as representative of the agricultural landscape typical of the region. Given the rural nature of the study area, visible colors are natural, muted shades of green, brown, gray, and other earth tones. When viewed from a distance, the landscape maintains a rather uniform and unbroken blending of colors, which tend to fade with hazing of varying atmospheric conditions.

The following describes the compatibility of the Project with regional landscape patterns within which it is contained and viewed. This evaluation is graphically depicted in the photographic simulations provided in Appendix A.

Form – The form of the regional landscape is essentially a planar landscape. The woodland edge of agricultural fields commonly creates a brief vertical offset of the prevailing planar form. The proposed Project will be comprised of 29 thin, tapered vertical structures distributed throughout the landscape; topped with large rotating blades. The introduction of such clearly man-made and kinetic structures creates a noticeable visual disruption of the agricultural landscape.

[15] Viewing distance is calculated based a 39.6-degree field-of-view for the 50mm camera lens used, and the 15.5" wide image presented in Appendix A. "Arm's length" is assumed to be approximately 22.5 inches from the eye. Arm's length varies for individual viewers.

Access roads associated with the Project will generally be visible to the foreground viewer. These roads will be similar to existing unpaved maintenance roads found frequently throughout the VRA study area.

Line – The existing landscape maintains a horizontal line formed by extended vistas over an agricultural plain that often forms the visible horizon. The well-defined vertical form of 29 turbines that may be visible across this plain introduces a contrasting and distinct perpendicular element into the landscape. Views will commonly include multiple turbines at varying distances from the viewer. It is anticipated that the turbines will most commonly be viewed in an off-axis manner creating the appearance of a rather random arrangement.

Color – Generally, the neutral off-white color of the proposed turbine tower, nacelle, and blades will be viewed against the background sky. Under bright conditions when the turbines are front lit (sun behind viewer) the turbines would be highly compatible with the hue, saturation and brightness of the background sky and distant elements of the natural landscape (see Images 1 and 3[16]). However, when turbines are backlit (sun in front of viewer) the shaded side of the turbine will be darker with increased contrast with the background sky (see Image 2). Increasing the distance between the viewer and turbines, and/or periods of increased atmospheric haze or precipitation will reduce the amount of color contrast.

Image 1 - Side lit

Image 2 - Back lit

Image 3 - Front lit

Turbine Color

Texture – The turbines will consist of a tubular style monopole tower, which provides a simple, visually appealing form. However, turbines have a riged, engineered texture that may contrast existing organic textures.

Scale/Spatial Dominance – The proposed turbines will be the tallest visible elements on the horizon and will be disproportionate to other elements (e.g. silos) commonly visible on the regional landscape. From most foreground and middleground vantage points the contrast of the proposed turbines with commonly recognizable features, such as structures and trees, will result in the proposed Project being perceived as a highly dominant visual element. However, when viewed from background vantage points, perceived scale and spatial dominance of the turbines begins to lessen.

[16] Images 1 - 3 are stock images from Saratoga Associates.

3.5.2 Visual Character during the Construction Period

Construction of the proposed wind turbines will require use of large mobile cranes and other large construction vehicles. Turbine components will be delivered in sections via large semi-trucks. The construction period for each turbine is expected to be quite short. As such, construction related visual impacts will be brief and are not expected to result in adverse prolonged visual impact to area residents or visitors.

3.6 Shadow Flicker Analysis

For the purpose of this analysis, shadow flicker shall be defined as:

> *Rotating blades of wind turbines will result in shadows moving across nearby structures and the surrounding landscape. When the repeating change of light intensity falls across a narrow opening, such as a window, it can cause a flicker effect within the structure (hereafter referred to as "receptors"), as the shadow appears to flick on and off. This effect is known as shadow flicker and only occurs within a structure.* [17]

Shadow flicker will only occur when certain conditions coincide. This would include:

- The turbine blades are rotating during daylight hours (sunrise to sunset), as shadow flicker will not occur at night. Also, shadow flicker will not occur when the turbine is not in operation.
- The sun is low in the sky (e.g. shortly after sunrise or shortly before sunset) so that the shadows are cast.
- Shadow-flicker will not occur on foggy or overcast days when daylight is not sufficiently bright to cast shadows.
- A receptor is within ten rotor diameters of the turbine. Evidence from operational turbines suggests that the intensity of shadow flicker is only an issue at short distances. Beyond ten rotor diameters, a person should not perceive a wind turbine to be chopping through sunlight, but rather as an object with the sun behind it. It is generally accepted that shadow flicker will have a minimal to unperceivable affect on properties at a distance greater than ten turbine rotor diameters[18] from the turbine.
- Turbine shadows can enter a structure only through unshaded windows that face the turbine.

Shadow flicker is a quantitative analysis identifying its potential effect within structures, however it should be noted that shadows outside of the structure might also be apparent. Shadow flicker may occur when light passes through vegetation or other structures, but mostly the shadow would be perceived as it moves across the landscape. These shadows are not considered a nuisance since outdoor ambient lighting is typically higher and the shadows rarely contribute to significant changes in light intensity. As such, outdoor impacts are not further evaluated in this analysis.

[17] *Onshore Wind Energy Planning Conditions Guidance Note – A Report for the Renewables Advisory Board and BERR (October 2007).*
[18] *Planning for Renewable Energy - A Companion Guide to PPS22 Queen's Printer and Controller of Her Majesty's Stationery Office 2004.*

Because of constantly changing solar aspect and azimuth, shadows will be cast on specific days of the year and may pass a stationary receptor relatively quickly. Shadow-flicker will not be an everyday event or be of extended duration when it does occur. Additionally, shadow-flicker is most likely to occur during early morning or late afternoon hours, thus specific receptors may experience shadow-flicker, but the occupants of the receptor may either be inactive or absent. For example, receptors such as residential dwellings located to the west of a turbine, will fall within the shadow zone shortly after sunrise when affected residents are typically asleep with shades drawn. Receptors located to the east of a turbine will fall within the shadow zone shortly before sunset (see Figure 4 for typical shadow pattern). In this case, receptors such as schools or office buildings are likely to be unoccupied during this time.

When the rotor plane is in-line with the sun and receptor (as seen from the receptor), the cast shadows will be very narrow (see Image 1), of low intensity, and will move more quickly past the stationary receptor. When the rotor plane is perpendicular to the sun-receptor "view line," the cast shadow of the blades will move within a larger elliptical area (see Image 2).

Image 1 – Aligned Rotor Plane

Image 2 – Perpendicular Aligned Rotor Plane

The distance between a wind turbine and a receptor directly affects the intensity of the shadows cast by the blades, and therefore the intensity of flickering. Shadows cast close to a turbine (e.g. 250 meters from the turbine) will be more intense, distinct and "focused" compared to the same shadow further away (e.g. 1,000 meters from the turbine). This is because a greater proportion of the sun's disc is intermittently blocked. Similarly, flickering is more intense if created by the area of a blade closer to the rotor and further from the tip. Beyond ten (10) rotor diameters the intensity of the blade shadow is considered negligible and at such a distance there will be virtually no distinct chopping of the sunlight.

3.6.1 Shadow Flicker Methodology

The Projects shadow-flicker analysis was conducted using *WindPRO Basis* software (WindPro) and associated shadow module. This is a widely accepted modeling software package developed specifically for the design and evaluation of wind power projects.

3.6.2 Data Input and Assumptions

Variables and assumptions used in calculating shadow-flicker include:

- Terrain – The terrain within the Project area was developed using a digital elevation model (DEM) obtained through the United States Geological Survey in 1/3 arc second resolution

(approximately 10 meters). This data was interpolated and exported at three-meter interval contours for use in WindPro.

- Latitude and Longitude – WindPro considers the azimuth and altitude of the sun in relation to the proposed turbine. For this analysis, the Project coordinates were specified by using Universal Transverse Mercator coordinate system (UTM) North American Datum (NAD) 83 Zone 18 (reflecting the appropriate zone for this region of New York).
- Turbine Dimensions and Blade Rotation Speed – Each turbine was modeled using the dimensions of a Vestas V126-3.45. That is, the analysis assumed a hub height of 285 feet (87 meters) and a rotor diameter of 413 feet (126 meters). The frequency of flickering is directly related to the rotor speed and number of blades on the rotor. The shadow flicker analysis assumed a three-bladed wind turbine rotating at 16.3 revolutions per minute (RPM), which is the maximum operating speed of the Vestas V126-3.45 turbine.
- Sun Coverage – Shadow flicker will occur when more than 20 percent of the sun is blocked by the turbine blade. Less than 20 percent will not result in a noticeable shadow.
- Sun Angle – The angle of the sun over the horizon will be at least three (3) degrees. A lower angle will result in the light passing through atmosphere becoming too diffused to form a coherent shadow.[19]
- Receptor Locations – Locations of structures (referred to as "receptors"), within the Project area, were provided to Saratoga Associates. The location of each receptor is shown in Figures 5 and 6. The shadow flicker analysis was conducted for all receptors located within a 4,134-foot (1,260-meters or 0.78 miles) radius of each proposed turbine. Within this distance 241 residential locations were identified.
- Receptor Windows – It was conservatively assumed that every receptor had windows (one meter by one meter) one meter above ground, in all directions. WindPro refers to this as the "Green house" mode.
- Sunshine probabilities (percentage of time from sunrise to sunset with sunshine) – The WindPro model calculated shadow frequency based on monthly sunshine probabilities. The following sunshine probabilities were used for this analysis and are on historic meteorological data for Buffalo, New York (closest major metropolitan area to the Project).[20]

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
31%	38%	46%	51%	56%	65%	67%	64%	57%	50%	29%	27%

- Operational Time/Rotor Orientation – The WindPro model assumes there will be no shadow flicker during calm winds (when the blades are not turning). Moreover, the orientation of the rotor (e.g., determined by wind direction) affects the size of a shadow cast area. To more accurately calculate the amount of time a shadow will be over a specific location (based on rotor orientation), the WindPro model considers typical wind direction. The following operational time (hours per year [hrs/yr]) of wind direction is based on collected meteorological data provided by Ball Hill Wind Energy, LLC :

[19] WindPro (EMD International A/S).
[20] http://www.ncdc.noaa.gov/ (Data for Buffalo, NY. Website last accessed on 11/15/15.)

N	NNE	ENE	E	ESE	SSE	S	SSW	WSW	W	WNW	NNW
491	399	331	246	272	482	1,169	1,032	1,059	1,395	1,179	705

Using these variables, WindPro was used to calculate the theoretical number of hours per year the shadow of a rotor would fall at any given location within the 4,134-foot turbine radius. This calculation includes the cumulative sum of shadow hours for all turbines and is accurate to a 10-meter grid cell resolution. Providing cumulative hours for a receptor does not take into account activities within the dwelling (i.e. rooms of primary use and enjoyment versus less frequently occupied rooms) or account for the direction/location of windows. Figure 5, illustrates the geographic area of cumulative shadow impact using the following increments:

- 0-2 hrs/yr;
- 2-10 hrs/yr;
- 10-20 hrs/yr;
- 20-30 hrs/yr;
- 30-40 hrs/yr; and
- 40+

WindPro does not have the capability to incorporate the possible screening effect of existing vegetation. To account for this condition, a second shadow limit map was prepared excluding areas determined through viewshed analysis to be screened from turbine visibility by existing vegetation. This vegetated condition shadow limits map, although not considered absolutely definitive, identifies the geographic area within which one may expect to have a potential for screening from turbine shadows by intervening forest vegetation. Figure 6, illustrates the geographic area of cumulative shadow impact including the screening effect of existing vegetation.

3.6.3 Shadow Flicker Impact on Existing Structures

There are 241 existing structures located within a 4,134-foot radius of the proposed turbines. These structures were identified through a combination of air-photo interpretation and field verification. Each existing structure was evaluated to determine potential shadow impact. Table 8 summarizes the number of hours per year each inventoried structure would theoretically fall within the shadow zone of one or more proposed turbine. The location of inventoried structures is included in Figure 5 and Figure 6.

Table 8 Shadow Flicker Summary

Map ID*	Maximum Potential Shadow Hours per Year[21]	Does the Receptor Have Visibility of the Project?[22]	Map ID*	Maximum Potential Shadow Hours per Year	Does the Receptor Have Visibility of the Project?
1	18:32	No	67	11:52	Yes
2	15:45	Yes	68	37:09	Yes
6	0:00	Yes	72	0:00	No
7	0:000	Yes	73	0:00	Yes
8	0:59	Yes	74	4:22	No
10	3:06	Yes	75	12:21	Yes
11	2:45	No	76	28:06	Yes
12	8:58	No	77	37:39	Yes
13	6:32	Yes	95	8:33	Yes
14	27:51	Yes	96	1:43	Yes
15	30:27	Yes	97	3:58	Yes
16	15:35	Yes	98	20:46	Yes
17	11:34	No	99	20:25	Yes
18	10:10	Yes	102	5:17	Yes
19	5:12	Yes	103	7:06	Yes
20	6:45	Yes	106	13:24	Yes
21	7:10	Yes	110	0:50	No
22	4:29	Yes	111	1:14	Yes
23	0:00	Yes	112	0:00	Yes
24	0:00	Yes	113	1:03	Yes
25	0:00	Yes	114	0:22	Yes
26	2:05	Yes	115	0:50	Yes
28	11:06	Yes	116	4:53	Yes
29	8:47	Yes	117	1:31	Yes
30	29:52	Yes	118	3:52	Yes
32	8:23	No	119	6:23	No
33	27:54	No	120	14:43	Yes
34	18:57	No	122	3:48	Yes
35	15:53	No	123	9:38	Yes
36	16:31	No	124	19:10	Yes
37	25:38	Yes	125	5:12	Yes
38	13:37	No	126	12:35	Yes
39	4:13	Yes	127	25:38	Yes
40	9:44	No	128	28:42	Yes
48	4:42	Yes	129	26:53	Yes
65	0:00	Yes	131	39:36	Yes
66	0:00	Yes	132	37:47	Yes

[21] Hours based on topography only.
[22] Visibility based on topography and vegetation viewshed data used for Figure 2.

Table 8 Shadow Flicker Summary

Map ID*	Maximum Potential Shadow Hours per Year[21]	Does the Receptor Have Visibility of the Project?[22]	Map ID*	Maximum Potential Shadow Hours per Year	Does the Receptor Have Visibility of the Project?
133	20:56	Yes	188	39:20	Yes
134	17:33	Yes	189	43:10	Yes
136	40:19	Yes	190	30:14	Yes
137	36:28	Yes	191	31:31	Yes
138	18:36	Yes	193	31:45	Yes
140	5:17	Yes	194	29:11	Yes
141	7:58	No	195	7:10	Yes
142	14:48	Yes	197	6:27	Yes
143	7:49	Yes	198	12:01	Yes
144	6:30	Yes	199	13:47	Yes
145	10:48	Yes	200	23:20	Yes
146	10:10	Yes	201	30:06	Yes
147	21:16	Yes	203	20:05	Yes
148	14:24	No	204	22:23	Yes
149	2:10	No	206	23:29	Yes
159	5:51	Yes	207	9:15	Yes
161	8:14	Yes	208	1:54	Yes
162	7:54	Yes	209	2:36	Yes
164	31:47	Yes	210	5:01	Yes
165	29:57	Yes	211	15:02	Yes
167	34:42	Yes	212	21:59	Yes
168	22:26	Yes	213	20:05	Yes
169	17:27	No	214	4:06	Yes
170	12:51	Yes	215	2:48	Yes
171	0:00	No	216	3:17	No
172	1:57	Yes	217	1:04	Yes
173	0:54	Yes	218	1:32	Yes
174	10:00	Yes	219	1:50	Yes
175	7:40	Yes	220	7:08	Yes
176	6:49	Yes	222	4:00	Yes
178	0:00	Yes	228	2:52	Yes
179	0:00	No	229	7:19	Yes
180	0:00	Yes	230	17:07	Yes
181	0:00	Yes	231	22:18	Yes
182	1:22	Yes	232	17:18	No
183	10:23	Yes	236	9:23	No
184	39:30	Yes	237	8:47	Yes
185	13:16	Yes	238	10:11	Yes
186	25:59	Yes	240	28:17	Yes
187	51:29	Yes	241	0:12	Yes

Table 8 Shadow Flicker Summary

Map ID*	Maximum Potential Shadow Hours per Year[21]	Does the Receptor Have Visibility of the Project?[22]	Map ID*	Maximum Potential Shadow Hours per Year	Does the Receptor Have Visibility of the Project?
243	7:08	Yes	283	0:00	Yes
244	21:46	Yes	284	0:00	Yes
245	0:00	No	285	0:00	Yes
246	4:43	No	286	0:00	Yes
247	4:03	Yes	287	0:00	Yes
248	2:05	Yes	288	0:00	Yes
249	4:00	Yes	289	0:00	Yes
250	4:22	Yes	290	0:00	Yes
251	29:27	Yes	291	0:00	Yes
252	39:32	Yes	292	0:00	Yes
253	42:47	Yes	293	0:00	No
254	21:35	Yes	294	0:00	Yes
255	28:38	Yes	295	0:00	Yes
256	3:49	Yes	296	0:00	Yes
257	8:20	Yes	297	0:00	Yes
258	10:40	Yes	298	0:00	Yes
259	9:58	Yes	299	0:00	Yes
260	18:15	No	300	0:00	Yes
261	21:09	Yes	301	0:00	Yes
262	5:55	Yes	302	0:00	Yes
263	10:58	No	303	0:00	Yes
264	16:29	No	304	0:00	Yes
265	16:41	Yes	305	0:00	Yes
266	35:14	Yes	306	0:00	Yes
267	21:33	Yes	307	0:00	Yes
268	23:00	No	308	0:00	No
269	0:00	No	309	0:00	Yes
270	1:29	No	310	0:00	Yes
271	5:48	Yes	311	0:00	Yes
272	11:49	Yes	312	0:00	Yes
273	10:08	No	313	0:00	Yes
274	24:20	Yes	314	0:00	Yes
275	0:00	Yes	315	0:00	Yes
276	0:00	Yes	316	0:00	Yes
277	8:06	No	317	0:00	Yes
278	34:11	Yes	318	0:00	Yes
279	13:27	Yes	319	7:00	Yes
280	42:02	Yes	320	10:36	No
281	0:00	Yes	321	9:54	Yes
282	0:00	No	322	2:41	Yes

Table 8 Shadow Flicker Summary

Map ID*	Maximum Potential Shadow Hours per Year[21]	Does the Receptor Have Visibility of the Project?[22]	Map ID*	Maximum Potential Shadow Hours per Year	Does the Receptor Have Visibility of the Project?
323	1:42	Yes	325	6:21	Yes
324	19:59	No	326	9:06	Yes
			327	6:15	No

* The numbering system used for identifying shadow flicker receptors is different from those numbers identifying visual resources. Receptor ID's shown on Figures 5 and 6 are out of sequence in order to reference those clearly identified as structures from previous evaluations. Additional or relocated ID points are also included in this analysis.

Based on the expected values (topography only) of the 241 studied receptors located within 4,134-feet of any turbines:

- 57 (23.6%) will theoretically not be impacted;
- 18 (7.5%) will theoretically be impacted 0-2 hrs/yr;
- 69 (28.6%) will theoretically be impacted 2-10 hrs/yr;
- 43 (17.8%) will theoretically be impacted 10-20 hrs/yr;
- 32 (13.3%) will theoretically be impacted 20-30 hrs/yr;
- 17 (7.1%) will theoretically be impacted 30-40 hrs/yr; and
- 5 (2.1%) will theoretically be impacted 40+ hrs/yr.

There are 22 receptors that will theoretically be impacted more than 30 hours per year, including:

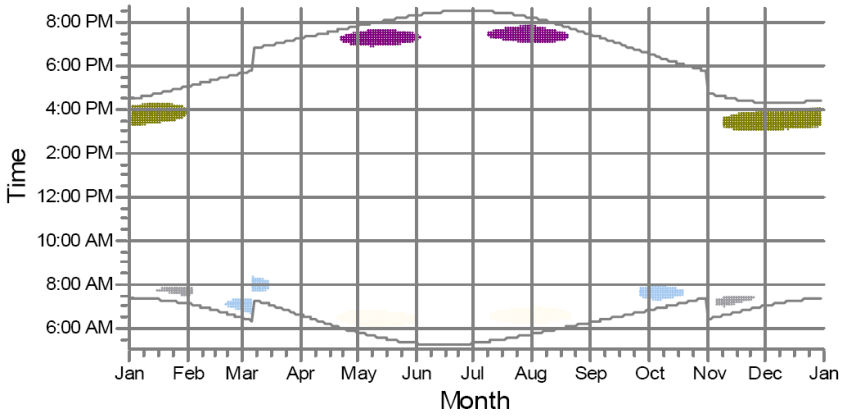
- Receptor 15 (30:27 hours)
- Receptor 68 (37:09 hours)
- Receptor 77 (37:39 hours)
- Receptor 131 (39:36 hours)
- Receptor 132 (37:47 hours)
- Receptor 136 (40:19 hours)
- Receptor 137 (36:28 hours)
- Receptor 164 (31:47 hours)
- Receptor 167 (34:42 hours)
- Receptor 184 (39:30 hours)
- Receptor 187 (51:29 hours)
- Receptor 188 (39:20 hours)
- Receptor 189 (43:10 hours)
- Receptor 190 (30:14 hours)
- Receptor 191 (31:31 hours)
- Receptor 193 (31:45 hours)
- Receptor 201 (30:06 hours)
- Receptor 252 (39:32 Hours)
- Receptor 253 (42:47 hours)
- Receptor 266 (35:14 hours)
- Receptor 278 (34:11 hours)
- Receptor 280 (42:02 hours)

Of those receptors that exceed 30 hours all are expected to have views of the Project. In addition, based on the data presented in Table 8, 39 of the 241 receptors will not have visibility of the Project. It is anticipated that those receptors without a view of the Project will not be impacted or will have reduced potential for impact from the shadow caused by the turbines.

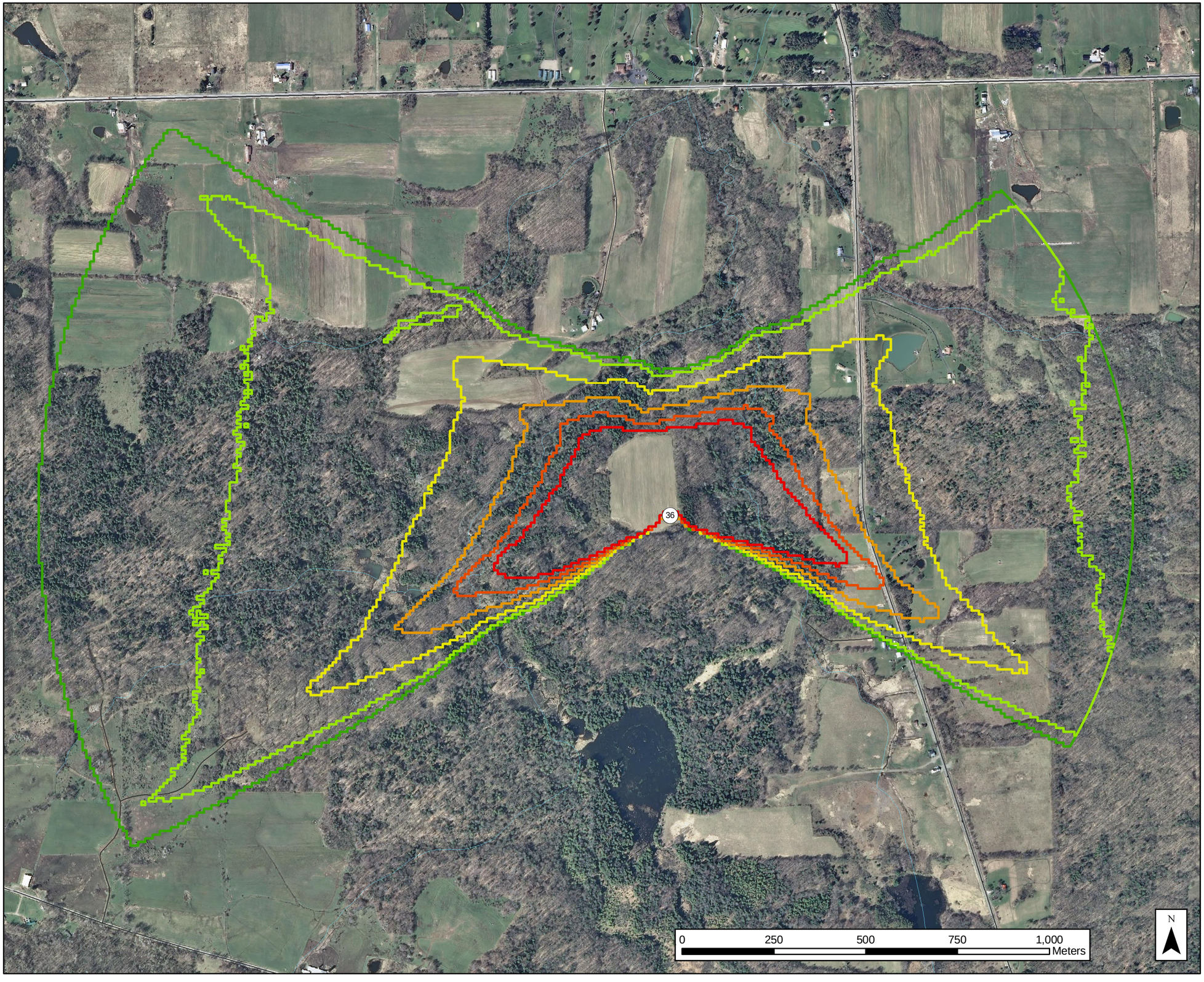
Included below is a graph, generated by WindPro, illustrating the general times of the day and year that shadows are likely at Receptor 187, which has the highest expected duration of shadow flicker. The graph does not include potential adjustments for sunshine probability[23], vegetative screening, or Project operating hours that may occur from year to year. Actual average hours therefore may be less than this graph shows, but the graph is useful because it illustrates when the shadows are physically possible to occur.

Receptor 187 – Shadow flicker is possible at this location during (i) mid January through early February between 7:45 AM and 8:00 AM and again early November through late November between 7:00 and 7:45 AM from turbine 12; (ii) early November through late January between 3:15 PM and 4:15 PM from turbine 13; (iii) early May through early August between 7:00 PM and 8:00 PM from turbine 14; (iv) late February through the beginning of March between 6:45 AM and 7:30 AM, beginning of March to mid March between 7:45 AM and 8:15 AM, and again from late September through mid October between 7:30 AM and 8:00 AM from turbine 19; and (v) mid April through mid May and again from late July through late August between 6:00 AM and 7:00 AM from turbine 20.

Potential Time and Duration of Shadow Flicker at Receptor 187



[23] The average amount of sunshine will change yearly.



TYPICAL SHADOW PATTERN FROM TURBINE 36

Ball Hill Wind Project

Figure 4
July 2016

KEY

36 Proposed Wind Turbine

Shadow Hours Per Year

- Less than 2
- 2 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- Greater than 40

PROJECT # 2015 - 15039.10

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File Location: B:\2015\15039\Maps\Flicker160602\FlickerTypicalPattern.mxd

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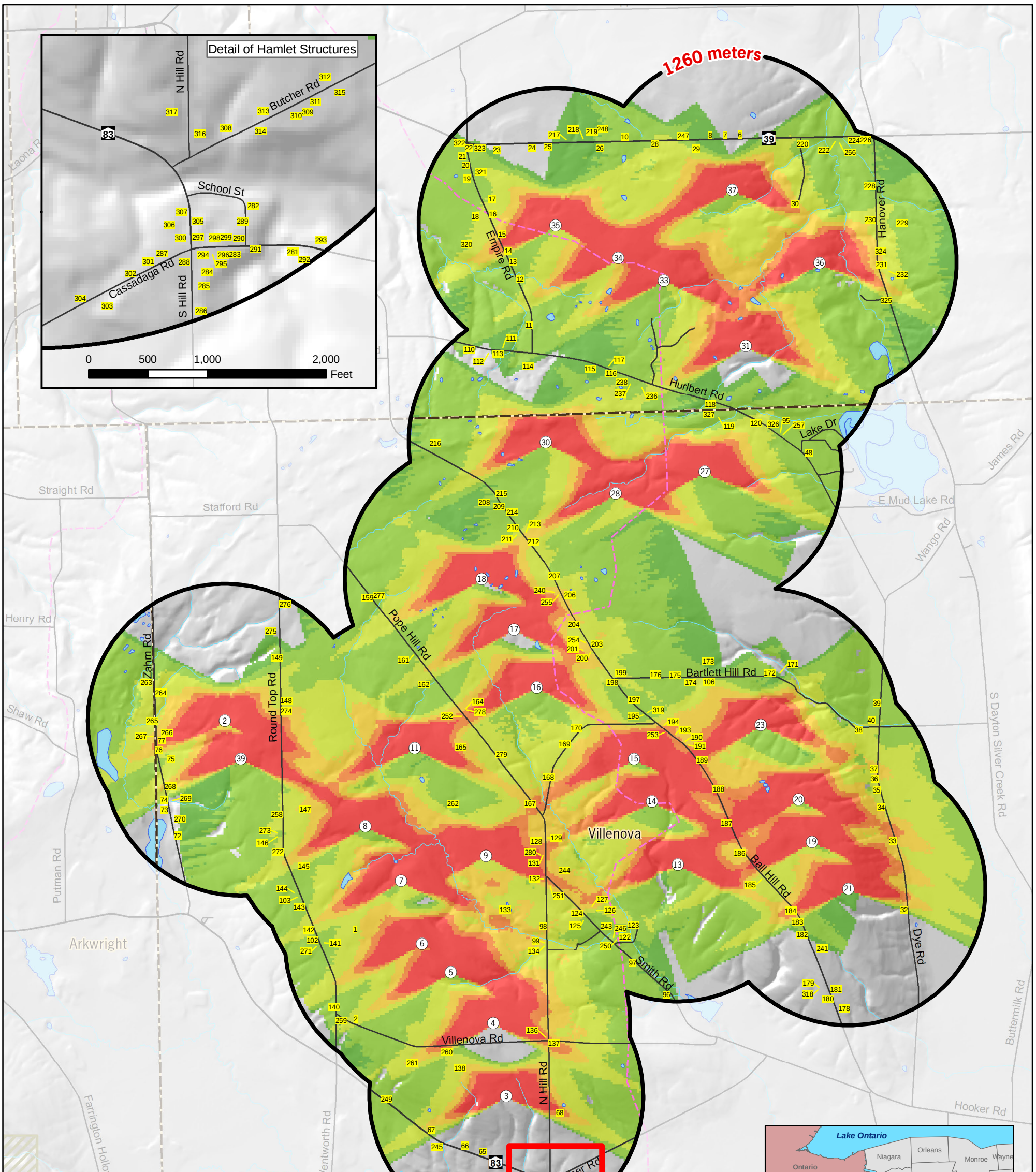

TOPOGRAPHIC SHADOW FLICKER ANALYSIS

Ball Hill Wind Project

Figure 5
July 2016

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect June 2, 2016 layout.

KEY

- ① Proposed Wind Turbine
- 248 Structure
- Snowmobile Trail
- Municipal Boundary
- Water Body
- State Forest
- Wildlife Management Area

Shadow Hours Per Year

- Less than 2
- 2 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- Greater than 40

PROJECT # 2015 - 15039.10

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File Location:
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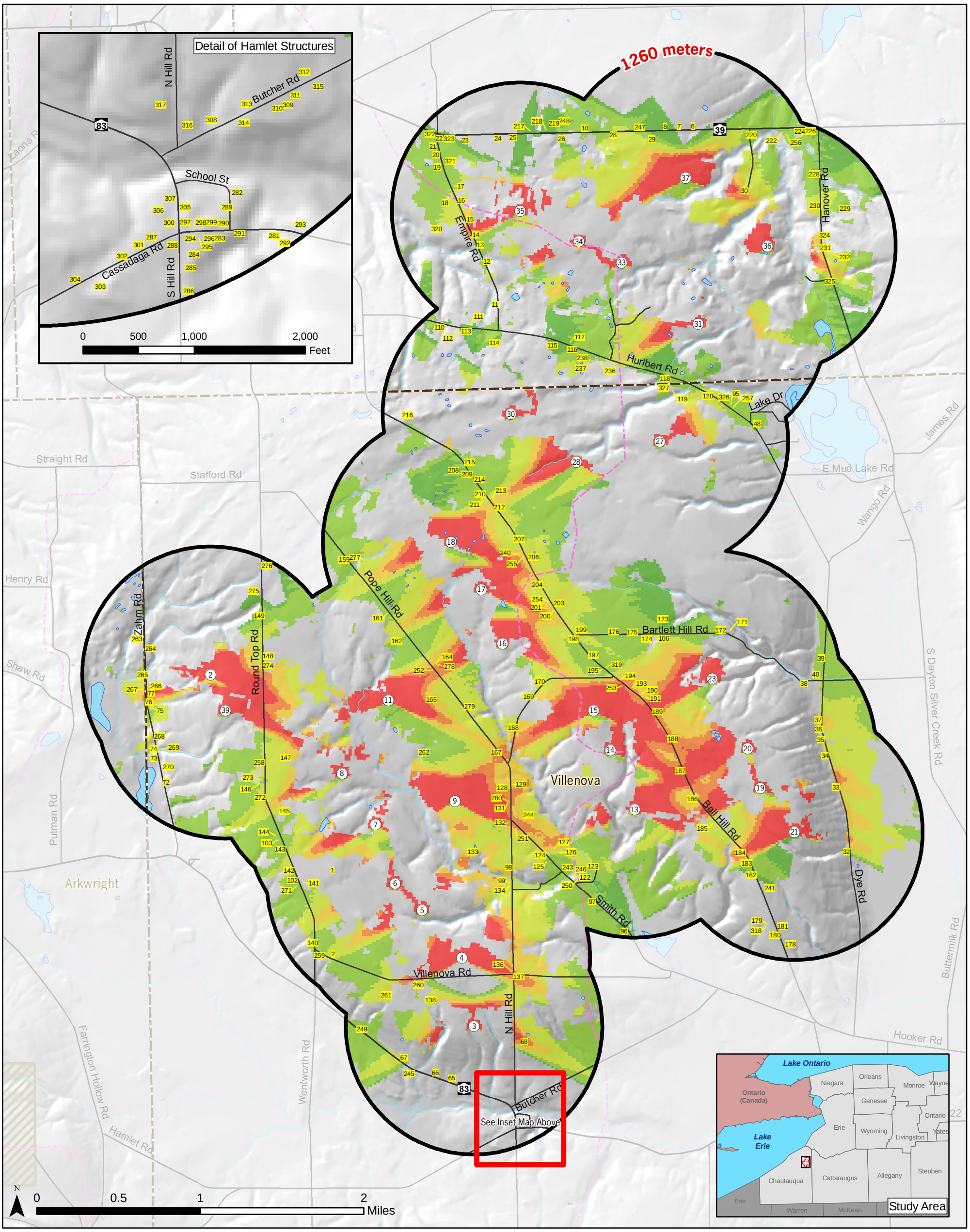

VEGETATED SHADOW FLICKER ANALYSIS*

Ball Hill Wind Project

*Assumes 40 foot (12.192 m) vegetation height in areas considered forested by the 2011 National Land Cover Dataset

Figure 6
July 2016

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect June 2, 2016 layout.

KEY

- ① Proposed Wind Turbine
- 248 Structure
- Snowmobile Trail
- Municipal Boundary
- Water Body
- State Forest
- Wildlife Management Area

Shadow Hours Per Year

- Less than 2
- 2 - 10
- 10 - 20
- 20 - 30
- 30 - 40
- Greater than 40

PROJECT # 2015 - 15039.10

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3.7 Cumulative Analysis

A cumulative analysis of the Project and the proposed Arkwright Summit Wind Farm and Cassadaga Wind Project was completed as part of this study.

The proposed Arkwright Summit Wind Farm (Arkwright Summit Wind Farm, LLC) is located within the Project's five-mile study area and consists of 38 2.0/2.2 MW turbines that are generally bounded by Straight Road to the north, Livermore Road/Ruttenbur Road to the east, CR 72 to the south, and Miller Road/Park Road to the west.

The proposed Cassadaga Wind Project (EverPower Wind Holdings, Inc.) is partially located within the Projects five-mile study area and consists of up to 62 3.0 MW turbines. The 23 turbines located within the study area are generally bound by Dybkas Road to the north, Dawson Road to the east, West Road to the south, and Rood Road to the west.

The cumulative analysis of these three (3) proposed projects includes a vegetated viewshed map and two (2) simulations.[24]

3.7.1 Cumulative Viewshed

A cumulative viewshed map (Appendix B – Figure B1) was created to show where there was a possibility to see the Project as well as the proposed Arkwright Summit Wind Farm and Cassadaga Wind Project from a specific location within the Projects five-mile study area.

The viewshed map, based on topography and vegetation, follows the same methodology discussed in section 3.1.1, above. The heights used for the cumulative viewshed map are:

- Ball Hill Wind Project (29 turbines) – 492-foot blade tip height (same height in Figures 1 and 2);
- Arkwright Summit Wind Farm (38 turbines including 2 alternative locations) – 492-foot blade tip height; and
- Cassadaga Wind Project (62 turbines) – 540-foot blade tip height.

Within the Projects five-mile study area, the potential visibility of the three (3) wind projects was further quantified to illustrate the number of turbines that may be visible from the previously identified sensitive resources and any given area. This cumulative degree of visibility is summarized on Table 9.

3.7.2 Viewshed Analysis

Based on Table 9 the total cumulative visibility of the proposed wind projects is approximately 40,645 acres. When compared to the viewshed completed for the Ball Hill Wind Project this is an increase of 8,015 acres. Theoretically, as the result of the two (2) adjacent wind projects, one (1) or more turbines would be visible from approximately 40.2% of the entire five-mile Project study area (comprised of 101,017 acres).

[24] Cumulative shadow-flicker analysis is not included.

The introduction of additional turbines within the same viewshed will increase the number of structures visible from many affected vantage points – thus creating a potential higher density of visible turbines. Viewer position is an important factor influencing which of the projects might be visible, or the number of total turbines within view. It is also possible that the adjacent projects may not be visible in a single field of view.

Table 9 Cumulative Viewshed Coverage Summary

	Vegetation and Topography Viewshed (Figure B1 - Cumulative Vegetated Viewshed Analysis)	
	Acres*	**Percent of Study Area**
No Structures Visible	60,372	59.8%
1-5 Structures Visible	5,420	5.2%
6-10 Structures Visible	4,613	4.5%
11-15 Structures Visible	3,604	3.6%
16-20 Structures Visible	2,937	2.9%
21-30 Structures Visible	4,744	4.6%
31-45 Structures Visible	6,442	6.4%
46-60 Structures Visible	5,436	5.4%
61-75 Structures Visible	3,853	3.8%
76-90 Structures Visible	2,338	2.3%
91-110 Structures Visible	862	0.9%
111-129 Structures Visible	576	0.6%
Total	101,017	100.0%

* Acreage quantities are rounded to nearest whole number and percentages are rounded to the nearest tenth.

As previously discussed, several factors suggest that actual visibility of the projects from many areas within the study area may be further reduced

3.7.3 Photo Simulations

Selection of Key Receptors for Photo Simulation – The specific location of the two (2) simulation locations was chosen for their relevance to the factors affecting visual impact (e.g. viewer/user groups, landscape units, distance zones and duration/frequency). Table 10 lists the key receptors selected for photo simulation.

Table 10 Key Receptors Selected for Cumulative Photo Simulation

Map ID	Receptor Name	Municipality
33	NYS Route 83	Town of Arkwright
54	Flucker Hill Road	Town of Villenova

All cumulative photo simulations are presented in Appendix B.

3.8 115 kV Transmission Line

The Project will require the construction of an approximately 5.8-mile 115 kV transmission line. The proposed transmission line will include a new substation, switchyard, and 60 new tangent and angle structures (i.e. transmission towers).

Although the route of the transmission line has not been finalized, a proposed route has been reviewed for this study with technical guidance from Ball Hill Wind Energy, LLC. The line will start at a new 175 by 290 foot substation located about 800 feet north of Hurlbert Road, east of Empire Road, in the Town of Hanover. The substation will then tie into a new115 kV transmission line placed on structures varying in height from 70 to 75 feet.[25] These structures will have an appearance of wood as they will be constructed using wood or metal that will be allowed to oxidize so that they will appear similar to the color of wood. All structures will be located within a permanent 80-foot Right-of-Way[26] (ROW) as it continues in a northerly direction terminating at a switchyard. From the switchyard, the line will be connected to an existing transmission line owned and operated by National Grid (photo to the right) located southeast of the Stebbins and Bennett State Road intersection.

Existing Transmission Line

The basic components of the substation and switchyard generally consist of a main transformer (substation only), a control house, capacitor banks, high voltage bus work, outdoor circuit breakers, relaying equipment, metal clad switchgear, steel support structures, an underground grounding grid, and overhead lightning suppression conductors. It is anticipated that the substation will be similar in characteristic to the built Bliss Windpark substation (photo to the right).

The transmission line will, along certain segments of the new ROW, require vegetation clearing. Although trees along the ROW will be permanently cleared so that they will not interfere with the transmission line once it is operational, the ROW will be allowed to return to a partial vegetative state (low scrub/shrub or agricultural crops).

Substation Example

3.8.1 Transmission Line Viewshed

To calculate the maximum area of potential visibility, one (1) control point was established at the high point for each of the 60 structures located between the proposed substation and switchyard. The resulting viewsheds identify the geographic area within a three-mile radius where some portion of the

[25] Actual structure heights and locations will vary based on final siting/design.
[26] A temporary 12-foot ROW will be used during construction.

proposed transmission line is theoretically visible based on intervening topography and/or existing mature vegetation (Appendix C – Figures C1 and C2).

3.8.2 Viewshed Analysis

Table 11 and Figure C2 illustrates that one (1) or more of the proposed transmission structures will theoretically be visible from approximately 23.1 percent of the three-mile radius, and that approximately 76.9 percent of this area will likely have no visibility of any of the structures when considering the vegetated viewshed. Visibility is most common from properties adjacent or in close proximity to the proposed transmission line, as well as areas to the north, east, and west. Visibility will also be evident from agricultural uplands with cleared lands and down slope vistas in the direction of the proposed transmission line.

Table 11 Transmission Line Viewshed Coverage Summary

	Topography Only Viewshed (Figure C1 – Transmission Line Topographic Viewshed)		**Vegetation and Topography Viewshed** (Figure C2 – Transmission Line Vegetated Viewshed)	
	Acres	**Percentage of Study Area**	**Acres**	**Percentage of Study Area**
No Structures Visible	12,595	32.3%	30,047	76.9%
1-5 Structures Visible	2,370	6.1%	2,502	6.4%
6-10 Structures Visible	1,552	4.0%	1,352	3.5%
11-15 Structures Visible	1,592	4.1%	1,083	2.7%
16-20 Structures Visible	2,000	5.1%	669	1.7%
21-35 Structures Visible	4,303	11.0%	1,547	4.0%
36-50 Structures Visible	5,984	15.2%	1,361	3.5%
51-56 Structures Visible	8,652	22.2%	489	1.3%
Total	39,048	100.0%	39,048	100.0%

*Table 11 and Figure C1 illustrate that one (1) or more structures are theoretically visible from approximately 67.7 percent of the three-mile radius. However, as discussed above, this unrealistic treeless condition analysis is used only to identify the maximum potential geographic area within which further investigation is appropriate. This viewshed is not representative of the anticipated geographic extent of visibility and is not intended for public interpretation. Acreage is rounded to the nearest whole number.

As shown on the vegetated viewshed, there is potential for high visibility along roadways located within the northern half of the 3-mile study area. Open views of the proposed transmission line will be available from many roadways where roadside vegetation is lacking. These roadways include, but are not limited to, the NYS Thruway (I-90), Hanover Road, County Route 89, Bennett State Road, and King Road. Many of these views may be fleeting and short in duration as viewers pass in vehicles. The proposed transmission line will bisect five (5) roadways including, NYS Route 39, with structures located in close proximity and on both sides of the roadways.

Viewers within close proximity to the proposed transmission line will notice that structures will frequently appear and disappear behind intervening foreground landform and vegetation as they move about the study area.

Viewshed mapping also shows that there is a potential for visibility of the structures within the Villages of Forestville and Silver Creek. Based on field investigations, it is anticipated that visibility would be substantially reduced by the relatively long distance between the village and the proposed

transmission line, the generally low/slim profile of the proposed structures, and screening such as structures and localized vegetation,

3.8.3 Photo Simulations

Selection of Key Receptors for Photo Simulation – Two (2) photo simulations were prepared to show how the proposed transmission line would appear in the landscape. The locations were selected within close proximity to the transmission line so that visibility of the slender transmission structures would be the greatest. Table 12 lists the key locations selected for photo simulation.

Table 12 Key Locations Selected for Photo Simulation

Map ID	Receptor Name	Municipality
T1	NYS Route 39	Town of Hanover
T2	King Road	Town of Hanover

The appearance and spacing of the structures is based on information provided by Ball Hill Wind Energy, LLC. All transmission line photo simulations are presented in Appendix C.

4.0 MITIGATION PROGRAM

Professional Design

- Proposed turbines will not be used for commercial advertising, or include conspicuous lettering or corporate logos identifying the Project owner or equipment manufacturer.
- Roads should be designed to generally follow topographic contours to minimize cut and fill and will be located in agricultural lands to the greatest extent possible to minimize vegetative cuts.
- The architectural style of the operations/maintenance structure should be similar to area structures. Concrete block construction and façade should be avoided.
- Fencing around the operations and maintenance building should be limited to only those areas needed for safety.
- Ball Hill Wind Energy, LLC will maximize to the extent possible the subsurface routing of electrical interconnects used to transmit power from between turbine locations.

Screening

- Considering the proposed Project includes 29 wind turbines that will be visible over a wide viewshed area, traditional treatments such as fences, earthen berms and vegetative screening cannot be applied in an effective manner to screen these major structures.
- Visibility of the proposed substation should be screened from the public right-of-way and non-participating landowners utilizing perimeter plantings. A mix of evergreen and deciduous plant materials should be used.
- Building foundation and perimeter plantings should be included in the development plans of the operations/maintenance building. Perimeter plantings should be used to screen service yard and other storage areas the public right-of-way and non-participating landowners. A mix of evergreen and deciduous plant materials should be used.
- Vehicles and areas of the storage yard located at the operations/maintenance building identified for long-term storage should be screened from non-participating parcels and roadways.
- Residences may utilize window shades or strategically placed vegetation in the event shadows cast by the turbines become a nuisance.

Project Siting/Relocation

- The proposed Project is located in the Towns of Villenova and Hanover for the following reasons:
  - Favorable elevation and exposure of the Project area which is well suited for receiving prevailing winds;
  - Reliable winds that meet the necessary criteria for a commercially viable wind energy project; and
  - The relatively low population of the Project area.

By their very nature, modern wind energy projects are large and highly visible facilities. The need to position wind turbines in areas of higher elevation cannot be readily avoided. Given the necessary scale of wind energy turbines and the number of turbines required for a sustainable project, there is no opportunity to substantially relocate the Project or any of its components to other sites in the Towns where it would be significantly less visible.

- Proposed turbines will maintain a minimum setback from residential structures. Such separation of uses assures maximum screening benefit of existing woodland vegetation, where such exists, and minimizes the potential for extended duration shadow flicker on nearby residences.
- Vegetation clearing along the transmission line ROW as well as around the base of the turbines and other project components should be kept to a minimum, however it should not impede operation.

Camouflage/Disguise

- As mandated by the FAA for aviation safety, the color of the blades, nacelle, and tower will be a neutral off-white.
- Utilizing wood or steel poles that oxidize to a brownish color for the transmission structures (not including the substation and switchyard), the color and materials of the structures will be compatible with the surrounding landscape.

Low Profile/Downsizing

- The profile of the wind turbines is dictated by operational efficiency. Because wind turbine power extraction is a function of the cube of wind speed (relatively large increases in power from small increases in wind speed), the height of a tower plays an important role in overall energy production. Reducing the height of the turbines to a meaningful degree would substantially reduce the amount of energy produced rendering the development of the Project impractical or would require constructing a greater number of smaller units to be economically viable.
- The shortest and fewest possible number of transmission poles should be used.

Alternate Technologies

- Wind energy itself is an alternative to traditional energy sources. Meaningful development of renewable wind energy will reduce reliance on fossil fuel combustion and nuclear fission facilities and result in reduction in air pollutants and greenhouse gasses.
- Alternative turbines have been considered (see Section 1.3 of the SDEIS) for this Project. While smaller turbines might be marginally less visible, a greater number would be required to provide the same energy output, resulting in increased visual impacts from higher blade rotation rate and a greater number of turbines within view. Likewise, a fewer number of larger wind turbine generators would require turbines of increased height and/or rotor diameter which would be more prominent in the landscape. Visually, a change in the height or number of turbines may provide a minimal benefit at a particular receptor, but it would do little to change the overall impact of the Project on the regional landscape.

Lighting

- Due to the height of the proposed turbines, the Federal Aviation Administration requires red flashing aviation obstruction lighting be placed atop the nacelle on approximately 22 of the 29 turbines to assure safe flight navigation in the vicinity of the Project. This federally mandated safety feature cannot be omitted or reduced. If appropriate, alternative approved FAA lighting options will be evaluated to determine if they can minimize the visual impact within the study area.
- Lighting for the substation/switchyard should be down firing, motion triggered, and task oriented (e.g. maintenance and emergency). Appropriate light shields should be used to minimize light trespass on neighboring properties or roadways.

Maintenance

- How a landscape and structures in the landscape are maintained has aesthetic implications to the long-term visual character of a project. Ball Hill Wind Energy, LLC places a high priority on facility maintenance, not only for operational purposes, but for aesthetic appearance as well. Recognizing that its public image will be directly linked to the outward appearance of its facilities and desiring to be a welcomed member of the community, Ball Hill Wind Energy, LLC will implement a strict policy of maintenance, including materials and practices that ensure a clean and well-maintained appearance over the full life of the facility.

Decommissioning

- The lifespan of the primary Project components is approximately 20 years. The wind turbines could be repaired indefinitely to extend their useful life. However, it is likely that advancements in technology within this time will make upgrades or replacement of the turbines a more attractive alternative. However, in the unlikely event that the site is to be abandoned, Ball Hill Wind Energy, LLC has developed a draft Decommissioning Plan which is included in the SDEIS as Appendix N. The Decommissioning Plan for the Project includes detailed cost estimates for the removal of Project components to a depth of four feet below grade. This will include the wind turbines, including the tower, nacelle, transformer, electrical components, concrete foundations, and maintenance roads. The Plan also describes the specific steps that will be taken in removing the wind turbines, including the tower, nacelle, transformer, electrical components, transmission lines, concrete foundations, and maintenance roads/rigging pads. Restoration of the areas after removal will include re-vegetation to return the area to as near its present condition as possible.
- When the transmission line, substation, and switchyard structures are no longer necessary, they should be removed. Disturbed areas will become re-established as natural or cultivated vegetation over time.

5.0 SUMMARY AND DISCUSSION OF POTENTIAL VISUAL IMPACT

Visibility Summary

The vegetated viewshed map clearly indicates that one (1) or more of the proposed turbines will be theoretically visible from approximately 32.3 percent of the five-mile radius study area (based on vegetative viewshed). Approximately 67.7 percent of the study area will likely have no visibility of any wind turbines. Visibility is most common in the agricultural uplands from cleared lands with down slope vistas in the direction of turbine groupings.

While viewshed mapping indicates that the Project will be visible within portions of the Village of South Dayton and the Village of Forestville, as well as several hamlets within the study area, field confirmation determined the prevalence of mature street trees and site landscaping combined with one to three story residential and commercial structures. Because of this, views will generally be screened by intervening vegetation and localized structures, although filtered or framed views are likely through foreground vegetation and buildings were found from isolated locations. Direct views are more prevalent on the outskirts of these community centers where localized residential and commercial structures, street trees and site landscaping are less likely to provide a visual barrier.

Open views of the Project will be available from many roadways where roadside vegetation is lacking. These roadways would include, but are not limited to, the NYS Thruway, NYS Routes 39, 83, and 322, County Routes 93 and 87, North and South Hill Road, Pope Hill Road, Farrington Hollow Road, Round Top Road, Aldrich Hill Road, Hanover Road, and Flucker Hill Road. Many of these views may be long distant (background view), fleeting as viewers pass in vehicles, or short in duration.

Views along roadways located in the center of the Project area are likely to include turbines on both sides of the road. Some locations may experience an impacted field of view exceeding 180 degrees. Roadways including Prospect Road (see Figure A3), Hurlbert/Dye Road, Round Top Road, and Pope Hill Road will be impacted by such view extents.

No views, or limited views will occur on the backside of the many hills and within ravines found throughout the five-mile study area. Where topography is oriented toward the turbines, dense forest cover commonly prevents distant views.

The area most directly affected by views of the Project will be where there is a significant amount of cleared or agricultural land within immediate proximity to the Project. Residents and visitors will regularly encounter proximate views of one or more turbines within the foreground and near-middle-ground distances (e.g., ½ to 1 ½ miles). This is also the distance at which the visual contrast of the turbines will be greatest. Within such close proximity, turbines frequently appear and disappear behind intervening foreground landforms and vegetation as viewers move about the Project area.

Impact on Visual Resources

Resources of Statewide Significance – Viewshed analysis, field investigation, and simulations determined that the visual resources of Statewide Significance (Boutwell Hill State Forest and Canadaway Creek WMA) would not be notably affected by the proposed Project. Views from these

resources were field verified from the property boundaries, which the vegetated viewshed analysis indicated having the highest potential for visibility; also it is anticipated that overall visibility would be minimal within the boundaries of the State-owned land due to the vegetative screening witnessed in the field.

In addition, five (5) resources were identified, beyond the five-mile study area, during the completion of the original Visual Resource Assessment. Based solely on results determined through the use of vegetated viewshed data, potential visibility consist of:

- Evangola State Park – Viewshed analysis indicates minimal Project visibility from this receptor.

- Harris Hill State Forest – Viewshed analysis indicates minimal Project visibility from this receptor.

- Zoar Valley Multiple Use Area – Viewshed analysis indicates no Project visibility from this receptor.

- Hatch Creek State Forest – Viewshed analysis indicates no Project visibility from this receptor.

- 5.2 miles of the Seaway Trail (NYS Route 5) falls within 7.5 miles of the Project (Figure A1). 2.3 miles or 44% percent of that length has potential visibility of the Project. Potential visibility is further reduced by screening (vegetation and structures) in developed areas such as the Village of Silver Creek.

The NYSDEC visual Policy states,

> *"Aesthetic impact occurs when there is a detrimental effect on the perceived beauty of a place or structure. Significant aesthetic impacts are those that may cause a diminishment of the public enjoyment and appreciation of an inventoried resource, or one that impairs the character or quality of such a place. Proposed large facilities by themselves should not be a trigger for a declaration of significance. Instead, a project by virtue of its siting in visual proximity to an inventoried resource may lead staff to conclude that there may be a significant impact."*

Based on this definition, it is reasonable to conclude that simple visibility of the proposed wind farm (albeit a large facility) from any of these affected resources of statewide significance does not imply detrimental effect on the perceived beauty of the place or structure; nor will the Project necessarily cause the diminishment of public enjoyment and appreciation of an inventoried resource, or impair the character or quality of such a place.

Resources of Local Interest – Because of the number, scale and distribution of the proposed turbines, some portion of the Project will be visible from places of local interest, that do not necessarily meet the broader statewide threshold for visual significance. Most commonly affected are roadside views along various county and local roadways (for example, see Figures A13 and A15-A16).

Views were found along portions of several county and town roads at varying distance. Most residential neighborhoods and other resources (e.g. playgrounds) located in the villages, hamlets, and throughout the study area where the prevalence of mature street trees and/or site landscaping combined with one (1) and two (2) story structures may substantially limit or screen distant views (for example, see Figures A11 and A13-A14).

In addition to those resources of local interest identified in the VRA, one notable resource, Lake Erie, is located beyond the five-mile study area. Based on field investigation of the shoreline area north of the Village of Silver Creek (within 7.5 miles of the Project), visibility along the shoreline is anticipated to be minimal due to screening caused by vegetation and structures. The potential for Project visibility is anticipated to increase the further the viewer is from the shore. Although a clear line of sight to the Project is a potential, visibility will be further reduced by such factors as distance, atmospheric conditions, and viewer activities.

Character of View

Within the study area typical views, outside developed communities, are characterized by a patchwork of working farms, old fields and forest on a landscape of rolling hills. Built structures consist primarily of low-density permanent homes and manufactured housing, along with accessory structures (barns, garages, sheds, etc.). Development density within the study area is variable, ranging from large, open lots set back from nearby roadways and neighboring properties, to neighborhood clusters of mid-20th century homes or Victorian style homes of varying quality, vintage and size in the more populated villages. Mobile home communities are present within the study area as well. Overall, the structures are of varying vintage and quality.

As shown in the simulations, the introduction of large, clearly man-made structures creates a visible disruption of the landscape. The prominent hills and forests in the study area should be effective sources of minimizing the visual impact of the wind turbines (for example, see Figure A10). This should be true in terms of how visible each turbine will be individually from any given point in the study area and how many turbines can be viewed from any one point in the study area. However, in more level areas, the proposed turbines will be the tallest visible elements within view and will be disproportionate to other elements in the immediate landscape (for example, see Figures A3 and A5). Given the rolling hills in the study area, distribution of turbines across an extended area will result in a minimization of having an overwhelmingly disproportionate amount of turbines visible from any single point (for example, see Figures A4, A10-A11). The moderately paced sweeping rotation of the turbine blades will heighten the conspicuity of the turbines no matter the degree of visibility.

Affected Viewers

The Towns of Hanover, Villenova, Perrysburg, Sheridan, Dayton, Charlotte, Cherry Creek, Leon, and Arkwright are each quite rural and have small populations. The population of the Town of Villenova is only 1,110 while the population of the Town of Hanover is 7,127. These towns have a population density of 32 and 149 persons per square mile, respectively. This compares with a population density of 127 persons per square mile for Chautauqua County, and 411 persons per square mile for New York State as a whole.

With the exception of a small section of I-90 within the study area, highways are generally lightly traveled. The small stretch of I-90 that goes through the study area has the highest average annual daily traffic (AADT) volume of any roads in the study area (approximately 24,200 vehicles per day). Aside from I-90, the most heavily traveled stretch of road that lies entirely within the study area is a section of NYS Route 39, located between US Route 20 (outside the five-mile study area) and County Route 141. This section of NYS Route 39 receives approximately 3,200 vehicles per day. While the Project will frequently be visible to local residents and travelers, the total number of potentially affected permanent year-round viewers within the study area is relatively small when compared to other regions of New York State.

The impact to those residents and tourists recreating in the study area will vary. The sensitivity of individuals to visual quality is variable; but to many, visual quality is an important and integral part of their outdoor experience. The presence of wind turbines may diminish the aesthetic experience for those that believe that the rural landscape should be preserved for agricultural, rural residential, open space and similar uses. Such viewers will likely have high sensitivity to the visual quality and landscape character, regardless of the frequency of duration of their exposure to the proposed Project.

Viewshed and field analysis determined that the Project would be visible from locations including the Overland Trail, Tri-County Country Club, Boutwell Hill State Forest (perimeter of property) and the Canadaway Creek WMA (perimeter of property). Hunters and snowmobile riders on private lands will most likely view the Project across open agricultural fields and may also have a view of the turbines in close proximity.

Other Project Components

Construction Related Impacts – Construction of the proposed wind turbines will require the use of large mobile cranes and other large construction vehicles. Turbine components will be delivered in sections via large semi-trucks. During construction, multiple laydown areas totaling 26.2 acres will be scattered throughout the Project area. A permanent O&M building, and associated infrastructure, will occupy 2.8 acres along North Hill Road in the Town of Villenova. The O&M building will provide a base of operations for the Project. The construction period for each turbine is expected to be quite short. As such, construction related visual impacts will be brief and are not expected to result in adverse prolonged visual impact to area residents or visitors.

Operations and Maintenance Building – The proposed operations and maintenance building will be located in the Town of Villenova and is a relatively minor component of the Project. The single story operations and maintenance building will be approximately 7,000 square feet in size, and of similar scale and architectural character to other large agricultural/industrial buildings in the area.

Access Roadways – Roadways to each turbine will be constructed in order for personnel to perform maintenance. These roadways will be similar in characteristic to farm driveways/roads and the driveways that lead to existing gas wells. These are relatively minor components of the Project and will not be highly visible.

Collection Line – It is anticipated that the interconnection cables (between the turbines) will be buried and will not be considered an impact.

FAA Lighting – While red flashing aviation obstruction lighting on communications towers are commonly visible nighttime elements almost everywhere, the concentration of lights within the turbine area would be somewhat unique. While red flashing aviation obstruction lighting on communications towers is commonly visible nighttime elements almost everywhere, the concentration of lights within the turbine area would be somewhat unique. Up to 22 red lights flashing in unison will be conspicuous and somewhat discordant with the current dark nighttime conditions. Although aviation obstruction lighting is generally directed upward, the relatively low intensity does not result in perceptible atmospheric illumination (sky glow).

A preliminary lighting plan, following FAA regulations, was developed for use in completing a viewshed map. The viewshed map clearly indicates that one or more of the 22 proposed lights would theoretically be visible from approximately 28.1 percent of the five-mile study area. The magnitude of this impact will depend on how many lighted turbines are visible at a specific location and existing ambient lighting conditions present within the view. Local residents quietly enjoying the rural nighttime setting will likely be more affected by this condition than would motorists traveling through the area after dark. These are federally mandated safety features and cannot be omitted of reduced. Daytime lighting of the turbines is not required.

Shadow Flicker

Based on Table 8 and Figures 5 and 6, of the 241 studied shadow receptors located within 4,134-feet of the proposed turbines:

- 57 (23.6%) will theoretically not be impacted;
- 18 (7.5%) will theoretically be impacted 0-2 hrs/yr;
- 69 (28.6%) will theoretically be impacted 2-10 hrs/yr;
- 43 (17.8%) will theoretically be impacted 10-20 hrs/yr;
- 32 (13.3%) will theoretically be impacted 20-30 hrs/yr;
- 17 (7.1%) will theoretically be impacted 30-40 hrs/yr; and
- 5 (2.1%) will theoretically be impacted 40+ hrs/yr.

All 22 receptors that exceed 30 hours of shadow will theoretically have views of the Project. For these receptors, if they are determined to be not participating in the Project, potential mitigation should be evaluated on a case-by-case basis. Potential mitigation for those ultimately participating in the Project may be included in their lease agreements.

There are no regulations or guidelines that establish an acceptable degree of shadow flicker impact on a potential receptor. Based on the limited number of hours any structure will be impacted, shadow flicker is not expected to create an adverse impact on most nearby residential dwellings. For residences where shadow flicker is greatest, this impact might be considered an annoyance by some, and unnoticed by others.

Cumulative Impact

With the introduction of the proposed Ball Hill Wind Project, as well as the Arkwright Summit Wind Farm and Cassadaga Wind Project, one (1) or more structures will be theoretically visible from approximately 40.2 percent of the Projects five-mile radius study area. The total cumulative visibility of the proposed wind projects is approximately 40,645 acres. When compared to the vegetated viewshed completed solely for the Ball Hill Wind Project this is an increase of 8,015 acres. Overall, the cumulative impact appears to be relatively minor as the increased geographic area of additional visibility is approximately 7.9% of the total acreage of the study area.

The introduction of additional turbines within the same viewshed will increase the number of structures visible from many affected vantage points – thus creating a potential higher density of visible structures. However, visibility of the projects is dependent on viewer location/orientation, distance, and other factors discussed in the VRA (Section 3.3). It is possible that with the additional turbines, the cumulative impact may be minimal (for example, see Figures B2 and B3). As illustrated in both figures, the additional Arkwright and Cassadaga turbines are visible in the distance, behind the proposed Project, limiting potential impact.

It is also possible that all three (3) projects may not be visible in a single field of view. For example, views of the Ball Hill Wind Project are to the east and north, views of the Arkwright Summit and Cassadaga projects are to the west and south. If a viewer is at a location north of the adjacent projects and is viewing eastward, it is possible that the adjacent projects will not be visible.

115 kV Transmission Line

Visibility is most common from properties adjacent or in close proximity to the proposed transmission line, as well as areas to the north, east, and west. Visibility will also be evident from agricultural uplands with cleared lands and down slope vistas in the direction of the proposed transmission line.

Open views of the proposed transmission line will be available from many roadways where roadside vegetation is lacking. These roadways would include, but are not limited to, the NYS Thruway (I-90), Hanover Road, County Route 89, Bennett State Road, and King Road. Many of these views may be fleeting as viewers pass in vehicles, short in duration, or in the context of other transmission structures. However, the transmission structures will be located in close proximity and on both sides of many roadways noted above (for example, see Figure C3).

Viewers within close proximity to the proposed transmission line will also notice that structures will frequently appear and disappear behind intervening foreground landform and vegetation as they move about the study area. Along some portions of the route, vegetation will need to be cleared (for example, see Figure C4). The clearing will be more noticeable in close proximity and along ridge tops.

Given the potential for limited visibility of the proposed transmission line and the frequency of existing electrical and telephone lines with the study area, the proposed line will not have a significant impact on the visual character of the region. When visible, the factors outlined in Section 3.3

(landscape unit, viewer group, distance zone and duration/frequency/circumstances of view), will have an effect on the structures visibility.

Comparison of the SVRA and Original VRA

Landscape Character/Visual Setting

In comparing the landscape character identified in both the SVRA and original VRA there has been little change within the study area. Some of the more notable differences include changes in roadside vegetation (e.g. vegetation growth or removal), as well as a few newly built structures. Generally, these structures were seen as small buildings (e.g. garage, barn), new utility poles, and an occasional residential structure.

Viewshed Mapping

The potential visibility identified in both the SVRA and original VRA are similar, not only in the number of acres, but geographic area as well. The SVRA evaluated a slightly larger study area (additional 995acres) and had a slight increase in visibility (3,425 acres) when comparing the vegetated viewshed maps. This increase in visibility is most likely the result of a larger study area and taller turbines.

Photographic Simulations

Although the Project contains 31fewer turbines than the layout presented in the original VRA, overall visibility of both projects are similar. The noticeable changes illustrated in the simulations are likely the result of the Project layout and reduction in the number of turbines. Generally, the increased heights of the turbines do not appear to be significant factor in the completed simulations.

Shadow Flicker Analysis

The potential shadow flicker evaluated in both the SVRA and VRA are generally similar, but it appears that the proposed Project will have an overall greater impact on structures receiving 30+ hours of shadow flicker per year. Although the Project has fewer turbines, it analyzed a larger study area (4,134 feet from a turbine) and more structures (receptors). The Project had notable differences in the following yearly categories:

- 0-2 hrs/yr – SVRA's 31.1% compared to the VRA's 23.6 for a difference of 7.5%;
- 2-10 hrs/yr – SVRA's 28.6% compared to the VRA's 40.1% for a difference of 11.5%;
- 10-20 hrs/yr – SVRA's 17.8% compared to the VRA's 19.1% for a difference of 1.3%;
- 20-30 hrs/yr – SVRA's 13.3% compared to the VRA's 10.2% for a difference of 2.1%;
- 30-40 hrs/yr – SVRA's 7.1% compared to the VRA's 2.5% for a difference of 4.6%; and
- 40+ hrs/yr – SVRA's 2.1% compared to the VRA's 4.5% for a difference of 2.4%.

Transmission Line

The SVRA reviewed a potential design for a 115 kV transmission line that was very similar to the 115 kV line analyzed in the original VRA. Both viewsheds were similar in the number of acres analyzed and the geographic area the transmission structures would be visible. The SVRA evaluated a slightly

smaller study area (128 acres less) with fewer structures. The Project has a slight increase in visibility (1.4% acres) when comparing the vegetated viewshed maps. The increased visibility is most likely the result of layout changes.

Visual Impact Conclusion

The U.S. Department of Energy and New York State Public Service Commission have mandated that renewable energy sources, such as wind turbines, will provide an increasing percentage of the nation's electricity in the coming years. Meaningful development of renewable wind energy will reduce the reliance on fossil fuel combustion and nuclear fission facilities and result in reduction in air pollutants and greenhouse gasses. This Project is proposed to meet, in small part, this ambitious federal and state objective to provide an environmentally friendly and renewable energy source to help meet the growing energy needs for New York State residents and business.

By their very nature, modern wind energy projects are large and highly visible facilities. The need to position these tall moving structures in highly visible locations cannot be readily avoided. The siting of wind turbines within a rural agricultural area provides increased opportunity for potentially discordant views both near and far. While the use of mitigation techniques will help to minimize adverse visual impact, the construction of the Project will be an undeniable visual presence on the landscape. However, unlike development projects such as housing complexes and commercial centers, the proposed wind energy facility can and will be decommissioned and removed at the end of its useful working life. All of the towers will be removed and the Project area restored as close to its present condition as possible, thus restoring the landscape to its original condition.

Glossary[27]

Aesthetic impact: Aesthetic impact occurs when there is a detrimental effect on the perceived beauty of a place or structure. Mere visibility, even startling visibility of a project proposal, should not be a threshold for decision-making. Instead a project, by virtue of its visibility, must clearly interfere with or reduce the public's enjoyment and/or appreciation of the appearance of an inventoried resource (e.g. cooling tower plume blocks a view from a State Park overlook).

Aesthetically significant place: A formally designated place visited by recreationists and others for the express purpose of enjoying its beauty. For example, millions of people visit Niagara Falls on an annual basis. They come from around the country and even from around the world. By these measurements, one can make the case that Niagara Falls (a designated State Park) is an aesthetic resource of national significance. Similarly, a resource that is visited by large numbers who come from across the state probably has statewide significance. A place visited primarily by people whose place of origin is local generally is generally of local significance. Unvisited places either have no significance or are "no trespass" places.

Aesthetic Quality: There is a difference between the quality of a resource and its significance level. The quality of the resource has to do with its component parts and their arrangement. The arrangement of the component parts is referred to as composition. The quality of the resource and the significance level are generally, though not always, correlated.

Atmospheric perspective: Even on the clearest of days, the sky is not entirely transparent because of the presence of atmospheric particulate matter. The light scattering effect of these particles causes atmospheric or aerial perspective, the second important form of perspective. In this form of perspective there is a reduction in the intensity of colors and the contrast between light and dark as the distance of objects from the observer increases. Contrast depends upon the position of the sun and the reflectance of the object, among other items. The net effect is that objects appear "washed out" over great distances.

Scientific Perspective: Scientific, linear, or size perspective is the reduction in the apparent size of objects as the distance from the observer increases. An object appears smaller and smaller as an observer moves further and further from it. At some distance, depending upon the size and degree of contrast between the object and its surroundings, the object may not be a point of interest for most people. At this hypothetical distance it can be argued that the object has little impact on the composition of the landscape of which it is a tiny part. Eventually, at even greater distances, the human eye is incapable of seeing the object at all.

Viewshed: A map that shows the geographic area from which a proposed action may be seen is a viewshed.

Visual Assessments: Analytical techniques that employ viewsheds, and/or line-of-sight profiles, and descriptions of aesthetic resources, to determine the impact of development upon aesthetic resources; and potential mitigation strategies to avoid, eliminate or reduce impacts on those resources.

Visual impact: Visual impact occurs when the mitigating effects of perspective do not reduce the visibility of an object to insignificant levels. Beauty plays no role in this concept. A visual impact may also be considered in the context of contrast. For instance, all other things being equal, a blue object seen against an orange background has greater visual impact than a blue object seen against the same colored blue background. Again, beauty plays no role in this concept.

[27] NYSDEC Visual Policy (2000) pp. 9-11.

References

New York State Department of Environmental Conservation (NYSDEC), 1992. *The SEQR Handbook.*

New York State Department of Environmental Conservation (NYSDEC). Not dated. *D.E.C. Aesthetics Handbook*. NYSDEC. Albany, NY.

New York State Department of Environmental Conservation (NYSDEC), July 31, 2000, Program Policy *Assessing and Mitigating Visual Impacts*, (DEP 00-2) NYSDEC, Albany, NY.

New York State Department of Transportation (NYSDOT). 1988. Engineering Instruction (EI) 88-43 – Visual Assessment. NYSDOT. Albany, NY.

U.S. Army Corps of Engineers, Huntsville Division (ACOE). Undated. *Aesthetic Resources: Identification, Analysis, and Evaluation.*

U.S. Department of Agriculture (USDA), National Forest Service. 1974. *Forest Service Landscape Management: The Visual Management System*, Handbook #462, Vol.2.

United States Department of Agriculture (USDA), National Forest Service, 1995. *Landscape Aesthetics – A Handbook for Scenery Management*. Agricultural Handbook No. 701. Washington, D.C.

United States Department of the Interior, Bureau of Land Management. 1980. *Visual Resource Management Program*. U.S. Government Printing Office 1980 0-302-993. Washington, D.C.

United States Department of Transportation, Federal highway Administration, 1981. *Visual Impact Assessment for Highway Projects*. Office of Environmental Policy. Washington, D.C.
Microsoft Streets and Trips (11.00.18.1900), Microsoft Corporation, 1988-2003
NPS. 2003. National Natural Landmarks. New York State.

NYSDEC. 2000. Assessing and mitigating visual impacts. Issued by Division/Office of Environmental Permits, Albany, NY.

Appendix A

Viewsheds and Photographic Simulations

7.5 - MILE VEGETATED VIEWSHED*

Ball Hill Wind Project

*Assumes 40 foot (12.192 m) vegetation height in areas considered forested by the 2011 National Land Cover Dataset

Figure A1
July 2016

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect June 2, 2016 layout.

KEY

- Proposed Wind Turbine
- Sensitive Resource
- Earl Cardot Eastside Overland Trail
- Equestrian Trail
- Snowmobile Trail
- County Boundary
- Municipal Boundary
- Cattaraugus Indian Reservation
- Water Body
- State Forest
- Wildlife Management Area

Number of Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 29

PROJECT # 2015 - 15039.10
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File Location:
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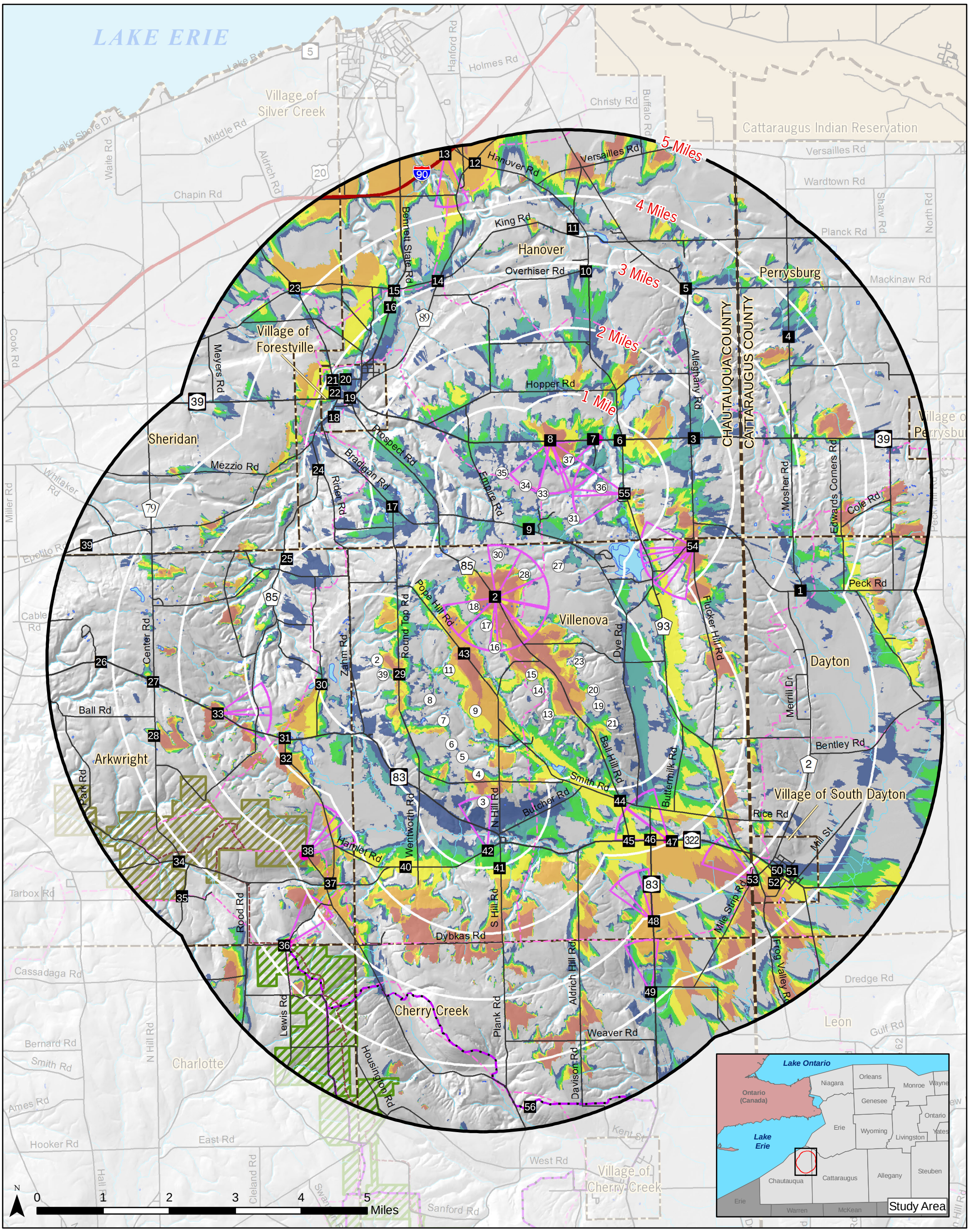

VEGETATED VIEWSHED* AND PHOTO LOCATIONS

Ball Hill Wind Project

*Assumes 40 foot (12.192 m) vegetation height in areas considered forested by the 2011 National Land Cover Dataset

Figure A2
July 2016

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect June 2, 2016 layout.

KEY

- Proposed Wind Turbine
- Sensitive Resource
- Earl Cardot Eastside Overland Trail
- Equestrian Trail
- Snowmobile Trail
- County Boundary
- Municipal Boundary
- Cattaraugus Indian Reservation
- Water Body
- State Forest
- Wildlife Management Area

Number of Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 29

Approximate Photo Angle

PROJECT # 2015 - 15039.10

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File Location:
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New York City > Saratoga Springs > Syracuse

Photo taken during 2008.

Existing Condition

FIGURE A3-a

Photo Simulation

VP#2 - Prospect Road (looking northeast to southeast)

Town of Villenova

Proposed Condition

FIGURE A3-b

Photo Simulation

VP#2 - Prospect Road (looking northeast to southeast)

Town of Villenova

Photo taken during 2008.

Existing Condition

FIGURE A3-c

Photo Simulation

VP#2 - Prospect Road (looking northeast to southeast)

Town of Villenova

Proposed Condition

FIGURE A3-d

Photo Simulation

VP#2 - Prospect Road (looking northeast to southeast)

Town of Villenova

Photo taken during 2008.

Existing Condition

FIGURE A3-e

Photo Simulation

VP#2 - Prospect Road (looking northeast to southeast)

Town of Villenova

Proposed Condition

FIGURE A3-f

Photo Simulation

VP#2 - Prospect Road (looking northeast to southeast)

Town of Villenova

Photo taken during 2008.

Existing Condition

FIGURE A3-g

Photo Simulation

VP#2 - Prospect Road (looking northeast to southeast)

Town of Villenova

Proposed Condition

FIGURE A3-h

Photo Simulation

VP#2 - Prospect Road (looking northeast to southeast)

Town of Villenova

Existing Condition

Proposed Condition

FIGURE A3-i

Photo Simulation

VP#2 - Prospect Road (looking northeast to southeast)

Town of Villenova

Photo taken during 2008.

Existing Condition

FIGURE A3-j

Photo Simulation

VP#2 - Prospect Road (looking southeast to west)

Town of Villenova

Proposed Condition

FIGURE A3-k

Photo Simulation

VP#2 - Prospect Road (looking southeast to west)

Town of Villenova

Photo taken during 2008.

Existing Condition

FIGURE A3-I

Photo Simulation

VP#2 - Prospect Road (looking southeast to west)

Town of Villenova

Proposed Condition

FIGURE A3-m

Photo Simulation

VP#2 - Prospect Road (looking southeast to west)

Town of Villenova

Photo taken during 2008.

Existing Condition

FIGURE A3-n

Photo Simulation

VP#2 - Prospect Road (looking southeast to west)

Town of Villenova

Proposed Condition

FIGURE A3-o

Photo Simulation

VP#2 - Prospect Road (looking southeast to west)

Town of Villenova

Existing Condition

Proposed Condition

FIGURE A3-p

Photo Simulation

VP#2 - Prospect Road (looking southeast to west)

Town of Villenova

Photo taken during 2008.

Existing Condition

FIGURE A4-a

Photo Simulation

VP# 7 - Tri-County Country Club (looking west)

Town of Hanover

Proposed Condition

FIGURE A4-b

Photo Simulation

VP# 7 - Tri-County Country Club (looking west)

Town of Hanover

Photo taken during 2008.

Existing Condition

FIGURE A5-a

Photo Simulation

VP# 8 - NYS Route 39 (looking southeast to southwest)

Town of Hanover

Proposed Condition

FIGURE A5-b

Photo Simulation

VP# 8 - NYS Route 39 (looking southeast to southwest)

Town of Hanover

Photo taken during 2008.

Existing Condition

FIGURE A5-c

Photo Simulation

VP# 8 - NYS Route 39 (looking southeast to southwest)

Town of Hanover

Proposed Condition

FIGURE A5-d

Photo Simulation

VP# 8 - NYS Route 39 (looking southeast to southwest)

Town of Hanover

Photo taken during 2008.

Existing Condition

FIGURE A5-e

Photo Simulation

VP# 8 - NYS Route 39 (looking southeast to southwest)

Town of Hanover

Proposed Condition

FIGURE A5-f

Photo Simulation

VP# 8 - NYS Route 39 (looking southeast to southwest)

Town of Hanover

Existing Condition

Proposed Condition

FIGURE A5-g

Photo Simulation

VP# 8 - NYS Route 39 (looking southeast to southwest)

Town of Hanover

Photo taken during 2008.

Existing Condition

FIGURE A6-a

Photo Simulation

VP#13 - NYS Thruway I-90 (looking south)

Town of Hanover

Proposed Condition

FIGURE A6-b

Photo Simulation

VP#13 - NYS Thruway I-90 (looking south)

Town of Hanover

Photo taken during 2015.

Existing Condition

FIGURE A7-a

Photo Simulation

VP# 33 - NYS Route 83 (looking northeast to southeast)

Town of Arkwright

Proposed Condition

FIGURE A7-b

Photo Simulation

VP# 33 - NYS Route 83 (looking northeast to southeast)

Town of Arkwright

Photo taken during 2008.

Existing Condition

FIGURE A7-c

Photo Simulation

VP# 33 - NYS Route 83 (looking northeast to southeast)

Town of Arkwright

Proposed Condition

FIGURE A7-d

Photo Simulation

VP# 33 - NYS Route 83 (looking northeast to southeast)

Town of Arkwright

Existing Condition

Proposed Condition

FIGURE A7-e

Photo Simulation

VP# 33 - NYS Route 83 (looking northeast to southeast)

Town of Arkwright

Photo taken during 2015.

Existing Condition

FIGURE A8-a

Photo Simulation

VP# 36 - Boutwell Hill State Forest and Overland Trail (looking northeast)

Town of Arkwright

Proposed Condition

FIGURE A8-b

Photo Simulation

VP# 36 - Boutwell Hill State Forest and Overland Trail (looking northeast)

Town of Arkwright

Photo taken during 2015

Existing Condition

FIGURE A9-a

Photo Simulation

VP# 38 - Canadaway Creek WMA (looking northeast)

Town of Arkwright

Proposed Condition

FIGURE A9-b

Photo Simulation

VP# 38 - Canadaway Creek WMA (looking northeast)

Town of Arkwright

Photo taken during 2015.

Existing Condition

FIGURE A9-c

Photo Simulation

VP# 38 - Canadaway Creek WMA (looking northeast)

Town of Arkwright

Proposed Condition

FIGURE A9-d

Photo Simulation

VP# 38 - Canadaway Creek WMA (looking northeast)

Town of Arkwright

Existing Condition

Proposed Condition

FIGURE A9-e

Photo Simulation

VP# 38 - Canadaway Creek WMA (looking northeast)

Town of Arkwright

Photo taken during 2015

Existing Condition

FIGURE A10-a

Photo Simulation

VP# 42 - Hamlet of Hamlet (looking northwest)

Town of Villenova

Proposed Condition

FIGURE A10-b

Photo Simulation

VP# 42 - Hamlet of Hamlet (looking northwest)

Town of Villenova

Photo taken during 2015.

Existing Condition

FIGURE A11-a

Photo Simulation

VP# 47 - NYS Route 322 (looking northwest)

Town of Villenova

Proposed Condition

FIGURE A11-b

Photo Simulation

VP# 47 - NYS Route 322 (looking northwest)

Town of Villenova

Photo taken during 2015.

Existing Condition

FIGURE A11-c

Photo Simulation

VP# 47 - NYS Route 322 (looking northwest)

Town of Villenova

Proposed Condition

FIGURE A11-d

Photo Simulation

VP# 47 - NYS Route 322 (looking northwest)

Town of Villenova

Existing Condition

Proposed Condition

FIGURE A11-e

Photo Simulation

VP# 47 - NYS Route 322 (looking northwest)

Town of Villenova

Photo taken during 2008

Existing Condition

FIGURE A12-a

Photo Simulation

VP# 48 - NYS Route 83 (looking northwest)

Town of Villenova

Proposed Condition

FIGURE A12-b

Photo Simulation

VP# 48 - NYS Route 83 (looking northwest)

Town of Villenova

Photo taken during 2008.

Existing Condition

FIGURE A13-a

Photo Simulation

VP# 49 - Pine Valley Central Schools (looking north)

Town of Cherry Creek

Proposed Condition

FIGURE A13-b

Photo Simulation

VP# 49 - Pine Valley Central Schools (looking north)

Town of Cherry Creek

Photo taken during 2015.

Existing Condition

FIGURE A14-a

Photo Simulation

VP# 53 - Village of South Dayton/Hamlet of Skunks Center (looking northwest)

Village of South Dayton

Proposed Condition

FIGURE A14-b

Photo Simulation

VP# 53 - Village of South Dayton/Hamlet of Skunks Center (looking northwest)

Village of South Dayton

Photo taken during 2015.

Existing Condition

FIGURE A15-a

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition

FIGURE A15-b

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Photo taken during 2015.

Existing Condition

FIGURE A15-c

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition

FIGURE A15-d

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Photo taken during 2015.

Existing Condition

FIGURE A15-e

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition

FIGURE A15-f

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Photo taken during 2015.

Existing Condition

FIGUREA 15-g

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition

FIGURE A15-h

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Existing Condition

Proposed Condition

FIGURE A15-i

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Photo taken during 2008.

Existing Condition

FIGURE A16-a

Photo Simulation

VP# 55 - County Route 93 (looking west)

Town of Hanover

Proposed Condition

FIGURE A16-b

Photo Simulation

VP# 55 - County Route 93 (looking west)

Town of Hanover

Photo taken during 2008.

Existing Condition

FIGURE A16-c

Photo Simulation

VP# 55 - County Route 93 (looking west)

Town of Hanover

Proposed Condition

FIGURE A16-d

Photo Simulation

VP# 55 - County Route 93 (looking west)

Town of Hanover

Existing Condition

Proposed Condition

FIGURE A16-e

Photo Simulation
VP# 55 - County Route 93 (looking west)
Town of Hanover

Appendix B

Cumulative Viewshed and Photographic Simulations

CUMULATIVE VEGETATED VIEWSHED*

Ball Hill Wind Project, Arkwright Summit Wind Farm, and Cassadaga Wind Project

*Assumes 40 foot (12.192 m) vegetation height in areas considered forested by the 2011 National Land Cover Dataset

Figure B1
July 2016

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect June 2, 2016 layout.

KEY

- Proposed Wind Turbine
- Cassadaga Wind Turbine
- Arkwright Summit Wind Turbine
- Potential Sensitive Resource
- Earl Cardot Eastside Overland Trail
- Equestrian Trail
- Snowmobile Trail
- County Boundary
- Municipal Boundary
- Cattaraugus Indian Reservation
- Water Body
- State Forest
- Wildlife Management Area

Number of Turbines Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 30
- 31 - 45
- 46 - 60
- 61 - 75
- 76 - 90
- 91 - 110
- 111 - 129

Approximate Photo Angle

PROJECT # 2015 - 15039.10

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File Location: B:\2015\15039\Maps\CumulativeVS160602\CumulativeVegViewshed.mxd

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New York City > Saratoga Springs > Syracuse

Photo taken during 2008.

Existing Condition

FIGURE B2-a

Photo Simulation

VP#33 - NYS Route 83 (looking northeast)

Town of Arkwright

Proposed Condition - Ball Hill Windpark

FIGURE B2-b

Photo Simulation

VP#33 - NYS Route 83 (looking northeast)

Town of Arkwright

Proposed Condition - Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B2-c

Photo Simulation

VP#33 - NYS Route 83 (looking northeast)

Town of Arkwright

Proposed Condition - Ball Hill Wind Project, Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B2-d

Photo Simulation

VP#33 - NYS Route 83 (looking northeast)

Town of Arkwright

Photo taken during 2008.

Existing Condition

FIGURE B2-e

Photo Simulation

VP#33 - NYS Route 83 (looking northeast)

Town of Arkwright

Proposed Condition - Ball Hill Windpark

FIGURE B2-f

Photo Simulation

VP#33 - NYS Route 83 (looking northeast)

Town of Arkwright

Proposed Condition - Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B2-g

Photo Simulation

VP#33 - NYS Route 83 (looking northeast)

Town of Arkwright

Proposed Condition - Ball Hill Wind Project, Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B2-h

Photo Simulation

VP#33 - NYS Route 83 (looking northeast)

Town of Arkwright

Existing Condition

Proposed Condition - Ball Hill Wind Project, Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B2-i

Photo Simulation
VP#2 - Prospect Road
Town of Villenova

Photo taken during 2015.

Existing Condition

FIGURE B3-a

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition - Ball Hill Wind Project

FIGURE B3-b

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition - Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B3-c

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition - Ball Hill Wind Project, Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B3-d

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Photo taken during 2015.

Existing Condition

FIGURE B3-e

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition - Ball Hill Wind Project

FIGURE B3-f

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition - Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B3-g

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition - Ball Hill Wind Project, Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B3-h

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Photo taken during 2015.

Existing Condition

FIGURE B3-i

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition - Ball Hill Wind Project

FIGURE B3-j

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition - Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B3-k

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition - Ball Hill Wind Project, Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B3-I

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Photo taken during 2015.

Existing Condition

FIGURE B3-m

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition - Ball Hill Wind Project

FIGURE B3-n

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition - Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B3-o

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Proposed Condition - Ball Hill Wind Project, Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B3-p

Photo Simulation

VP# 54 - Flucker Hill Road (looking southwest to northwest)

Town of Villenova

Existing Condition

Proposed Condition- Ball Hill Wind Project, Arkwright Summit Wind Farm and Cassadaga Wind Project

FIGURE B3-q

Photo Simulation

VP# 54 - Flucker Hill Road

Town of Villenova

Appendix C

115 kV Transmission Viewshed and Photographic Simulations

TRANSMISSION LINE TOPOGRAPHIC VIEWSHED

Ball Hill Wind Project

Figure C1
July 2016

Transmission Line Structure Locations based on August 2012 data.

KEY

- ① Proposed Wind Turbine
- • Transmission Line Structure
- Proposed Transmission Centerline
- Snowmobile Trail
- Municipal Boundary
- County Boundary
- Water Body

Number of Structures Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 35
- 36 - 50
- 51 - 60

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File Location:
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New York City > Saratoga Springs > Syracuse

TRANSMISSION LINE VEGETATED VIEWSHED*

Ball Hill Wind Project

*Assumes 40 foot (12.192 m) vegetation height in areas considered forested by the 2001 National Land Cover Dataset

Figure C2
July 2016

Transmission Line Structure Locations based on August 2012 data.

KEY

- ① Proposed Wind Turbine
- • Transmission Line Structure
- Proposed Transmission Centerline
- Snowmobile Trail
- Municipal Boundary
- County Boundary
- Water Body
- T1 Approximate Photo Angle with Photo Location ID

Number of Structures Visible

- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 35
- 36 - 50
- 51 - 60

PROJECT # 2015 - 15039.10

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File Location: B:\2015\15039\Maps\TLine120814\tlinevegviewshed.mxd

SARATOGA ASSOCIATES
Landscape Architects, Architects, Engineers, and Planners, P.C.
New York City > Saratoga Springs > Syracuse

Photo taken during 2015.

Existing Condition

FIGURE C3-a

Photo Simulation

VP#T1 - NYS Route 39 (looking southwest to northwest)

Town of Hanover

Proposed Condition

FIGURE C3-b

Photo Simulation

VP#T1 - NYS Route 39 (looking southwest to northwest)

Town of Hanover

Photo taken during 2015.

Existing Condition

FIGURE C3-c

Photo Simulation

VP#T1 - NYS Route 39 (looking southwest to northwest)

Town of Hanover

Proposed Condition

FIGURE C3-d

Photo Simulation

VP#T1 - NYS Route 39 (looking southwest to northwest)

Town of Hanover

Photo taken during 2015.

Existing Condition

FIGURE C3-e

Photo Simulation

VP#T1 - NYS Route 39 (looking southwest to northwest)

Town of Hanover

Proposed Condition

FIGURE C3-f

Photo Simulation

VP#T1 - NYS Route 39 (looking southwest to northwest)

Town of Hanover

Photo taken during 2015.

Existing Condition

FIGURE C3-g

Photo Simulation

VP#T1 - NYS Route 39 (looking southwest to northwest)

Town of Hanover

Proposed Condition

FIGURE C3-h

Photo Simulation

VP#T1 - NYS Route 39 (looking southwest to northwest)

Town of Hanover

Existing Condition

Proposed Condition

FIGURE C3-i

Photo Simulation

VP#T1 - NYS Route 39 (looking southwest to northwest)

Town of Hanover

Photo taken during 2015.

Existing Condition

FIGURE C4-a

Photo Simulation

VP#T2 - King Road (looking west)

Town of Hanover

Proposed Condition

FIGURE C4-b

Photo Simulation
VP#T2 - King Road (looking west)
Town of Hanover

SARATOGA ASSOCIATES

Landscape Architects, Architects,
Engineers, and Planners, P.C.

Memorandum

Date:	July 17, 2016
To:	Ms. Tegan Kondak
From:	John Guariglia, RLA
Project Name:	Ball Hill Wind Project
Project #:	2015-039
Subject:	Micro-Siting of Turbines 27 and 34

Subsequent to the completion of Saratoga Associates Landscape Architects, Architects, Engineers, and Planners, P.C. (Saratoga Associates) work on the *Ball Hill Wind Project Final Visual Resource Assessment*, Ecology & Environment, Inc (E&E) identified two wind turbines that have been micro sited. As a result it is anticipated that these changes result in:

1. Turbine 27 moving approximately 485 feet to the northwest, and
2. Turbines 34 moving approximately 415 feet to the southeast.

In an effort to explain how these changes would impact the previously completed illustrations, Saratoga Associates offers the following:

<u>Viewshed Mapping</u>
It is not anticipated that these moves will cause a noticeable change in their potential visibility.

<u>Photographic Simulations</u>
The new location of turbine 27 would mostly affect simulations completed at viewpoint locations 2, 8, and 54.

1. Viewpoint 2 (Prospect Road) – Although the turbine would be seen in a different location, the appearance of the turbine is generally expected to be the same.
2. Viewpoint 8 (NYS Route 39) – This turbine will be moving slightly closer to Viewpoint 8. The turbine may be seen to be slightly taller, but with the distance between the turbine and viewer this minor change would probably go unnoticed.
3. Viewpoint 54 (Flucker Hill Road) – This turbine will be moving slightly further away from Viewpoint 54. The turbine may be seen to be slightly smaller, but with the distance between the turbine and viewer this minor change would probably go unnoticed.

Generally for these locations, visibility and appearance are not expected to change from what was previously illustrated.

The new location of turbine 34 would mostly affect simulations completed at viewpoint locations 7, 8, 54, and 55.

1. Viewpoint 7 (Tri-County Country Club) – This turbine does not appear to be visible from this location due to vegetative screening. It is anticipated that this will still be the case.
2. Viewpoint 8 (NYS Route 39) – This turbine will be moving slightly further away from Viewpoint 8. The turbine may be seen to be slightly smaller, but with the distance between the turbine and viewer this minor change would probably go unnoticed.
3. Viewpoint 54 (Flucker Hill Road) – This turbine will be moving slightly closer to Viewpoint 54. The turbine may be seen to be slightly taller, but with the distance between the turbine and viewer this minor change would probably go unnoticed.
4. Viewpoint 55 (Country Route 93) – This turbine will be moving slightly closer to Viewpoint 55. The turbine may be seen to be slightly taller, but with the distance between the turbine and viewer this minor change would probably go unnoticed.

Generally for these locations, visibility and appearance are not expected to change from what was previously illustrated.

These viewpoint locations were selected based on the orientation of the views captured in the photographs and because they are in relative close proximity to the turbines. These turbines may also be visible in other photos, however due to the distance between viewer and turbine the changes would be slight and most likely be unrecognizable.

<u>Shadow Flicker</u>
Based on the changes in the location of these turbines, there is expected to be some minor impact to nearby residential dwellings. However, the changes in potential shadow flicker do not appear to be highly significant. Reviewing the information contained in the latest report, it is anticipated that the following may occur:

1. The new location of turbine 27 may result in noticeable increases to receptors 118, 119, and 327. There is also a potential to see some level of reduction to receptor 326. Since Receptors 118, 119, and 326 are on the fringe of the individual turbines study area, and these receptors were originally subject to a maximum potential of less than 10 shadow hours per year, it is anticipated that these changes will most likely be minor. Receptor 327 which, like the others, have less than 10 shadow hours per year, may have a slightly higher increase than the others, however it is not anticipated to be a significant increase.

2. The new location of turbine 34 may result in an increase at receptor 11 and a reduction at receptor 12. Since these two receptors are on the fringe of the turbines study area and were originally subject to a maximum potential of less than 10 shadow hours per year, it is anticipated that these changes will most likely be minor.

Appendix F: FAA Advisory Circular 70/7460-1 L, Obstruction Marking and Lighting

U.S. Department
of Transportation
Federal Aviation
Administration

Advisory Circular

Subject: Obstruction Marking and Lighting **Date:** 12/04/15 **AC No:** 70/7460-IL
Initiated By: AJV-15

1. **Purpose.**

This Advisory Circular (AC) sets forth standards for marking and lighting obstructions that have been deemed to be a hazard to navigable airspace.

2. Advisory Circular 70/7460-1L is effective immediately. However, flashing L-810 lighting has a delayed effective date and becomes mandatory on September 15, 2016.

3. **Cancellation.**

Advisory Circular 70/7460-1K, Obstruction Lighting and Marking, dated February 1, 2007, is cancelled.

4. **Principal Changes.**

The principal changes in this AC are:

1. The height of a structure identified as an obstruction has been lowered from 500 feet above ground level (AGL) to 499 feet above ground level, by amendment to Title 14 Code of Federal Regulations (14 CFR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace* (75 Federal Register 42303, July 21, 2010). Accordingly, all structures that are above 499 feet AGL are considered obstructions and the Federal Aviation Administration (FAA) will study them to determine their effect on the navigable airspace. This will ensure that all usable airspace at and above 500 feet AGL is addressed during an aeronautical study and that this airspace is protected from obstructions that may create a hazard to air navigation.
2. Standards for voluntary marking of meteorological evaluation towers (METs), less than 200 feet above ground level (AGL), has been added to provide recommendations towards increasing conspicuity of these structures, particularly

for low-level agricultural flight operations. These standards include those for lighting and marking of the tower and associated guy wires.

3. A new Chapter 14, Aircraft Detection Lighting Systems, has been added to provide performance standards for these types of systems.
4. New lighting and marking standards are provided to reduce impact on migratory bird populations.
5. Medium-intensity white and medium-intensity dual obstruction light are now authorized on towers up to and including 700 feet AGL.
6. Editorial changes have been made.

5. **Related Reading Material.**

1. Advisory Circular 150/5345-43, Specification of Obstruction Marking and Lighting.
2. 14 CFR Part 77, Safe, Efficient Use and Preservation of the Navigable Airspace.

6. **Application.**

The FAA recommends the guidelines and standards in this AC for determining the proper way to light and mark obstructions affecting navigable airspace. This AC does not constitute a regulation and, in general, is not mandatory. However, a sponsor proposing any type of construction or alteration of a structure that may affect the National Airspace System (NAS) is required under the provisions of Title 14 Code of Federal Regulations to notify the FAA by completing the Notice of Proposed Construction or Alteration form (FAA Form 7460-1). These guidelines may become mandatory as part of the FAA's determination and should be followed on a case-by-case basis, as required.

7. **Comments or Suggestions.**

Direct comments or suggestions regarding this AC to:

Manager, Obstruction Evaluation Group
Federal Aviation Administration
ATTN: AJV-15
800 Independence Avenue, S.W.
Washington, DC 20591

Jodi S. McCarthy
Director, Airspace Services

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CHAPTER 1. ADMINISTRATIVE AND GENERAL PROCEDURES

1.1 Reporting Requirements.

A sponsor proposing any type of construction or alteration of a structure that may affect the NAS as required under the provisions of Title 14 Code of Federal Regulations (CFR) Part 77, Construction or alteration requiring notice, is to notify the Federal Aviation Administration (FAA) by completing the Notice of Proposed Construction or Alteration form (FAA Form 7460-1). This form should be filed electronically at http://oeaaa.faa.gov.

1.2 Preconstruction Notice.

The notice must be submitted:

1. At least 45 days prior to the date of proposed construction or alteration is to begin.
2. On or before the date an application for a construction permit is filed with the Federal Communications Commission (FCC). (The FCC advises its applicants to file with the FAA well in advance of the 45-day period to expedite FCC processing.)

1.3 FAA Acknowledgement.

The FAA will acknowledge, in writing, each FAA Form 7460-1 notice received.

1.4 Supplemental Notice Requirement.

1. If required, the FAA will include a statement requiring the filing of FAA Form 7460-2, Notice of Actual Construction or Alteration, on the determination. All FAA Forms 7460-2 should be filed electronically at http://oeaaa.faa.gov.
2. FAA Form 7460-2 Part 1 is to be completed and sent to the FAA at least 10 days prior to starting the actual construction or alteration of a structure. Part 2 shall be submitted within 5 days after the structure has reached its greatest height. The form should be filed electronically at http://oeaaa.faa.gov.
3. In addition, a supplemental notice shall be submitted upon abandonment of construction.
4. Letters are acceptable in cases where the construction/alteration is temporary or a proposal is abandoned. This notification process gives the FAA the necessary time to change effected procedures and/or minimum flight altitudes and to otherwise alert airmen of the structure's presence.

   Note: Notification, as required in the determination, is critical to aviation safety.

1.5 Modifications and Deviations.

Requests for modification or deviation from the standards outlined in this AC must be submitted to the FAA Obstruction Evaluation Group (OEG). The sponsor is responsible for adhering to approved marking and/or lighting limitations, and/or recommendations given, and should notify the FAA and FCC (for those structures regulated by the FCC) prior to removal of marking and/or lighting. A request received after a determination is issued may require a new study and could result in a new determination.

1. Modification Examples. Modifications will be based on whether they impact aviation safety. Examples of modifications are as follows:

   a. Marking and/or Lighting Only a Portion of an Object. The object may be located with respect to other objects or terrain that only a portion of it needs to be marked or lighted.

   b. No Marking and/or Lighting. The object may be located with respect to other objects or terrain, removed from the general flow of air traffic, or may be so conspicuous by its shape, size or color that marking or lighting would serve no useful purpose.

   c. Voluntary Marking and/or Lighting. The object may be located with respect to other objects or terrain that the sponsor feels increased conspicuity would better serve aviation safety. Sponsors who desire to voluntarily mark and/or light their structure should do so in accordance with this AC.

   d. Marking or Lighting an Object in Accordance with the Standards for an Object of Greater Height or Size. The object may present such an extraordinary hazard potential that higher standards may be recommended for increased conspicuity to ensure aviation safety.

2. Deviations. The assigned Obstruction Evaluation Specialist will conduct an aeronautical study of the proposed deviation(s) and forward their recommendation to FAA Headquarters, OEG Manager, in Washington, DC, for final approval. Examples of deviations that may be considered:

   a. Colors of objects.

   b. Dimensions of color bands or rectangles.

   c. Colors/types of lights.

   d. Basic signals and intensity of lighting.

   e. Night/day lighting combinations.

   f. Flash rate.

3. The FAA strongly recommends that owners become familiar with the different types of lighting systems and to specifically request the type of lighting system desired when submitting FAA Form 7460-1. Information on these systems is given in Table A-1 in Appendix A. While the FAA will make every effort to accommodate the structure sponsor's request, sponsors should also request

information from system manufacturers to determine which system best meets their needs based on purpose, installation, and maintenance costs.

1.6 **Additional Notification.**

Any change to the submitted information on which the FAA has based its determination, including modification, deviation, or optional upgrade to white lighting on structures, may require notice to the FCC prior to making the change for proper authorization and annotations of obstruction marking and lighting. These structures may be subject to inspection and enforcement of marking and lighting requirements by the FCC. FCC Forms and Bulletins can be obtained from the FCC's National Call Center at 1-888-CALL-FCC (1-888-225-5322) or online at http://www.fcc.gov/forms. Upon completion of the actual change, complete the "Add Supplemental Notice (7460-2 Form)" at the http://oeaaa.faa.gov website. You may also mail the FAA Form 7460-2 to:

FAA Aeronautical Information Services
1305 E W Hwy
Silver Spring, MD 20910
1-800-626-3677

CHAPTER 2. GENERAL

2.1 Structures to be Marked and Lighted.

Any temporary or permanent structure, including all appurtenances, that exceeds an overall height of 200 feet (61 m) above ground level (AGL) or exceeds any obstruction standard contained in 14 CFR Part 77 should be marked and/or lighted. However, an FAA aeronautical study may reveal that the absence of marking and/or lighting will not impair aviation safety. Conversely, the object may present such an extraordinary hazard potential that higher standards may be recommended for increased conspicuity to ensure aviation safety. In general, commercial outside lighting should not be used in lieu of FAA-recommended marking and/or lighting. Recommendations on marking and/or lighting structures can vary, depending on terrain features, weather patterns, geographic location, and in the case of wind turbines, the number of structures and overall design layout. The FAA may also recommend marking and/or lighting a structure that does not exceed 200 (61 m) feet AGL or 14 CFR Part 77 standards because of its particular location. The marking and lighting configurations are illustrated in Appendix A, Figures A-1 through A-27.

2.2 Guyed Structures.

The guys of a 2,000-foot (610-m) skeletal tower are anchored between 1,600 feet (488 m) and 2,000 feet (610 m) from the base of the structure. This places a portion of the guys 1,500 feet (458 m) from the tower at a height of between 125 feet (38 m) and 500 feet (153 m) AGL. Title 14 CFR Part 91, Section 119, requires pilots, when operating over other than congested areas, to remain at least 500 feet (153 m) from man-made structures. Therefore, the tower must be cleared by 2,000 feet (610 m) horizontally to avoid all guy wires. Properly maintained marking and lighting are important for increased conspicuity because the guys of a structure are difficult to see until the aircraft is dangerously close.

2.3 Marking and Lighting Equipment.

Considerable effort and research was expended to determine the minimum marking and lighting systems or quality of materials that will produce an acceptable level of aviation safety. The FAA will recommend only those marking and lighting systems that meet established technical standards. While additional lights may be desirable to identify an obstruction to air navigation and may, on occasion, be recommended, the FAA will recommend minimum standards in the interest of safety, economy, and related concerns. Therefore, to provide an adequate level of safety, obstruction lighting systems should be installed, operated, and maintained in accordance with the recommended standards herein. Table A-1 in Appendix A contains descriptions of each FAA-approved obstruction lighting fixture that is referred to in this AC.

2.4 Light Failure Notification.

2.4.1 Sponsors should consider that conspicuity is achieved only when all recommended lights are working. Partial equipment outages decrease the margin of safety. Any outage should be corrected as soon as possible. Failure of steady-burning side or intermediate lights should be corrected as soon as possible, but notification is not required.

2.4.2 Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately by calling Outage Reporting and Notice to Airmen (NOTAM) 877-487-6867, or for Alaska 800-478-3576, so a NOTAM can be issued. Lights that are voluntary (not required by an FAA determination) do not require a NOTAM. For structures that are regulated by the FCC, the FCC advises that noncompliance with notification procedures could subject the sponsor to penalties or monetary forfeitures.

2.4.3 The following information should be specified for outage reporting:

1. Name of persons or organizations reporting the light failures, including any title, address, and telephone number.
2. The type of structure.
3. Location of structure (including latitude and longitude, if known, prominent structures, landmarks, etc.).
4. Height of structure AGL/above mean sea level (AMSL) if known.
5. A return to service date.
6. FCC Antenna Structure Registration Number (for structures that are regulated by the FCC).

Note 1: When the primary lamp in a double obstruction light fails, and the secondary lamp comes on, no report is required.

Note 2: After 15 days, the NOTAM is automatically deleted from the system. The sponsor is responsible for calling outage reporting to extend the outage date or to report a return to service date.

2.5 Notification of Restoration.

As soon as normal operation is restored, notify outage reporting. For structures that are regulated by the FCC, the FCC advises that noncompliance with notification procedures could subject the sponsor to penalties or monetary forfeitures.

2.6 Federal Communications Commission (FCC) Requirement.

The use of a high-intensity flashing white lighting system on structures located in residential neighborhoods (as defined by applicable zoning laws) trigger requirements for FCC licenses and an environmental assessment.

2.7 Voluntary Marking of Meteorological Evaluation Towers (METs) Less Than 200 Feet (61 m) AGL.

2.7.1 Recommendation.

The FAA recommends voluntary marking of METs less than 200 feet (61 m) AGL in accordance with marking guidance contained in this advisory circular (AC). Historically, this guidance has not been applied. However, the FAA recognizes the need to address safety impacts to low-level agricultural flight operations, and it believes that voluntarily marking METs less than 200 feet (61 m) AGL in remote and rural areas enhance the conspicuity of these structures.

2.7.2 Painting.

METs should be painted in accordance to the criteria contained in Chapter 3, paragraphs 3.1 through 3.4, specifically, with alternate bands of aviation orange and white paint. In addition, paragraph 3.5 states that all markings should be replaced when faded or otherwise deteriorated.

2.7.3 High-Visibility Sleeves.

It is recommended that several high-visibility sleeves be installed on the MET's outer guy wires. One high-visibility sleeve should be installed on each guy wire, as close to the anchor point as possible, but at a, height well above the crop or vegetation canopy. A second sleeve should be installed on the same outer guy wires midway between the location of the lower sleeve and the upper attachment point of the guy wire to the MET.

2.7.4 Spherical Markers.

It is also recommended that high-visibility aviation orange spherical marker (or cable) balls be attached to the guy wires. Spherical markers should be installed and displayed in accordance to Chapter 3, paragraph 3.5. The FAA, however, recognizes various weather conditions and manufacturing placement standards may affect the placement and use of high-visibility sleeves and/or spherical markers. Thus, some flexibility is allowed when determining sleeve length and marker placement on METs.

2.8 Obstruction Height Definition Changed to 499 Feet AGL.

Because of changes made to 14 CFR Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, on July 21, 2010, the height of a structure (identified as an obstruction) was lowered to 499 feet AGL from 500 feet AGL. Consequently, all structures that are above 499 feet AGL will be designated as obstructions. The FAA will conduct an aeronautical study to determine the effect on navigable airspace. This will ensure all usable airspace at and above 500 feet AGL is addressed during the study and the airspace is safe for air navigation.

CHAPTER 3. MARKING GUIDELINES

3.1 Purpose.

This chapter provides recommended guidelines to make certain structures conspicuous to pilots during daylight hours. One way to achieve this conspicuity is to paint and/or mark these structures. Recommendations on marking structures can vary, depending on terrain features, weather patterns, geographic location, and the number of structures. Specific marking guidelines for wind turbines are contained in Chapter 13.

3.2 Paint Colors.

Alternate sections of aviation orange and white paint should be used as the contrast in colors provides maximum visibility of an obstruction. Specific paint standards are contained in Chapter 12.

3.3 Paint Standards.

To be effective, the paint used should meet specific color requirements when freshly applied to a structure. Because all outdoor paints deteriorate with time, and it is not practical to give a maintenance schedule for all climates, surfaces should be repainted when the color changes noticeably or its effectiveness is reduced by scaling, oxidation, chipping, or layers of contamination. The subsequent standards should be followed.

3.3.1 Materials and Application.

The FAA recommends that quality paint and materials be selected to maximize years of service. The paint should be appropriate for the surfaces to be painted, including any previous coatings, and suitable for the environmental conditions. Surface preparation and paint application should follow the manufacturer's recommendations.

> **Note:** In-Service Aviation Orange Color Tolerance Charts are available from private suppliers for determining when repainting is required. The color should be sampled on the upper half of the structure, since weathering is greater there.

3.3.2 Surfaces not Requiring Paint.

Ladders, decks, and walkways of steel towers and similar structures do not need to be painted if a smooth surface presents a potential hazard to maintenance personnel. Painting may also be omitted from precision or critical surfaces if the paint would have an adverse effect on the transmission or radiation characteristics of a signal. However, the structure's overall marking effect should not be reduced.

3.3.3 Skeletal Structures.

Complete all marking/painting prior to or immediately upon completion of construction. This applies to catenary support structures, radio and television towers, and similar skeletal structures. To be effective, paint should be applied to all inner and outer surfaces of the framework.

3.4 Paint Patterns.

Various types of paint patterns are used to mark structures. The pattern is determined by the size and shape of the structure. The following patterns are recommended.

3.4.1 Solid Pattern.

Obstacles should be painted aviation orange if the structure's horizontal and vertical dimensions do not exceed 10.5 feet (3.2 m).

3.4.2 Checkerboard Pattern.

Alternating rectangles of aviation orange and white are normally displayed on the following structures:

1. Water, gas, and grain storage tanks.
2. Buildings, as required.
3. Large structures exceeding 10.5 feet (3.2 m) across, having a horizontal dimension that is equal to or greater than the vertical dimension.

3.4.3 Size of Patterns.

The sides of the checkerboard pattern should measure not less than 5 feet (1.5 m) or more than 20 feet (6 m) and should be as nearly square as possible. However, if it is impractical because of the size or shape of a structure, the sides of the patterns may be less than 5 feet (1.5 m). When possible, the corner surfaces should be painted aviation orange. (See Figures A-15 and A-16 in Appendix A.)

3.4.4 Alternate Bands.

Alternate bands of aviation orange and white are normally displayed on the following structures:

1. Communication towers and catenary support structures.
2. Poles.
3. Smokestacks.
4. Skeletal framework of storage tanks and similar structures.
5. Structures that appear narrow from a side view are 10.5 feet (3.2 m) or more across, and the horizontal dimension is less than the vertical dimension.
6. Coaxial cable, conduits, and other cables attached to the face of a tower.

3.4.5 Color Band Characteristics.

Bands for structures of any height should be:

1. Equal in width, provided each band is not less than 1 1/2 feet (0.5 m) or more than 100 feet (31 m) wide.
2. Perpendicular to the vertical axis with the bands at the top and bottom painted orange.

3. An odd number of bands on the structure.
4. Approximately one-seventh the height, if the structure is equal to or less than 700 feet (214 m) AGL. For each additional 200 feet (61 m) or fraction thereof, add one (1) additional orange and one (1) additional white band. Table 3-1 shows the required band widths based on the height of the structure.
5. Equal and in proportion to the structure's AGL height.

Table 3-1. Structure Height to Bandwidth Ratio

Example: If a structure is:		Band Width
Greater Than	**Equal to or Less Than**	
10.5 feet (3.2 m)	700 feet (214 m)	1/7 of height
700 feet (214 m)	900 feet (275 m)	1/9 of height
900 feet (275 m)	1,100 feet (336 m)	1/11of height
1,100 feet (336 m)	1,300 feet (397 m)	1/13 of height

3.4.6 Structures With a Cover or Roof.

If the structure has a cover or roof, the highest orange band should be continued to cover the entire top of the structure. (See Figures A-15 and A-16 in Appendix A.)

3.4.7 Skeletal Structures Atop Buildings.

If a flagpole, skeletal structure, or similar object is erected on top of a building, the combined height of the object and building will determine whether marking is recommended. However, only the height of the object filed with the FAA determines the width of the color bands.

3.4.8 Partial Marking.

If marking is recommended for only a portion of a structure because the structure is shielded by other objects or terrain, the width of the bands should be determined by the overall height of the structure. A minimum of three bands should be displayed on the upper portion of the structure.

3.4.9 Teardrop Pattern.

Spherical water storage tanks with a single, circular standpipe support may be marked in a teardrop-striped pattern. The tank should show alternate stripes of aviation orange and white. The stripes should extend from the top center of the tank to its supporting standpipe. The width of the stripes should be equal, and the width of each stripe at the greatest girth of the tank should not be less than 5 feet (1.5 m) nor more than 15 feet (4.6 m). (See Figure A-17 in Appendix A.)

3.4.10 Community Names.

If it is desirable to paint the name of the community on the side of a tank, the stripe pattern may be broken to serve this purpose. This open area should have a maximum height of 3 feet (0.9 m). (See Figure A-17 in Appendix A.)

3.4.11 Exceptions.

Structural designs not conducive to standard markings may be marked as follows:

1. If it is not practical to paint the roof of a structure in a checkerboard pattern, it may be painted solid orange.
2. If a spherical structure is not suitable for an exact checkerboard pattern, the shape of the rectangles may be modified to fit the shape of the surface.
3. Storage tanks not suitable for a checkerboard pattern may have alternating bands of aviation orange and white or a limited checkerboard pattern applied to the upper one-third of the structure.
4. The skeletal framework of certain water, gas, and grain storage tanks may be excluded from the checkerboard pattern.

3.5 **Unlighted Markers.**

Unlighted markers are used to identify structures and to make them more conspicuous when it is impractical to paint them. Unlighted markers may also be used in addition to aviation orange and white paint when additional conspicuity is necessary for aviation safety. Unlighted markers should be displayed in conspicuous positions on or adjacent to the structures so as to retain the general definition of the structure. They should be recognizable in clear, daytime visibility from a distance of at least 4,000 feet (1,219 m) and in all directions from which aircraft are likely to approach. Unlighted markers should be distinctively shaped, i.e., spherical or cylindrical, so that they are not mistaken for items that are used to convey other information. They should be replaced when faded or otherwise deteriorated.

3.5.1 Spherical Markers.

Spherical markers are used to identify overhead wires and catenary transmission lines that are less than 69 kV. Markers may be of another shape, i.e., cylindrical, provided the projected area of such markers is not less than that presented by a spherical marker.

1. Size and Color.

   The diameter of the markers used on extensive catenary wires (catenary wires that cross canyons, lakes, rivers, etc.) should not be less than 36 inches (91 cm). Smaller 20-inch (51-cm) spheres are permitted on less extensive catenary wires or on power lines below 50 feet (15 m) AGL and within 1,500 feet (458 m) of an airport runway end. Each marker should be a solid color, specifically aviation orange, white, or yellow.

2. Installations.

   a. Spacing. Unlighted markers should be spaced equally along the wire at approximately 200-foot (61-m) intervals, or fraction thereof. There should be less space between markers in critical areas near runway ends [i.e., 30 feet to 50 feet (10 m to 15 m)]. They should be displayed on the highest wire or by another means at the same height as the highest wire. Where there is more than one wire at the highest point, the markers may be installed alternately along each wire if the distance between adjacent markers meets the spacing standard of 200 feet or less. This method distributes the weight and wind-loading factors. (See Figure A-1 in Appendix A.)

   b. Pattern. An alternating color scheme provides the most conspicuity against all backgrounds. Unlighted markers should be installed by alternating solid-colored markers of aviation orange, white, and yellow. Normally, an orange marker is placed at each end of a line and the spacing is adjusted [not to exceed 200 feet (61 m)] to accommodate the rest of the markers. When less than four markers are used, they should all be aviation orange. (See Figure A-1 in Appendix A.)

   c. Wire Sag. Wire Sag, or droop, will occur due to temperature, wire weight, wind, etc. Twenty-five (25) feet (7.62 m) is the maximum allowable distance between the highest wire installed with marker balls and the highest wire without marker balls, and shall not violate the sag requirements of the transmission line design.

   d. Adjacent Lines. Catenary crossings with multiple transmission lines require appropriate markers when the adjacent catenary structure's outside lines are greater than 200 feet (61 m) away from the center of the primary structure. (See Figure A-2 in Appendix A.) If the outside lines of the adjacent catenary structure are within 200 feet (61 m) or less from the center of the primary structure, markers are not required on the adjacent lines. (See Figure A-3 in Appendix A.)

3.5.2 Flag Markers.

Flags are used to mark certain structures or objects when it is technically impractical to use spherical markers or paint. Some examples are temporary construction equipment, cranes, derricks, oil and other drilling rigs. Catenaries should use spherical markers.

1. Minimum Size. Each side of the flag marker should be at least 2 feet (0.6 m) in length.

2. Color Patterns. Flags should be colored as follows:

   a. Solid. Aviation orange.

   b. Orange and White. Arrange two triangular sections, one aviation orange and the other white to form a rectangle.

c. Checkerboard. Flags 3 feet (0.9 m) or larger should be a checkerboard pattern of aviation orange and white squares, each 1 foot (0.3 m) plus or minus 10 percent.

3. Shape. Flags should be rectangular in shape and have stiffeners to keep them from drooping in calm wind.

4. Display. Flag markers should be displayed around, on top, or along the highest edge of the obstruction. When flags are used to mark extensive or closely grouped obstructions, they should be displayed approximately 50 feet (15 m) apart. The flag stakes should be strong enough to support the flags and be higher than the surrounding ground, structures, and/or objects of natural growth.

3.6 Unusual Complexities.

The FAA may also recommend appropriate marking in an area in which grouped obstructions present a common obstruction to air navigation.

3.7 Omission or Alternatives to Marking.

The alternatives listed below require FAA review and concurrence.

3.7.1 High-Intensity Flashing White Lighting Systems.

High-intensity flashing white lighting systems are more effective than aviation orange and white paint and therefore can be recommended instead of paint marking. This is particularly true under certain ambient light conditions involving the position of the sun relative to the direction of flight. When high-intensity lighting systems are operated during daytime and twilight, other methods of marking may be omitted. When operated 24 hours a day, other methods of marking and lighting may be omitted.

3.7.2 Medium-Intensity Flashing White Lighting Systems.

When medium-intensity flashing white lighting systems are operated during daytime and twilight on structures 700 feet (213 m) AGL or less, other methods of marking may be omitted.

Note: Sponsors must ensure that alternatives to marking are coordinated with the FCC for structures under its jurisdiction prior to making the change.

CHAPTER 4. LIGHTING GUIDELINE

4.1 Purpose.

This chapter describes the various obstruction lighting systems used to identify structures that have been determined to require added conspicuity. The lighting standards in this AC are the minimum necessary for aviation safety. Recommendations on lighting structures can vary, depending on terrain features, weather patterns, geographic location, and number of structures. Specific lighting guidelines for wind turbines are contained in Chapter 13.

4.2 Standards.

The standards outlined in this AC are based on using light units that meet specified intensities, beam patterns, color, and flash rates as stated in AC 150/5345-43, *Specification for Obstruction Lighting Equipment*. These standards may be obtained from: www.faa.gov/airports/resources/advisory_circulars/

4.3 Lighting Systems.

Obstruction lighting may be displayed on structures as follows:

1. Aviation Red Obstruction Lights. Use flashing lights and/or steady-burning lights during nighttime. Tower structures are typically marked with flashing red lights. Buildings and smaller obstructions located near airports should be marked with steady-burning red lights. (See Chapter 5).

2. Medium-Intensity Flashing White Obstruction Lights. Medium-intensity flashing white obstruction lights may be used during daytime and twilight with automatically selected reduced intensity for nighttime operation. When this system is used on structures 700 feet (213 m) AGL or less, other methods of marking and lighting the structure may be omitted. Aviation orange and white paint is always required for daytime marking on structures exceeding 700 feet (213 m) AGL. This system is not normally recommended on structures 200 feet (61 m) AGL or less.

3. High-Intensity Flashing White Obstruction Lights. High-intensity flashing white obstruction lights may be used during daytime with automatically selected reduced intensities for twilight and nighttime operations. When this system is used, other methods of marking and lighting the structure may be omitted. This system should not be used on structures 700 feet (213 m) AGL or less, unless an FAA aeronautical study shows otherwise.

   Note: All flashing lights on a structure should flash simultaneously except for catenary support structures, which have a distinct flashing sequence between the levels of lights (see paragraph 4.4).

4. Dual Lighting. This system consists of red lights for nighttime and high- or medium-intensity flashing white obstruction lights for daytime and twilight. When a dual lighting system incorporates medium-intensity flashing white lights on

structures 700 feet (213 m) AGL or less or high-intensity flashing white lights on structures greater than 700 feet (213 m) AGL, other methods of marking the structure may be omitted.

5. Obstruction Lights During Construction. As the height of the structure exceeds each level at which permanent obstruction lights would be recommended, two or more lights of the type specified in the determination should be installed at that level. Temporary high or medium-intensity flashing white lights, as recommended in the determination, should be operated 24 hours a day until all permanent lights are in operation. In either case, two or more lights should be installed on the uppermost part of the structure any time it exceeds the height of the temporary construction equipment. They may be turned off for periods when they could interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level.

6. Obstruction Lights in Urban Areas. When a structure is located in an urban area where there are numerous other white lights (e.g., streetlights) red obstruction lights with painting or a medium-intensity dual system is recommended. Medium-intensity lighting is not normally recommended on structures less than 200 feet (61 m).

7. Temporary Construction Equipment Lighting. Since there is such a variance in construction cranes, derricks and other drilling rigs, each case should be considered individually. Lights should be installed according to the standards given in Chapters 5, 6, 7, or 8, as they would apply to permanent structures.

4.4 **Lighted Spherical Markers.**

4.4.1 Lighted markers are available for increased night conspicuity of high-voltage (69 kV or greater) transmission line catenary wires. These markers should be used on transmission line catenary wires near airports, heliports, across rivers, canyons, lakes, etc. The lighted markers should be manufacturer-certified as recognizable from a minimum distance of 4,000 feet (1,219 m) under nighttime conditions, minimum Visual Flight Rule (VFR) conditions or having a minimum intensity of at least 32.5 candelas. The lighting unit should emit a steady-burning, red light.

4.4.2 Lighted markers should be installed on the highest energized line. If the lighted markers are installed on a line other than the highest catenary, then markers specified in Chapter 3 paragraph 3.5 should be used in addition to the lighted markers. The maximum distance between the line energizing the lighted markers and the highest catenary above the lighted marker should be no more than 25 feet (7.62 m) and shall not violate the sag requirements of the transmission line design.

4.4.3 Lighted markers should be distinctively shaped, (i.e., spherical or cylindrical) so they are not mistaken for items that are used to convey other information. They should be visible in all directions from which aircraft are likely to approach. The area in the

immediate vicinity of the supporting structure's base should be clear of all items and/or objects of natural growth that could interfere with the line-of-sight between a pilot and the structure's lights. (See Figure A-4 in Appendix A.) When a catenary wire crossing requires three or more supporting structures, the inner structures should be equipped with enough light units per level to provide full coverage from which aircraft are likely to approach.

4.5 Inspection, Repair, and Maintenance.

To ensure the proper candela output for fixtures with incandescent lamps, the voltage provided to the lamp filament should not vary more than plus or minus three percent of the lamp's rated voltage. The input voltage should be measured at the closest disconnecting means to the lamp fixture with the lamp operating during the hours of normal operation. (For strobes, the input voltage of the power supplies should be within 10 percent of rated voltage.) Lamps should be replaced after being in operation for approximately 75 percent of their rated life or immediately upon failure. Flashtubes in a light unit should be replaced immediately upon failure, when the peak effective intensity falls below specification limits or when the fixture begins skipping flashes, or at the manufacturer's recommended intervals. Due to the effects of harsh environments, light fixture lenses should be visually inspected every 24 months, or when the light fixture fails, for ultraviolet (UV) damage, cracks, crazing, dirt buildup, etc., to ensure the certified light output has not deteriorated. (See Chapter 2 paragraph 2.4 for reporting requirements in case of failure.) Lenses that have cracks, UV damage, crazing, or excessive dirt buildup should be cleaned or replaced.

4.6 Nonstandard Lights.

Moored balloons, chimneys, church steeples, and similar obstructions may be floodlighted by fixed search light projectors installed at three or more equidistant points around the base of each obstruction. The searchlight projectors should provide an average illumination of at least 15 foot-candles (161.45 lux) over the top one-third of the obstruction.

4.7 Placement Factors.

The height of the structure AGL determines the number of light levels. The light levels may be adjusted slightly, but not to exceed 10 feet (3 m) when necessary to accommodate guy wires and personnel who replace or repair light fixtures. Except for catenary wire support structures, the following factors should be considered when determining the placement of obstruction lights on a structure.

1. Red Obstruction Lighting Systems. The structure's overall height, including all appurtenances, such as rods, antennas, and obstruction lights, determines the number of light levels.
2. Medium-Intensity Flashing White Obstruction Lighting Systems. The structure's overall height, including all appurtenances such as rods, antennas, and obstruction lights, determines the number of light levels.

3. High-Intensity Flashing White Obstruction Lighting Systems. The main structure's overall height, excluding all appurtenances, such as rods, antennas, and obstruction lights, determines the number of light levels.

4. Dual Obstruction Lighting Systems. The structure's overall height, including all appurtenances, such as rods, antennas, and obstruction lights, is used to determine the number of light levels for a medium-intensity white obstruction light/red obstruction dual lighting system. The structure's overall height, excluding all appurtenances, is used to determine the number of light levels for a high-intensity white obstruction light/red obstruction dual lighting system.

5. Adjacent Structures. The elevation of the tops of adjacent buildings in congested areas may be used as the equivalent of ground level to determine the correct number of light levels required.

6. Shielded Lights. If an adjacent structure or object blocks the visibility of an obstruction light, the light's horizontal placement should be adjusted or additional lights should be mounted on that object to retain or contribute to the definition of the obstruction.

7. Nesting of Lights. Care should be taken to ensure that obstruction lights do not become blocked or "nested" as new antennas, hardware, or appurtenances are added to the top of a structure. If new equipment is added that blocks the obstruction light's visibility, the light fixtures must be relocated and/or raised so that it is not blocked by the new equipment. For example, when new larger cellular antenna panels are fitted to older towers, the obstruction light will need to be raised so that it is not blocked by the larger antenna panels. The widest structure, appurtenance, lightning rod, or antenna that can be placed in front of an obstruction light (excluding the L-810 light) without significantly blocking the obstruction light's visibility should be no wider than 7/8 of an inch. Due to their smaller size, L-810 lights should not be blocked by any structure.

4.8 **Monitoring Obstruction Lights.**

Obstruction lighting systems should be closely monitored by visual or automatic means. It is extremely important to visually inspect obstruction lighting in all operating intensities at least once every 24 hours on systems without automatic monitoring. In the event a structure is not readily accessible for visual observation, a properly maintained automatic monitor should be used. This monitor should be designed to register the malfunction of any light on the obstruction regardless of its position or color. When using remote monitoring devices, the system's communication and operational status should be confirmed at least once every 24 hours. The monitor (aural or visual) should be located in an area generally occupied by the responsible personnel. In some cases, this may require a remote monitor in an attended location. For each structure, a log should be maintained in which the lighting system's daily operations status is recorded. Light fixture lenses should be replaced if serious cracks, hazing, dirt buildup, etc., has occurred.

4.9 **Ice Shields.**

Where icing is likely to occur, metal grates or similar protective ice shields should be installed directly over each light unit to prevent falling ice or accumulation from damaging the light units. The light should be mounted in a manner to ensure an unobstructed view of at least one light by a pilot approaching from any direction.

4.10 **Light Shields.**

In general, light shields are not permitted because of the adverse effects they have on the obstruction light fixture's photometrics. In addition, these shields can promote undesired snow accumulation, bird nesting, and wind loading.

4.11 **Distraction.**

When obstruction lights are in proximity to a navigable waterway, they may distract vessel operators. To avoid interference with marine navigation, coordinate with the Commander of the District Office, United States (U.S.) Coast Guard before installing the lighting system. The contact information for the U.S. Coast Guard is:

Commandant (CG-5531)
U.S. Coast Guard
2100 2nd St SW, Stop 7580
Washington, DC 20593-7580
202-372-1561

CHAPTER 5. RED OBSTRUCTION LIGHT SYSTEM

5.1 Purpose.

Red obstruction lights are used to increase conspicuity during nighttime. Daytime and twilight marking is required. Recommendations on lighting structures can vary, depending on terrain features, weather patterns, geographic location, and number of structures. Specific lighting guidelines for wind turbines are contained in Chapter 13.

5.2 Standards.

The red obstruction light system is composed of flashing omnidirectional lights (L-864) and/or steady-burning or flashing (L-810) lights. When one or more levels are comprised of flashing lights, the lights should flash simultaneously. The number of light levels needed is shown in Figure A-6 in Appendix A.

1. Single Obstruction Light. A single red obstruction light (L-810) may be used when more than one obstruction light is required either vertically or horizontally, or when maintenance is needed, and can be installed within a reasonable time.
   a. Top Level. A single steady-burning light (L-810) may be used to identify low structures, such as airport instrument landing system buildings, as well as long horizontal structures, such as perimeter fences and building roof outlines.
   b. Intermediate Level. Single flashing or steady-burning lights (as appropriate for size and type of structure) may be used on skeletal and solid structures when more than one level of lights is installed, and there are two or more single lights per level.
2. Double Obstruction Light. A double steady-burning (L-810) light should be installed when used as a top light, at each end of a row of single obstruction lights, and in areas or locations where the failure of a single unit could cause an obstruction to be totally unlighted.
   a. Top Level. Structures 150 feet (46 m) AGL or less should have one or more double steady-burning lights installed at the highest point and operating simultaneously.
   b. Intermediate Level. Double flashing or steady-burning lights (as appropriate for size and type of structure) should be installed at intermediate levels when a malfunction of a single light could create an unsafe condition and in remote areas where maintenance cannot be performed within a reasonable time. Both units may operate simultaneously, or a transfer relay may be used to switch to a spare unit should the active system fail.
   c. Lowest Level. The lowest level of light units may be installed at a higher elevation than normal on a structure if the surrounding terrain, trees, or adjacent building(s) would obscure the lights. In certain instances, as determined by the FAA, the lowest level of lights may be eliminated.

5.3 **Control Device.**

Red obstruction lights should be operated by an acceptable control device (e.g., photocell, timer, etc.) adjusted so the lights will be turned on when the northern sky illuminance reaching a vertical surface falls below a level of 60 foot-candles (645.8 lux) but before reaching a level of 35 foot-candles (376.7 lux). The control device should turn the lights off when the northern sky illuminance rises to a level of not more than 60 foot-candles (645.8 lux). The lights may also remain on continuously. The sensing device should, if practical, face the northern sky in the Northern Hemisphere. (See AC 150/5345-43.)

5.4 **Poles, Towers, and Similar Skeletal Structures.**

The following standards apply to radio and television towers, supporting structures for overhead transmission lines, and similar structures.

1. Top-Mounted Obstruction Light.

   a. Structures 150 Feet (46 m) AGL or Less. Two or more steady-burning red (L-810) lights should be installed in a manner to ensure an unobstructed view of one or more lights by a pilot.

   b. Structures Exceeding 150 Feet (46 m) AGL. At least one red flashing (L-864) light should be installed in a manner to ensure an unobstructed view of one or more lights by a pilot.

   c. Appurtenances 40 Feet (12 m) or Less. If a rod, antenna, or other appurtenance 40 feet (12 m) or less in height is incapable of supporting a red flashing light, then it may be placed at the base of the appurtenance. If the mounting location does not allow an unobstructed view of the light by a pilot, then additional lights should be added.

   d. Appurtenances Exceeding 40 Feet (12 m). If a rod, antenna, or other appurtenance exceeding 40 feet (12 m) in height is incapable of supporting a red flashing light, a supporting mast with one or more lights should be installed adjacent to the appurtenance. Adjacent installations should not exceed the appurtenance's height and be within 40 feet (12 m) of the tip to allow the pilot an unobstructed view of at least one light. If the rod, antenna, or other appurtenance is 7/8 inch wide or more, at least two lights must be installed on the supporting mast to provide the necessary unobstructed view.

2. Mounting Intermediate Levels. The number of light levels is determined by the height of the structure, including all appurtenances, as shown in Figure A-6 in Appendix A. The number of lights on each level is determined by the shape and height of the structure. These lights should be mounted to ensure an unobstructed view of at least one light by a pilot.

   a. Steady-Burning Lights (L-810).

i. Structures 150 Feet (46 m) AGL or Less. Two or more steady-burning (L-810) lights should be installed diagonally or on diametrically opposite positions.

ii. Structures Exceeding 150 Feet (46 m) AGL. These structures do not require steady-burning (L-810) lights.

b. Flashing Lights (L-810). For structures exceeding 151 feet (46 m) but not more than 350 feet (107 m) at intermediate levels, two or more flashing (L-810) lights should be mounted outside at diagonally opposite positions of intermediate levels. These lights should be configured to flash simultaneously with the L-864 flashing light on the top of the structure at a rate of 30 flashes per minute (fpm) (± 3 fpm).

c. Flashing Lights (L-864).

i. Structures 350 Feet (107 m) AGL or Less. These structures do not require flashing (L-864) lights at intermediate levels.

ii. Structures Exceeding 350 Feet (107 m) AGL. At intermediate levels, as shown in Figure A-6 in Appendix A, two (L-864) lights should be mounted outside at diagonally opposite positions.

5.5 Chimneys, Flare Stacks, and Similar Solid Structures.

5.5.1 Number of Light Units.

The number of units recommended depends on the diameter of the structure at the top. The number of lights recommended below is the minimum.

1. Structures 20 Feet (6 m) or Less in Diameter. Three light units per level (see Figure A-20 in Appendix A).
2. Structures Exceeding 20 Feet (6 m) but not More Than 100 Feet (31 m) in Diameter. Four light units per level (see Figure A-20 in Appendix A).
3. Structures Exceeding 100 Feet (31 m) but not More Than 200 Feet (61 m) in Diameter. Six light units per level (see Figure A-21 in Appendix A).
4. Structures Exceeding 200 Feet (61 m) in Diameter. Eight light units per level.

5.5.2 Top-Mounted Obstruction Lights.

1. Structures 150 Feet (46 m) AGL or Less. L-810 lights should be installed horizontally at regular intervals at or near the top.
2. Structures Exceeding 150 Feet (46 m) AGL. At least three L-864 lights should be installed.
3. Chimneys, Cooling Towers, and Flare Stacks. Lights may be displayed as low as 20 feet (6-m) below the top (see Figure A-13 in Appendix A) to avoid the obscuring effect of deposits and heat generally emitted by this type of structure. It is important that these lights are readily accessible for cleaning and lamp replacement. It is understood that with flare stacks, as well as any other structures associated with the

petrol-chemical industry, normal lighting requirements may not be necessary. This could be due to the location of the flare stack/structure within a large, well-lighted, petrol-chemical plant, or the fact that the flare, or working lights surrounding the flare stack/structure, is as conspicuous as obstruction lights.

5.5.3 Mounting Intermediate Levels.

The number of light levels is determined by the height of the structure including all appurtenances. For cooling towers 600 feet (183 m) AGL or less, intermediate light levels are not necessary. Structures between 150 feet and 350 feet AGL or less should have a second level of steady-burning red light units installed approximately at the midpoint of the structure and in a vertical line with the top level of lights. Structures exceeding 350 feet (107 m) AGL should have a second level of flashing light units.

1. Steady-Burning (L-810) Lights. The recommended number of light levels is shown in Figure A-15 in Appendix A. At least three lights should be installed on each level.
2. Flashing (L-864) Lights. The recommended number of light levels is shown in Figure A-6 in Appendix A. At least three lights should be installed on each level.
   a. Structures 350 Feet (107 m) AGL or Less. These structures do not need intermediate levels of flashing lights.
   b. Structures Exceeding 350 Feet (107 m) AGL. At least three flashing (L-864) lights should be installed on each level in a manner, allowing an unobstructed view of at least one light.

5.6 Group of Obstructions.

When individual objects, except wind turbines, within a group of obstructions are not the same height and are spaced a maximum of 150 feet (46 m) apart, the prominent objects within the group should be lighted in accordance with the standards for individual obstructions of a corresponding height. If the outer structure is shorter than the prominent object, the outer structure should be lighted in accordance with the standards for individual obstructions of a corresponding height. Light units should be placed to ensure that the light is visible to a pilot approaching from any direction. In addition, at least one flashing light should be installed at the top of a prominent center obstruction or on a special tower located near the center of the group. For the purpose of marking and lighting obstructions other than wind turbines, a group of obstructions is considered to be three (3) or more structures.

5.7 Alternate Method of Displaying Obstruction Lights.

The FAA may recommend that lights be placed on poles equal to the height of the obstruction and installed on or adjacent to the structure instead of installing lights on the obstruction.

5.8 Prominent Buildings, Bridges, and Similar Extensive Obstructions.

When objects within a group of obstructions are approximately the same overall height above the surface and are located a maximum of 150 feet (46 m) apart, the group of obstructions may be considered an extensive obstruction. Light units should be installed on the same horizontal plane at the highest portion, or edge, of the prominent obstructions. Light units should be placed to ensure the light is visible to a pilot approaching from any direction. If the structure is a bridge and is over navigable water, the sponsor must obtain prior approval of the lighting installation from the Commander of the District Office of the U.S. Coast Guard to avoid interference with marine navigation. Steady-burning lights should be displayed to indicate the extent of the obstruction, as follows:

1. Structures 150 Feet (46 m) or Less in Any Horizontal Direction. If the structure/bridge/extensive obstruction is 150 feet (46 m) or less horizontally, at least one steady-burning light (L-810) should be displayed on the highest point at each end of the obstruction's major axis. If this is impractical because of the overall shape, display a double obstruction light in the center of the highest point.

2. Structures Exceeding 150 Feet (46 m) in at Least One Horizontal Direction. If the structure/bridge/extensive obstruction exceeds 150 feet (46 m) horizontally, at least one steady-burning light should be displayed for each 150 feet (46 m), or fraction thereof, of the overall length of the major axis. At least one of these lights should be displayed on the highest point at each end of the obstruction. Additional lights should be displayed at approximately equal intervals, not to exceed 150 feet (46 m) on the highest points along the edge between the end lights. If an obstruction is located near a landing area and two or more edges are the same height, the edge nearest the landing area should be lighted.

3. Structures Exceeding 150 Feet (46 m) AGL. Steady-burning red obstruction lights should be installed on the highest point at each end. At intermediate levels, steady-burning red lights should be displayed for each 150 feet (46 m), or fraction thereof. The vertical position of these lights should be equidistant between the top lights and the ground level, as the shape and type of obstruction will permit. A steady-burning red light should be displayed at each outside corner on each level with the remaining lights evenly spaced between the corner lights.

4. Exceptions. Flashing red lights (L-864) may be used instead of steady-burning lights if early or special warning is necessary. These lights should be displayed on the highest points of an extensive obstruction at intervals not exceeding 3,000 feet (915 m). At least three lights should be displayed on one side of the extensive obstruction to indicate a line of lights. (See Figure A-22 in Appendix A.)

5. Ice Shields. See paragraph 4.9.

CHAPTER 6. MEDIUM-INTENSITY FLASHING WHITE OBSTRUCTION LIGHT SYSTEMS

6.1 Purpose.

Medium-intensity flashing white (L-865) obstruction lights may provide conspicuity both day and night. Recommendations on lighting structures can vary, depending on terrain features, weather patterns, geographic location, and number of structures.

6.2 Standards.

6.2.1 The medium-intensity flashing white light system is normally composed of flashing omnidirectional lights. Medium-intensity flashing white obstruction lights may be used during daytime and twilight with automatically selected, reduced intensity for nighttime operation. When this system is used on structures 700 feet (213 m) AGL or less, other methods of marking and lighting the structure may be omitted. (Aviation orange and white paint is always required for daytime marking on structures exceeding 700 feet (213 m) AGL. This system is not normally recommended on structures 200 feet (61 m) AGL or less. The number of light levels needed is shown in Figure A-7 in Appendix A.

6.2.2 Using a 24-hour, medium-intensity, flashing white light system in urban/populated areas is not normally recommended due to their tendency to blend with the background lighting in these areas at night. This makes it extremely difficult for some types of aviation operations, i.e., medical-evacuation (medevac) and police helicopters to see these structures. Using this type of system in urban and rural areas often results in complaints. In addition, this system is not recommended on structures within 3 nautical miles (NM) of an airport.

6.3 Radio and Television Towers and Similar Skeletal Structures.

6.3.1 Mounting Lights.

The number of levels recommended depends on the height of the structure, including antennas and similar appurtenances.

1. Top Levels. One or more lights should be installed at the highest point to provide 360-degree coverage, ensuring an unobstructed view by a pilot approaching from any direction.
2. Appurtenances 40 Feet (12 m) or Less. If a rod, antenna, or other appurtenance 40 feet (12 m) or less in height is incapable of supporting the medium-intensity flashing white light, then it may be placed at the base of the appurtenance. If the mounting location does not allow an unobstructed view of the medium-intensity flashing white light by a pilot approaching from any direction, then additional lights should be added.
3. Appurtenances Exceeding 40 Feet (12 m). If a rod, antenna, or other appurtenance exceeds 40 feet (12 m) above the tip of the main structure, a medium-intensity

flashing white light should be placed within 40 feet (12 m) from the top of the appurtenance. If the appurtenance (such as a whip antenna) is incapable of supporting the light, one or more lights should be mounted on a pole adjacent to the appurtenance. Adjacent installations should not exceed the height of the appurtenance and be within 40 feet (12 m) of the tip to allow the pilot an unobstructed view of at least one light. If the rod, antenna, or other appurtenance is 7/8 of an inch wide or more, at least two lights must be installed on the supporting mast to provide the necessary unobstructed view.

6.3.2 Intermediate Levels.

At intermediate levels, two or more lights (L-865) should be mounted outside at diagonally or diametrically opposite positions of intermediate levels. The lowest light level should not be less than 200 feet (61 m) AGL.

6.3.3 Lowest Levels.

The lowest level of light units may be installed at a higher elevation than normal on a structure if the surrounding terrain, trees, or adjacent building(s) would obscure the lights. In certain instances, as determined by the FAA, the lowest level of lights may be eliminated.

6.3.4 Structures 700 Feet (213 m) AGL or Less.

When medium-intensity flashing white lights are used during nighttime and twilight only, marking is required for daytime. When operated 24 hours a day, other methods of marking and lighting are not required.

6.3.5 Structures Exceeding 700 Feet (213 m) AGL.

The lights should be used during nighttime and twilight and may be used 24 hours a day. Marking is always required for daytime.

6.3.6 Ice Shields.

See paragraph 4.9.

6.4 **Control Device.**

The light intensity is controlled by a device (photocell) that changes the light's intensity when the ambient light changes. The system should automatically change intensity steps when, in the Northern Hemisphere, the northern sky illumination reaching a north-facing vertical surface is as follows:

1. Twilight-to-Night. This should not occur before the illumination drops below 5 foot-candles (53.8 lux) but should occur before it drops below 2 foot-candles (21.5 lux).
2. Night-to-Day. The intensity changes listed in subparagraph 6.4 1 above should be reversed when changing from the night-to-day mode.

6.5 **Chimneys, Flare Stacks, and Similar Solid Structures.**

The number of light units recommended depends on the diameter of the structure at the top. Normally, the top level is on the highest point of a structure. However, the top level of chimney lights may be installed as low as 20 feet (6 m) below the top to minimize deposit build-up due to emissions. (See Figure A-13 in Appendix A.) The number of lights recommended below is the minimum, as shown in Figure A-20 in Appendix A.

1. Structures 20 Feet (6 m) or Less in Diameter. Three light units per level. (See Figure A-20 in Appendix A.)
2. Structures Exceeding 20 Feet (6 m) but not More Than 100 Feet (31 m) in Diameter. Four light units per level. (See Figure A-20 in Appendix A.)
3. Structures Exceeding 100 Feet (31 m) but not More Than 200 Feet (61 m) in Diameter. Six light units per level. (See Figure A-21 in Appendix A.)
4. Structures Exceeding 200 Feet (61 m) in Diameter. Eight light units per level.

6.6 **Group of Obstructions.**

When individual objects within a group of obstructions are not the same height and are spaced a maximum of 150 feet (46 m) apart, the prominent objects within the group should be lighted in accordance with the standards for individual obstructions of a corresponding height. If the outer structure is shorter than the prominent object, the outer structure should be lighted in accordance with the standards for individual obstructions of a corresponding height. Light units should be placed to ensure that the light is visible to a pilot approaching from any direction. In addition, at least one medium-intensity flashing white light should be installed at the top of a prominent center obstruction or on a special tower located near the center of the group.

6.7 **Special Cases.**

When lighting systems are installed on structures located near highways, waterways, airport approach areas, etc., caution should be exercised to ensure that the lights do not distract or otherwise cause a hazard to motorists, vessel operators, or pilots on an approach to an airport. In these cases, shielding may be necessary. This shielding should not derogate the lighting system's intended purpose.

6.8 **Prominent Buildings and Similar Extensive Obstructions.**

When objects within a group of obstructions are approximately the same overall height above the surface and are located a maximum of 150 feet (46 m) apart, the group of obstructions may be considered an extensive obstruction. Light units should be installed on the same horizontal plane at the highest portion, or edge, of the prominent obstructions. Light units should be placed to ensure that the light is visible to a pilot approaching from any direction. Lights should be displayed to indicate the extent of the obstruction as follows:

1. Structures 150 Feet (46 m) or Less in Any Horizontal Direction. If the structure/extensive obstruction is 150 feet (46 m) or less horizontally, at least one light should be displayed on the highest point at each end of the obstruction's major axis. If this is impractical because of the overall shape, display a double obstruction light in the center of the highest point.
2. Structures Exceeding 150 Feet (46 m) in at Least One Horizontal Direction. If the structure/extensive obstruction exceeds 150 feet (46 m) horizontally, at least one light should be displayed for each 150 feet (46 m), or fraction thereof, of the overall length of the major axis. At least one of these lights should be displayed on the highest point at each end of the obstruction. Additional lights should be displayed at approximately equal intervals not to exceed 150 feet (46 m) on the highest points along the edge between the end lights. If an obstruction is located near a landing area and two or more edges are the same height, the edge nearest the landing area should be lighted.
3. Structures Exceeding 150 Feet (46 m) AGL. Lights should be installed on the highest point at each end. At intermediate levels, lights should be displayed for each 150 feet (46 m), or fraction thereof. The vertical position of these lights should be equidistant between the top lights and the ground level as the shape and type of obstruction will permit. One such light should be displayed at each outside corner on each level with the remaining lights evenly spaced between the corner lights.

CHAPTER 7. HIGH-INTENSITY FLASHING WHITE OBSTRUCTION LIGHT SYSTEMS

7.1 Purpose.

High-intensity (L-856) flashing white obstruction lights provides the highest degree of conspicuity both day and night. Recommendations on lighting structures can vary, depending on terrain features, weather patterns, geographic location, and number of structures.

7.2 Standards.

High-intensity flashing white obstruction lights should be used during daytime with automatically selected, reduced intensities for twilight and nighttime operations. When high-intensity white obstruction lights are operated 24 hours a day, other methods of marking and lighting may be omitted. This system should not be recommended on structures 700 feet (213 m) AGL or less unless an FAA aeronautical study shows otherwise. The number of light levels needed is shown in Figures A-8 and A-9 in Appendix A.

7.3 Control Device.

7.3.1 Light intensity is controlled by a device (photocell) that changes the light's intensity when the ambient light changes. Using a 24-hour, high-intensity flashing white light system in urban/populated areas is not normally recommended due to their tendency to merge with background lighting in these areas at night. This makes it extremely difficult for some types of aviation operations (i.e., medevac) and police helicopters to see these structures. Using this type of system in urban and rural areas often results in complaints.

7.3.2 The system should automatically change intensity steps when, in the Northern Hemisphere, the northern sky illuminance reaching a north-facing vertical surface is as follows:

1. Day-to-Twilight. This should not occur before the illumination drops to 60 foot-candles (645.8 lux) but should occur before it drops below 35 foot-candles (376.7 lux). The illuminance-sensing device should, if practical, face the northern sky in the Northern Hemisphere.
2. Twilight-to-Night. This should not occur before the illumination drops below 5 foot-candles (53.8 lux) but should occur before it drops below 2 foot-candles (21.5 lux).
3. Night-to-Day. The intensity changes listed in subparagraphs 7.3.2 1 and 7.3.2.2 above should be reversed when changing from the night-to-day mode.

7.4 **Units per Level.**

One or more light units are needed to obtain the desired horizontal coverage. The number of light units recommended per level (except for the supporting structures of catenary wires and buildings) depends upon the average outside diameter of the specific structure and the horizontal beam width of the light fixture. Light units should be installed to ensure an unobstructed view of the system by a pilot approaching from **any** direction. The number of lights recommended below is the minimum.

1. Structures 20 Feet (6 m) or Less in Diameter. Three light units per level.
2. Structures Exceeding 20 Feet (6 m) but not More Than 100 Feet (31 m) in Diameter. Four light units per level.
3. Structures Exceeding 100 Feet (31 m) in Diameter. Six light units per level.

7.5 **Installation Guidance.**

On most obstruction high-intensity light fixtures, the effective peak intensity of the light beam can be adjusted from 0 to 8 degrees above the horizon. Standard installation should place the top light at 0 degrees to the horizontal and all other light units installed in accordance with Table 7-1.

Table 7-1. Light Unit Elevation Above the Horizontal

Height of Light Unit Above Terrain	Degrees of Elevation Above the Horizontal
Exceeding 500 feet AGL	0
Above 400 feet to 500 feet AGL	1
Above 300 feet to 400 feet AGL	2
300 feet AGL or less	3

1. Vertical Aiming. When terrain, nearby residential areas, or other situations dictate, the light beam may be further elevated above the horizontal. The main beam of light at the lowest level should not strike the ground closer than 3 statute miles (5 km) from the structure. If additional adjustments are necessary, the lights may be individually adjusted upward, in 1-degree increments, starting at the bottom. Excessive elevation may reduce its conspicuity by raising the beam above a collision course flight path.
2. Special Cases. When lighting systems are installed on structures located near highways, waterways, airport approach areas, etc., caution should be exercised to ensure that the lights do not distract or otherwise cause a hazard to motorists, vessel operators, or pilots on an approach to an airport. In these cases, shielding or adjusting the aim of the vertical or horizontal light may be necessary. This adjustment should not derogate the lighting system's intended purpose. Such

adjustments may require an additional review, as described in Chapter 1 paragraph 1.5.

3. Relocation or Omission of Light Units. Light units should not be installed in such a manner that the light pattern/output is disrupted by the structure.

   a. Lowest Level. The lowest level of light units may be installed at a higher elevation than normal on a structure if the surrounding terrain, trees, or adjacent building(s) would obscure the lights. In certain instances, as determined by the FAA, the lowest level of lights may be eliminated.

   b. Two Adjacent Structures. When two structures are within 500 feet (153 m) of each other and the light units are installed at the same levels, the sides of the structures facing each other do not need be lighted. (See Figures A-18 and A-19.) However, all lights on both structures must flash simultaneously, except for adjacent catenary support structures. Vertical placement of the lights should be adjusted to either or both structures' intermediate levels to place the lights on the same horizontal plane. If one structure is higher than the other, a complete level(s) of lights should be installed on the higher structure that extends above the top of the lower structure. If the structures are of such heights that the levels of lights cannot be placed in identical horizontal planes, then the light units should be placed so that the center of the horizontal beam patterns do not face toward the adjacent structure. For example, structures situated north and south of each other should have the light units on both structures installed on a northwest/southeast and northeast/southwest orientation.

   c. Three or More Adjacent Structures. The treatment of a cluster of structures as an individual or a complex of structures will be determined by the FAA, taking into consideration the location, heights, and spacing of other structures.

7.6 Antenna or Similar Appurtenance Light.

When a structure lighted by a high-intensity, flashing white light system is topped with an antenna or similar appurtenance exceeding 40 feet (12 m) in height, a medium-intensity flashing white light (L-865) should be placed within 40 feet (12 m) from the tip of the appurtenance. This light should operate 24 hours a day and flash simultaneously with the rest of the lighting system. The location of the appurtenance light is shown in Figure A-9 in Appendix A. Structures with an appurtenance 40 feet (12 m) or less in height should be lit in accordance with Figure A-8.

7.7 Chimneys, Flare Stacks, and Similar Solid Structures.

The number of light levels depends on the height of the structure, excluding appurtenances. Three or more lights should be installed on each level to ensure an unobstructed view by the pilot. Normally, the top level is on the highest point of a structure. However, the top level of chimney lights may be installed as low as 20 feet (6 m) below the top to minimize deposit buildup due to emissions.

7.8 Radio and Television Towers and Similar Skeletal Structures.

1. Mounting Lights. The number of levels recommended depends on the height of the structure, including antennas and similar appurtenances. At least three lights should be installed on each level and mounted to ensure that the effective intensity of the full horizontal beam coverage is not impaired by the structural members.
2. Top Level. One level of lights should be installed at the highest point of the structure. If the highest point is a rod or antenna incapable of supporting a lighting system, then the top level of lights should be installed at the highest portion of the main skeletal structure. If guy wires come together at the top, it may be necessary to install this level of lights as low as 10 feet (3 m) below the top. If the rod or antenna exceeds 40 feet (12 m) above the main structure, a medium-intensity, flashing white light (L-865) should be mounted on the highest point. (See Figure A-9 in Appendix A.) If the appurtenance (such as a whip antenna) is incapable of supporting a medium-intensity light, one or more lights should be installed on a pole adjacent to the appurtenance. The adjacent installation should not exceed the height of the appurtenance and be within 40 feet (12 m) of the top, allowing a pilot an unobstructed view of at least one light. If the rod, antenna, or other appurtenance is 7/8 of an inch wide or more, at least two lights must be installed on the supporting mast to provide the necessary unobstructed view.
3. Ice Shields. See paragraph 4.9.

7.9 Hyperbolic Cooling Towers.

Light units should be installed to ensure an unobstructed view of at least two lights by a pilot approaching from any direction.

1. Number of Light Units. The number of units recommended depends on the diameter of the structure at the top, as shown in Figure A-21 in Appendix A. The number of lights recommended below is the minimum.
   a. Structures 20 Feet (6 m) or Less in Diameter. Three light units per level.
   b. Structures Exceeding 20 Feet (6 m) but not More Than 100 Feet (31 m) in Diameter. Four light units per level.
   c. Structures Exceeding 100 Feet (31 m) but not More Than 200 Feet (61 m) Diameter. Six light units per level.
   d. Structures Exceeding 200 Feet (61 m) in Diameter. Eight light units per level.
2. Structures Exceeding 600 Feet (183 m) AGL. Structures exceeding 600 feet (183 m) AGL should have a second level of light units installed approximately at the midpoint of the structure and in a vertical line with the top level of lights.

7.10 **Prominent Buildings and Similar Extensive Obstructions.**

When objects within a group of obstructions are approximately the same overall height above the surface and are located not more than 150 feet (46 m) apart, the group of obstructions may be considered an extensive obstruction. Light units should be installed on the same horizontal plane at the highest portion, or edge, of the prominent obstructions. Light units should be placed to ensure that the light is visible to a pilot approaching from **any** direction. These lights may require shielding, such as louvers, to ensure minimum adverse impact on local communities. Use extreme caution when using high-intensity flashing white lights.

1. If the obstruction is 200 feet (61 m) or less in either horizontal dimension, three or more light units should be installed at the highest portion of the structure to ensure that at least one light is visible to a pilot approaching from any direction. Light units may be mounted on a single pedestal at or near the center of the obstruction. If the light units are placed more than 10 feet (3 m) from the center point of the structure, use a minimum of four light units.
2. If the obstruction exceeds 200 feet (61 m) in one horizontal dimension, but is 200 feet (61 m) or less in the other, two light units should be placed on each of the shorter sides. These light units may be installed either adjacent to each other at the midpoint of the obstruction's edge or at (near) each corner, with the light unit aimed to provide 180 degrees of coverage at each edge. One or more light units should be installed along the overall length of the major axis. These lights should be installed at approximately equal intervals, not to exceed a distance of 100 feet (31 m) from the corners or from each other.
3. If the obstruction exceeds 200 feet (61 m) in both horizontal dimensions, the light units should be equally spaced along the overall perimeter of the obstruction at intervals of 100 feet (31 m), or fraction thereof.

CHAPTER 8. DUAL LIGHTING WITH RED/MEDIUM-INTENSITY FLASHING WHITE LIGHT SYSTEMS

8.1 Purpose.

This dual lighting system includes red lights (L-864) for nighttime and medium-intensity, flashing white lights (L-865) for daytime and twilight use. This lighting system may be used in lieu of operating a medium-intensity flashing white lighting system at night. There may be some populated areas where nighttime use of medium-intensity light systems may cause significant environmental concerns. Using the dual lighting system should reduce/mitigate those concerns. Recommendations on lighting structures can vary, depending on terrain features, weather patterns, geographic location, and number of structures.

8.2 Installation.

The light units should be installed as specified in Chapters 4, 5, and 6. The number of light levels needed is dependent on the height of the obstruction, as shown in Figure A-10 in Appendix A.

8.3 Operation.

Light systems should be operated as specified in Chapter 3. Both systems should not be operated at the same time; however, there should be no more than a 2-second delay when changing from one system to the other. Outage of the uppermost red light shall cause the white obstruction light system to activate and operate in its specified "night" step intensity.

8.4 Control Device.

The light system is controlled by a device (photocell) that changes the light's intensity when the ambient light changes. The system should automatically change steps when, in the Northern Hemisphere, the northern sky illuminance reaching a north-facing vertical surface is as follows:

1. Twilight-to-Night. This should not occur before the illumination drops below 5 foot-candles (53.8 lux) but should occur before it drops below 2 foot-candles (21.5 lux).
2. Night-to-Day. The intensity changes listed in subparagraph 8.4 1 above should be reversed when changing from the night-to-day mode.

8.5 Antenna or Similar Appurtenance Light.

When a structure equipped with a dual lighting system is topped with an antenna or similar appurtenance exceeding 40 feet (12 m) in height, a medium-intensity flashing white (L-865) and a flashing red light (L-864) should be placed within 40 feet (12 m) from the tip of the appurtenance. The white light should operate during daytime and

twilight and the red light during nighttime. These lights should flash simultaneously with the rest of the lighting system.

8.6 **Omission of Marking.**

When medium-intensity white obstruction lights are operated on structures 700 feet (213 m) AGL or less during daytime and twilight, other methods of marking may be omitted.

CHAPTER 9. DUAL LIGHTING WITH RED/HIGH-INTENSITY FLASHING WHITE LIGHT SYSTEMS

9.1 Purpose.

This dual lighting system includes red lights (L-864) for nighttime and high-intensity flashing white lights (L-856) for daytime and twilight use. This lighting system may be used in lieu of operating a flashing white lighting system at night. There may be some populated areas where nighttime use of high-intensity lights may cause significant environmental concerns and complaints. Using the dual lighting system should reduce/mitigate those concerns. Recommendations on lighting structures can vary, depending on terrain features, weather patterns, geographic location, and number of structures.

9.2 Installation.

The light units should be installed as specified in Chapters 4, 5, and 7. The number of light levels needed is shown in Figures A-11 and A-12 in Appendix A.

9.3 Operation.

Lighting systems should be operated as specified in Chapters 4, 5, and 7. These systems should not be operated at simultaneously; however, there should be no more than a 2-second delay when changing from one system to the other. Outage of the uppermost red light shall cause the white obstruction lighting system to activate and operate in its specified "night" step intensity.

9.4 Control Device.

9.4.1 The light intensity is controlled by a device (photocell) that changes the light intensity when the ambient light changes.

9.4.2 The system should automatically change intensity steps when, in the Northern Hemisphere, the northern sky illuminance reaching a north-facing vertical surface is as follows:

1. Day-to-Twilight. This should not occur before the illumination drops to 60 foot-candles (645.8 lux) but should occur before it drops below 35 foot-candles (376.7 lux). The illuminance-sensing device should, if practical, face the northern sky in the Northern Hemisphere.
2. Twilight-to-Night. This should not occur before the illumination drops below 5 foot-candles (53.8 lux) but should occur before it drops below 2 foot-candles (21.5 lux).
3. Night-to-Day. The intensity changes listed in subparagraph 9.4.2 1 and 9.4.2.2 above should be reversed when changing from the night to day mode.

9.5 Antenna or Similar Appurtenance Light.

When a structure using this dual lighting system is topped with an antenna or similar appurtenance exceeding 40 feet (12 m) in height, a medium-intensity flashing white light (L-865) and a red flashing light (L-864) should be placed within 40 feet (12 m) from the tip of the appurtenance. (See Figure A-11 in Appendix A.) The white light should operate during daytime and twilight and the red light during nighttime. Structures with an appurtenance 40 feet (12 m) or less in height should be lit in accordance with Figure A-12 in Appendix A.

9.6 **Omission of Marking.**

When high-intensity white obstruction lights are operated during daytime and twilight, other methods of marking may be omitted.

CHAPTER 10. MARKING AND LIGHTING OF CATENARY AND CATENARY SUPPORT STRUCTURES

10.1 Purpose.

This chapter provides guidelines for marking and lighting catenary and catenary support structures. For the purpose of marking and lighting, catenary is defined as suspended wires (or lines) kept at a defined mechanical tension by supporting structures. These wires may be either energized or non-energized and are used for transmission, distribution, or for other purposes, as defined. The recommended marking and lighting of both the structures and wires provides day and night conspicuity and assists pilots in identifying and avoiding catenary wires and associated support structures.

10.2 Catenary Marking Standards.

Catenary wires should be marked with lighted or unlighted marker balls to make the wires more visible to pilots approaching the hazard. High-voltage (69 kV or greater) transmission lines are typically mounted on large catenary support structures and should be fitted with lighted markers to provide sufficient conspicuity in both day and nighttime conditions. Transmission lines that are less than 69 kV are typically mounted on smaller catenary support structures and should be fitted with unlighted markers that provide daytime conspicuity.

10.2.1 Catenary Markers.

Lighted markers provide increased nighttime conspicuity of high-voltage (69 kV or greater) transmission line catenary wires. However, since lighted markers require a minimum line load to operate, it should be noted that the lights may not be operational under certain transmission system conditions, such as power outages or line maintenance. These lighted markers should be used on transmission line catenary wires near airports, heliports, across rivers, canyons, lakes, areas of known risk to aviation, etc. The lighted markers should be manufacturer-certified as (1) recognizable from a minimum distance of 4,000 feet (1,219 m) under nighttime conditions, (2) minimum VFR conditions, or (3) have a minimum intensity of at least 32.5 candelas. The lighting unit should emit a steady-burning red light. Lighted markers should be used on the highest energized line. If the lighted markers are installed on a line other than the highest catenary wire, then the unlighted markers specified in Chapter 3 paragraph 3.5 should be used in addition to the lighted markers. The maximum sag distance between the line energizing the lighted markers and the highest catenary wire above the lighted markers should be no more than 25 feet (7.6 m), and it should not violate the sag requirements of the transmission line design. (See Figure A-5 in Appendix A.) Markers should be distinctively shaped, i.e., spherical or cylindrical, so that they are not mistaken for items used to convey other information. They should be visible to a pilot approaching from any direction. The area in the immediate vicinity of the supporting structure's base should be clear of all items and/or objects of natural growth that could interfere with the line-of-sight between a pilot and the structure's markers.

10.2.1.1 Size and Color.

The diameter of the markers (lighted and unlighted) used on extensive catenary wires that cross canyons, lakes, rivers, etc., should not be less than 36 inches (91 cm). Preferred 20-inch (51-cm) markers, or smaller 12-inch (30.48-cm) markers, are permitted on less extensive catenary wires or on power lines below 50 feet (15 m) above the ground and within 1,500 feet (458 m) of an airport runway end. Each lighted marker should be a solid color; specifically aviation orange, white, or yellow. For transmission lines that are configured in a "double-bundled" arrangement and would typically require the larger 36-inch markers, the next smaller size marker may be used to prevent the marker from rubbing against the parallel transmission line.

10.2.1.2 Installation.

1. Spacing. Lighted markers should be spaced equally along the wire at intervals of approximately 200 feet (61 m), or a fraction thereof. Intervals between markers should be less in critical areas near runway ends, i.e., 30 feet to 50 feet (10 m to 15 m). If the lighted markers are installed on a line other than the highest catenary wire, then unlighted markers specified in Chapter 3 paragraph 3.5 should be used in addition to the lighted markers. The maximum distance between the line energizing the lighted markers and the highest catenary wire above the line with the lighted markers can be no more than 25 feet (7.62 m), so long as the requirement does not violate the transmission line design's droop requirement. The lighted markers may be installed alternately along each wire if the distance between adjacent markers meets the 200-foot (61m) spacing standard. This method allows the weight and wind loading factors to be distributed. (See Figure A-5 in Appendix A.)

2. Pattern. An alternating color scheme provides the most conspicuity against all backgrounds. Lighted and unlighted markers should be installed by alternating solid-colored markers of aviation orange, white, and yellow. Normally, an orange marker is placed at each end of a line and the spacing is adjusted [not to exceed 200 feet (61 m)] to accommodate the rest of the markers. When less than four markers are used, they should all be aviation orange. (See Figure A-5 in Appendix A).

3. Wire Sag. Wire sag or droop will occur due to temperature, wire weight, wind, etc. Twenty-five (25) feet (7.62 m) is the maximum allowable distance between the highest wire installed with marker balls and the highest wire without marker balls, and it should not violate the transmission line design's sag requirements. (See Figure A-5 in Appendix A.)

4. Adjacent Lines. Catenary crossings with multiple transmission lines require appropriate markers when the adjacent catenary structure's

outside lines are greater than 200 ft (61 m) away from the center of the primary structure. (See Figure A-2 in Appendix A.) If the outside lines of the adjacent catenary structure are within 200 ft (61m) or less from the center of the primary structure, markers are not required on the adjacent lines. (See Figure A-3 in Appendix A.)

10.3 **Catenary Lighting Standards.**

When using medium-intensity flashing white (L-866), high-intensity flashing white (L-857), dual medium-intensity (L-866/L-885), or dual high-intensity (L-857/L-885) lighting systems operated 24 hours a day, other marking of the support structure is not necessary.

1. Levels. A system of three levels of sequentially flashing light units should be installed on each supporting structure or adjacent terrain. One level should be installed at the top of the structure, one at the height of the lowest point in the catenary wire, and one level approximately midway between the other two light levels. In general, the middle level should be at least 50 feet (15 m) from the other two levels. The middle light unit may be omitted when the distance between the top and the bottom light levels is less than 100 feet (30 m).

   a. Top Levels. One or more lights should be installed at the top of the structure to provide 360-degree coverage, ensuring an unobstructed view. If the installation presents a potential danger to maintenance personnel or inhibits lightning protection, the top level of lights may be mounted as low as 20 feet (6 m) below the highest point of the structure.

   b. Horizontal Coverage. The light units at the middle and bottom levels should be installed to provide a minimum of 180-degree coverage, centered perpendicularly to the flyway. When a catenary crossing is situated near a bend in a river, canyon, etc., or is not perpendicular to the flyway, the horizontal beam should be directed to provide the most effective light coverage to warn pilots approaching from either direction of the catenary wires.

   c. Variation. The vertical and horizontal arrangements of the lights may be subject to the structural limits of the towers and/or adjacent terrain. A tolerance of 20 percent from uniform spacing of the bottom and middle light is allowed. If the base of the supporting structure(s) is higher than the lowest point in the catenary, such as a canyon crossing, one or more lights should be installed on the adjacent terrain at the level of the lowest point in the span. These lights should be installed on the structure or terrain at the height of the lowest point in the catenary. (See Figure A-4 in Appendix A).

2. Flash Sequence and Duration. The flash sequence for catenary wire support structures should be middle, top, and bottom with all lights on the same level flashing simultaneously. This pattern of flashes is designed to present a unique signal that pilots should interpret as a warning that catenary wires are in the vicinity of the lights. The time intervals for the sequence and duration of the flash pattern are outlined in FAA AC 150/5345-43, Specification for Obstruction Lighting

Equipment. If Light-Emitting Diode (LED) obstruction light fixtures are used to light catenary wires, a slower flash rate of 40 fpm is allowed to enable each light fixture to make a well-defined flash so that the middle-top-bottom flash pattern will be easily recognized. Field experience has shown that LED fixtures flashing at 60 fpm, as specified in AC 150/5345-43, do not have enough time to turn off in between flash cycles, and appear as if they are steady-burning. Slowing the flash rate to 40 fpm promotes a cleaner, crisper presentation for the pilot to recognize. In the event there are only two levels of lights, the lights should simply alternate at the same flash rate/duration as if there were three lights.

3. Synchronization. Although not required, it is preferred that the corresponding light levels on associated supporting towers of a catenary crossing flash simultaneously.

4. Structures 700 feet (213 m) AGL or Less. When medium-intensity white lights (L-866) are operated 24 hours a day or when a dual red/medium-intensity light system (L-866 daytime and twilight/L-885 nighttime) is used, marking can be omitted. When using a medium-intensity white light (L-866) or a flashing red light (L-885) during twilight or nighttime only, paint should be used for daytime marking.

5. Structures Exceeding 700 Feet (213 m) AGL. When high-intensity white lights (L-857) are operated 24 hours a day or when a dual red/high-intensity system (L-857 daytime and twilight/L-885 nighttime) is used, marking can be omitted. This system should not be used on structures 700 feet (153 m) or less unless an FAA aeronautical study shows otherwise. When a flashing red obstruction light (L-885), a medium-intensity (L-866) flashing white lighting system, or a high-intensity white lighting system (L-857) is used for nighttime and twilight only, paint should be used for daytime marking.

10.4 **Control Device.**

The light intensity is controlled by a device (photocell) that changes the intensity when the ambient light changes. The lighting system should automatically change intensity steps when, in the Northern Hemisphere, the northern sky illuminance reaching a north-facing vertical surface is as follows:

1. Day-to-Twilight (L-857 System). This should not occur before the illumination drops to 60 foot-candles (645.8 lux) but should occur before it drops below 35 foot-candles (376.7 lux). The illuminance-sensing device should, if practical, face the northern sky in the Northern Hemisphere.

2. Twilight-to-Night (L-857 System). This should not occur before the illumination drops below 5 foot-candles (53.8 lux) but should occur before it drops below 2 foot-candles (21.5 lux).

3. Night-to-Day. The intensity changes listed in subparagraph 10.4.1 and 10.4.2 above should be reversed when changing from the night-to-day mode.

4. Day-to-Night (L-866 or L-885/L-866). This should not occur before the illumination drops below 5 foot-candles (563.8 lux) but should occur before it drops below 2 foot-candles (21.5 lux).
5. Night-to-Day. The intensity changes listed in subparagraph10.4.4 above should be reversed when changing from the night-to-day mode.
6. Red Obstruction (L-885). The red lights should not turn on until the illumination drops below 60 foot-candles (645.8 lux) but should occur before reaching a level of 35 foot-candles (367.7 lux). Lights should not turn off before the illumination rises above 35 foot-candles (367.7 lux) but should occur before reaching 60 foot-candles (645.8 lux).

10.5 Area Surrounding Catenary Wire Support Structures.

The area in the immediate vicinity of the supporting structure's base should be clear of all items and/or objects of natural growth that could interfere with the line-of-sight between a pilot and the structure's lights.

10.6 Three or More Catenary Wire Support Structures.

Where a catenary wire crossing requires three or more supporting structures, the inner structures should be equipped with enough light units per level to provide full 360-degree coverage across rivers, canyons, lakes, areas of known risk to aviation, etc.

10.7 Adjacent Catenary Structures.

Where an adjacent catenary wire crossing requires three or more supporting structures, the inner structures should be equipped with enough light units per level to provide full 360-degree coverage across rivers, canyons, lakes, areas of known risk to aviation, etc.

CHAPTER 11. MARKING AND LIGHTING MOORED BALLOONS AND KITES

11.1 Purpose.

The purpose of marking and lighting moored balloons, kites, and their cables or mooring lines is to indicate the presence and general definition of these objects to pilots when approaching from **any** direction.

11.2 Standards.

These marking and lighting standards pertain to all moored balloons and kites that require marking and lighting under 14 CFR Part 101.

11.3 Marking.

Flag markers should be used on mooring lines to warn pilots of their presence during daylight hours.

1. Display. Markers should be displayed at no more than 50-foot (15-m) intervals and should be visible for at least 1 statute mile.
2. Shape. Markers should be rectangular in shape and not less than 2 feet (0.6 m) on a side. Stiffeners should be used in the borders to expose a large area and to prevent drooping in calm wind or wrapping around the cable.
3. Color Patterns. One of the following color patterns should be used:
   a. Solid Color. Aviation orange.
   b. Orange and White. Two triangular sections, one of aviation orange and the other white, combined to form a rectangle.
   c. Refer to paragraph 12.2 Paint Standard.

11.4 Purpose.

Flashing obstruction lights should be used on moored balloons or kites and their mooring lines to warn pilots of their presence during the hours between sunset and sunrise and during periods of reduced visibility. These lights may be operated 24 hours a day.

1. Systems. Flashing red (L-864) or white lights (L-865) may be used to light moored balloons or kites. High-intensity lights (L-856) are not recommended.
2. Display. Flashing lights should be displayed on the top, nose section, tail section, and on the tether cable approximately 15 feet (4.6 m) below the craft to define the extremes of size and shape. Additional lights should be equally spaced along the cable's overall length for each 350 feet (107 m), or fraction thereof.
3. Exceptions. When the requirements of this paragraph cannot be met, floodlights may be used.

11.5 **Operational Characteristics.**

The light intensity is controlled by a device (photocell) that changes the intensity when the ambient light changes. The system should automatically turn the lights on and change intensities as ambient light conditions change. The reverse order should apply in changing from nighttime-to-daytime operation. The lights should flash simultaneously.

CHAPTER 12. MARKING AND LIGHTING EQUIPMENT AND INFORMATION

12.1 Purpose.

This chapter lists documents relating to obstruction marking and lighting systems and where they may be obtained.

12.2 Paint Standard.

12.2.1 Paint and aviation colors/gloss, referred to in this AC, with the exception of wind turbines, should conform to Federal Standard FED-STD-595. Wind turbines shall meet the standards in Chapter 13 paragraph 13.4 of this AC.

12.2.2 Approved colors shall be formulated without using lead, zinc chromate, or other heavy metals to match international aviation orange, white, and yellow, as listed in Table 12-1. All coatings shall be manufactured and labeled to meet Federal Environmental Protection Act Volatile Organic Compound(s) guidelines, including the National Volatile Organic Compound Emission Standards for architectural coatings.

1. Exterior Acrylic Waterborne Paint. Coatings should be ready-mixed, 100 percent acrylic, exterior latex formulated for application directly to galvanized surfaces. Ferrous iron and steel or nongalvanized surfaces shall be primed with a manufacturer-recommended primer compatible with the finish coat.
2. Exterior Solvent-Borne Alkyd-Based Paint. Coatings should be ready-mixed, alkyd-based, exterior enamel for application directly to nongalvanized surfaces, such as ferrous iron and steel. Galvanized surfaces shall be primed with a manufacturer-recommended primer compatible with the finish coat.

Table 12-1. Federal Standard FED-STD-595

Color	Number
Orange	12197
White	17875
Yellow	13538

12.3 Availability of Specifications.

Federal specifications describing the technical characteristics of various paints and their application techniques may be obtained from:

GSA - Specification Branch
301 7th Street NW
Room 6109
Washington, DC 20407
Telephone: (202) 619-8925

URL:
https://gsafas.secure.force.com/fedspecs?CFID=4925496&CFTOKEN=a7069f081ddb8f75-F75D2F5A-5056-8700-5912C733830A0C3

12.4 Lights and Associated Equipment.

The lighting equipment referred to in this AC should conform to the latest edition of one of the following specifications, as applicable:

1. Obstruction Lighting Equipment.
   a. AC 150/5345-43, *FAA Specification for Obstruction Lighting Equipment*.
   b. Military Specifications MIL-L-6273, *Light, Navigational, Beacon, Obstacle or Code, Type G-1*.
   c. Military Specifications MIL-L-7830, *Light Assembly, Markers, Aircraft Obstruction*.
2. Certified Equipment.
   a. AC 150/5345-53, *Airport Lighting Certification Program*, lists the manufacturers that have demonstrated compliance with the specification requirements of AC 150/5345-43.
   b. Other manufacturers' equipment may be used provided the equipment meets the specification requirements of AC 150/5345-43.
3. Airport Lighting Installation and Maintenance.
   AC 150/5340-30, *Design and Installation Details for Airport Visual Aids*.
4. Vehicles.
   a. AC 150/5210-5, *Painting, Marking, and Lighting of Vehicles Used on an Airport*, contains provisions for marking vehicles principally used on airports.
   b. FAA Facilities**.** Obstruction marking for FAA facilities shall conform to FAA Drawing Number D-5480, referenced in FAA Standard FAA-STD-003, *Paint Systems for Structures*.

12.5 **Availability.**

The standards and specifications listed above may be obtained from:

1. Military Specifications: Copies of Military standards and specification may be obtained from:

   DAP/DODSSP
   Building 4, Section D.
   700 Robbins Ave.
   Philadelphia, PA 19111-5094
   Tel; (215)697-2179
   FAX: (215)697-1460
   URL: https://acc.dau.mil/dodssp

2. FAA Advisory Circulars: Copies of FAA ACs may be obtained online at:

   http://www.faa.gov/airports/resources/advisory_circulars/

CHAPTER 13. MARKING AND LIGHTING WIND TURBINES

13.1 Purpose.

This chapter provides guidelines for the marking and lighting of wind turbine farms. These guidelines are applicable to single wind turbines and wind turbine farms. For the purpose of this AC, wind turbine farms are defined as a wind turbine development that contains more than three turbines. The recommended marking and lighting of these structures is intended to provide day and night conspicuity and to assist pilots in identifying and avoiding these obstacles.

13.2 General Standards.

The development of wind turbine farms is a very dynamic process, which changes based on the terrain. Each wind turbine farm is unique. Therefore, it is important that a lighting plan be developed that provides sufficient safety for air traffic. Proximity to airports and VFR routes, extreme terrain where heights may vary widely, and local flight activity should be considered when developing a lighting plan. The following guidelines are recommended for wind turbines.

13.3 Wind Turbine Configurations.

Prior to marking and lighting the wind turbine farm, the configuration and the terrain of the wind turbine farm should be determined. The following is a description of the most common configurations.

1. Linear—wind turbine farms in a direct, consecutive configuration, often located along a ridge line, the face of a mountain, or along borders of a mesa or field. The line may be ragged in shape or be periodically broken, and may vary in size from just a few turbines to many turbines forming a line that is several miles long.
2. Cluster—wind turbine farms arranged in circular configuration. A cluster is typically characterized by having a pronounced perimeter, with various turbines placed inside the circle at various, erratic distances throughout the center of the circle.
3. Grid—wind turbine farms arranged in a geographical shape, such as a square or a rectangle, in which the turbines are placed a consistent distance from each other in rows, giving the appearance that they are part of a square pattern.

13.4 Marking Standards.

13.4.1 Wind turbines should be painted white or light grey, as these colors have been shown to be the most effective method for providing daytime conspicuity. Wind turbine manufacturers typically use a European color-matching system that is referred to as the RAL Color Standard. Unlike the Federal Specification 595, the RAL system used a four-digit code to identify a specific color of paint. For example, an RAL 9xxx code would represent a color in the white/black range, and an RAL 6xxx code would be in

the grey range. Most wind turbines currently produced are painted light grey, RAL 7035, which is the darkest acceptable off-white paint allowed. The preferred white paint color is pure white, RAL 9010, or an equivalent. Any shade of white between these two RAL specifications is strongly recommended. See Table 13-1.

Table 13-1. Wind Turbine Paint Standard Colors

Color	RAL Number
Pure White	9010
Light Grey (Darkest Acceptable)	7035

13.4.2 In geographic areas that experience lengthy periods of snow cover (i.e., Alaska), and where it is deemed necessary, the mast of the turbine may be painted alternating bands of aviation orange and white to provide additional contrast against the snow. The nacelle and blades of the turbine shall remain solid white or light grey. (See Figure A-24 in Appendix A.)

13.4.3 Blades or blade tips shall not be painted or manufactured in colors to camouflage wind turbines with the surrounding terrain. (See Figure A-25 in Appendix A.)

13.4.4 For turbines that are constructed with lattice-type masts, the mast structure shall be painted with alternating bands of aviation orange and white, in accordance with Chapter 3. The turbine's nacelle and blades shall remain solid white or light grey.

13.5 **Lighting Standards.**

13.5.1 Nighttime wind turbine obstruction lighting should consist of FAA L-864 aviation red flashing, strobe, or pulsed obstruction lights. Studies have shown that red lights provide the most conspicuity to pilots.

13.5.2 In most cases, not all wind turbine units within a wind turbine farm need to be lighted. Obstruction lights should be placed along the perimeter of the wind turbine farm so that there are no unlit separations or gaps more than 1/2 statute mile (sm) (804 m). Wind turbines within a grid or cluster should not have an unlighted separation or gap of more than 1 sm (1.6 km) across the interior of a grid or cluster of turbines. (See Figure A-26 in Appendix A.)

13.5.3 Any array of flashing, strobe, or pulsed obstruction lighting should be synchronized to flash simultaneously (within ±1/20 second (0.05 second) of each other).

13.5.4 Should any lighting fixture or the lighting system synchronization fail, a lighting outage report should be prepared in accordance with Chapter 2 paragraph 2.4.

13.5.5 Light fixtures should be placed as high as possible on the turbine nacelle so they are visible by a pilot approaching from **any** direction. (See Figure A-23 in Appendix A.)

13.5.6 Daytime lighting of wind turbines is not required. See paragraph 13.4 for daytime marking requirements.

13.5.7 When developing lighting plans for wind turbine farms, it is best to use an aerial-view map or diagram of the turbine farm to plan the location of the required lighting. This way, a certain degree of strategy plan can be applied, which, in many instances, results in a minimal number of lights.

13.5.8 For linear turbine configurations, lights should be placed on the turbine positioned at each end of a line or string of turbines. Lights should also be placed along the line of turbines so that there is no more than a 1/2-sm (2,640-foot (805-m)) gap between the lighted turbines. In the event the gap between lights on the last segment of turbines is significantly short, it may be appropriate to move the lights on the turbine string back toward the starting point to present a well-balanced string of lights. High concentrations of lights should be avoided. (See Figure A-26 in Appendix A.)

13.5.9 For cluster turbine configurations, a turbine should be selected as a starting point along the outer perimeter of the cluster. The turbine should be lighted, and a light should be placed on the next turbine along the perimeter of the cluster (clockwise or counterclockwise) so that no more than a 1/2-sm (2,640-foot (805-m)) gap exists. This pattern should be continued around the perimeter of the cluster until the starting point is reached. In the event that the gap between the lights on the last segment of turbines is significantly short, it may be appropriate to move the lights along the perimeter of the cluster back toward the starting point to present a well-balanced perimeter of lights. If the distance across the cluster is greater than 1 sm, additional lights should be placed on other turbines throughout the center of the cluster so that there are no unlighted gaps across the cluster. (See Figure A-26 in Appendix A.) (Example: If the distance across a wind turbine farm is 1.8 sm (2.9 km), a light should be placed on a turbine at approximately every 0.9 sm (1.4 km).

13.5.10 For grid turbine configurations, turbines on the corners of the farm should be lit, and then use the same concept for selecting which turbines should be lit as outlined in paragraph 13.5.9.

13.5.11 Special Considerations.

13.5.11.1 Occasionally, some wind turbines may be located apart from the main group of turbines. If one or two wind turbines protrude from the general limits of the turbine farm, these turbines should be lighted in addition to those identified in the main group.

13.5.11.2 Additional lighting may be necessary on wind turbines located on the interior of a cluster or grid configuration whose height is 100 feet (30 m) or higher than the other wind turbines located within the farm.

13.6 **Wind Turbines Above 499 Feet.**

13.6.1 For wind turbines with a rotor tip height, while at top dead center, greater than 499 feet (153 m) AGL, but less than 699 feet AGL, the turbines should be lighted in accordance with paragraph 13.5. In addition to these requirements, the top of the turbine's nacelle should be equipped with a second L-864 flashing red light. (See Figure A-23 in Appendix A.)

13.6.2 The two obstruction lights should be arranged horizontally, positioned on opposite sides of the nacelle, visible to a pilot approaching from **any** direction, and flash simultaneously. (See Figure A-23 in Appendix A.) This lighting configuration ensures the turbines in this size category are always lighted.

13.6.3 In the event one of the two obstruction lights fails, no light failure notification is required; however, the light should be restored to service as soon as possible.

13.6.4 All turbines within this size category should be illuminated, regardless of their location within a wind turbine farm, and should be configured to flash simultaneously with the other turbines in the same farm. This requirement ensures the pilots operating at 500 feet AGL have sufficient warning that a wind turbine obstruction may be within their flight path.

13.7 **Wind Turbines at or Above 699 Feet (213 m).**

13.7.1 For wind turbines with a rotor tip height, while at top dead center, at or above 699 feet (213 m) AGL, additional lighting is required. All wind turbines of this size, regardless of number or configuration should be lighted.

13.7.2 In addition to the lighting identified in paragraph 13.6, an additional level of lights is required at a point midway between the top of the nacelle and ground level. The location of the additional lights may be adjusted as necessary to allow mounting at a seam within the turbine's mast.

13.7.2.1 The additional level of lights should consist of a minimum of three L-810 flashing red lights configured to flash in unison with the two L-864 red flashing lights located at the top of the nacelle at a rate of 30 fpm (± 3 fpm). The L-810s should be spaced at equal distances around the mast. The light should be installed to ensure a pilot approaching from **any** direction has an unobstructed view of at least two of the lights. (See Figure A-23 in Appendix A.)

13.7.2.2 For wind turbine structures with a mast diameter greater than 20 feet (6 m), four L-810 red lights should be used.

13.7.2.3 All turbines within this size category should be illuminated, regardless of their location within a turbine farm, and should be configured to flash simultaneously with the other turbines in the same farm. This requirement

ensures the pilots operating at 500 feet AGL have sufficient warning that a wind turbine obstruction may be within their flight path.

13.8 **Lighting of Wind Turbines During Construction Phase.**

To ensure proper conspicuity of turbines at night during construction, all turbines should be lighted with temporary lighting once they reach a height of 200 feet (61 m) or greater until the permanent lighting configuration is turned on. As the structure's height continues to increase, the temporary lighting should be relocated to the structure's uppermost height. The temporary lighting may be turned off for short periods if they interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An L-810 steady-burning red light shall be used to light the structure during the construction phase, if the permanent L-864 flashing-red lights are not in place. If power is not available, turbines should be lighted with a self-contained, solar-powered, LED, steady-burning red light that meets the photometric requirements of an FAA L-810 lighting system. The lights should be positioned to ensure a pilot has an unobstructed view of at least one light at each level. Using a NOTAM (D) to justify not lighting the turbines until the entire project is completed is prohibited.

13.9 **Lighting and Marking of Airborne Wind Turbines.**

The FAA is currently conducting research to develop special lighting and marking standards for Airborne Wind Turbines. Sponsors should consult with their respective FAA OE Specialists for updated information.

13.10 **Lighting and Marking of Offshore Wind Turbines.**

FAA lighting and marking recommendations apply to structures out to 12 NM from the coast of the United States, which is the extent of the territorial seas. The Bureau of Ocean Energy Management (BOEM), which maintains jurisdiction of land leases beyond the 12 NM, may also require compliance with the marking and/or lighting recommendations identified in this AC.

CHAPTER 14. AIRCRAFT DETECTION LIGHTING SYSTEMS

14.1 Purpose.

Aircraft Detection Lighting Systems (ADLS) are sensor-based systems designed to detect aircraft as they approach an obstruction or group of obstructions; these systems automatically activate the appropriate obstruction lights until they are no longer needed by the aircraft. This technology reduces the impact of nighttime lighting on nearby communities and migratory birds and extends the life expectancy of obstruction lights.

14.2 General Standards.

14.2.1 The system should be designed with sufficient sensors to provide complete detection coverage for aircraft that enter a three-dimensional volume of airspace, or coverage area, around the obstruction(s) (see Figure A-27 in Appendix A), as follows:

1. Horizontal detection coverage should provide for obstruction lighting to be activated and illuminated prior to aircraft penetrating the perimeter of the volume, which is a minimum of 3 NM (5.5 km) away from the obstruction or the perimeter of a group of obstructions.
2. Vertical detection coverage should provide for obstruction lighting to be activated and illuminated prior to aircraft penetrating the volume, which extends from the ground up to 1,000 feet (304 m) above the highest part of the obstruction or group of obstructions, for all areas within the 3 NM (5.5 km) perimeter defined in subparagraph 14.2.1 1 above.
3. In some circumstances, it may not be possible to meet the volume area defined above because the terrain may mask the detection signal from acquiring an aircraft target within the 3 NM (5.5 km) perimeter. In these cases, the sponsor should identify these areas in their application to the FAA for further evaluation.
4. In some situations, lighting not controlled by the ADLS may be required when the 3 NM (5.5 km) perimeter is not achievable to ensure pilots have sufficient warning before approaching the obstructions.

14.2.2 The ADLS should activate the obstruction lighting system in sufficient time to allow the lights to illuminate and synchronize to flash simultaneously prior to an aircraft penetrating the volume defined above. The lights should remain on for a specific time period, as follows:

1. For ADLSs capable of continuously monitoring aircraft while they are within the 3 NM/1,000 foot (5.5 km/304 m) volume, the obstruction lights should stay on until the aircraft exits the volume. In the event detection of the aircraft is lost while being continuously monitored within the 3 NM/1,000 foot (5.5 km/304 m) volume, the ADLS should initiate a 30-minute timer and keep the obstruction lights on until the timer expires. This should provide the untracked aircraft sufficient time to exit the area and give the ADLS time to reset.

2. For ADLSs without the capability of monitoring aircraft targets in the 3 nm/1,000 foot (5.5 km/304 m) volume, the obstruction lights should stay on for a preset amount of time, calculated as follows:

   a. For single obstructions: 7 minutes.

   b. For groups of obstructions: (the widest dimension in nautical miles + 6) x 90 seconds equals the number of seconds the light(s) should remain on.

14.2.3 Acceptance of ADLS applications will be on a case-by-case basis and may be modified, adjusted, or denied based on proximity of the obstruction or group of obstructions to airports, low-altitude flight routes, military training areas, or other areas of frequent flight activity. It may be appropriate to keep certain obstructions closest to these known activity areas illuminated during the nighttime hours, while the remainder of the group's obstruction lighting is controlled by the ADLS.

14.2.4 Project sponsors requesting ADLS use should include in their application maps or diagrams indicating the location of the proposed sensors, the range of each sensor, and a visual indication showing how each sensor's detection arc provides the full horizontal and vertical coverage, as required under paragraph 14.2.1. In the event that detection coverage is not 100 percent due to terrain masking, project sponsors should provide multiple maps or diagrams that indicate coverage at the affected altitudes. A sample diagram is shown in Figure A-27 in Appendix A.

14.2.5 Types of ADLS Component or System Failure Events.

1. In the event of an ADLS component or system failure, the ADLS should automatically turn on all the obstruction lighting and operate in accordance with this AC as if it was not controlled by an ADLS. The obstruction lighting must remain in this state until the ADLS and its components are restored.

2. In the event that an ADLS component failure occurs and an individual obstruction light cannot be controlled by the ADLS, but the rest of the ADLS is functional, that particular obstruction light should automatically turn on and operate in accordance with this AC as if it was not controlled by an ADLS, and the remaining obstruction lights can continue to be controlled by the ADLS. The obstruction lighting will remain in this state until the ADLS and its components are restored.

3. Complete light failure should be addressed in accordance with Chapter 2 paragraph 2.4.

14.2.6 The ADLS's communication and operational status shall be checked at least once every 24 hours to ensure both are operational.

14.2.7 The ADLS should be able to detect an aircraft with a cross-sectional area of 1 square meter or more within the volume, as required in subparagraphs 14.2.1 1 and 14.2.1 2.

14.2.8 Each ADLS installation should maintain a log of activity data for a period of no less than the previous 15 days. This data should include, but not be limited to, the date, time, duration of all system activations/deactivations, track of aircraft activity,

maintenance issues, system errors, communication and operational issues, lighting outages/issues, etc.

14.2.9 Operational Frequencies.

1. Unlicensed devices (including FCC Part 15) devices cannot be used for this type of system.
2. Any frequency used for the operation of ADLS must be individually licensed through the FCC.

14.3 **Voice/Audio Option.**

14.3.1 ADLS may include an optional voice/audio feature that transmits a low-power, audible warning message to provide pilots additional information on the obstruction they are approaching.

14.3.2 The audible transmission should be in accordance with appropriate FAA and FCC regulations.

14.3.3 The audible transmission should be over an aviation frequency licensed by the FCC and authorized under the Code of Federal Regulations Title 47- Part 87.483 (excluding 121.5 MHz).

Note: Using air traffic control frequencies in the 117.975-MHz to 137-MHz frequency band is prohibited for this operation.

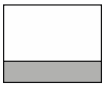
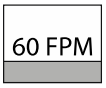
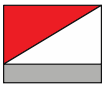
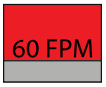
14.3.4 The audible message should consist of three quick tones, followed by a verbal message that describes the type of obstruction the system is protecting. Appropriate terms to be used include tower(s), wind turbine(s), or power line(s).

14.3.5 The audible message should be repeated three times or until the system determines the aircraft is no longer within the audible warning area defined in the following paragraph.

14.3.6 The audible message should be considered as a secondary, final warning and should be activated when an aircraft is within 1/2 NM (926 m) horizontally and 500 feet (152 m) vertically of the obstruction. The use of, or variation to, the audible warning zone may occur, depending on site-specific conditions or obstruction types.

APPENDIX A. SPECIFICATIONS FOR OBSTRUCTION LIGHTING EQUIPMENT CLASSIFICATION

Table A-1. FAA-Approved Obstruction Lighting Fixtures

Type	Symbol	Description
L-810		Steady-Burning - RED Single Obstruction Light
L-810		Steady-Burning – RED Double Obstruction Light
L-856		High-Intensity Flashing – WHITE Obstruction Light (40 FPM)
L-857		High-Intensity Flashing – WHITE Catenary Light (60 FPM)
L-864		Medium-Intensity Flashing – RED Obstruction Light (20-40 FPM)
L-865		Medium-Intensity Flashing – WHITE Obstruction Light (40-FPM)
L-866		Medium-Intensity Flashing - WHITE Catenary Light (60-FPM)
L-864/L-865		Medium-Intensity Flashing Dual – RED / WHITE Obstruction Light (20-40 FPM) Obstruction Light (40 FPM)
L-885		Low-Intensity Flashing - RED Red Catenary Light (60 FPM)
FPM = Flashes Per Minute		

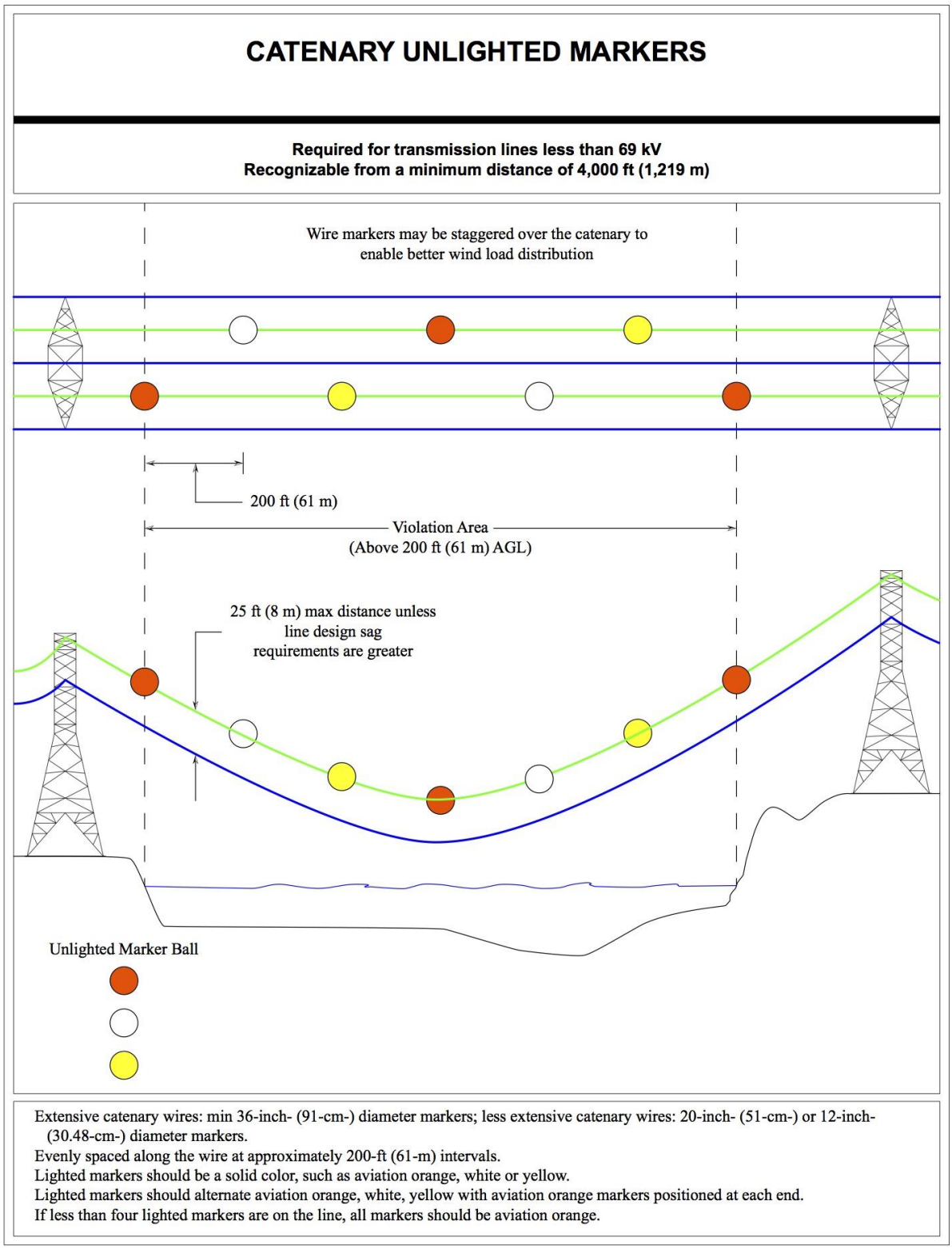


Figure A-1. Catenary Unlighted Markers

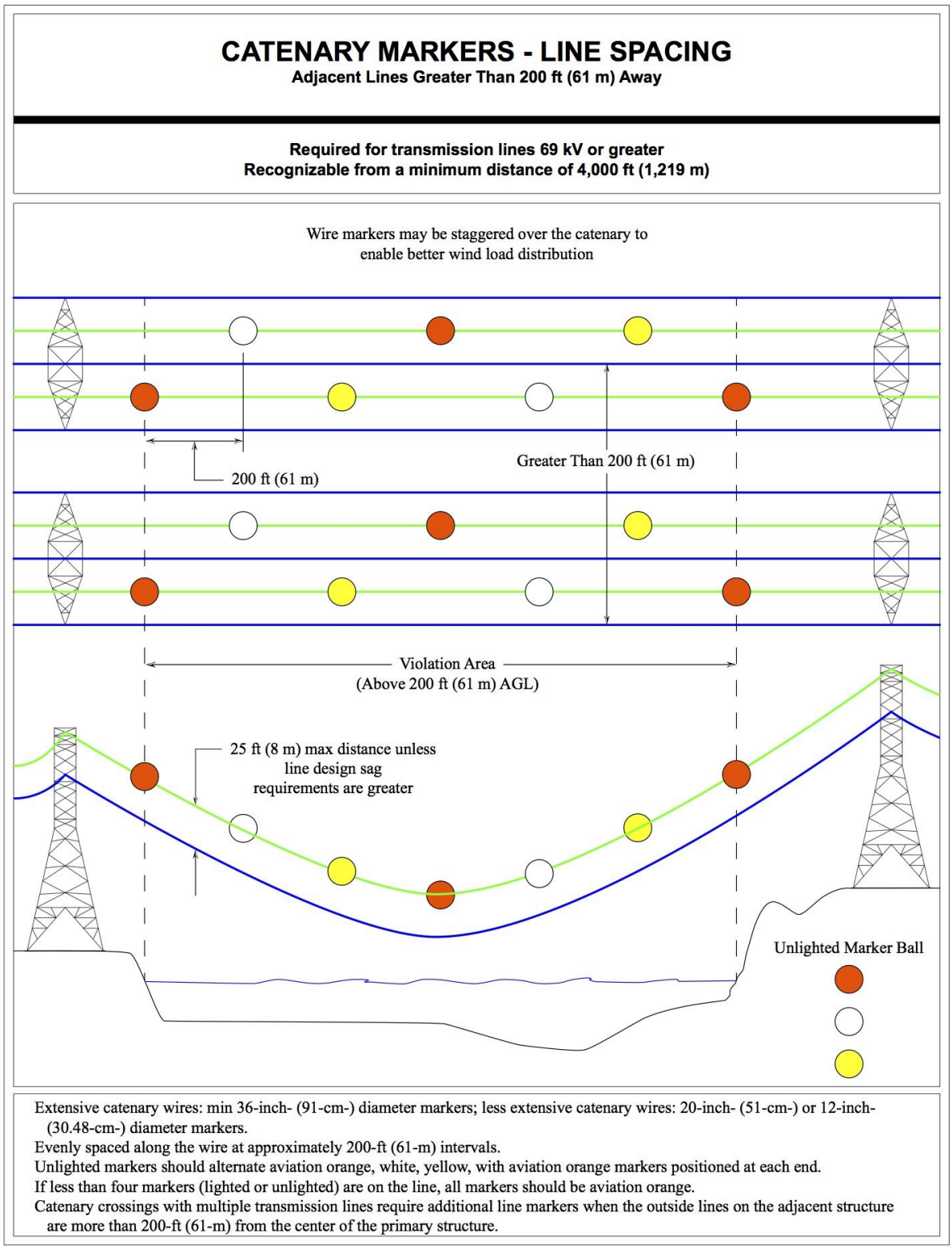


Figure A-2. Catenary Markers - Line Spacing (Adjacent Lines Greater Than 200 ft (61 m) Away)

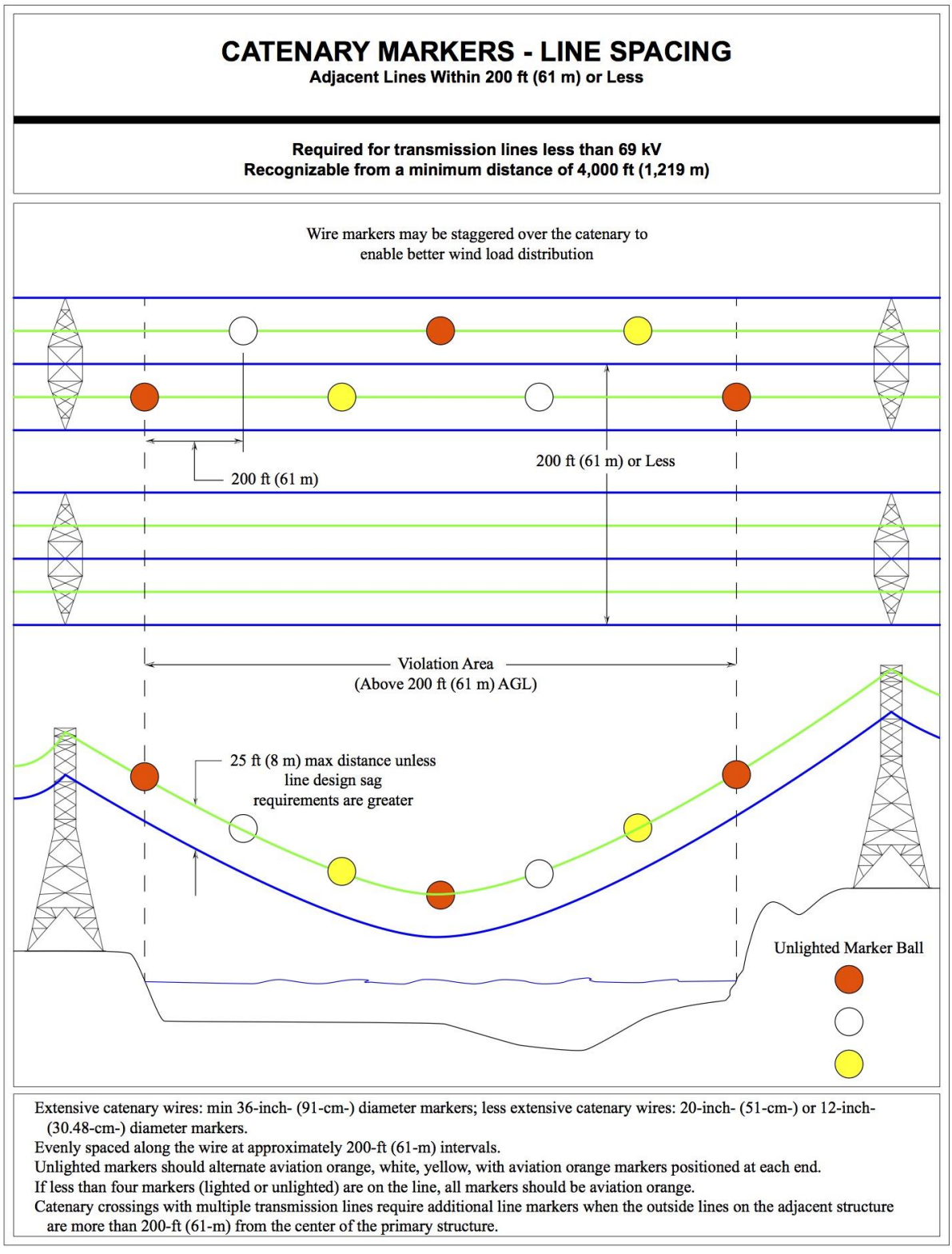


Figure A-3. Catenary Markers – Line Spacing (Adjacent Lines Within 200 ft (61 m) or Less

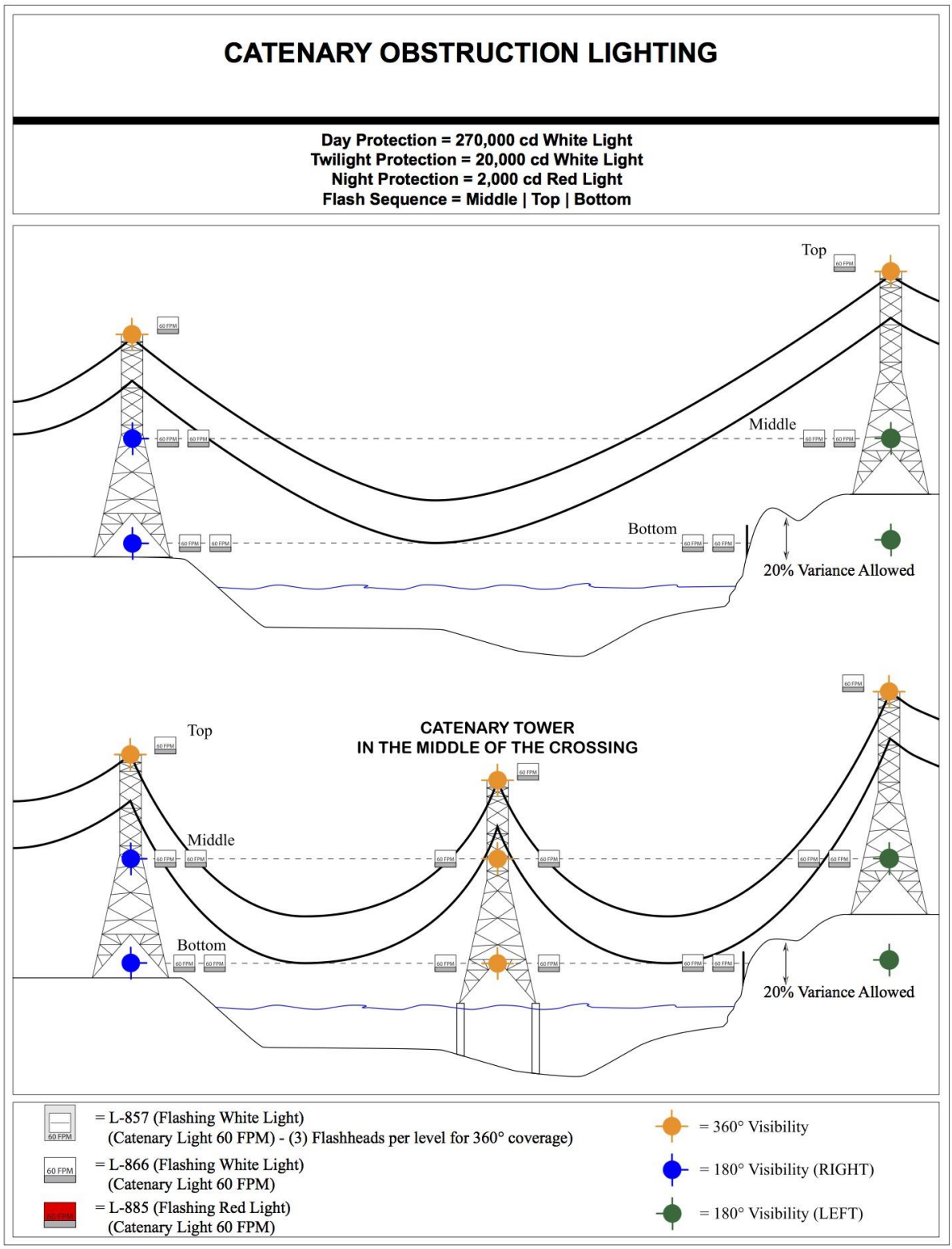


Figure A-4. Catenary Obstruction Lighting

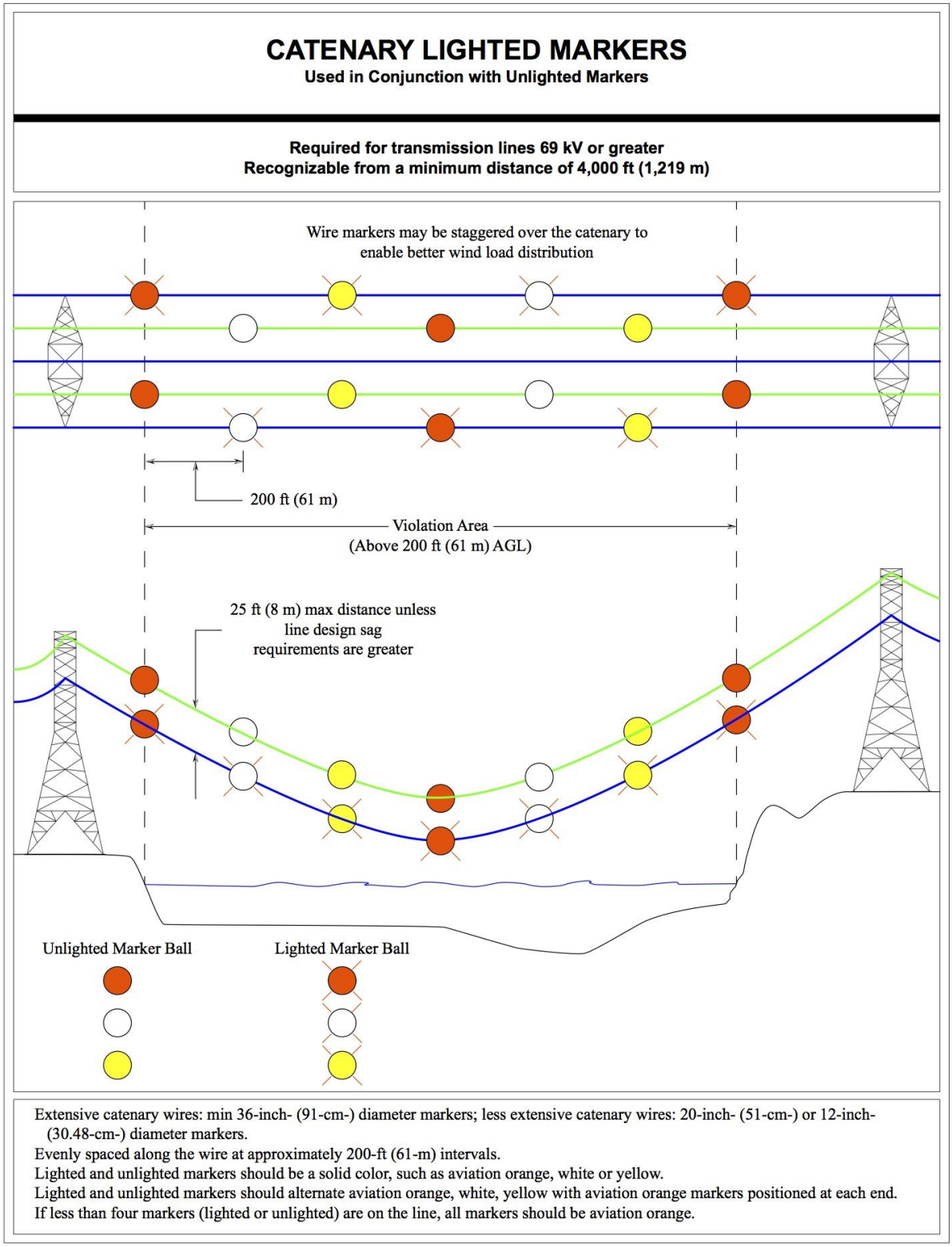


Figure A-5. Catenary Lighted Markers

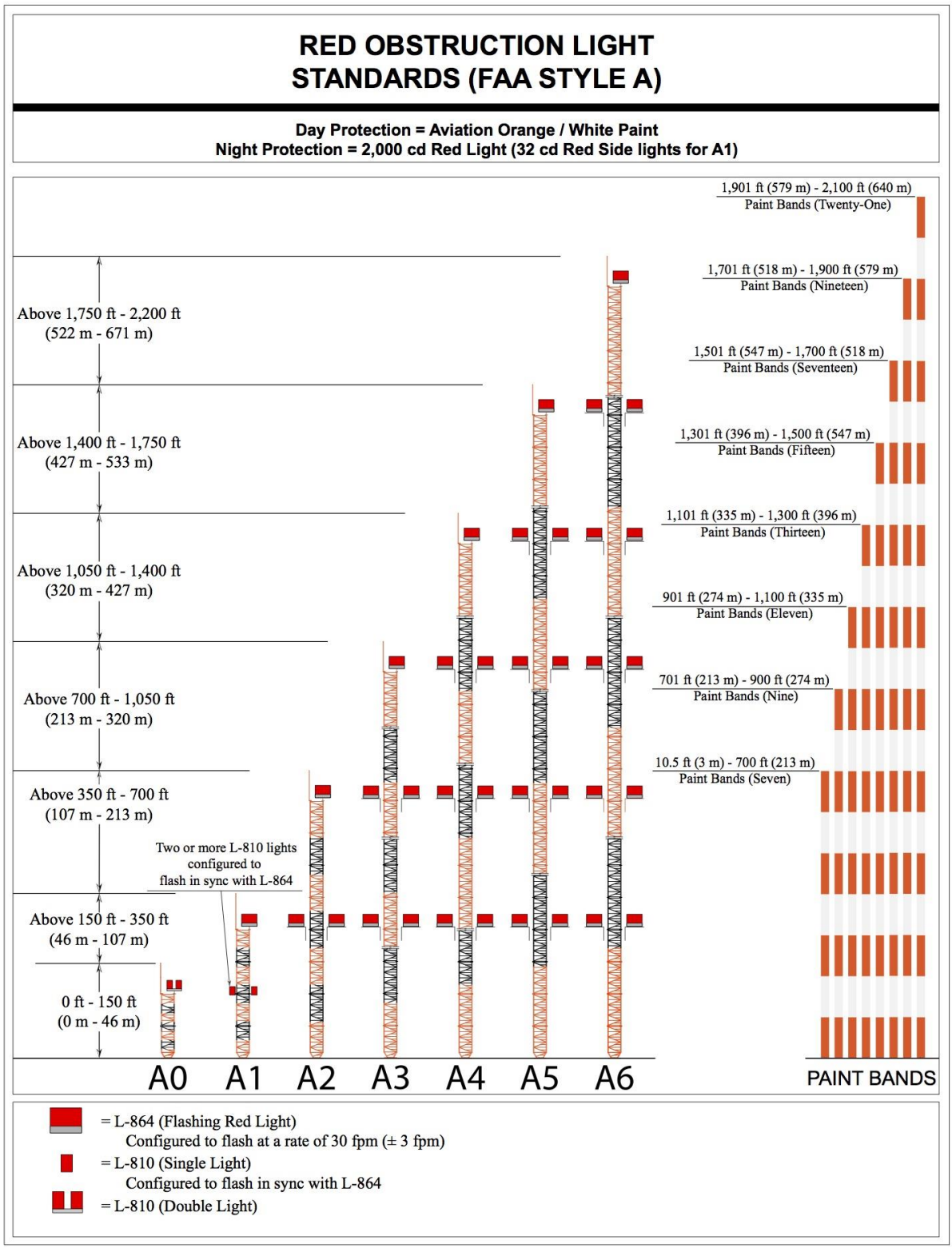


Figure A-6. Red Obstruction Light Standards

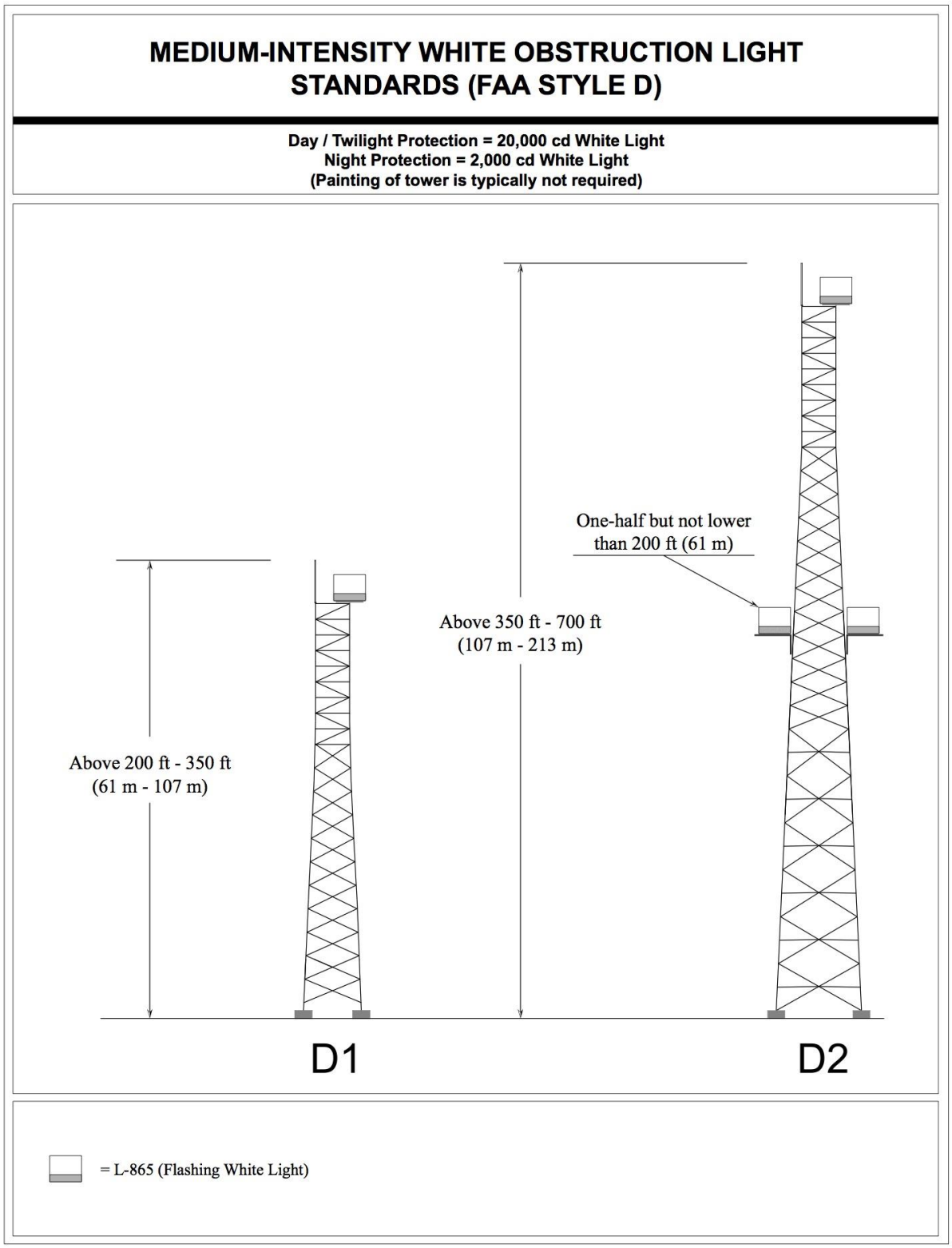


Figure A-7. Medium-Intensity White Obstruction Light Standards

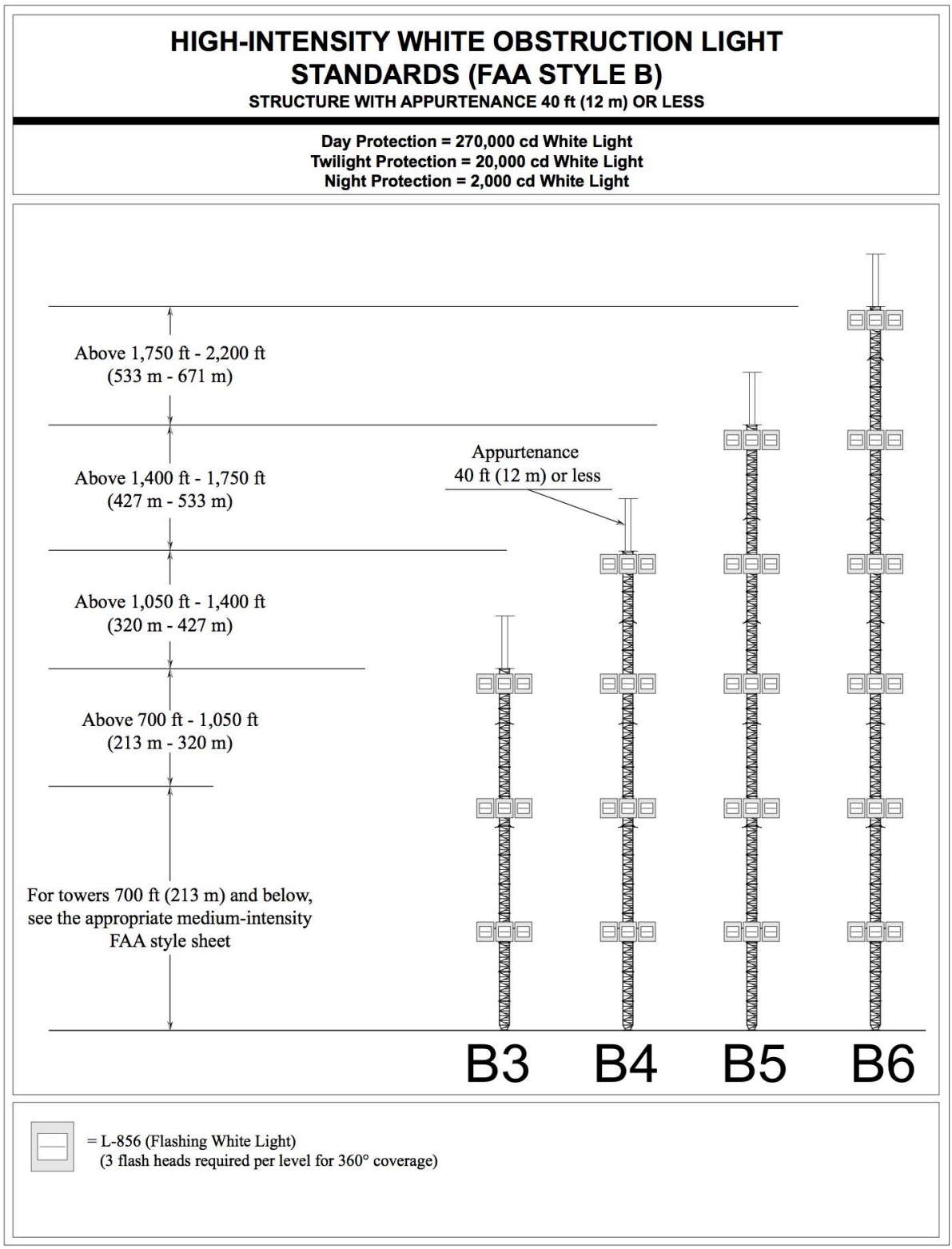


Figure A-8. High-Intensity White Obstruction Light Standards—Structures With Appurtenance 40 Feet or Less

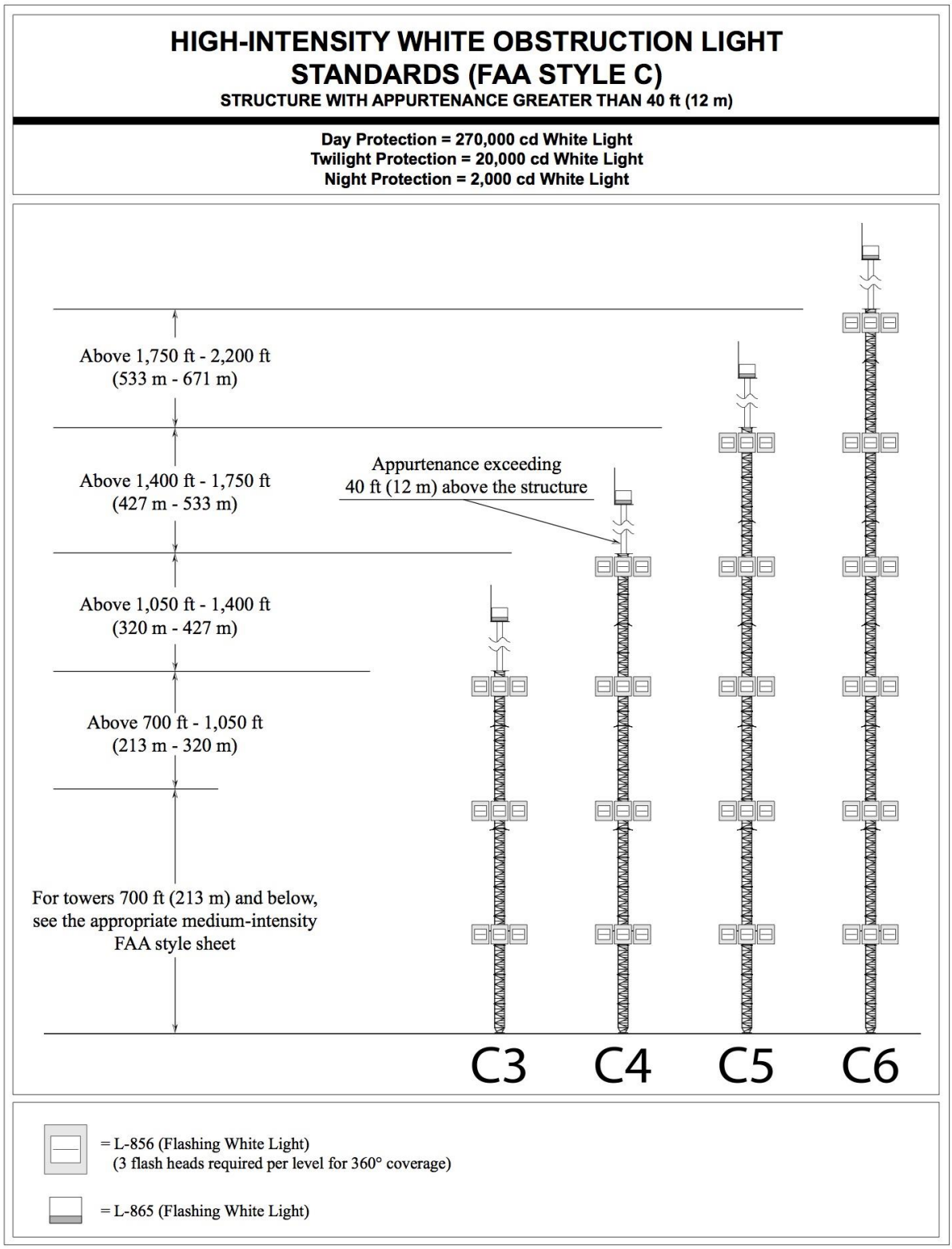


Figure A-9. High-Intensity Obstruction Lighting Standards—Structures With Appurtenance Over 40 Feet High

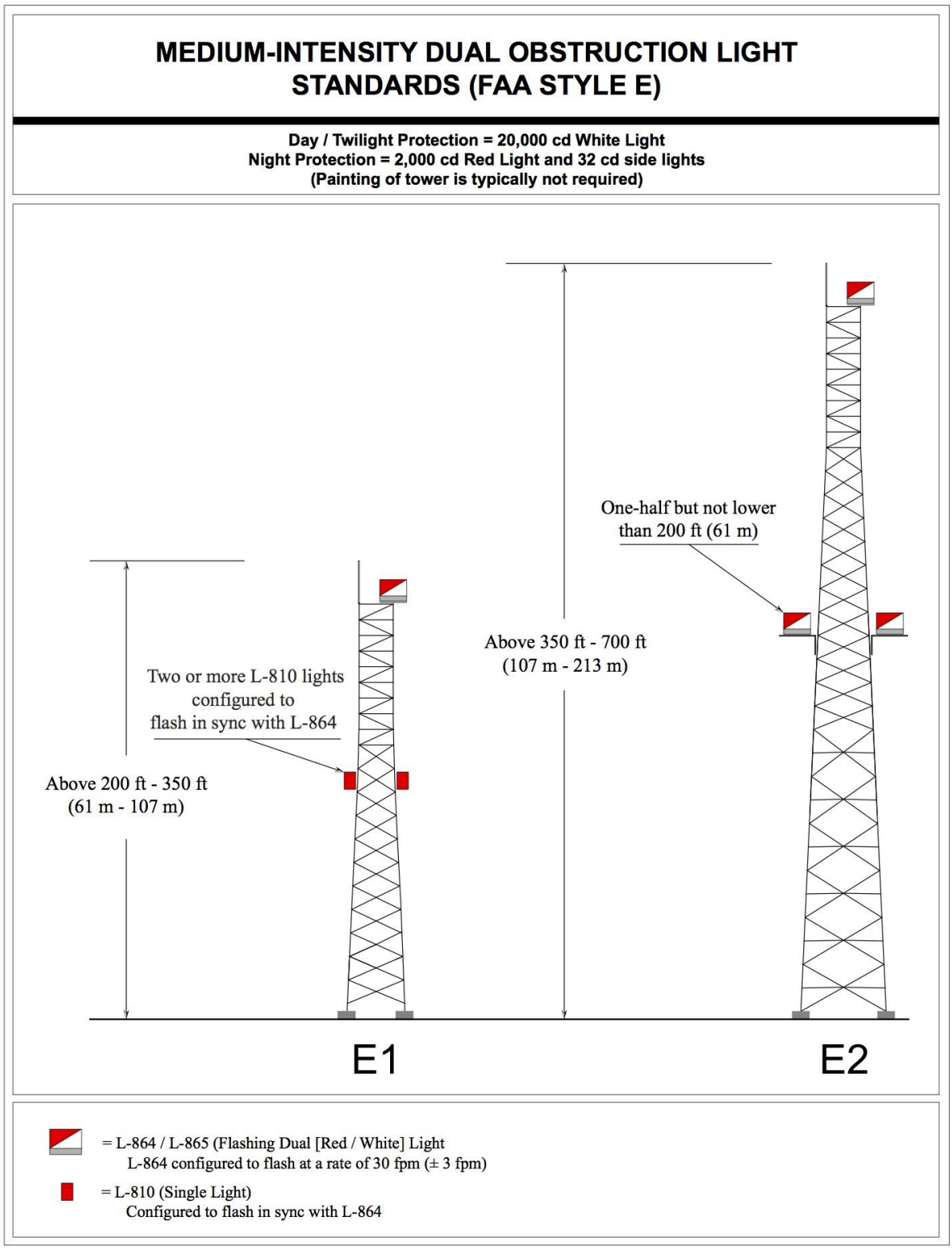


Figure A-10. Medium-Intensity Dual Obstruction Lighting Standards

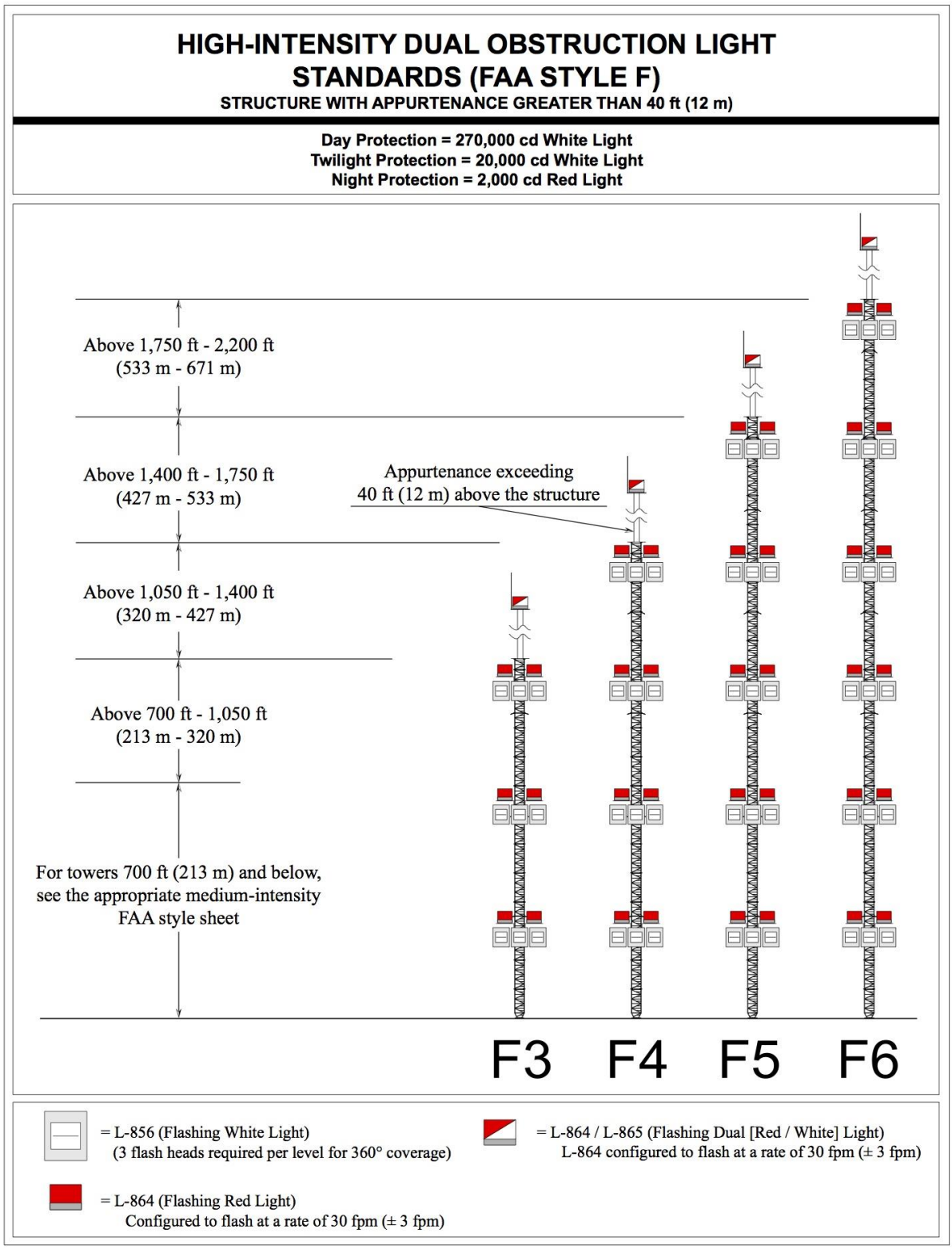


Figure A-11. High-Intensity Dual Obstruction Lighting Standards—Structures With Appurtenance Over 40 Feet High

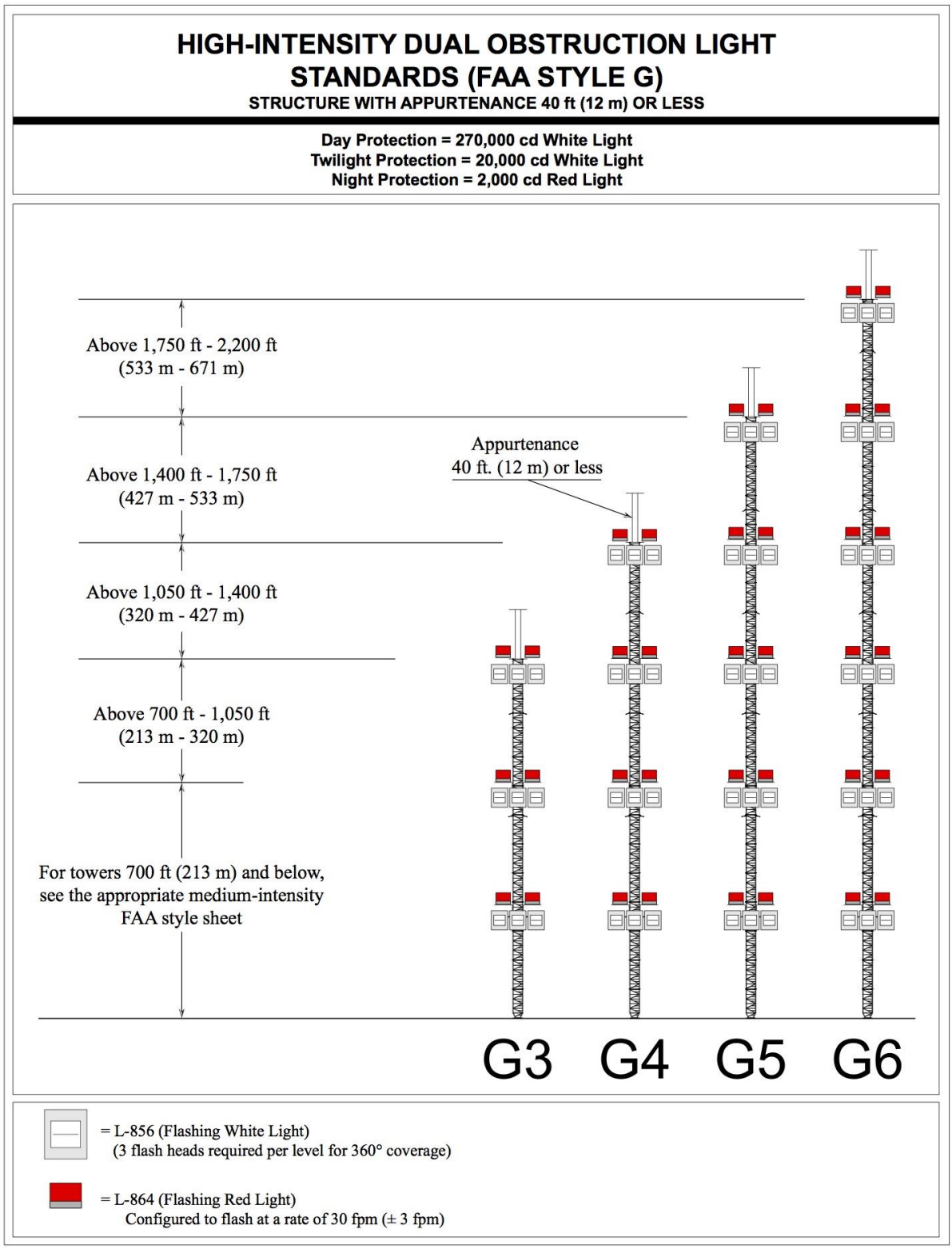


Figure A-12. High-Intensity Dual Obstruction Lighting Standards—Structures With Appurtenance 40 Feet or Less

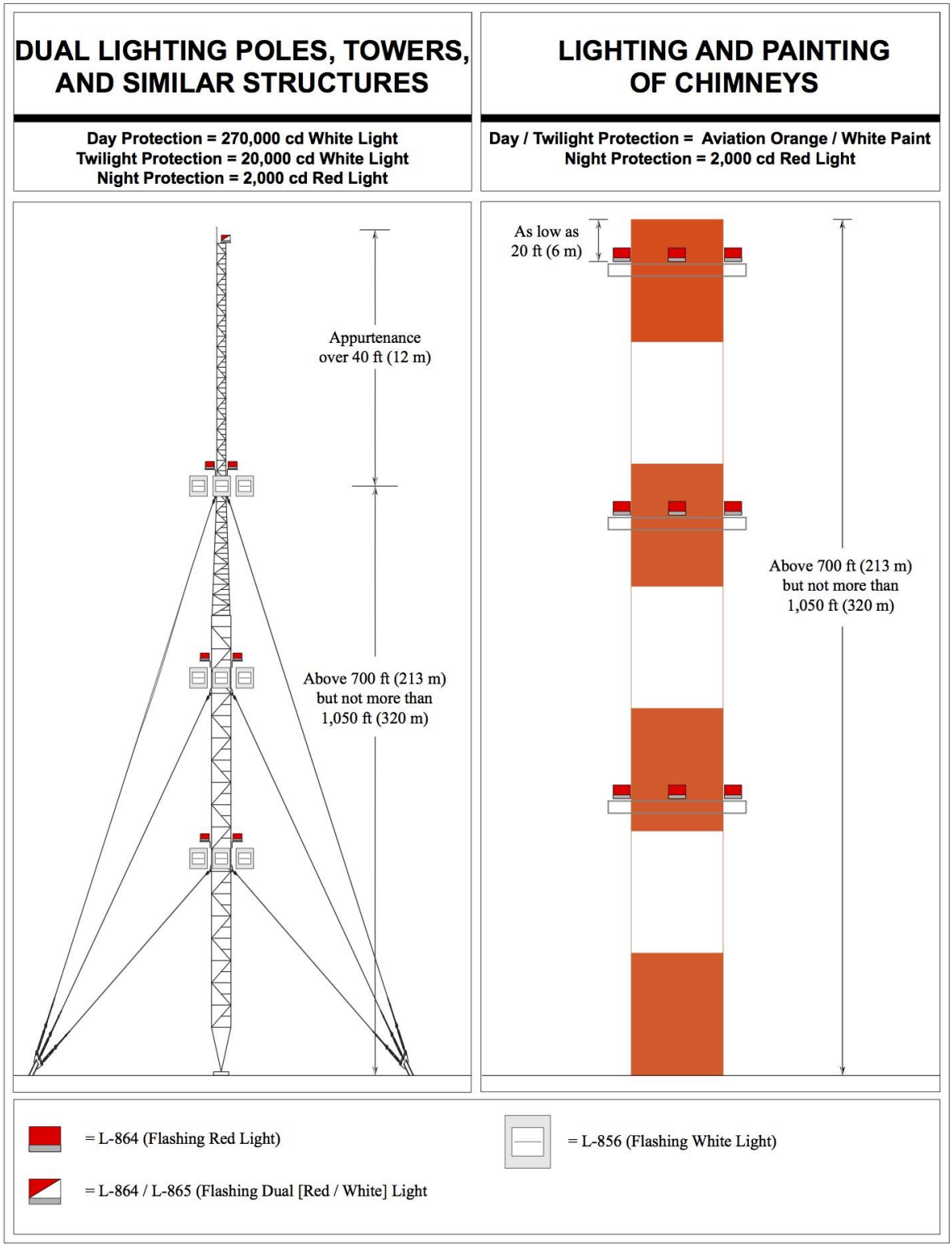


Figure A-13. Painting and/or Dual Lighting of Chimneys, Poles, Towers, and Similar Structures

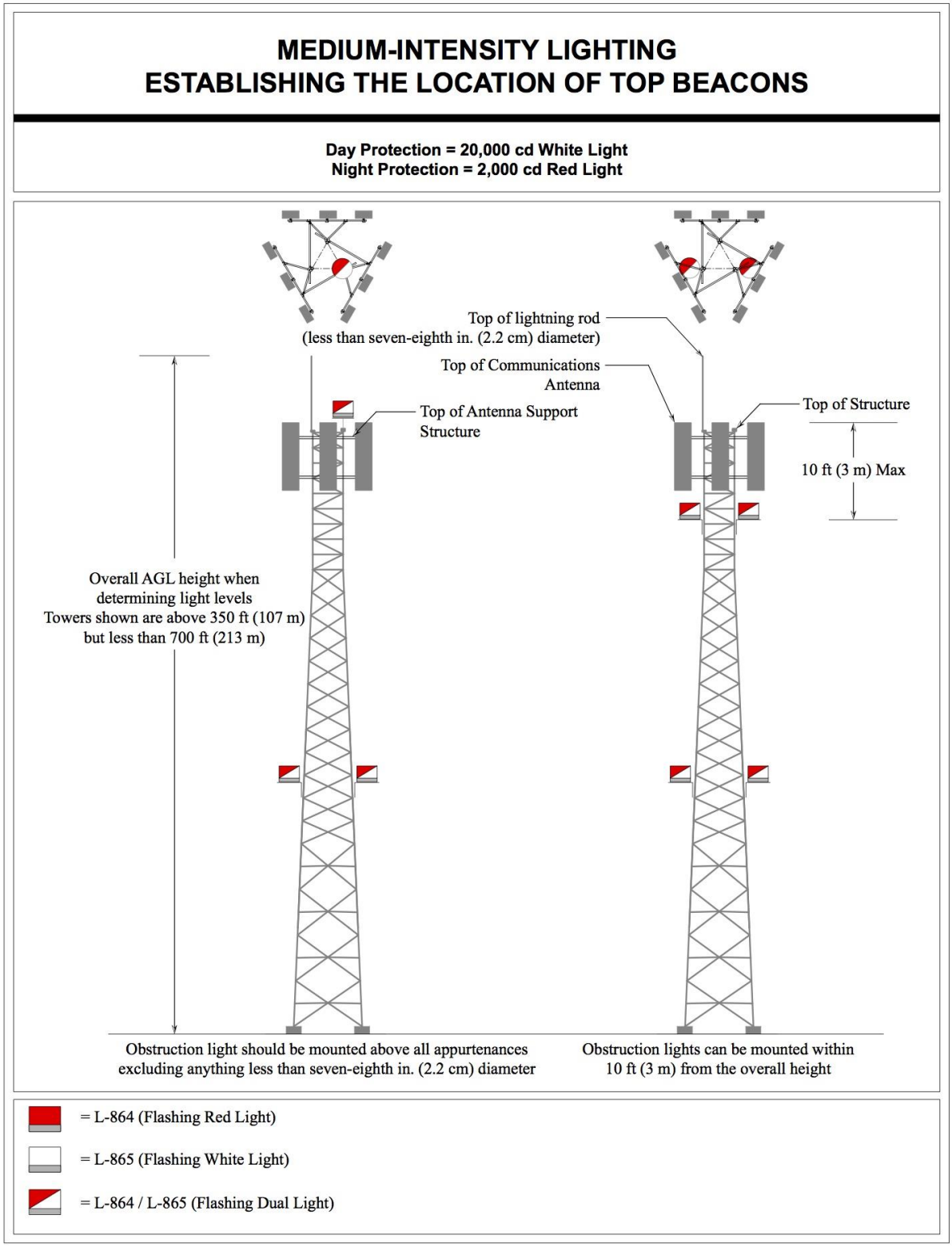


Figure A-14. Medium-Intensity Lighting—Establishing the Location of Top Beacons

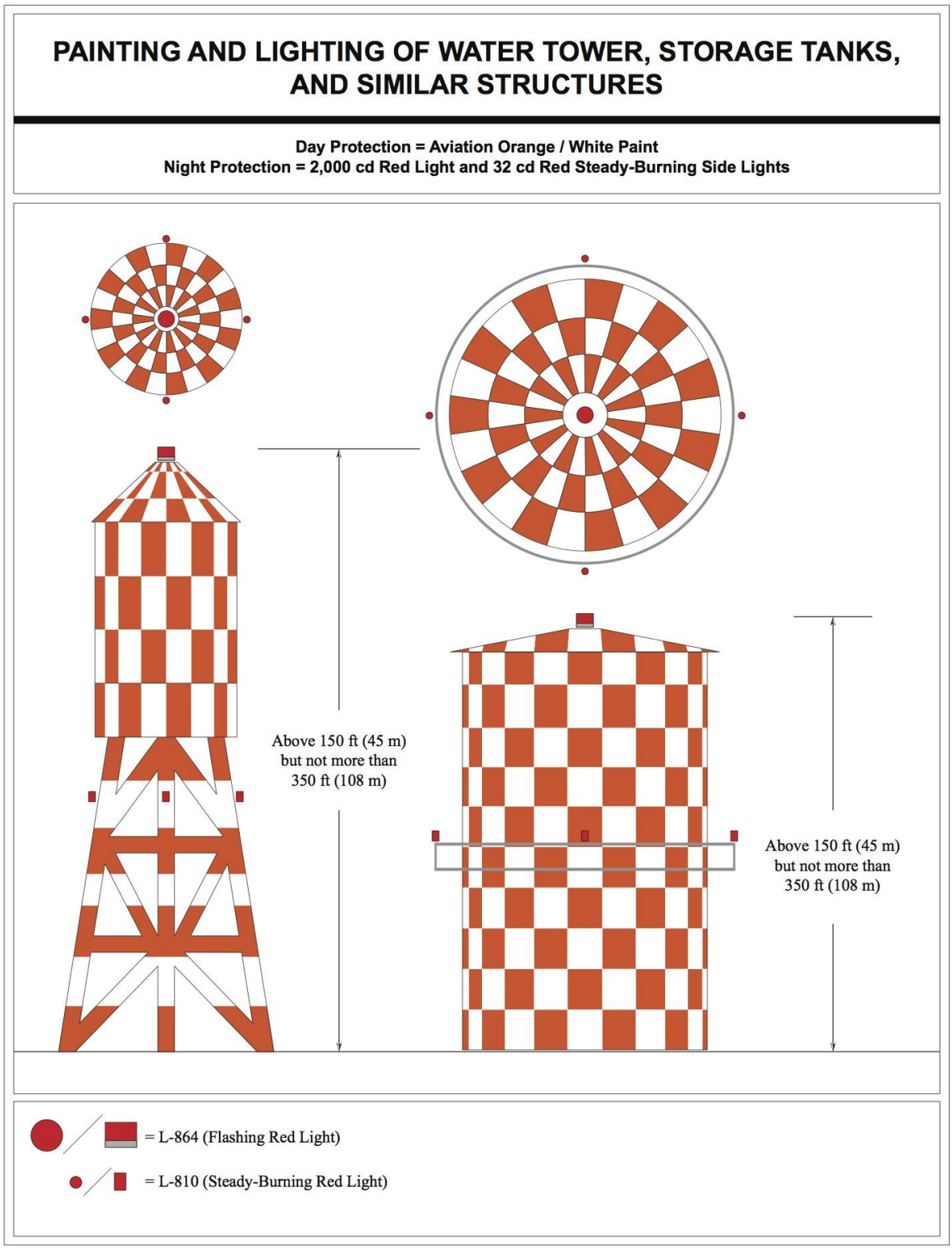


Figure A-15. Painting and Lighting of Water Towers, Storage Tanks, and Similar Structures

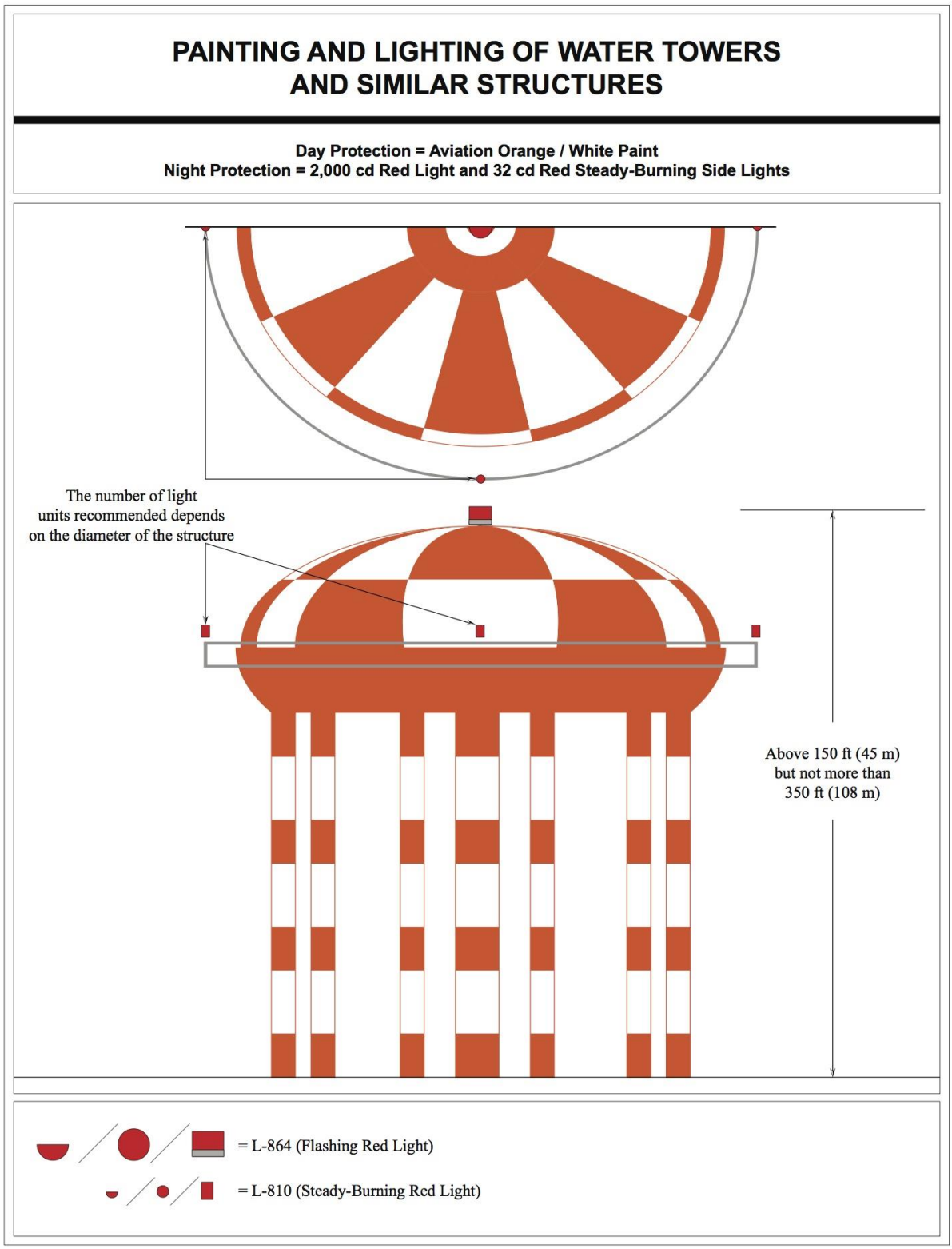


Figure A-16. Painting and Lighting of Water Towers and Similar Structures

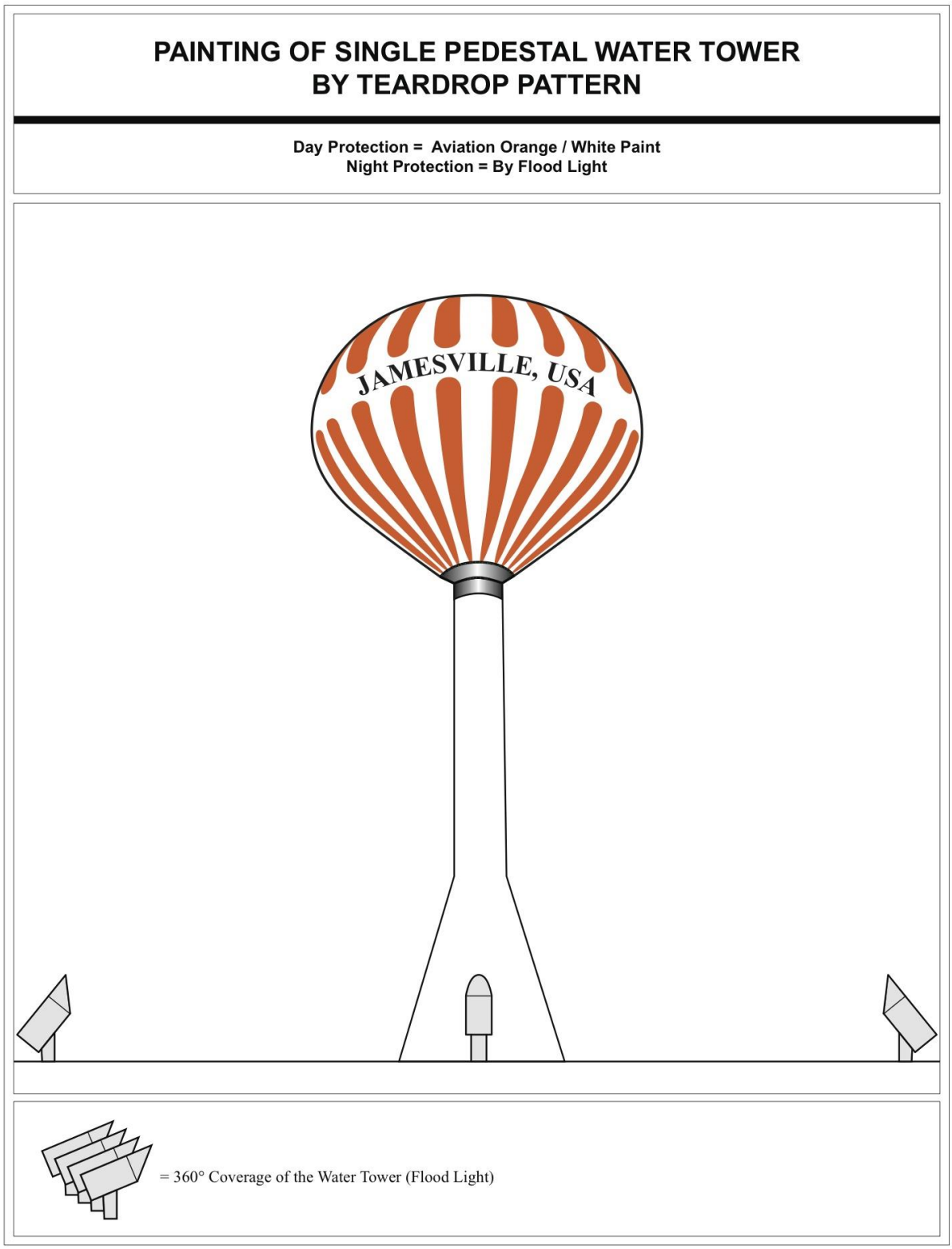


Figure A-17. Painting a Single Pedestal Water Tower Using the Teardrop Pattern

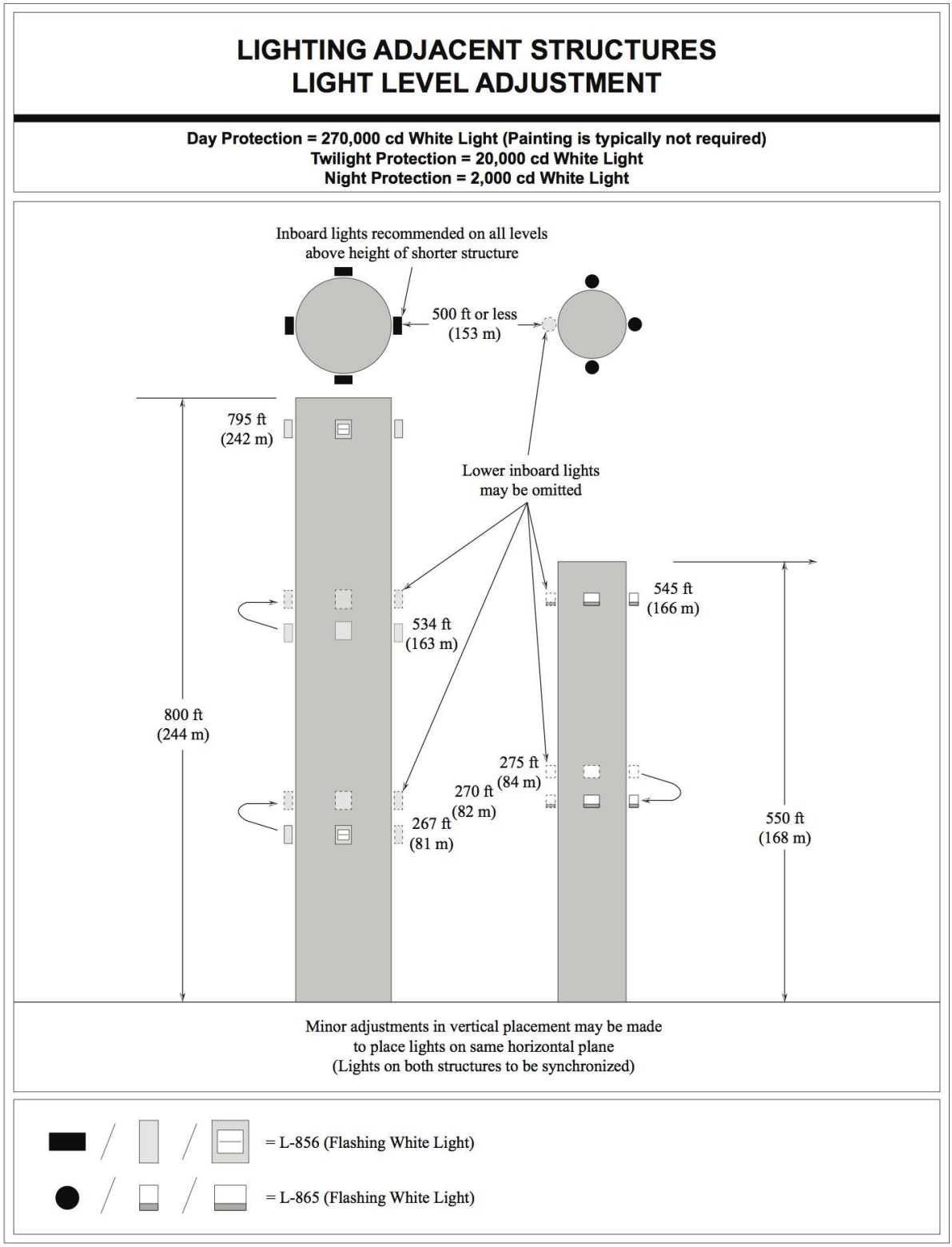


Figure A-18. Lighting Adjacent Structures—Light Level Adjustment

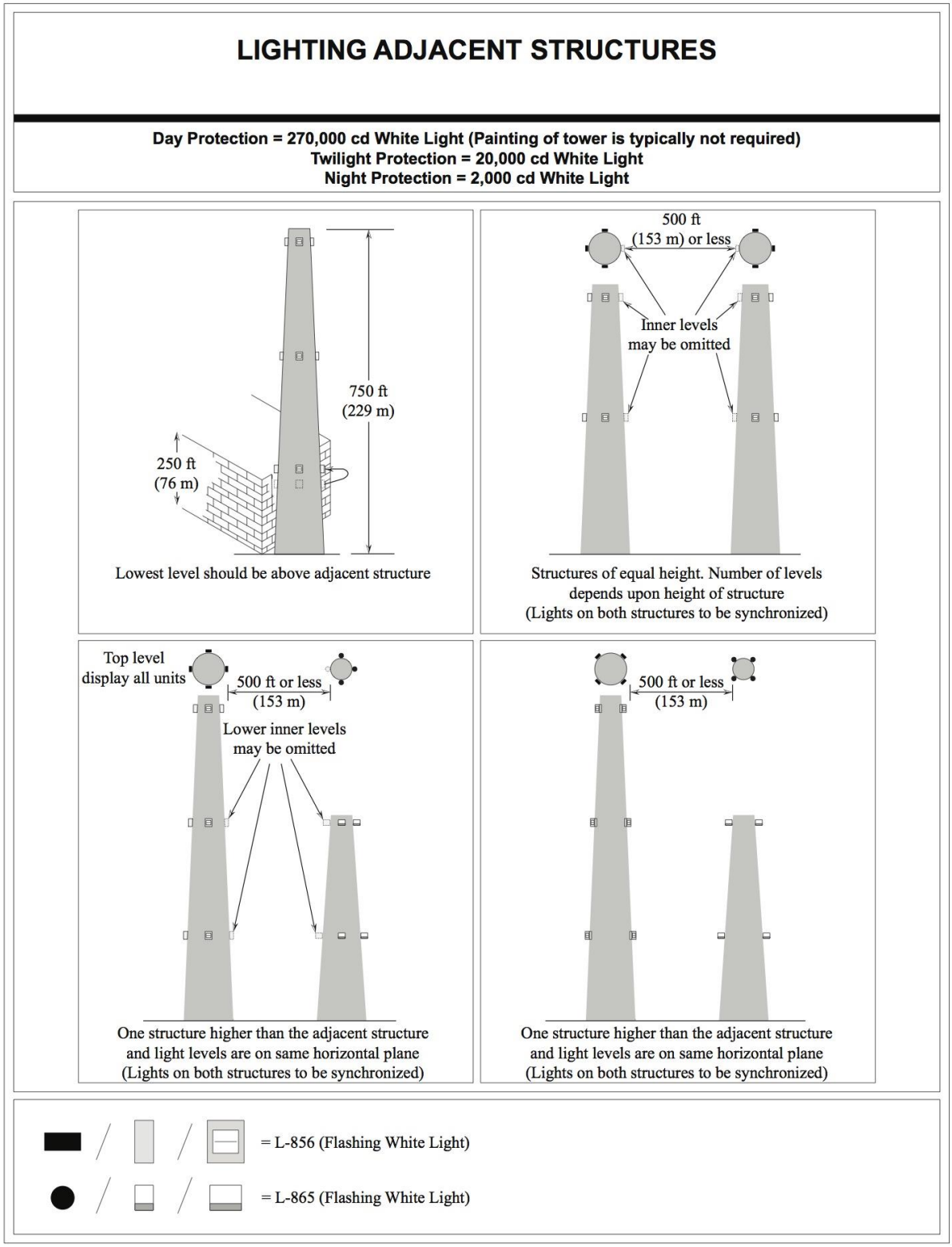


Figure A-19. Lighting Adjacent Structures

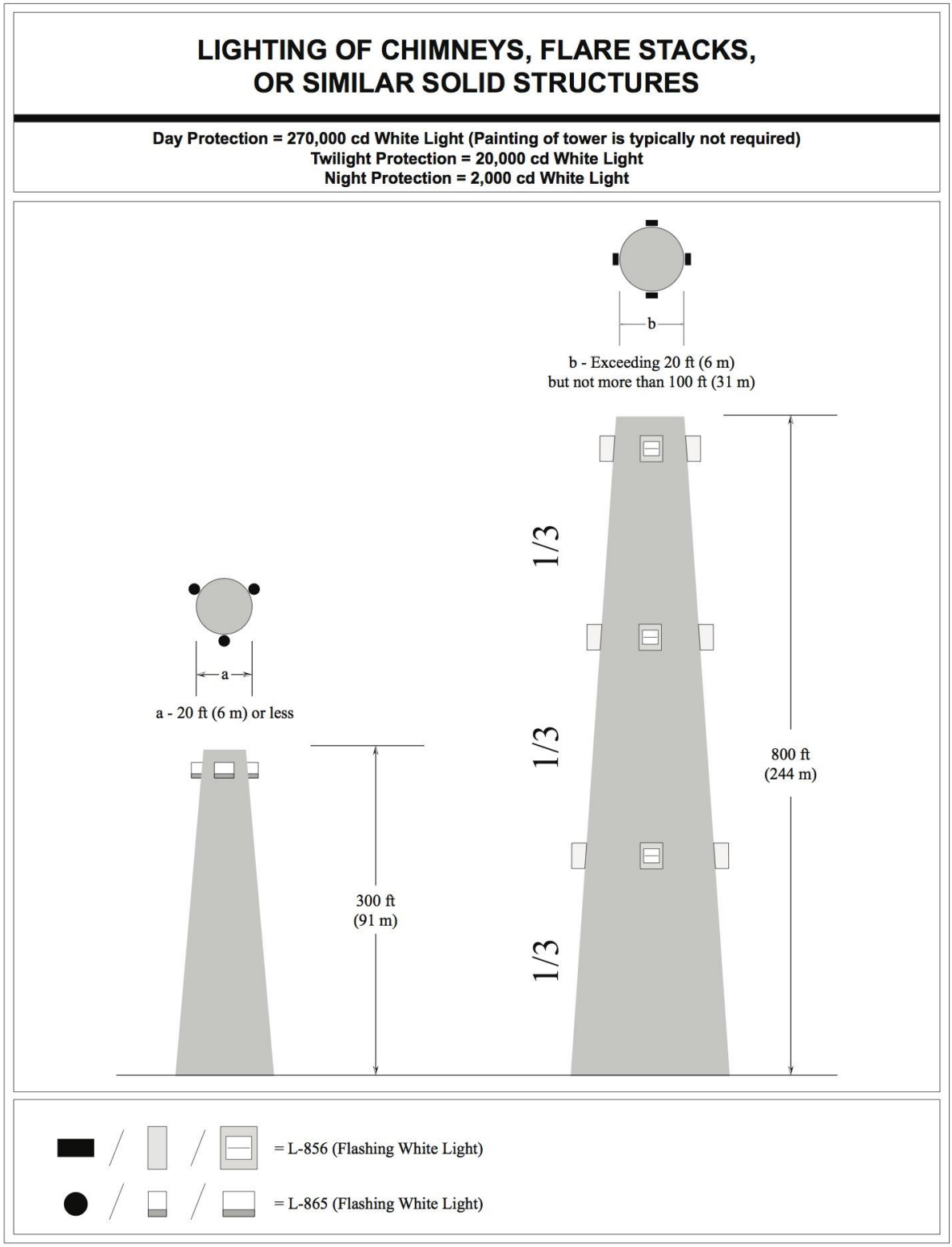


Figure A-20. Lighting of Chimneys, Flare Stacks, or Similar Solid Structures

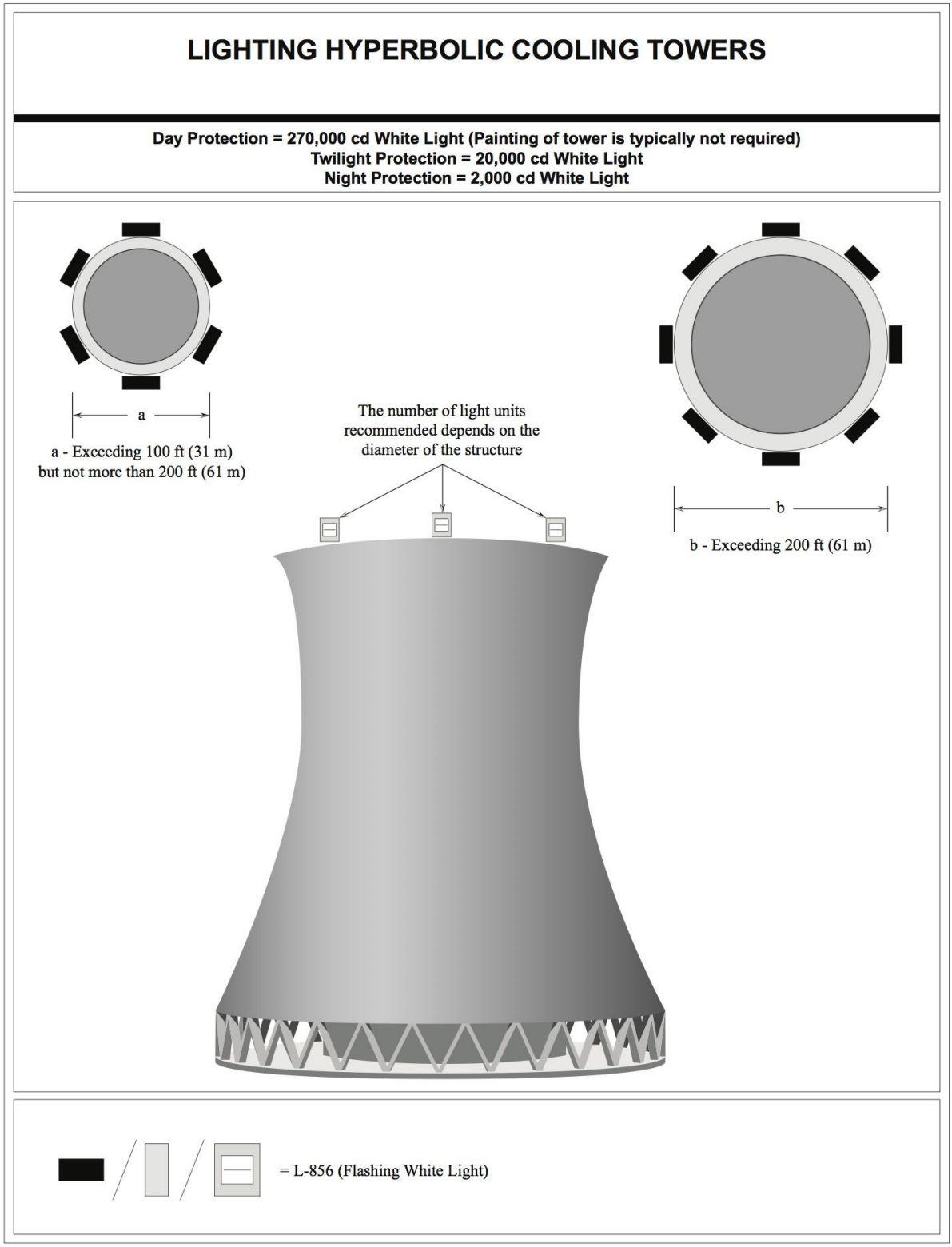


Figure A-21. Hyperbolic Cooling Tower

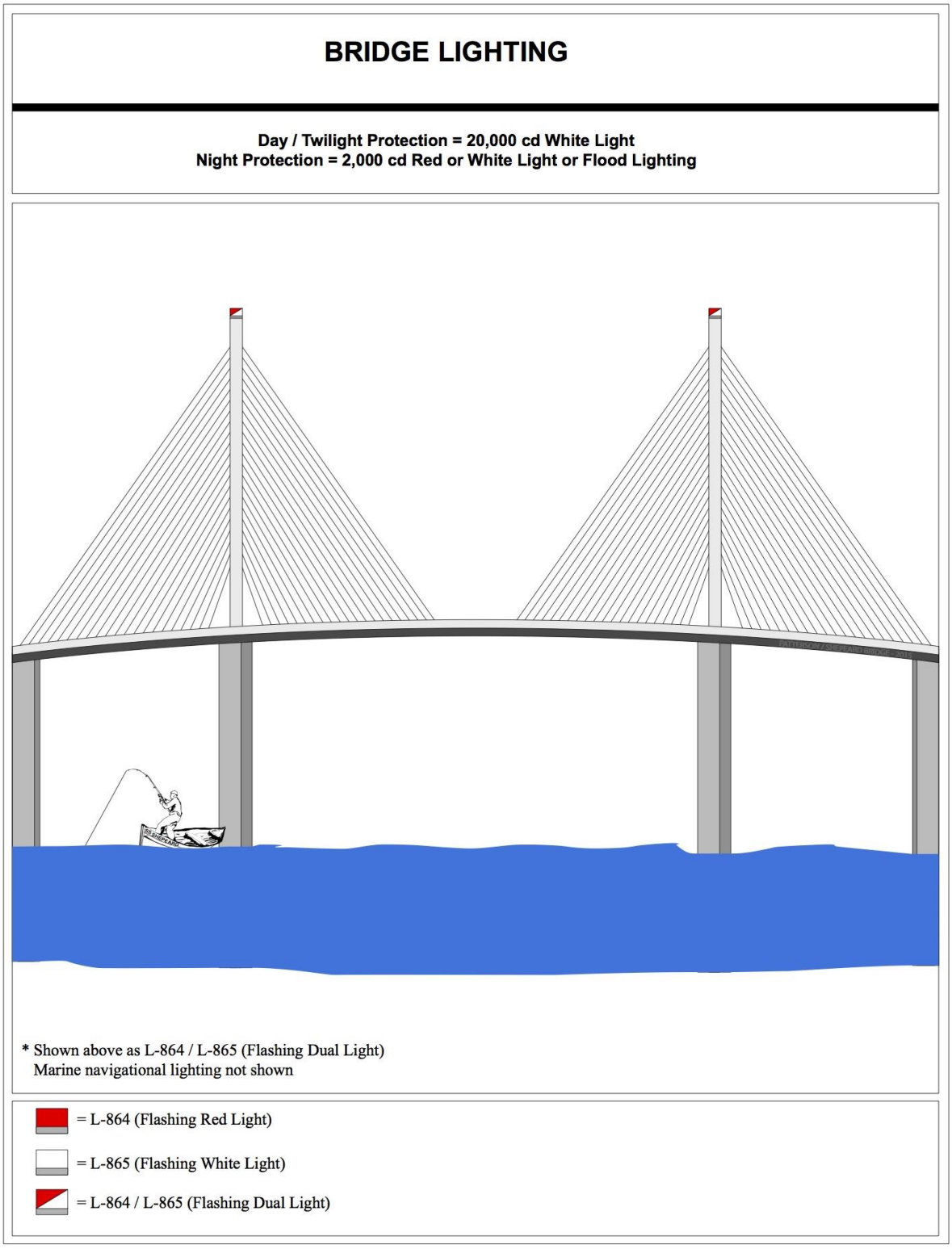


Figure A-22. Bridge Lighting

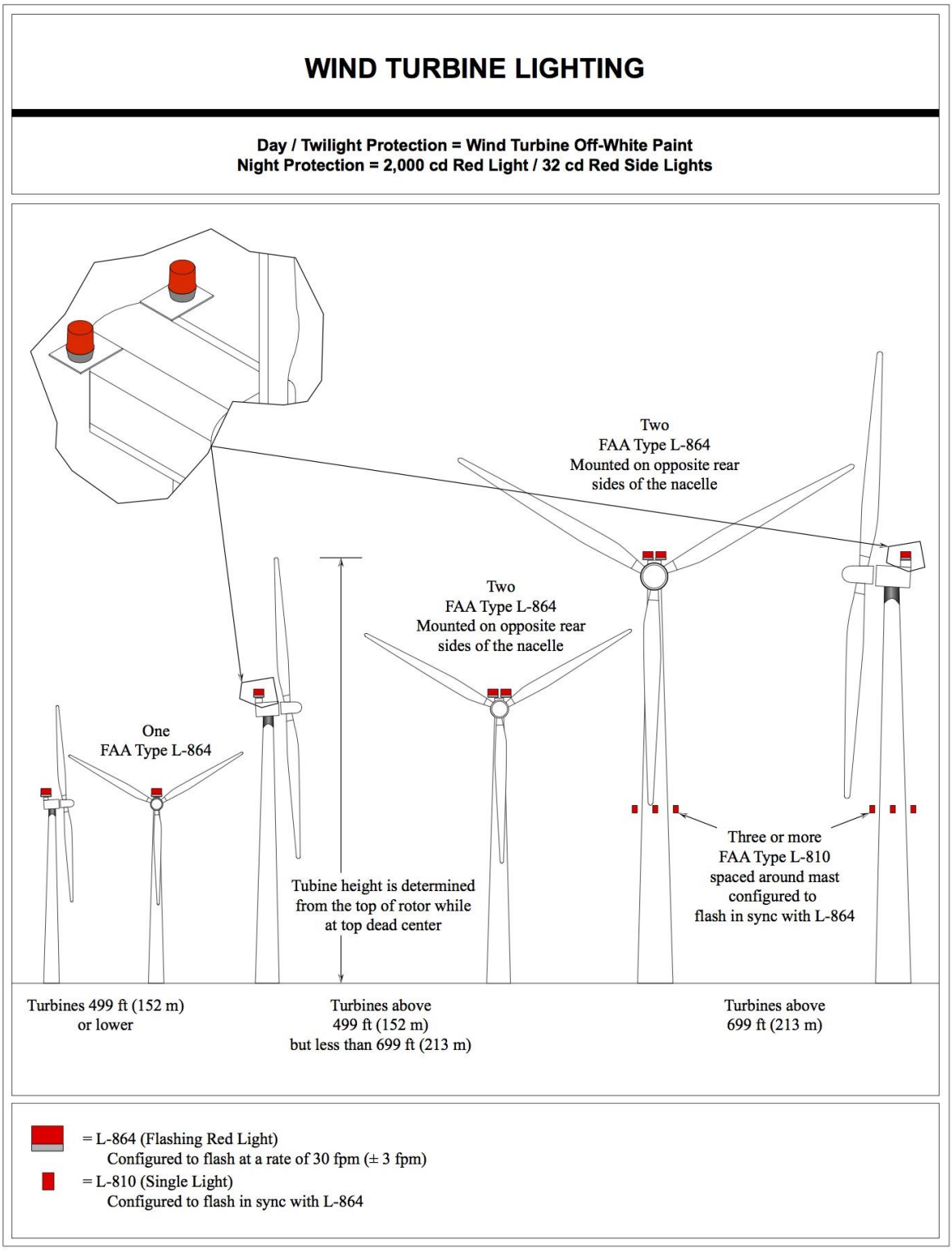


Figure A-23. Wind Turbine Lighting

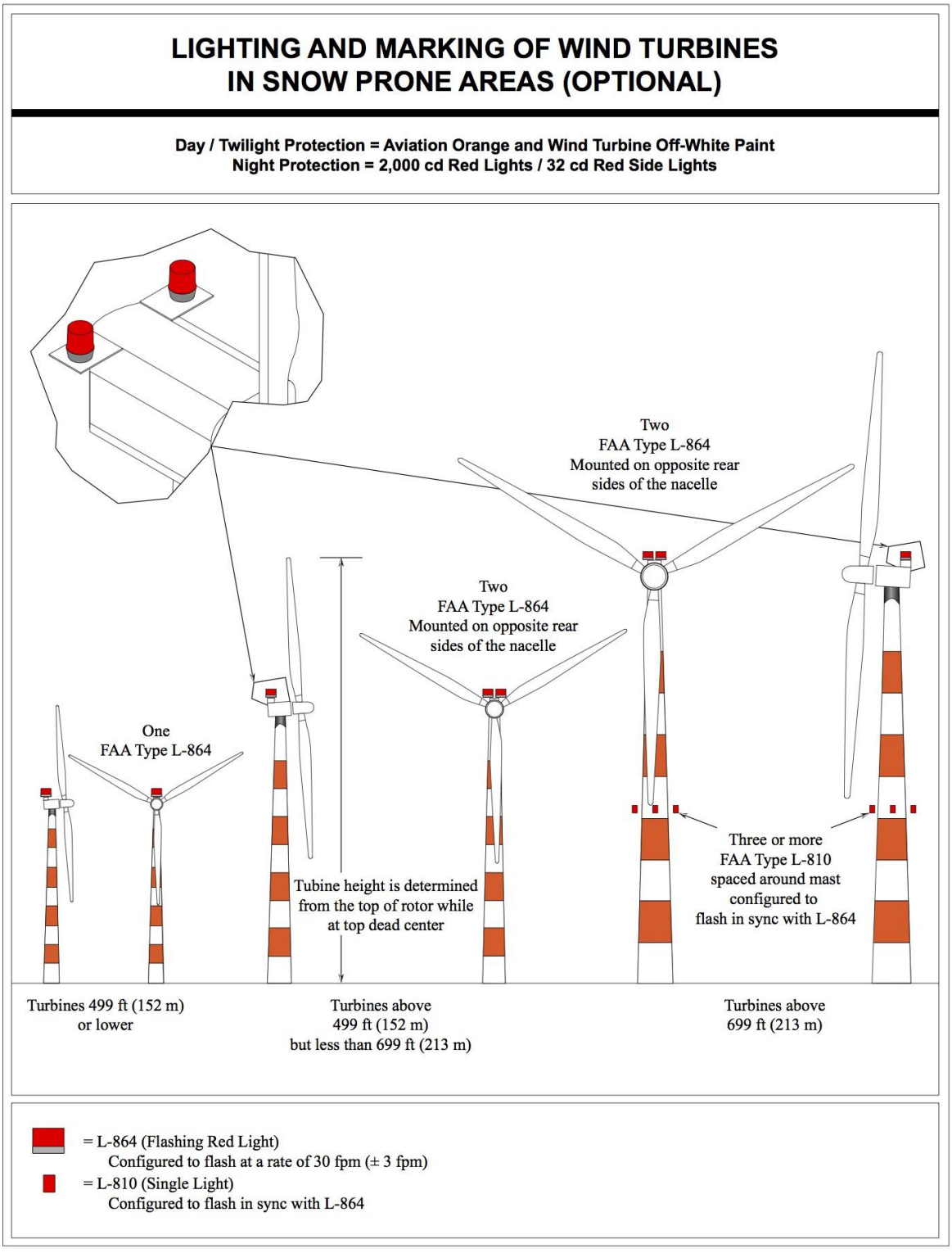


Figure A-24. Wind Turbine Lighting and Marking in Snow Prone Areas (Optional)

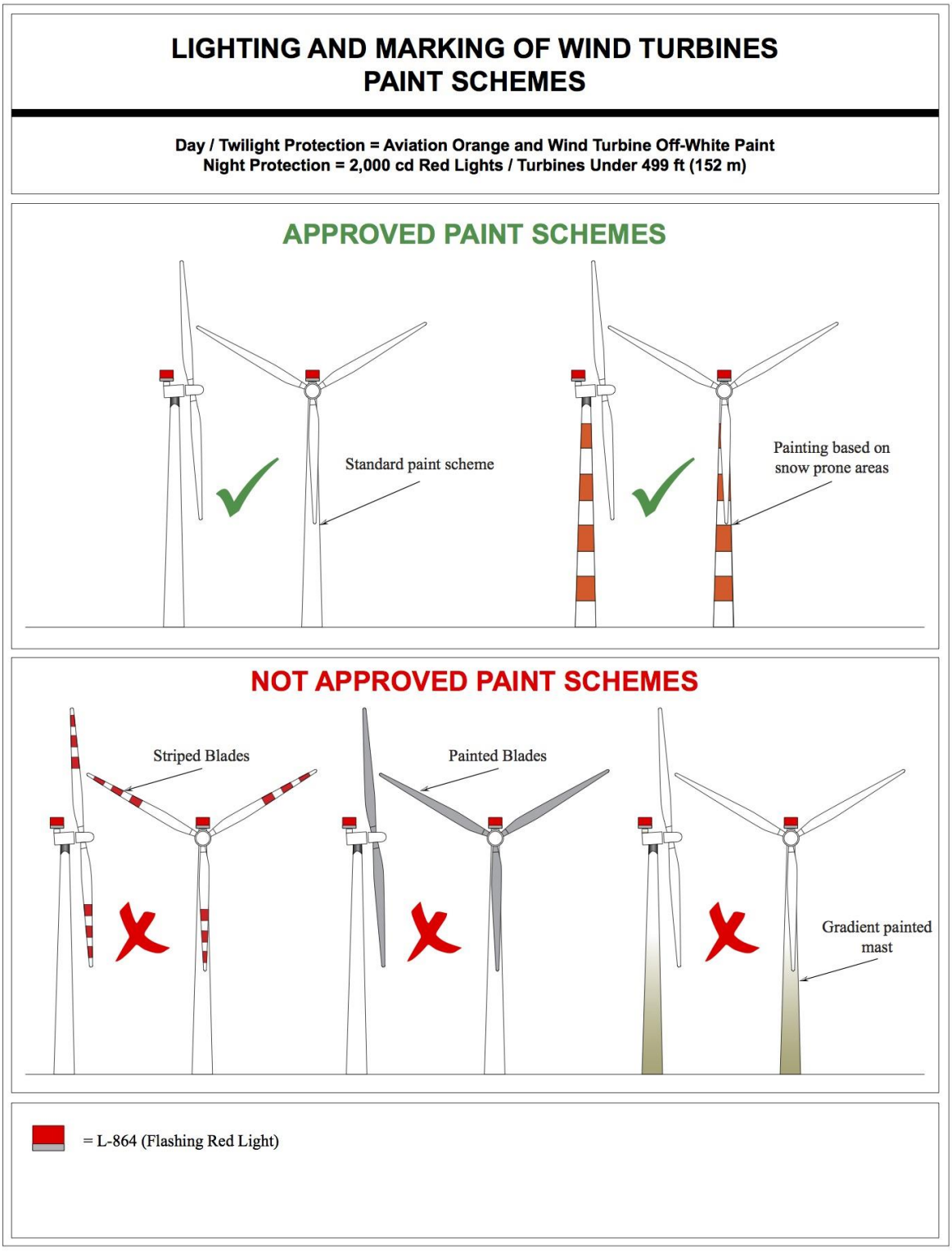


Figure A-25. Lighting and Marking of Wind Turbines – Paint Schemes

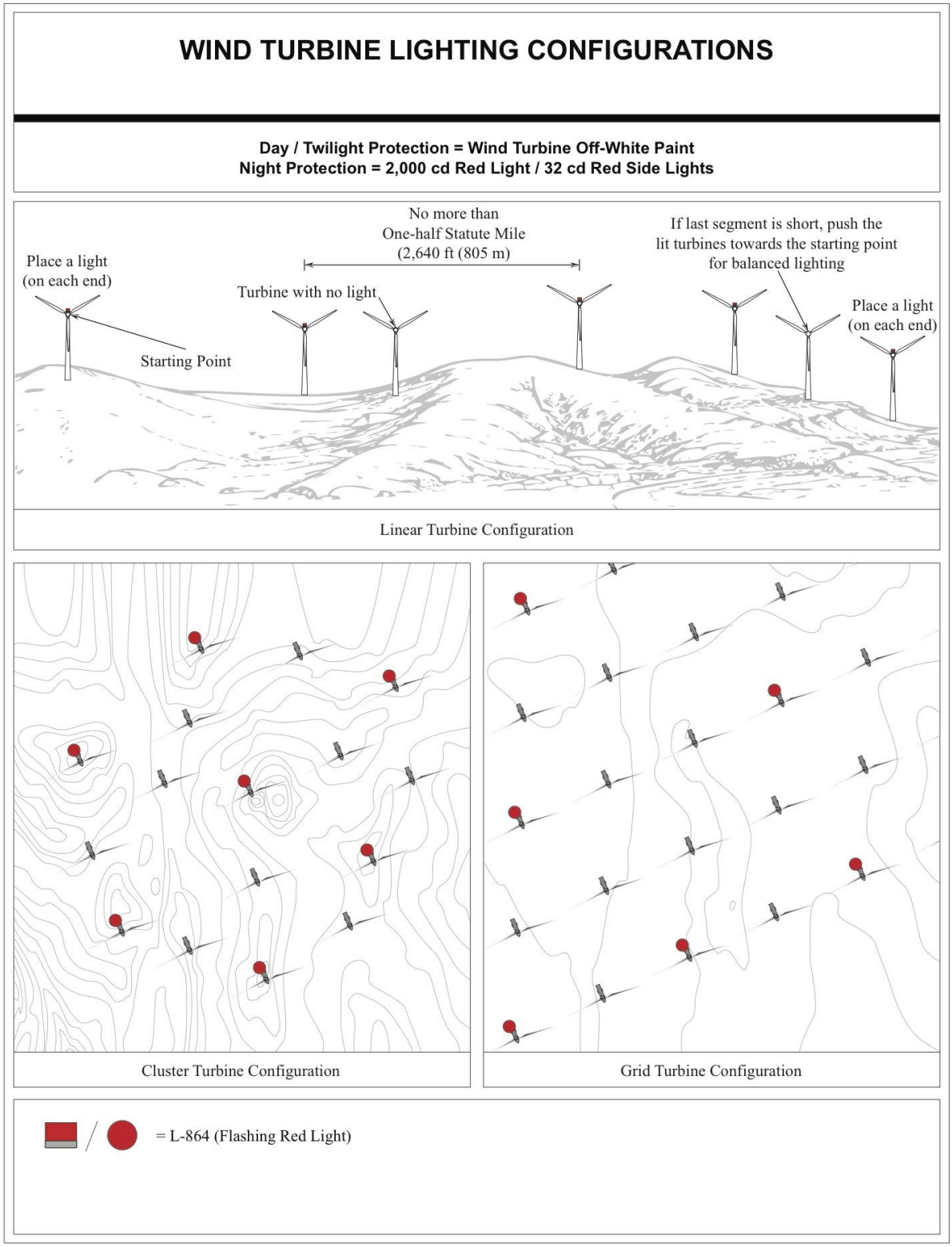


Figure A-26. Wind Turbine Lighting Configurations

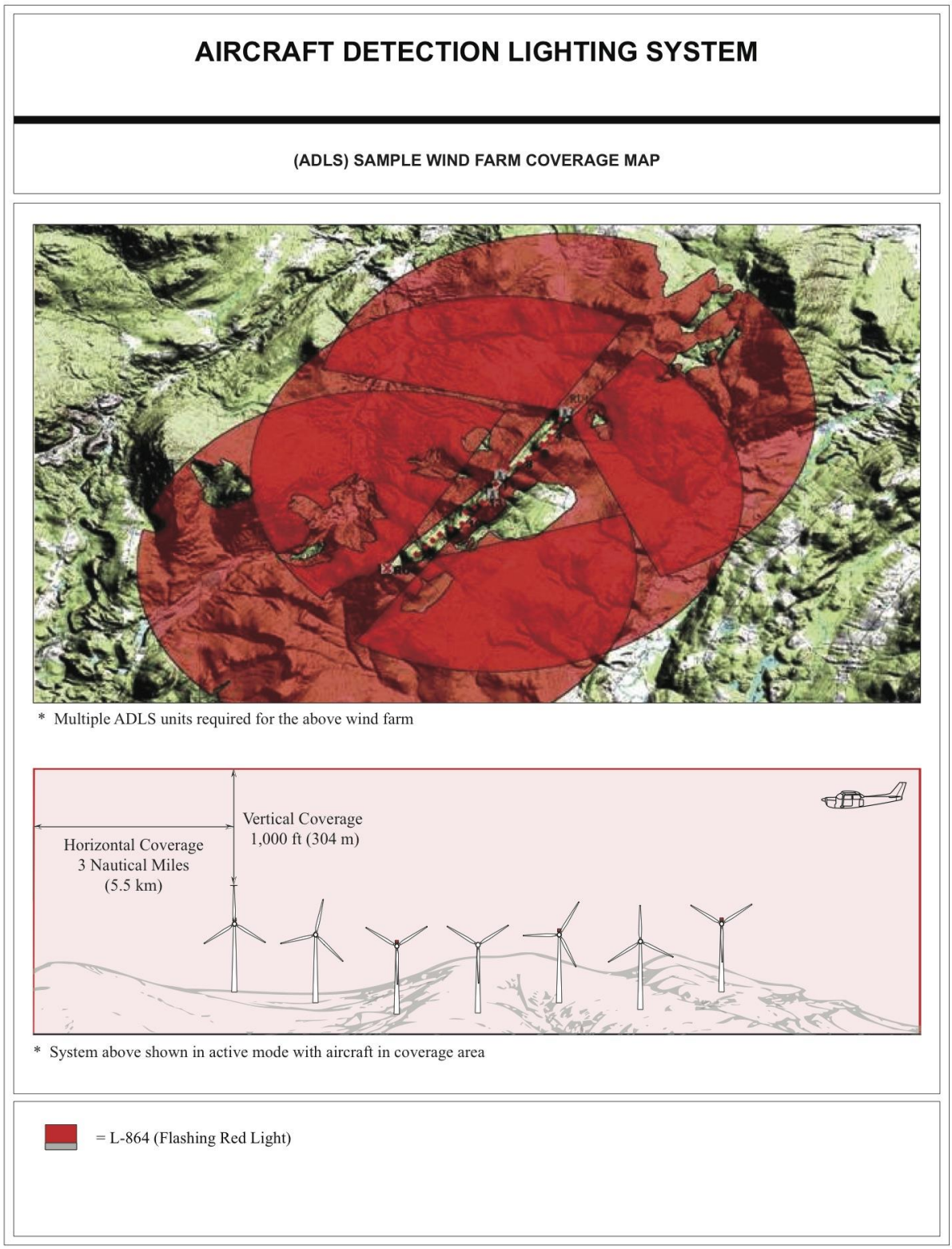


Figure A-27. Sample of Aircraft Detection Lighting System Coverage Map

APPENDIX B. MISCELLANEOUS

B-1 **Rationale for Obstruction Light Intensities**.

Sections 91.117, 91.119 and 91.155 of 14 CFR Part 91, *General Operating and Flight Rules*, prescribe aircraft speed restrictions, minimum safe altitudes, and basic visual flight rules (VFR) weather minimums for governing the operation of aircraft, including helicopters, within the United States.

B-2 **Distance Versus Intensities**.

Table B-1 shows the distance the various intensities are visible under 1 and 3 statute miles meteorological visibilities:

Table B-1. Distance and Intensity

Time Period	Meteorological Visibility Statute Miles	Distance Statute Miles	Intensity Candelas
Night		2.9 (4.7 km)	1,500 (±25%)
	3 (4.8 km)	3.1 (4.9 km)	2,000 (±25%)
		1.4 (2.2 km)	32
Day		1.5 (2.4 km)	200,000
	1 (1.6 km)	1.4 (2.2 km)	100,000
		1.0 (1.6 km)	20,000 (±25%)
Day		3.0 (4.8 km)	200,000
	3 (4.8 km)	2.7 (4.3 km)	100,000
		1.8 (2.9 km)	20,000 (±25%)
Twilight	1 (1.6 km)	1.0 (1.6 km) to 1.5 (2.4 km)	20,000 (±25%)
Twilight	3 (4.8 km)	1.8 (2.9 km) to 4.2 (6.7 km)	20,000 (±25%)

Note: Distance calculated for north sky illuminance.

B-3 **Conclusion**.

Aircraft pilots travelling at 165 kt (190 mph/306 kph) or less should be able to see obstruction lights in sufficient time to avoid the structure by at least 2,000 feet (610 m) horizontally under all conditions of operation, provided the pilot is operating in accordance with 14 CFR Part 91. Pilots operating 250 kt (288 mph/463 kph) aircraft should be able to see the obstruction lights unless the weather deteriorates to 1 statute mile (1.6 km) visibility at night, during which time period 2,000 candelas enables the light to be seen at 1.2 statute miles (1.9 km). To provide an acquisition distance of 1.5 statute miles, a higher intensity of 20,000 candelas would be required. This light, with 3-statute mile visibility at night, could generate a residential annoyance factor. In addition, aircraft at these speeds can normally be expected to operate under instrument flight rules (IFR) at night when the visibility is 1 statute mile (1.6 km).

Note: The 2,000-foot avoidance distance comes from the guy wires of a 2,000-foot structure. The guy wires at a 45-degree angle would be at a distance of 1,500 feet from the structure at a 500-foot elevation. Since the aircraft is to be 500 feet clear of obstacles (the guy wire), the distance of avoidance from the structure is 1,500 + 500 = 2,000 feet. (See Figure B-1.)

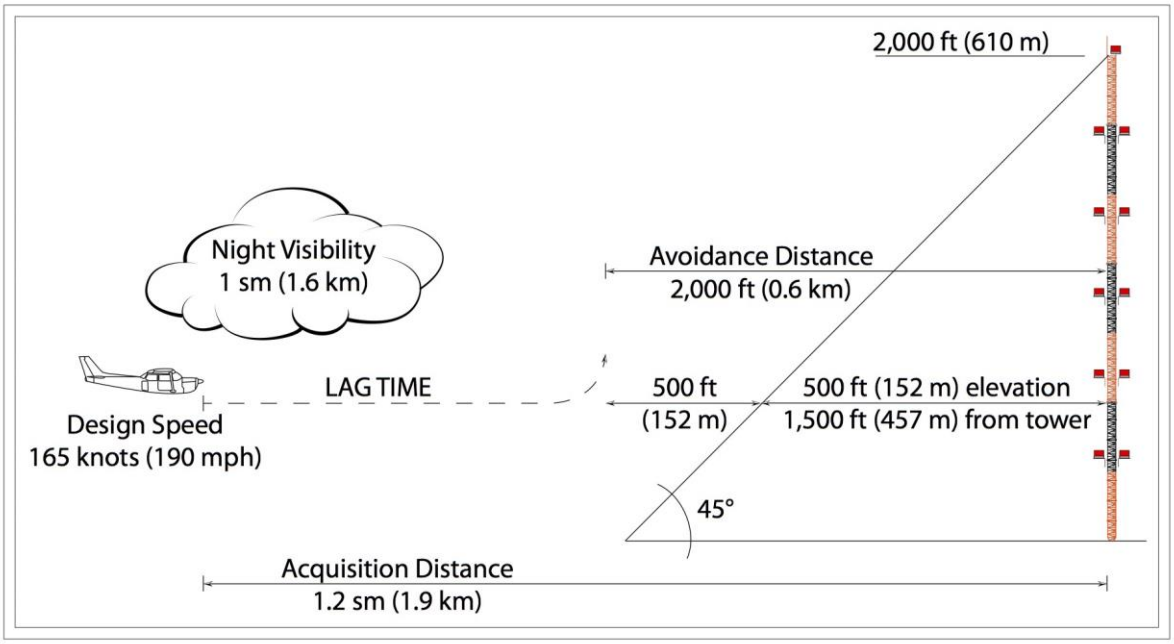


Figure B-1. Illustration of Acquisition Distance Calculation

B-4 **Definitions**.

B-4.1 Flight Visibility.

The average forward horizontal distance, from the cockpit of an aircraft in flight, at which prominent unlighted objects may be seen and identified by day and prominent lighted objects may be seen and identified by night.

Reference: *Airman's Information Manual Pilot/Controller Glossary*.

B-4.2 Meteorological Visibility.

A term that denotes the greatest distance, expressed in statute miles, that selected objects (visibility markers) or lights of moderate intensity (25 candelas) can be seen and identified under specified conditions of observation.

B-5 **Lighting System Configuration**.

1. Configuration A . Red Obstruction Lighting System.
2. Configuration B. High-Intensity White Obstruction Lights for structures with appurtenance 40 feet or less.
3. Configuration C. High-Intensity White Obstruction Lights for structures with appurtenance greater than 40 feet.
4. Configuration D. Medium-Intensity White Obstruction Lights.
5. Configuration E. Medium-Intensity Dual White and Red Obstruction Lights.
6. Configuration F. High-Intensity Dual Obstruction Lights for structures with appurtenance greater than 40 feet.
7. Configuration G. High-Intensity Dual Obstruction Lights for structures with appurtenance 40 feet or less.

Example: "Configuration B 3" denotes a high-intensity lighting system with three levels of light.

Appendix G: FAA Determinations of No Hazard to Air Navigation

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8080-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T2
Location:	Hamlet, NY
Latitude:	42-24-42.29N NAD 83
Longitude:	79-10-17.74W
Heights:	1541 feet site elevation (SE)
	499 feet above ground level (AGL)
	2040 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2040 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8080-OE.

Signature Control No: 273432843-301612352 (DNE -WT)
Brenda Mumper
Specialist

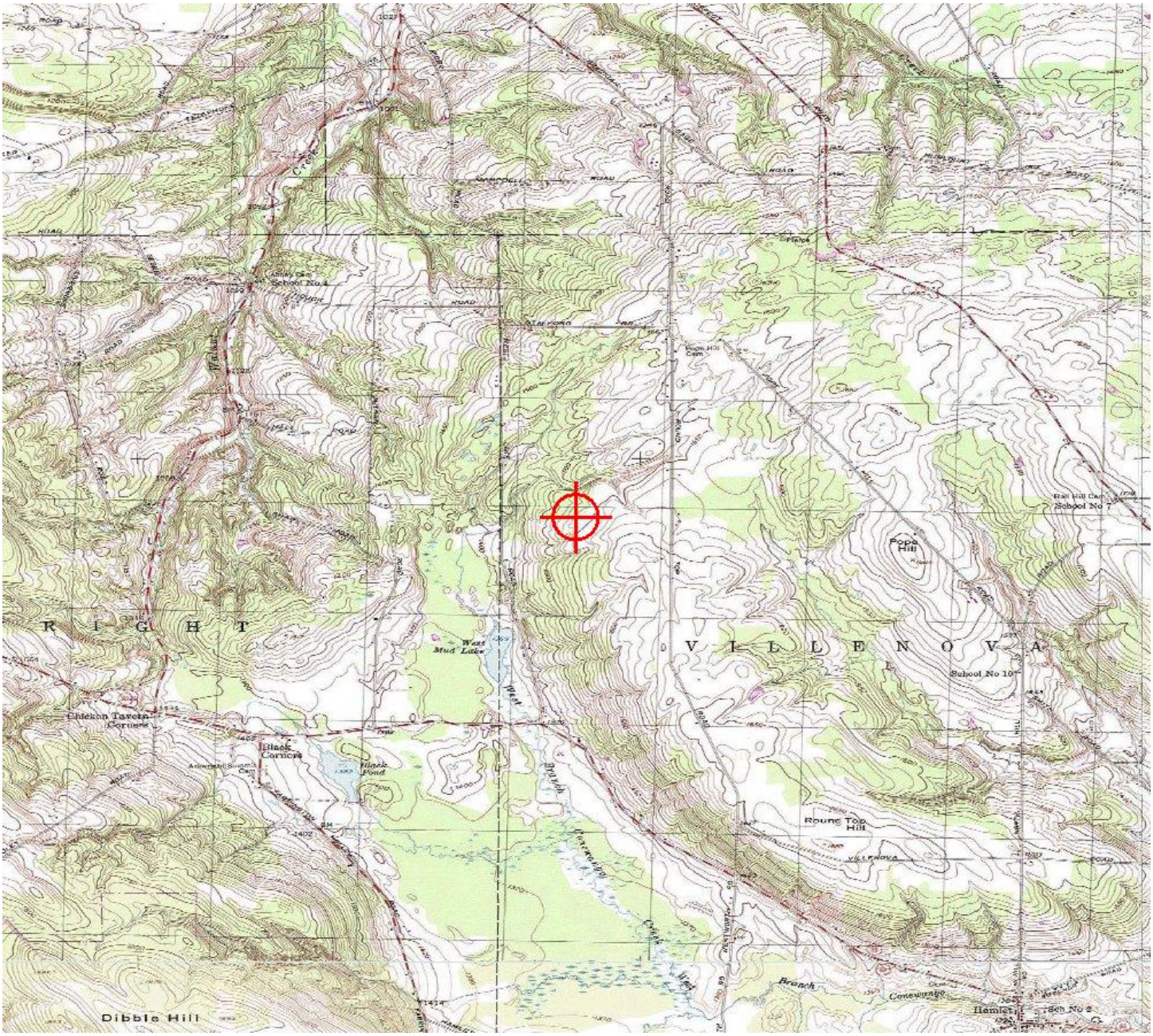
Attachment(s)
Additional Information
Map(s)

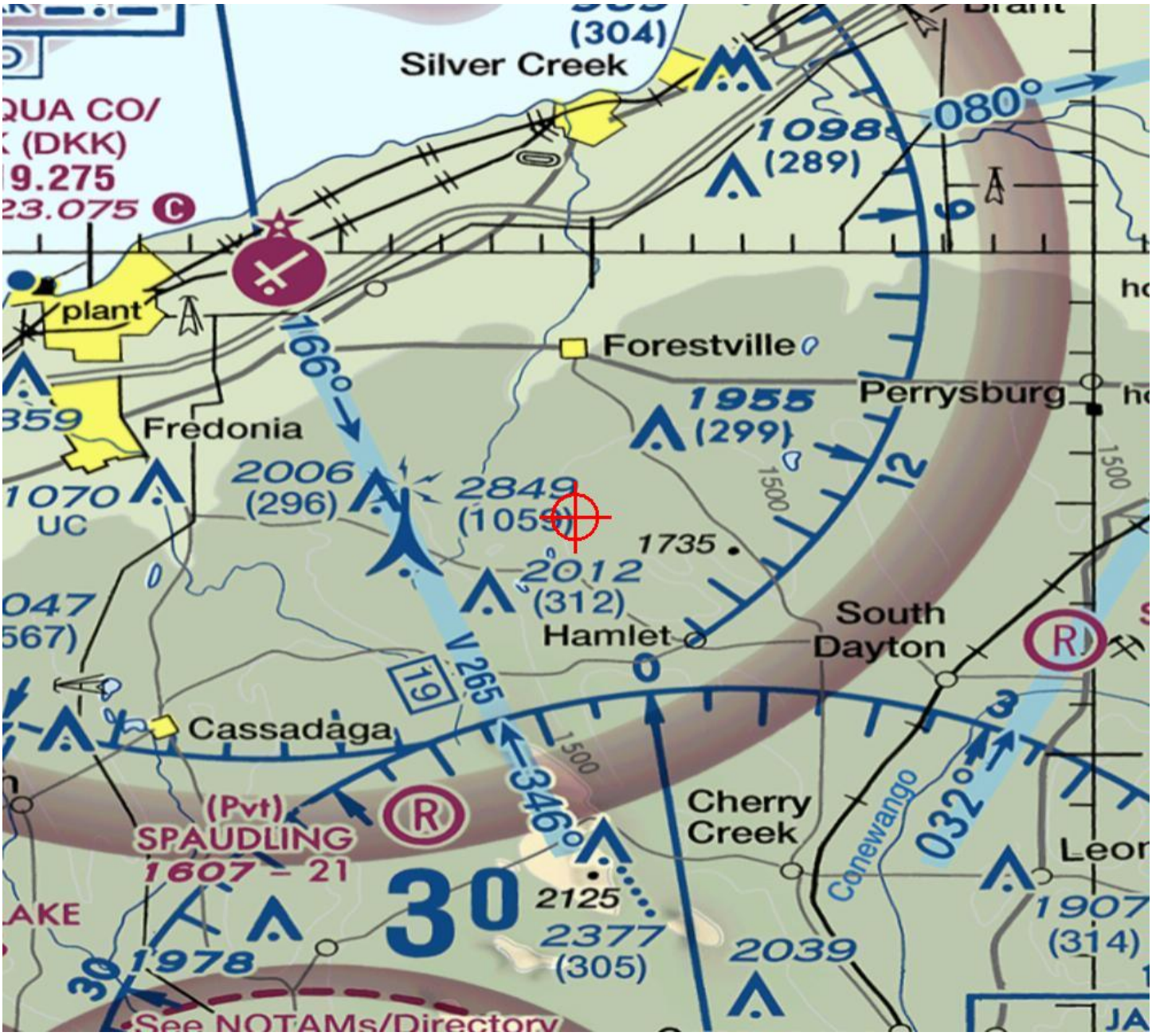
Additional information for ASN 2015-WTE-8080-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8080-OE

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South
Dayton
Hamlet
V 265
19
Cassadaga
346°
Cherry
Creek
032°
Canewango
(Pvt)
SPAUDLING
1607 – 21
30
2125
2377
(305)
1978
2039
1907
(314)
See NOTAMs/Directory
1500
12
3
UC

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8081-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T3
Location:	Hamlet, NY
Latitude:	42-22-48.64N NAD 83
Longitude:	79-08-19.95W
Heights:	1618 feet site elevation (SE)
	499 feet above ground level (AGL)
	2117 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

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It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

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__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

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(b) extended, revised, or terminated by the issuing office.

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If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8081-OE.

Signature Control No: 273432844-301612339 (DNE -WT)
Brenda Mumper
Specialist

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Map(s)

Additional information for ASN 2015-WTE-8081-OE

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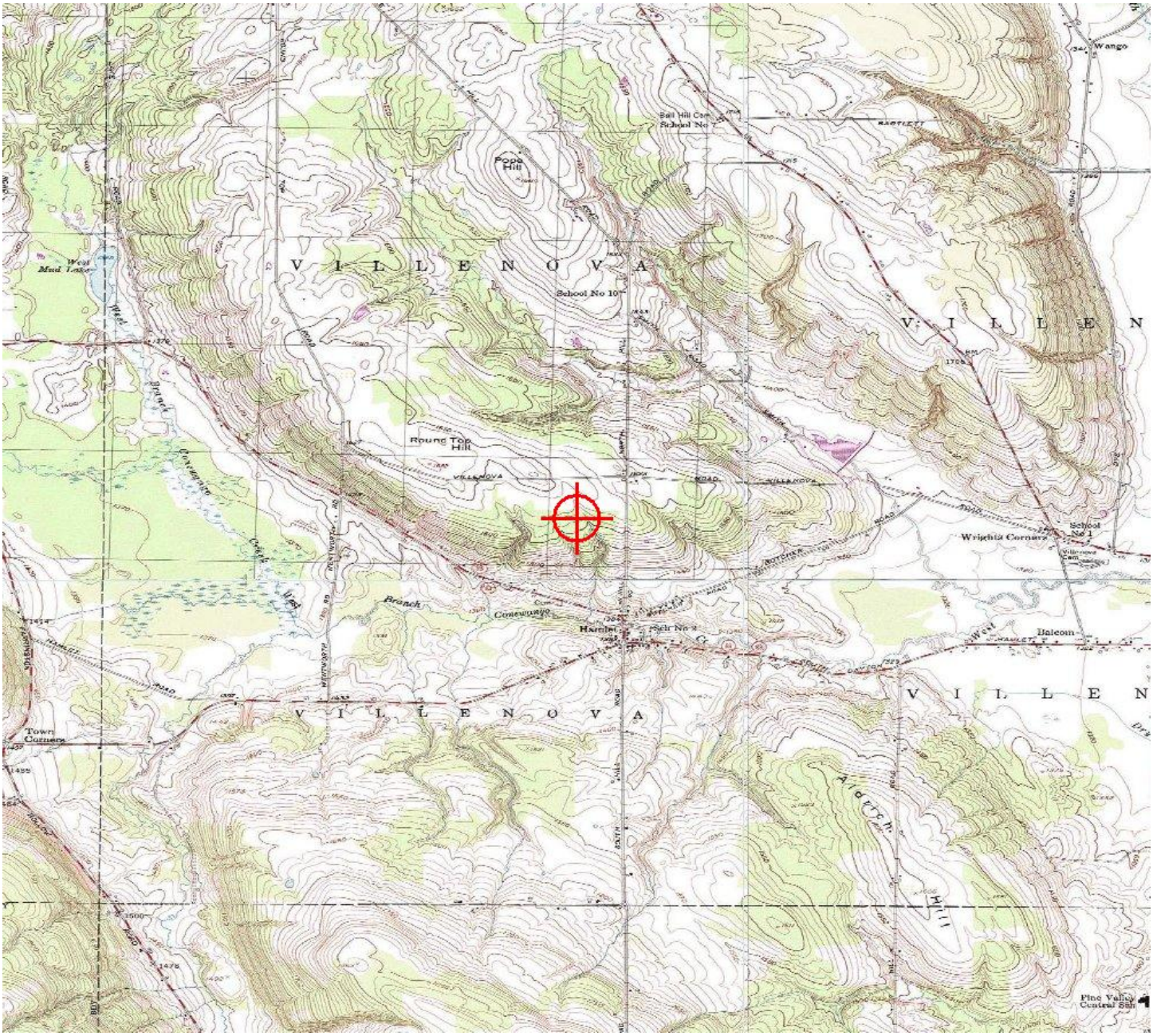
All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8081-OE



Sectional Map for ASN 2015-WTE-8081-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8082-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T4
Location:	Hamlet, NY
Latitude:	42-23-08.19N NAD 83
Longitude:	79-08-29.54W
Heights:	1632 feet site elevation (SE)
	499 feet above ground level (AGL)
	2131 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2131 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8082-OE.

Signature Control No: 273432845-301612342 (DNE -WT)
Brenda Mumper
Specialist

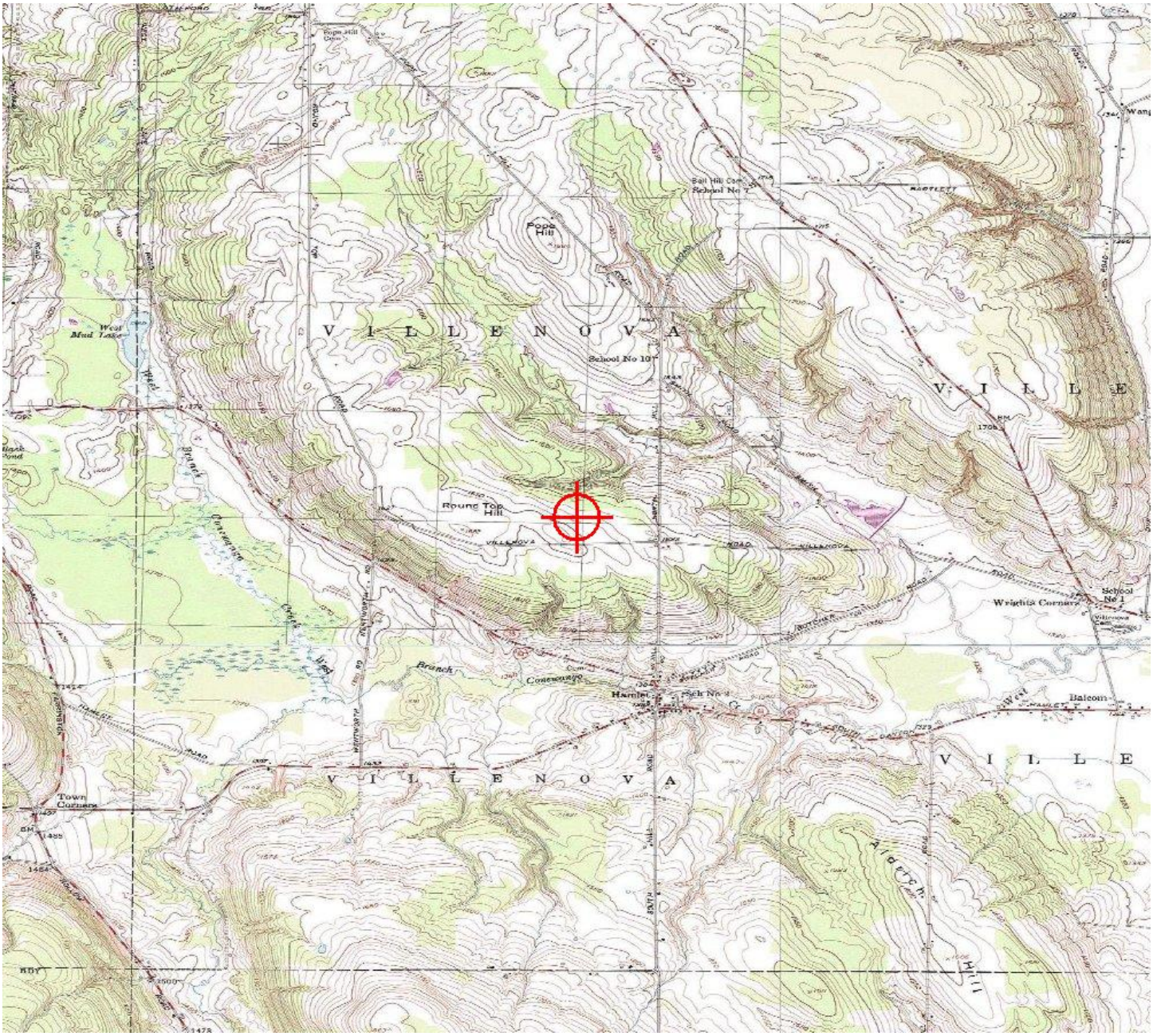
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8082-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8082-OE



Sectional Map for ASN 2015-WTE-8082-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8083-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T5
Location:	Hamlet, NY
Latitude:	42-23-22.69N NAD 83
Longitude:	79-08-46.67W
Heights:	1631 feet site elevation (SE)
	499 feet above ground level (AGL)
	2130 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2130 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8083-OE.

Signature Control No: 273432846-301612350 (DNE -WT)
Brenda Mumper
Specialist

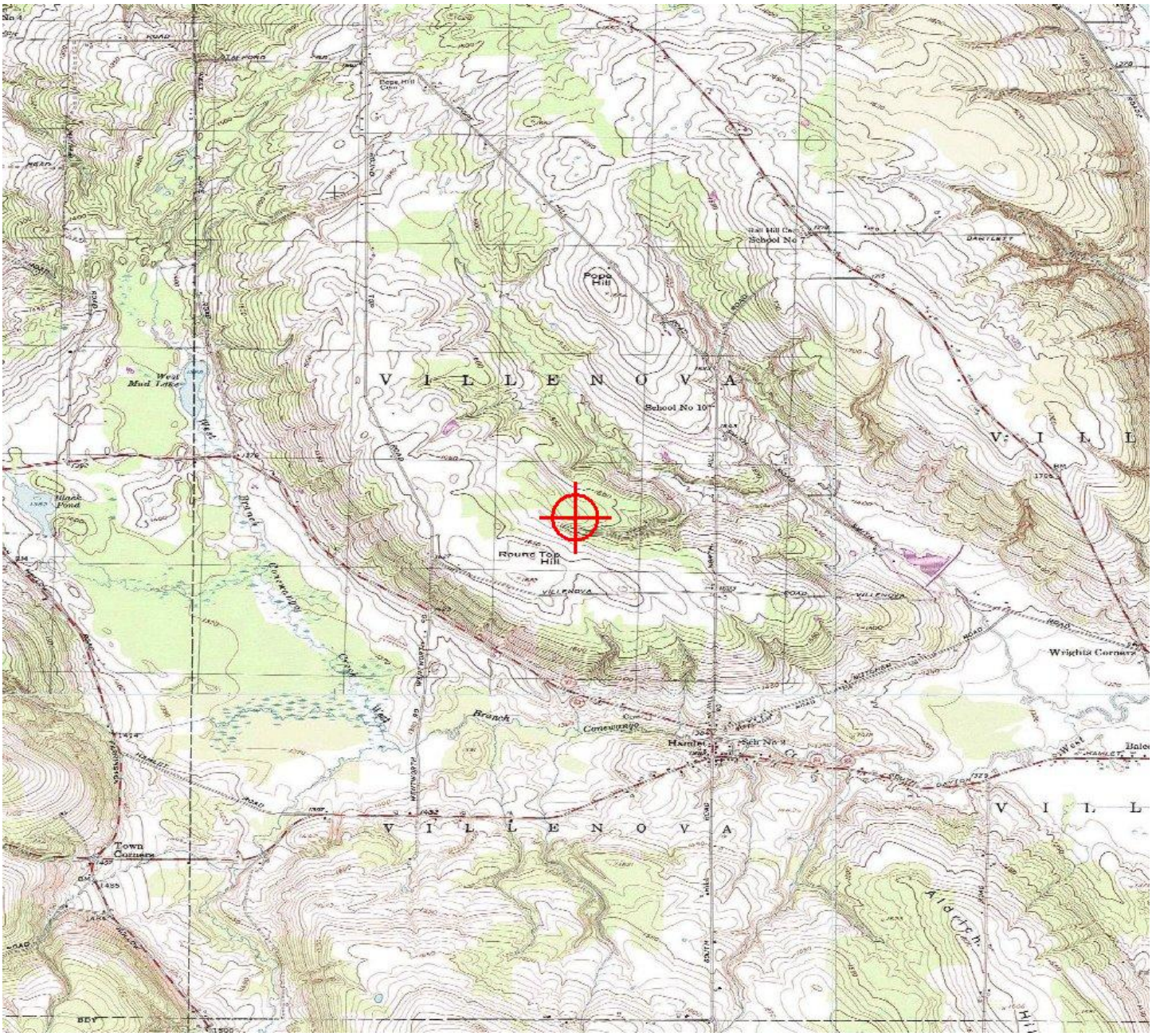
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8083-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8083-OE



Sectional Map for ASN 2015-WTE-8083-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8084-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T6
Location:	Hamlet, NY
Latitude:	42-23-34.10N NAD 83
Longitude:	79-08-54.31W
Heights:	1622 feet site elevation (SE)
	499 feet above ground level (AGL)
	2121 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2121 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8084-OE.

Signature Control No: 273432847-301612348 (DNE -WT)
Brenda Mumper
Specialist

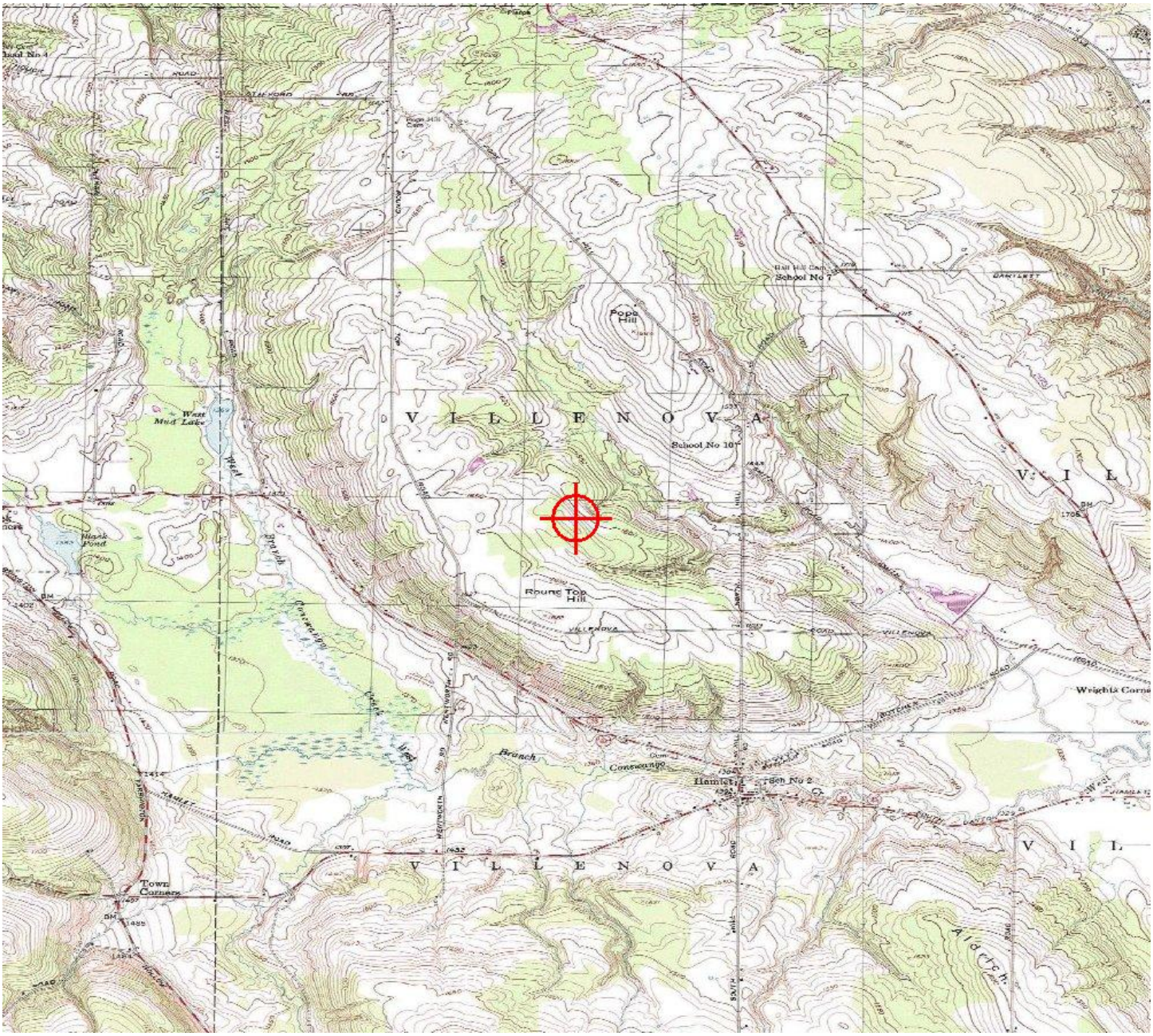
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8084-OE

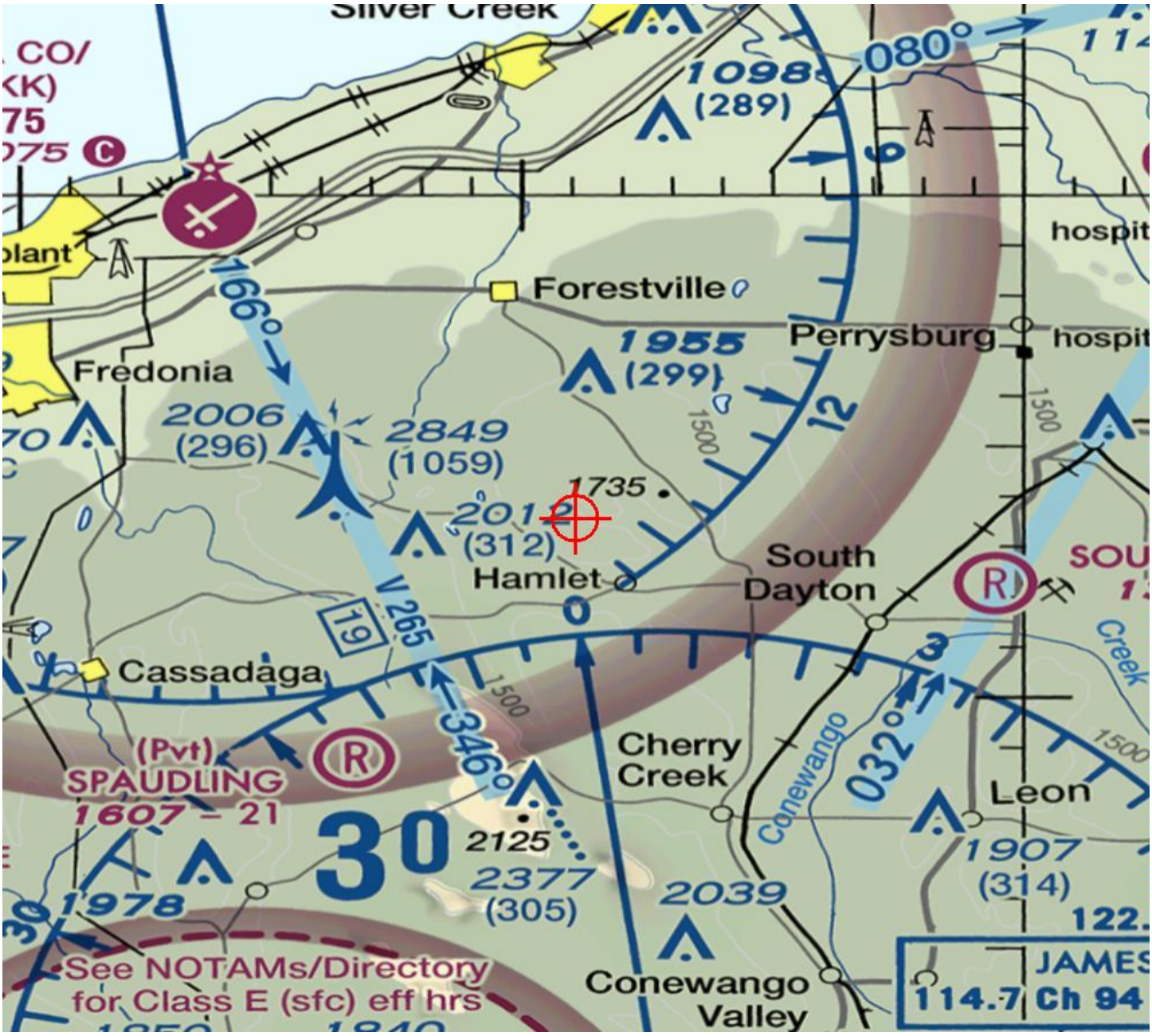
The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8084-OE



Sectional Map for ASN 2015-WTE-8084-OE



Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8085-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T7
Location:	Hamlet, NY
Latitude:	42-23-47.93N NAD 83
Longitude:	79-09-01.51W
Heights:	1605 feet site elevation (SE)
	499 feet above ground level (AGL)
	2104 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2104 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8085-OE.

Signature Control No: 273432848-301612355 (DNE -WT)
Brenda Mumper
Specialist

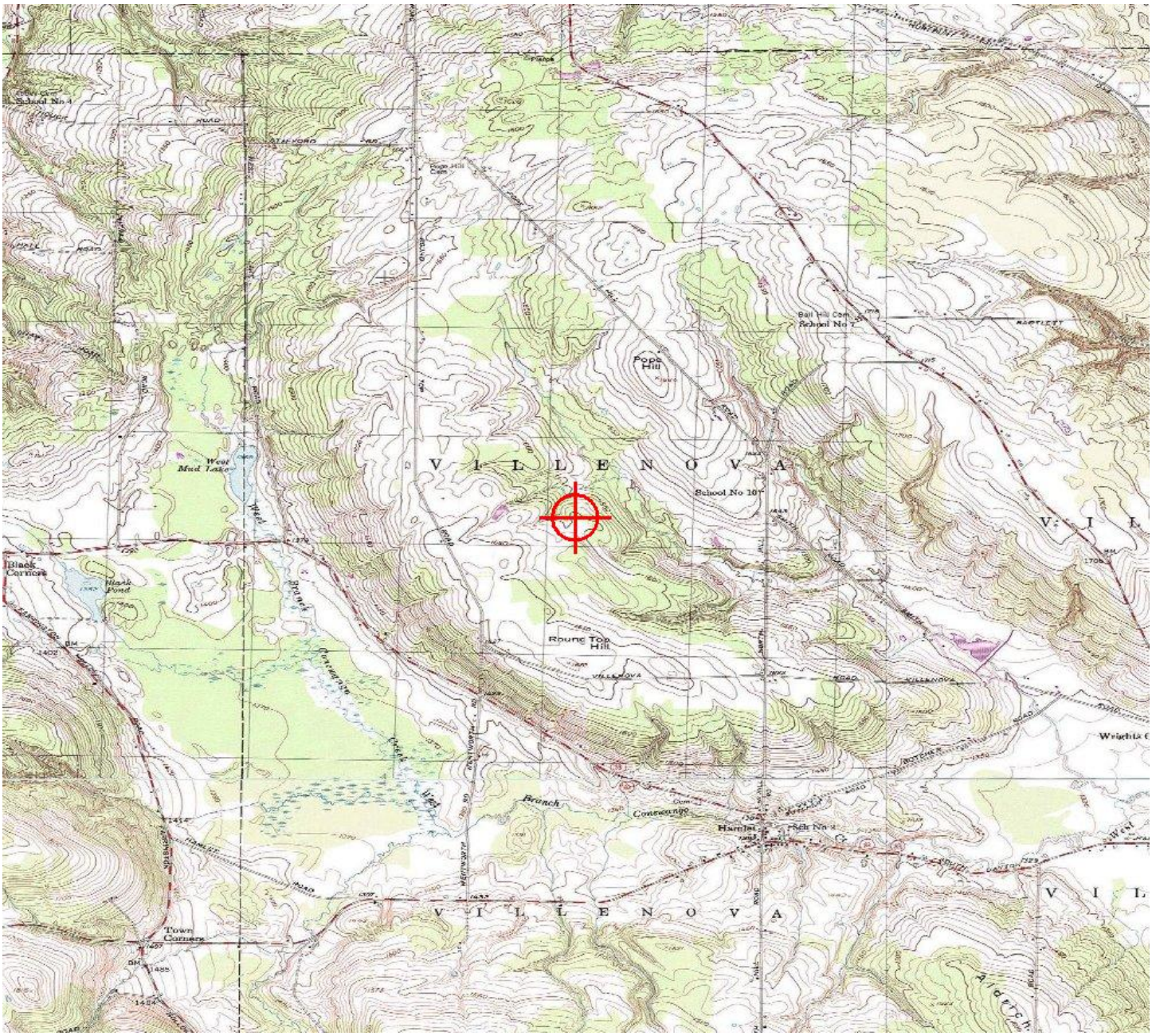
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8085-OE

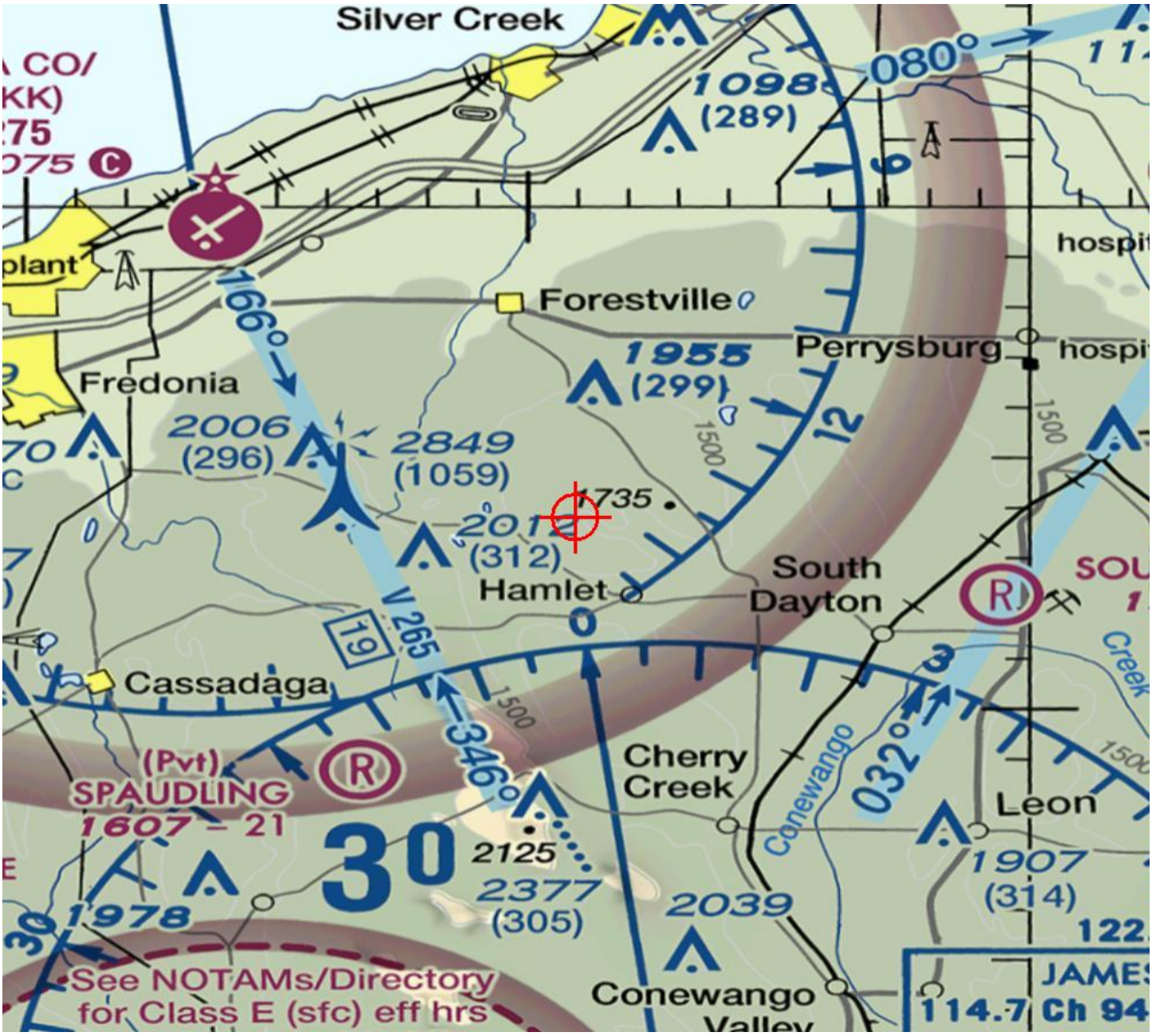
The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8085-OE



Sectional Map for ASN 2015-WTE-8085-OE



Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8086-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T8
Location:	Hamlet, NY
Latitude:	42-24-06.15N NAD 83
Longitude:	79-09-17.25W
Heights:	1605 feet site elevation (SE)
	499 feet above ground level (AGL)
	2104 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2104 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8086-OE.

Signature Control No: 273432850-301612344 (DNE -WT)
Brenda Mumper
Specialist

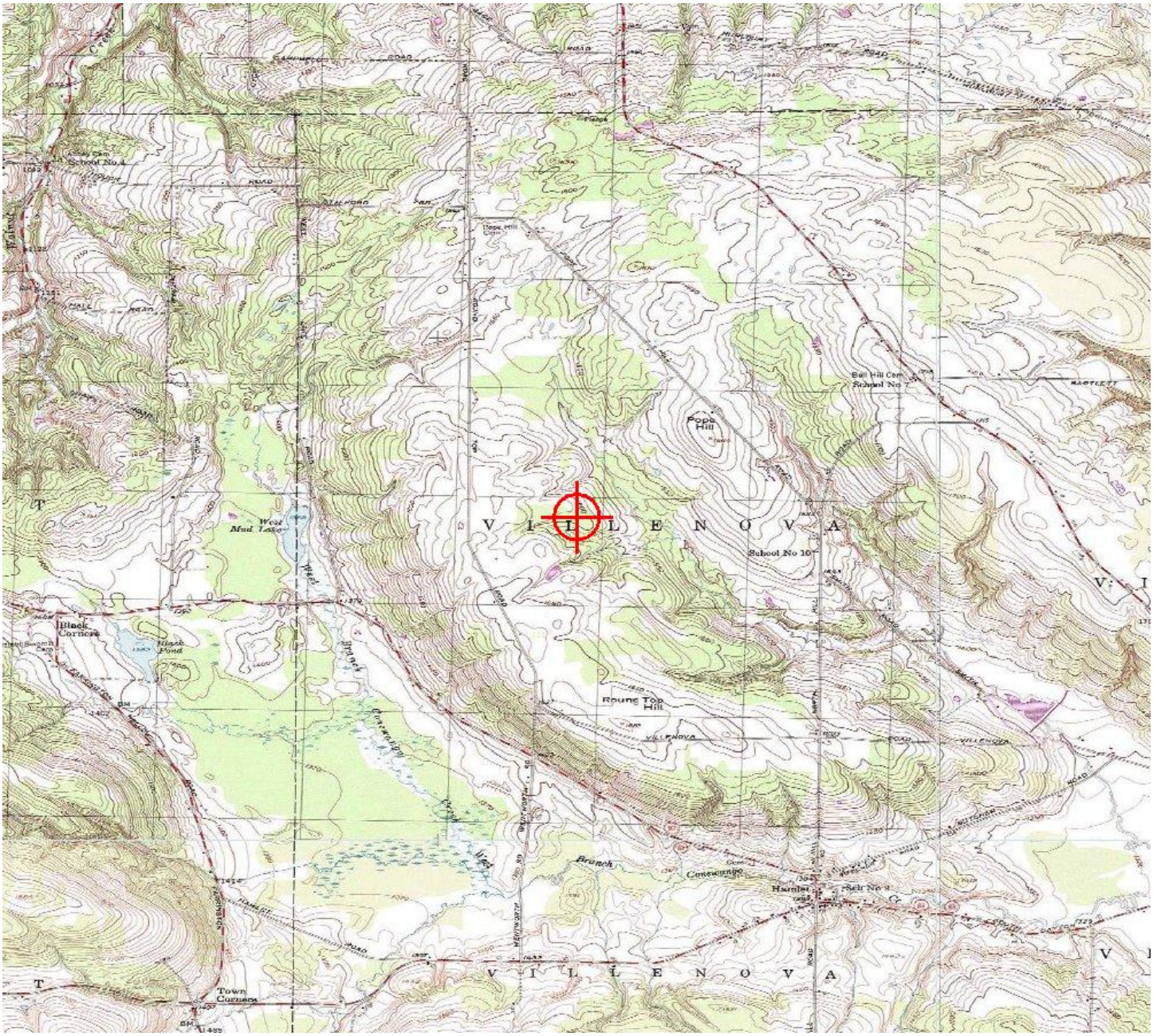
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8086-OE

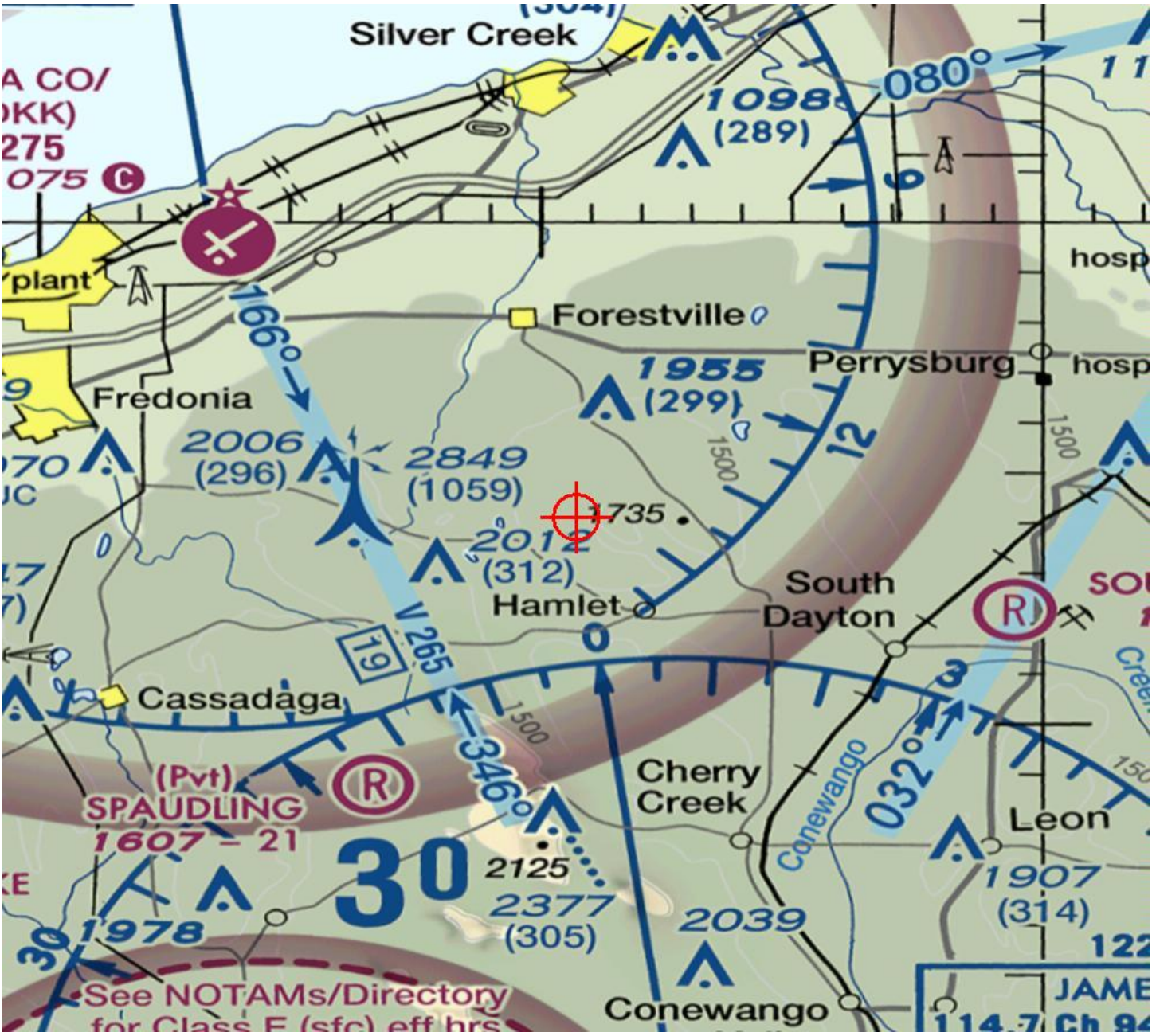
The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8086-OE



Sectional Map for ASN 2015-WTE-8086-OE



Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8087-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T9
Location:	Hamlet, NY
Latitude:	42-23-56.70N NAD 83
Longitude:	79-08-28.54W
Heights:	1555 feet site elevation (SE)
	499 feet above ground level (AGL)
	2054 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2054 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8087-OE.

Signature Control No: 273432851-301612351 (DNE -WT)
Brenda Mumper
Specialist

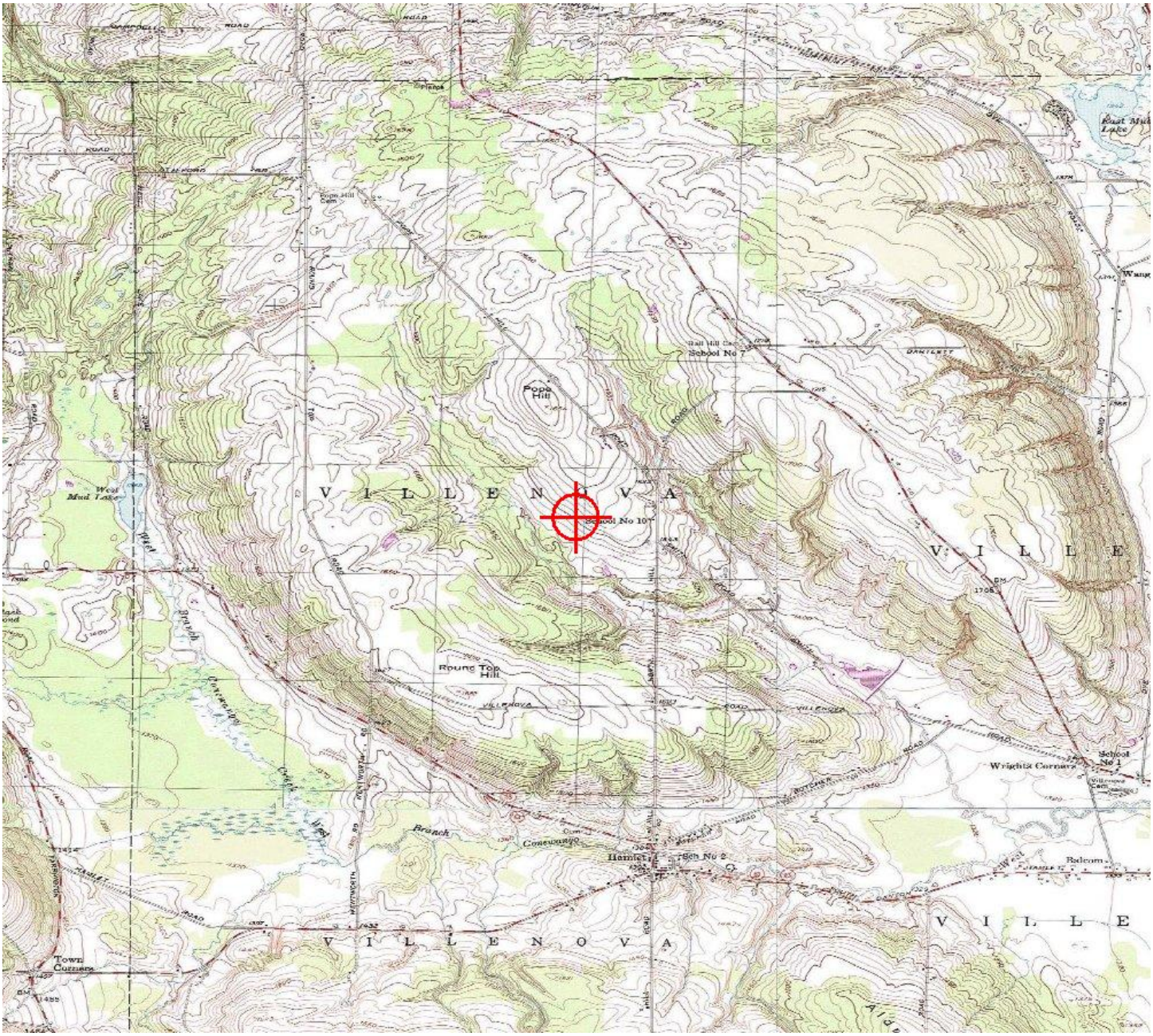
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8087-OE

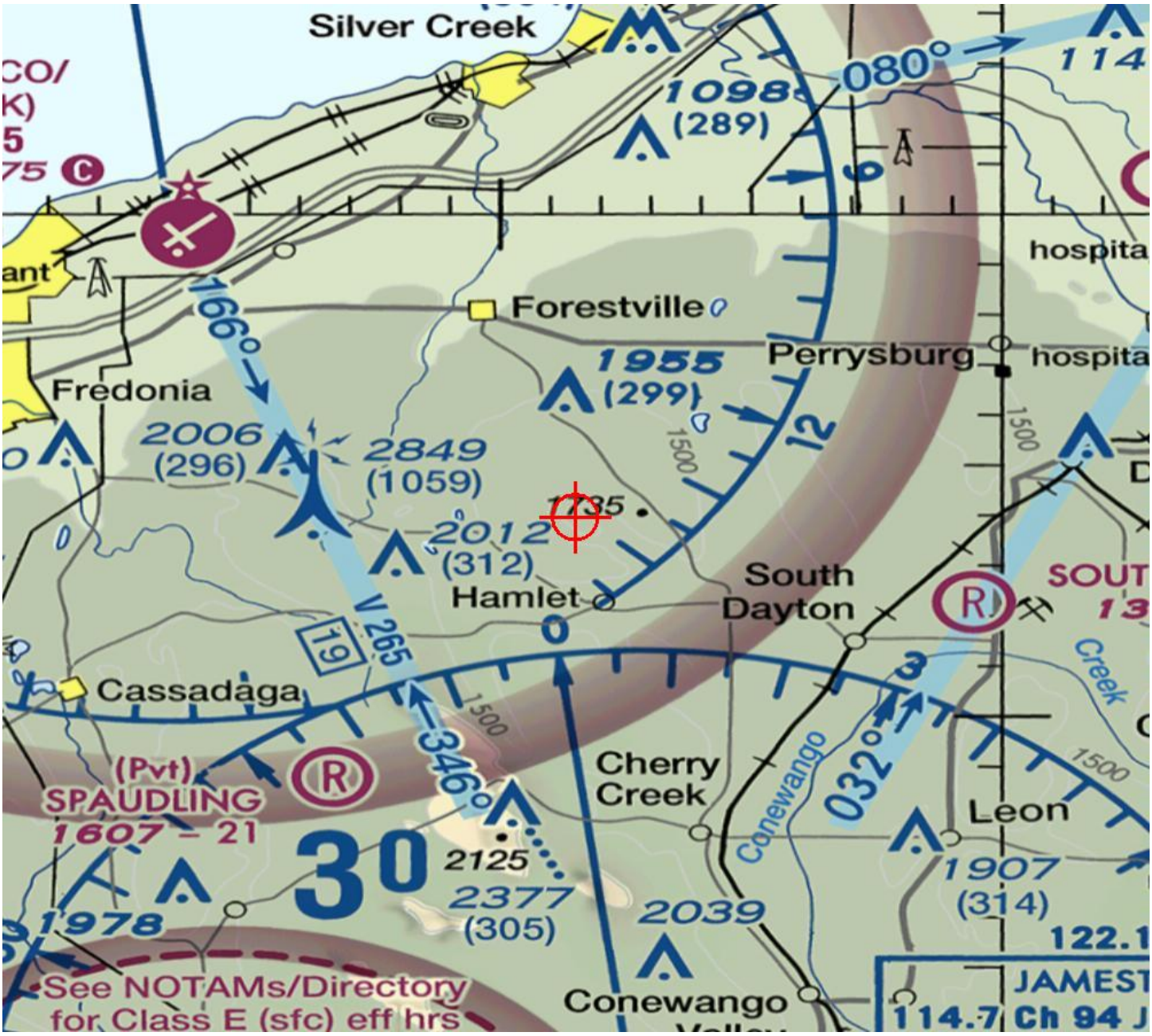
The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8087-OE



Sectional Map for ASN 2015-WTE-8087-OE



Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8088-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T11
Location:	Hamlet, NY
Latitude:	42-24-29.14N NAD 83
Longitude:	79-08-56.63W
Heights:	1590 feet site elevation (SE)
	499 feet above ground level (AGL)
	2089 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2089 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

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Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8088-OE.

Signature Control No: 273432852-301612349 (DNE -WT)
Brenda Mumper
Specialist

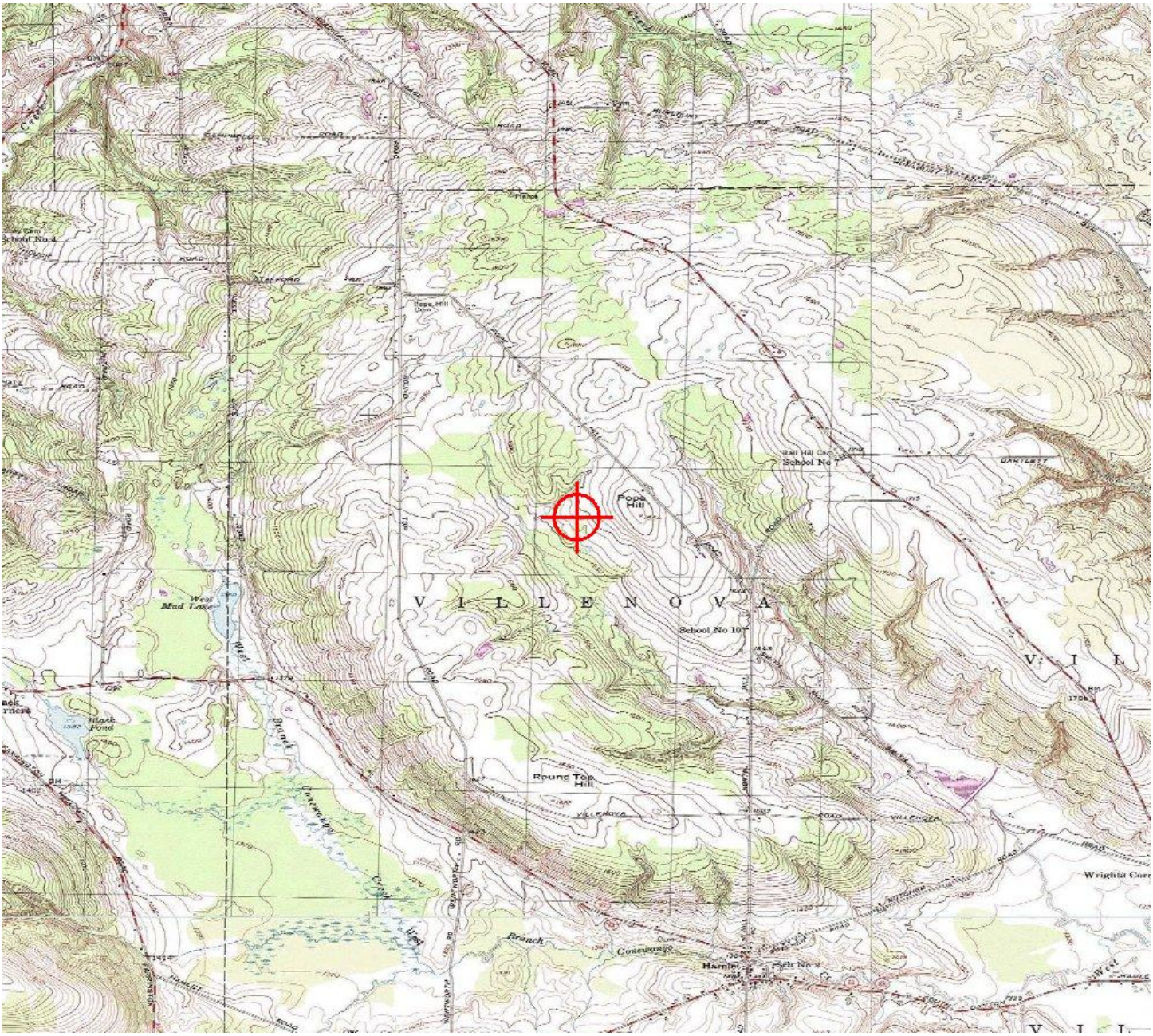
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8088-OE

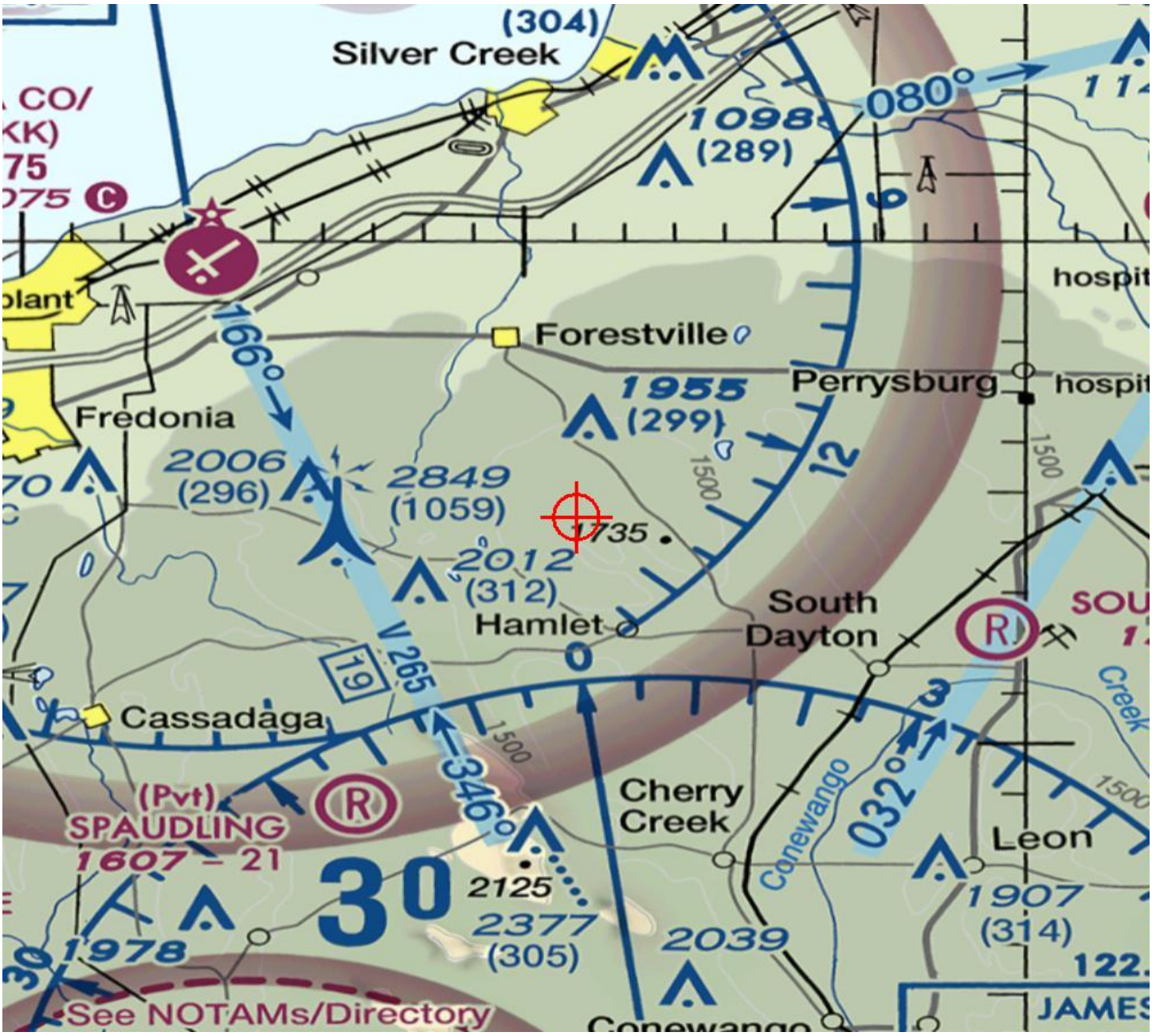
The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8088-OE



Sectional Map for ASN 2015-WTE-8088-OE



Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8090-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T13
Location:	Hamlet, NY
Latitude:	42-23-52.64N NAD 83
Longitude:	79-07-11.91W
Heights:	1643 feet site elevation (SE)
	499 feet above ground level (AGL)
	2142 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2142 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8090-OE.

Signature Control No: 273432855-301612354 (DNE -WT)
Brenda Mumper
Specialist

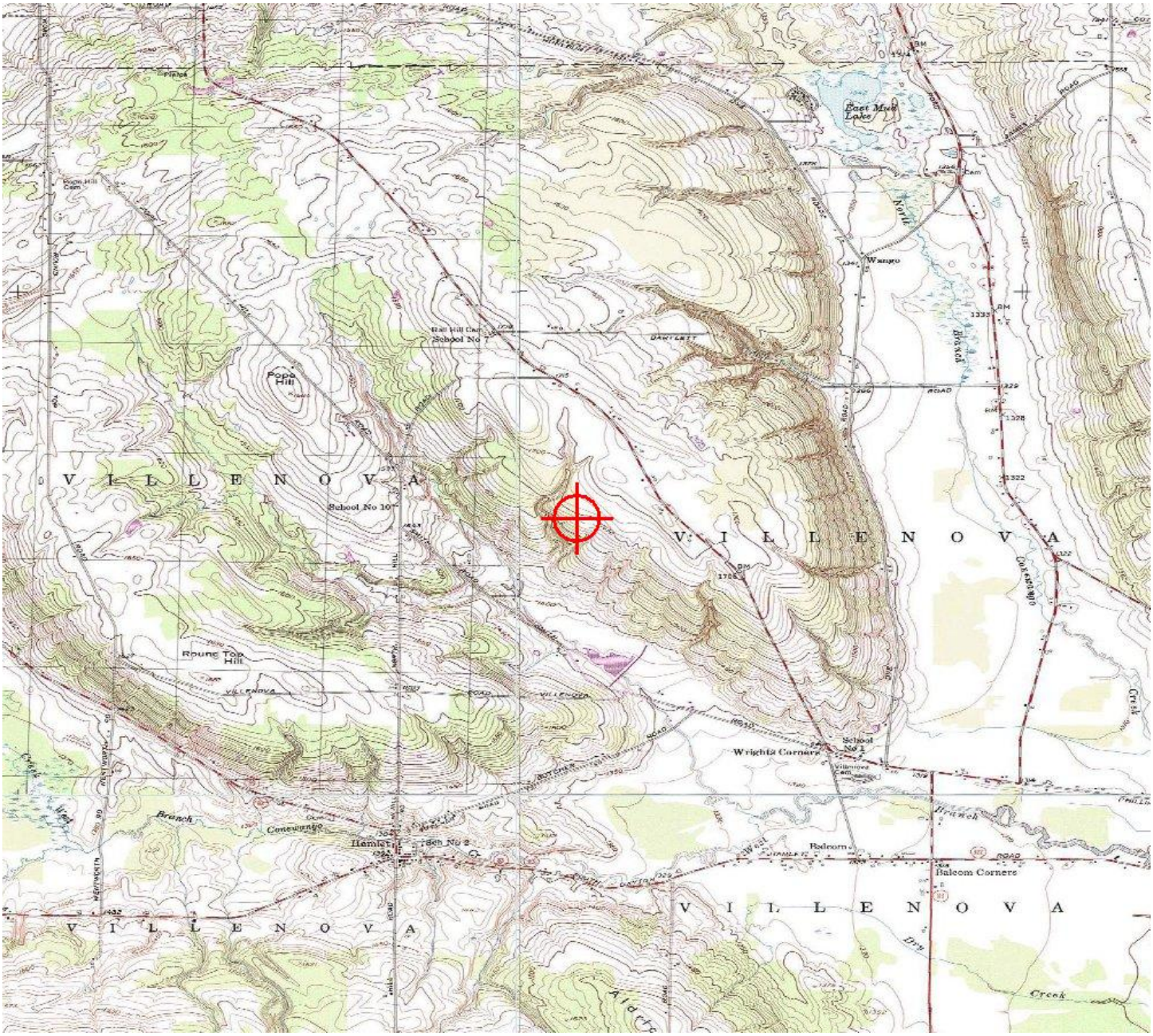
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8090-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8090-OE



Sectional Map for ASN 2015-WTE-8090-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8091-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T14
Location:	Hamlet, NY
Latitude:	42-24-13.49N NAD 83
Longitude:	79-07-19.91W
Heights:	1705 feet site elevation (SE)
	499 feet above ground level (AGL)
	2204 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

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__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2204 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

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If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8091-OE.

Signature Control No: 273432856-301612338 (DNE -WT)
Brenda Mumper
Specialist

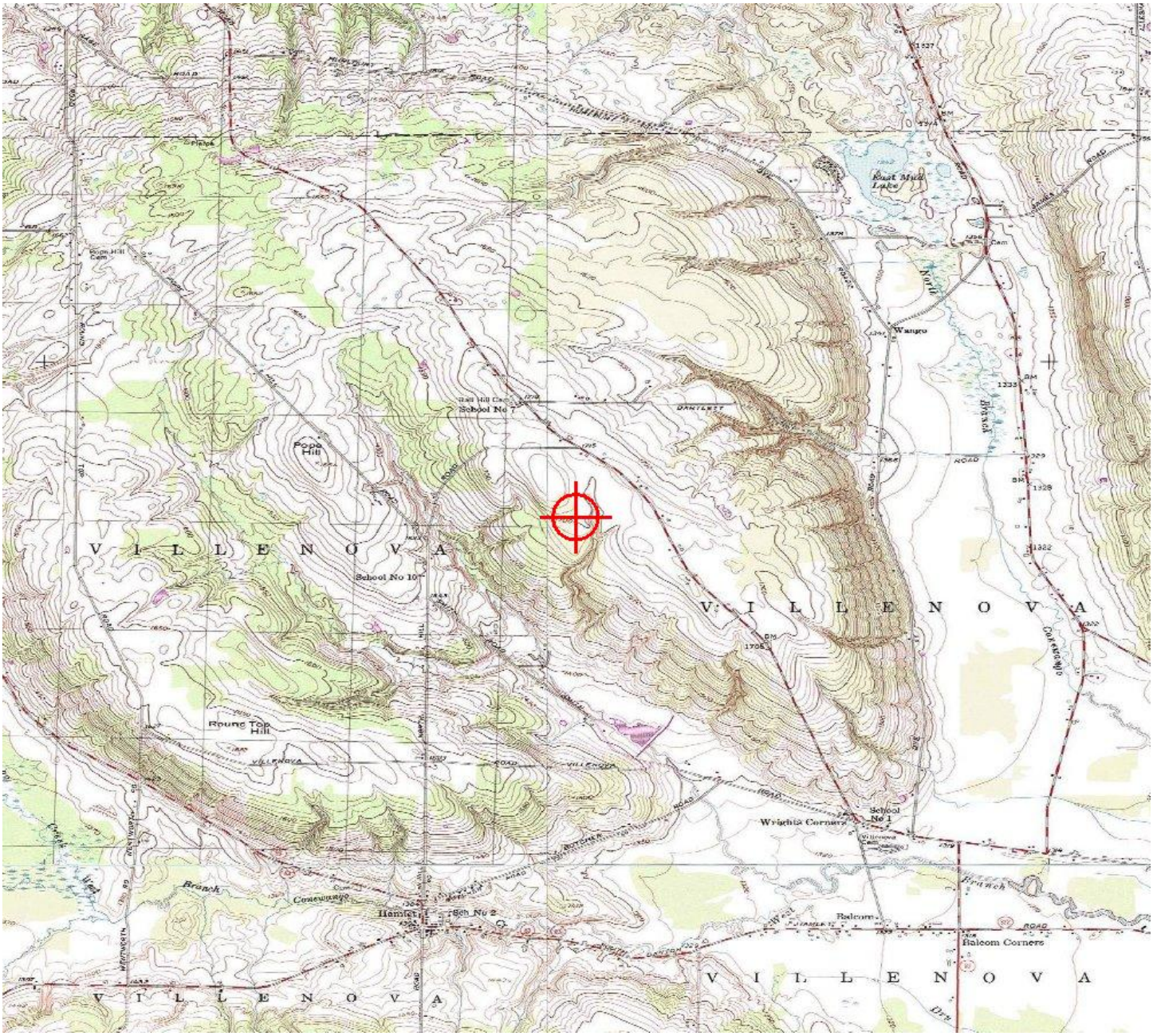
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8091-OE

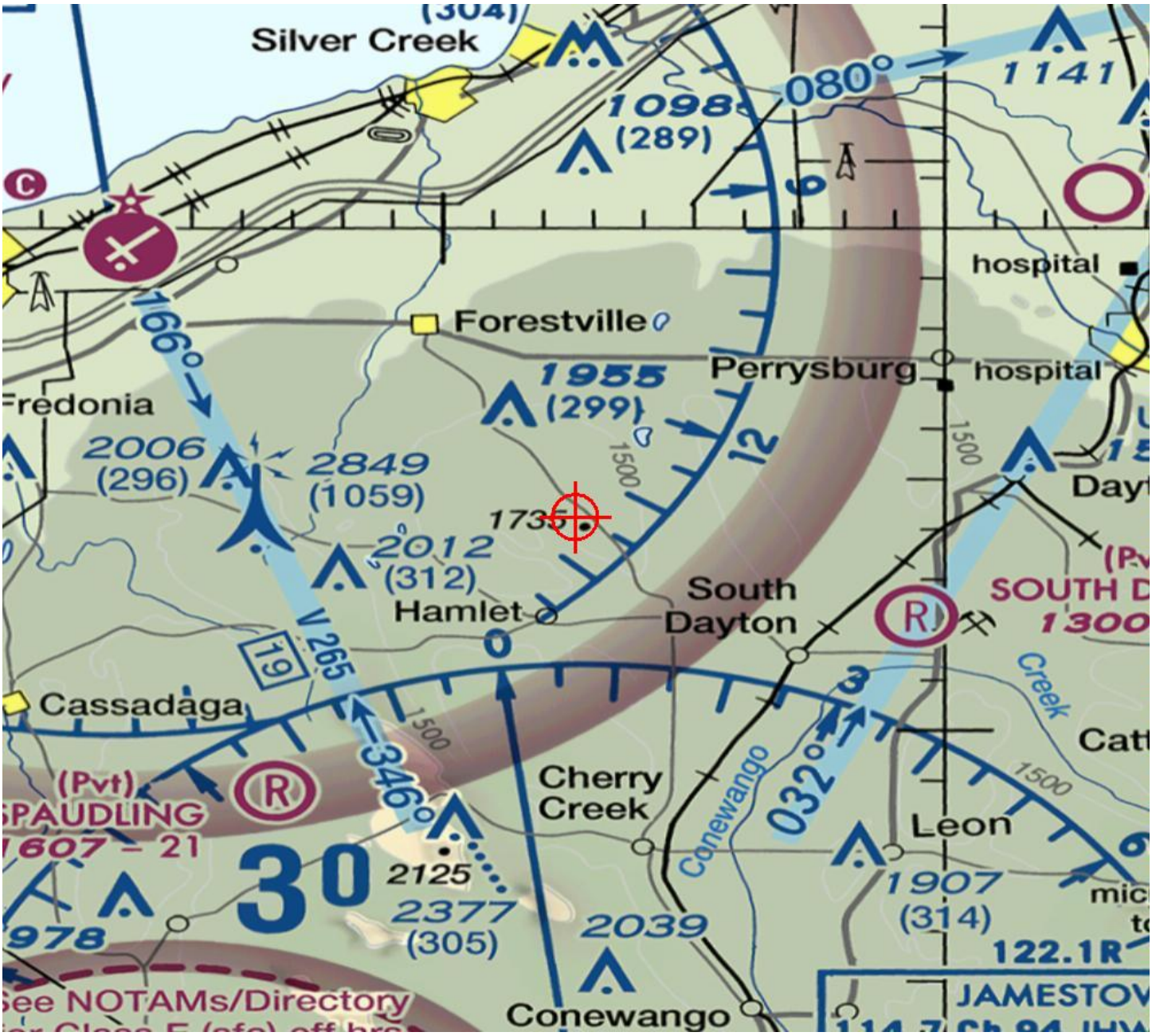
The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8091-OE



Sectional Map for ASN 2015-WTE-8091-OE



Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8092-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T15
Location:	Hamlet, NY
Latitude:	42-24-23.23N NAD 83
Longitude:	79-07-35.11W
Heights:	1700 feet site elevation (SE)
	499 feet above ground level (AGL)
	2199 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2199 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8092-OE.

Signature Control No: 273432857-301612353 (DNE -WT)
Brenda Mumper
Specialist

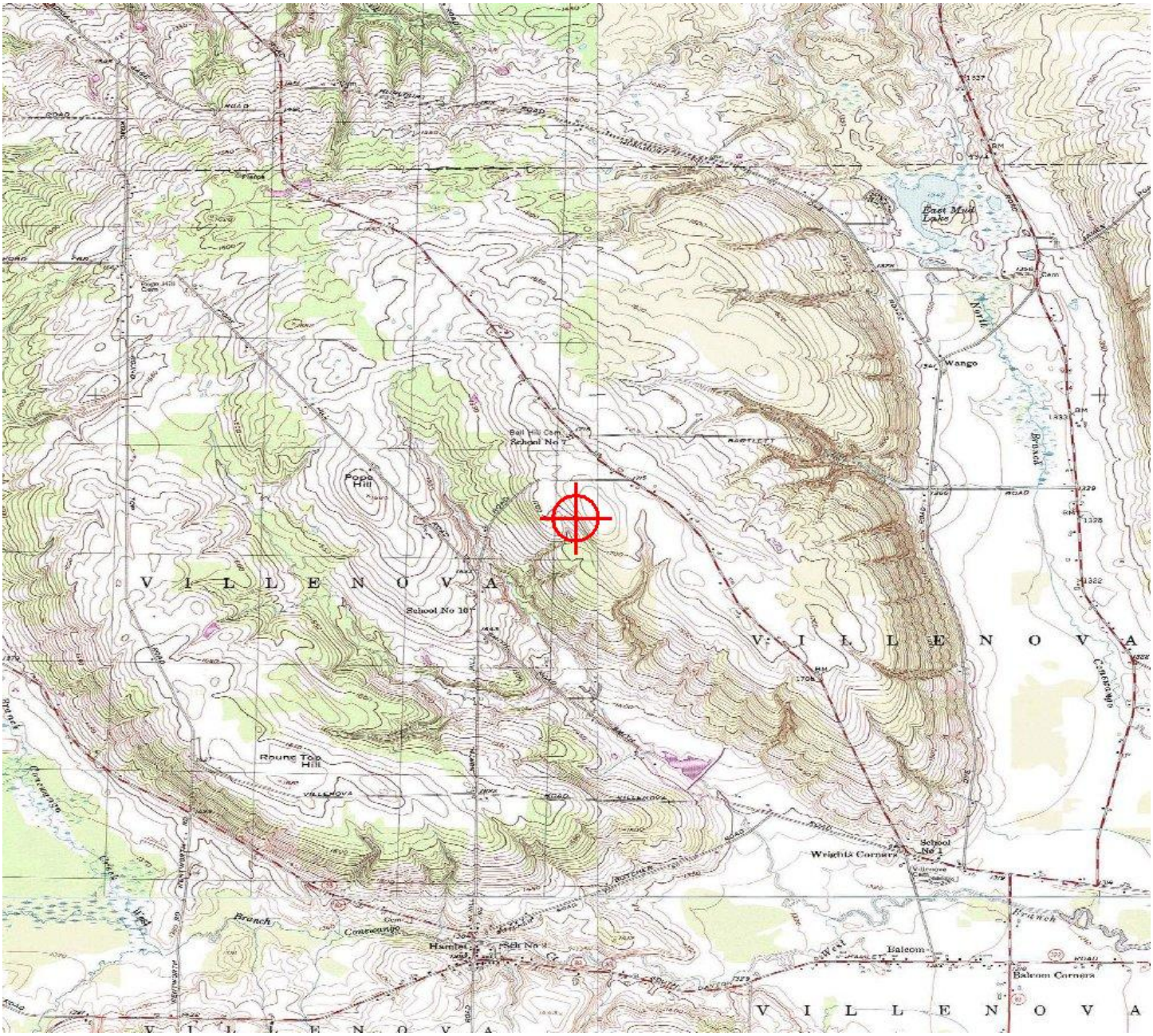
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8092-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8092-OE



Sectional Map for ASN 2015-WTE-8092-OE

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Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8093-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T16
Location:	Hamlet, NY
Latitude:	42-24-46.73N NAD 83
Longitude:	79-08-07.68W
Heights:	1640 feet site elevation (SE)
	499 feet above ground level (AGL)
	2139 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2139 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8093-OE.

Signature Control No: 273432858-301612347 (DNE -WT)
Brenda Mumper
Specialist

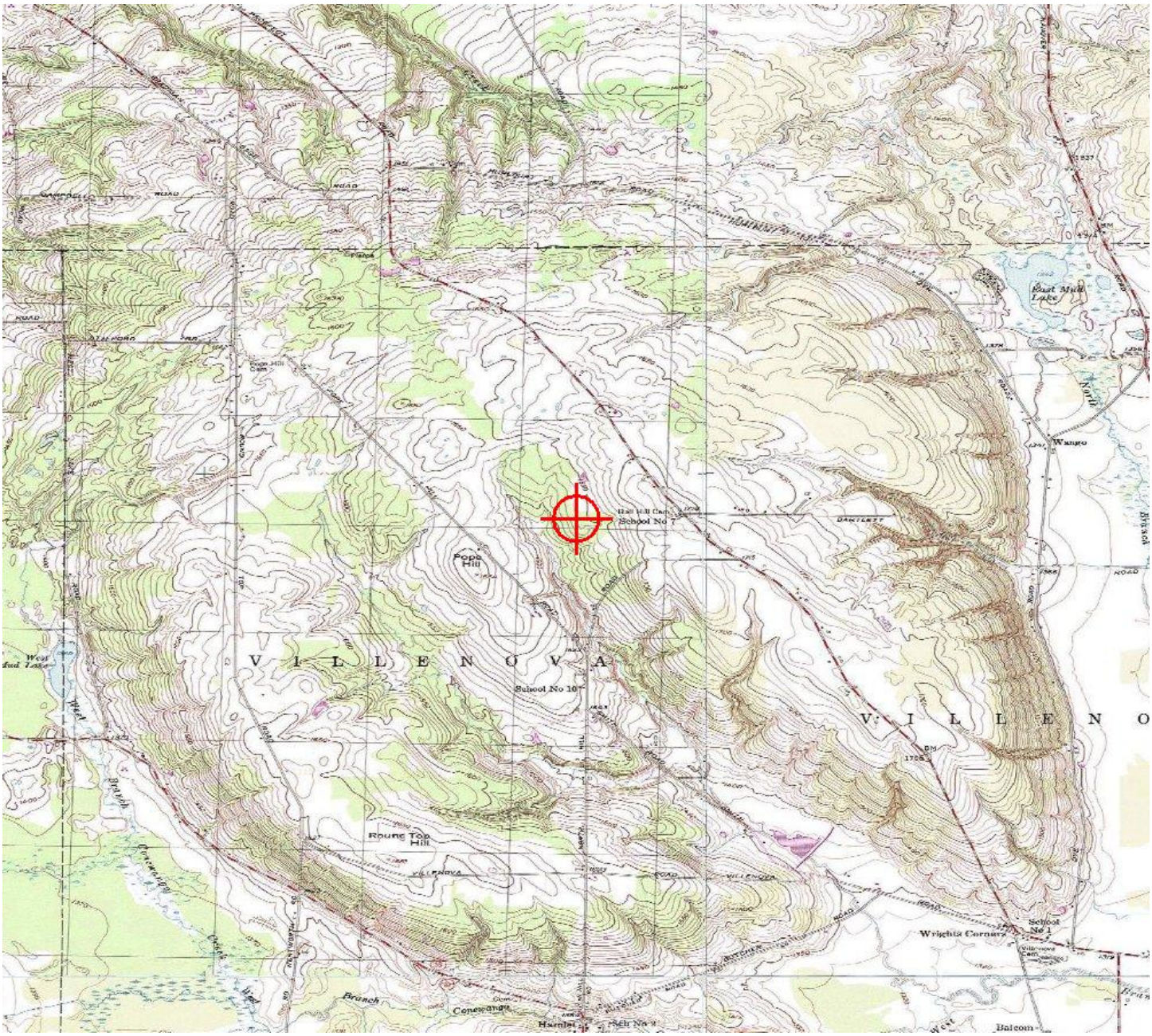
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8093-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8093-OE



Sectional Map for ASN 2015-WTE-8093-OE

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Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8094-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T17
Location:	Hamlet, NY
Latitude:	42-25-00.39N NAD 83
Longitude:	79-08-21.83W
Heights:	1632 feet site elevation (SE)
	499 feet above ground level (AGL)
	2131 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2131 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

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Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

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This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8094-OE.

Signature Control No: 273432860-301612357 (DNE -WT)
Brenda Mumper
Specialist

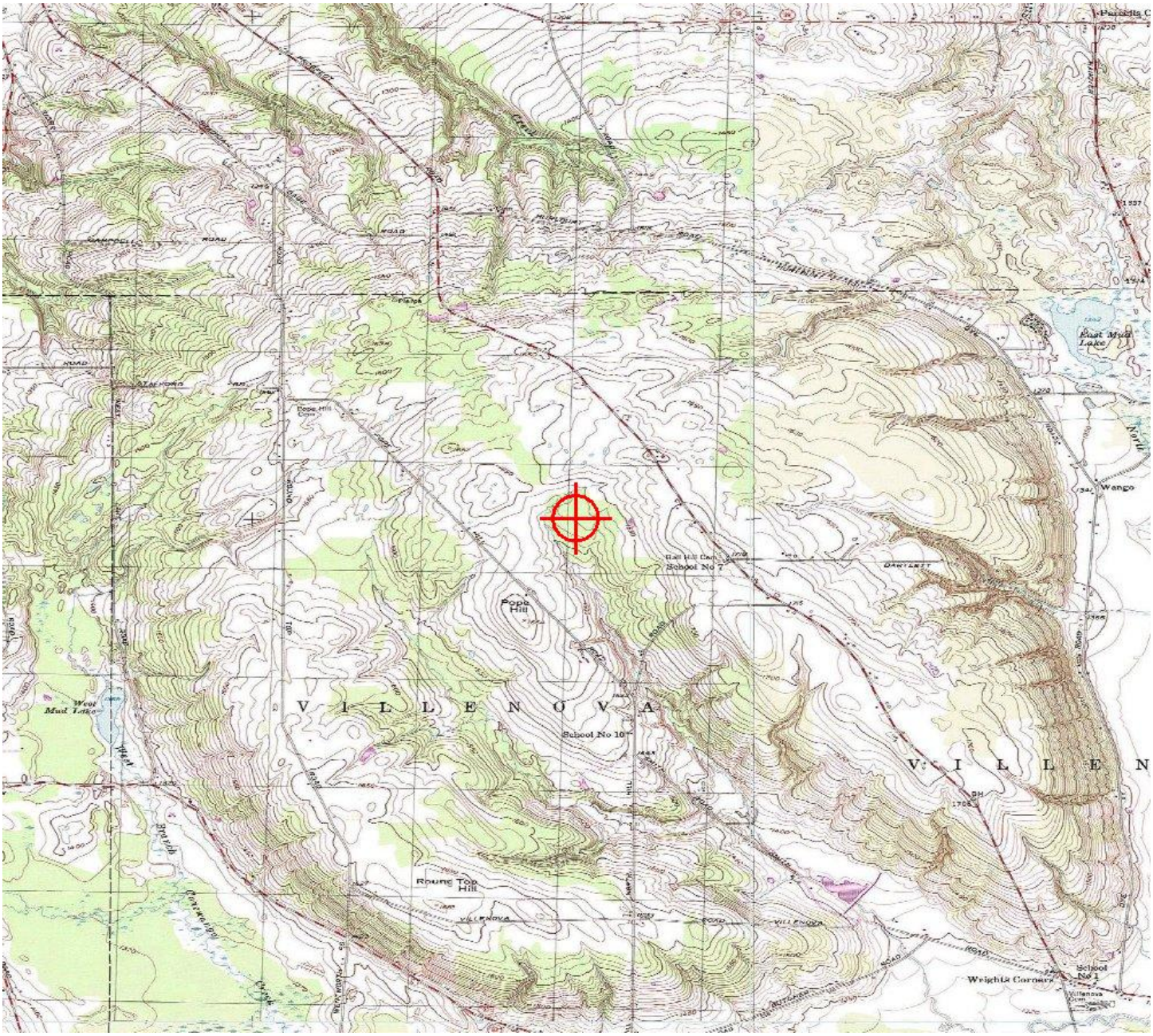
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8094-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8094-OE



Sectional Map for ASN 2015-WTE-8094-OE

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Aeronautical Study No.
2015-WTE-8095-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T18
Location:	Hamlet, NY
Latitude:	42-25-19.11N NAD 83
Longitude:	79-08-28.15W
Heights:	1660 feet site elevation (SE)
	499 feet above ground level (AGL)
	2159 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure would have no substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on the operation of air navigation facilities. Therefore, pursuant to the authority delegated to me, it is hereby determined that the structure would not be a hazard to air navigation provided the following condition(s) is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

__X__ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

Any height exceeding 499 feet above ground level (2159 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is subject to review if an interested party files a petition that is received by the FAA on or before September 10, 2016. In the event a petition for review is filed, it must contain a full statement of the basis upon which it is made and be submitted to the Manager, Airspace Policy & Regulation, Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591.

This determination becomes final on September 20, 2016 unless a petition is timely filed. In which case, this determination will not become final pending disposition of the petition. Interested parties will be notified of the grant of any review. For any questions regarding your petition, please contact Airspace Regulations & ATC Procedures Group via telephone -- 202-267-8783 - or facsimile 202-267-9328.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

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This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

This aeronautical study considered and analyzed the impact on existing and proposed arrival, departure, and en route procedures for aircraft operating under both visual flight rules and instrument flight rules; the impact on all existing and planned public-use airports, military airports and aeronautical facilities; and the cumulative impact resulting from the studied structure when combined with the impact of other existing or proposed structures. The study disclosed that the described structure would have no substantial adverse effect on air navigation.

An account of the study findings, aeronautical objections received by the FAA during the study (if any), and the basis for the FAA's decision in this matter can be found on the following page(s).

If we can be of further assistance, please contact Brenda Mumper, at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8095-OE.

Signature Control No: 273432861-301594060 (DNH -WT)
Mike Helvey
Manager, Obstruction Evaluation Group

Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8095-OE

The proposed structures noted in this letter are part of a proposed wind farm that would be located near Hamlet, New York. They would be located from 6.35 to 7.21 nautical miles (NM) southeast of the airport reference point for the Chautauqua County/Dunkirk Airport (DKK) in Dunkirk, New York. The determinations for each of the structures will be available upon issuance on the website, http://oeaaa.faa.gov.

Following are the Aeronautical Study Numbers, coordinates, site elevation, above ground level and above mean sea level heights for each of the proposals:

2015-WTE-8095-OE 42-25-19.11N / 79-08-28.15W 1660 / 499 / 2159
2015-WTE-8117-OE 42-25-28.86N / 79-08-55.62W 1640 / 499 / 2139
2015-WTE-8118-OE 42-25-51.55N / 79-09-21.52W 1605 / 499 / 2104
2015-WTE-8119-OE 42-25-45.90N / 79-09-02.69W 1622 / 499 / 2121

OBSTRUCTION STANDARD(S) EXCEEDED

Section 77.17(a)(3): A height within a terminal obstacle clearance area, including an initial approach segment, a departure area, and a circling approach area, which would result in the vertical distance between any point on the object and an established minimum instrument flight altitude within that area or segment to be less than the required obstacle clearance.

The proposals would exceed this obstruction standard as noted as applied to DKK:

2015-WTE-8095-OE
Obstacle penetrates Runway 15 Diverse A departure area 14 feet requiring Take-off Minimum and (Obstacle) Departure Procedures, Runway 15, std. with a min climb gradient increase from 354 feet per NM to 2600 (an increase from 2000).

2015-WTE-8117-OE
Obstacle penetrates Runway 15 Diverse A departure area 46 feet requiring Take-off Minimum and (Obstacle) Departure Procedures, Runway 15, std. with a min climb gradient increase from 354 feet per NM to 2600 (an increase from 2000).

2015-WTE-8118-OE
Obstacle penetrates Runway 15 Diverse A departure area 87 feet requiring Take-off Minimum and (Obstacle) Departure Procedures, Runway 15, std. with a min climb gradient increase from 354 feet per NM to 2600 (an increase from 2000).

2015-WTE-8119-OE
Obstacle penetrates Runway 15 Diverse A departure area 71 feet requiring Take-off Minimum and (Obstacle) Departure Procedures, Runway 15, std. with a min climb gradient increase from 354 feet per NM to 2600 (an increase from 2000).

The proposal was circularized on July 29, 2016, to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No comments were received as a result of the circularization.

Aeronautical study disclosed that the structure would have no significant effect on any existing or proposed arrival, departure, or en route instrument flight rule (IFR) operations or procedures. Further study did not

indicate that the IFR impacts noted above would affect a significant number of aircraft operations; therefore, those impacts would not create substantial adverse effect.

Study for possible visual flight rules (VFR) effect disclosed that the proposal would have no effect on any existing or proposed arrival or departure VFR operations or procedures. It would not conflict with airspace required to conduct normal VFR traffic pattern operations at DKK or any other known public-use or military airports. At 499 ft. AGL, the proposed structure would not have a substantial adverse effect on VFR en route flight operations.

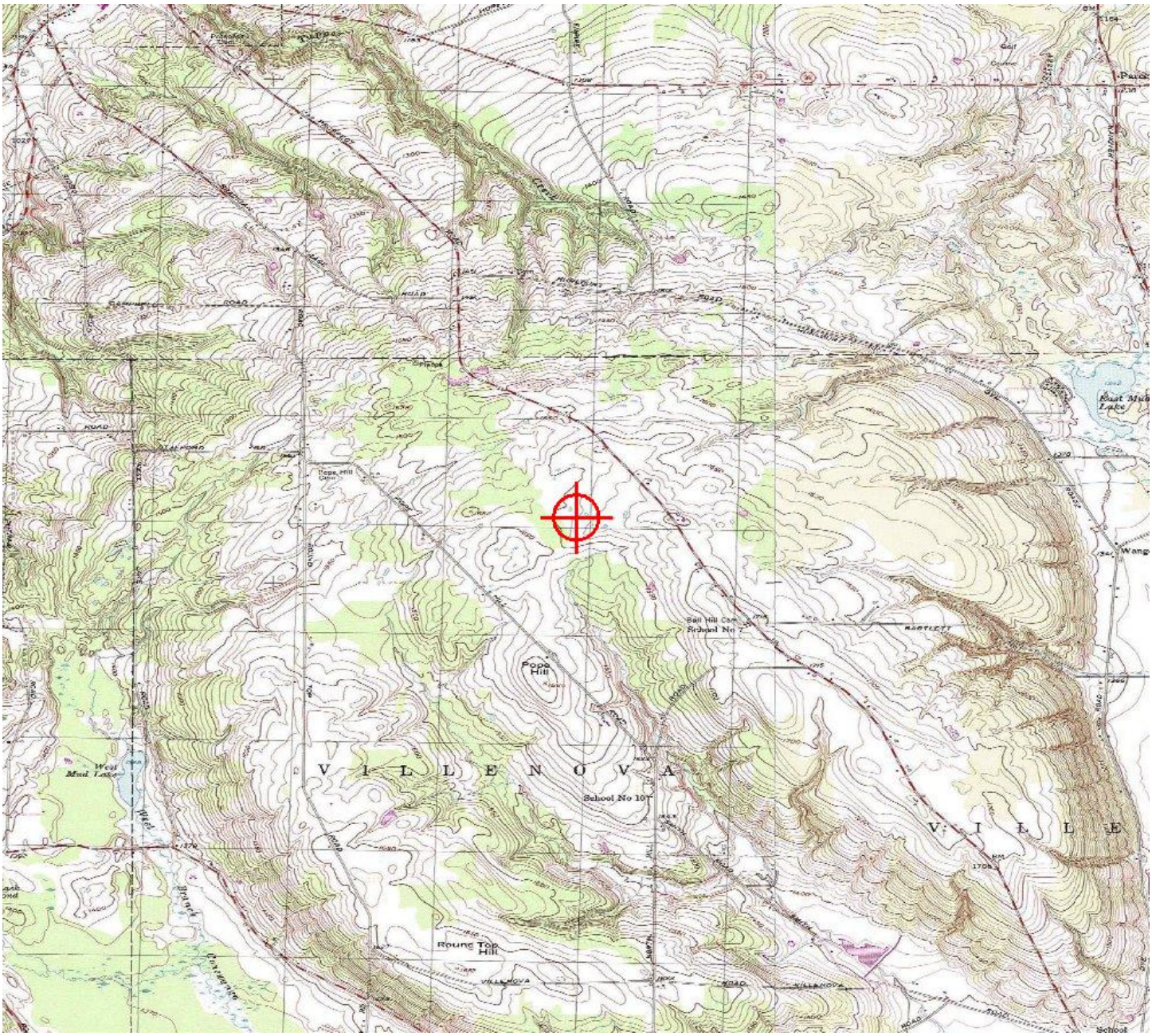
The cumulative impact of the structure, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the proposal affect the capacity of any known existing or planned public-use or military airport. The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

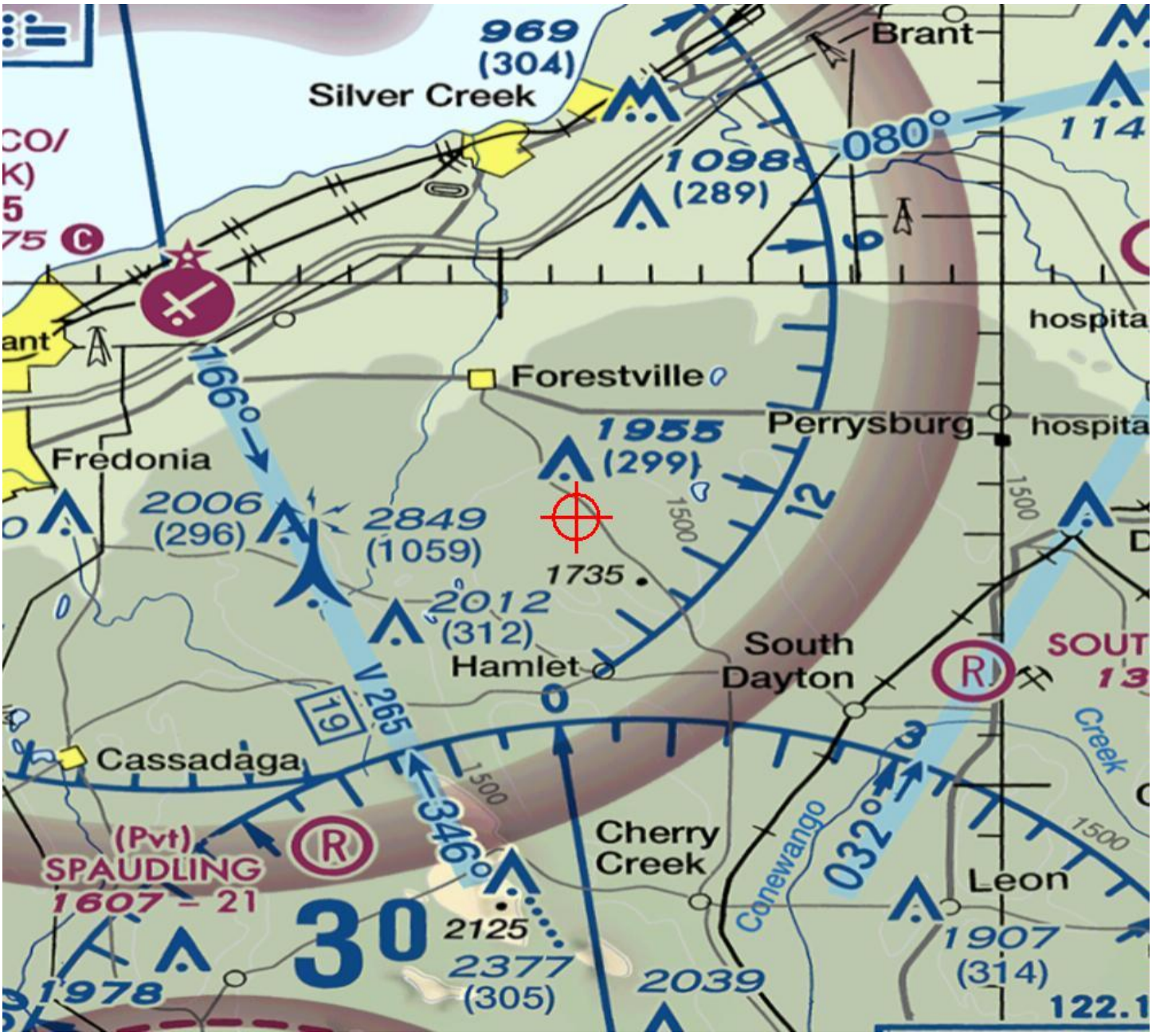
Therefore, it is determined that the proposed structure would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation.

All determinations will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

NOTE: IT IS IMPERATIVE THAT PART 1 OF THE 7460-2 FORM IS SUBMITTED AT LEAST 10 DAYS PRIOR TO BEGINNING CONSTRUCTION SO IFR ALTITUDES MAY BE AMENDED AS REQUIRED.

TOPO Map for ASN 2015-WTE-8095-OE

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(304)
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1098
(289)
114
hospita
Forestville
166°
Perrysburg
1955
(299)
Fredonia
2006
(296)
2849
(1059)
1735
2012
(312)
Hamlet
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Dayton
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Cassadaga
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Mail Processing Center
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Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8096-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
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Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T19
Location:	Hamlet, NY
Latitude:	42-23-55.14N NAD 83
Longitude:	79-06-18.89W
Heights:	1703 feet site elevation (SE)
	499 feet above ground level (AGL)
	2202 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2202 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8096-OE.

Signature Control No: 273432862-301612346 (DNE -WT)
Brenda Mumper
Specialist

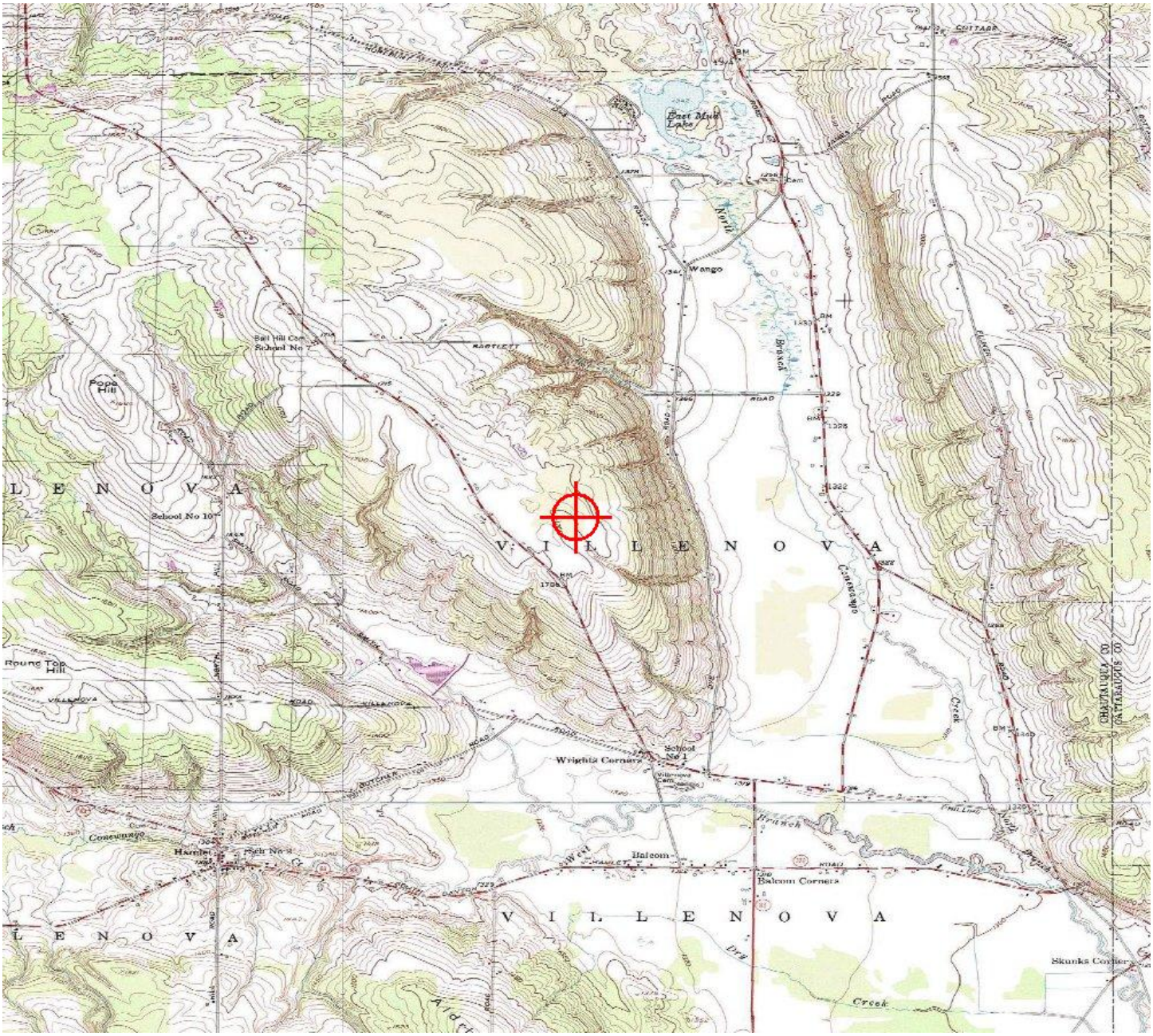
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8096-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8096-OE



Sectional Map for ASN 2015-WTE-8096-OE

Mail Processing Center
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Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8097-OE

Issued Date: 08/11/2016

Elizabeth King
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**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T20
Location:	Hamlet, NY
Latitude:	42-24-04.09N NAD 83
Longitude:	79-06-27.97W
Heights:	1708 feet site elevation (SE)
	499 feet above ground level (AGL)
	2207 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2207 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8097-OE.

Signature Control No: 273432863-301612356 (DNE -WT)
Brenda Mumper
Specialist

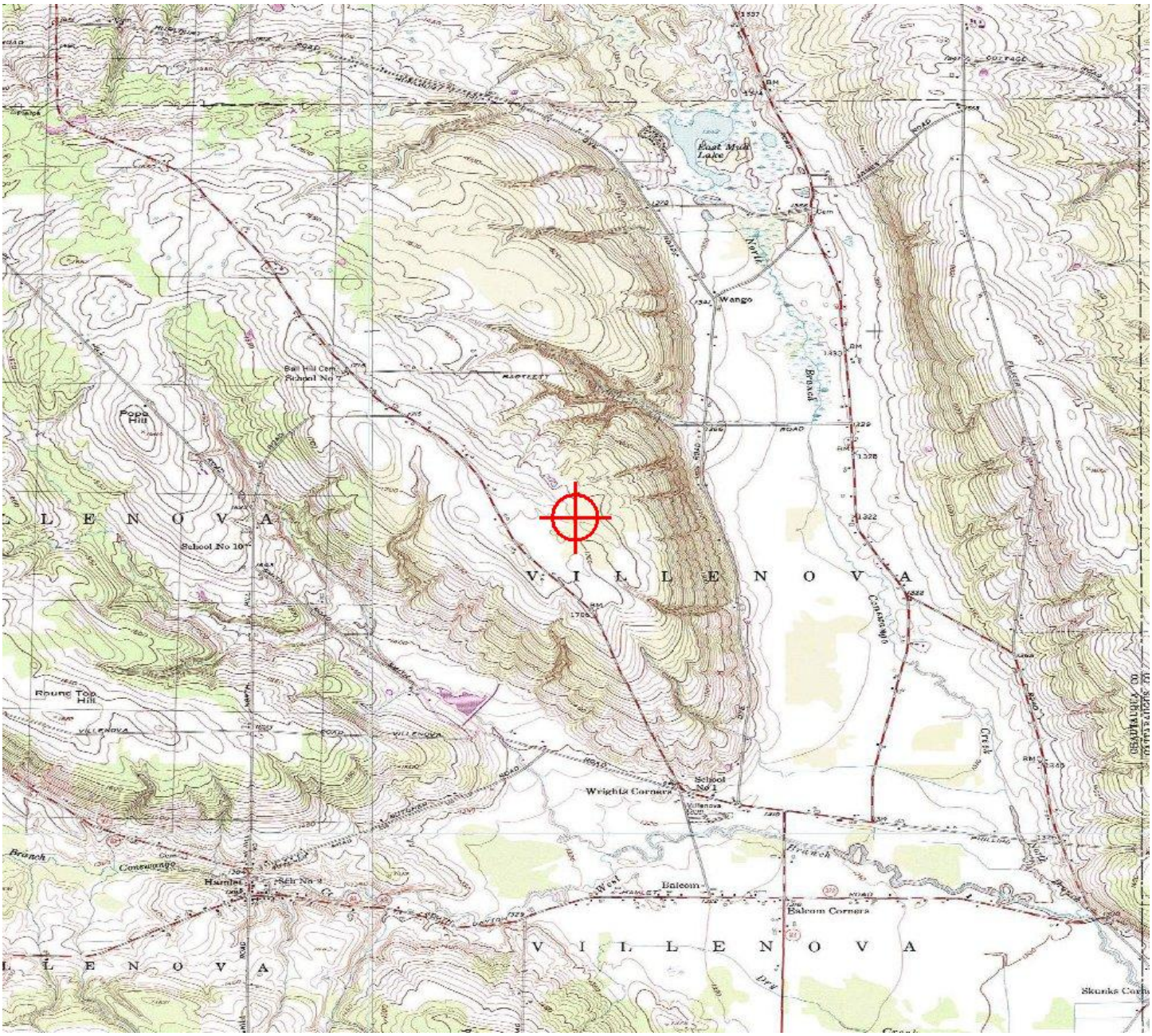
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8097-OE

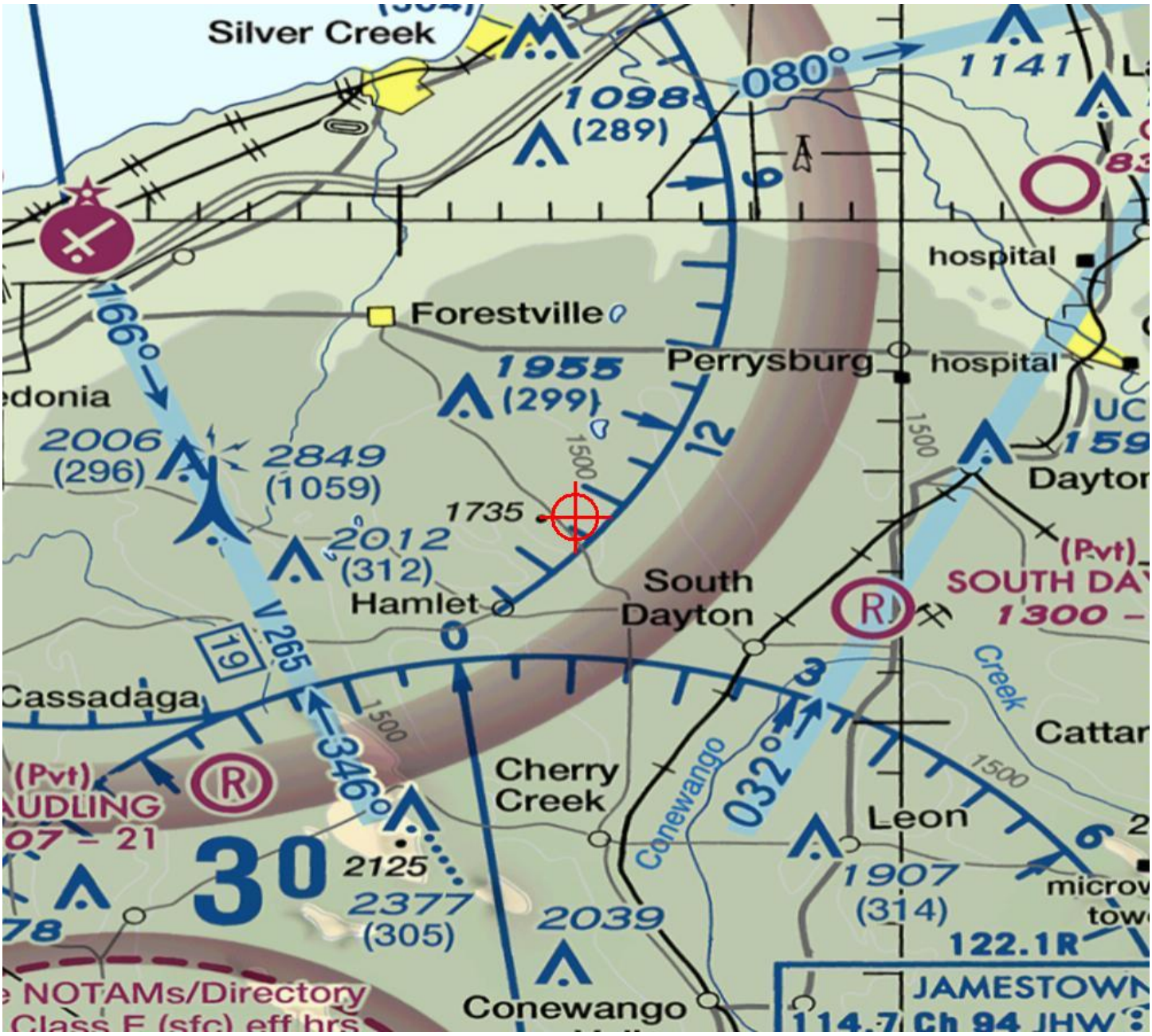
The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8097-OE



Sectional Map for ASN 2015-WTE-8097-OE



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10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8098-OE

Issued Date: 08/11/2016

Elizabeth King
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Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T21
Location:	Hamlet, NY
Latitude:	42-23-45.81N NAD 83
Longitude:	79-06-01.68W
Heights:	1670 feet site elevation (SE)
	499 feet above ground level (AGL)
	2169 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2169 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8098-OE.

Signature Control No: 273432866-301612343 (DNE -WT)
Brenda Mumper
Specialist

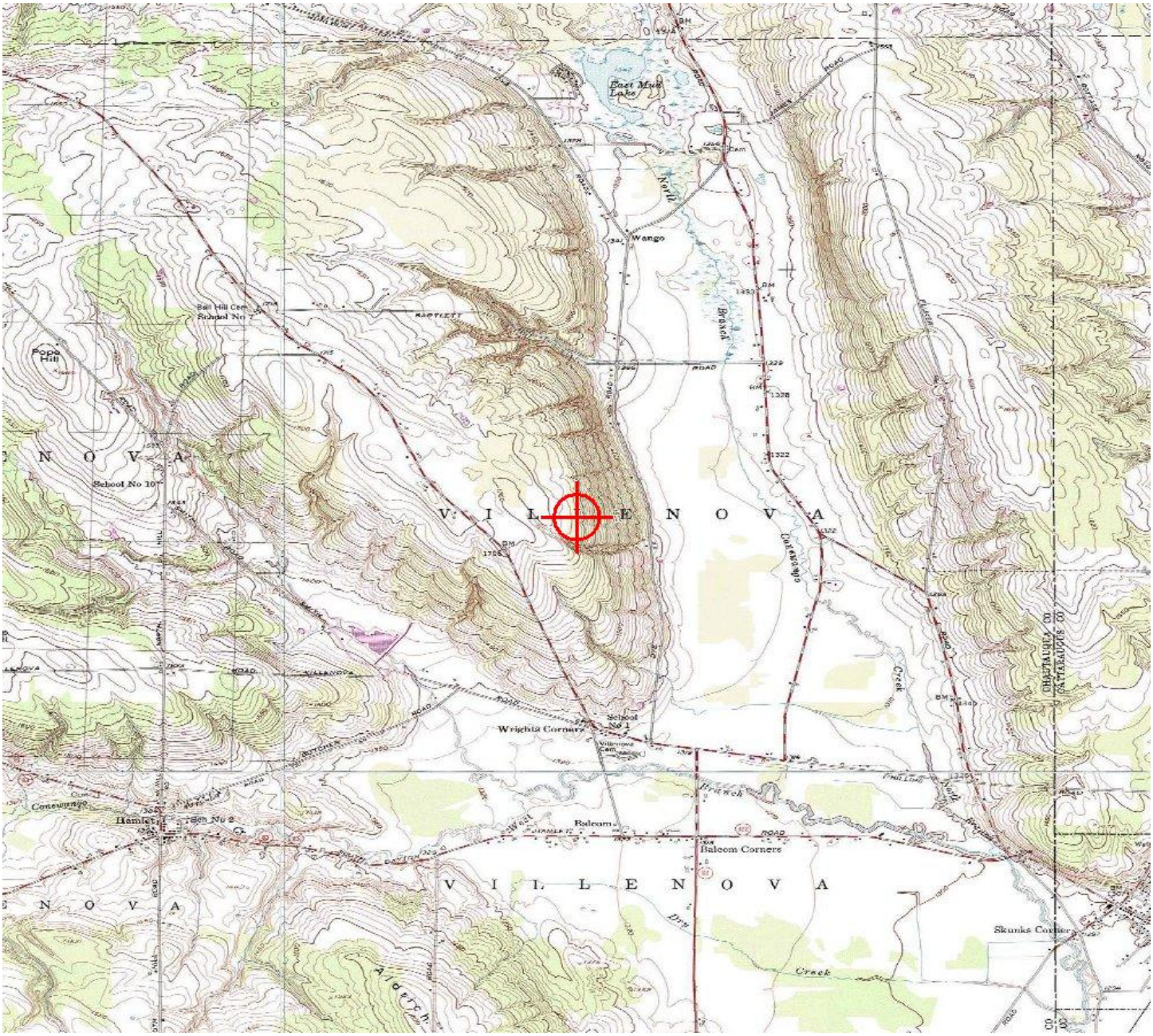
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8098-OE

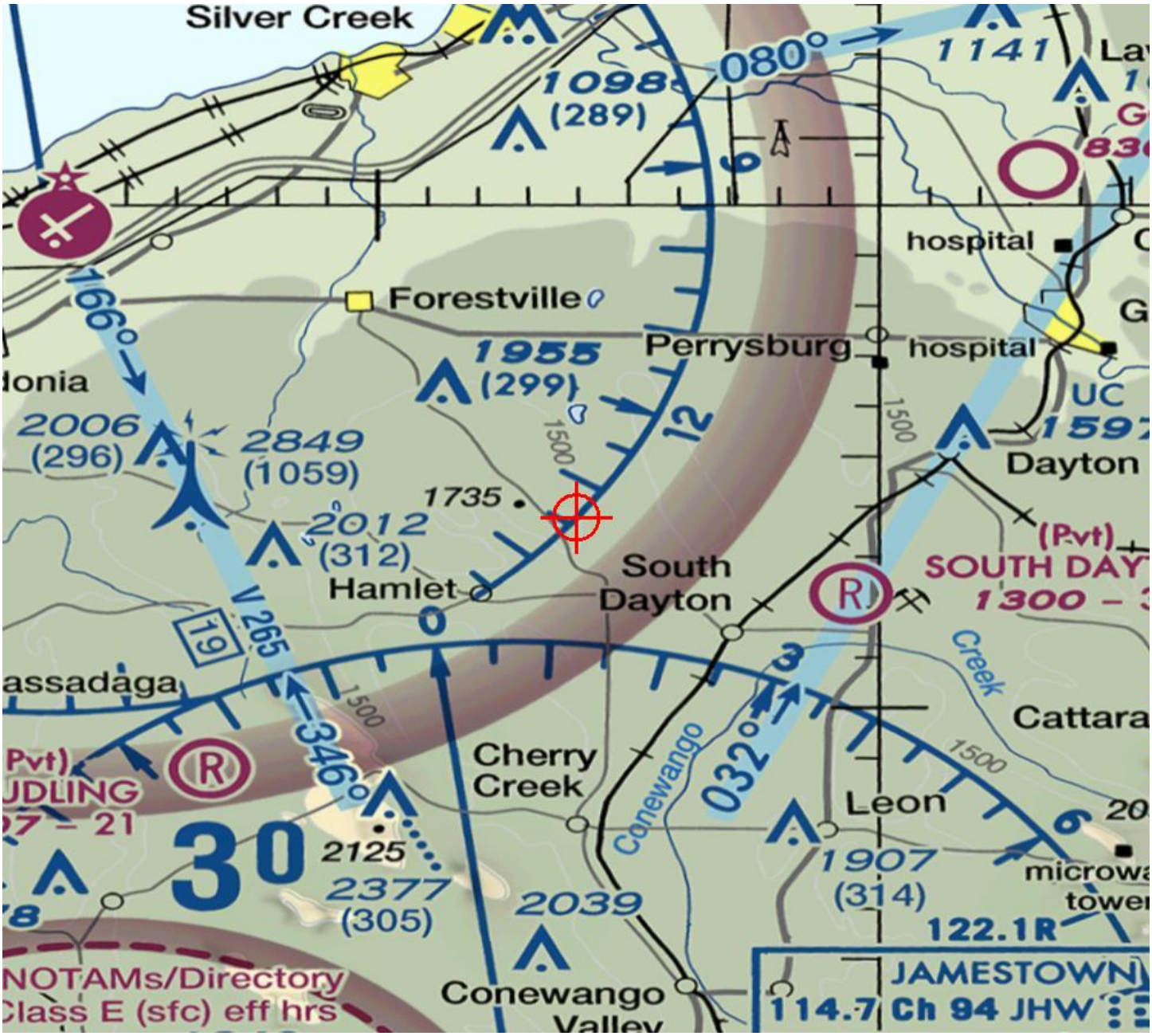
The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8098-OE



Sectional Map for ASN 2015-WTE-8098-OE



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Aeronautical Study No.
2015-WTE-8099-OE

Issued Date: 08/11/2016

Elizabeth King
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Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T23
Location:	Hamlet, NY
Latitude:	42-24-33.78N NAD 83
Longitude:	79-06-40.44W
Heights:	1648 feet site elevation (SE)
	499 feet above ground level (AGL)
	2147 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2147 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

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If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8099-OE.

Signature Control No: 273432867-301612341 (DNE -WT)
Brenda Mumper
Specialist

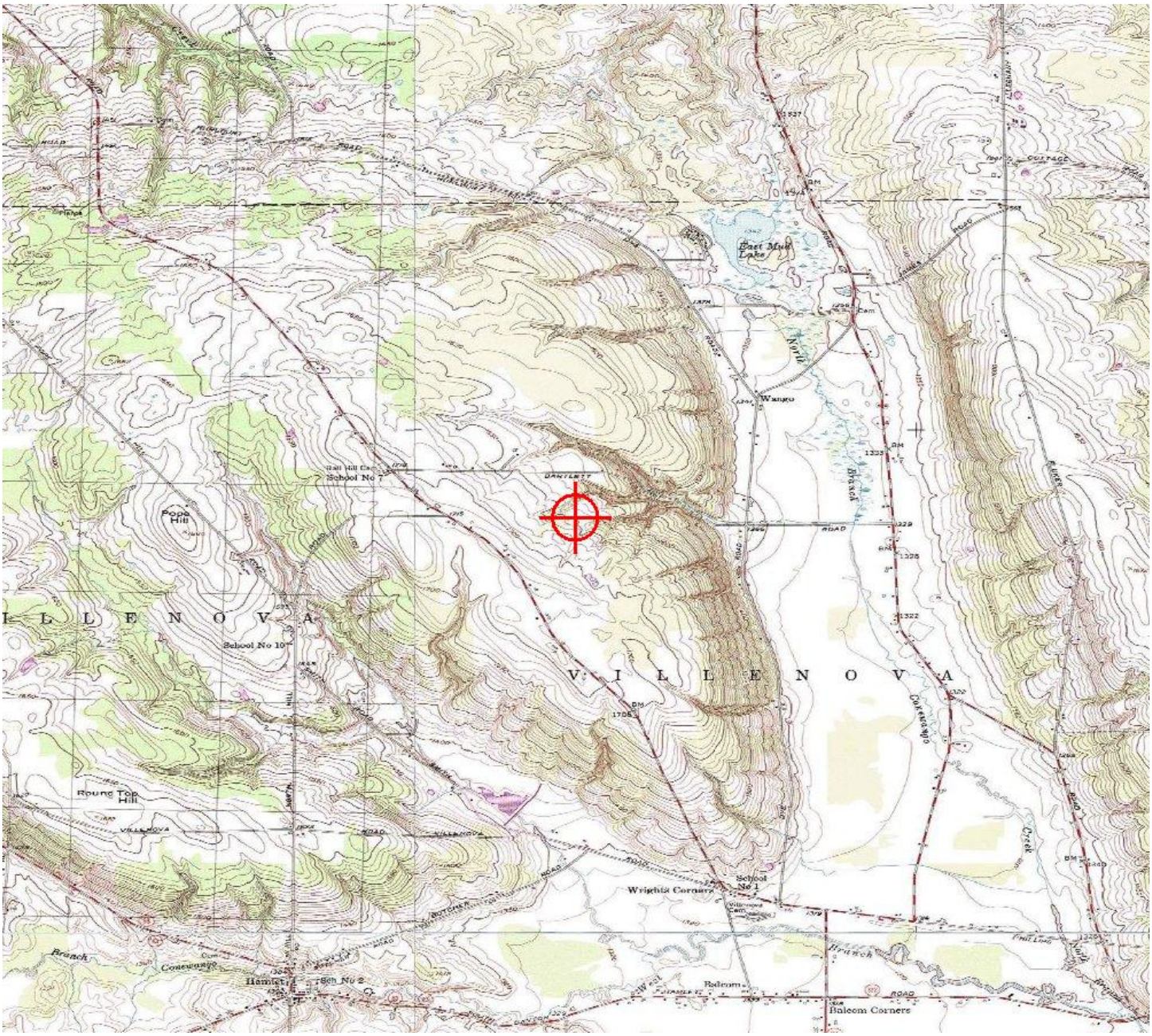
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8099-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8099-OE



Sectional Map for ASN 2015-WTE-8099-OE

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Obstruction Evaluation Group
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Aeronautical Study No.
2015-WTE-8102-OE

Issued Date: 08/11/2016

Elizabeth King
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11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T27
Location:	Hamlet, NY
Latitude:	42-25-40.48N NAD 83
Longitude:	79-07-07.42W
Heights:	1605 feet site elevation (SE)
	499 feet above ground level (AGL)
	2104 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2104 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8102-OE.

Signature Control No: 273432873-301612369 (DNE -WT)
Brenda Mumper
Specialist

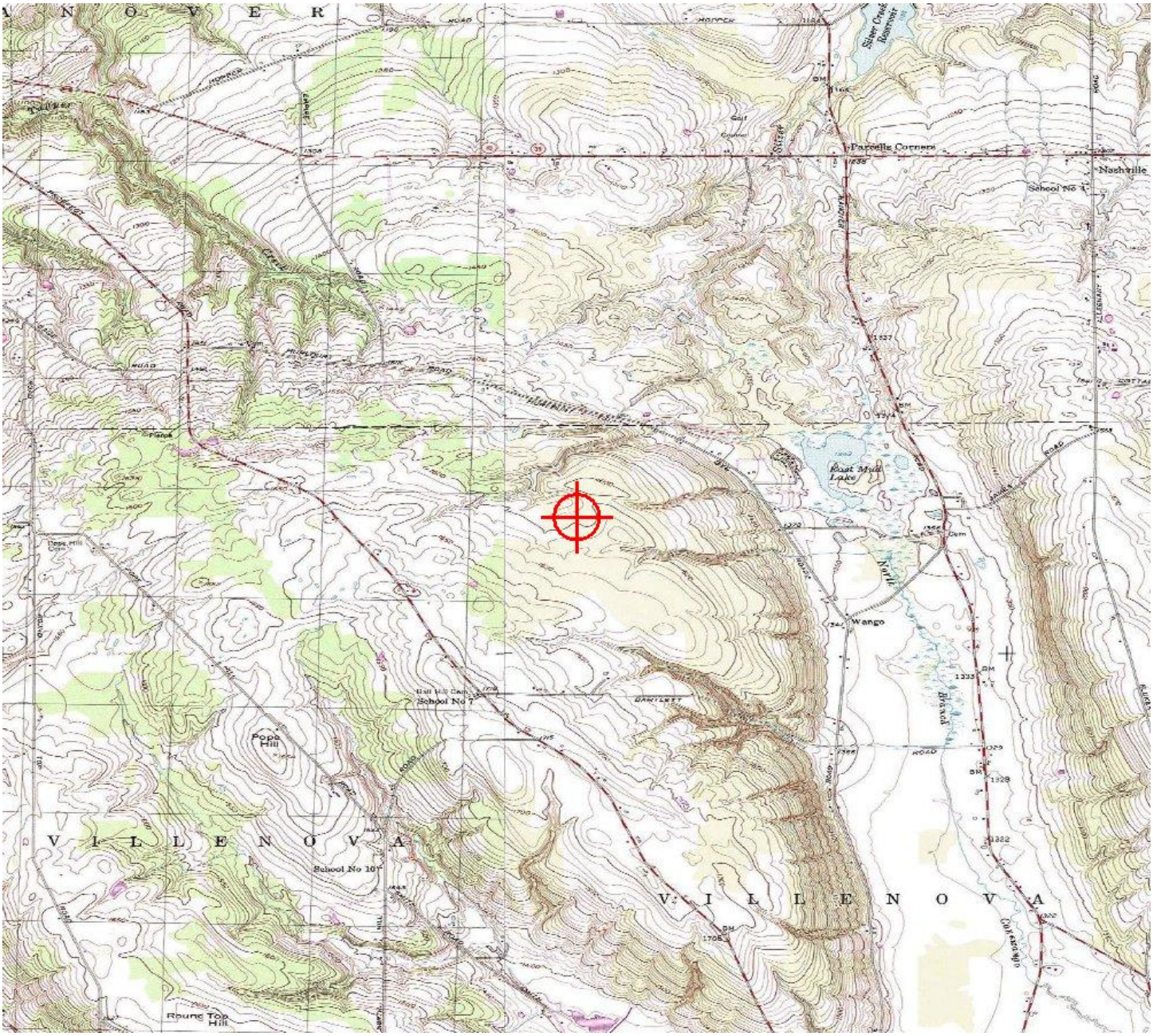
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8102-OE

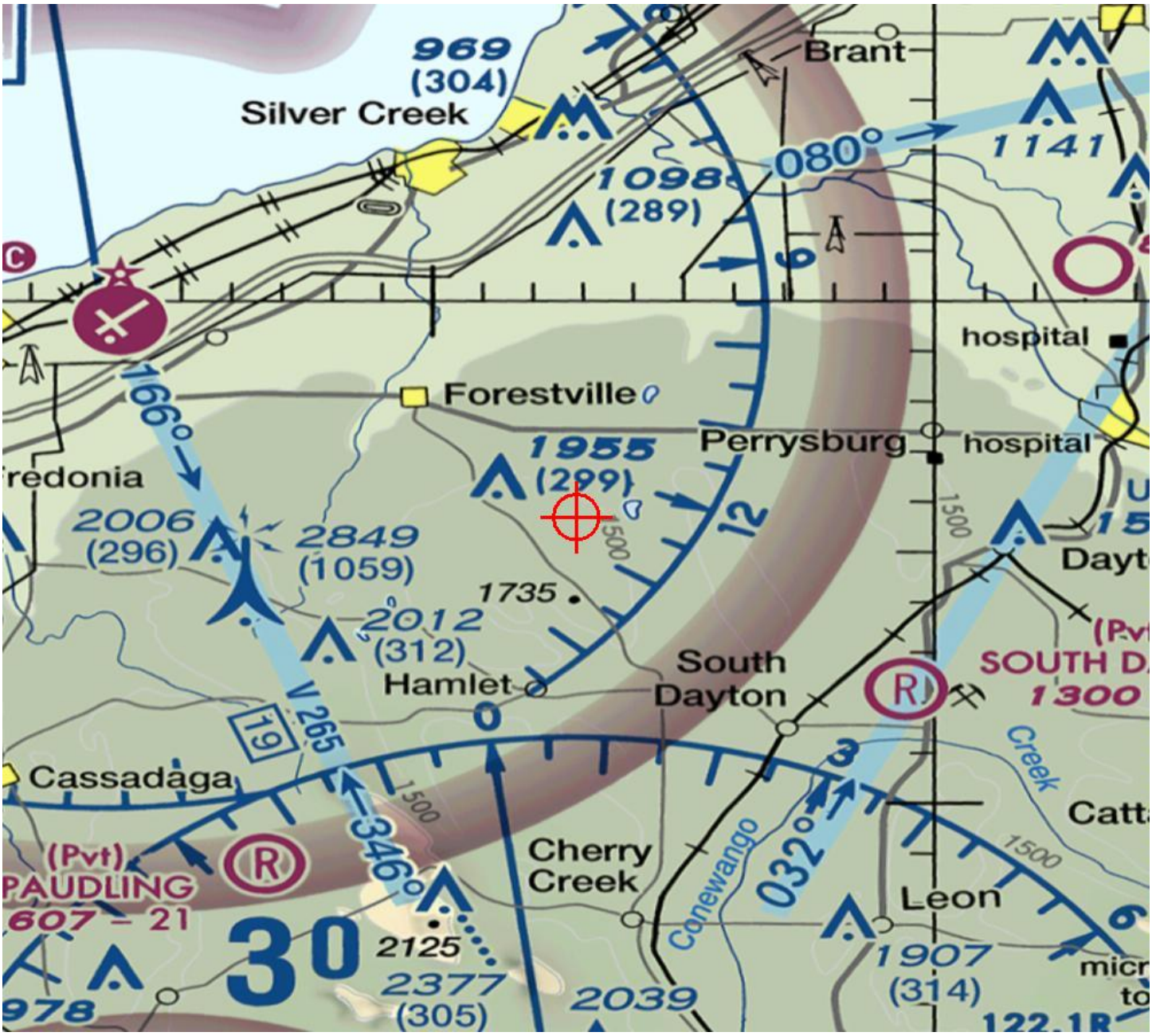
The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8102-OE



Sectional Map for ASN 2015-WTE-8102-OE



Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8103-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T28
Location:	Hamlet, NY
Latitude:	42-25-44.39N NAD 83
Longitude:	79-07-30.76W
Heights:	1600 feet site elevation (SE)
	499 feet above ground level (AGL)
	2099 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2099 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8103-OE.

Signature Control No: 273432874-301612372 (DNE -WT)
Brenda Mumper
Specialist

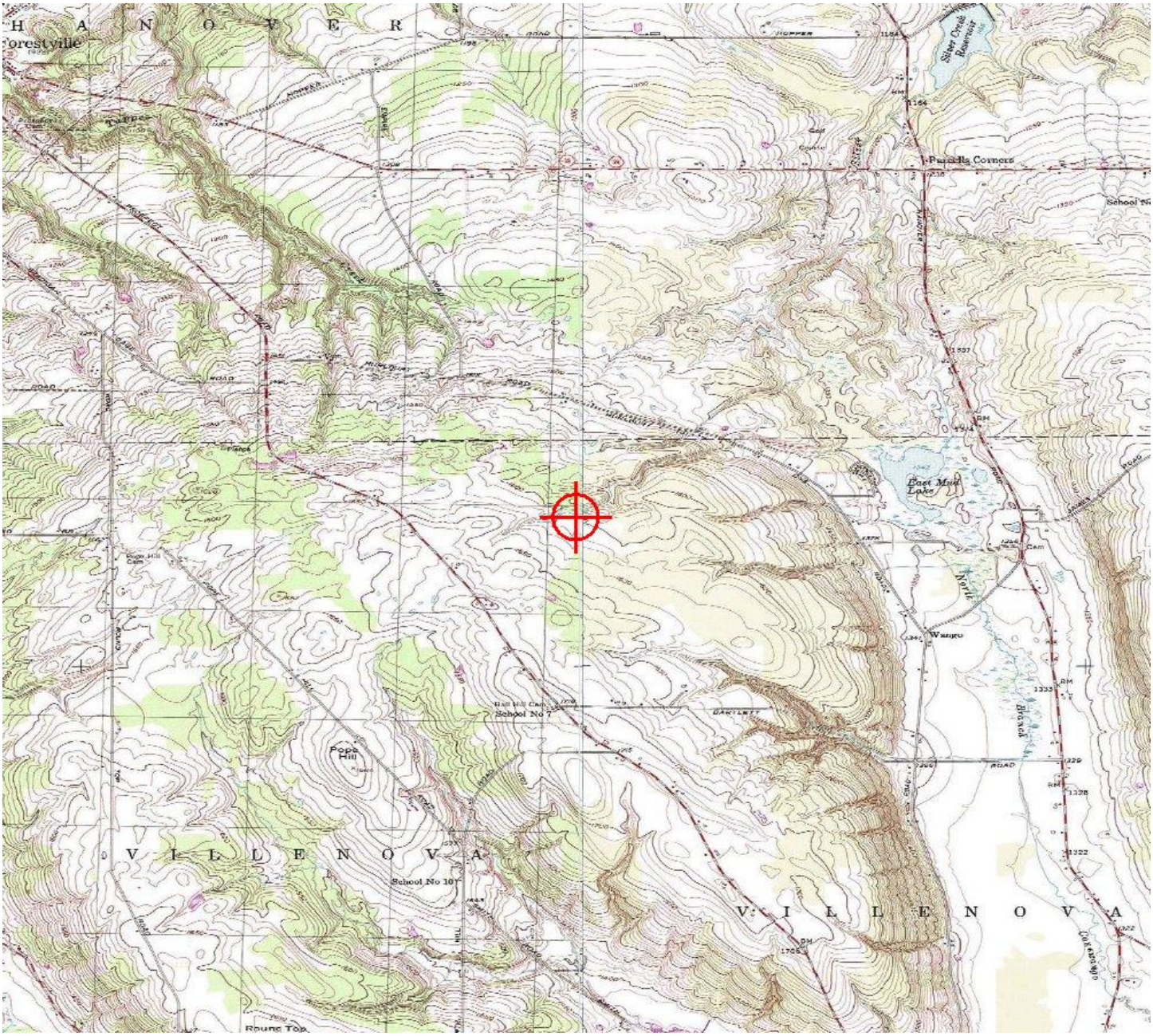
Attachment(s)
Additional Information
Map(s)

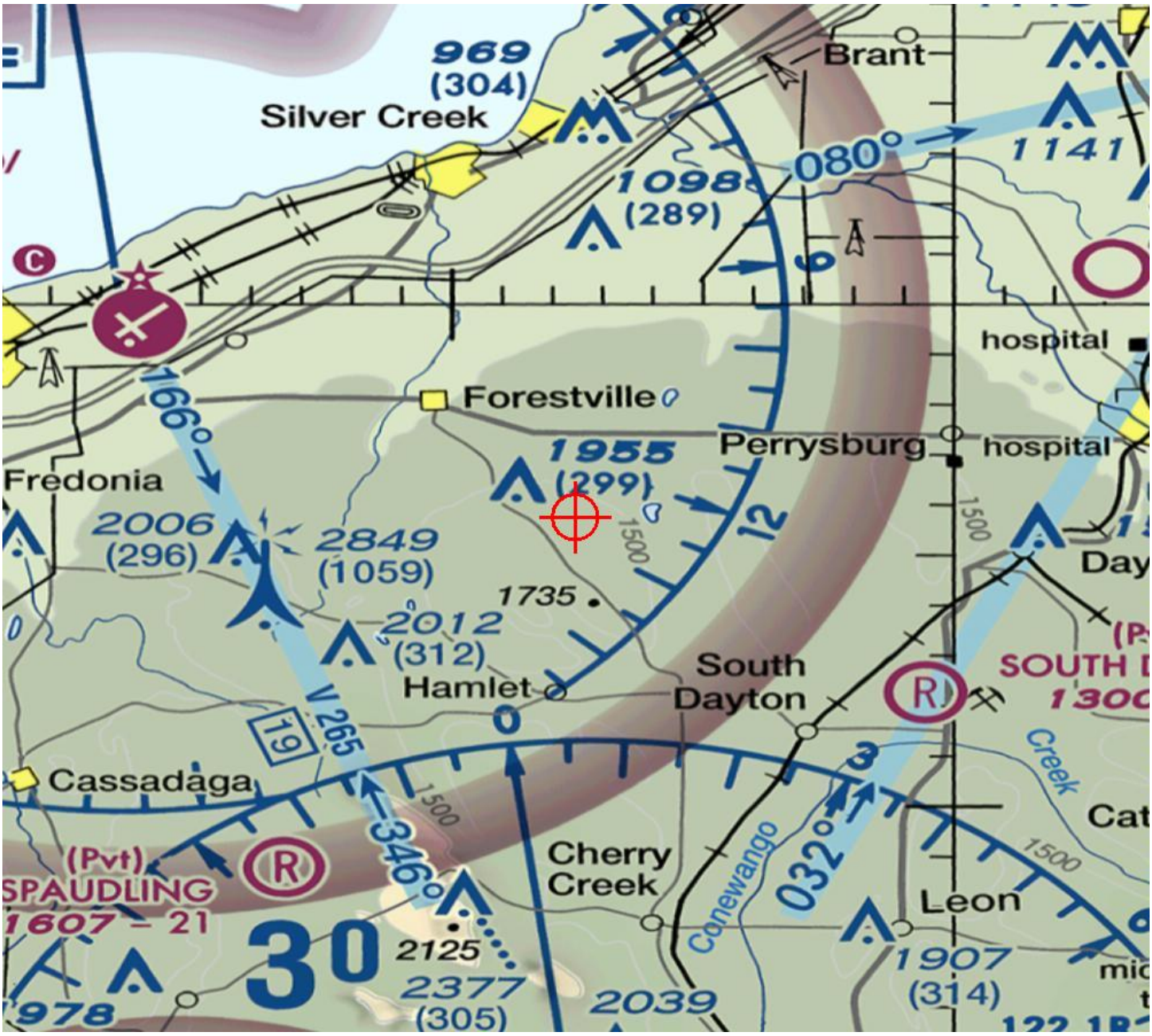
Additional information for ASN 2015-WTE-8103-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8103-OE




969
(304)
Silver Creek
Brant
1141
080°
1098
(289)
hospital
Forestville
166°
Perrysburg
hospital
1955
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Fredonia
2006
(296)
2849
(1059)
1735
2012
(312)
Hamlet
South
Dayton
V 265
19
Cassadaga
346°
Cherry
Creek
Conewango
032°
Creek
Leon
(Pvt)
SPAUDLING
1607 – 21
978
30
2125
2377
(305)
2039
1907
(314)
1500

Mail Processing Center
Federal Aviation Administration
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Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8105-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T30
Location:	Hamlet, NY
Latitude:	42-25-59.82N NAD 83
Longitude:	79-08-00.17W
Heights:	1610 feet site elevation (SE)
	499 feet above ground level (AGL)
	2109 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2109 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8105-OE.

Signature Control No: 273432877-301612379 (DNE -WT)
Brenda Mumper
Specialist

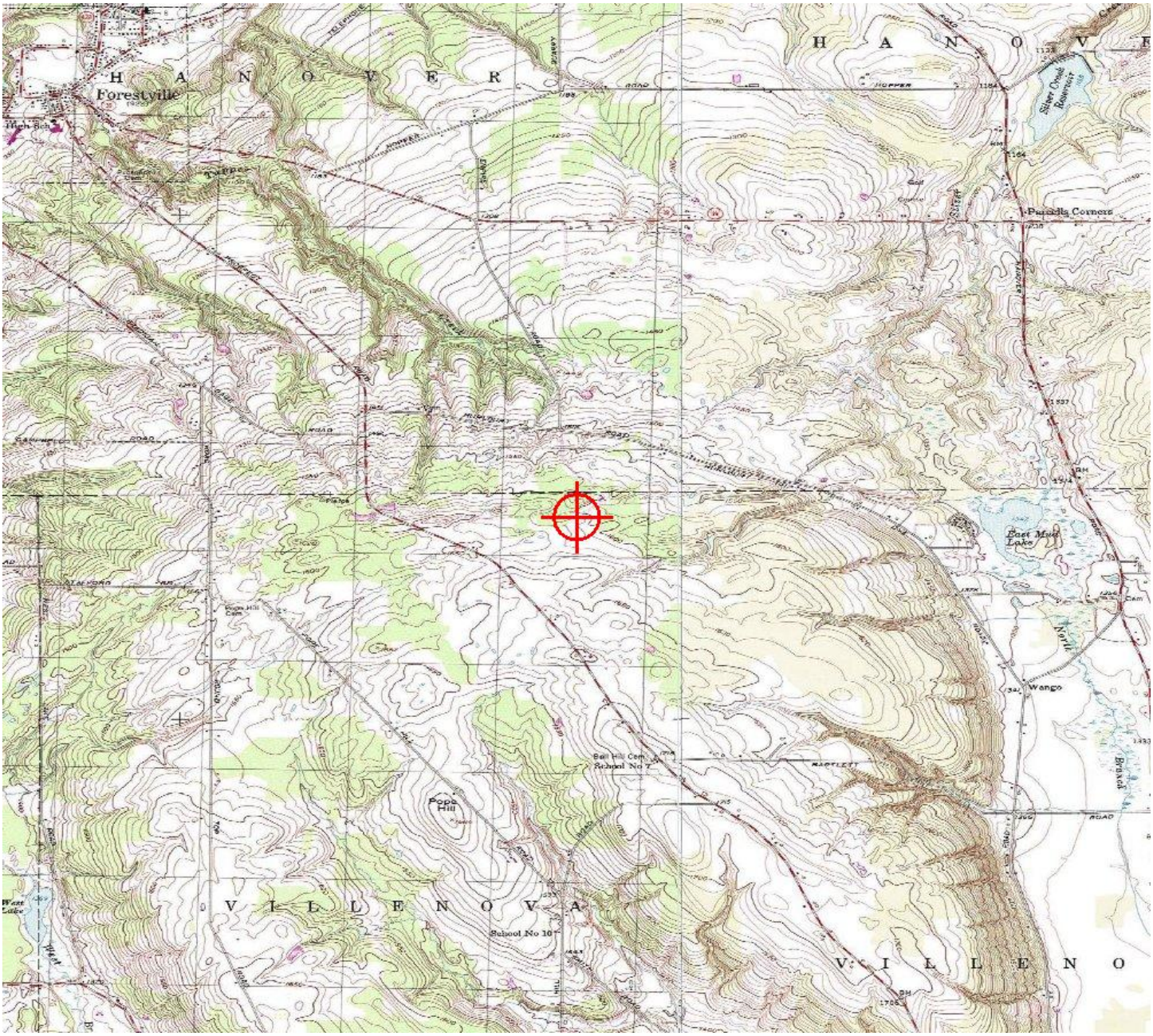
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8105-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8105-OE



Sectional Map for ASN 2015-WTE-8105-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8106-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T31
Location:	Hamlet, NY
Latitude:	42-26-26.82N NAD 83
Longitude:	79-06-39.83W
Heights:	1450 feet site elevation (SE)
	499 feet above ground level (AGL)
	1949 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (1949 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8106-OE.

Signature Control No: 273432878-301612383 (DNE -WT)
Brenda Mumper
Specialist

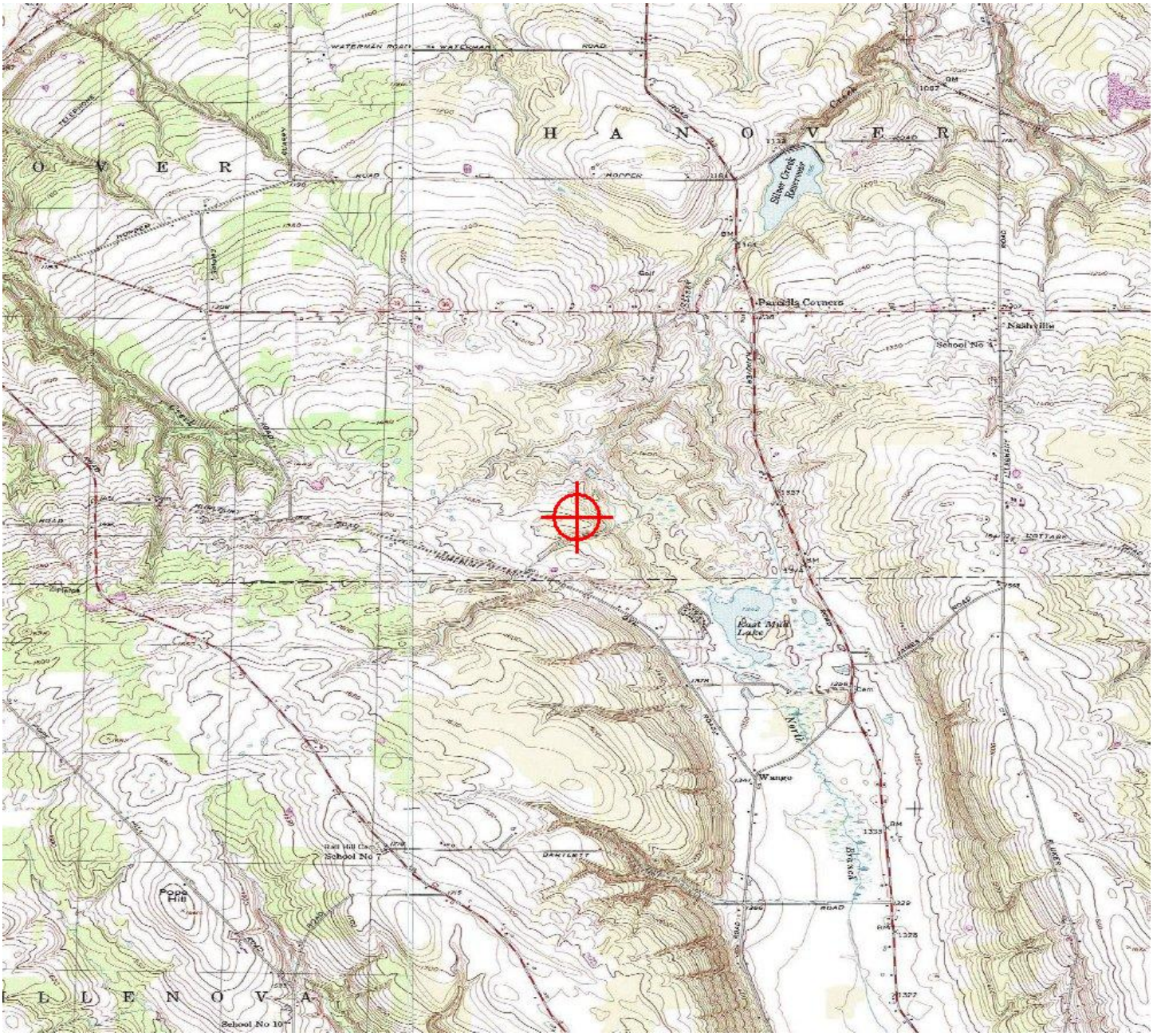
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8106-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8106-OE



Sectional Map for ASN 2015-WTE-8106-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8108-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T33
Location:	Hamlet, NY
Latitude:	42-26-46.95N NAD 83
Longitude:	79-07-12.22W
Heights:	1440 feet site elevation (SE)
	499 feet above ground level (AGL)
	1939 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (1939 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8108-OE.

Signature Control No: 273432885-301612389 (DNE -WT)
Brenda Mumper
Specialist

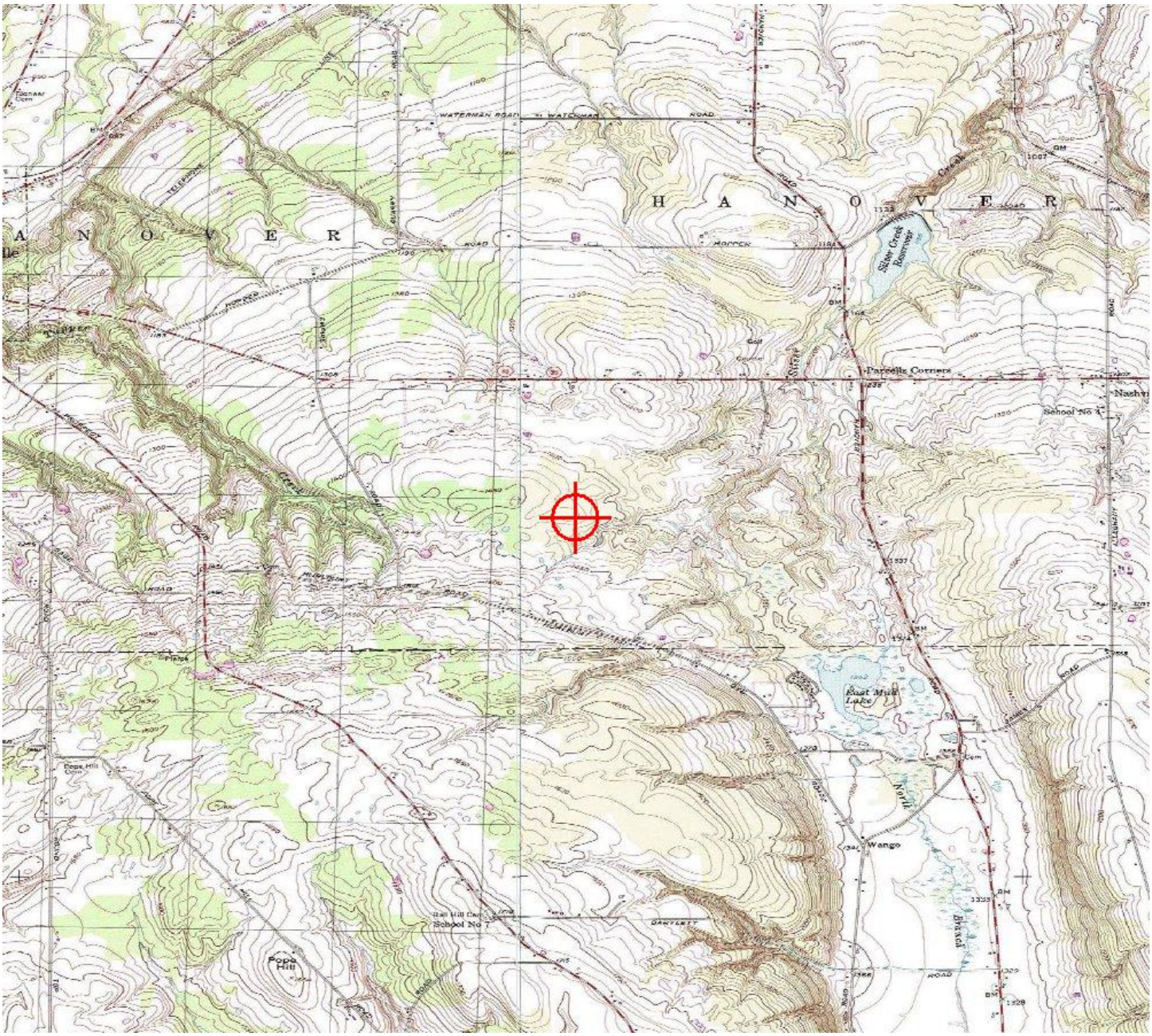
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8108-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8108-OE



Sectional Map for ASN 2015-WTE-8108-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8109-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T34
Location:	Hamlet, NY
Latitude:	42-26-53.98N NAD 83
Longitude:	79-07-30.58W
Heights:	1458 feet site elevation (SE)
	499 feet above ground level (AGL)
	1957 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (1957 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8109-OE.

Signature Control No: 273432886-301612392 (DNE -WT)
Brenda Mumper
Specialist

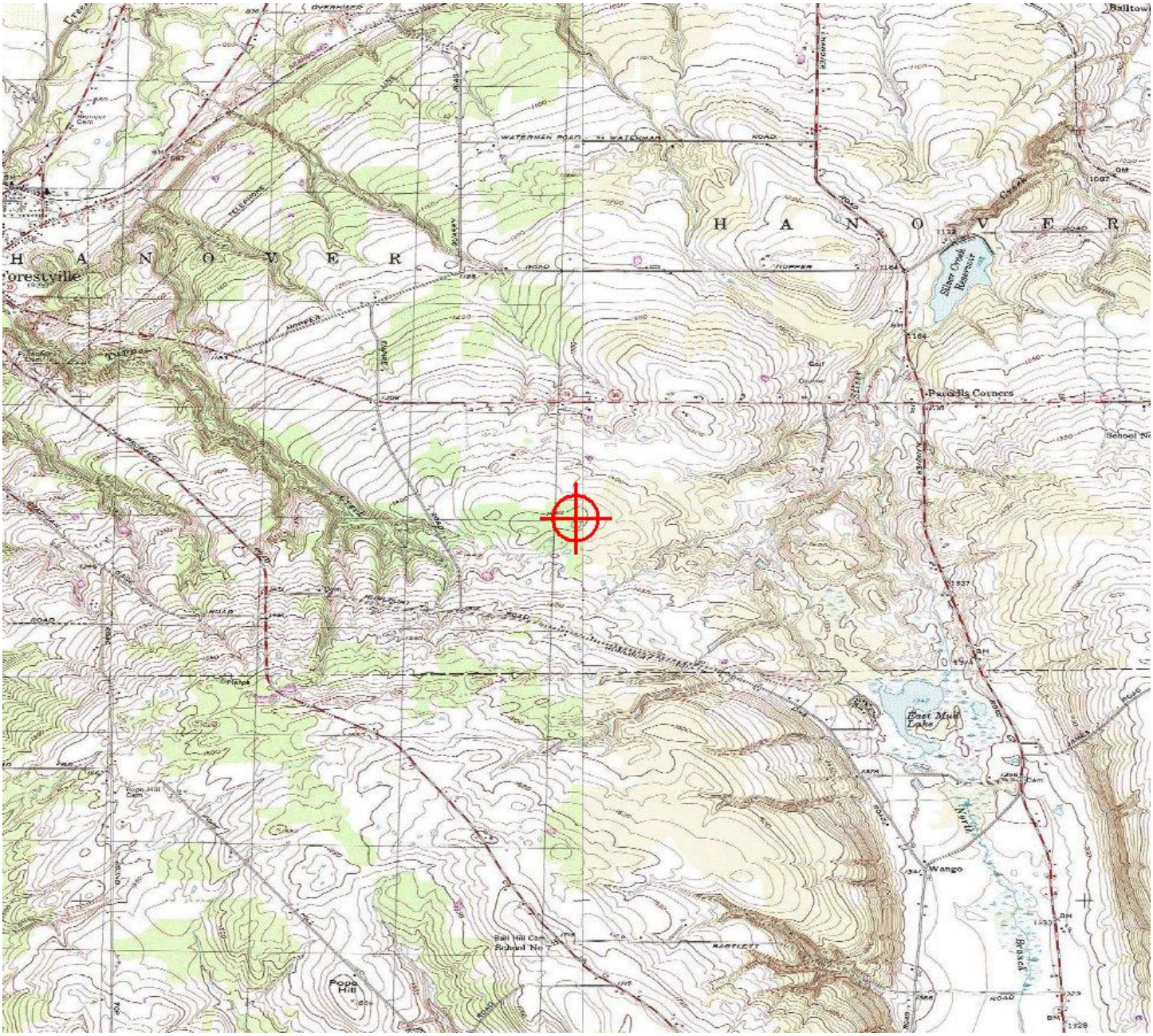
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8109-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8109-OE



Sectional Map for ASN 2015-WTE-8109-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8110-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T35
Location:	Hamlet, NY
Latitude:	42-27-06.65N NAD 83
Longitude:	79-07-51.51W
Heights:	1422 feet site elevation (SE)
	499 feet above ground level (AGL)
	1921 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (1921 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8110-OE.

Signature Control No: 273432887-301612396 (DNE -WT)
Brenda Mumper
Specialist

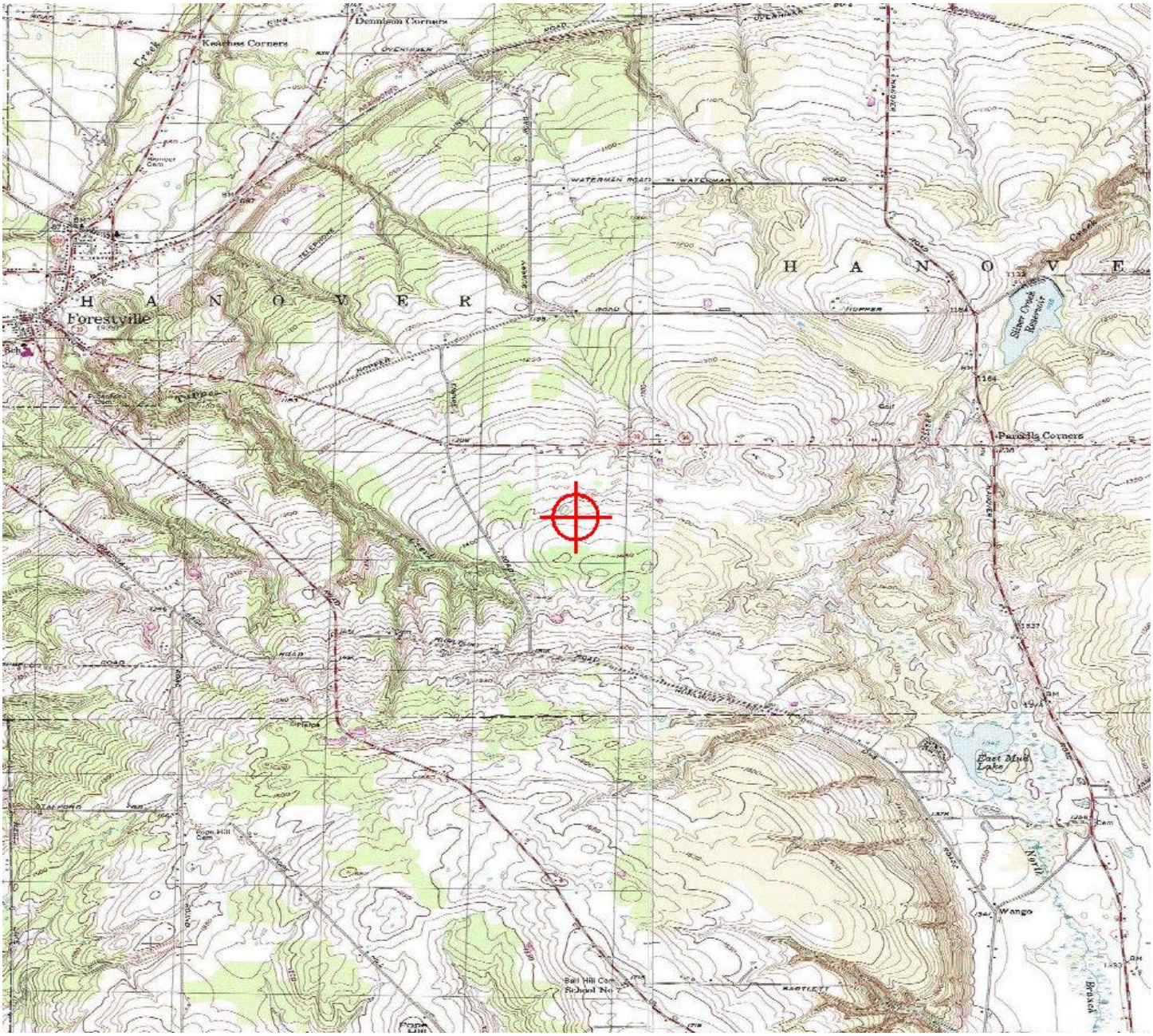
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8110-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8110-OE



Sectional Map for ASN 2015-WTE-8110-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8111-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T36
Location:	Hamlet, NY
Latitude:	42-26-52.77N NAD 83
Longitude:	79-06-15.90W
Heights:	1365 feet site elevation (SE)
	499 feet above ground level (AGL)
	1864 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (1864 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

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Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8111-OE.

Signature Control No: 273432888-301612399 (DNE -WT)
Brenda Mumper
Specialist

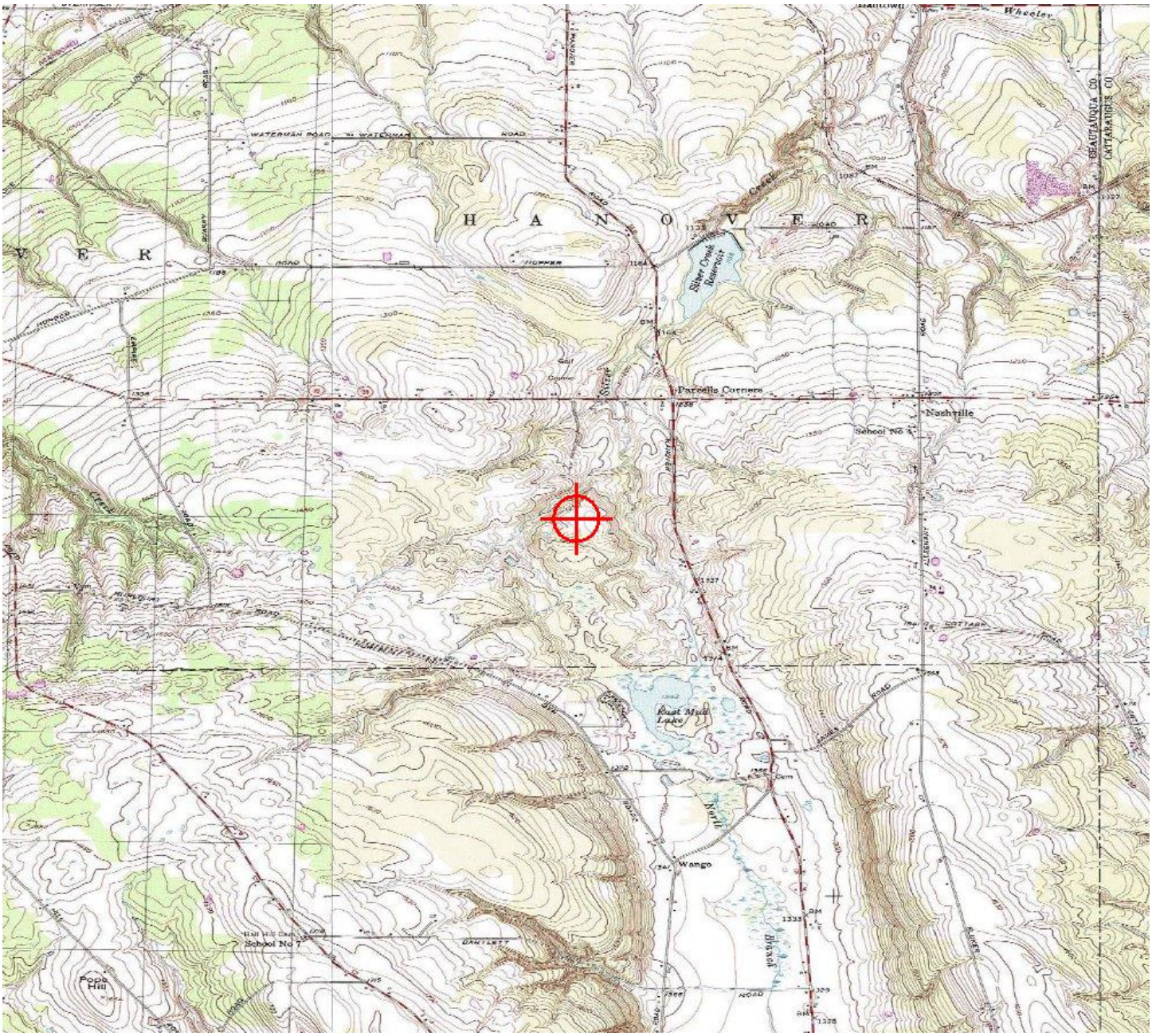
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8111-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8111-OE



Sectional Map for ASN 2015-WTE-8111-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8112-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T37
Location:	Hamlet, NY
Latitude:	42-27-02.38N NAD 83
Longitude:	79-06-38.87W
Heights:	1375 feet site elevation (SE)
	499 feet above ground level (AGL)
	1874 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (1874 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

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If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8112-OE.

Signature Control No: 273432889-301612402 (DNE -WT)
Brenda Mumper
Specialist

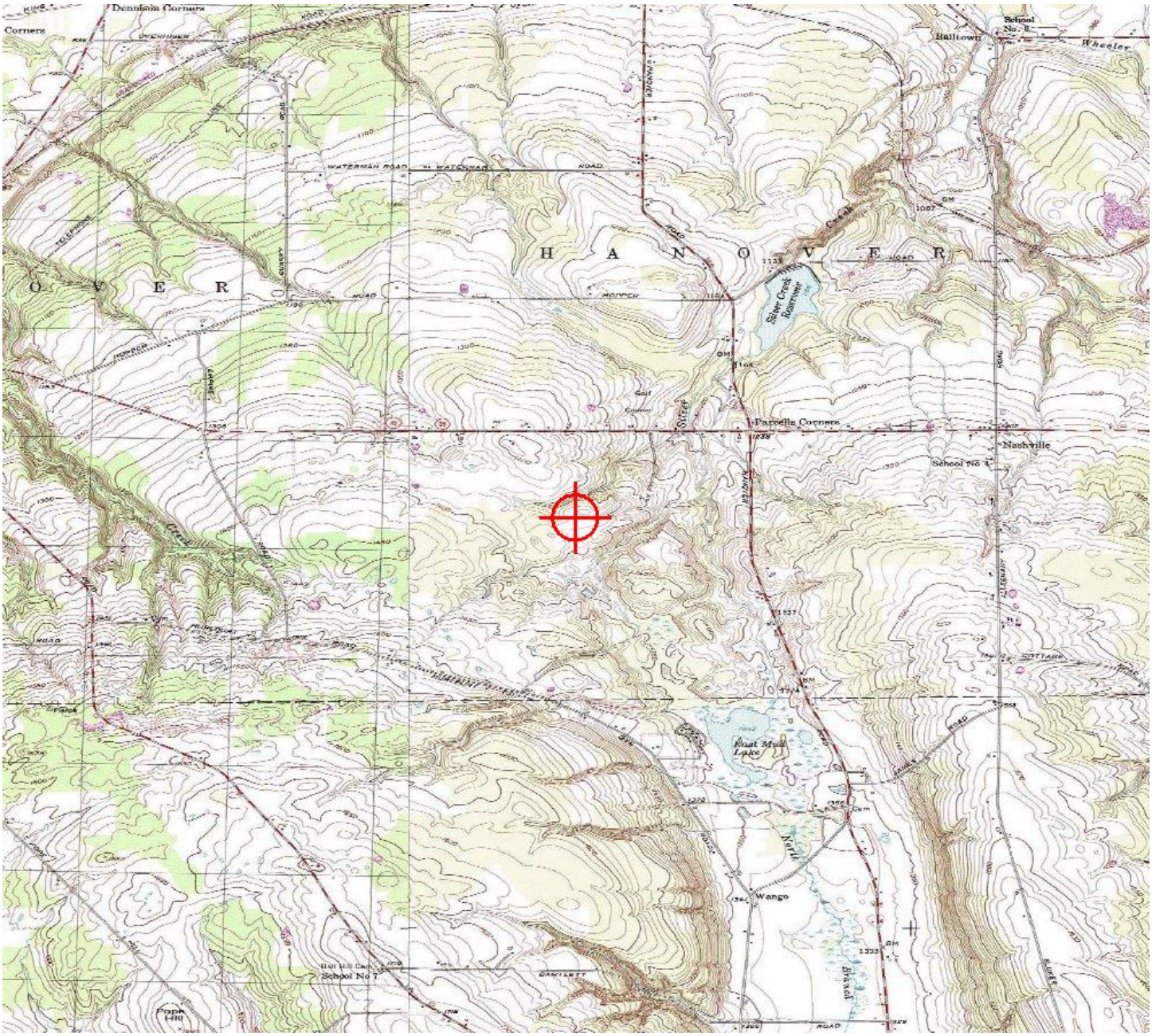
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8112-OE

The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8112-OE



Sectional Map for ASN 2015-WTE-8112-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2015-WTE-8114-OE

Issued Date: 08/11/2016

Elizabeth King
Ball Hill Wind Energy, LLC
11101 W 120th Ave.
Suite 400
Broomfield, CO 80021

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Wind Turbine T39
Location:	Hamlet, NY
Latitude:	42-24-13.86N NAD 83
Longitude:	79-10-11.26W
Heights:	1569 feet site elevation (SE)
	499 feet above ground level (AGL)
	2068 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

As a condition to this Determination, the structure is marked/lighted in accordance with FAA Advisory circular 70/7460-1 L, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.
Any height exceeding 499 feet above ground level (2068 feet above mean sea level), will result in a substantial adverse effect and would warrant a Determination of Hazard to Air Navigation.

This determination expires on 02/11/2018 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. This determination is based, in part, on the foregoing description which includes specific coordinates and heights . Any changes in coordinates will void this determination. Any future construction or alteration requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

If we can be of further assistance, please contact our office at (816) 329-2524. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2015-WTE-8114-OE.

Signature Control No: 273432891-301612416 (DNE -WT)
Brenda Mumper
Specialist

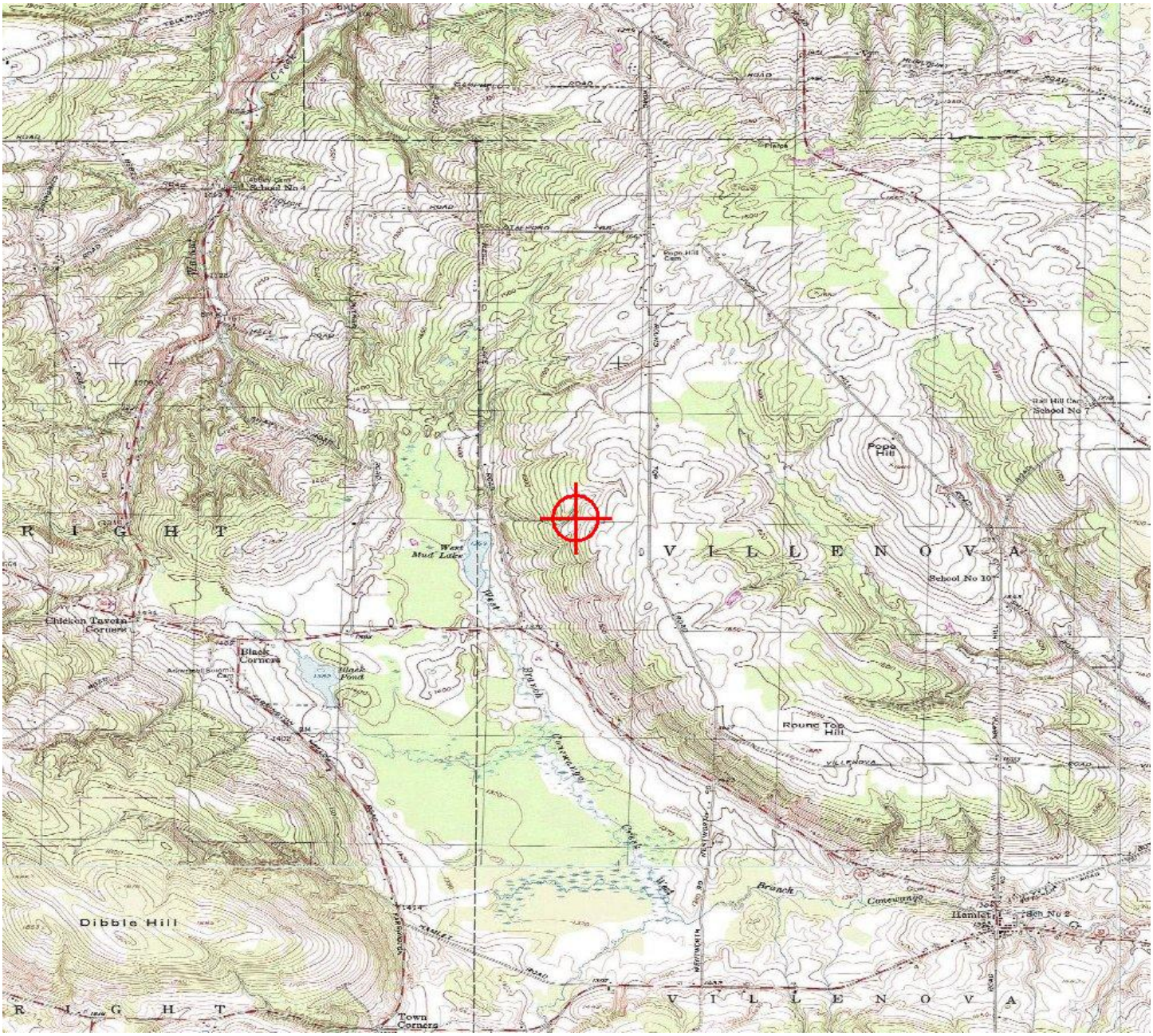
Attachment(s)
Additional Information
Map(s)

Additional information for ASN 2015-WTE-8114-OE

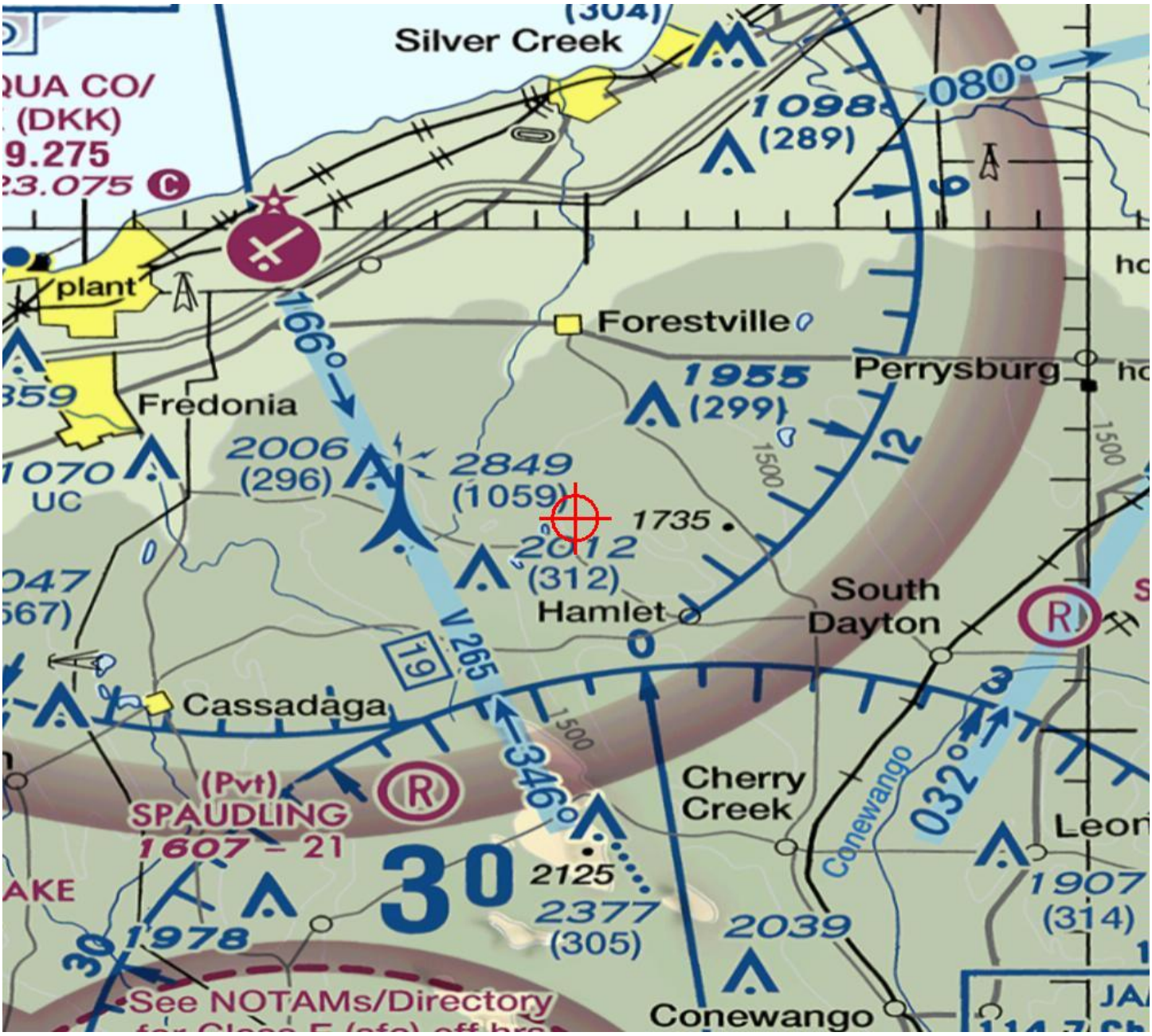
The FAA's Technical Operations office noted impacts to the Buffalo Airport Surveillance Radar; however, the affected Air Traffic Control facilities indicated that the radar impacts would not have a significant effect on their operations.

All determinations in this project will be issued with an obstruction marking and lighting condition of white paint and synchronized red lights. When the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height, the sponsor may request a re-evaluation. The request may be e-mailed to Brenda Mumper (brenda.mumper@faa.gov). A portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2015-WTE-8114-OE



Sectional Map for ASN 2015-WTE-8114-OE



Appendix H: Sound Level Assessment Report, Ball Hill Wind Project

SOUND LEVEL ASSESSMENT REPORT

Ball Hill Wind Project
Towns of Villenova & Hanover
Chautauqua County, NY

Prepared for:

Renewable Energy Systems Americas Inc.
11101 West 120th Avenue, Suite 400
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August 30, 2016
Revised October 4, 2016

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1.0 EXECUTIVE SUMMARY

Epsilon Associates, Inc. (Epsilon) has conducted a sound level assessment for Renewable Energy Systems Americas, Inc. (RES) of the Ball Hill Wind Project, a proposed wind power generation facility in Chautauqua County, New York. RES is considering up to 29 wind turbine generators comprised of Vestas V126-3.45 units with a hub height of 87 meters and a rotor diameter of 126 meters. The study references a previously completed sound-monitoring program conducted to determine existing sound levels in the vicinity of the Project, includes computer modeling to predict future sound levels when the wind turbines and the associated electrical substations are operational, and compares the operational sound levels to applicable state and local criteria.

Sound impacts associated with all 29 proposed wind turbine generators and two proposed electrical transformers were modeled at 768 discrete receptor locations, including the closest structures, using Cadna/A noise calculation software. Maximum operational sound levels at all of the nearest structures to the Project are predicted to be equal to or less than 50 dBA, in compliance with local noise limits specified by the Towns of Hanover and Villenova. Additionally, the Project is anticipated to meet the suggested noise guidelines recommended by the New York State Department of Environmental Conservation (NYSDEC) to avoid the potential for adverse noise impacts in the community.

An evaluation was also performed to assess tonality and low frequency sound with respect to Project operation. No pure tones were identified in the sound power level spectra for the Vestas V126-3.45 unit, or in the calculated received sound pressure levels at the closest structure to the Project. Low frequency sound levels at all modeled structures are also well below the recommended criteria to avoid disturbance indoors as well as any potential vibration and rattle.

2.0 PROJECT OVERVIEW

Renewable Energy Systems Americas, Inc. (RES) is proposing to install twenty-nine (29) Vestas V126-3.45 wind turbines and a 5.8 mile 115kV transmission line at the proposed Ball Hill Wind Project site (the Project) located in the Towns of Hanover and Villenova in Chautauqua County, NY. Hessler Associates, Inc. (Hessler) completed a background sound level monitoring program in March 2008 to determine existing sound levels in the vicinity of the Project. Epsilon Associates, Inc. (Epsilon) has conducted computer modeling to predict future sound levels when the proposed wind turbines and associated electrical transformers would be operational. The results of this analysis and an evaluation of compliance with applicable criteria are presented herein.

3.0 SOUND METRICS

There are several ways in which sound levels are measured and quantified, all of which use the logarithmic decibel (dB) scale to accommodate the wide range of sound intensities found in the environment. An interesting property of the logarithmic scale is that the sound pressure levels of two distinct sounds are not directly additive. For example, if a sound of 50 dB is added to another sound of 50 dB, the total sound level is only a three-decibel increase (to 53 dB), not a doubling to 100 dB. Thus, every three dB change in sound level represents a doubling or halving of sound energy. A change in sound level of less than three dB is generally considered just perceptible to the human ear[1].

Another property of the decibel scale is that if one source of sound is 10 dB (or more) louder than another source, then the quieter source does not contribute significantly to the overall sound level which remains the same as that of the louder source. For example, the combined sound level of a source of sound at 60 dB plus another source of sound at 47 dB is simply 60 dB.

The sound level meter used to measure noise is a standardized instrument.[2] It contains "weighting networks" to adjust the frequency response of the instrument to approximate that of the human ear under various conditions. One network is the A-weighting network (there are also B- and C-weighting networks). The A-weighted scale (dBA) most closely approximates how the human ear responds to sound at various frequencies, and is typically used for community sound level measurements[3]. Sounds are frequently reported as detected with the A-weighting network of the sound level meter. A-weighted sound levels emphasize the middle frequency (*i.e.,* middle pitched – around 1,000 Hertz (Hz) sounds), and de-emphasize lower and higher frequency sounds. A-weighted sound levels are reported in decibels designated as "dBA." For reference, sound pressure levels for some common indoor and outdoor environments are shown in Figure 3-1.

Two methods exist for describing sounds in our environment that vary with time: these are exceedance levels and the equivalent level, both of which are derived from a large number of moment-to-moment A-weighted sound level measurements. Several sound level metrics that are commonly reported in community sound monitoring programs are described below.

---

[1] Bies, David A., and Hansen, Colin H. *Engineering Noise Control: Theory and Practice*. 4th ed. New York: Spon Press, 2009. 85. Print

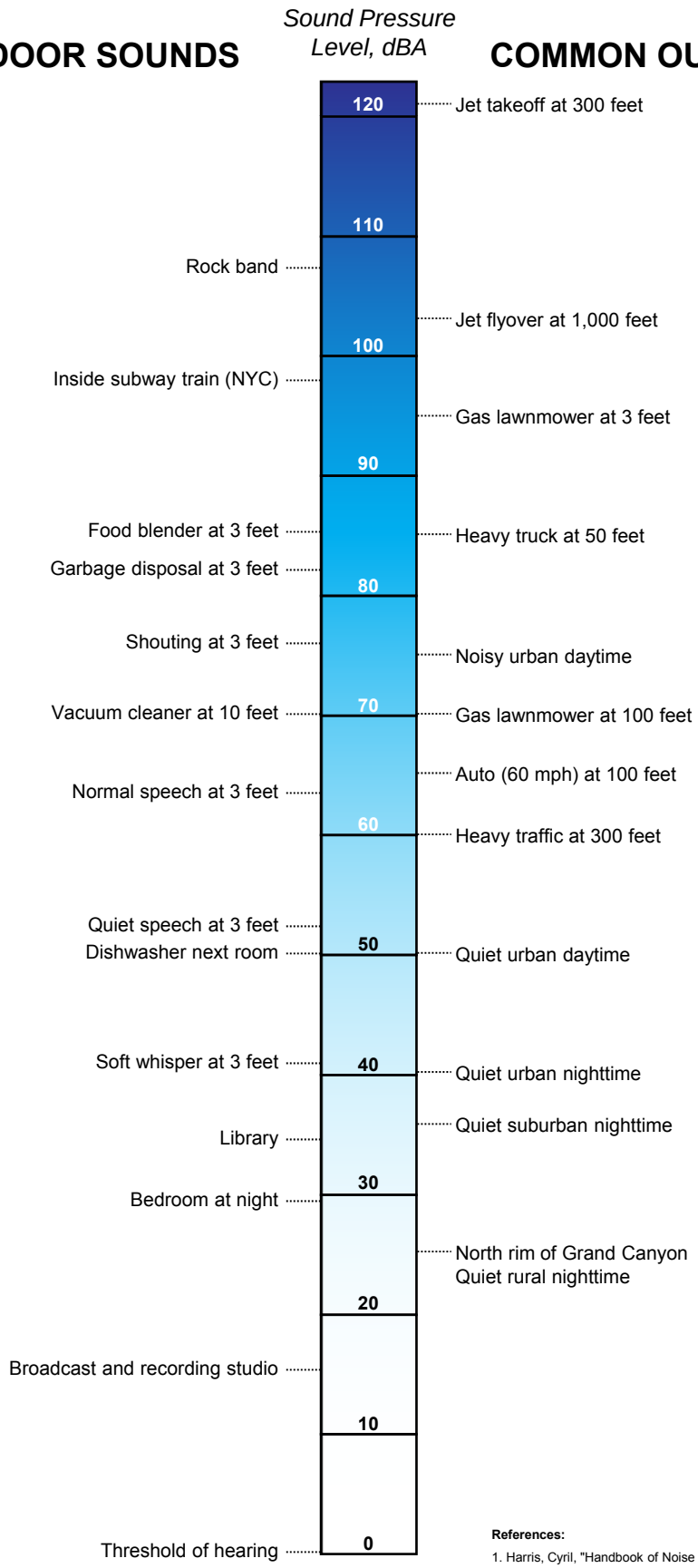
[2] American National Standards Institute. *"ANSI S1.4-1983: Specification for Sound Level Meters."* Acoustical Society of America.

[3] Bies, David A., and Hansen, Colin H. *Engineering Noise Control: Theory and Practice*. 4th ed. New York: Spon Press, 2009. 103. Print

- Exceedance levels, designated L_n, where n can have a value of 0 to 100 percent, are values from the cumulative amplitude distribution of all of the sound levels observed during a measurement period. L_{90} is the sound level in dBA exceeded 90 percent of the time during the measurement period and is close to the lowest sound level observed. It is essentially the residual sound level when there are no obvious nearby intermittent noise sources. L_{10} is the sound level in dBA exceeded 10 percent of the time during the measurement period.

- L_{eq}, the equivalent level, is the level of a hypothetical steady sound that would have the same energy (*i.e.,* the same time-averaged mean square sound pressure) as the actual fluctuating sound observed. The equivalent level is designated L_{eq} and is also A-weighted. The equivalent level represents the time average of the fluctuating sound pressure, but because sound is represented on a logarithmic scale and the averaging is done with linear mean square sound pressure values, the L_{eq} is mostly determined by occasional loud noises, such as a passing vehicle or an aircraft flyover.

In short, by using various sound metrics it is possible to separate prevailing, steady sounds (the L_{90}) from occasional, louder sounds (L_{10}) in the acoustic environment or combined equivalent levels (L_{eq}).



References:

1. Harris, Cyril, "Handbook of Noise Acoustical Measurements and Noise Control", p 1-10., 1998
2. "Controlling Noise", USAF, AFMC, AFDTC, Elgin AFB, Fact Sheet, August 1996
3. California Dept. of Trans., "Technical Noise Supplement", Oct, 1998

Figure 3-1

Common Sound Levels in the Environment

4.0 NOISE REGULATIONS

Noise is officially defined as "unwanted sound". The principal feature of this definition is that there must be sound energy and that there must be someone hearing it who considers it unwanted. Noise impact is judged on two bases: the extent to which governmental regulations or guidelines may be exceeded, and the extent to which it is estimated that people may be annoyed or otherwise adversely affected by the sound. Regulatory authority for assessing and controlling noise is contained in both the State Environmental Quality Review Act (SEQRA) and specific Department program policy documents. Specific regulatory references are discussed below.

4.1 Federal Regulations

There are no federal community noise regulations applicable to wind farms.

4.2 New York State Regulations

Noise is an aspect of the environment under SEQRA (see 6 NYCRR 617.2(1)), and a substantial adverse change in existing noise levels can be (if not mitigated to the maximum extent practicable) among the indicators of significant adverse impacts on the environment.

4.3 Local Regulations

Article XVI, Section 1606 (Zoning District and Bulk Requirements), Parts 3 through 6 of the Town of Hanover Wind Law contains a noise limit applicable to Wind Energy Conversion Systems (WECS) which requires that:

> "The statistical sound pressure level generated by a WECS shall not exceed L_{10} – 50 dBA measured at any off site residence existing at the time of application. If the ambient sound level exceeds 48 dBA, the standard shall be ambient dBA plus 5 dBA. Independent certification shall be provided before and after construction demonstrating compliance with this requirement.

In the event audible noise due to WECS operation contains a steady pure tone, such as a whine, screech or hum, the standards for audible noise set forth in this subsection shall be reduced by five dBA. A pure tone is defined to exist if the 1/3 octave band sound pressure level in the band, including the tone, exceeds the arithmetic average of the sound pressure levels of the two contiguous bands by:

- 5 dB for center frequencies of 500 Hz or above
- 8 dB for center frequencies between 160 and 500 Hz
- 15 dB for center frequencies less than or equal to 125 Hz

In the event the ambient noise level (exclusive of the development in question) exceeds the applicable standard given above, the applicable standard shall be adjusted so as to equal the ambient noise level."

Section 690.12 (Setbacks for Wind Energy Conversion Systems), Parts A through D of Local Law No. 1 of 2007 for the Town of Villenova contains an identical noise limit to the Town of Hanover, as described above.

4.4 NYSDEC Guidelines

The NYSDEC has published a guidance document[4] for assessing noise impacts (NYSDEC, 2001). The guidance document states that the addition of any noise source, in a non-industrial setting, should not raise the ambient noise level above a maximum of 65 dBA. Ambient sound levels in industrial or commercial areas may exceed 65 dBA with a high end of approximately 79 dBA. In these instances, mitigation measures utilizing best management practices should be used in an effort to ensure minimum impacts.

This guidance document also states that sound level increases from 0-3 dBA should have no appreciable effect on receptors, increases from 3-6 dBA may have potential for adverse noise impact only in cases where the most sensitive of receptors are present, and increases of more than 6 dBA may require a closer analysis of impact potential depending on existing sound levels and the character of surrounding land use and receptors. An increase of 10 dBA deserves consideration of avoidance and mitigation measures in most cases.

The typical ability of an individual to perceive changes in noise levels is summarized in Table 4-1. These guidelines allow direct estimation of an individual's probable perception of a change in community noise levels.

Table 4-1 Thresholds for Sound Pressure Level Increases

Increase in Sound Pressure (dBA)	Community Reaction
0-3	No appreciable effect
3-6	Potential effect for sensitive receptors
Over 6	Closer analysis required

Source: NYSDEC, "Assessing and Mitigating Noise Impacts", Division of Environmental Permits, February 2, 2001.

[4] Program Policy Assessing and Mitigating Noise Impacts issued by the New York State Department of Environmental Conservation (NYSDEC), Feb. 2001

5.0 EXISTING SOUND LEVELS

Details of the existing sound level measurement methodology, measurement locations, instrumentation, and meteorological conditions can be found in §2.0 of the Environmental Sound Survey and Noble Impact Assessment Report issued by Hessler Associates, Inc. [Report No. 1813-063008-A], dated July 16, 2008 ("Hessler's Report"). A brief discussion of the measured background sound levels as a function of wind speed for use in evaluating compliance with NYSDEC noise guidelines can be found in §6.0 below.

6.0 FUTURE CONDITIONS

6.1 Equipment and Operating Conditions

6.1.1 Vestas V126-3.45 Wind Turbines

Each of the twenty-nine (29) proposed Vestas V126-3.45 wind turbines being considered for the Ball Hill Wind Project have a rotor diameter of 126 meters and a hub height of 87 meters. Table 6-1 presents the manufacturer-provided broadband sound power level, PWL, as a function of wind speed for the Vestas unit used as input to the model. Under peak sound-producing operating conditions, each turbine has an A-weighted sound power level of 107.3 dBA plus an uncertainty factor of 2.0 dBA, as provided by the manufacturer. Octave-band sound power levels, as calculated from one-third octave band data, are presented in Table 6-2 for hub height wind speeds of 11 m/s, corresponding to the maximum A-weighted sound power level output. This represents the operating condition for which compliance with the Town of Hanover and Town of Villenova noise limit of 50 dBA shall be evaluated.

Table 6-1 Vestas V126-3.45 Broadband Sound Power Level (dBA) as a Function of Wind Speed

	Wind Speed at Hub Height of 87m AGL (m/s)							
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Turbine PWL[1] (dBA)	91.9	93.2	96.2	99.5	102.5	105.2	107.1	107.3

1. Does not include uncertainty factor

Table 6-2 Vestas V126-3.45 Octave-Band Sound Power Levels (dBA)

Turbine PWL[1] (dB) by Octave-Band Center Frequency (Hz)								
31.5 Hz	**63 Hz**	**125 Hz**	**250 Hz**	**500 Hz**	**1 kHz**	**2 kHz**	**4 kHz**	**8 kHz**
76.2	85.9	92.6	99.0	102.4	102.9	97.8	90.0	69.4

1. Octave-band sound power levels at hub height wind speeds of 11 m/s, not including uncertainty factor

The NYSDEC criteria discussed in §4.4 is based on an evaluation of the increase over ambient sound levels which vary both as a function of turbine output and wind speed. Critical operating conditions occur at a wind speed when the turbine sound level is highest relative to the ambient sound level. Table 6-3 below compares the relative difference between turbine output and ambient sound level based on the regression analysis provided in Figure 2.7.2 of Hessler's report which presents the measured background L_{eq} sound level as a function of normalized wind speed at 10 meters above ground level (AGL).

It can be seen from Table 6-3 that a hub height wind speed of 10 m/s corresponds to the highest wind turbine sound power output relative to measured background sound levels, representing "critical-case" conditions in terms of an increase over ambient. For the Vestas V126-3.45 turbine model, the turbine sound power output at this wind speed is only 0.2 dBA less than the maximum output at 11 m/s.

Table 6-3 Comparison of Background SPL and Vestas V126-3.45 Turbine PWL to Determine "Critical-Case" Design Wind Speed

Wind Speed at 87m (m/s)	4	5	6	7	8	9	**10**	11	12	13
Wind Speed at 10m[1] (m/s)	2.8	3.6	4.3	5.0	5.7	6.4	**7.1**	7.8	8.5	9.2
Turbine PWL (dBA)	91.9	93.2	96.2	99.5	102.5	105.2	**107.1**	107.3	107.3	107.3
Background L_{eq} SPL[2] (dBA)	39.5	40.2	41.0	41.8	42.5	43.3	**44.1**	44.8	45.6	46.4
Turbine PWL – Background SPL (dBA)	52.4	53.0	55.2	57.7	60.0	61.9	**63.0**	62.5	61.7	60.9

1. Normalized using logarithmic profile described in IEC Standard 61400-11, Equation (7)
2. Calculated using regression line equation provided in Figure 2.7.2 of Hessler's report

6.1.2 Transformers

A 5.8 mile 115kV transmission line will connect the wind turbines to the electrical grid. This transmission line will have a substation at either end. The interconnection substation at the northern end of the transmission line ("northern substation") will have one 230 MVA transformer, while the collection substation ("southern substation") will have one 120 MVA transformer. The two transformers were included in the model assuming the sound power level inputs presented in Table 6-4 below, as calculated based on their respective MVA ratings.

Table 6-4 Transformer Sound Power Levels[1] (dBA)

MVA	dBA	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
120	100	57	76	88	91	96	93	89	84	75
230	102	59	78	90	93	98	95	91	86	77

1. Based on MVA rating of 120 or 230 MVA, as calculated using the methodology described in Table 4.5 of the Edison Electric Institute's "Electric Power Plant Environmental Noise Guide (Volume I, 2nd Ed., 1984). Sound levels for the 230 MVA transformer are 2 dB lower than estimated by the EEI method. This reduction will be achieved by either specifying quieter equipment or installation of a sound wall.

6.2 Modeling Methodology

Sound impacts associated with the proposed wind turbine generators and proposed substation transformers were predicted using Cadna/A noise calculation software

(DataKustik Corporation, 2015). This software, which implements the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation), offers a refined set of computations accounting for local topography, ground attenuation, drop-off with distance, barrier shielding, and atmospheric absorption of sound from multiple sound sources.

Inputs and significant parameters employed in the model are described below:

- *Project Layout:* A project layout comprised of a total of 29 proposed wind turbine locations and two proposed transformer locations was provided by RES along with a shapefile of the Project property boundary for use as input in the model.

- *Sensitive Receptors:* A shapefile of 768 receptors, including the closest structures to the Project, was provided by RES and used as input to the model. All receptors were modeled with a height of 1.5 meters AGL to mimic the ears of a typical standing observer.

- *Terrain Elevation:* Elevation contours for the modeling domain with 3 meter resolution were directly imported into Cadna/A which allowed for consideration of terrain shielding where appropriate. These contours were generated from elevation information derived from the National Elevation Database (NED) developed by the U.S. Geological Survey.

- *Source Sound Levels & Controls:* Manufacturer-provided octave-band sound power levels for the Vestas V126-3.45 MW units, presented above in §6.1.1 were used as input in the model.

- *Meteorological Conditions:* A temperature of 10ºC (50ºF) and a relative humidity of 70% was assumed in the model.

- *Ground Attenuation:* Spectral ground absorption was calculated using a G-factor of 0.5 to represent a moderately reflective surface.

Several modeling assumptions inherent in the ISO 9613-2 calculation methodology, or selected as conditional inputs by the user, were implemented in the Cadna/A model to ensure conservative results (i.e., higher sound levels), and are described below:

- Modeled source sound power level inputs represent acoustic emissions measured in accordance with IEC 61400-11 corresponding to maximum sound power output, plus an additional manufacturer-provided uncertainty factor of 2 dBA for the wind turbines.

- All modeled sources were assumed to be operating simultaneously and at the design wind speed corresponding to maximum sound power emissions.

- Predicted sound levels were computed with the assumption that each receptor was always located directly downwind from every turbine simultaneously. While a physical impossibility, this provides conservative results and is required by the ISO 9613-2 standard.

- As per ISO 9613-2, the model assumed favorable conditions for sound propagation, corresponding to a moderate, well-developed ground-based temperature inversion, as might occur on a calm, clear night.

- A mixture of hard and porous ground was assumed for the surrounding Project area to represent a surface that is partially reflective, a conservative assumption for much of the year when the ground would be covered in vegetation.

- Meteorological conditions assumed in the model (T = 10°C/RH = 70%) were selected to minimize atmospheric attenuation in the 500 Hz and 1 kHz octave-bands where the human ear is most sensitive.

- No additional attenuation due to tree shielding, air turbulence, or wind shadow effects was considered in the model.

Sound levels due to the operation of all 29 wind turbines and the two transformers were modeled at each of the 768 discrete receptor locations, including the closest structures to the Project. In addition, sound levels were modeled across a large grid of receptor points, spaced 100 meters apart, to create sound level isopleths across the entire Project area.

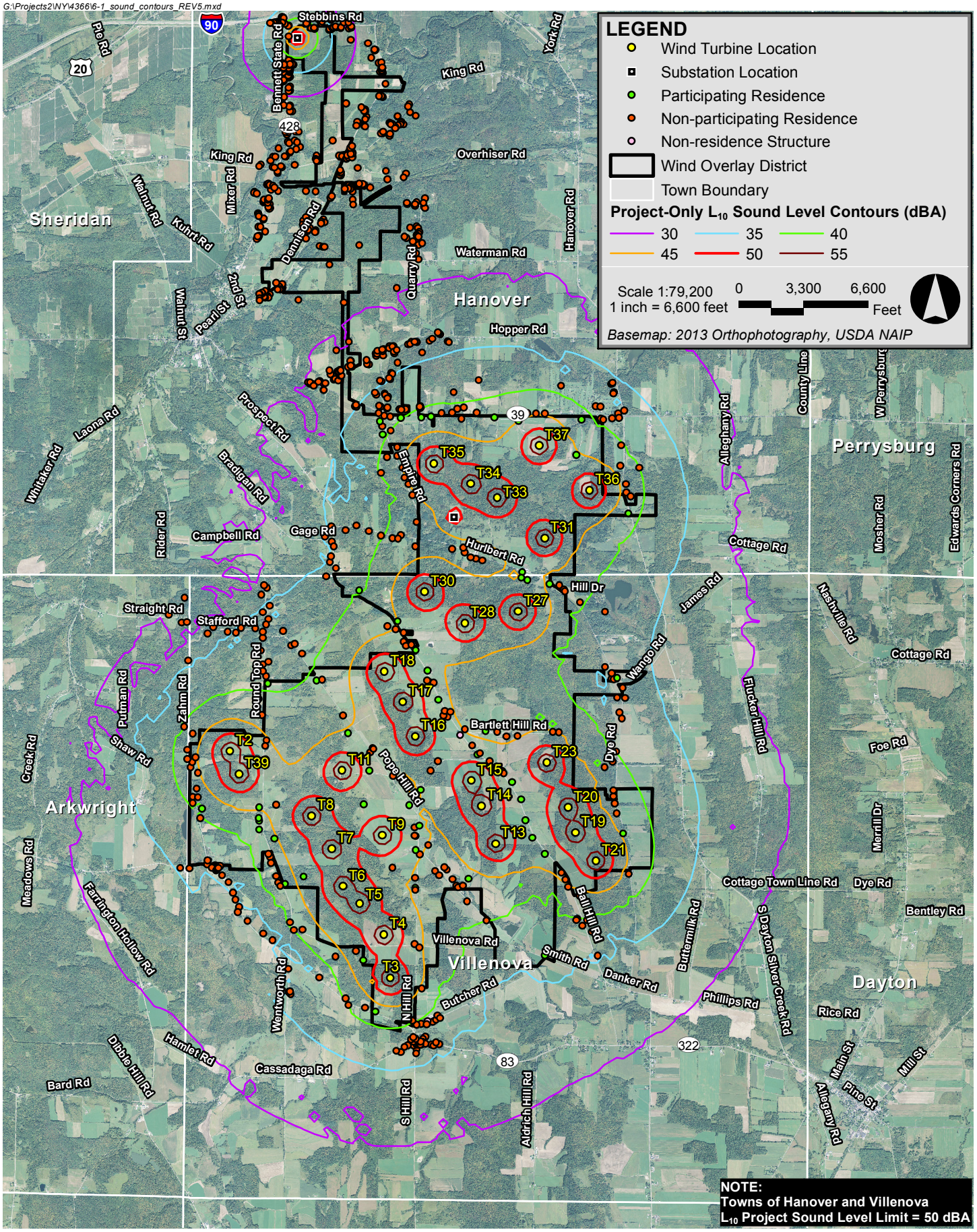
6.3 Modeling Sound Level Results

Modeling results for the Vestas V126-3.45 turbine, representing maximum Project-only L_{10} sound levels, are illustrated in Figure 6-1 as iso-dBA contour lines overlaid on aerial imagery of the Project site. Predicted L_{10} sound levels, ranging from 20 to 49 dBA, and L_{eq} sound levels, ranging from 19 to 48 dBA, at the closest structures to the Project are presented in tabular form in Table A-1 of Appendix A at all 768 discrete modeling receptors. These predicted sound levels which contain a wind turbine manufacturer-provided uncertainty factor of 2 dBA are "Project-only" and do not include any contributions from existing background sound sources.

The calculated maximum L_{10} values shown in Figure 6-1 and presented in Table A-1 include an adjustment of 1 dBA added to the modeled maximum L_{eq} turbine sound levels. This allows for the approximate conversion of L_{eq} to L_{10} sound levels used for evaluating compliance with the local noise limits, and is based on empirical data from several Epsilon Associates, Inc. measurement programs where wind turbines are the primary noise source.

In addition, data from a recent acoustical research study found similar results where the L_{10} sound level is approximately 1 dBA higher than the L_{eq} sound level.[5]

[5] RSG et al, "Massachusetts Study on Wind Turbine Acoustics," Massachusetts Clean Energy Center and Massachusetts Department of Environmental Protection, 2016.



Ball Hill Wind Project Hanover & Villenova, New York

Epsilon ASSOCIATES INC.

Figure 6-1

Maximum Project-Only L_{10} Sound Levels
Vestas V126-3.45 MW (11m/s at 87m HH)

7.0 EVALUATION OF SOUND LEVELS

7.1 Local Regulations

As presented in Table A-1 of Appendix A and illustrated in Figure 6-1, predicted L_{10} sound levels from the Project under conditions of maximum wind turbine sound output (corresponding to a hub height wind speed of 11 m/s) are less than or equal to the 50 dBA limit specified by the Towns of Hanover and Villenova at all receptors representing the closest structures to the Project.

With regard to "pure tones", as defined in §4.3, an evaluation of the maximum one-third octave-band sound power levels for the Vestas V126-3.45 model, provided by the turbine manufacturer, is presented in Table 7-1. This analysis indicates that even under conditions of maximum turbine sound power output, corresponding to hub height wind speeds of 11 m/s, no pure tones shall be emitted.

Table 7-1 Tonal Analysis: Vestas V126-3.45 Sound Power Level Emissions

One-Third Octave-band Center Frequency (Hz)	Sound Power Level[1] (dB)	Average Sound Power Level of Contiguous Bands (dB)	Difference between Sound Power Level and Contiguous Average[2] (dB)	Tonal Limit (dB)	Meets Tonal Limit?[3]
25	114.3	-	-	-	-
32	108.6	111.4	-3	15	Yes
40	108.5	108.4	0	15	Yes
50	108.1	107.9	0	15	Yes
63	107.3	106.8	0	15	Yes
80	105.5	106.0	0	15	Yes
100	104.6	105.1	0	15	Yes
125	104.6	103.4	1	15	Yes
160	102.1	103.3	-1	8	Yes
200	102.0	102.1	0	8	Yes
250	102.1	102.5	0	8	Yes
315	103.0	101.8	1	8	Yes
400	101.5	101.9	0	8	Yes
500	100.7	101.0	0	5	Yes
630	100.4	99.8	1	5	Yes
800	98.8	99.5	-1	5	Yes
1000	98.5	98.0	1	5	Yes
1250	97.1	95.9	1	5	Yes
1600	93.3	94.6	-1	5	Yes
2000	92.1	91.5	1	5	Yes
2500	89.7	89.2	1	5	Yes
3150	86.3	87.4	-1	5	Yes
4000	85.0	81.4	4	5	Yes
5000	76.5	76.8	0	5	Yes
6300	68.6	69.1	0	5	Yes

Table 7-1 Tonal Analysis: Vestas V126-3.45 Sound Power Level Emissions (Continued)

One-Third Octave-band Center Frequency (Hz)	Sound Power Level[1] (dB)	Average Sound Power Level of Contiguous Bands (dB)	Difference between Sound Power Level and Contiguous Average[2] (dB)	Tonal Limit (dB)	Meets Tonal Limit?[3]
8000	61.6	63.9	-2	5	Yes
10000	59.2	-	-	-	-

1. One-third octave-band sound power level for Vestas V126-3.45 turbine at hub height wind speeds of 11m/s
2. Rounded to the nearest whole number decibel
3. Compliance evaluation of "pure tone" criteria described in §4.3

Additionally, one-third octave-band received sound pressure levels were calculated at the closest structure (receptor #177) to a turbine (T15), accounting for geometric divergence and atmospheric absorption, at a distance of approximately 1,150 feet (350 meters). Results presented in Table 7-2 show that received sound pressure levels due to the wind turbines are not expected to result in any pure tones, as defined by the Towns of Hanover and Villenova.

Table 7-2 Tonal Analysis: Vestas V126-3.45 Received Sound Pressure Levels

One-Third Octave-band Center Frequency (Hz)	Received Sound Pressure Level[1] (dB)	Average Sound Pressure Level of Contiguous Bands (dB)	Difference between Sound Pressure Level and Contiguous Average[2] (dB)	Tonal Limit (dB)	Meets Tonal Limit?[3]
25	55.2	-	-	-	-
32	49.5	52.3	-3	15	Yes
40	49.4	49.2	0	15	Yes
50	49.0	48.8	0	15	Yes
63	48.2	47.7	1	15	Yes
80	46.4	46.8	0	15	Yes
100	45.4	45.9	0	15	Yes
125	45.4	44.1	1	15	Yes
160	42.8	44.0	-1	8	Yes
200	42.6	42.7	0	8	Yes
250	42.6	43.0	0	8	Yes
315	43.4	42.2	1	8	Yes
400	41.7	42.0	0	8	Yes
500	40.7	40.9	0	5	Yes
630	40.2	39.5	1	5	Yes
800	38.4	39.0	-1	5	Yes
1000	37.8	37.2	1	5	Yes
1250	36.0	34.7	1	5	Yes
1600	31.6	32.9	-1	5	Yes

Table 7-2 Tonal Analysis: Vestas V126-3.45 Received Sound Pressure Levels (Continued)

One-Third Octave-band Center Frequency (Hz)	Received Sound Pressure Level[1] (dB)	Average Sound Pressure Level of Contiguous Bands (dB)	Difference between Sound Pressure Level and Contiguous Average[2] (dB)	Tonal Limit (dB)	Meets Tonal Limit?[3]
2000	29.8	29.1	1	5	Yes
2500	26.7	25.6	1	5	Yes
3150	21.3	21.8	0	5	Yes
4000	16.9	12.7	4	5	Yes
5000	4.1	8.4	-4	5	Yes
6300	0.0	2.1	-2	5	Yes
8000	0.0	0.0	0	5	Yes
10000	0.0	-	-	-	-

1. Calculated sound pressure level due to a single turbine at a distance of ~1,150 feet (receptor #177), based on Vestas V126-3.45 one-third octave-band sound power levels for hub height wind speeds of 11 m/s
2. Rounded to the nearest whole number decibel
3. Compliance evaluation of "pure tone" criteria described in §4.3

Since no one-third octave-band data has been provided for the substation equipment, a tonal analysis for the proposed transformers has not been conducted. However, as part of the project design, Ball Hill Wind will specify a custom built transformer, and will include a specification that no prominent discrete tone will be created. This unit will be tested for sound after it is built.

7.2 NYSDEC Criteria

The predicted L_{eq} sound levels at the nearest structures presented in Table A-1 of Appendix A were compared to the existing ambient L_{eq} sound levels with respect to the NYSDEC criteria discussed in §4.4. As shown in Table 6-3, the calculated background sound level for the Project area at the "critical-case" hub height wind speed of 10 m/s is 44.1 dBA. In order for the Project to meet the suggested 6 dBA cumulative increase threshold recommended in the NYSDEC guidance document, L_{eq} sound levels from the Project should remain at or below 48.8 dBA. That is to say, a Project level of 48.8 dBA added to a background level of 44.1 dBA would result in a combined level of 50.1 dBA, which is 6 dBA above background, when rounded to the nearest whole decibel.

Maximum L_{eq} sound levels from the Project at all of the nearest structures are predicted to be no greater than 48.8 dBA even under conditions of maximum turbine sound power output. Additionally, future sound levels combining the Project with the existing background are anticipated to remain less than or equal to 50 dBA, well below the suggested 65 dBA threshold recommended in the NYSDEC guidance document.

7.3 Low Frequency Sound

Table 7-3 compares predicted maximum Project-only L_{10} sound levels in the 32, 63 and 125 Hz octave-bands to the equivalent outdoor sound pressure levels corresponding to the NC-30 noise criteria curve recommended for bedrooms and to levels associated with moderately perceptible vibration and rattle."[6] Results indicate that of the ten structures of greatest potential Project impact, predicted sound levels are well below both relevant criteria, indicating that no low-frequency sound impacts are expected.

Table 7-3 Predicted Worst-Case Low Frequency Sound Levels

Modeling Receptor ID	Sound Pressure Level (dB)		
	31.5 Hz	63 Hz	125 Hz
	(dB)	(dB)	(dB)
177	62	58	51
376	49	54	52
178	61	57	50
179	61	57	50
180	61	57	50
151	61	57	50
175	61	57	50
176	61	57	50
174	61	57	50
172	61	57	50
NC-30 Equivalent Outdoor Sound Pressure Levels	74	66	57
Equivalent Outdoor Sound Pressure Levels for Moderately Perceptible Vibration & Rattle	71	79	NA

Another metric commonly used to assess low frequency noise is the "C-weighted" sound level. For the Vestas V126-3.45 turbine, the maximum C-weighted sound level at any of the modeling receptors representing the closest structures to the Project is predicted to be less than or equal to 63 dBC. For context, ANSI Standard B133.8 "Gas Turbine Installation

[6] O'Neal, Robert D., Hellweg Jr., Robert D., Lampeter, Richard M. "Low Frequency Noise and Infrasound from Wind Turbines." Noise Control Engineering Journal 59.2 (2011): 139. Print.

Sound Emissions" describes a threshold of 75 to 80 dBC as the approximate level at which complaints and the perception of vibrations due to airborne sound may occur.

7.4 Construction Noise

A qualitative discussion of construction noise related to the proposed Ball Hill Wind Project can be found in §3.9 of Hessler's report.

8.0 CONCLUSIONS

A comprehensive sound level assessment conducted for the Ball Hill Wind Project indicates that predicted sound level impacts from the 29 proposed Vestas V126-3.45 wind turbine generators and two proposed electrical transformers are expected to meet the Town of Hanover and Town of Villenova noise limit at each of the closest structures to the Project. Additionally, the Project is anticipated to meet the suggested criteria recommended in the NYSDEC guidance document for avoiding the potential for adverse community noise impacts. No pure tones were identified in the sound power level spectra, nor in the calculated received sound pressure levels at the closest structure for the turbine model under consideration. Low frequency sound levels at the closest structures to the Project are also predicted to be well below the recommended criteria to avoid disturbance, vibration, and rattle indoors.

Due to the nature of wind turbine noise and the relative background sound levels in the area, noise from the project is likely to be audible at times at some of the closest residences. However, conservative modeling assumptions were made to account for the occasional occurrence of conditions which may favor propagation of sound from the Project or increase the perceptibility of turbine noise. A vast majority of the time, nominal sound levels from the project are likely to be significantly less than those predicted in this analysis, which are based on worst-case conditions. Project impacts are anticipated to meet state guidelines for minimizing adverse impacts as well as all local noise limits applicable to the Project.

Appendix A
Vestas V126-3.45 Sound Level Modeling Results

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
1	302835	265921	46	45
2	302817	265099	43	42
3	305211	265779	43	42
4	303337	270719	37	36
5	306582	273125	45	44
6	306448	273126	45	44
7	306310	273130	44	43
8	306063	273131	43	42
9	305523	273141	41	40
10	304592	271431	43	42
11	304524	271857	44	43
12	304464	272023	45	44
13	304408	272125	45	44
14	304370	272276	45	44
15	304291	272464	43	42
16	304288	272601	43	42
17	304129	272449	41	40
18	304063	272798	39	38
19	304054	272920	39	38
20	304025	273005	38	37
21	304089	273088	38	37
22	304345	273055	40	39
23	304667	273065	42	41
24	304815	273077	42	41
25	305292	273044	42	41
26	305322	273216	41	40
27	305800	273064	42	41
28	306179	273013	45	44
29	307071	272480	46	45
30	306588	264701	37	36
31	307892	265960	44	43
32	307805	266595	45	44
33	307706	266908	43	42
34	307670	267064	44	43
35	307651	267168	42	41
36	307650	267265	41	40
37	307520	267624	42	41
38	307696	267868	40	39
39	307640	267712	41	40
40	307788	268380	37	36
41	307746	268479	37	36
42	307714	268704	37	36

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting]	Y [Northing]		
	(m)	(m)		
43	307627	269003	37	36
44	307655	268993	36	35
45	307626	269084	36	35
46	307132	270187	41	40
47	301451	266094	36	35
48	301466	266093	36	35
49	301483	266092	36	35
50	301500	266093	36	35
51	301516	266092	36	35
52	301532	266092	36	35
53	301570	265944	36	35
54	301671	265836	36	35
55	301738	265672	35	34
56	301780	265566	35	34
57	301829	265450	35	34
58	301965	265234	35	34
59	302204	265039	34	33
60	302353	264933	35	34
61	303080	264353	38	37
62	303951	263822	43	42
63	303790	263883	42	41
64	303484	264028	40	39
65	304671	264182	44	43
66	301336	266118	36	35
67	301338	266177	36	35
68	301228	266832	40	39
69	301114	267071	41	40
70	301116	267164	41	40
71	301191	267536	45	44
72	301079	267623	43	42
73	301106	267708	44	43
74	301041	269283	35	34
75	302266	270414	34	33
76	302218	270455	33	32
77	302179	270309	33	32
78	302198	270031	35	34
79	302304	270136	35	34
80	302288	269923	36	35
81	302252	269847	36	35
82	303188	270587	37	36
83	303244	270812	37	36
84	303257	270903	36	35
85	303267	271364	36	35

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
86	303270	271133	36	35
87	303307	271057	36	35
88	306880	270386	43	42
89	305683	265239	40	39
90	305379	265538	42	41
91	304567	265903	45	44
92	304571	265747	44	43
93	302312	266233	43	42
94	302200	269222	38	37
95	306160	268107	45	44
96	303487	271309	37	36
97	303655	271379	38	37
98	303849	271296	39	38
99	304038	271224	40	39
100	304347	271236	42	41
101	304214	271187	41	40
102	304301	271181	41	41
103	304573	271057	43	42
104	305144	271018	44	43
105	305337	270967	44	44
106	305319	271039	45	44
107	306239	270659	46	45
108	306314	270535	46	45
109	306655	270474	45	44
110	305237	265757	43	42
111	305314	265779	43	42
112	305395	265887	44	43
113	304880	266010	44	43
114	304939	265943	43	42
115	305060	266030	44	43
116	305021	266071	44	43
117	304560	266685	46	45
118	304631	266714	46	45
119	304643	266268	45	44
120	304582	266553	46	45
121	304580	266336	46	45
122	304221	266066	47	46
123	304573	265716	44	43
124	304562	264878	47	46
125	304636	264824	46	45
126	303764	264620	48	47
127	302619	265214	42	41
128	302550	265807	43	42

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
129	302409	265930	43	42
130	302326	266139	43	42
131	302285	266277	43	42
132	302379	266514	45	44
133	302143	266794	44	43
134	302407	267041	46	45
135	302262	268044	45	44
136	302189	268440	43	42
137	302250	269039	39	38
138	302199	269120	38	37
139	302286	269264	38	37
140	302199	269635	37	36
141	302202	269733	36	35
142	302517	269746	37	36
143	302640	269518	38	37
144	302698	269540	38	37
145	302808	269389	39	38
146	303038	268970	41	40
147	303444	268430	44	43
148	303530	268156	46	45
149	303872	267853	47	46
150	303911	267922	47	46
151	303855	267569	48	47
152	304478	267032	46	45
153	304653	267271	45	44
154	304810	267574	47	46
155	304925	267717	47	46
156	306809	268168	45	44
157	306715	268173	45	44
158	306154	268298	43	42
159	305986	268102	44	43
160	305847	268175	44	43
161	305666	268187	44	43
162	307410	264695	36	35
163	307313	265066	38	37
164	307087	265268	40	39
165	307165	265160	39	38
166	307242	265245	40	39
167	306947	265758	45	44
168	306907	265874	46	45
169	306846	265982	46	45
170	306587	266276	47	46
171	306392	266522	47	46

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
172	306280	266803	48	47
173	306214	267120	48	47
174	306072	267387	48	47
175	305920	267565	48	47
176	305950	267530	48	47
177	305730	267653	49	48
178	305830	267632	48	47
179	305729	267720	48	47
180	305540	267818	48	47
181	305461	267962	46	45
182	305346	268213	45	44
183	305077	268412	46	45
184	305007	268430	47	46
185	305030	268499	46	45
186	305116	268483	45	44
187	304928	268671	47	46
188	304793	268945	47	46
189	304852	268940	46	45
190	304762	269125	46	45
191	304137	269816	45	44
192	304268	269771	45	44
193	304391	269573	46	45
194	304424	269508	46	45
195	304578	269443	46	45
196	304511	269528	46	45
197	304389	269720	45	44
198	304296	269893	45	44
199	303701	270372	40	39
200	304983	273128	42	41
201	305140	273136	41	40
202	305222	273197	41	40
203	307157	273030	41	40
204	307459	273045	40	39
205	307496	273029	39	38
206	307631	273047	39	38
207	307725	273122	38	37
208	307739	273054	38	37
209	307820	273167	37	36
210	307770	272626	40	39
211	308054	272278	40	39
212	307760	272313	43	42
213	307851	271897	43	42
214	307919	271835	42	41

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
215	307525	270039	38	37
216	306902	270361	42	41
217	305613	270835	44	43
218	305510	270866	44	43
219	305433	270887	44	43
220	303164	271210	35	34
221	304756	268970	47	46
222	307127	265624	44	43
223	305147	265883	43	42
224	304777	266410	45	44
225	303534	263922	40	39
226	302441	265831	43	42
227	305267	268124	46	45
228	302146	266999	45	44
229	302684	265087	41	40
230	303648	264766	47	46
231	303329	264680	44	43
232	303767	267050	47	46
233	300989	270263	29	28
234	300939	269870	29	28
235	300734	269991	29	28
236	301022	269877	29	28
237	300982	268255	41	40
238	301111	268150	43	42
239	301024	267891	43	42
240	301156	267779	45	44
241	301028	267753	43	42
242	301174	267287	43	42
243	301193	267155	41	40
244	301253	266981	41	40
245	301059	266053	36	35
246	300915	266057	35	34
247	301423	266076	36	35
248	301411	266064	36	35
249	301474	266013	36	35
250	301487	266028	36	35
251	301498	266042	36	35
252	301505	266053	36	35
253	301809	265370	34	33
254	302594	264485	35	34
255	302638	264095	36	35
256	302599	264129	35	34
257	302623	264141	36	35

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting]	Y [Northing]		
	(m)	(m)		
258	302474	265774	43	42
259	302146	266655	44	43
260	302141	266834	44	43
261	302241	267952	46	45
262	302140	268685	41	40
263	302277	268929	39	38
264	302169	269437	37	36
265	302088	269783	36	35
266	301866	269792	35	34
267	301782	269714	35	34
268	301654	269728	35	34
269	301431	269805	33	32
270	301343	269705	30	29
271	303123	268986	42	41
272	303921	267910	47	46
273	304227	267491	46	45
274	304561	266556	47	46
275	304942	263321	36	35
276	304823	263316	37	36
277	304725	263437	37	36
278	304669	263313	37	36
279	304602	263271	37	36
280	304593	263236	37	36
281	304584	263172	36	35
282	304488	263322	38	37
283	304544	263298	37	36
284	304696	263398	37	36
285	304686	263355	37	36
286	304728	263326	37	36
287	304851	263295	36	35
288	304895	263345	36	35
289	304593	263315	37	36
290	304617	263316	37	36
291	304645	263313	37	36
292	304581	263360	38	37
293	304627	263358	37	36
294	304653	263358	37	36
295	304537	263360	38	37
296	304453	263302	37	36
297	304406	263272	37	36
298	304345	263191	37	36
299	304276	263213	37	36
300	304583	263402	38	37

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
301	304509	263395	38	37
302	304542	263426	38	37
303	304661	263637	39	38
304	304864	263672	39	38
305	304841	263664	39	38
306	304892	263698	38	37
307	304917	263762	39	38
308	304758	263678	39	38
309	304749	263627	39	38
310	304954	263720	38	37
311	304594	263625	40	39
312	304523	263682	41	40
313	307076	265245	40	39
314	307835	268700	36	35
315	307798	268862	36	35
316	305581	267840	47	46
317	304039	272195	41	40
318	304193	272856	40	39
319	304005	273128	37	36
320	304187	273074	39	38
321	307847	272022	43	42
322	307885	271567	42	41
323	307710	269011	36	35
324	307523	269182	36	35
325	306815	270457	43	42
326	306226	270568	46	45
327	303952	278773	27	27
328	303934	278769	27	27
329	303935	278785	27	27
330	304005	278574	27	26
331	304041	278582	26	26
332	303890	278654	28	27
333	303403	279128	33	33
334	303832	278880	28	28
335	303275	279101	35	35
336	303091	279223	37	37
337	303100	279250	36	36
338	303538	279105	31	31
339	302881	279231	40	40
340	303566	278929	31	31
341	302951	279115	41	41
342	302998	279106	40	40
343	303006	279100	40	40

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
344	302998	279118	40	40
345	303097	279223	37	37
346	303057	279270	32	32
347	303071	279258	37	37
348	303110	279185	37	37
349	303122	279219	36	36
350	303233	279088	35	35
351	303251	279094	35	35
352	303238	279099	35	35
353	303282	279118	35	35
354	303301	279125	34	34
355	303346	279129	33	33
356	303333	279140	34	34
357	303414	279115	33	33
358	303254	279332	33	33
359	303253	279352	33	33
360	303253	279279	34	34
361	303260	279244	34	34
362	303418	279128	32	32
363	303458	279204	27	27
364	303577	279117	31	30
365	303574	279138	31	30
366	303531	279202	26	26
367	302890	279200	41	41
368	302619	278608	38	38
369	302618	278611	38	38
370	302600	278617	38	38
371	302536	278563	37	37
372	302490	278574	36	36
373	302425	278783	39	39
374	302879	279189	41	41
376	302604	278985	47	47
377	302593	279152	42	42
378	302598	279152	42	42
379	302596	279146	42	42
380	302495	279286	38	38
381	302508	279284	38	38
382	302514	279263	38	38
383	302527	279271	38	38
384	302545	279181	41	41
385	302502	279197	39	39
386	302470	279144	40	40
387	302439	279096	40	40

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
388	302444	279126	39	39
389	302424	279132	39	39
390	302411	279141	38	38
391	302435	279216	38	38
392	302419	279197	38	38
393	302394	279207	37	37
394	302375	279201	37	37
395	302330	279194	36	36
396	302314	279193	36	36
397	302660	277826	28	28
398	302622	277825	28	28
399	302622	277912	29	29
400	302611	277896	29	28
401	302528	277916	29	28
402	302621	278357	34	34
403	302623	278150	31	31
404	302599	278137	31	31
405	302621	278208	32	32
406	302600	278189	31	31
407	302601	278340	33	33
408	302611	278359	34	34
409	302594	278377	34	34
410	302613	278425	35	35
411	302592	278441	35	35
412	302617	278450	35	35
413	302630	278469	36	36
414	302625	278479	36	36
415	302600	278486	36	36
416	302674	278547	37	37
417	302664	278554	37	37
418	302608	278545	37	37
419	302624	278556	37	37
420	302416	278043	29	29
421	302457	278037	29	29
422	302532	278046	30	30
423	302461	278204	31	31
424	302437	278232	31	31
425	302435	278240	31	31
426	302491	278276	32	32
427	302525	278289	32	32
428	302519	278290	32	32
429	302523	278305	33	33
430	302482	278396	34	34

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
431	302512	278421	34	34
432	302509	278476	35	35
433	302519	278494	35	35
434	302531	278548	36	36
435	303814	277735	25	25
436	303778	277598	25	25
437	303688	277646	25	25
438	303670	277655	26	25
439	303656	277599	25	25
440	303789	277581	23	22
441	303798	277696	25	25
442	303795	277810	26	25
443	303785	277852	26	26
444	303772	277832	26	26
445	303734	277884	26	26
446	303497	277946	27	27
447	303492	277948	27	27
448	304581	277748	23	22
449	304491	277803	23	22
450	304389	277614	21	20
451	304353	277657	21	21
452	304343	277644	20	20
453	304340	277620	20	20
454	304302	277600	21	20
455	304255	277573	23	23
456	304298	277736	24	24
457	304480	277933	24	24
458	304456	277901	24	24
459	304298	277747	25	24
460	304220	277620	20	19
461	304171	277641	23	22
462	304185	277629	22	22
463	304193	277614	24	23
464	304114	278250	25	25
465	304062	278044	25	25
466	304047	278062	25	25
467	304010	278061	26	25
468	304025	278433	26	26
469	304064	278417	26	26
470	304058	278432	26	26
471	304048	278455	26	26
472	304045	278488	26	26
473	304055	278488	26	26

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
474	304053	278499	26	26
475	303871	276634	22	21
476	304260	277555	23	23
477	304114	276890	22	21
478	304426	276850	22	21
479	304391	276793	22	21
480	304139	276763	22	21
481	304174	277440	21	20
482	304066	277477	24	23
483	304038	277478	24	23
484	304072	277506	24	23
485	304177	277467	23	23
486	303284	277367	26	25
487	302870	276586	22	21
488	303593	276574	22	21
489	303774	276667	22	21
490	303778	276677	22	21
491	303758	276693	22	21
492	303703	276700	22	21
493	303023	276577	23	22
494	303543	276674	22	22
495	303569	276654	22	21
496	303577	276637	22	21
497	303562	276614	22	21
498	303533	276627	22	21
499	303475	276619	22	21
500	303414	276817	22	22
501	303420	276831	22	22
502	303391	276833	22	22
503	303402	276867	22	22
504	303417	276872	22	22
505	303405	276903	22	22
506	303677	276940	22	22
507	303569	277166	23	23
508	303574	277167	23	23
509	303039	277134	25	25
510	303026	277080	25	24
511	303041	277068	25	24
512	303039	277049	25	24
513	303385	277133	24	24
514	303436	277123	24	24
515	303494	277078	23	23
516	303505	277077	23	23

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
517	303535	277098	23	23
518	303514	277141	24	23
519	303602	277112	23	23
520	303585	277102	23	23
521	303592	277177	23	23
522	303592	277165	23	23
523	303566	277158	23	23
524	303559	277257	24	24
525	303590	277285	24	24
526	302437	276861	22	22
527	302444	276583	24	24
528	302329	276605	24	23
529	302269	276682	24	23
530	302354	276951	23	22
531	302775	277268	25	25
532	302447	277249	23	23
533	302385	277112	25	24
534	302359	277114	25	24
535	302317	277052	25	24
536	302574	277464	26	26
537	302585	277491	26	26
538	302555	277494	26	26
539	302567	277548	26	26
540	302581	277522	26	26
541	302589	277345	24	23
542	302607	277328	23	23
543	302710	277501	26	26
544	302761	277502	26	26
545	302696	277368	26	25
546	302739	277344	26	25
547	302724	277233	25	25
548	302616	277181	20	20
549	302632	277198	21	20
550	302695	276984	25	24
551	302561	277113	20	20
552	302544	277123	20	20
553	302393	277115	23	23
554	302492	276944	21	20
555	302483	276963	21	21
556	302426	276888	22	22
557	302378	276946	23	22
558	302175	276994	25	24
559	302143	276966	24	24

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
560	302069	276570	23	22
561	302290	276698	24	23
562	302306	276680	24	23
563	302357	276664	24	23
564	302380	276640	24	23
565	302123	275860	23	22
566	302107	275843	23	22
567	302304	276378	24	23
568	302316	276317	24	23
569	302068	276554	23	22
570	302102	276544	23	22
571	302242	275955	24	23
572	302128	276238	24	23
573	302206	276138	24	23
574	302299	276305	24	23
575	302286	276332	24	23
576	302213	276401	24	23
577	302211	276412	24	23
578	302213	276429	24	23
579	302221	276447	24	23
580	302281	276395	24	23
581	302278	276448	24	23
582	302294	276468	24	23
583	302672	275736	22	21
584	302830	276122	22	21
585	302826	276059	22	21
586	302213	276156	24	23
587	302134	276216	24	23
588	302137	276190	24	23
589	302132	276027	24	23
590	302163	276027	24	23
591	302144	275889	24	23
592	302119	275877	23	22
593	302702	275709	22	21
594	303087	275724	23	22
595	303138	275715	23	22
596	302923	276004	22	21
597	303047	276313	22	21
598	303156	275712	23	22
599	302873	275849	22	21
600	303704	275741	27	26
601	302872	276178	22	21
602	303602	276452	22	21

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
603	303608	276369	22	21
604	303250	276479	22	21
605	303273	276502	22	21
606	303143	276144	22	21
607	303160	276093	22	21
608	303112	276107	22	21
609	303105	276084	22	21
610	303022	275973	22	21
611	303026	275955	22	21
612	303011	275949	22	21
613	302940	276007	22	21
614	302891	275962	22	21
615	302866	276041	22	21
616	302880	276073	22	21
617	302901	275980	22	21
618	304564	275585	28	28
619	304709	276334	27	26
620	304721	276467	26	26
621	304717	276314	27	26
622	304698	276396	27	26
623	304592	276412	26	26
624	304568	276352	27	26
625	304568	276378	27	26
626	304447	276374	26	25
627	304436	276397	26	25
628	304594	276036	27	27
629	304610	276009	28	27
630	304630	275944	28	27
631	304622	275922	28	27
632	304595	275900	28	27
633	304596	275886	28	27
634	304593	275781	28	27
635	304583	275785	28	27
636	304620	275871	28	27
637	304494	276013	27	26
638	304433	275853	27	26
639	304408	275874	27	26
640	304535	275796	28	27
641	304583	275611	28	27
642	304619	275749	28	27
643	304681	275775	28	27
644	304284	275074	30	29
645	304621	275515	29	28

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
646	304543	275188	30	29
647	303460	274849	28	27
648	303237	275436	27	26
649	302229	275008	23	22
650	302756	274888	27	26
651	302500	275138	23	22
652	302463	275086	23	22
653	302459	275095	23	22
654	302473	275057	23	22
655	302469	275046	23	22
656	302432	275049	23	22
657	302408	275159	23	22
658	302260	274966	23	22
659	302309	274975	23	22
660	302277	274948	23	22
661	302289	274924	23	22
662	302237	274924	23	22
663	302218	274937	23	22
664	302241	275031	22	22
665	302192	274991	22	22
666	302185	275005	22	22
667	302162	274974	22	22
668	302148	274978	22	22
669	302150	274913	23	22
670	302154	274882	23	22
671	303589	273856	33	32
672	303084	273630	31	30
673	303539	274238	31	30
674	303344	274105	31	30
675	303566	273944	32	31
676	303563	273943	32	31
677	303143	273583	32	31
678	302979	273579	31	30
679	302935	273579	31	30
680	302903	273610	31	30
681	302937	273604	31	30
682	303062	273617	31	30
683	303174	273595	32	31
684	303252	273734	32	31
685	303240	273795	32	31
686	303309	273650	32	31
687	303323	273659	32	31
688	303372	273636	33	32

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
689	303408	273711	32	31
690	303426	273712	32	31
691	303360	273776	32	31
692	303371	273784	32	31
693	303379	273778	32	31
694	303400	273801	32	31
695	303410	273792	32	31
696	303530	273846	32	31
697	303564	273866	32	31
698	303847	273887	33	32
699	303825	273893	33	32
700	303812	273958	33	32
701	304296	273918	34	33
702	304200	273757	35	34
703	304214	273744	35	34
704	304183	273653	35	34
705	304164	273671	35	34
706	304044	273623	35	34
707	304022	273633	35	34
708	304793	274253	34	33
709	304598	274231	33	32
710	304596	274236	33	32
711	304512	274234	33	32
712	304678	274071	34	33
713	303961	274013	33	32
714	303955	274055	33	32
715	303976	274046	33	32
716	303986	274097	33	32
717	304070	274025	33	32
718	304060	274087	33	32
719	304074	274125	33	32
720	304060	274118	33	32
721	304169	274172	33	32
722	304163	274138	33	32
723	304229	274173	33	32
724	304217	274163	33	32
725	304244	274057	34	33
726	304237	274082	33	32
727	304287	274112	33	32
728	304462	274198	33	32
729	304490	274204	33	32
730	304561	274239	33	32
731	304838	274286	34	33

Table A-1
Predicted Sound Level Modeling Results
Vestas V126-3.45

Receptor ID	NAD 1983 State Plane New York West FIPS 3103		L10 Sound Level (dBA)	Leq Sound Level (dBA)
	X [Easting] (m)	Y [Northing] (m)		
732	305074	274244	34	33
733	305560	273641	38	37
734	305097	274231	34	33
735	304962	274353	33	32
736	304938	274369	33	32
737	304924	274382	33	32
738	307620	273580	36	35
739	307632	273587	36	35
740	307635	273601	36	35
741	307656	273453	36	35
742	307654	273429	37	36
743	307379	273236	39	38
744	307447	273233	39	38
745	306837	273553	39	38
746	305172	273449	39	38
747	304420	273191	39	38
748	303963	273412	36	35
749	304145	273388	37	36
750	304648	273235	40	39
751	304655	273215	40	39
752	304640	273211	40	39
753	304640	273231	40	39
754	303943	273445	35	34
755	304097	273432	36	35
756	304103	273413	36	35
757	304139	273360	37	36
758	304031	273230	37	36
759	304012	273245	37	36
760	304133	273206	38	37
761	304136	273216	38	37
762	304324	273193	39	38
763	304354	273184	39	38
764	303636	273239	35	34
765	302990	273552	31	30
766	303145	273489	32	31
767	303149	273489	32	31
768	303655	273231	35	34
769	303649	273255	35	34