

**STATE ENVIRONMENTAL QUALITY REVIEW ACT  
NOTICE OF INTENT TO ACT AS SEQRA LEAD AGENCY**

Dated: June 13, 2018

This notice is issued pursuant to 6 NYCRR Part 617 of the regulations, implementing Article 8 of the Environmental Conservation Law, together known as the State Environmental Quality Review Act ("SEQRA").

The Town Board of the Town of Villenova (the "Town Board") previously acted as Lead Agency for the Ball Hill Windpark. An application to modify the prior approval and applicable local laws has been submitted and the Town Board has determined that the action described below is subject to SEQRA and may involve one or more other involved or interested agencies. The Town Board has made a preliminary determination that this is a Type I action in accordance with 6 NYCRR §617.6(a)(1)(iv), requiring coordinated review. The Town Board has stated its intent to act as Lead Agency. In the absence of written objections from any other involved agencies within thirty (30) days from the date of this notice, the Town Board will re-assume the Lead Agency role for this action pursuant to 6 NYCRR §617.6(b)(3)(i).

The applications, plans and full Environmental Assessment Form are attached for your information.

**Name of Action: Ball Hill Windpark**

**SEQR Status:** Type I

**Description of Action:** The Project has been approved for construction in the Towns of Villenova and Hanover, Chautauqua County, New York at various locations, and proposes the construction and operation of a wind energy facility and associated infrastructure including but not limited to access roads, collection and transmission lines, and substation(s). The current application would modify the Special Use Permit and applicable local laws to allow taller turbines, and also reflect reduced impacts, such as the removal of the transmission line and one substation and reduction of wetlands impacts.

**Other Interested and/or Involved Agencies:**

1. New York State Department of Environmental Conservation (Albany and Region 9)
2. New York State Office of Parks, Recreation and Historic Preservation
3. State of New York Department of Transportation - Region Five
4. New York State Department of Public Service - PSC

5. United States Department of the Interior
6. U.S. Army Corps of Engineers - Pittsburgh District
7. Town of Villenova Highway Superintendent
8. Chautauqua County Highway Department
9. Chautauqua County Planning Department
10. Chautauqua County IDA
11. New York State Department of Agriculture and Markets
12. Town of Hanover
13. New York State Energy and Research Development Agency

**For Further Information:**

Contact Person: Daniel A. Spitzer, Esq.  
Hodgson Russ, LLP  
Address: 140 Pearl Street, Suite 100  
Buffalo, New York 14202

**Date of Mailing:** June 13, 2018

LOCAL LAW  
INTRODUCTION NO. 1 OF 2018  
OF THE TOWN OF VILLENNOVA

**A LOCAL LAW TO AMEND SECTION 690.09(A)(13) OF THE ZONING LOCAL LAW OF THE TOWN OF VILLENNOVA TO INCREASE THE MAXIMUM HEIGHT AND REQUIRED SETBACK OF ANY WIND ENERGY CONVERSION SYSTEM ("WECS") COMMONLY KNOWN AS A "WIND TURBINE" OR "WINDMILL"**

*Be it enacted by the Town Board of the Town of Villenova as follows:*

**Section 1** Section 690.07(A)(5)(h) of Article VI-A, Wind Energy Facilities, of the Zoning Local Law of the Town of Villenova is amended to read

(h) To demonstrate compliance with the setback requirements of this Article, circles drawn around each proposed tower location equal to:

- (i) One and a half times the tower height radius.
- (ii) Five-hundred ninety-nine foot radius.
- (iii) One-thousand two-hundred foot radius.

**Section 2.** Section 690.09(A)(13) of Article VI-A, Wind Energy Facilities, of the Zoning Local Law of the Town of Villenova is amended to read

13. The maximum Total Height of any WECS shall be 599 feet.

**Section 3.** Section 690.12(E) of Article VI-A, Wind Energy Facilities, of the Zoning Local Law of the Town of Villenova) is amended to read

1. 599 feet from the nearest Site boundary property line, except the setback shall be 599 feet where the boundary is with state, county, town, or village-owned property.

2. 599 feet from the nearest public road.

3. 1,000 feet from the nearest off-Site residence existing at the time of application, measured from the exterior of such residence.

4. 100 feet from state-identified wetlands. This distance may be adjusted to be greater or lesser at the discretion of the reviewing body, based on topography, land cover, land uses, and other factors that influence the flight patterns of resident birds.

5. 500 feet from gas wells, unless waived in writing by the property owner and well owner.

§ 2. Effective Date.

This local law shall take effect upon its filing with the Secretary of State in accordance with the Municipal Home Rule Law.

LOCAL LAW  
INTRODUCTION NO. 2 OF 2018  
OF THE TOWN OF VILLENNOVA

**A LOCAL LAW TO AMEND THE ZONING MAP OF THE TOWN OF VILLENNOVA TO  
CREATE A WIND OVERLAY DISTRICT**

*Be it enacted by the Town Board of the Town of Villenova as follows:*

Section 1. The official map of the Town of Villenova is amended amend the wind overlay zone, as shown on the attached map.

Section 2. Effective Date.

This local law shall take effect upon its filing with the Secretary of State in accordance with the Municipal Home Rule Law.

**RESOLUTION OF THE TOWN BOARD OF THE TOWN OF  
VILLENOVA ACCEPTING THE APPLICATION FOR THE  
MODIFICATION OF THE PROPOSED BALL HILL WINDPARK,  
STATING THE TOWN BOARD’S INTENT TO ACT AS LEAD  
AGENCY ON THE MODIFICATION APPLICATION,  
INTRODUCING LOCAL LAW INTRODUCTION NO. 1 OF 2018  
MODIFYING THE TOWN OF VILLENOVA WIND ENERGY  
FACILITIES LAW AND LOCAL LAW INTRODUCTION NO. 2 OF  
2018 MODIFYING THE WIND OVERLAY DISTRICT, CALLING  
FOR A PUBLIC HEARING ON THE PROPOSED MODIFICATION  
AND THE PROPOSED LOCAL LAWS, AND REFERRING THE  
PROPOSED MODIFICATION AND THE LOCAL LAWS TO THE  
TOWN AND COUNTY PLANNING BOARDS**

WHEREAS, the Ball Hill Windpark has been approved in the Town of Villenova and the Town of Hanover (the “Project”); and

WHEREAS, Ball Hill Wind Energy, LLC (“Ball Hill”) has submitted an application (the “Application”) to the Town of the Villenova to modify the Special Use Permit for the Project, and the existing Wind Overlay District, as well as for an amendment of the Wind Energy Facilities Law of the Town of Villenova, as amended (the “Wind Energy Facilities Law”); to raise the maximum height and amend the setbacks and

WHEREAS, the Town Board of the Town of Villenova and its consultants have reviewed the application for completeness in accordance with the requirements of Wind Energy Facilities Law; and

WHEREAS, The Town Board wishes to reestablish itself as Lead Agency for review of the proposed modification pursuant to the State Environmental Quality Review Act (“SEQRA”)

NOW THEREFORE, based on such review and consideration, the Town Board of the Town of Villenova hereby

1. Declares that the Ball Hill Windpark Modification Application is complete.
2. As required by §690.08(E) of the Wind Energy Facilities Law, Ball Hill shall post the completed Application on the Internet.
3. Local Law Introduction No. 1 of 2018 modifying the Town of Villenova Wind Energy Facilities Law and Local Law Introduction No. 2 of 2018 modifying the Wind Overlay District, copies of which are attached, are hereby introduced.
4. The Application and the Local Law Introductions are hereby referred to the Town and County Planning Boards.
5. The Town Board hereby declares the Application and the Local Laws to be Type I actions, and adopts the attached Notice of Intent to act as Lead Agency under SEQRA

6. U.S. Army Corps of Engineers - Pittsburgh District
7. Town of Villenova Highway Superintendent
8. Chautauqua County Highway Department
9. Chautauqua County Planning Department
10. Chautauqua County IDA
11. New York State Department of Agriculture and Markets
12. Town of Hanover

**For Further Information:**

Contact Person: Daniel A. Spitzer, Esq.  
Hodgson Russ, LLP  
Address: 140 Pearl Street, Suite 100  
Buffalo, New York 14202

**Date of Mailing:** June 13, 2018

# CHAUTAUQUA COUNTY MUNICIPAL ZONING REFERRAL FORM

April 2015

SEND TO:  
CHAUTAUQUA COUNTY PLANNING BOARD  
c/o COUNTY PLANNING DIVISION  
200 HARRISON ST.  
JAMESTOWN, NY 14701

<b>FOR COUNTY USE ONLY:</b>	
MUNICIPALITY:	_____
DATE RECEIVED:	_____
POSTMARK DATE:	_____
HEARING DATE:	_____
DECISION DATE:	_____
DATE COUNTY RESPONSE SENT	_____

**1. TYPE OF ACTION:**

- |   |  |
|---|--|
| <input checked="" type="checkbox"/> Zoning Ordinance or Local Law (Adopt / Amend) | <input type="checkbox"/> Site Plan Approval            |
| <input type="checkbox"/> Comprehensive Plan (Adopt / Amend)                       | <input checked="" type="checkbox"/> Special Use Permit |
| <input type="checkbox"/> Use Variance   | <input type="checkbox"/> Area Variance                 |

**2. REASON FOR REFERRAL: affects property lying within 500 feet of:** (Please check all that apply.)

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Municipal Boundary * (name) _____           | <input checked="" type="checkbox"/> County or State Road Route # _____  |
| <input type="checkbox"/> County-Owned Drainage Channel                          | <input checked="" type="checkbox"/> Operating Farm Located in a State Certified Ag District (except area variances) |
| <input type="checkbox"/> Existing/Proposed County/State Park or Recreation Area | <input type="checkbox"/> County or State owned land with Public Bldg.   |

\* Has neighboring municipality been notified 10 days prior of hearing date for special use permit, use variance, or site plan approval per NYS Gen. Municipal Law 239-nn?  Yes  No  Not Applicable

**3. NAME OF APPLICANT:** \_\_\_\_\_

**TAX PARCEL #:** Sect \_\_\_\_\_ Block \_\_\_\_\_ Lot \_\_\_\_\_; Sect \_\_\_\_\_ Block \_\_\_\_\_ Lot \_\_\_\_\_; Sect \_\_\_\_\_ Block \_\_\_\_\_ Lot \_\_\_\_\_

**STREET ADDRESS:** N/A

**ZONING DISTRICT:** Wind Overlay

**4. GENERAL DESCRIPTION OF PROPOSED PROJECT** IN ENOUGH DETAIL TO ALLOW THE COUNTY PLANNING BOARD TO EVALUATE ITS POTENTIAL IMPACTS – INCLUDE CONCERNS IDENTIFIED BY REFERRING MUNICIPALITY (attach additional page if needed).

Amended SUP for Ball Hill Wind Farm and Local Laws regulating height and setbacks,  
and establishing Overlay District.

**5. SUPPORTING DOCUMENTS:** Please check all information requested below, unless not required by your board to make its decision, and **attach**:

- |   |   |
|---|---|
| <input checked="" type="checkbox"/> Completed Environmental Assessment Form   | <input type="checkbox"/> Basic sketch of the proposal   |
| <input checked="" type="checkbox"/> Location map with scale   | <input checked="" type="checkbox"/> <b>Copy of applicable zoning ordinance or law section</b> |
| <input checked="" type="checkbox"/> In the case of the adoption or amendment of a zoning ordinance or local law, the complete text of the proposed ordinance or local law as well as all existing provisions. |   |
| <input checked="" type="checkbox"/> Other(s) <b>Application</b>   |   |

**6. WHY ACTION IS NEEDED** (e.g. 5 foot side yard request while law requires 10 feet; required parking not provided; not use by right; use not allowed in district, etc. – attach page if additional space needed):

To allow taller towers; new technology requires updates

**7. PREVIOUS REQUEST:** Has this request been made in the past?  Yes  No If yes, why was it denied/withdrawn?

**For the main Project**

**8. WETLANDS/PROTECTED WATER BODIES/FLOOD ZONE//DRAINAGE:**

Is land in question in a designated state\* or federal wetland?  Yes  No  Unknown

\* ( If unknown, this information can be obtained from the NYS DEC at (716) 372 – 0645 )

Will the project result in disturbance of land within 50 feet of the bed or banks of a protected water body?

Yes  No  Unknown

Is land in question within a flood zone as shown on National Flood Insurance rate maps?

Yes  No  Unknown

Will project result in short or long-term drainage problems?

Yes  No  Unknown

**9. STATE ENVIRONMENTAL QUALITY REVIEW ACT (SEQR) :** (Please check all that apply.)

Type I action (Requires long Environmental Assessment Form [EAF], requires designation of Lead Agency) –  
Lead Agency for this action \_\_\_\_\_

Unlisted action (Requires short EAF, long EAF optional, coordination for Lead Agency optional)

Type II action (Not subject to SEQR review according to Part 617.5)

**10. WATER & SEWAGE:**

Is municipal water available for this project?

Yes  No  Not Applicable

If no, will sufficient well water be available?

Yes  No  Unknown

Are municipal sewers available for this project?

Yes  No  Not Applicable

If no, has on-site treatment system been approved?

Yes  No  Unknown

**11. TRAFFIC SAFETY:**

Will this project have an impact on traffic safety and/or congestion?  Yes  No  Unknown

Describe impact and mitigation measures to relieve negative impacts:

\_\_\_\_\_  
\_\_\_\_\_

**12. PRESENT CHARACTER OR USE OF PROPERTY IN QUESTION** (e.g. - single-family house, commercial use, farm / agriculture, woods, etc.):

**Agricultural**

**CHARACTER OF NEIGHBORING PROPERTY:** (e.g. - uses or structures, and zoning district):

	CHARACTER	ZONE		CHARACTER	ZONE
NORTH:			SOUTH:		
EAST:			WEST:		

13. **PUBLIC HEARING:** Date 6/26 Time: 7pm **FINAL DECISION:** Date \_\_\_\_\_ Time: \_\_\_\_\_

14. **FROM:** Town / Village / City of Villenova Date \_\_\_\_\_

**REFERRING OFFICIAL (Must be the chair of the board that will make a decision regarding this zoning referral)**

Chair, ZBA  Chair, Planning Board  Mayor  Supervisor  Council Chair

Name & Mailing address of above Referring Official: Rich Ardillo, Town Supervisor,

1094 Butcher Road, South Dayton, NY 14138. Phone 716 988-3476

Signature of Referring Official as listed above: \_\_\_\_\_

Building Inspector/Zoning Officer or other person who can provide additional information:

Daniel Spitzer, Esq. Phone 716 848 1420



**Application of Ball Hill Wind LLC to modify the Special Use Permit for Wind Energy Facilities Issues in December 2016 and to Amend Villenova Local Law No. 1 of 2007 to increase the maximum height and required setbacks for WECS and modify the Wind Overlay District**

**Town of Villenova, Chautauqua County, NY**

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## **Ball Hill Wind Energy Project 2018 Application**

### **Executive Summary**

Ball Hill Wind Energy, LLC (“Ball Hill” or “Applicant”) continues to propose the development, construction, ownership, operation and maintenance of an approximately 100.5 MW wind energy facility to be known as the "Ball Hill Wind Energy Project" in Chautauqua County, New York. The Ball Hill Wind Energy Project will be located in portions of the Towns of Villenova and Hanover, and will produce electricity from wind, a renewable energy source. The Project as described herein is a modification of the previously approved Ball Hill Wind Energy Project, utilizing the same Project Area but incorporating new turbine technology and a minor modification to the Project layout.

Ball Hill hereby submits an application to modify the Wind Overlay Zone District and amend the Special Use Permit for wind energy facilities issued in December 2016 and to amend Villenova Local Law No. 1 of 2007 entitled “Wind Energy Facilities Law” (“Wind Law”) to (i) increase the maximum height restriction from 495 feet up to 599 feet, (ii) to increase the required setbacks from Site boundary property lines and roads from 500 feet to 599 feet, (iii) to amend the application requirements for demonstration of compliance with applicable setbacks to require a circle drawn from the turbine center from 500 feet to 599 feet, and (iv) to modify the Wind Overlay District.

The Project remains essentially the same as approved in December 2016 with the exception of the following: (i) all of the 29 previously approved Wind Energy Conversion Systems (“WECS”) will be increased in height, subject to an approved maximum of 599 feet, (ii) three (3) turbines will be shifted less than 135 feet so that all 29 WECS will meet the new minimum setback requirement or have setback waivers as needed, (iii) the previously approved 5.7 mile 115 kV overhead transmission line (“OTL”) is eliminated and will be replaced with four +/- 5.0 mile predominantly underground circuits, and (iv) the southern collection substation (Collection Substation) and associated facilities will be eliminated. These changes will allow for the use of newer, more efficient turbine technology that was not available for this Project in 2016 (the “2016 Application”), and reduce a variety of impacts associated with the 2016 permitted layout. The proposed layout for the Project is shown in Figure 1.

### **Project Description**

Ball Hill submits this 2018 Application to accommodate modifications of the previously approved Special Use Permit for the Project utilizing the same Project area in the Wind Overlay District established in 2016 (modified as proposed herein), but will incorporate new turbine technology and retain essentially the same Project layout.

Consistent with the 2016 Application, once constructed the Ball Hill Wind Energy Project will consist of 29 WECS (23 of which will be located in Villenova and 6 of which will be located in Hanover). The Project will also include ±13 miles of gravel roads to provide access to the WECS as well as ±26 miles of buried electrical collection lines to connect the WECS and to bring the electricity generated by the WECS to a new interconnection substation, to be integrated into the power grid. The 2018 Application increases the maximum height of the WECS to 599 feet, eliminates the previously approved 5.7-mile 115kV overhead transmission line (“OTL”), eliminates the southern collection substation (Collection Substation), and replaces the OTL with four ±5.0-mile 34.5 kV predominantly underground circuits. The collection lines in the generation area will be predominantly underground and, to the extent practicable, follow existing rights-

of-way and roads and the underground  $\pm 5.0$ -mile circuits will essentially follow the same right-of-way as the previously approved OTL. The proposed operations and maintenance building remains unchanged (collectively, the “Project”).

As of this application, the Project proposes and analyzes the Vestas V136 3.45MW wind energy conversion systems (the “V136 turbine”), on 105-meter towers<sup>1</sup>. The V136 turbine is a three-bladed, upwind, horizontal-axis wind turbine with a rotor diameter of  $\pm 446$  feet (136 meters). The blades will be approximately 121 feet (37 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 WECS is  $\pm 586$  feet (177 meters) when a rotor blade is at the top of its rotation. Once installed, each WECS will occupy a round, slightly exposed base approximately 78 feet (23.8 meters) in diameter. The Visual Impacts Technical Memo prepared for this submittal, and included herein as Appendix E, assumes an approved maximum blade tip height of 599 feet.

## **Project Background**

Upon receipt of an Amended Application from Ball Hill in October 2015, the Town of Villenova Town Board (“Board”) confirmed its status as 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 Amended Application. In January 2016, the Board received, reviewed and accepted a Supplemental Draft Environmental Impact Statement (“SDEIS”) and held a public hearing on the SDEIS and opened a  $\pm 45$ -day comment period. As described in the SDEIS, the Project then proposed the construction of 36 WECS – either Vestas 110 2.2MW or GE 2.3MW, or an equivalent WECS– and associated electrical collection lines, access roads, operations and maintenance building, approximately 5.7 miles of 230kv electrical overhead transmission line terminated by a new collection substation and an interconnection switchyard. Comments from the NYS Public Service Commission (“NYSPSC”), NYS Department of Environmental Conservation (“NYSDEC”), and members of the public were received regarding the SDEIS.

In September 2016, 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, Ball Hill submitted an Amended Application reducing the number of WECS to 29, each generating 3.45MW of electricity at revised locations (“2016 Amended Application”). The Board accepted the Amended Application as complete and held a public hearing on the Amended Application. As a result of the reduction of the number of WECS and the revised locations, the Project reduced the need for ancillary facilities as described above, avoided and/or minimized related impacts while maintaining the  $\pm 100$  MW capacity for electrical production. All impact studies associated with this revised design were updated and included in the Final Environmental Impact Study (“FEIS”) which Board issued in November 2016. In December 2016, the Board issued SEQRA Findings determining that the Project had mitigated or avoided any significant environmental impacts to the maximum extent practicable and that the benefits of the Project to the community outweighed the resulting Project related impacts.

In December 2016, the Board issued a Special Use Permit for the WECS and wind energy facilities constituting the Project, adopted local laws establishing a Wind Overlay District and amending the Wind

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<sup>1</sup> This turbine is representative of a class of turbines that are under consideration for the project. The noise characteristics of the V136 turbine represent the most conservative parameters for any of these turbines, and the visual impacts of the turbines are being assessed at the legal maximum allowable height level proposed in the Local Laws herein (599 feet).

Dated: Wednesday, June 13, 2018

Law to increase the maximum permitted height of a WECS to 495 feet. This represented the culmination of an eight-year review of the Project and its various iterations.

5Click here to enter text.

## **Section I — Project Overview**

### **1. Applicant Information**

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

Mark Lyons, Senior Manager, Project Development  
Renewable Energy Systems Americas  
455 Boston Post Road, Suite 206  
Old Saybrook, CT 06475  
(860) 661-3818

### **RES Experience and Qualifications**

This information was provided in the September 2016 Amended Application and is incorporated herein by reference.

### **2. Property Owner Information**

The 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 agreements 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 were provided on DVD as Appendix B to the 2016 Amended Application and Table 4 of the 2016 which Amended Application included the name and address of each landowner.

Ball Hill is providing updated landowner information showing only the changes from the 2016 Amended Application as Table 1 (Appendix A).

**Table 1: Ball Hill Wind Land Rights Additions**

<b>Table 1: Additional Property Owner Information</b>								
<b>Tax ID</b>	<b>Property Owner</b>	<b>Mailing Address</b>				<b>Property Location</b>		<b>Status</b>
		<b>Street Address</b>	<b>City</b>	<b>State</b>	<b>Zip Code</b>	<b>Road</b>	<b>Town</b>	
118.00-1-49	Jashua Wood	911 Hurlburt Road	Forestville	NY	14062	Hurlburt	Villanova	MOL
135.00-1-5						Hurlburt	Hanover	MOL
135.00-1-2						Hurlburt	Hanover	MOL
118.00-1-33	Wesley E. and Elizabeth D. Smith	152 Milnor Ave	Lackawanna	NY	14218	Hanover Road	Hanover	MOL
84.00-1-55.2	Olsen and Sons Contractors, Inc.	PO Box 9,1275 Overhiser Rd	Forestville	NY	14062	Overhiser Rd	Hanover	MOL
83.00-1-56.1	Stanley Thompson	1234 Overhiser Road	Forestville	NY	14062	Dennison Road	Hanover	MOL
100.00-1-8	Michael B. Johnson and Amy L. Johnson	1266 Hopper Road	Forestville	NY	14062	1266 Hopper Road	Hanover	MOL
134.00-1-40	Nadine R. McCarthy	17 Chestnut St PO Box 431	Forestville	NY	14062	Round top Road	Villanova	MOL
151.00-2-7.2	Robert D. Barnes	9225 Pope Hill Rd	Forestville	NY	14062	North Hill Road	Villanova	MOL
151.00-2-5.2						9225 Pope Hill Rd	Villanova	MOL
151.00-2-7.1						North Hill Road	Villanova	MOL
118.00-1-37	Richard A. Brunea and Jeffery Brunea	515 Route 39	Forestville	NY	14062	Route 39	Hanover	MOL
118.00-1-38								MOL
152.00-2-19.4	Richard A. Nagel and Marlene Nagel	139 Main Street	South Dayton	NY	14138	Dye Rd	Villanova	MOL
118-00-1-5	Mihkel P. Raag		Forestville	NY	14062		Hanover	Pending

**3. Property Identification of each Turbine**

The properties on which all proposed WECS will be located have not changed from the 2016 Amended Application, and that information is incorporated by reference herein.

**4. Description of Project Modifications**

In this 2018 Application, the following modifications of the Project are proposed:

1. Three (3) of the 29 WECS (all in Villenova) require minor location changes (less than 135 feet) in order to comply with the proposed larger minimum setback requirements.
2. All 29 WECS will increase in height, subject to an approved maximum of 599 feet. The comparisons of the approved turbine locations for T2, T4 and T8 in 2016 and the proposed locations in the 2018 Application are shown in **Figures 2, 3 and 4**.
3. The previously approved 5.7-mile overhead transmission line will be eliminated.
4. The Collection Substation will be eliminated.
5. Four +/- 5.0 mile predominantly underground circuits will tie the generation portion of the Project to the substation located in proximity to the existing 230 kV transmission line and generally follow the previously approved right-of-way for the OTL. Minor changes in the right-of-way alignment have been made to minimize wetland and tree clearing impacts.
6. The remaining wind energy facilities and the operations and maintenance building proposed previously remain unchanged by the 2018 Application.

This 2018 Application, the Expanded Full Environmental Assessment Form (FEAF) (Appendix C), and the attached updated studies address impacts resulting from the proposed changes to the turbine type and height, relocation of three (3) WECS, and the elimination of the 5.7-mile OTL and its replacement with four +/- 5.0-mile underground circuits. All other impacts associated with the layout in this 2018 Application have been investigated and described in updated studies, including but not limited to: noise, visual impacts, and wetlands which were included in the 2016 Amended Application and Project’s FEIS.

<b>Table 2: Ball Hill Wind Project Summary of Changes from the 2016 Special Use Permit</b>	
<b>Facility</b>	<b>Modifications and Rationale</b>
Turbine 2	Turbine moved ±129’ to comply with proposed 599’ setback
Turbine 4	Turbine moved ±132’ to comply with proposed 599’ setback
Turbine 8	Turbine moved ±128’ to comply with proposed 599’ setback
Collection Substation	Eliminated; will result in reduced noise and light impacts
5.7-mile Overhead Transmission Line	Eliminated; replaced with four +/- 5.0 mile underground circuits to avoid and/or reduce wetlands, tree clearing and visual impacts.



## Section II – Site Plans

### 5. Plot Plan of Project

[Readers Note: These maps are submitted as part of the 2018 Application as 11”X17” sheets. Larger maps will be provided to the Town clerk upon submission of the 2018 Application.]

Elements of the Plot Plan, provided in compliance with Wind Law §690.07, are shown as follows:

- a. Property lines and physical dimensions of the Site: **See Figure 1.**
- b. Location, approximate dimensions, and types of major existing structures within five hundred (500) feet of the boundaries of the proposed Wind Overlay District: All structures identified in this area are estimated to be approximately 2500 square feet in size. **See Figure 1.**
- c. Location and elevation of each relocated WECS: **See Figures 2, 3 and 4 and Table 3.**
- d. Location of all above ground utility lines on this site within one radius of the Total Height of the WECS or other Project components: There are no changes to the location of above ground utility lines on this site within one radius of the Total Height of the WECS or other Project components shown in December 2016. **See Figure 1.**
- e. Location and size of structures above 35 feet within a five-hundred-foot radius of the proposed WECS: **See Figure 1.**
- f. Zoning designation of the subject and adjacent properties as set forth in the official zoning map: Apart from the modifications to the Wind Overlay District proposed herein, there are no changes to the zoning designation of the subject and adjacent properties shown in December 2016.
- g. Proposed boundaries of the Wind Overlay District: There are three (3) proposed minor additions to the Wind Overlay District established in December 2016 (WECS T2, T4, and T8). The minor locational adjustments to these three turbines were made to comply with the increased setback limits proposed in the Local Law. The modifications proposed to the Wind Overlay District would, in one instance, accommodate a slight re-routing of the Project electric interconnection lines and, in two instances, incorporate parcels providing waivers to comply with the increased minimum WECS setbacks proposed herein. **See Figure 1.**
- h. Compliance with setback requirements: **See Figures 1, 2, 3 and 4.<sup>2</sup>**
- i. Location of residential structures within 1,200 feet of the tower: There is only one (1) residential structure within 1,200 feet of any WECS. T15 is located 1190 feet from the residence on the Press Property (SBL 152.00-1-14).
- j. All proposed facilities: **See Figure 1.** No fencing is currently proposed around Project

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<sup>2</sup> As the 2018 Application includes a request to amend the maximum height restriction in §690.09(a) (13) to 599 feet, the figures showing compliance with setback requirements details compliance with the proposed 599 feet setback.

facilities.

**Table 3 Relocated WECS Coordinates – Villenova**

<b>Table 3: Relocated WECS Coordinates – Villenova</b>				
<b>WECS ID</b>	<b>Tax Map ID</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Elevation (feet)</b>
T2	134.00-1-40	42°24'39.61”	79°10'12.10"	1562.5
T4	168.00-1-49	42°23'7.83"	79° 8'27.63"	1633.9
T8	151.00-2-21	42°24'4.91"	79° 9'16.90"	1604.4

**6. WECS Drawing**

The vertical drawing and access door for the WECS was submitted as Figure 6 in the 2016 Amended Application and is incorporated herein by reference. The tower and all WECS components will be off-white and non-reflective as described in the attached visual assessment report. All climbing ladders will be internal and accessed only through the access door of the WECS. A drawing showing the proposed V136 turbine is attached as Figure 5. Additional information and the specifications of the WECS are presented in Appendix D, Vestas 136, 3.45 MW Series Wind Turbine Brochure.

**7. Landscaping Plan**

The SDEIS and FEIS contained a detailed description of the areas to be cleared for all wind energy facilities. 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 and FEIS will be employed for the three (3) relocated WECS as well as the 26 WECS that were not relocated.

**8. Lighting Plan**

As approved in 2016, the Project proposed 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 was attached to the 2018 Application as Appendix I. However, the FAA requires lighting for all obstructions over 500 feet in height. As such, all 29 turbines will be required to be constructed with hazard warning lights. The lights to be used in this plan are synchronized red lights and are identified in the VRA. The specifications for these lights were included as part of Section 17 a/b of the 2016 Amended Application.

All twenty-nine (29) proposed WECS have received a Determination of No Hazard from the FAA, each of which is conditioned on the obstruction marking and lighting condition of white paint and synchronized red lights. Copies of all FAA Determinations of No Hazard are attached hereto as Appendix J.

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. The specifications for these lights were attached to the 2016 Amended Application as Appendix C and are incorporated herein by reference.

**9. Property Owner Information**

(a) Table 11 of the 2016 Amended Application identified all property owners in the Town of Villenova either inside or within 500 feet of the boundary of the Wind Overlay District established in 2016. There are no changes to the Wind Overlay District (WOD) approved in December 2016.

(b) Agricultural Data Statement

In accordance with New York State Agriculture and Markets Law §305-a, Ball Hill submitted an Agricultural Data Statement (see Appendix E of 2016 Amended Application) as the Project is located in two Chautauqua County Agricultural Districts: District 5 (CHAT005) and District 10 (CHAT010). As the Project Area has not changed, there are no other agricultural data districts affected by the 2018 Application. Ball Hill will provide a copy of the Agricultural Data Statement (see Appendix B) 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 hearings to be held on the 2018 Application.

(c) GML § 803 Disclosure

As disclosed previously, Villenova Town Council Member Sarah LoManto has entered into a lease agreement with Ball Hill for use of lands with tax map numbers 134.00-2-10, 134-2-11 and 135.00-1-6 owned by Council member LoManto and her husband, located on Prospect Road in the Town of Villenova, Chautauqua County, New York (the “Property”) for the Project. The Property is located within the Wind Overlay District created in December 2016 and may have wind energy facilities located thereon if the Ball Hill’s 2018 Application is approved. A copy of the Memorandum of Lease between Ball Hill and Michael and Sarah LoManto was provided in the 2016 Amended Application and is incorporated herein by reference.

Council Member LoManto has previously disclosed her agreement with Ball Hill at open meetings of the Villenova Town Board and recused herself from all proceedings related to the Project. Ball Hill also submitted a similar disclosure in 2016 for Council Member LoManto. Ball Hill has requested that Council Member LoManto continue to recuse herself from the proceedings before the Villenova Town Board for all matters related to the Project, including without limitation, all deliberations and votes related to Ball Hill’s 2018 Application.

### **Section III: Project Information**

#### **10. Ball Hill Wind Energy Project Decommissioning Plan**

As stated in the 2016 Amended Application and FEIS, the expected useful life of the Project components is 25-30 years, although it is reasonable to expect that this life can and will be extended by proper maintenance. The Wind Energy Conversion Facilities/Systems Decommissioning Process Description contained in the 2016 Amended Application and the FEIS remains effective and no changes are required due to the 2018 Application.

#### **11. Complaint Resolution**

Ball Hill will implement the complaint resolution procedure set forth in the 2016 Amended Application to provide and maintain good relations between Ball Hill and the community which is incorporated herein by reference.

#### **12. Construction Schedule and Description of Delivery Vehicles and Routes**

- (a) Ball Hill submitted an updated construction schedule for the Project as Figure 7 of the 2016 Amended Application and it is incorporated herein by reference.
- (b) The Transportation and Haul Route studies submitted in the 2008 DEIS, 2016 SDEIS and updates in the FEIS remain valid for the 2018 Application and are incorporated herein by reference. As the road network and the Project Area remain substantially unchanged, these reports and their conclusions remain valid for the 2018 Application.

### **13. Environmental Assessment Form (EAF)**

A completed Part 1 of the Expanded Full Environmental Assessment Form (FEAF) with exhibits is attached hereto as Appendix C.

### **14. Wind Measurement Tower Applications**

The Applicant does not request a Special Use Permit for Wind Measurement Towers from the Town at this time.

### **15. WECS Specifications and Material Safety Data Sheet**

- (a) Specifications on the WECS are presented in the **Vestas 136, 3.45 MW Series Wind Turbine Brochure** attached hereto as **Appendix D**. Specifications on sound levels are presented in Section 17d this application.
- (b) Figure 5 of the 2018 Application shows the vertical drawing of the WECS.
- (c) Material Safety Data Sheets applicable to both the V126 and V136 turbines were attached electronically to the 2016 Amended Application as Appendix G and are incorporated herein by reference.

### **16. Declaration of Environmental Significance**

Due to the minor changes proposed to the Project including minor relocations of three (3) WECS, an increase in the height of the turbines, the elimination of the 5.7-mile OTL, Collection Substation, and addition of four +/-5.0-mile underground circuits; Ball Hill defers to the Board, as SEQRA Lead Agency, to make an appropriate determination under SEQRA.

### **17. Draft Environmental Impact Statement (DEIS) Submittal Information**

The materials submitted with the 2016 Amended Application remain valid and are incorporated herein by reference. As a result of the proposed increase in height, elimination of the 5.7 OTL and Collection Substation, use of four +/- 5.0-mile underground circuits, and relocation of three (3) WECS as set forth in this 2018 Application, the following documents have been updated are being submitted with the FEAF herewith:

- **Appendix E: Updated Shadow Flicker and Visual Resource Assessment prepared by Saratoga Associates.**
- **Appendix F: Noise Analysis prepared by Epsilon Associates.**
- **Appendix G: Cultural Resources, including additional SHPO correspondence by Panamerican Consultants, Inc.**

**18. Tower Design Information**

The V136/3.45 Type Certificate is submitted as tower design information for the WECS (see Appendix H).

**19. Ice and Blade Throw Analysis**

Ice and Blade Throw Analysis was provided in the 2016 Amended Application and the FEIS. This analysis is hereby updated as follows in accordance with the dimensions of the reference WECS model V136 at a maximum blade tip height of 599 feet:

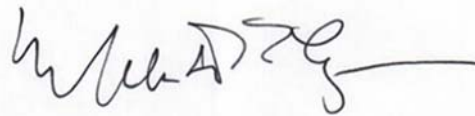
Based on best practice safety practices and setback requirements, the risk of blade throw and ice throw is minimal. Ice on turbine blades and towers can pose a safety risk for the general public depending on the site-specific siting of each turbine in relation to publicly accessible areas such as roads, 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 county setbacks as well as internal RES best practice safety standards of 1.5 times tip height, or approximately up to 270 meters. In addition, 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. 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 (<68m). The maximum throw distance based on best practice formulas is approximately 380m, 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.

**20. Statement of Truth and Accuracy**

I, Mark Lyons, as the RES Americas Senior Manager of Project Development, am responsible for all aspects of application and permitting with respect to RES’ Ball Hill Wind Energy Project in the Towns of Villenova and Hanover, Chautauqua County, New York. I have reviewed this Application and the materials submitted therewith and am familiar with the same, and hereby attest that the representations and statements made herein are true and accurate to the best of my knowledge.

BALL HILL WIND ENERGY, LLC,  
A RES Americas company.

By: \_



---

Dated: Wednesday, June 13, 2018

Name: Mark Lyons  
Its: Senior Manager, Project Development  
Date: June 8, 2018

Dated: Wednesday, June 13, 2018



# Appendix A



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\*\*\*



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 #: TT2017003490  
 Consideration: 1610.00

Transfer Tax	8.00
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Total: 8.00

INSTRUMENT #: DE2017002309

Receipt#: 201706179832  
 Clerk: AH  
 Rec Date: 03/29/2017 03:50:48 PM  
 Doc Grp: D  
 Descrip: MEMO OF LEASE  
 Num Pgs: 7  
 Rec'd Frm: RES AMERICA DEV

Party1: BARNES ROBERT D  
 Party2: BALL HILL WIND ENERGY LLC  
 Town: VILLENova

Record and Return To:

RES AMERICAS INC  
 330 SECONS AVENUE 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 14, 2017, by and between Robert D. Barnes ("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 14, 2017, 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: Robert D Barnes  
Name: Robert D. Barnes

TENANT:

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

By: RES America Developments Inc.  
its Manager

By:   
Name: PETER ROOD  
Title: REGIONAL VICE PRESIDENT

STATE OF NEW YORK )  
 )  
COUNTY OF CHAUTAUQUA )

On the 2<sup>nd</sup> day of February in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Robert D. Barnes, 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 14<sup>th</sup> day of FEBRUARY in the year 2017 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

## EXHIBIT A TO MEMORANDUM OF LEASE

### LEGAL DESCRIPTION OF PREMISES

**ALL THAT TRACT OR PARCEL OF LAND**, in the Town of Villenova, County of Chautauqua, State of New York, being the south part of Lot No. 46 in the 5<sup>th</sup> Township and 10<sup>th</sup> Range of townships of the Holland Land Company's Survey, bounded south on the south line of said lot 46; east by the east line of said lot 46; on the north by lands formerly owned by John Steward; and west by the west line of said lot 46, containing 50 acres of land.

**ALSO** part of Lot 45 in the same township and range and bounded as follows: Beginning at the northeast corner of said lot 45 and running west on the north line of said lot, 59 chains and 81 links; thence south 3 chains and 34 1/3 links; thence east on a line parallel to the said north line 59 chains 81 links; thence north 3 chains and 34 links to the place of beginning; containing 20 acres of land, being in all 70 acres of land.

**ALSO, ALL THAT TRACT OR PARCEL OF LAND**, situate in the Town of Villenova, County of Chautauqua and State of New York, distinguished by a part of Lot No. 45 in Township 5 in the 10<sup>th</sup> Range of Townships of the Holland Land Company's Survey, bounded as follows: Commencing at a hemlock stake in the west line of said lot at the southwest corner of land now or formerly owned by George Sharp; thence south on said west line 26 chains 85 links; thence east parallel to the north line of said lot 16 chains and 63 links to a stake; thence north parallel to said west line 6 chains 26 links to a stake; thence east parallel to said north line 43 chains 18 links to the east line of said lot; thence north along said east line which is the center of the highway 20 chains 59 links to lands now or formerly of George Sharp; thence west parallel to said north line of the lot, 59 chains 81 links to the place of beginning. Excepting and reserving so much as is now used and occupied as a School House Site. The entire premises above described consists of approximately 203 acres of land. Also excepting approximately 15.225 acres of land by deed from Sidney V. Ortel and Janice C. Ortel to Joseph W. Zrimsek and Judy A. Zrimsek, Liber 1439 page 440.

**EXCEPTING AND RESERVING, ALL THAT TRACT OR PARCEL OF LAND**, situate in the Town of Villenova, County of Chautauqua and the State of New York, being a part of Lot-46 and a part of Lot-45, Town -5 and Range-10 of the Holland Land Company's survey and being further bounded and described as follows:

**BEGINNING** at the southwesterly corner of Lot-46; thence North 02° 24' 35" West 554.66 feet along the westerly bounds of Lot-46 to an existing iron pin & cap; thence North 88° 25' 32" East 3137.89 feet to a 1 inch diam. iron pipe and cap; thence continuing North 88° 25' 32" East 41.47 feet to a point on the centerline of Pope Hill Road; thence South 39° 00' 52" East 62.97 feet along the said road centerline to a point; thence South 88° 25' 32" West 44.47 feet to a 1 inch diam. iron pipe and cap; thence continuing South 88° 25' 32" West 1964.92 feet to a 1 inch diam. iron pipe and cap; thence South 02° 20' 34" East 2090.49 feet to a 1 inch diam. iron pipe and cap; thence South 88° 22' 03" West 314.00 feet to a 1 inch diam. iron pipe and cap; thence South 02° 18' 55" East 413.16 feet to a 1 inch diam. iron pipe and cap; thence South 88° 22' 43" West 1097.58 feet to a 1 inch diam. iron pipe and cap on the westerly bounds of Lot-45; thence North 02° 12' 16" West 716.53 feet along the said westerly lot bounds to an existing iron pin and cap; thence North 02° 20' 12" West 1283.67 feet along the said lot bounds to the point or place of beginning.

Containing 82.00 acres of land more or less according to a land survey prepared by Steven A. Carlson, L.L.S. Dated September 6, 2006 and designated as Job No. 5-14-06.

***ALL THAT TRACT OR PARCEL OF LAND***, situate in the Town of Villenova, County of Chautauqua and the State of New York, being a part of Lot 45, Town 5, and Range 10 of the Holland Land Company's Survey and being further bounded and described as follows:

**BEGINNING** at an existing iron pin located at the southwest corner of lands conveyed by M & L Trucking, LLC. to Robert D. Barnes and Susan E. Barnes by Warranty Deed dated November 1, 2006, recorded in the Chautauqua County Clerk's Office on November 8, 2006 in Liber 2613 of Deeds at page 381; thence S 88° 22' 03" W a distance of 314.00 feet to an existing iron pin; thence S 2° 18' 55" E a distance of 413.16 feet to an existing iron pin; thence S 88° 22' 43" W a distance of 1,097.58 feet to an existing iron pin marking the southwest corner of lands conveyed to parties of the first part by M & L Trucking, LLC. by Warranty Deed recorded in the Chautauqua County Clerk's Office on December 11, 2007 in Liber 2641 of Deeds at page 885; thence N 2° 12' 16" W a distance of approximately 716.53 feet to an existing iron pin; thence N 2° 20' 12" W a distance of approximately 1,060.45 feet to a point, which point is 220.44 feet southerly from the north line of Holland Land Company Lot 45; thence N 88° 25' 32" E a distance of approximately 1,411.58 feet to an existing iron pin on the west line of lands conveyed by M & L Trucking, LLC. to Barnes as aforesaid; thence S 2° 20' 34" E a distance of approximately 1,400.00 feet along said Barnes' westerly line to the point and 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 #: DE2018001157

Receipt#: 201806199007  
Clerk: AH  
Rec Date: 01/11/2018 10:49:11 AM  
Doc Grp: D  
Descrip: MEMO OF LEASE  
Num Pgs: 7  
Rec'd Frm: RES AMERICA INC

Party1: BRUNEA RICHARD A -LIFE ESTATE  
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 16.00

Sub Total: 16.00

Total: 96.00

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

\*\*\*\*\* Transfer Tax \*\*\*\*\*  
Transfer Tax #: TT2018002663  
Consideration: 3899.00

Transfer Tax 16.00

Total: 16.00

Record and Return To:

RES AMERICAS INC  
455 BOSTON POST RD  
SUITE 820  
OLD SAYBROOK CT 06475

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 April 04, 2017, by and between Richard A. Brunea, as to a life estate and Jeffrey Brunea, 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 April 04, 2017, 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: Jeffrey 7. Brunea P.O.A.  
Name: Jeffrey Brunea, attorney in fact for  
Richard A. Brunea, as to a life estate

By: Jeffrey 7. Brunea  
Name: Jeffrey Brunea, as to the remainder

TENANT:

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

By: RES America Developments Inc.  
its Manager

By:   
Name: Peter Rood  
Title: Regional Vice President

STATE OF NEW YORK )  
 )  
COUNTY OF CHAUTAUQUA )

On the 23<sup>rd</sup> day of March in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Jeffrey Brunea, attorney in fact for Richard A. Brunea, 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

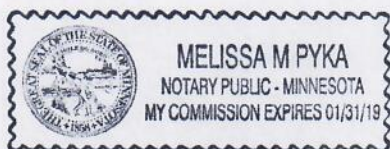
STATE OF NEW YORK )  
 )  
COUNTY OF CHAUTAUQUA )

On the 23<sup>rd</sup> day of March in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Jeffrey Brunea, 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 MINNESOTA )  
 )  
COUNTY OF HENNEPIN )

On the 04 day of April in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Peter Road, 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**

ALL THAT TRACT OR PARCEL OF LAND, situate in the Town of Hanover, County of Chautauqua and State of New York, known as parts of Lots 18, 24, and 25, according to the Holland Land Company's survey, and is 122 and 2/10 acres of land from the West part of Lot No. 18;

COMMENCING at the Northwest corner of Stephen Parsells farm, running West along the North line of said Lot No. 18, 20 chains 7 links to the Northwest corner of said lot;

THENCE South 60 chains 29 links to the Southwest corner of said lot;

THENCE East along the South line of said Lot No. 18, 20 chains 50 links;

THENCE North along Stephen Parsells West line, 60 chains 24 links to the place of BEGINNING, more or less.

ALSO, 106 acres of land from the Southeast corner of Lot 25;

COMMENCING at a stake which stands, 21 chains 50 links South from the Northeast corner of said Lot 25;

RUNNING THENCE South, 38 chains 79 links to the Southeast corner of said Lot 25;

THENCE West along the South line of said Lot 25, 34 chains 92 links to land formerly owned by Burr Bagley;

THENCE North 12 degrees 25 minutes East, 26 chains 93 links to the Southwest corner of a piece of land deeded to Lucius Jones by Thomas Bagley;

THENCE RUNNING North 56 degrees 55 minutes East, 5 chains 75 links;

THENCE North 79 degrees East, 7 chains;

THENCE North 50 degrees East, 10 chains;

THENCE North 82 degrees East, 10 chains to the place of beginning, more or less.

ALSO, 166 ACRES from the Northeast part of Lot No. 24, bounded as follows:

COMMENCING at the Northeast corner of said Lot 24;

RUNNING West along the North line of said Lot 24, 49 chains 15 links to land owned by Charles Moore in 1890;

THENCE South 41 chains 36 links;

THENCE East, 49 chains 15 links to the East line of said Lot 24;

THENCE North, 41 chains 36 links to the place of BEGINNING, excluding from said bounds a piece of land from the Southwest corner of said lot deeded by Lucius Jones to Charles Moore.

EXCEPTING the premises conveyed by George Smith and Hattie E. Smith to the County of Chautauqua by warranty deed dated by November 8, 1929, and recorded in the Chautauqua County Clerk's Office November 15, 1929 in Liber 541 of Deeds, at Page 408.

ALSO EXCEPTING SO MUCH of the lands appropriated by the People of the State of New York by Notice of Appropriation to Richard A. Brunea, Paul L. Smith and Alene B. Smith, his wife and New York Telephone Company, dated January 23, 1991 and recorded January 23, 1991 in the Chautauqua County Clerk's Office in Liber 2241 of Deeds, Page 66.

ALSO EXCEPTING SO MUCH of the lands conveyed by Deed from Richard A. Brunea to Paul L. Smith and Alene B. Smith, husband and wife, dated December 18, 1979 and recorded January 31, 1980 in the Chautauqua County Clerk's Office in Liber 1856 of Deeds, Page 535.

ALSO EXCEPTING SO MUCH of the lands conveyed by deed from Richard A. Brunea to Jeffrey T. Brunea and Gloria J. Reigle, dated April 18, 1991 and recorded May 2, 1991 in the Chautauqua county Clerk's Office in Liber 2248 of Deeds, Page 135.



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 #: DE2018001158

Receipt#: 201806199007

Clerk: AH

Rec Date: 01/11/2018 10:49:12 AM

Doc Grp: D

Descrip: AMENDED MEM LSE

Num Pgs: 6

Rec'd Frm: RES AMERICA INC

Party1: BRUNEA RICHARD 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
Notations	0.50
TP584	5.00

Sub Total: 75.50

Transfer Tax	
Transfer Tax	0.00

Sub Total: 0.00

Total: 75.50

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

\*\*\*\*\* Transfer Tax \*\*\*\*\*  
 Transfer Tax #: TT2018002664  
 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 AMERICAS INC  
455 BOSTON POST RD  
SUITE 820  
OLD SAYBROOK CT 06475



RECORDING REQUESTED BY AND  
WHEN RECORDED RETURN TO:

Ball Hill Wind Energy, LLC  
c/o RES America Developments Inc.  
11101 W. 120<sup>th</sup> Ave., Ste. 400  
Broomfield, CO 80021  
Attn: Susan Brinks

(Space Above for Recorder's Use Only)

**AMENDMENT TO MEMORANDUM OF LEASE**

THIS AMENDMENT TO MEMORANDUM OF LEASE ("*Amendment*") is made and entered into as of April 04, 2017, by and between Richard A. Brunea ("*Landlord*") and Ball Hill Wind Energy, LLC, a Delaware limited liability company ("*Tenant*").

**RECITALS**

A. Landlord and Tenant entered into that certain Wind Energy Ground Lease, dated as of August 12, 2016 and Addendum to Lease dated August 12, 2016 (collectively, the "*Lease*"), a memorandum of which was recorded on December 30, 2016 in the records of the Chautauqua County, New York as Instrument No. DE2016007814 (the "*Memorandum*"), pursuant to which Tenant agreed to lease the Premises from Landlord for the development, construction and operation of Windpower Facilities in connection with the Project.

B. By an Amendment to Wind Energy Ground Lease ("*Lease Amendment*") of even date herewith, Landlord and Tenant amended the Lease to modify the Premises as set forth in the Lease.

C. Landlord and Tenant now wish to amend the Memorandum to give record notice of the Lease Amendment and the terms thereof.

D. Capitalized terms used but not defined herein shall have the meanings ascribed to those terms in the Lease

**AGREEMENT**

NOW, THEREFORE, in consideration of the foregoing and the mutual promises set forth below and for other good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, Landlord and Tenant, intending to be legally bound, mutually agree to amend the Lease as follows:

1. Definitions. Unless specifically defined herein, all capitalized terms used in this Amendment shall have the meaning assigned to them in the Lease.

DE2016-7814

2. Premises. The Lease is hereby amended to delete Exhibit A in its entirety and to replace it with **Exhibit A** attached hereto. The Premises as used in the Lease shall mean the real property more particularly described on Exhibit A attached hereto.

3. Counterparts. This Amendment may be executed in counterparts, each of which shall constitute an original, and all of which, when taken together, shall constitute one and the same instrument.

4. Entire Agreement. This Amendment, together with the Lease, constitutes the entire agreement between Landlord and Tenant regarding the subject matter contained herein and supersedes any and all prior and/or contemporaneous oral or written negotiations, agreements or understandings.

5. Headings. The paragraph headings used herein are inserted for convenience only and shall not affect in any way the meaning or interpretation of this Amendment.

6. Modifications. Except as specifically amended hereby, all of the terms and conditions of the Lease are and shall remain in full force and effect and are hereby ratified and confirmed. In the event of a conflict between the provisions of this Amendment and the provisions of the Lease, the provisions of this Amendment shall control. No subsequent change or addition to this Amendment shall be binding unless in writing and duly executed by both Landlord and Tenant.

7. Successors and Assigns. This Amendment shall be binding upon and shall inure to the benefit of the permitted successors and assigns of the Parties hereto.

8. Choice of Law. This Amendment shall be interpreted and enforced in accordance with the laws of the State in which the Premises are located.

*[Signature page follows]*

IN WITNESS WHEREOF, the Parties hereto have executed this Amendment as of the dates set forth below, to be effective as of the Effective Date first set forth above.

**LANDLORD:**

Jeffrey Brunea P.O.A.  
Jeffrey Brunea, attorney in fact for Richard A. Brunea

Date: 3-23-17

**TENANT:**

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

By: RES America Developments Inc.,  
its Manager

By: 

Name: Peter Rood

Title: Regional Vice President

Date: April 04, 2017

STATE OF NEW YORK )  
 )  
COUNTY OF CHAUTAUQUA )

On the 23<sup>rd</sup> day of March in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Jeffrey Brunea, attorney in fact for Richard A. Brunea, 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 MINNESOTA )  
 )  
COUNTY OF HENNEPIN )

On the 04 day of April in the year 2017 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**

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. 18, Town 6 and Range 10 according to the Holland Land Company's survey and bounded and described as follows:

BEGINNING at a point in the centerline of Route No. 39, which point is 463 feet easterly along the said centerline from the northwesterly corner of Lot No. 18;

THENCE southerly at an interior angle of 83 degrees 30 minutes a distance of 351.04 feet to an iron pin;

THENCE westerly parallel with the centerline of Route #39 a distance of 185.33 feet to an iron pin;

THENCE northwesterly at an interior angle of 102 degrees 12 minutes a distance of 107.67 feet to an iron pin;

THENCE northwesterly at an interior angle of 161 degrees 18 minutes a distance of 245.17 feet to the centerline of Route #39;

THENCE easterly along the centerline of Route # 39 a distance of 220.00 feet to the point or place of BEGINNING.

Containing approximately 1.70 acres



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 #: DE2017003621  
 Receipt#: 201706184678  
 Clerk: AH  
 Rec Date: 06/14/2017 10:10:55 AM  
 Doc Grp: D  
 Descrip: EASEMENT  
 Num Pgs: 7  
 Rec'd Frm: RES AMERICA DEV  
 Party1: H OLSEN + SONS CONTRACTORS INC  
 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
<b>Sub Total:</b>	<b>80.00</b>
Transfer Tax	
Transfer Tax	0.00
<b>Sub Total:</b>	<b>0.00</b>
<b>Total:</b>	<b>80.00</b>
**** NOTICE: THIS IS NOT A BILL ****	
***** Transfer Tax *****	
Transfer Tax #: TT2017004454	
Consideration: 500.00	
<b>Total:</b>	<b>0.00</b>

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 AVENUE S  
 SUITE 820  
 MINNEAPOLIS MN 55401

**After recording return to:**  
Ball Hill Wind Energy, LLC  
11101 W. 120<sup>th</sup> Ave., Suite 400  
Broomfield, Colorado 80021  
ATTN: General Counsel

THIS SPACE FOR RECORDERS USE ONLY

**MEMORANDUM OF TRANSMISSION EASEMENT AGREEMENT**

THIS MEMORANDUM OF TRANSMISSION EASEMENT AGREEMENT (this “**Memorandum**”), is made, dated and effective as of April 04, 2016~~7~~ (the “**Effective Date**”), between **H. Olsen & Sons Contractors, Inc.** (together with its successors, assigns and heirs, “**Landowner**”), whose address is 1275 Overhiser Road, P.O. Box 9, Forestville, NY 14062, and **BALL HILL WIND ENERGY, LLC** a Delaware limited liability company (together with its transferees, successors and assigns, “**Grantee**”), whose address is 11101 W. 120<sup>th</sup> Ave., Suite 400, Broomfield, CO 80021, with regards to the following:

1. Landowner and Grantee did enter into that certain TRANSMISSION EASEMENT AGREEMENT dated April 04, 2016~~7~~ (the “**Agreement**”), which affects the real property located in the Town of Hanover, Chautauqua County, New York, as more particularly described in **Exhibit A** attached hereto (the “**Property**”). Capitalized terms used and not defined herein have the meaning given the same in the Agreement.

2. The Agreement grants, and Landowner hereby grants, Grantee, among other things, for the development, erection, construction, re-construction, installation, replacement, relocation, removal, maintenance, operation and use of overhead and underground electrical transmission facilities including without limitation, poles, towers, other structures, guys, wires, cables, conduits, and appurtenances thereto, and any and all other facilities, equipment and improvements related thereto (collectively, the “**Transmission Facilities**”). The Agreement contains, among other things, certain Landowner and third party use and development restrictions on the Property.

3. This Memorandum does not supersede, modify, amend or otherwise change the terms, conditions or covenants of the Agreement, and Landowner and Grantee executed and are recording this Memorandum for the purposes set forth herein and for providing constructive notice of the Agreement and Grantee’s rights thereunder and hereunder. The terms, conditions and covenants of the Agreement are set forth at length in the Agreement and are incorporated herein by reference as though fully set forth herein. This Memorandum shall not, in any manner or form whatsoever, alter, modify or vary the terms, covenants and conditions of the Agreement.

4. This Memorandum shall also bind and benefit, as the case may be, the heirs, legal representatives, assigns and successors of the respective parties hereto, and all covenants, conditions and agreements contained herein shall be construed as covenants running with the land to the extent consistent with applicable law.

5. Landowner shall have no ownership, lien, security or other interest in any Transmission Facilities installed on the Easement Property, or any profits derived therefrom, and Grantee may remove any or all Transmission Facilities at any time.

6. This Memorandum may be executed in counterparts, each of which shall be deemed an original and all of which when taken together shall constitute one and the same document.

[signature page to follow]



IN WITNESS WHEREOF, the parties have executed this Memorandum to be effective as of the date first written above.

**LANDOWNER:**

**GRANTEE:**

H. Olsen & Sons Contractors, Inc.

BALL HILL WIND ENERGY, LLC,  
a Delaware limited liability company

By: Gerald M. Olsen  
Name: GERALD M. OLSEN  
Title: PRESIDENT

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

By: Gleenn R. Olsen  
Name: GLENN R. OLSEN  
Title: V.P.

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

By: Larson E. Olsen  
Name: LARSON E. OLSEN  
Title: P.O.

By: Valerie A. Robinson  
Name: Valerie A. Robinson  
Title: P.O.

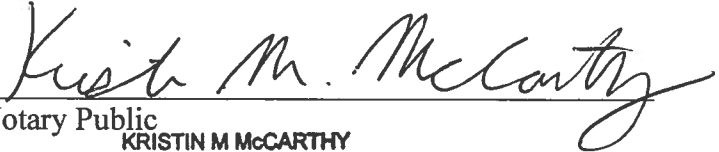
By: Jacquelyn M. Kerstetter  
Name: Jacquelyn M. Kerstetter  
Title: part owner

STATE OF NEW YORK )

: ss.

COUNTY OF CHAUTAUQUA )

On the 23<sup>rd</sup> day of March, in the year 2017, before me, the undersigned, personally appeared Gerald M. Olsen, 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 individuals(s) acted, executed the instrument.

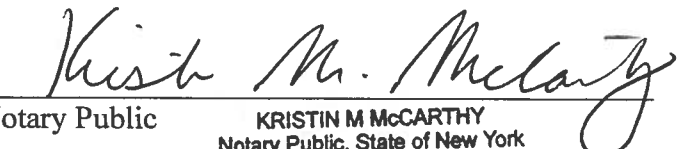
  
Notary Public  
KRISTIN M McCARTHY  
Notary Public, State of New York  
No. 01MC6318749  
Qualified in Erie County  
My Commission Expires 2-2-2017

STATE OF NEW YORK )

: ss.

COUNTY OF CHAUTAUQUA)

On the 23<sup>rd</sup> day of March, in the year 2017, before me, the undersigned, personally appeared Glenn R. Olsen, 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 individuals(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 2-2-2017

STATE OF NEW YORK )

: ss.

COUNTY OF CHAUTAUQUA)

On the 23<sup>rd</sup> day of March, in the year 2017, before me, the undersigned, personally appeared Lason E. Olsen, 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 individuals(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 )

: ss.

COUNTY OF CHAUTAUQUA)

On the 23<sup>rd</sup> day of March, in the year 2017, before me, the undersigned, 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 individuals(s) acted, executed the instrument.

Kristin M. McCarthy  
Notary Public Kristin M. McCarthy  
Notary Public State of New York  
Erie County  
Commission Expires 02/02/2019

STATE OF NEW YORK )

: ss.

COUNTY OF CHAUTAUQUA)

On the 23<sup>rd</sup> day of March, in the year 2017, before me, the undersigned, 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 individuals(s) acted, executed the instrument.

Kristin M. McCarthy  
Notary Public Kristin M. McCarthy  
Notary Public State of New York  
Erie County  
Commission Expires 02/02/2019

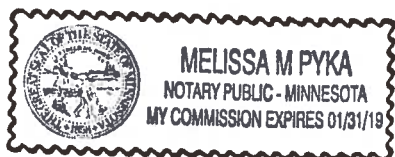
STATE OF MINNESOTA )

: ss.

COUNTY OF HENNEPIN )

On the 04 day of April, in the year 2017, before me, the undersigned, 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 individuals(s) acted, executed the instrument.

Melissa M. Pyka  
Notary Public



**EXHIBIT A TO MEMORANDUM OF TRANSMISSION EASEMENT AGREEMENT**

Legal Description

X 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 44, Township 6, Range 10, of the Holland Land Company's Survey, bounded and described as follows: C

Beginning at a point in the intersection of the north bounds of the New York & Lake Erie Railroad and the centerline of Quarry Road; thence south along the centerline of Quarry Road, to the south bounds of the New York & Lake Erie Railroad; thence southwesterly along the south bounds of the said Railroad, to the West bounds of lands conveyed to Valerie Robinson by a deed recorded in the Chautauqua County Clerk's Office in Liber 2452 of Deeds at page 921; thence north along said Robinson's west bounds, to the north bounds of the said New York & Lake Erie Railroad; thence northeasterly along said Railroad's north bounds, to the point or place of beginning, containing 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 #: DE2017002308

Receipt#: 201706179832

Clerk: AH

Rec Date: 03/29/2017 03:50:47 PM

Doc Grp: D

Descrip: MEMO OF LEASE

Num Pgs: 6

Rec'd Frm: RES AMERICA DEV

Party1: JOHNSON MICHAEL B

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 #: TT2017003489  
 Consideration: 5000.00

Transfer Tax	20.00
--------------	-------

Total: 20.00

Record and Return To:

RES AMERICAS INC  
 330 SECONS AVENUE 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 January 25, 2017, by and between Michael B. Johnson and Amy L. 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 January 25 2017, 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:   
Name: Michael B. Johnson

By:   
Name: Amy L. Johnson

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 6<sup>th</sup> day of January in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Michael B. 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  
Notary Public, State of New York  
No. 01MC6318749  
Qualified in Erie County  
My Commission Expires 2-2-19

STATE OF NEW YORK )  
 )  
COUNTY OF CHAUTAUQUA )

On the 6<sup>th</sup> day of January in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Amy L. 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  
Notary Public, State of New York  
No. 01MC6318749  
Qualified in Erie County  
My Commission Expires 2-2-19

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

On the 25 day of January in the year 2017 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**

A 120 foot corridor of land parallel to the western boundary of Tax Parcel ID 100.00-1-8:  
Tax Parcel ID 100.00-1-8 is described below:

**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 forty two (42) and forty-three (43) in the Sixth Township and Tenth Range of the Holland Land Company's Survey bounded as follows:

**COMMENCING** at the southwest corner of lands devised by Abel Dye to Orvin J. Dye on the west sixty-two (62) chains seven (7) links to the northwest corner thereof; thence east along the lines of lands formerly owned by George Johnson four (4) chains three (3) links to lands formerly owned by Abel Dye; thence south parallel to the first mentioned line sixty-two (62) chains and seven (7) links to lands formerly owned Lucius H. Dye; thence west four (4) chains three (3) links to the place of beginning, containing twenty five (25) acres more or less.

Being the same lands devised by Abel Dye to Orvin J. Dye.

**ALSO, ALL THAT TRACT OR PARCEL OF LAND**, situate on the northerly side of McKee Road in the Town of Hanover, Chautauqua County and State of New York, being a part of Lot Number Forty-two (42), Township Six (6), Range Ten (10) of the Holland Land Company's Survey bounded west by twenty-five (25) acres devised to Orvin Dye, on the south by the McKee Road and extending north from said McKee Road far enough to contain and comprise ten acres of land.

**ALSO**, described by survey made by Eli Keyes, commencing in the north bounds of the McKee Road where the same intersects the east bounds of said twenty five acres devised to Orvin J. Dye; thence north along said Dye boundary eight hundred fifty feet; thence east six hundred eighteen and 65/100 feet at right angles; thence south at right angles five hundred fifty eight and 25/100 feet to the north bounds of the McKee Road; thence west along said McKee Road to the place of beginning containing 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 #: DE2017005604

Receipt#: 201706189934  
Clerk: KAS  
Rec Date: 08/28/2017 11:30:44 AM  
Doc Grp: D  
Descrip: MEMO OF LEASE  
Num Pgs: 6  
Rec'd Frm: RES AMERICAS INC

Party1: MCCARTHY NADINE R  
Party2: BALL HILL WIND ENERGY LLC  
Town: VILLENOVA

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 #: TT2018000738  
Consideration: 1000.00

Transfer Tax 4.00

Total: 4.00

Record and Return To:

RES AMERICAS INC  
330 S SECOND AVE STE 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  
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 JUNE 16, 2017, by and between Nadine R. McCarthy (“*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 five (5) years, commencing on JUNE 16, 2017, (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: Nadine R. McCarthy  
Name: Nadine R. McCarthy

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 )

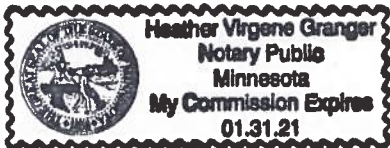
On the 2<sup>nd</sup> day of May in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Nadine R. McCarthy, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within 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.

R. TIMOTHY EADES NO. 4829414  
Notary Public, State of New York  
Qualified in Chautauqua County  
My Commission Expires April 30, 2019

R. Timothy Eades  
Notary Public

STATE OF MINNESOTA )  
 )  
COUNTY OF HENNEPIN )

On the 16<sup>th</sup> day of JUNE in the year 2017 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

**EXHIBIT A TO MEMORANDUM OF LEASE**

**LEGAL DESCRIPTION OF PREMISES**

THAT TRACT OR PARCEL OF LAND situated in the Town of Villenova, County of Chautauqua and State of New York being a part of Lot No. 62, Township 5 and Range 10 according to the Holland Land Company's Survey and more particularly described as follows:

Beginning at a point on the centerline of the existing pavement of Roundtop Road, which point is 262.30 feet Southerly from the Northerly boundary of said Lot No. 62 as measured along the centerline of said Roundtop Road; Thence South 89 degrees 20' West a distance of 705.0 feet to an existing iron pin and passing through an iron pin located 24.75 feet Westerly from the point of beginning; Thence South 52 degrees 37' West a distance of 166.4 feet to an existing iron pin; Thence North 27 degrees 09' West a distance of 406.5 feet to an existing iron pin on the Northerly boundary of said Lot No. 62; Thence South 89 degrees 28' West a distance of 477.5 feet to an iron pin; Thence South 15 degrees 36' West a distance of 399.2 feet to an iron pin; Thence South 5 degrees 23' West a distance of 336 feet to an iron pin; Thence North, 88 degrees 01' West a distance of 187.4 feet to an iron pin; Thence South 2 degrees 23' West a distance of 108.7 feet to an iron pin; Thence South 48 degrees 18' West a distance of 431.4 feet to an iron pin; Thence South 15 degrees 16' West a distance of 212.3 feet to an iron pin; Thence North 89 degrees 45' East a distance of 2209 feet to a point on the centerline of Roundtop Road and passing through an iron pin located 24.75 feet Westerly from the centerline of said Roundtop Road; Thence North 0 degrees along the centerline of said Roundtop Road a distance of 1055 feet to the point or 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 #: DE2018001160

Receipt#: 201806199007  
 Clerk: AH  
 Rec Date: 01/11/2018 10:49:12 AM  
 Doc Grp: D  
 Descrip: MEMO OF AGREEMT  
 Num Pgs: 7  
 Rec'd Frm: RES AMERICA INC

Party1: NAGEL RICHARD A  
 Party2: BALL HILL WIND ENERGY LLC  
 Town: VILLENova

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	0.00

Sub Total: 0.00

Total: 80.00

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

\*\*\*\*\* Transfer Tax \*\*\*\*\*  
 Transfer Tax #: TT2018002666  
 Consideration: 500.00

Total: 0.00

Record and Return To:

RES AMERICAS INC  
 455 BOSTON POST RD  
 SUITE 820  
 OLD SAYBROOK CT 06475

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 WECS SETBACK WAIVER AND CONSENT AGREEMENT

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 WECS SETBACK WAIVER AND CONSENT AGREEMENT ("**Memorandum**") is made and entered into as of September 19, 2017, by and between Richard A. Nagel and Marlene Nagel, as husband and wife ("**Owner**") and Ball Hill Wind Energy, LLC, a Delaware limited liability company (the "**Company**").

1. **Waiver and Consent.** For the term and upon the provisions set forth in that WECS Setback Waiver and Consent Agreement of even date herewith between Owner and the Company (the "**Agreement**"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Owner hereby waives application to the Premises of Wind Energy Conversion System setbacks and noise limits as specified in Town of Villenova Local Law No.1 of 2007.
2. **Term.** The Term of the Agreement is thirty (30) years, commencing on September 19 2017, which the Company has the option to extend for three (3) periods of ten (10) years each.
3. **Notice.** This Memorandum is prepared for the purpose of giving notice of the Agreement and in no way modifies the express provisions of the Agreement. This Memorandum shall continue to constitute notice of the Agreement, even if the Agreement is subsequently amended.
4. **Successors and Assigns.** Owner and the Company intend that the covenants, conditions and restrictions contained in the Agreement shall be both personal to Owner and the Company 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.
5. **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 Agreement has been executed as of the date first written above.

*[SIGNATURES TO FOLLOW]*

OWNER:


By: Richard A. Nagel  
Name: Richard A. Nagel

By: Marlene R. Nagel  
Name: Marlene Nagel

COMPANY:

Ball Hill Wind Energy, LLC  
a Delaware limited liability company

By: RES America Developments Inc.,  
its Manager

By:   
Name: Peter Rood  
Title: Vice President

STATE OF NEW YORK )  
                                  Cattaraugus )  
COUNTY OF CHAUTAUQUA )

On the 7<sup>th</sup> day of September in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Richard A. Nagel, 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 )  
                                  Cattaraugus )  
COUNTY OF CHAUTAUQUA )

On the 7<sup>th</sup> day of September in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Marlene Nagel, 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 19<sup>th</sup> day of September in the year 2017 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.

Jr [Signature]  
Notary Public



## EXHIBIT A TO MEMORANDUM OF AGREEMENT

### LEGAL DESCRIPTION OF PREMISES

ALL THAT TRACT OR PARCEL OF LAND situate in the Town of Villenova, County of Chautauqua and State of New York, being part of Lot 21, Town 5 and Range 10 of the Holland Land Company's survey and further bounded and described as follows:

BEGINNING at a point in the centerline of Dye Road (49.5' right of way) where said centerline intersects with the south line of said Lot 21, said point of beginning being in the northerly line of lands conveyed by Ronald C. Langless and Lorena J. Langless to Monroe Ridge, Inc. by deed dated December 18, 1972, and recorded in the Chautauqua County Clerk's office January 23, 1973, in Liber 1442 of Deeds at page 286;

thence S 88°-37'-47" W, along the south line of Lot 21 and north line of said Monroe Ridge, Inc., 30.00 feet to a set rebar with cap;

thence continuing along the same course S 88°-37'-47" W, and still along the south line of Lot 21 and the north line of Monroe Ridge, Inc., 1,879.37 feet to a set rebar with cap at the southeasterly corner of lands conveyed by Leo Stelmach, also know as Leo Stelmack, to Robert Malvestuto, by deed dated July 23, 1992, and recorded in the Chautauqua County Clerk's office July 28, 1992, in Liber 2277 of Deeds at page 578;

thence N 01°-03'-57" W, along the easterly line of said Malvestuto, 957.73 feet to a set rebar with cap;

thence N 88°-45'-19" E, 1,822.84 feet to a set rebar with cap;

thence continuing along the same course N 88°-45'-19" E, 24.75 feet to a point in the centerline of Dye Road;

thence S 04°-22'-10" E, along the centerline of Dye Road, 69.12 feet to a point;

thence S 87°-09'-22" W, 23.04 feet to a set rebar with cap;

thence continuing along the same course S 87°-09'-22" W, 132.49 feet to a set rebar with cap;

thence S 42°-21'-14" W, 87.81 feet to a set rebar with cap;

thence S 05°-16'-00" W, 113.94 feet to a set rebar with cap;

thence N 86°-31'-47" E, 213.52 feet to a set rebar with cap;

thence continuing along the same course N 86°-31'-47" E, 24.99 feet to a point in the centerline of Dye Road;

thence S 04°-22'-10" E, along the centerline of Dye Road, 580.84 feet to a point;

thence S 07°-15'-26" E, and still along the centerline of Dye Road, 133.40 feet to the point of beginning containing 40.2958 acres of land to be the same more or less.

SUBJECT TO the right of the public in and to Dye Road.

SUBJECT TO any utility easements or rights of ways of record that may validly affect the above described premises.

SUBJECT TO any oil and gas leases of record that may validly affect the above described premises.

ACCORDING TO a survey by Michael J. Rodgers Land Surveyor, P.C., licensed land surveyors, Jamestown, New York, originally dated March 31, 2003, and last revised October 22, 2003.

**ALSO**

ALL THAT TRACT OR PARCEL OF LAND situate in the Town of Villenova, County of Chautauqua and State of New York being part of Lot 13, Town 5 and Range 10 of the Holland Land Company's survey and further bounded and described as follows:

BEGINNING at a set rebar with cap in the westerly line of Lot 13; said iron stake and point of beginning being also the southwesterly corner of lands conveyed by Helen B. Newcomb by Marine Midland Bank, as Guardian of the property of Helen B. Newcomb, to Bruce Duane Newcomb by deed dated July 8, 1996 and recorded in the Chautauqua County Clerk's office August 2, 1996, in Liber 2352 of Deeds at page 112;  
thence N 88°-52'-42" E along the southerly line of said Newcomb, 2,659.38 feet to a set rebar with cap;  
thence continuing along the same course N 88°-52'-42" E and still along the southerly line of said Newcomb, 24.75 feet to a point in the centerline of County Highway No. 103 (49.5' right of way), also known as Buttermilk Road;  
thence S 07°-40'-17" E along the centerline of County Highway No. 103, 124.98 feet to a point;  
thence S 02°-25'-02" E and still along the centerline of County Highway No. 103, 243.37 feet to a point at the northeasterly corner of lands conveyed by Arthur W. Nagel to Edward G. Sinn and Darlene J. Sinn by deed dated July 20, 2001 and recorded in the Chautauqua County Clerk's office July 24, 2001, in Liber 2372 of Deeds at page 186;  
thence N 56°-57'-58" W along the northeasterly line of said Sinn, 30.38 feet to an existing iron stake;  
thence continuing along the same course N 56°-57'-58" W and still along the northeasterly line of said Sinn, 228.76 feet to an existing iron stake;  
thence S 02°-25'-02" E along the westerly line of said Sinn, 58.04 feet to a set rebar with cap;  
thence S 88°-52'-42" W, 2,491.03 feet to a set rebar with cap in the westerly line of said Lot 13;  
thence N 01°-03'-57" W along the westerly line of Lot 13, 280.00 feet to the point of beginning containing 17.4032 acres of land to be the same more or less.

SUBJECT TO the right of the public in and to County Highway No. 103.

SUBJECT TO any utility easements or rights of ways of record that may validly affect the above described premises.

SUBJECT TO any oil and gas leases of record that may validly affect the above described premises.

ALSO CONVEYING a right of way along an existing gravel drive running across lands adjoining westerly of the above described premises, from Dye Road to the southwesterly corner of the above described premises.

According to a survey by Michael J. Rodgers Land Surveyor, P.C., licensed land surveyors, Jamestown, New York, dated March 31, 2003.



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 #: DE2018001161

Receipt#: 201806199007  
Clerk: AH  
Rec Date: 01/11/2018 10:49:12 AM  
Doc Grp: D  
Descrip: MEMO OF AGREEMT  
Num Pgs: 6  
Rec'd Frm: RES AMERICA INC

Party1: SMITH WESLEY E  
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	0.00

Sub Total: 0.00

Total: 75.00

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

\*\*\*\*\* Transfer Tax \*\*\*\*\*  
Transfer Tax #: TT2018002667  
Consideration: 500.00

Total: 0.00

Record and Return To:

RES AMERICAS INC  
455 BOSTON POST RD  
SUITE 820  
OLD SAYBROOK CT 06475

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



RECORDING REQUESTED BY AND  
WHEN RECORDED RETURN TO:

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

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(Space Above for Recorder's Use Only)

THIS MEMORANDUM OF WECS SETBACK WAIVER AND CONSENT AGREEMENT ("**Memorandum**") is made and entered into as of November 9, 2017, by and between Wesley E. Smith and Elizabeth D. Smith, as husband and wife ("**Owner**") and Ball Hill Wind Energy, LLC, a Delaware limited liability company (the "**Company**").

1. **Waiver and Consent.** For the term and upon the provisions set forth in that WECS Setback Waiver and Consent Agreement of even date herewith between Owner and the Company (the "**Agreement**"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Owner hereby waives application to the Premises of Wind Energy Conversion System setbacks and noise limits as specified in Town of Villenova Local Law No.1 of 2007.
2. **Term.** The Term of the Agreement is thirty (30) years, commencing on November 9 2017, which the Company has the option to extend for three (3) periods of ten (10) years each.
3. **Notice.** This Memorandum is prepared for the purpose of giving notice of the Agreement and in no way modifies the express provisions of the Agreement. This Memorandum shall continue to constitute notice of the Agreement, even if the Agreement is subsequently amended.
4. **Successors and Assigns.** Owner and the Company intend that the covenants, conditions and restrictions contained in the Agreement shall be both personal to Owner and the Company 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.
5. **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 Agreement has been executed as of the date first written above.

*[SIGNATURES TO FOLLOW]*

OWNER:

By: Wesley E. Smith  
Name: Wesley E. Smith

By: Elizabeth D. Smith 10/25/17  
Name: Elizabeth D. Smith

COMPANY:

Ball Hill Wind Energy, LLC  
a Delaware limited liability company

By: RES America Developments Inc.,  
its Manager

By: [Signature]  
Name: Ernan Lammers  
Title: Vice President - Development

STATE OF NEW YORK )  
                                  erie )  
COUNTY OF CHAUTAUQUA )

On the 25<sup>th</sup> day of October in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Wesley E. 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.

Kristin M. McCarthy  
Notary Public  
KRISTIN M MCCARTHY  
Notary Public, State of New York  
No. 01MC6318749  
Qualified in Erie County  
My Commission Expires 2-2-19

STATE OF NEW YORK )  
                                  erie )  
COUNTY OF CHAUTAUQUA )

On the 25<sup>th</sup> day of October in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Elizabeth D. 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.

Kristin M. McCarthy  
Notary Public  
KRISTIN M MCCARTHY  
Notary Public, State of New York  
No. 01MC6318749  
Qualified in Erie County  
My Commission Expires 2-2-19

STATE OF MINNESOTA )  
                                  ) )  
COUNTY OF HENNEPIN )

On the 9<sup>th</sup> day of November in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Brian Lammers, 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.

  
Jonathan Kroger Pettengill Jr  
Notary Public  
Minnesota  
My Commission Expires 01.31.22

[Signature]  
Notary Public

**EXHIBIT A TO MEMORANDUM OF AGREEMENT**

**LEGAL DESCRIPTION OF PREMISES**

BEGINNING at a point in the south line of Lot 18 at the southwest corner of premises conveyed to Charles J. Gray and Sandra Gray, his wife, by Deed dated March 18, 1999, and recorded April 1, 1999 in Liber 2410 of Deeds at page 234, which is also the southwest corner of premises conveyed to Stephen Parsells by Deed dated Nov. 19, 1822 and recorded March 4, 1823 in Liber 4 of Deeds at page 186; thence easterly along the south line of Lot 18, 1096.3 feet, more or less, to a point which is the southeast corner of premises conveyed by the two aforementioned Deeds; thence northerly along the east lines of premises conveyed by the two aforementioned Deeds 1001.8 feet, more or less, to a point; thence westerly on a line parallel to the south line of Lot 18, 1106.5 feet, more or less, to a point in the west line of premises conveyed by the two aforementioned Deeds; thence southerly along the west line of premises conveyed by the two aforementioned Deeds, 1001.8 feet, more or less, 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 #: DE2018001159

Receipt#: 201806199007

Clerk: AH

Rec Date: 01/11/2018 10:49:12 AM

Doc Grp: D

Descrip: MEMO OF EASEMNT

Num Pgs: 7

Rec'd Frm: RES AMERICA INC

Party1: THOMPSON STANLEY R

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 #: TT2018002665  
 Consideration: 1000.00

Transfer Tax	4.00
--------------	------

Total: 4.00

Record and Return To:

RES AMERICAS INC  
 455 BOSTON POST RD  
 SUITE 820  
 OLD SAYBROOK CT 06475

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

6

**After recording return to:**  
Ball Hill Wind Energy, LLC  
11101 W. 120<sup>th</sup> Ave., Suite 400  
Broomfield, Colorado 80021  
ATTN: General Counsel

THIS SPACE FOR RECORDERS USE ONLY

## MEMORANDUM OF TRANSMISSION EASEMENT AGREEMENT

THIS MEMORANDUM OF TRANSMISSION EASEMENT AGREEMENT (this “**Memorandum**”), is made, dated and effective as of December 28, 2017 (the “**Effective Date**”), between Stanley R. Thompson and Jean M. Thompson, as husband and wife (together with its successors, assigns and heirs, “**Landowner**”), whose address is 1349 Stebbins Road, Silver Creek, New York 14136, and BALL HILL WIND ENERGY, LLC a Delaware limited liability company (together with its transferees, successors and assigns, “**Grantee**”), whose address is 11101 W. 120<sup>th</sup> Ave., Suite 400, Broomfield, CO 80021, with regards to the following:

1. Landowner and Grantee did enter into that certain TRANSMISSION EASEMENT AGREEMENT dated December 28, 2017 (the “**Agreement**”), which affects the real property located in the Town of Hanover, Chautauqua County, New York, as more particularly described and depicted in **Exhibit A and A-1** attached hereto (the “**Property**”). Capitalized terms used and not defined herein have the meaning given the same in the Agreement.

2. The Agreement grants, and Landowner hereby grants, Grantee, among other things, for the development, erection, construction, re-construction, installation, replacement, relocation, removal, maintenance, operation and use of underground electrical transmission facilities including without limitation, wires, cables, conduits, and appurtenances thereto, and any and all other facilities, equipment and improvements related thereto (collectively, the “**Transmission Facilities**”). The Agreement contains, among other things, certain Landowner and third party use and development restrictions on the Property.

3. This Memorandum does not supersede, modify, amend or otherwise change the terms, conditions or covenants of the Agreement, and Landowner and Grantee executed and are recording this Memorandum for the purposes set forth herein and for providing constructive notice of the Agreement and Grantee’s rights thereunder and hereunder. The terms, conditions and covenants of the Agreement are set forth at length in the Agreement and are incorporated herein by reference as though fully set forth herein. This Memorandum shall not, in any manner or form whatsoever, alter, modify or vary the terms, covenants and conditions of the Agreement.

4. This Memorandum shall also bind and benefit, as the case may be, the heirs, legal representatives, assigns and successors of the respective parties hereto, and all covenants, conditions and agreements contained herein shall be construed as covenants running with the land to the extent consistent with applicable law.

5. Landowner shall have no ownership, lien, security or other interest in any Transmission Facilities installed on the Easement Property, or any profits derived therefrom, and Grantee may remove any or all Transmission Facilities at any time.

6. This Memorandum may be executed in counterparts, each of which shall be deemed an original and all of which when taken together shall constitute one and the same document.

[signature page to follow]



IN WITNESS WHEREOF, the parties have executed this Memorandum to be effective as of the date first written above.

**LANDOWNER:**

By: Stanley R Thompson  
Name: Stanley R. Thompson  
Title: Owner

By: Jean M Thompson  
Name: Jean M. Thompson  
Title: owner

**GRANTEE:**

BALL HILL WIND ENERGY, LLC,  
a Delaware limited liability company

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

By: Brian Lammers  
Name: Brian Lammers  
Title: VP for Development - north

STATE OF NEW YORK )

: ss.

COUNTY OF CHAUTAUQUA )

On the 4<sup>th</sup> day of December, in the year 2017, before me, the undersigned, personally appeared Stanley R. Thompson, 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 individuals(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 )

: ss.

COUNTY OF CHAUTAUQUA)

On the 4<sup>th</sup> day of December, in the year 2017, before me, the undersigned, personally appeared Jean M. Thompson, 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 individuals(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 )

: ss.

COUNTY OF Hennepin )

On the 25<sup>th</sup> day of December, in the year 2017, before me, the undersigned, personally appeared Brian Lummers, 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 individuals(s) acted, executed the instrument.

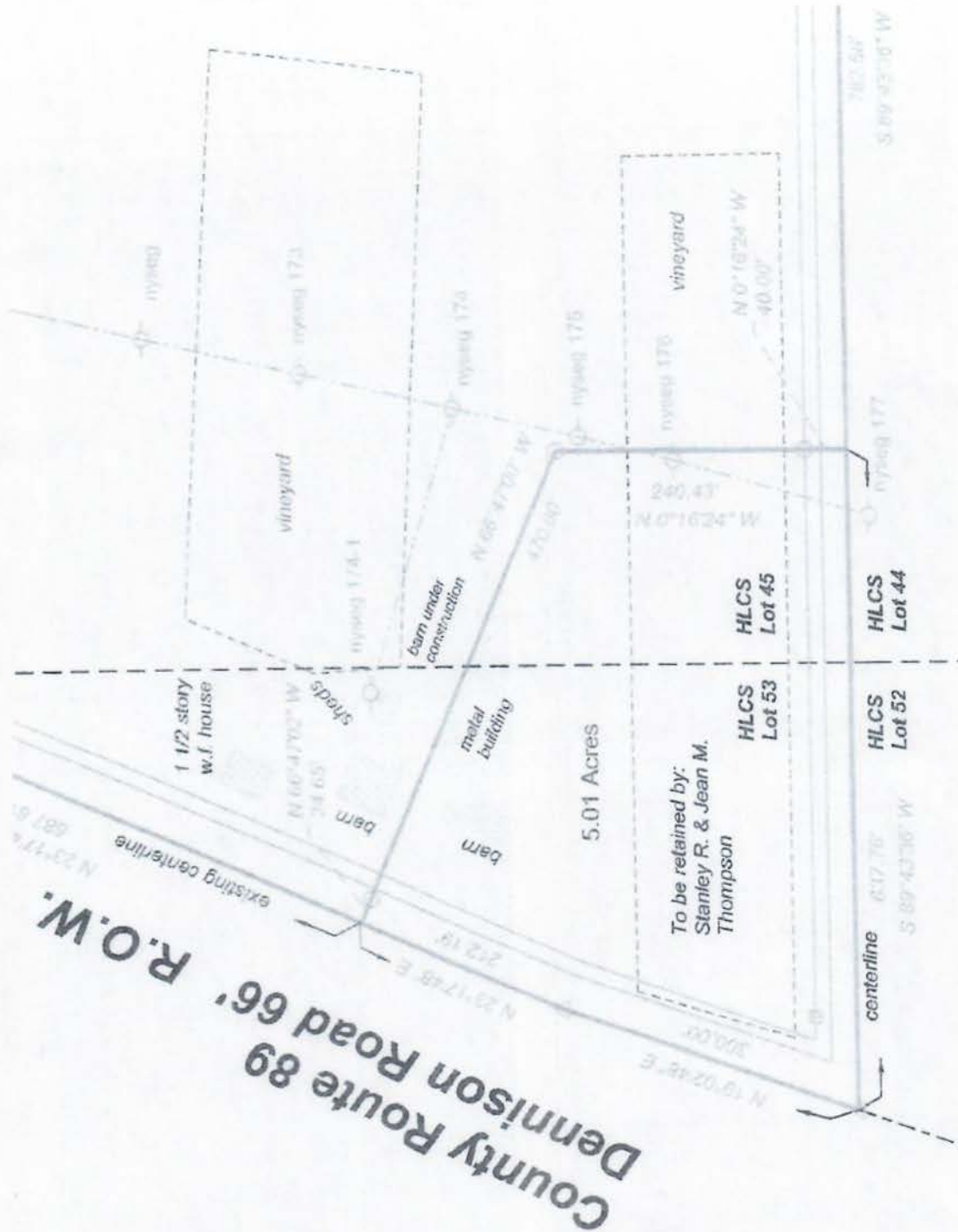
Jonathan Kroger Pettengill Jr  
Notary Public



**EXHIBIT A TO MEMORANDUM OF TRANSMISSION EASEMENT AGREEMENT**

Legal Description

The approximately 0.75 acre sector created by a 230 foot radius circle whose center is the southwestern corner of Tax Parcel 83.00-1-56.1 situated in the Town of Hanover, Chautauqua County, New York, as depicted on Exhibit A-1 hereof. Tax Parcel 83.00-1-56.1 is depicted below and totals approximately 5.0 acres, more or less:



**EXHIBIT A-1 TO MEMORANDUM OF TRANSMISSION EASEMENT AGREEMENT**

Depiction of Easement Property



RECORDING REQUESTED BY AND  
WHEN RECORDED RETURN TO:

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

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(Space Above for Recorder's Use Only)

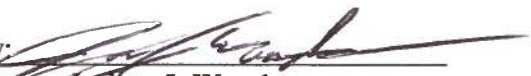
THIS MEMORANDUM OF WECS SETBACK WAIVER AND CONSENT AGREEMENT ("*Memorandum*") is made and entered into as of June 8, 2018, by and between Jashua J. Woods, a married man as to his sole and separate property ("*Owner*") and Ball Hill Wind Energy, LLC, a Delaware limited liability company (the "*Company*").

1. **Waiver and Consent.** For the term and upon the provisions set forth in that WECS Setback Waiver and Consent Agreement of even date herewith between Owner and the Company (the "*Agreement*"), all of which provisions are specifically made a part hereof as though fully and completely set forth herein, Owner hereby waives application to the Premises of Wind Energy Conversion System property line setback as specified in Town of Villenova Local Law No.1 of 2007 for one (1) WECS, provided such WECS is located a minimum distance of 450-feet from the Premises.
2. **Term.** The Term of the Agreement is thirty (30) years, commencing on \_\_\_\_\_ 2018, which the Company has the option to extend for three (3) periods of ten (10) years each.
3. **Notice.** This Memorandum is prepared for the purpose of giving notice of the Agreement and in no way modifies the express provisions of the Agreement. This Memorandum shall continue to constitute notice of the Agreement, even if the Agreement is subsequently amended.
4. **Successors and Assigns.** Owner and the Company intend that the covenants, conditions and restrictions contained in the Agreement shall be both personal to Owner and the Company 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.

5. **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 Agreement has been executed as of the date first written above.

*[SIGNATURES TO FOLLOW]*


OWNER:

By:   
Name: Jashua J. Woods

COMPANY:

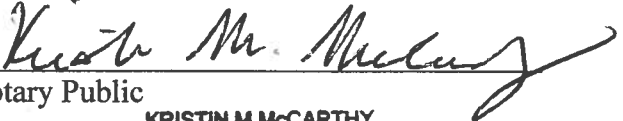
Ball Hill Wind Energy, LLC  
a Delaware limited liability company

By: RES America Developments Inc.,  
its Manager

By:   
Name: Brian Lammers  
Title: Regional Vice President

STATE OF NEW YORK )  
 )  
COUNTY OF CHAUTAUQUA )

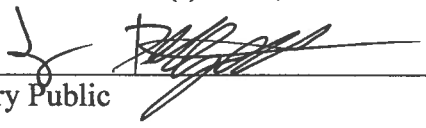
On the 17<sup>th</sup> day of May in the year 2017 before me, the undersigned, a notary public in and for said state, personally appeared Jashua J. Woods, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is\are subscribed to the within 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 2-2-19

STATE OF MINNESOTA )  
 )  
COUNTY OF HENNEPIN )

On the 8<sup>th</sup> day of June in the year 2018 before me, the undersigned, a notary public in and for said state, personally appeared Brian Lemmes, 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 AGREEMENT**

**LEGAL DESCRIPTION OF PREMISES**

**All That Tract or Parcel of Land**, situate in the Towns of Hanover and Villenova, County of Chautauqua, and State of New York, being part of Lots 32 and 40 in Townships 6 and 5 and Range 10 of the Holland Land Company's survey, and more particularly described as follows:

**Beginning** in the centerline of Hurlburt Road (49.5 feet wide) as now laid out and occupied at the intersection thereof with the easterly line of lands conveyed from Duman to Duman by deed recorded in Liber 2417 of Deeds at Page 794 in the office of the Chautauqua County Clerk, said point of beginning also being located 1939.92 feet northwesterly along said centerline of Hurlburt Road from the intersection thereof with the east line of said Lot 32; thence South 17 degrees 05 minutes 46 seconds West (record bearing) a distance of 300 feet along said easterly line of Duman lands to an existing iron pin at a deflection point therein, and passing through an existing iron pin located 35 feet southerly along the last described course from said centerline of Hurlburt Road; thence South 2 degrees 57 minutes 12 seconds West a distance of 1011.77 feet along said easterly line of Duman lands to an existing iron pin in the south line of said Lot 32; thence South 89 degrees 32 minutes 08 seconds East a distance of 726.61 feet along said south line of Lot 32 to an existing iron pin in the easterly line of lands conveyed from Merritt to McManus by deed recorded in Liber 37 of Deeds at Page 197 in the office of the Chautauqua County Clerk; thence South 0 degrees 55 minutes West a distance of 1465.7 feet along said easterly line of McManus lands to an existing iron pin; thence South 0 degrees 11 minutes East a distance of 537.6 feet along the westerly line of lands of

Waligora (now or formerly) to an existing iron pin in the northerly line of lands conveyed from Seth W. Holmes to Borden W. Simmons; thence South 88 degrees 28 minutes West a distance of 1089.96 feet along said northerly line of Simmons lands to an existing iron pin; thence North 0 degrees 36 minutes East a distance of 387 feet along the westerly line of lands conveyed from Crowell to Shadle by deed recorded in Liber 1267 of Deeds at Page 34 in the office of the Chautauqua County Clerk to an existing iron pin at a deflection point therein; thence North 2 degrees 30 minutes East a distance of 249.16 feet along said westerly line of Shadle lands to an existing iron pin; thence North 0 degrees 58 minutes East a distance of 1405.36 feet along the westerly line of said McManus lands to an iron post in said South line of Lot 32; thence North 89 degrees 32 minutes 08 seconds West a distance of 191.57 feet along said South line of Lot 32 to an existing iron pin in the westerly line of said Duman lands; thence North 0 degrees 48 minutes 48 seconds East a distance of 1536.24 feet along said westerly line of Duman lands to a point in said centerline of Hurlburt Road, and passing through an existing iron pin located 23.93 feet southerly along the last described course from said centerline of Hurlburt Road; thence southeasterly following a regular curve to the right having a radius of 1565.82 feet an arc distance of 240.24 feet along said centerline of Hurlburt Road to a point; thence South 68 degrees 28 minutes East a distance of 459.64 feet along said centerline of Hurlburt Road to the point or place of beginning, and containing 68.83 acres of land more or less, and being the intent to describe all that tract or parcel of land conveyed to Cronkhite by deed recorded by Instrument No. 2014-2053 in the office of the Chautauqua County Clerk. Subject to rights of others in Hurlburt Road.

# **Appendix B**



# Agricultural Data Statement

Date 6/4/2018

**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: <u>Ball Hill Wind Energy, LLC, Mark Lyons, Senior Manager</u> Address: <u>11101 W. 120th Ave., Suite 400</u> <u>Broomfield, CO 80021</u>	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: The Applicant 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" in portions of the towns of Villenova and Hanover. The Project consists of 29 turbines with associated access roads and electrical collection system. Not all parcels are actively farmed, but notice is being sent to all parcels within 1500 feet of the Proposed Wind Overlay district.

3. Location of project: Address: Portions of the Towns of Villenova and Hanover  
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 CHAT005; CHAT010 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: <u>See attached list of parcels within 1500 feet</u> Address: <u>of the Proposed Wind Overlay District.</u> Is this parcel actively farmed? <input type="checkbox"/> NO <input type="checkbox"/> YES	Name: _____ Address: _____ Is this parcel actively farmed? <input type="checkbox"/> NO <input type="checkbox"/> YES
Name: _____ Address: _____ Is this parcel actively farmed? <input type="checkbox"/> NO <input type="checkbox"/> YES	Name: _____ Address: _____ Is this parcel actively farmed? <input type="checkbox"/> NO <input type="checkbox"/> 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.



Villenova

Application # \_\_\_\_\_

# Agricultural Data Statement

Date 6/4/2018

**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: <u>Ball Hill Wind Energy, LLC, Mark Lyons, Senior Manager</u> Address: <u>11101 W. 120th Ave., Suite 400</u> <u>Broomfield, CO 80021</u>	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: The Applicant 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" in portions of the towns of Villenova and Hanover. The Project consists of 29 turbines with associated access roads and electrical collection system. Not all parcels are actively farmed, but notice is being sent to all parcels within 1500 feet of the Proposed Wind Overlay district.

3. Location of project: Address: Portions of the Towns of Villenova and Hanover  
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 CHAT005; CHAT010 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: <u>See attached list of parcels within 1500 feet</u> Address: <u>of the Proposed Wind Overlay District.</u> Is this parcel actively farmed? <input type="checkbox"/> NO <input type="checkbox"/> YES	Name: _____ Address: _____ Is this parcel actively farmed? <input type="checkbox"/> NO <input type="checkbox"/> YES
Name: _____ Address: _____ Is this parcel actively farmed? <input type="checkbox"/> NO <input type="checkbox"/> YES	Name: _____ Address: _____ Is this parcel actively farmed? <input type="checkbox"/> NO <input type="checkbox"/> 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 C

**Full Environmental Assessment Form**  
**Part 1 - Project and Setting**

**Instructions for Completing Part 1**

**Part 1 is to be completed by the applicant or project sponsor.** Responses become part of the application for approval or funding, are subject to public review, and may be subject to further verification.

Complete Part 1 based on information currently available. If additional research or investigation would be needed to fully respond to any item, please answer as thoroughly as possible based on current information; indicate whether missing information does not exist, or is not reasonably available to the sponsor; and, when possible, generally describe work or studies which would be necessary to update or fully develop that information.

Applicants/sponsors must complete all items in Sections A & B. In Sections C, D & E, most items contain an initial question that must be answered either “Yes” or “No”. If the answer to the initial question is “Yes”, complete the sub-questions that follow. If the answer to the initial question is “No”, proceed to the next question. Section F allows the project sponsor to identify and attach any additional information. Section G requires the name and signature of the project sponsor to verify that the information contained in Part 1 is accurate and complete.

**A. Project and Sponsor Information.**

Name of Action or Project:		
Project Location (describe, and attach a general location map):		
Brief Description of Proposed Action (include purpose or need):		
Name of Applicant/Sponsor:		Telephone:
		E-Mail:
Address:		
City/PO:	State:	Zip Code:
Project Contact (if not same as sponsor; give name and title/role):		Telephone:
		E-Mail:
Address:		
City/PO:	State:	Zip Code:
Property Owner (if not same as sponsor):		Telephone:
		E-Mail:
Address:		
City/PO:	State:	Zip Code:

**B. Government Approvals**

**B. Government Approvals, Funding, or Sponsorship.** (“Funding” includes grants, loans, tax relief, and any other forms of financial assistance.)

Government Entity	If Yes: Identify Agency and Approval(s) Required	Application Date (Actual or projected)
a. City Council, Town Board, or Village Board of Trustees <input type="checkbox"/> Yes <input type="checkbox"/> No		
b. City, Town or Village Planning Board or Commission <input type="checkbox"/> Yes <input type="checkbox"/> No		
c. City Council, Town or Village Zoning Board of Appeals <input type="checkbox"/> Yes <input type="checkbox"/> No		
d. Other local agencies <input type="checkbox"/> Yes <input type="checkbox"/> No		
e. County agencies <input type="checkbox"/> Yes <input type="checkbox"/> No		
f. Regional agencies <input type="checkbox"/> Yes <input type="checkbox"/> No		
g. State agencies <input type="checkbox"/> Yes <input type="checkbox"/> No		
h. Federal agencies <input type="checkbox"/> Yes <input type="checkbox"/> No		
i. Coastal Resources. <ul style="list-style-type: none"> <li>i. Is the project site within a Coastal Area, or the waterfront area of a Designated Inland Waterway? <input type="checkbox"/> Yes <input type="checkbox"/> No</li> <li>ii. Is the project site located in a community with an approved Local Waterfront Revitalization Program? <input type="checkbox"/> Yes <input type="checkbox"/> No</li> <li>iii. Is the project site within a Coastal Erosion Hazard Area? <input type="checkbox"/> Yes <input type="checkbox"/> No</li> </ul>		

**C. Planning and Zoning**

**C.1. Planning and zoning actions.**

Will administrative or legislative adoption, or amendment of a plan, local law, ordinance, rule or regulation be the only approval(s) which must be granted to enable the proposed action to proceed?  Yes  No

- **If Yes**, complete sections C, F and G.
- **If No**, proceed to question C.2 and complete all remaining sections and questions in Part 1

**C.2. Adopted land use plans.**

a. Do any municipally- adopted (city, town, village or county) comprehensive land use plan(s) include the site where the proposed action would be located?  Yes  No

If Yes, does the comprehensive plan include specific recommendations for the site where the proposed action would be located?  Yes  No

b. Is the site of the proposed action within any local or regional special planning district (for example: Greenway Brownfield Opportunity Area (BOA); designated State or Federal heritage area; watershed management plan; or other?)  Yes  No

If Yes, identify the plan(s):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

c. Is the proposed action located wholly or partially within an area listed in an adopted municipal open space plan, or an adopted municipal farmland protection plan?  Yes  No

If Yes, identify the plan(s):

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



**C.3. Zoning**

a. Is the site of the proposed action located in a municipality with an adopted zoning law or ordinance.  Yes  No  
If Yes, what is the zoning classification(s) including any applicable overlay district?

\_\_\_\_\_

\_\_\_\_\_

b. Is the use permitted or allowed by a special or conditional use permit?  Yes  No

c. Is a zoning change requested as part of the proposed action?  Yes  No

If Yes,

i. What is the proposed new zoning for the site? \_\_\_\_\_

**C.4. Existing community services.**

a. In what school district is the project site located? \_\_\_\_\_

b. What police or other public protection forces serve the project site?  
\_\_\_\_\_

c. Which fire protection and emergency medical services serve the project site?  
\_\_\_\_\_

d. What parks serve the project site?  
\_\_\_\_\_  
\_\_\_\_\_

**D. Project Details**

**D.1. Proposed and Potential Development**

a. What is the general nature of the proposed action (e.g., residential, industrial, commercial, recreational; if mixed, include all components)?  
\_\_\_\_\_

b. a. Total acreage of the site of the proposed action? \_\_\_\_\_ acres  
b. Total acreage to be physically disturbed? \_\_\_\_\_ acres  
c. Total acreage (project site and any contiguous properties) owned or controlled by the applicant or project sponsor? \_\_\_\_\_ acres

c. Is the proposed action an expansion of an existing project or use?  Yes  No  
i. If Yes, what is the approximate percentage of the proposed expansion and identify the units (e.g., acres, miles, housing units, square feet)? % \_\_\_\_\_ Units: \_\_\_\_\_

d. Is the proposed action a subdivision, or does it include a subdivision?  Yes  No  
If Yes,

i. Purpose or type of subdivision? (e.g., residential, industrial, commercial; if mixed, specify types)  
\_\_\_\_\_

ii. Is a cluster/conservation layout proposed?  Yes  No

iii. Number of lots proposed? \_\_\_\_\_

iv. Minimum and maximum proposed lot sizes? Minimum \_\_\_\_\_ Maximum \_\_\_\_\_

e. Will proposed action be constructed in multiple phases?  Yes  No

i. If No, anticipated period of construction: \_\_\_\_\_ months

ii. If Yes:

- Total number of phases anticipated \_\_\_\_\_
- Anticipated commencement date of phase 1 (including demolition) \_\_\_\_\_ month \_\_\_\_\_ year
- Anticipated completion date of final phase \_\_\_\_\_ month \_\_\_\_\_ year

• Generally describe connections or relationships among phases, including any contingencies where progress of one phase may determine timing or duration of future phases: \_\_\_\_\_

\_\_\_\_\_  
\_\_\_\_\_

f. Does the project include new residential uses?  Yes  No  
 If Yes, show numbers of units proposed.

	<u>One Family</u>	<u>Two Family</u>	<u>Three Family</u>	<u>Multiple Family (four or more)</u>
Initial Phase	_____	_____	_____	_____
At completion	_____	_____	_____	_____
of all phases	_____	_____	_____	_____

g. Does the proposed action include new non-residential construction (including expansions)?  Yes  No  
 If Yes,

i. Total number of structures \_\_\_\_\_

ii. Dimensions (in feet) of largest proposed structure: \_\_\_\_\_ height; \_\_\_\_\_ width; and \_\_\_\_\_ length

iii. Approximate extent of building space to be heated or cooled: \_\_\_\_\_ square feet

h. Does the proposed action include construction or other activities that will result in the impoundment of any liquids, such as creation of a water supply, reservoir, pond, lake, waste lagoon or other storage?  Yes  No  
 If Yes,

i. Purpose of the impoundment: \_\_\_\_\_

ii. If a water impoundment, the principal source of the water:  Ground water  Surface water streams  Other specify: \_\_\_\_\_

iii. If other than water, identify the type of impounded/contained liquids and their source.  
 \_\_\_\_\_

iv. Approximate size of the proposed impoundment. Volume: \_\_\_\_\_ million gallons; surface area: \_\_\_\_\_ acres

v. Dimensions of the proposed dam or impounding structure: \_\_\_\_\_ height; \_\_\_\_\_ length

vi. Construction method/materials for the proposed dam or impounding structure (e.g., earth fill, rock, wood, concrete):  
 \_\_\_\_\_

**D.2. Project Operations**

a. Does the proposed action include any excavation, mining, or dredging, during construction, operations, or both?  Yes  No  
 (Not including general site preparation, grading or installation of utilities or foundations where all excavated materials will remain onsite)  
 If Yes:

i. What is the purpose of the excavation or dredging? \_\_\_\_\_

ii. How much material (including rock, earth, sediments, etc.) is proposed to be removed from the site?

- Volume (specify tons or cubic yards): \_\_\_\_\_
- Over what duration of time? \_\_\_\_\_

iii. Describe nature and characteristics of materials to be excavated or dredged, and plans to use, manage or dispose of them.  
 \_\_\_\_\_  
 \_\_\_\_\_

iv. Will there be onsite dewatering or processing of excavated materials?  Yes  No  
 If yes, describe. \_\_\_\_\_  
 \_\_\_\_\_

v. What is the total area to be dredged or excavated? \_\_\_\_\_ acres

vi. What is the maximum area to be worked at any one time? \_\_\_\_\_ acres

vii. What would be the maximum depth of excavation or dredging? \_\_\_\_\_ feet

viii. Will the excavation require blasting?  Yes  No

ix. Summarize site reclamation goals and plan: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

b. Would the proposed action cause or result in alteration of, increase or decrease in size of, or encroachment into any existing wetland, waterbody, shoreline, beach or adjacent area?  Yes  No  
 If Yes:

i. Identify the wetland or waterbody which would be affected (by name, water index number, wetland map number or geographic description): \_\_\_\_\_  
 \_\_\_\_\_

ii. Describe how the proposed action would affect that waterbody or wetland, e.g. excavation, fill, placement of structures, or alteration of channels, banks and shorelines. Indicate extent of activities, alterations and additions in square feet or acres:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

iii. Will proposed action cause or result in disturbance to bottom sediments?  Yes  No

If Yes, describe: \_\_\_\_\_

iv. Will proposed action cause or result in the destruction or removal of aquatic vegetation?  Yes  No

If Yes:

- acres of aquatic vegetation proposed to be removed: \_\_\_\_\_
- expected acreage of aquatic vegetation remaining after project completion: \_\_\_\_\_
- purpose of proposed removal (e.g. beach clearing, invasive species control, boat access): \_\_\_\_\_
- proposed method of plant removal: \_\_\_\_\_
- if chemical/herbicide treatment will be used, specify product(s): \_\_\_\_\_

v. Describe any proposed reclamation/mitigation following disturbance: \_\_\_\_\_

c. Will the proposed action use, or create a new demand for water?  Yes  No

If Yes:

i. Total anticipated water usage/demand per day: \_\_\_\_\_ gallons/day

ii. Will the proposed action obtain water from an existing public water supply?  Yes  No

If Yes:

- Name of district or service area: \_\_\_\_\_
- Does the existing public water supply have capacity to serve the proposal?  Yes  No
- Is the project site in the existing district?  Yes  No
- Is expansion of the district needed?  Yes  No
- Do existing lines serve the project site?  Yes  No

iii. Will line extension within an existing district be necessary to supply the project?  Yes  No

If Yes:

- Describe extensions or capacity expansions proposed to serve this project: \_\_\_\_\_
- Source(s) of supply for the district: \_\_\_\_\_

iv. Is a new water supply district or service area proposed to be formed to serve the project site?  Yes  No

If Yes:

- Applicant/sponsor for new district: \_\_\_\_\_
- Date application submitted or anticipated: \_\_\_\_\_
- Proposed source(s) of supply for new district: \_\_\_\_\_

v. If a public water supply will not be used, describe plans to provide water supply for the project: \_\_\_\_\_

vi. If water supply will be from wells (public or private), maximum pumping capacity: \_\_\_\_\_ gallons/minute.

d. Will the proposed action generate liquid wastes?  Yes  No

If Yes:

i. Total anticipated liquid waste generation per day: \_\_\_\_\_ gallons/day

ii. Nature of liquid wastes to be generated (e.g., sanitary wastewater, industrial; if combination, describe all components and approximate volumes or proportions of each): \_\_\_\_\_

iii. Will the proposed action use any existing public wastewater treatment facilities?  Yes  No

If Yes:

- Name of wastewater treatment plant to be used: \_\_\_\_\_
- Name of district: \_\_\_\_\_
- Does the existing wastewater treatment plant have capacity to serve the project?  Yes  No
- Is the project site in the existing district?  Yes  No
- Is expansion of the district needed?  Yes  No

• Do existing sewer lines serve the project site?  Yes  No  
 • Will line extension within an existing district be necessary to serve the project?  Yes  No  
 If Yes:  
 • Describe extensions or capacity expansions proposed to serve this project: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

iv. Will a new wastewater (sewage) treatment district be formed to serve the project site?  Yes  No  
 If Yes:  
 • Applicant/sponsor for new district: \_\_\_\_\_  
 • Date application submitted or anticipated: \_\_\_\_\_  
 • What is the receiving water for the wastewater discharge? \_\_\_\_\_

v. If public facilities will not be used, describe plans to provide wastewater treatment for the project, including specifying proposed receiving water (name and classification if surface discharge, or describe subsurface disposal plans):  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

vi. Describe any plans or designs to capture, recycle or reuse liquid waste: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

e. Will the proposed action disturb more than one acre and create stormwater runoff, either from new point sources (i.e. ditches, pipes, swales, curbs, gutters or other concentrated flows of stormwater) or non-point source (i.e. sheet flow) during construction or post construction?  Yes  No  
 If Yes:  
 i. How much impervious surface will the project create in relation to total size of project parcel?  
     \_\_\_\_\_ Square feet or \_\_\_\_\_ acres (impervious surface)  
     \_\_\_\_\_ Square feet or \_\_\_\_\_ acres (parcel size)  
 ii. Describe types of new point sources. \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

iii. Where will the stormwater runoff be directed (i.e. on-site stormwater management facility/structures, adjacent properties, groundwater, on-site surface water or off-site surface waters)?  
 \_\_\_\_\_  
 \_\_\_\_\_  
 • If to surface waters, identify receiving water bodies or wetlands: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

• Will stormwater runoff flow to adjacent properties?  Yes  No

iv. Does proposed plan minimize impervious surfaces, use pervious materials or collect and re-use stormwater?  Yes  No

f. Does the proposed action include, or will it use on-site, one or more sources of air emissions, including fuel combustion, waste incineration, or other processes or operations?  Yes  No  
 If Yes, identify:  
 i. Mobile sources during project operations (e.g., heavy equipment, fleet or delivery vehicles)  
 \_\_\_\_\_  
 ii. Stationary sources during construction (e.g., power generation, structural heating, batch plant, crushers)  
 \_\_\_\_\_  
 iii. Stationary sources during operations (e.g., process emissions, large boilers, electric generation)  
 \_\_\_\_\_  
 \_\_\_\_\_

g. Will any air emission sources named in D.2.f (above), require a NY State Air Registration, Air Facility Permit, or Federal Clean Air Act Title IV or Title V Permit?  Yes  No  
 If Yes:  
 i. Is the project site located in an Air quality non-attainment area? (Area routinely or periodically fails to meet ambient air quality standards for all or some parts of the year)  Yes  No  
 ii. In addition to emissions as calculated in the application, the project will generate:  
 • \_\_\_\_\_ Tons/year (short tons) of Carbon Dioxide (CO<sub>2</sub>)  
 • \_\_\_\_\_ Tons/year (short tons) of Nitrous Oxide (N<sub>2</sub>O)  
 • \_\_\_\_\_ Tons/year (short tons) of Perfluorocarbons (PFCs)  
 • \_\_\_\_\_ Tons/year (short tons) of Sulfur Hexafluoride (SF<sub>6</sub>)  
 • \_\_\_\_\_ Tons/year (short tons) of Carbon Dioxide equivalent of Hydroflouorocarbons (HFCs)  
 • \_\_\_\_\_ Tons/year (short tons) of Hazardous Air Pollutants (HAPs)

h. Will the proposed action generate or emit methane (including, but not limited to, sewage treatment plants, landfills, composting facilities)?  Yes  No

If Yes:

*i.* Estimate methane generation in tons/year (metric): \_\_\_\_\_

*ii.* Describe any methane capture, control or elimination measures included in project design (e.g., combustion to generate heat or electricity, flaring): \_\_\_\_\_

---

i. Will the proposed action result in the release of air pollutants from open-air operations or processes, such as quarry or landfill operations?  Yes  No

If Yes: Describe operations and nature of emissions (e.g., diesel exhaust, rock particulates/dust):

\_\_\_\_\_

---

j. Will the proposed action result in a substantial increase in traffic above present levels or generate substantial new demand for transportation facilities or services?  Yes  No

If Yes:

*i.* When is the peak traffic expected (Check all that apply):  Morning  Evening  Weekend  
 Randomly between hours of \_\_\_\_\_ to \_\_\_\_\_.

*ii.* For commercial activities only, projected number of semi-trailer truck trips/day: \_\_\_\_\_

*iii.* Parking spaces: Existing \_\_\_\_\_ Proposed \_\_\_\_\_ Net increase/decrease \_\_\_\_\_

*iv.* Does the proposed action include any shared use parking?  Yes  No

*v.* If the proposed action includes any modification of existing roads, creation of new roads or change in existing access, describe:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

*vi.* Are public/private transportation service(s) or facilities available within 1/2 mile of the proposed site?  Yes  No

*vii.* Will the proposed action include access to public transportation or accommodations for use of hybrid, electric or other alternative fueled vehicles?  Yes  No

*viii.* Will the proposed action include plans for pedestrian or bicycle accommodations for connections to existing pedestrian or bicycle routes?  Yes  No

---

k. Will the proposed action (for commercial or industrial projects only) generate new or additional demand for energy?  Yes  No

If Yes:

*i.* Estimate annual electricity demand during operation of the proposed action: \_\_\_\_\_

\_\_\_\_\_

*ii.* Anticipated sources/suppliers of electricity for the project (e.g., on-site combustion, on-site renewable, via grid/local utility, or other):

\_\_\_\_\_

*iii.* Will the proposed action require a new, or an upgrade to, an existing substation?  Yes  No

---

l. Hours of operation. Answer all items which apply.

<p><i>i.</i> During Construction:</p> <ul style="list-style-type: none"> <li>• Monday - Friday: _____</li> <li>• Saturday: _____</li> <li>• Sunday: _____</li> <li>• Holidays: _____</li> </ul>	<p><i>ii.</i> During Operations:</p> <ul style="list-style-type: none"> <li>• Monday - Friday: _____</li> <li>• Saturday: _____</li> <li>• Sunday: _____</li> <li>• Holidays: _____</li> </ul>
---	--

m. Will the proposed action produce noise that will exceed existing ambient noise levels during construction, operation, or both?  Yes  No  
 If yes:  
 i. Provide details including sources, time of day and duration:  
 \_\_\_\_\_  
 \_\_\_\_\_

ii. Will proposed action remove existing natural barriers that could act as a noise barrier or screen?  Yes  No  
 Describe: \_\_\_\_\_  
 \_\_\_\_\_

---

n. Will the proposed action have outdoor lighting?  Yes  No  
 If yes:  
 i. Describe source(s), location(s), height of fixture(s), direction/aim, and proximity to nearest occupied structures:  
 \_\_\_\_\_  
 \_\_\_\_\_

ii. Will proposed action remove existing natural barriers that could act as a light barrier or screen?  Yes  No  
 Describe: \_\_\_\_\_  
 \_\_\_\_\_

---

o. Does the proposed action have the potential to produce odors for more than one hour per day?  Yes  No  
 If Yes, describe possible sources, potential frequency and duration of odor emissions, and proximity to nearest occupied structures: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

---

p. Will the proposed action include any bulk storage of petroleum (combined capacity of over 1,100 gallons) or chemical products 185 gallons in above ground storage or any amount in underground storage?  Yes  No  
 If Yes:  
 i. Product(s) to be stored \_\_\_\_\_  
 ii. Volume(s) \_\_\_\_\_ per unit time \_\_\_\_\_ (e.g., month, year)  
 iii. Generally describe proposed storage facilities: \_\_\_\_\_  
 \_\_\_\_\_

---

q. Will the proposed action (commercial, industrial and recreational projects only) use pesticides (i.e., herbicides, insecticides) during construction or operation?  Yes  No  
 If Yes:  
 i. Describe proposed treatment(s):  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

ii. Will the proposed action use Integrated Pest Management Practices?  Yes  No

---

r. Will the proposed action (commercial or industrial projects only) involve or require the management or disposal of solid waste (excluding hazardous materials)?  Yes  No  
 If Yes:  
 i. Describe any solid waste(s) to be generated during construction or operation of the facility:  
 • Construction: \_\_\_\_\_ tons per \_\_\_\_\_ (unit of time)  
 • Operation : \_\_\_\_\_ tons per \_\_\_\_\_ (unit of time)  
 ii. Describe any proposals for on-site minimization, recycling or reuse of materials to avoid disposal as solid waste:  
 • Construction: \_\_\_\_\_  
 \_\_\_\_\_  
 • Operation: \_\_\_\_\_  
 \_\_\_\_\_  
 iii. Proposed disposal methods/facilities for solid waste generated on-site:  
 • Construction: \_\_\_\_\_  
 \_\_\_\_\_  
 • Operation: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

s. Does the proposed action include construction or modification of a solid waste management facility?  Yes  No  
 If Yes:  
 i. Type of management or handling of waste proposed for the site (e.g., recycling or transfer station, composting, landfill, or other disposal activities): \_\_\_\_\_  
 ii. Anticipated rate of disposal/processing:  
 • \_\_\_\_\_ Tons/month, if transfer or other non-combustion/thermal treatment, or  
 • \_\_\_\_\_ Tons/hour, if combustion or thermal treatment  
 iii. If landfill, anticipated site life: \_\_\_\_\_ years

t. Will proposed action at the site involve the commercial generation, treatment, storage, or disposal of hazardous waste?  Yes  No  
 If Yes:  
 i. Name(s) of all hazardous wastes or constituents to be generated, handled or managed at facility: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 ii. Generally describe processes or activities involving hazardous wastes or constituents: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 iii. Specify amount to be handled or generated \_\_\_\_\_ tons/month  
 iv. Describe any proposals for on-site minimization, recycling or reuse of hazardous constituents: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 v. Will any hazardous wastes be disposed at an existing offsite hazardous waste facility?  Yes  No  
 If Yes: provide name and location of facility: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 If No: describe proposed management of any hazardous wastes which will not be sent to a hazardous waste facility:  
 \_\_\_\_\_  
 \_\_\_\_\_

**E. Site and Setting of Proposed Action**

**E.1. Land uses on and surrounding the project site**

a. Existing land uses.  
 i. Check all uses that occur on, adjoining and near the project site.  
 Urban  Industrial  Commercial  Residential (suburban)  Rural (non-farm)  
 Forest  Agriculture  Aquatic  Other (specify): \_\_\_\_\_  
 ii. If mix of uses, generally describe:  
 \_\_\_\_\_  
 \_\_\_\_\_

b. Land uses and covertypes on the project site.

Land use or Covertypes	Current Acreage	Acreage After Project Completion	Change (Acres +/-)
• Roads, buildings, and other paved or impervious surfaces			
• Forested			
• Meadows, grasslands or brushlands (non-agricultural, including abandoned agricultural)			
• Agricultural (includes active orchards, field, greenhouse etc.)			
• Surface water features (lakes, ponds, streams, rivers, etc.)			
• Wetlands (freshwater or tidal)			
• Non-vegetated (bare rock, earth or fill)			
• Other Describe: _____ _____			

c. Is the project site presently used by members of the community for public recreation?  Yes  No  
i. If Yes: explain: \_\_\_\_\_

---

d. Are there any facilities serving children, the elderly, people with disabilities (e.g., schools, hospitals, licensed day care centers, or group homes) within 1500 feet of the project site?  Yes  No  
If Yes,  
i. Identify Facilities:  
\_\_\_\_\_

---

e. Does the project site contain an existing dam?  Yes  No  
If Yes:  
i. Dimensions of the dam and impoundment:  

- Dam height: \_\_\_\_\_ feet
- Dam length: \_\_\_\_\_ feet
- Surface area: \_\_\_\_\_ acres
- Volume impounded: \_\_\_\_\_ gallons OR acre-feet

ii. Dam's existing hazard classification: \_\_\_\_\_  
iii. Provide date and summarize results of last inspection:  
\_\_\_\_\_

---

f. Has the project site ever been used as a municipal, commercial or industrial solid waste management facility, or does the project site adjoin property which is now, or was at one time, used as a solid waste management facility?  Yes  No  
If Yes:  
i. Has the facility been formally closed?  Yes  No  

- If yes, cite sources/documentation: \_\_\_\_\_

ii. Describe the location of the project site relative to the boundaries of the solid waste management facility:  
\_\_\_\_\_

---

g. Have hazardous wastes been generated, treated and/or disposed of at the site, or does the project site adjoin property which is now or was at one time used to commercially treat, store and/or dispose of hazardous waste?  Yes  No  
If Yes:  
i. Describe waste(s) handled and waste management activities, including approximate time when activities occurred:  
\_\_\_\_\_

---

h. Potential contamination history. Has there been a reported spill at the proposed project site, or have any remedial actions been conducted at or adjacent to the proposed site?  Yes  No  
If Yes:  
i. Is any portion of the site listed on the NYSDEC Spills Incidents database or Environmental Site Remediation database? Check all that apply:  Yes  No  
 Yes – Spills Incidents database Provide DEC ID number(s): \_\_\_\_\_  
 Yes – Environmental Site Remediation database Provide DEC ID number(s): \_\_\_\_\_  
 Neither database  
ii. If site has been subject of RCRA corrective activities, describe control measures: \_\_\_\_\_  
\_\_\_\_\_

---

iii. Is the project within 2000 feet of any site in the NYSDEC Environmental Site Remediation database?  Yes  No  
If yes, provide DEC ID number(s): \_\_\_\_\_  
iv. If yes to (i), (ii) or (iii) above, describe current status of site(s):  
\_\_\_\_\_



v. Is the project site subject to an institutional control limiting property uses?  Yes  No

- If yes, DEC site ID number: \_\_\_\_\_
- Describe the type of institutional control (e.g., deed restriction or easement): \_\_\_\_\_
- Describe any use limitations: \_\_\_\_\_
- Describe any engineering controls: \_\_\_\_\_
- Will the project affect the institutional or engineering controls in place?  Yes  No
- Explain: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

---

**E.2. Natural Resources On or Near Project Site**

a. What is the average depth to bedrock on the project site? \_\_\_\_\_ feet

b. Are there bedrock outcroppings on the project site?  Yes  No  
 If Yes, what proportion of the site is comprised of bedrock outcroppings? \_\_\_\_\_%

c. Predominant soil type(s) present on project site: \_\_\_\_\_ %  
 \_\_\_\_\_ %  
 \_\_\_\_\_ %

d. What is the average depth to the water table on the project site? Average: \_\_\_\_\_ feet

e. Drainage status of project site soils:  Well Drained: \_\_\_\_\_ % of site  
 Moderately Well Drained: \_\_\_\_\_ % of site  
 Poorly Drained \_\_\_\_\_ % of site

f. Approximate proportion of proposed action site with slopes:  0-10%: \_\_\_\_\_ % of site  
 10-15%: \_\_\_\_\_ % of site  
 15% or greater: \_\_\_\_\_ % of site

g. Are there any unique geologic features on the project site?  Yes  No  
 If Yes, describe: \_\_\_\_\_  
 \_\_\_\_\_

h. Surface water features.

i. Does any portion of the project site contain wetlands or other waterbodies (including streams, rivers, ponds or lakes)?  Yes  No

ii. Do any wetlands or other waterbodies adjoin the project site?  Yes  No  
 If Yes to either *i* or *ii*, continue. If No, skip to E.2.i.

iii. Are any of the wetlands or waterbodies within or adjoining the project site regulated by any federal, state or local agency?  Yes  No

iv. For each identified regulated wetland and waterbody on the project site, provide the following information:

- Streams: Name \_\_\_\_\_ Classification \_\_\_\_\_
- Lakes or Ponds: Name \_\_\_\_\_ Classification \_\_\_\_\_
- Wetlands: Name \_\_\_\_\_ Approximate Size \_\_\_\_\_
- Wetland No. (if regulated by DEC) \_\_\_\_\_

v. Are any of the above water bodies listed in the most recent compilation of NYS water quality-impaired waterbodies?  Yes  No  
 If yes, name of impaired water body/bodies and basis for listing as impaired: \_\_\_\_\_  
 \_\_\_\_\_

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i. Is the project site in a designated Floodway?  Yes  No

j. Is the project site in the 100 year Floodplain?  Yes  No

k. Is the project site in the 500 year Floodplain?  Yes  No

l. Is the project site located over, or immediately adjoining, a primary, principal or sole source aquifer?  Yes  No  
 If Yes:  
 i. Name of aquifer: \_\_\_\_\_

<p>m. Identify the predominant wildlife species that occupy or use the project site: _____</p> <p>_____</p> <p>_____</p>	
<p>n. Does the project site contain a designated significant natural community? <span style="float: right;"><input type="checkbox"/> Yes <input type="checkbox"/> No</span></p> <p>If Yes:</p> <p style="margin-left: 20px;">i. Describe the habitat/community (composition, function, and basis for designation): _____</p> <p style="margin-left: 20px;">ii. Source(s) of description or evaluation: _____</p> <p style="margin-left: 20px;">iii. Extent of community/habitat:</p> <ul style="list-style-type: none"> <li>• Currently: _____ acres</li> <li>• Following completion of project as proposed: _____ acres</li> <li>• Gain or loss (indicate + or -): _____ acres</li> </ul>	
<p>o. Does project site contain any species of plant or animal that is listed by the federal government or NYS as endangered or threatened, or does it contain any areas identified as habitat for an endangered or threatened species? <span style="float: right;"><input type="checkbox"/> Yes <input type="checkbox"/> No</span></p>	
<p>p. Does the project site contain any species of plant or animal that is listed by NYS as rare, or as a species of special concern? <span style="float: right;"><input type="checkbox"/> Yes <input type="checkbox"/> No</span></p>	
<p>q. Is the project site or adjoining area currently used for hunting, trapping, fishing or shell fishing? <span style="float: right;"><input type="checkbox"/> Yes <input type="checkbox"/> No</span></p> <p>If yes, give a brief description of how the proposed action may affect that use: _____</p> <p>_____</p>	
<p><b>E.3. Designated Public Resources On or Near Project Site</b></p>	
<p>a. Is the project site, or any portion of it, located in a designated agricultural district certified pursuant to Agriculture and Markets Law, Article 25-AA, Section 303 and 304? <span style="float: right;"><input type="checkbox"/> Yes <input type="checkbox"/> No</span></p> <p>If Yes, provide county plus district name/number: _____</p>	
<p>b. Are agricultural lands consisting of highly productive soils present? <span style="float: right;"><input type="checkbox"/> Yes <input type="checkbox"/> No</span></p> <p style="margin-left: 20px;">i. If Yes: acreage(s) on project site? _____</p> <p style="margin-left: 20px;">ii. Source(s) of soil rating(s): _____</p>	
<p>c. Does the project site contain all or part of, or is it substantially contiguous to, a registered National Natural Landmark? <span style="float: right;"><input type="checkbox"/> Yes <input type="checkbox"/> No</span></p> <p>If Yes:</p> <p style="margin-left: 20px;">i. Nature of the natural landmark: <input type="checkbox"/> Biological Community <input type="checkbox"/> Geological Feature</p> <p style="margin-left: 20px;">ii. Provide brief description of landmark, including values behind designation and approximate size/extent: _____</p> <p>_____</p> <p>_____</p>	
<p>d. Is the project site located in or does it adjoin a state listed Critical Environmental Area? <span style="float: right;"><input type="checkbox"/> Yes <input type="checkbox"/> No</span></p> <p>If Yes:</p> <p style="margin-left: 20px;">i. CEA name: _____</p> <p style="margin-left: 20px;">ii. Basis for designation: _____</p> <p style="margin-left: 20px;">iii. Designating agency and date: _____</p>	

e. Does the project site contain, or is it substantially contiguous to, a building, archaeological site, or district which is listed on, or has been nominated by the NYS Board of Historic Preservation for inclusion on, the State or National Register of Historic Places?	<input type="checkbox"/> Yes <input type="checkbox"/> No
If Yes:	
<i>i.</i> Nature of historic/archaeological resource: <input type="checkbox"/> Archaeological Site <input type="checkbox"/> Historic Building or District	
<i>ii.</i> Name: _____	
<i>iii.</i> Brief description of attributes on which listing is based: _____	
f. Is the project site, or any portion of it, located in or adjacent to an area designated as sensitive for archaeological sites on the NY State Historic Preservation Office (SHPO) archaeological site inventory?	<input type="checkbox"/> Yes <input type="checkbox"/> No
g. Have additional archaeological or historic site(s) or resources been identified on the project site?	
If Yes:	
<i>i.</i> Describe possible resource(s): _____	
<i>ii.</i> Basis for identification: _____	
h. Is the project site within five miles of any officially designated and publicly accessible federal, state, or local scenic or aesthetic resource?	<input type="checkbox"/> Yes <input type="checkbox"/> No
If Yes:	
<i>i.</i> Identify resource: _____	
<i>ii.</i> Nature of, or basis for, designation (e.g., established highway overlook, state or local park, state historic trail or scenic byway, etc.): _____	
<i>iii.</i> Distance between project and resource: _____ miles.	
i. Is the project site located within a designated river corridor under the Wild, Scenic and Recreational Rivers Program 6 NYCRR 666?	<input type="checkbox"/> Yes <input type="checkbox"/> No
If Yes:	
<i>i.</i> Identify the name of the river and its designation: _____	
<i>ii.</i> Is the activity consistent with development restrictions contained in 6NYCRR Part 666?	
	<input type="checkbox"/> Yes <input type="checkbox"/> No

**F. Additional Information**

Attach any additional information which may be needed to clarify your project.

If you have identified any adverse impacts which could be associated with your proposal, please describe those impacts plus any measures which you propose to avoid or minimize them.

**G. Verification**

I certify that the information provided is true to the best of my knowledge.

Applicant/Sponsor Name \_\_\_\_\_ Date \_\_\_\_\_

Signature \_\_\_\_\_ Title \_\_\_\_\_

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**Full Environmental Assessment Form  
Ball Hill Wind Energy Project  
Modification of Special Use Permits and Height Restrictions  
Towns of Villenova and Hanover, Chautauqua County, NY**

**Section F. Additional Information**

The following supplements and expands upon the information provided in the Full Environmental Assessment Form (FEAF) – Part 1 completed for the Ball Hill Wind Energy Project. The Project has been described in detail previously in the DEIS (2008), SDEIS (2016), FEIS (2016) and SEQRA Statement of Findings (2016) that were developed by the Applicant and the Lead Agency. The information provided herein represents a discussion of substantive changes to the information arising from the proposed modifications to the Project.

**A. Project Purpose and Need**

The Proposed Action modifies the previously approved Ball Hill Wind Energy Project (which consists of 29 wind turbines, associated electrical collection and transmission lines, access roads and related wind energy facilities which include an operations and maintenance facility) by increasing the total maximum permissible height of all 29 wind turbines from 495 feet to a maximum of 599 feet, the minor relocation of three (3) wind turbines (less than 135' from their approved locations), and replacement of the ±5.7-mile overhead 115kV transmission interconnection circuit and associated Collection Substation with ±5.0 miles of four (4) predominantly underground 34.5kV circuits. The locations of twenty-six (26) of the wind turbines remain unchanged, as does the substation for interconnection with the existing 230 kV transmission line.

The proposed height increase is necessary to increase the efficiency and capacity of the wind turbines allowing for production of the most electricity within the same project footprint. Replacement of the overhead lines with underground cables will minimize visual, wetland, noise and agricultural impacts from the previously proposed 5.7-mile transmission line, which included the proposed use of approximately 80-foot-high poles and an additional substation. These changes will require the amendment of the Town of Villenova and Town of Hanover Zoning Laws to increase the maximum permitted height to accommodate the proposed wind turbines, and modification of the previously issued special use permits from the Town of Villenova and the Town of Hanover.

**B. Government Approvals**

Discretionary approvals may include the following:

Town of Villenova:	Amendment to Special Use Permit and Local Law Amendment
Town of Hanover:	Amendment to Special Use Permit and Local Law Amendment
County of Chautauqua Planning Board:	Review and Referral

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## **C. Planning and Zoning**

### **C.3. Zoning**

The zoning laws for both the Town of Villenova and the Town of Hanover regulate wind energy facilities and were discussed in the DEIS (Section 2.23), SDEIS (Section 2.12), and SEQRA Statement of Findings (pp. 24-32) for the Project. The proposed action seeking amendment of the maximum permitted height regulations in both the Villenova and Hanover Zoning Laws to allow for a height increase of 104 feet to accommodate the proposed wind turbines.

## **D. Project Details**

### **D.2. Project Operations**

#### **D.2.a Excavation**

Each wind turbine would permanently occupy a round foundation base that is approximately 78 feet in diameter, only a portion of which would be exposed. Preparation of each turbine site for installation of spread footer foundations would involve excavation of surface materials to a depth of approximately 10 feet. After excavation is complete, concrete would be spread on the bottom of the excavation to level it in preparation of the rebar installation. After the rebar, steel and a turbine bolt cage would be installed, and the concrete placed for the foundation and turbine pedestal. Each foundation would utilize approximately 625 cubic yards of concrete and rebar steel. The final design of each foundation will be submitted with the building permit application for each turbine site.

Additional details relative to Project construction can be found in section 1.2.2 of the DEIS and 1.3.3 of the FEIS.

#### **D.2.b Wetlands and Waterbodies**

While the proposed turbine height increase will not result in changes to the wetland and waterbody impacts discussed in the SDEIS and FEIS, the layout changes resulting from the minor shift of T8 will result in avoidance of approximately 408 square feet of temporary impacts to Wetland Q1, a palustrine scrub-shrub (PSS) wetland. However, the revised limits of disturbance for T8 now encroaches on a small portion (566 square feet [.013 acres]) of Wetland A653, a Palustrine Emergent wetland (PEM). This increase in impact, 166 square feet, is de minimis and is offset by the significant decrease in impacts resulting from the transmission line modifications described below.

The replacement of the 115kV overhead transmission line with four circuits of collection that will be installed predominantly underground will result in a significant decrease in the wetland impacts discussed in the SDEIS, FEIS, and SEQRA Statement of Findings. The decrease is the result of the elimination of a portion of the right-of-way southwest of T35, the realignment of a portion of the right-of-way between Dennison Road and the Interconnection Substation, and the planned directional bore under the forested portions of NYSDEC Freshwater Wetland SC-12 and SC-13. Table 1 presents the changes in the impacts resulting from the construction of transmission and substation facilities since the SDEIS.

The route and installation modifications have resulted in a 6.52 acre decrease in the temporary wetland impacts, an approximately 50% reduction in the impacts previously anticipated from the

electrical corridor connecting the Project to the Interconnection Substation. This reduction includes avoidance of more than 3 acres of forested wetland conversion, of which 2.8 acres are NYSDEC jurisdictional.

The reroute between Dennison Road and the Interconnection Substation was facilitated by the change from overhead to underground construction. Previously the overhead 115kV transmission line was routed to minimize permanent impacts to active agricultural land from the placement of pole structures, which resulted in additional wetland impacts. As the installation of underground electrical lines only temporarily impacts agricultural activities during the construction season, the alignment was modified allowing for minimization of impacts to several large NYSDEC Freshwater Wetlands. This change, coupled with the proposed directional bore, resulted in a decrease in impacts to NYSDEC Freshwater Wetlands SC-12 and SC-12 from 5.9 acres of temporary disturbance to 0.55 acres. It also eliminated all 2.82 acres of impacts resulting from the permanent removal of trees in these wetlands. In addition, the impacts to the 100-foot regulated adjacent areas decreased from 3.33 acre to 1.97 acres and an additional 1.55 acres of adjacent area tree removal was avoided. As proposed, the 0.55 acres of temporary impacts are limited to portions of the Freshwater Wetlands located within active or fallow agricultural fields.

A Joint Application for Permit describing the proposed Project impacts, including the removal of the overhead transmission line, and mitigation was submitted to the USACE and NYSDEC in May 2017, copies of which were provided to the towns of Villanova and Hanover. An addendum describing the minor changes associated with the shifting of the three turbines will be provided in June 2018. Ball Hill is in discussion with the USACE to determine a final mitigation plan to address the proposed impacts. It is anticipated that final permits will be received in Fall 2018.

**Table 1  
Transmission Line and Substation Wetland Impacts**

Document	Total Construction Disturbance (acres)	Ground Disturbance and Placement of Fill Impacts in all Wetlands		Forested Wetland Impacts		Emergent and Scrub/Shrub Wetlands Allowed to Revert to Their Natural State
		Placement of Fill (acres)	Temporary Ground Disturbance and Temporary Placement of Fill (acres)	Permanent Impacts due to Permanent Forest Conversion (acres)	Temporary Forest Conversion	
SDEIS	10.44	1.02	9.42	3.17	0.00	6.24
FEIS	13.44	0.00	13.44	6.13	0.00	7.31
June 2018 Amendment	6.92	0.00	6.92	3.03	0.00	3.89
Change from FEIS	(-6.52)	0.00	(-6.52)	(-3.10)	0.00	(-3.42)

#### D.2.e Stormwater

The proposed modifications to the Project will not result in significant changes to the potential impacts from stormwater runoff that were described in the DEIS, SDEIS, and FEIS. The removal of the Collection Substation results in a decrease of approximately 1 acre of graveled surface. A draft Stormwater Pollution Prevention Plan (SWPPP) was provided in Appendix E of the FEIS. This document will be updated prior to construction to reflect the final design changes, and authorization under the State Pollutant Discharge Elimination System (SPDES) General Permit for Stormwater Discharges from Construction Activity (GP-0-15-002) will be obtained from NYSDEC.

**D.2.j Traffic**

The proposed modifications to the Project may result in an increase in construction related traffic. The Transportation Study provided in Appendix M of the FEIS assumed approximately 1,392 truckloads of concrete would be necessary to complete the foundations for the 29 turbines. Given the larger turbine requires a larger foundation, it is anticipated that 1,812 truckloads will be needed (assuming 10 yards per trip) which represents an additional 420 truckloads (approximately 14 additional trips per turbine).

As discussed in Section 2.11 of the SDEIS and in the SEQRA Statement of Findings, construction related traffic will be limited to the hours allowed in the local laws. In addition, Ball Hill will manage construction traffic in accordance with its road use agreements, which designate approved routes as well as provide a commitment to repair and/or improve roadways utilized by the Project.

**D.2.l Hours of Operation**

**D.2.m Noise**

The comprehensive sound level assessment report prepared for the Project on October 4, 2016 (Sound Report) and incorporated in the FEIS was revised October 23, 2017 to assess the sound level effects of the turbine changes and elimination of Collection Substation proposed herein (Revised Sound Modeling Memo, see Appendix F of the Application). A summary of the changes in A-weighted L<sub>10</sub> sound power levels at the 769 receptor points studied for the Project in the Sound Report is presented in Table 2.

**Table 2  
 Change in A-weighted L<sub>10</sub> Sound Power Levels**

Sound Level Change	Number of Receptor Points	Resulting Sound Level
No Change	589	
Quieter	161	
+1db	17	≤26db (16 points); 36db (1 point)
+2db	2	22db

With the proposed changes, the Project remains fully compliant with all applicable noise restrictions in Town local laws.

**D.2.n Outdoor Lighting**

Pursuant to Federal Aviation Administration (FAA) requirements, all 29 WECS will include hazard lighting. This is required as all twenty-nine (29) proposed WECS have received a Determination of No Hazard from the FAA, each of which is conditioned on the obstruction marking and lighting condition of white paint and synchronized red lights. Copies of all FAA Determinations of No Hazard are provided in Appendix I of the Application. There will be no lights during the day. There will be red flashing lights during the night, designed at a minimum intensity and duration of time with an illumination pattern that will primarily be directed upward, as recommended by the FAA

As described in the FEIS (FEIS; Table 2.4-1) lighting at the substation and O&M facility will consist of manually activated full-cutoff exterior lighting and temporary work lighting, with no drop-down optics. 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. Elimination of the Collection Substation will result in a decrease in the anticipated light sources from the Project.

#### **D.2.p Bulk Storage of Petroleum**

Sources of oil could include the main power transformer, gear oils, and hydraulic fluids located in the turbines, and any oil or fuel storage as part of construction. As discussed in the DEIS, SDEIS, and FEIS, Ball Hill will develop and implement a construction spill prevention and control (SPCC) plan prior to construction. In addition, prior to operation of the Project, Ball Hill will develop an operational SPCC plan, pursuant to 40 Code of Federal Regulations (CFR) Part 112, because the volume of oil stored on site would be greater than 1,320 gallons. Ball Hill general policies for the implementation of environmental monitoring practices are included in the Environmental Monitoring Plan in Appendix S of the FEIS.

#### **D.2.q Use of Pesticides**

As noted in the SEQRA Statement of Findings (pp. 81), the application of herbicides and pesticides is not anticipated, except for within the fenced substation enclosure. The elimination of the Collection Substation, as well as most of the overhead lines, has minimized the potential areas that herbicides may be used.

### **E. Site and Setting of Proposed Action**

#### **E.1.a Existing Land Uses**

The proposed modifications to the Project do not result in any substantive changes to the existing land uses described in the DEIS, SDEIS, and FEIS.

#### **E.1.b Land Use and Covertypes**

The proposed modifications to the height of the proposed turbines and the minor shifts of three turbines do not result in any substantive changes to the existing land uses described in the DEIS, SDEIS, and FEIS.

The replacement of the 115kV overhead transmission line with four circuits of predominantly buried electrical lines will result in a minor decrease in the amount of tree clearing necessary and a slight increase in the acreage of agricultural lands crossed by the Project. The realignment of the right-of-way that was facilitated by the change from overhead to underground, as well as the directional bore under the NYSDEC wetland, decreases the proposed tree clearing necessary for the project by approximately 7 acres. The realignment will result in approximately 3.7 acres (approximately 2,000 linear feet) of additional impacts to agricultural land. However, unlike the placement of poles and guy wires, these impacts will be temporary and limited to the duration of construction and restoration. As described in the SEQRA Statement of Findings (pp. 22), activities within agricultural fields will be conducted in accordance with applicable NY State Department of Agriculture and Markets (NYSDAM) guidelines to the greatest extent practicable, and in accordance with Town approvals and landowner input. It should be noted that NYSDAM has



indicated a strong preference for underground placement of electrical collection wires within agricultural fields.

### **E.1.h. Potential Contamination History**

Ball Hill is unaware of any sources of contamination exist near Project facilities. A Phase I Environmental Site Assessment will be completed as part of Project to identify any possible environmental concerns.”

## **E.2. Natural Resources on or Near Project Site**

### **E.2.c-f Soils**

See DEIS (Section 2.3), SDEIS (Section 2.2), and FEIS (Section 1.4.2) for a detailed discussion of soil types that occur within the Project Area.

### **E.2.h Surface Water Features**

The proposed modifications to the Project will not result in a substantive change the surface water bodies discussed in the DEIS, SDEIS, nor FEIS.

### **E.2.m Wildlife**

Section 2.9.3 of the DEIS, 2.5 of the SDEIS, and various comment responses within the FEIS describe the wildlife that occur within the Project Area. The proposed Project modifications do not result in substantive changes to these discussions.

Please see the Additional Information section below for a discussion of the potential effects on bird and bat species resulting from the proposed Project modifications.

### **E.2.o Threatened and Endangered Species**

Section 2.9.3.2 of the DEIS, 2.5 of the SDEIS, and various comment responses within the FEIS address the potential for occurrence and impacts to non-avian and bat threatened and endangered species. The proposed Project modifications do not result in substantive changes to these discussions.

Please see the Additional Information section below for a discussion of the potential effects on bird and bat species resulting from the proposed Project modifications.

## **E.3. Designated Public Resources on or Near Project Site**

### **E.3.a-b Agricultural Land**

The Project is located in two Chautauqua County Agricultural Districts: District 5 (CHAT005) and District 10 (CHAT010). While the modification to the collection line right-of-way north of Dennison Road will involve additional active agricultural land, it is generally located within the same mapped soil types as the previous route. These soils have been identified as Prime Farmland, Prime Farmland if drained, and Farmland of Statewide Importance.

As discussed previously, the realignment will result in approximately 3.7 acres (approximately 2,000 linear feet) of additional impacts to agricultural land. However, unlike the placement of poles and guy wires, these impacts will be temporary and limited to the duration of construction and restoration. As described in the SEQRA Statement of Findings (pp. 22), activities within agricultural fields will be conducted in accordance with applicable NY State Department of Agriculture and Markets (NYSDAM) guidelines to the greatest extent practicable, and in accordance with Town approvals and landowner input. It should be noted that NYSDAM has indicated a strong preference for underground placement of electrical collection wires within agricultural fields.

### **E.3.e-f Cultural Resources**

#### Archaeological

On May 25, 2018 Panamerican Consultants, Inc (Panamerican) sent correspondence to the NYS Historic Preservation Office (SHPO) which described the proposed Project modifications, noted that they constitute a reduction in proposed Project disturbance area, and requested concurrence with their findings that no additional impacts to archaeological resources will occur. On May 29, 2018 Ball Hill received correspondence from the SHPO concurring with Panamerican's findings and indicating that no additional archaeological investigations are required. This correspondence is provided in Appendix G of the application.

#### Architectural

On June 5, 2018 Panamerican issued a letter summarizing the results of its review of any potential additional impacts to historic structures that might result from the modified viewshed associated with the proposed Project changes. This letter states: "The revised viewshed map documenting minimal increase in the positive viewshed and the [Saratoga Associates] report concludes that it is not anticipated that the adjustments (turbine model and layout) will significantly change the appearance of the previously approved Project layout, or its impacts on historic structures. This recommendation will be submitted to the New York SHPO for their confirmation and concurrence."

### **E.3.h Scenic and Aesthetic Resources (Visual Impacts)**

In February 2018, Saratoga Associates completed a Technical Memorandum which analyzed the potential for additional impacts resulting from the proposed modifications (see Appendix E of the application). The review found that the increase in turbine height would result in the following:

- The Project screening would decrease by approximately 1.1% (from 67.7% to 66.6%) within the five-mile study area utilizing the vegetated viewshed mapping. However, this increase in visibility would be further mitigated by localized conditions such as landscaping, hedgerows, and structures.
- Within the 33.4% of the study area where the Project is visible, the increase in height has increased the area where 26-29 turbines will be visible by 2.2% (approximately 2,200 acres).
- A review of potential sensitive resources indicates that one additional resource, the Hamlet of Balltown, would potentially have the view of one turbine.

- A review of resources of Statewide Significance indicates that the Project would remain not notably visible at either Boutwell Hill State Forest or Canadaway Creek Wildlife Management Area.
- The Project previously anticipated having 22 of 29 turbines fitted with FAA lighting. Given the increase in height all 29 turbines will require lighting. However, as the previously lit turbines were located around the perimeter of the site, the increase in the area where lit turbines will be visible is relatively small (approximately 2%, from 28.1% to 29.6%)
- The increased height will result in an increase in the number of receptors potentially receiving 10-20 and 30+ hours of shadow flicker per year. In total, 35 receptors may exceed 30 hours of shadow flicker (an increase of 13 from 2016). The increases are:
  - 10-20 hrs/yr: 5 additional receptors (+2.1%)
  - 30-40 hrs/yr: 2 additional receptors (+0.8%)
  - 40+ hrs/yr: 11 additional receptors (+4.5%)

It should be noted that in the Statement of Findings issued for the Project, the Lead Agency found that the shadow flicker analysis is considered to present a worst-case scenario, and that it is anticipated that the number of hours per year that some receptors will experience shadow flicker will be less than modeled.

While the increase in turbine height has resulted in minor increases to the potential visual impacts from the proposed Project, the replacement of the overhead 115kV overhead transmission line with a 34.5kV collection system installed predominately underground has resulted in decreased impacts to residences along the proposed transmission corridor.

Mitigation for the visual effects of the proposed Project were described in Section 2.7 of the SDEIS, Appendix I of the FEIS, and contemplated by the Lead Agency in the Statement of Findings (pp. 149-155).

### **Additional Information**

#### **Effects on Bird/Bats from Increased Tower Height**

There is an increase in overall Project rotor sweep area of approximately 667,535 square feet with the change to 29 taller turbines. This is the equivalent of adding the sweep area of approximately five more turbines at the previously proposed dimensions. This is a ~17% increase in rotor sweep for the entire project. The maximum blade tip height at the new proposed turbines would increase 104 feet from 495 feet to 599 feet above ground level (agl). The minimum blade tip height at these turbines would rise by 58 feet, going from a previous height of 78 feet agl to 136 feet agl. These changes in dimensions and sweep area have been reviewed for possible changes in the potential impacts on bird and bat resources from those previously identified in the FEIS (Appendix H-1).

In the FEIS, the approximate number of bird and bat fatalities for the Ball Hill Wind project were estimated on a per-turbine and per-megawatt (MW) basis. The minimum and maximum per-turbine and per-MW rates from post-construction mortality monitoring studies in New York were used to establish a range of potential bird and bat fatalities. There are many differences in the post-construction mortality monitoring studies conducted in New York, including turbine height and turbine rotor sweep. The range of New York study

results are within the North American range of study results and provide reasonable estimates of bird and bat fatalities from collision for a project in New York. As the number of turbines and total MWs proposed for the Ball Hill Wind project are unchanged, there are no changes to these fatality estimate calculations. The approximate fatalities in the FEIS ranged from 19 to 563 birds per year and 20 to 1,630 bats per year. Ball Hill's plan to voluntarily reduce operations during the times of increased bat risk will result in lower mortality than the sites previously studied that did not employ similar operational reductions.

Taller turbines and more overall rotor sweep in the Project area could result in some slightly higher fatality rates than the previous proposed turbines. Most nocturnal songbird migration occurs between 400 feet agl and 2,000 feet agl. With turbines that are 104 feet taller and now reaching to 599 feet agl, more nocturnal bird migrants than previously may encounter the risk of turbine collision. Most diurnal bird flight occur below 500 feet agl, and with the lower reach of the rotors 42 feet higher than previously proposed, there could be slightly fewer bird collisions with the turbines in the daytime.

Potential changes are less clear for bats, but the current consensus is that taller turbines serve as a greater attractant to bats, perhaps being viewed as "taller trees" and from greater distances, and thus pose increased risk of collision. Similar to diurnal bird flight, the 58 feet of more open-air space from the ground could benefit some bat species that tend to fly closer to the ground when foraging. Even with taller turbines and more rotor swept area, it is not anticipated that fatalities to birds and bats would fall outside of the minimum and maximum rates from other studies in New York, as identified in the FEIS.

As part of the Article 11 permitting process, Ball Hill is coordinating with NYSDEC to develop a plan to mitigate for the potential incidental take of Northern Long Eared Bats (NLEB) which is listed as Threatened by both the State and Federal governments. While the details of this mitigation are not yet final, it will include periodic adjustments to the cut-in speed of the WECS as well as other components which will result in net positive benefits to the species. The final mitigation plan will be provided to the Town upon completion.

# Appendix D

# 4 MW PLATFORM

# 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 92 GW of installed capacity in 79 countries. That is more than anyone else in the industry. We currently monitor over 33,000 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 4 MW Platform today?**

The Vestas 4 MW platform\* was introduced in 2010 with the launch of the V112-3.0 MW<sup>®</sup>. Over 18 GW of the 4 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 4 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 extent possible. In addition, our engineers have increased the nominal power across the entire platform improving your energy production significantly.

With this expansion, the 4 MW platform covers all IEC wind classes with a variety of rotor sizes and a higher rated output power of up to 4.2 MW.

You can choose from the following turbines on the 4 MW platform:

- V105-3.45 MW<sup>™</sup> – IEC IA
- V112-3.45 MW<sup>®</sup> – IEC IA
- V117-3.45 MW<sup>®</sup> – IEC IB/IEC IIA
- V117-4.2 MW<sup>™</sup> – IEC IB/IEC IIA/IEC S
- V126-3.45 MW<sup>®</sup> – IEC IIB/IEC IIA
- V136-3.45 MW<sup>®</sup> – IEC IIB/IEC IIIA
- V136-4.2 MW<sup>™</sup> – IEC IIB/IEC S
- V150-4.2 MW<sup>™</sup> – IEC IIIB/IEC S

All variants of the 4 MW platform are based on the proven technology of the V112-3.0 MW<sup>®</sup> with a full-scale converter, providing you with superior grid performance.

Our 4 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.

\* Formerly named the Vestas 3 MW platform



**+64,000**

The V112-3.45 MW<sup>®</sup> and the other 4 MW variants advance the already proven technology powering over 64,000 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<sup>®</sup>, V117-3.45 MW<sup>®</sup>, V117-4.2 MW<sup>™</sup>, V126-3.45 MW<sup>®</sup>, V136-3.45 MW<sup>®</sup>, V136-4.2 MW<sup>™</sup> and V150-4.2 MW<sup>™</sup> are available with several Sound Optimised 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 4 MW platform is a low-risk choice. It is based on the proven technologies that underpin more than 64,000 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 4 MW platform delivers unrivalled energy production. The proven blade technology from the V112-3.0 MW<sup>®</sup> is used on the V105-3.45 MW<sup>™</sup>, the V112-3.45 MW<sup>®</sup>, V117-3.45 MW<sup>®</sup> and V117-4.2 MW<sup>™</sup>. The industry known structural shell blades are used on the V126-3.45 MW<sup>®</sup>, V136-3.45 MW<sup>®</sup>, V136-4.2 MW<sup>™</sup> and V150-4.2 MW<sup>™</sup> - a technology which is also used on the 2 MW V110-2.0 MW<sup>®</sup>, V116-2.0 MW<sup>™</sup> and V120-2.0 MW<sup>™</sup> variants.

## **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 4 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)
<b>4 MW TURBINES</b>			
V105-3.45 MW™ IEC IA			Standard IEC conditions
V112-3.45 MW® IEC IA			Standard IEC conditions
V117-3.45 MW® IEC IB/IEC IIA		Standard IEC conditions	Standard IEC conditions
V117-4.2 MW™ IEC IB/IEC IIA/IEC S		Standard IEC conditions	Standard IEC conditions
V126-3.45 MW® IEC IIA/ IEC IIB	Standard IEC conditions	Standard IEC conditions	Site dependent
V136-3.45 MW® IEC IIB/ IEC IIIA	Standard IEC conditions	Standard IEC conditions	Site dependent
V136-4.2 MW™ IEC IIB/IEC S	Standard IEC conditions	Standard IEC conditions	Site dependent
V150-4.2 MW™ IEC IIB/IEC S	Standard IEC conditions	Site dependent	

■ Standard IEC conditions    ■ Site dependent

**Options available for the 4 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 4 MW platform:

- Power Optimised Modes
- Load Optimised Modes
- 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
- Aviation Lights
- Aviation Markings on the Blades
- Vestas IntelliLight™

**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 4 MW platform.



# Is the 4 MW platform the optimal choice for your specific site?

## One common nacelle – six different rotor sizes

The wind conditions on a wind project site are often not identical. The 4 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 4 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°, V117-4.2 MW™, V126-3.45 MW°, 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 4 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/IEC IIB, V136-3.45 MW° IEC IIB/IEC IIIA and V136-4.2 MW IEC IIB/IEC S 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 V150-4.2 MW™ IEC IIIB/IEC S 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 V150-4.2 MW™ is one of the highest producing low wind turbines available, some old permits may simply be too tight to accept it. Although the V117-3.45 MW°, V126-3.45 MW°, V136-3.45 MW° and V136-4.2 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 4 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,



# +33,000

The Vestas Performance and Diagnostics Centre monitors more than 33,000 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

Maximum	104.5 dB(A)**
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\*\*Sound Optimised Modes dependent on site and country

#### ROTOR

Rotor diameter	105 m
Swept area	8,659 m <sup>2</sup>
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
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#### TOWER

Hub height	72.5 m (IEC IA)
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#### 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

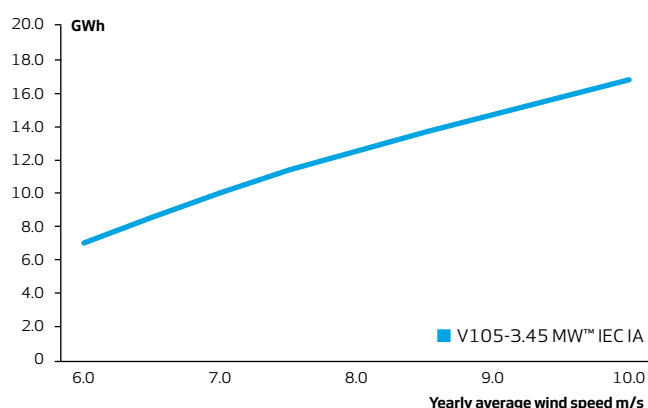
Length	51.2 m
Max. chord	4 m

Max. weight per unit for transportation	70 metric tonnes
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#### TURBINE OPTIONS

- High Wind Operation
- Power Optimised Mode up to 3.6 MW (site specific)
- Load Optimised Modes down to 3.0 MW
- Condition Monitoring System
- Service Personnel Lift
- Vestas Ice Detection
- Low Temperature Operation to -30°C
- Fire Suppression
- Shadow Detection
- Increased Cut-In
- Aviation Lights
- Aviation Markings on the Blades
- Vestas IntelliLight™

#### 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<sup>®</sup>

## 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

Maximum	105.4 dB(A)**
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\*\*Sound Optimised Modes dependent on site and country

#### ROTOR

Rotor diameter	112 m
Swept area	9,852 m <sup>2</sup>
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
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#### TOWER

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

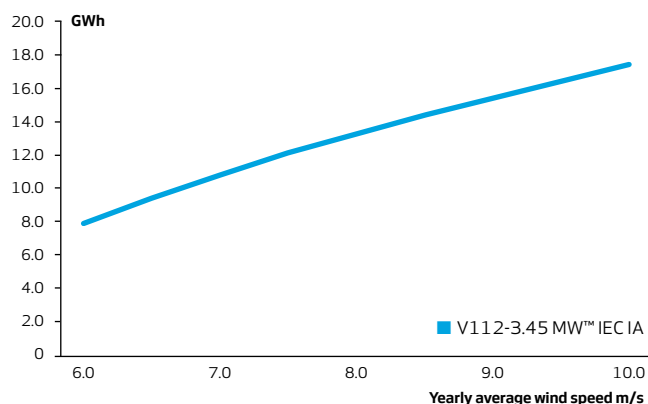
Length	54.7 m
Max. chord	4 m

Max. weight per unit for transportation	70 metric tonnes
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#### TURBINE OPTIONS

- High Wind Operation
- Power Optimised Mode up to 3.6 MW (site specific)
- Load Optimised Modes down to 3.0 MW
- 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
- Aviation Lights
- Aviation Markings on the Blades
- Vestas IntelliLight™

#### 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<sup>®</sup>

## 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

Maximum	106.8 dB(A)**
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\*\*Sound Optimised Modes dependent on site and country

#### ROTOR

Rotor diameter	117 m
Swept area	10,751 m <sup>2</sup>
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
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#### TOWER

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

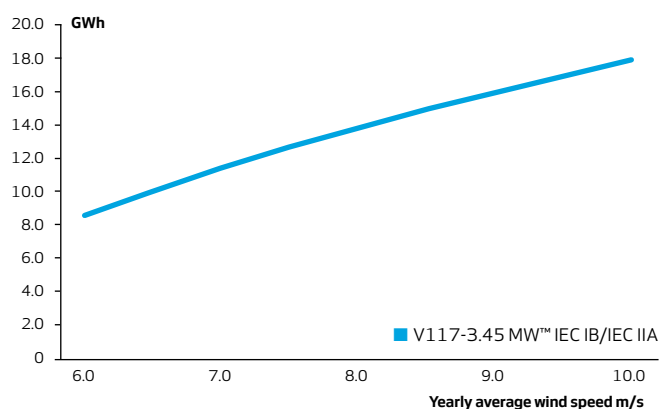
Length	57.2 m
Max. chord	4 m

Max. weight per unit for transportation	70 metric tonnes
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#### TURBINE OPTIONS

- High Wind Operation
- Power Optimised Mode up to 3.6 MW (site specific)
- Load Optimised Modes down to 3.0 MW
- 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
- Aviation Lights
- Aviation Markings on the Blades
- Vestas IntelliLight™

#### ANNUAL ENERGY PRODUCTION



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

# V117-4.2 MW™

## IEC IB/IEC IIA/IEC S

### Facts & figures

#### POWER REGULATION

Pitch regulated with variable speed

#### OPERATING DATA

Rated power	4,000 kW/4,200 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/IEC S
Standard operating temperature range from -20°C* to +45°C with de-rating above 30°C (4,000 kW)	

\*subject to different temperature options

#### SOUND POWER

Maximum	106 dB(A)**
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\*\*Sound Optimised Modes dependent on site and country

#### ROTOR

Rotor diameter	117 m
Swept area	10,751 m <sup>2</sup>
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
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#### TOWER

Hub heights	91.5 m (IEC IB) 84 m (IEC IIA)
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#### 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

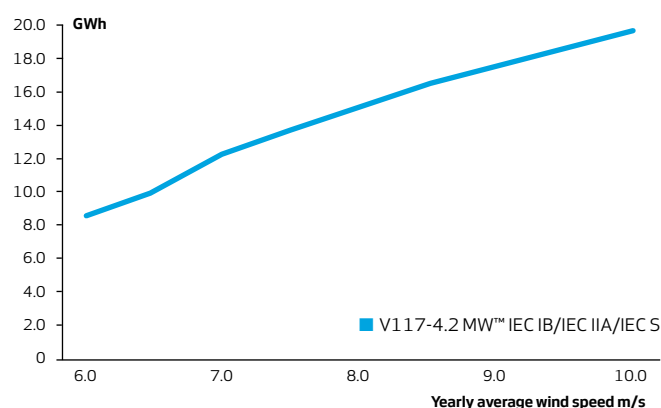
Max. weight per unit for transportation

70 metric tonnes

#### TURBINE OPTIONS

- High Wind Operation
- 4.2 MW Power Optimised Mode (site specific)
- Load Optimised Modes down to 3.6 MW
- 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
- Aviation Lights
- Aviation Markings on the Blades
- Vestas IntelliLight®

#### 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<sup>®</sup>

## IEC IIB/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 IIB/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

Maximum	104.4 dB(A)** / 107.3 dB(A)**
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\*\*Sound Optimised Modes dependent on site and country

#### ROTOR

Rotor diameter	126 m
Swept area	12,469 m <sup>2</sup>
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
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#### TOWER

Hub heights 87 m (IEC IIB/IEC IIA), 117 m (IEC IIB/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 <sup>®</sup> )	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

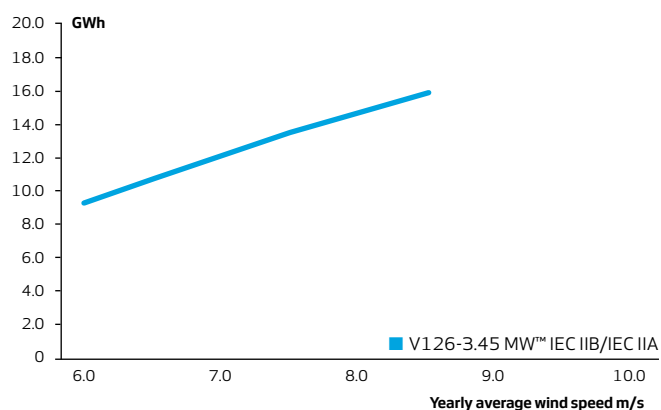
Max. weight per unit for transportation

70 metric tonnes

#### TURBINE OPTIONS

- High Wind Operation
- Power Optimised Mode up to 3.6 MW (site specific)
- Load Optimised Modes down to 3.0 MW
- 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
- Aviation Lights
- Aviation Markings on the Blades
- Vestas IntelliLight™

#### 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<sup>®</sup>

## IEC IIB/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 IIB/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

Maximum 105.5 dB(A)\*\*

\*\*Sound Optimised Modes dependent on site and country

#### ROTOR

Rotor diameter	136 m
Swept area	14,527 m <sup>2</sup>
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
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#### TOWER

Hub heights 82 m (IEC IIB/IEC IIIA), 105 m (IEC IIIA), 112 m (IEC IIB/IEC IIIA), 132 m (IEC IIB/IEC IIIA/ DIBt2), 142 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	66.7 m
Max. chord	4.1 m

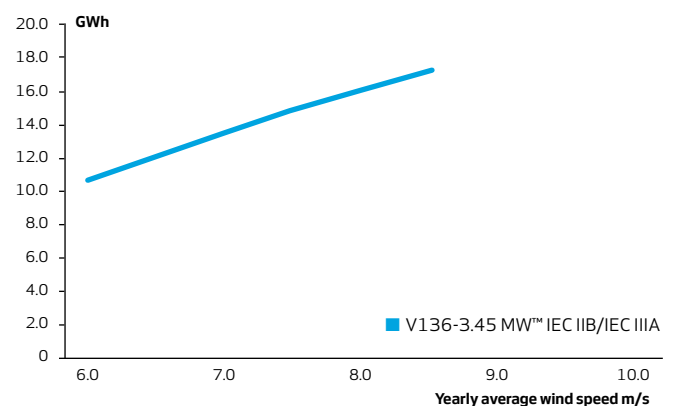
Max. weight per unit for transportation

70 metric tonnes

#### TURBINE OPTIONS

- High Wind Operation
- Power Optimised Mode up to 3.6 MW (site specific)
- Load Optimised Modes down to 3.0 MW
- 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
- Aviation Lights
- Aviation Markings on the Blades
- Vestas IntelliLight™

#### ANNUAL ENERGY PRODUCTION



#### Assumptions

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

# V136-4.2 MW™

## IEC IIB/IEC S

### Facts & figures

**POWER REGULATION** Pitch regulated with variable speed

**OPERATING DATA**  
 Rated power 4,000 kW/4,200 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 IIB/IEC S  
 Standard operating temperature range from -20°C\* to +45°C with de-rating above 30°C (4,000 kW)

\*subject to different temperature options

**SOUND POWER**  
 Maximum 103.9 dB(A)\*\*  
 \*\*Sound Optimised modes dependent on site and country

**ROTOR**  
 Rotor diameter 136 m  
 Swept area 14,527 m<sup>2</sup>  
 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 Site and country specific

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

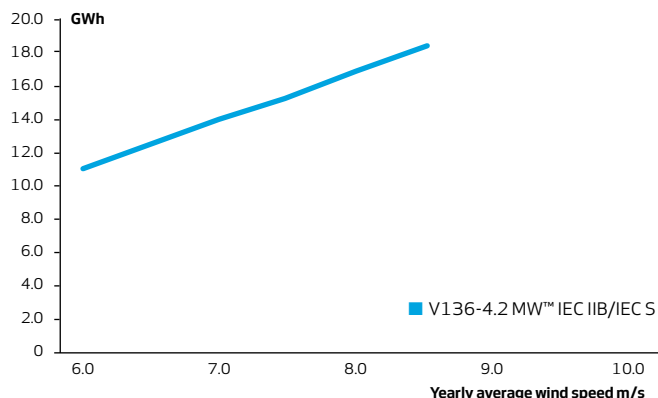
**HUB DIMENSIONS**  
 Max. transport height 3.8 m  
 Max. transport width 3.8 m  
 Max. transport length 5.5 m

**BLADE DIMENSIONS**  
 Length 66.7 m  
 Max. chord 4.1 m

Max. weight per unit for transportation 70 metric tonnes

- TURBINE OPTIONS**
- High Wind Operation
  - 4.2 MW Power Optimised Mode (site specific)
  - Load Optimised Modes down to 3.6 MW
  - Condition Monitoring System
  - Service Personnel Lift
  - Vestas Ice Detection
  - Low Temperature Operation to - 30°C
  - Fire Suppression
  - Shadow detection
  - Increased Cut-In
  - Aviation Lights
  - Aviation Markings on the Blades
  - Vestas IntelliLight®

**ANNUAL ENERGY PRODUCTION**



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

# V150-4.2 MW™

## IEC IIIB/IEC S

### Facts & figures

**POWER REGULATION** Pitch regulated with variable speed

#### OPERATING DATA

Rated power 4,000 kW/4,200 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 IIIB/IEC S  
 Standard operating temperature range from -20°C\* to +45°C with de-rating above 30°C (4,000 kW)

\*subject to different temperature options

#### SOUND POWER

Maximum 104.9 dB(A)\*\*

\*\*Sound Optimised modes dependent on site and country

#### ROTOR

Rotor diameter 150 m  
 Swept area 17,671 m<sup>2</sup>  
 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 Site and country specific

#### 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

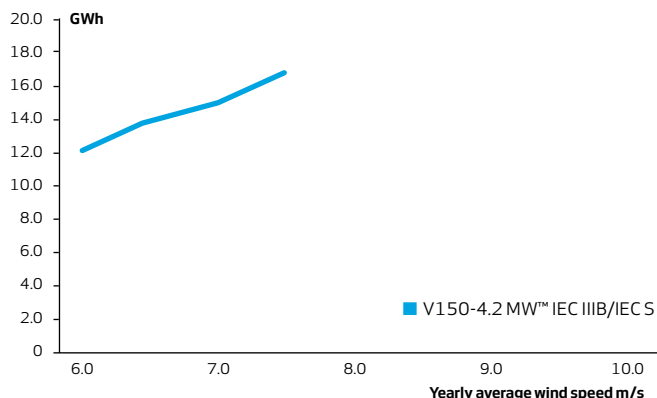
Length 73.7 m  
 Max. chord 4.2 m

Max. weight per unit for transportation 70 metric tonnes

#### TURBINE OPTIONS

- 4.2 MW Power Optimised Mode (site specific)
- Load Optimised Modes down to 3.6 MW
- Condition Monitoring System
- Service Personnel Lift
- Vestas Ice Detection
- Low Temperature Operation to -30°C
- Fire Suppression
- Shadow detection
- Increased Cut-In
- Aviation Lights
- Aviation Markings on the Blades
- Vestas IntelliLight®

#### ANNUAL ENERGY PRODUCTION



#### Assumptions

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







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# Appendix E

# BALL HILL WIND PROJECT VISUAL RESOURCE ASSESSMENT – TECHNICAL MEMORANDUM

Prepared for:  
Ball Hill Wind Energy, LLC  
1101 W. 120<sup>th</sup> Ave., Suite 400  
Broomfield, CO 80021

June 2018



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## Summary

Ball Hill Wind Energy, LLC (“Ball Hill Wind”) is proposing to develop a wind-powered electrical-generating facility consisting of 29 turbines with a maximum total project capacity of 100.05 megawatts (MW). The proposed Ball Hill Wind Project (referred to as the “Project”) will be located in the Towns of Villenova and Hanover, Chautauqua County, New York.

In 2015, Ball Hill Wind retained Saratoga Associates, Landscape Architects, Architects, Engineers, and Planners, P.C. (“Saratoga Associates”) to complete a Supplemental Visual Resource Assessment (referred to as the “SVRA”) of the Project using its then-proposed layout (referred to as the “2016 Layout”). Since the completion of the SVRA, Ball Hill Wind further revised the proposed Project by changing turbine type, marginally shifting the positions of three (3) turbine locations, and moving the proposed above-ground interconnection transmission line (“gen-tie”) predominantly underground (referred to as “2018 Layout”).<sup>1</sup> The purpose of this technical memorandum is to describe and assess any differences in the Project’s visual impact as a result of these proposed changes.

As discussed in more detail below, Saratoga Associates’ assessment of any change in the potential visual impacts of the proposed Ball Hill Wind Project as a result of the layout revisions (turbine change and predominantly undergrounding the gen-tie) consists of several aspects, including: determining where within a five-mile radius study area turbines might be visible “Zone of Visual Influence” (or “ZVI”); determining where within such study area significant periods of “shadow-flicker” may occur; and determining the degree of Project visibility from certain identified “sensitive viewpoints”. The general conclusion is that the proposed layout changes will not significantly change the visual impact of the Project, except that the height increase of the taller turbines may be perceptible from nearby viewpoints, and visibility of the originally proposed collection substation and 5.7 mile overhead electrical line will be eliminated entirely.

## Project Description Comparison

The 2016 Layout included twenty-nine (29) turbines in the Towns of Villenova (23 turbines) and Hanover (6 turbines). The proposed turbines were Vestas V126-3.45 MW, which had a hub height of 285 feet (87 meters), a rotor diameter of 413 feet (126 meters), and a maximum blade tip height of approximately 492 feet (150 meters). A 5.7-mile overhead 115 kV transmission line was proposed to originate at a new 115/34.5kv collection substation and connect the turbines with an existing National Grid 230 kV transmission line in the Town of Hanover. The line included 60 tangent and angled structures, an 8.7-acre switchyard, and an approximately 5-acre collection substation.

The 2018 Layout will consist of twenty-nine (29), yet taller, turbines. The proposed turbine manufacturer and dimension for this layout has not been determined. For the purpose of this Memorandum, the following heights were used as a worse-case scenario:

- > 27 turbines with a hub height of 360 feet (110 meters), a rotor diameter of 497 feet (146 meters), for a maximum blade tip height of 599 feet (183 meters);

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<sup>1</sup> While the conceptual design plan is to install the entire length of the gen-tie underground, subsurface or gradient conditions may reveal a need to run on the surface for a minimal number of short spans at an estimated height of 40 feet, which would be potentially visible.

- > One (1) turbine with a hub height of 344 (105 meters), a rotor diameter of 486 feet (148 meters), for a maximum blade tip height of 587 feet (179 meters); and
- > One (1) turbine with a hub height of 344 (105 meters), a rotor diameter of 444 feet (136 meters), for a maximum blade tip height of 566 feet (173 meters).<sup>2</sup>

This revised turbine configuration represents an increase of up to 75 feet (23 meters) in hub height and 65 feet (20 meters) to the rotor diameter. The turbine model proposed for the 2018 Layout will result in an increase in maximum blade tip height of up to 107 feet (approximately 33 meters) as compared to the 2016 Layout.

The proposed turbine locations are substantially similar in both layouts, with only three (3) turbines being marginally shifted in the 2018 Layout. It is not anticipated that the adjustments (turbine model and layout) will significantly change the appearance of the previously approved Project layout. The 2018 Layout also removes the above-ground 115 kV transmission line, predominantly undergrounds the gen-tie, and eliminates the collection substation. An approximate 80-foot-wide clearing will be required through vegetation, which is less than the previously proposed Project.

#### Wind Turbine Analysis

Turbine Viewshed Mapping (Zone of Visual Influence) – The Zone of Visual Influence (ZVI) is the area within a five-mile radius of the proposed Project Area in which the Project can be seen. As summarized in Table 1, based on the 2016 Layout, landform and existing natural vegetation would screen visibility of Project turbines, in approximately 67.7 percent of the SVRA five-mile radius study area. Visibility would be further reduced by hedgerows, site landscaping, and various structures (e.g. residential dwellings). Views are most common in agricultural uplands with cleared lands and down-slope vistas in the direction of the turbines. A breakdown of the number of visible turbines is presented in Table 1.

**Table 1 2016 Layout – Turbine Viewshed Coverage Summary**

	Topography Only Viewshed		Vegetation and Topography Viewshed	
	Acres	Percentage of Study Area	Acres	Percentage of Study Area
No Turbines Visible	16,978	16.8%	68,387	67.7%
1-5 Turbines Visible	8,183	8.1%	7,664	7.6%
6-10 Turbines Visible	8,269	8.2%	6,119	6.1%
11-15 Turbines Visible	8,359	8.3%	4,735	4.6%
16-20 Turbines Visible	13,808	13.7%	5,350	5.3%
21-25 Turbines Visible	14,683	14.5%	5,248	5.2%
26-29 Turbines Visible	30,738	30.4%	3,515	3.5%
<b>Total</b>	<b>101,017</b>	<b>100.0%</b>	<b>101,017</b>	<b>100.0%</b>

<sup>2</sup> The blade tip heights of 566 and 587 feet were requested by the FAA.

Based on the vegetated viewshed map created for the 2018 Layout, turbines would potentially be screened from approximately 66.1 percent (versus 67.7 percent for the 2016 Layout) of the five-mile study area, due to intervening landform and forest cover. The Layout will result in slight changes to the geographic area where turbines would be visible (i.e. there will be an increase or decrease to the number of turbines visible in each identified turbine grouping). Similarly, as noted above, visibility of the turbines will be further reduced as a result of hedgerows, site landscaping, and structures. As illustrated in Table 2, Figure A2, this Layout results in a 1.6% increase of visibility (total acres) of turbines in the 2018 Layout versus the 2016 Layout.

**Table 2 2018 Layout – Turbine Viewshed Coverage Summary**

	Topography Only Viewshed (Figure A1 – Topographic Viewshed)		Vegetation and Topography Viewshed (Figure A2 - Vegetated Viewshed)	
	Acres	Percentage of Study Area	Acres	Percentage of Study Area
No Turbines Visible	14,333	14.2%	66,757	66.1%
1-5 Turbines Visible	7,250	7.2%	7,015	7.0%
6-10 Turbines Visible	7,128	7.0%	5,641	5.6%
11-15 Turbines Visible	6,958	6.9%	4,741	4.7%
16-20 Turbines Visible	11,729	11.6%	5,265	5.2%
21-25 Turbines Visible	12,906	12.8%	5,076	5.0%
26-29 Turbines Visible	40,700	40.3%	6,509	6.4%
<b>Total</b>	<b>101,004</b>	<b>100.0%</b>	<b>101,004</b>	<b>100.0%</b>

\*Tables 1 and 2 illustrate that one (1) or more structures are theoretically visible from approximately 83.2 and 85.8 percent of the five-mile study radius, respectively, when evaluating the Topographic Viewshed. However, as discussed in the SVRA, 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.

The vegetated viewshed map illustrates that the 2018 Layout would be visible within portions of the Villages of Forestville and South Dayton. Most of the potential visibility within these villages would be screened by structures and localized vegetation. From the downtown sections of both villages, potential Project visibility appears to be minimal, if any. 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. The Project may also be visible within the hamlets scattered throughout the study area.

The Project will be openly visible 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 of short duration. Visibility along

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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 possible. 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.

The potential visibility based on the 2016 and 2018 Layouts is similar, not only in the number of acres, but geographic area as well. With the increased height, a higher number (one (1) or more) of turbines may be visible from areas identified for potential visibility. The percentage of acres visible in each study area for each turbine grouping is identified in Tables 1 and 2. As shown in Table 2, the 26-29 turbine grouping has the largest increase of potential visibility (increase of 2,994 acres).

Turbine Visibility Evaluation of Inventoried Resources – In addition to predicting the overall viewshed area for the proposed Project, the SVRA also addressed its visibility from specific potentially sensitive resources. To accomplish this, the SVRA identified fifty-six (56) visual resources of national, state or local significance within the five-mile study area. Viewshed analysis determined that twelve (12) of these resources would likely be fully screened by intervening landform or vegetation, and forty-four (44) visual resources may have a line-of-sight to one (1) or more of the proposed turbines.

In evaluating the visibility based on the 2018 Layout, it was determined that eleven (11) of the inventoried resources would remain fully screened by topography and vegetation. The hamlet of Balltown would have a potential view of one (1) turbine.

Resources of Statewide Significance – The SVRA identified two (2) resources of Statewide Significance within the five-mile study area: the Boutwell Hill State Forest (including the Overland Trail) and the Canadaway Creek Wildlife Management Area. Viewshed analysis and simulations, based on the 2016 Layout, indicate that the Project would not be notably visible from either of these resources. Views of the 2016 layout were confirmed, by field investigation, along property boundaries as these locations had the highest potential for visibility based on the vegetated viewshed map. Overall visibility within the State-owned lands appears to be minimal based on the witnessed vegetative screening potential.

No changes based on the 2018 Layout is expected.

Degree of Turbine Visibility – The SVRA included photo simulations from 14 representative locations. Table 3 lists the key locations that were selected for these simulations.

Overall visibility is anticipated to be similar in both Layouts. Noticeable changes in turbine visibility

are the result of their increased height. Generally, the difference in height will be more noticeable when viewed in close proximity. The further they are from viewer, the less noticeable the height difference is expected to be.

Character of View – Typical views within the study area, outside developed communities, is 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, 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-20<sup>th</sup> 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.

The SVRA addressed the compatibility of the 2016 Layout with regional landscape patterns. The 2018 Layout is substantially similar in visual character and will generally be consistent with the findings of the SVRA.

Affected Viewers – In completing the SVRA, it was reported that the study area is quite rural with a small population. With the exception of a small section of the NYS Thruway (I-90) within the study area, highways are lightly traveled. The short 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 U.S. 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 areas within New York State.

The impacts to residents and tourists recreating in the study area will vary based on individual sensitivities and expectations. Visual quality is an important and integral part of the outdoor experience for many people. 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 sensitivity to the visual quality and landscape character, regardless of the frequency of duration of their exposure to the proposed Project.

**Table 3 Key Resources Selected for Photo Simulation (2016 Layout)**

Map ID	Resource 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



Conversely, some people may enjoy seeing wind turbines in the landscape – for their intrinsic appearance or for what they may represent.

Viewshed and field analysis determined that the Project would be visible from 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.

The 2018 Layout is expected to be similarly visible.

115 kV Transmission Line Analysis

The 2016 Layout included the construction of an approximately 5.7-mile 115 kV above-ground transmission line that included: a new substation, switchyard, and 60 tangent and angle structures (i.e. transmission towers or structures). It was determined this line (one (1) or more structures) could be visible from approximately 23.1 percent of the three-mile radius study area (measured from the proposed transmission line centerline). Visibility would be most common from properties adjacent, or in close proximity to the proposed line, roadways where the transmission line crossed, as well as areas to the north, east and west. Visibility would also be evident from agricultural uplands with cleared lands and down slope vistas in the direction of the proposed transmission line.

The 2018 Layout eliminates the overhead 115 kV transmission line and collection station entirely, in favor of a predominantly underground gen-tie. The 60 tangent and angled structures, all

of which are located within the turbine five-mile study area, will no longer exist, significantly reducing the visibility of the Project. As a result, 7,332 acres of the five-mile study area will no longer have a potential for visual impact caused by the transmission line structures (based on the three-mile transmission line study area).

**Table 4 Resources Located Within the Five-Mile Turbine and Three-Mile Transmission Line Study Areas**

Map ID	Resource Name	Number of Transmission Line Structures Visible
2	Prospect Road	44
3	Hamlet of Nashville	0
6	Hamlet of Parcels Corners	0
7	Tri-County Country Club	0
8	NYS Route 39	56
9	Hurlbert Road	32
10	Hamlet of Smiths Mills	0
11	Town of Hanover Park	0
12	Hanover Road	56
13	NYS Thruway (I-90)	56
14	Hamlet of Dennison Corners	19
15	Hamlet of Keaches Corners	0
16	Bennett State Road	53
17	Bradigan Road	25
18	Forestville School Complex	7
19	Village of Forestville	51
20	American Legion Post 953 Ball Fields	13
21	Village of Forestville Park	0
22	Walnut Falls	0
23	Hawkins Corner	53
24	Creek Road	8
25	Western NY Land Conservancy Hill Side Acres	0
29	Peak on Round Top Road	0
30	Putman Road	0
43	Pope Hill Road	0
54	Flucker Hill Road	0
55	County Route 93	15

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When considering the visibility of the Project during the completion of the SVRA, 27 of the resources identified in the turbine analysis were located within the transmission line study area. These resources and the number of transmission structures visible (based on the vegetated viewshed) are identified in Table 4.

Just over half of these locations had possible visibility of the proposed transmission line. By predominantly undergrounding the gen-tie, these locations will no longer have potential for impact.

Although the 60 transmission structures will no longer be part of the Project, it should be noted that viewers may occasionally see a cleared corridor for the predominantly underground gen-tie, but any visibility of man-made structures will be eliminated.

### Other Project Components

Night Lighting – While red flashing aviation obstruction lighting on communications towers is a commonly visible nighttime element almost everywhere, the concentration of lights, flashing in unison, within the turbine area would be somewhat different. Although aviation obstruction lighting is generally directed upward, the relatively low intensity does not result in perceptible atmospheric illumination (sky glow).

The SVRA evaluated 22 red lights based on a preliminary lighting plan that followed FAA regulations. A completed viewshed map analysis indicated that one (1) or more of the 22 proposed lights would theoretically be visible from approximately 28.1 percent of the five-mile study area.

As required by the FAA, it has been determined that all 29 turbines will need to be lit. The 2018 Layout, which will have all 29 turbines lit, is expected to have one (1) or more of the lit turbines visible from approximately 30.0 percent of the study area (see Appendix A). This results in a 1.9 percent increase in the study area with theoretical visibility.

Roadways – There should be no difference in potential visual impacts resulting from the proposed layout changes.

### Construction Related Impacts

There should be no difference in potential visual impacts resulting from the proposed layout changes.

### Cumulative Impact

As a result of the proposed revisions in the 2018 Layout, a slight increase is expected in the total acreage that may have visibility by those wind projects reviewed. With the introduction of the proposed Ball Hill Wind Project (2016 Layout), 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.

Based on the 2018 Layout one (1) or more structures will be theoretically visible from approximately 41.0 percent of the Projects five-mile radius study area (see Appendix B). The total cumulative

visibility of the proposed wind projects is approximately 41,451 acres. This represents an increase of 806 acres when compared to the 2016 Layout.

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. It is possible that with the additional turbines, the impact may be minimal.

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.

### Shadow-Flicker

Due to the change in turbine height there was an increase number of shadow receptors (i.e. residential dwellings) that may receive 40+ hours of shadow-flicker, when compared to the 2016 Layout. Using the same shadow-flicker data inputs identified in the SVRA, 241 receptors (located within 4,462-feet of the turbines<sup>3</sup>) were evaluated using the 2018 Layout (see Appendix C). It is anticipated that:

- > 54 (22.4%) receptors will theoretically not be impacted;
- > 9 (3.7%) receptors will theoretically be impacted 0-2 hrs/yr;
- > 57 (23.7%) receptors will theoretically be impacted 2-10 hrs/yr;
- > 46 (19.1%) receptors will theoretically be impacted 10-20 hrs/yr;
- > 30 (12.4%) receptors will theoretically be impacted 20-30 hrs/yr;
- > 17 (7.1%) receptors will theoretically be impacted 30-40 hrs/yr; and
- > 28 (11.6%) receptors will theoretically be impacted 40+ hrs/yr.

The potential shadow-flicker evaluated for both Layouts are similar, but it appears that the 2018 Layout will result in an overall greater number of structures receiving 10-20 and 40+ hours of shadow-flicker per year. In comparing both layouts the differences in hourly categories are as follows:

**Table 5 Shadow Receptor Comparison Summary**

	<b>2018 Layout</b> Percentage of Receptors within Each Grouping	<b>2016 Layout</b> Percentage of Receptors within Each Grouping	<b>Difference Between Layouts</b> (2018 Layout used as baseline)
0-2 hrs/yr	26.1%	31.1%	Decrease of 5.0%
2-10 hrs/yr	23.7%	28.6%	Decrease of 4.9%
10-20 hrs/yr	19.1%	17.8%	Increase of 1.3%
20-30 hrs/yr	12.4%	13.3%	Decrease of 0.9%
30-40 hrs/yr	7.1%	7.1%	No Change
40+ hrs/yr	11.6%	2.1%	Increase of 9.5%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	

<sup>3</sup> The same receptors were used in the 2018 Layout analysis in order to determine change from the 2016 Layout. Although the 2018 Layout has a slightly larger study area (based on rotor diameter) additional receptors are not included.

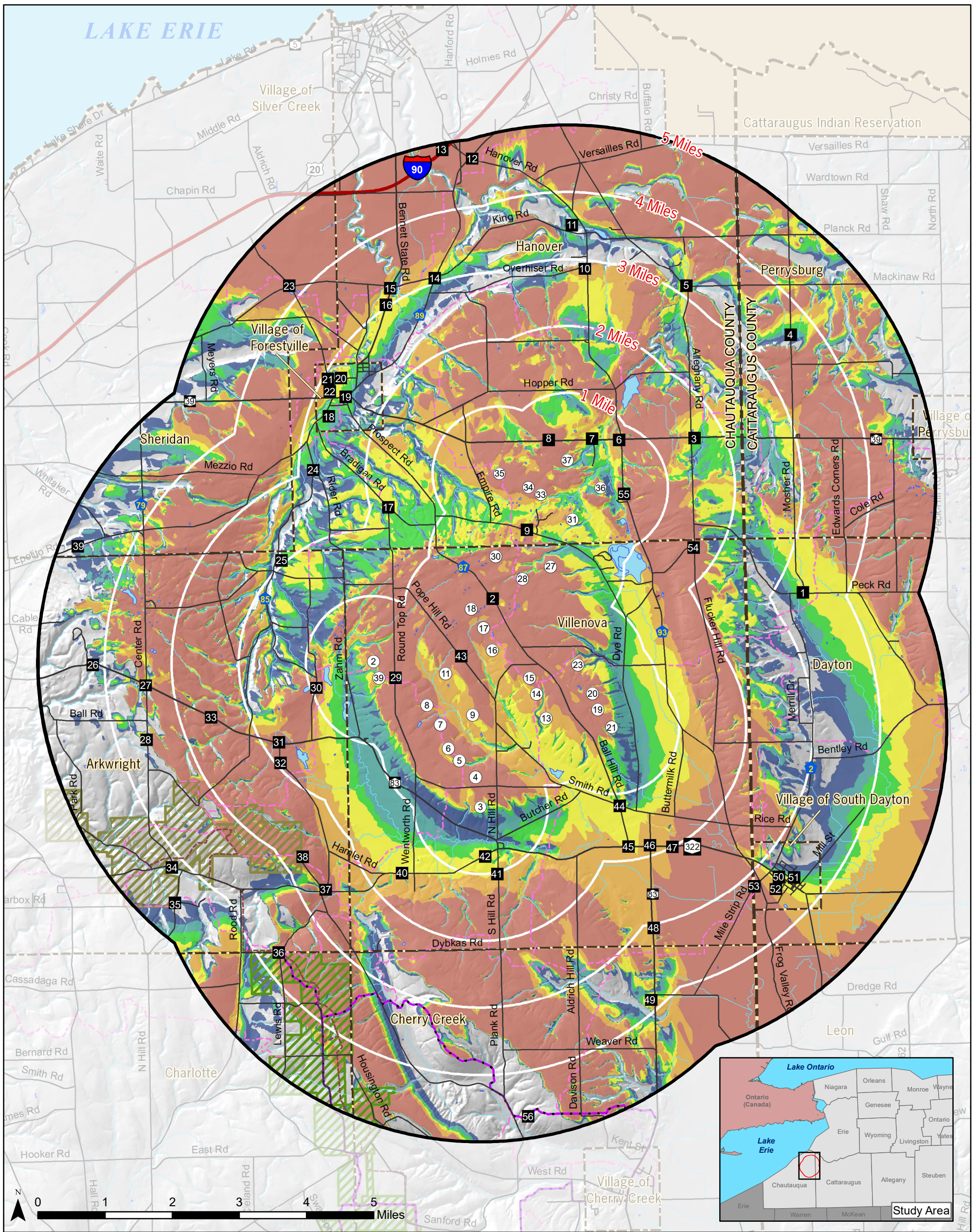
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### Visual Impact Conclusion

The Project and overall visibility is not expected to significantly change as a result of proposed changes to the 2016 Layout. Moreover, with the removal of the overhead transmission line, the need for 60 transmission structures is no longer required. The removal of these structures significantly reduces overall Project visibility.

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Appendix A  
**Project Viewshed Mapping**



# TOPOGRAPHIC VIEWSHED

## Ball Hill Wind Project

Figure A1  
June 2018

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect May 22, 2018 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

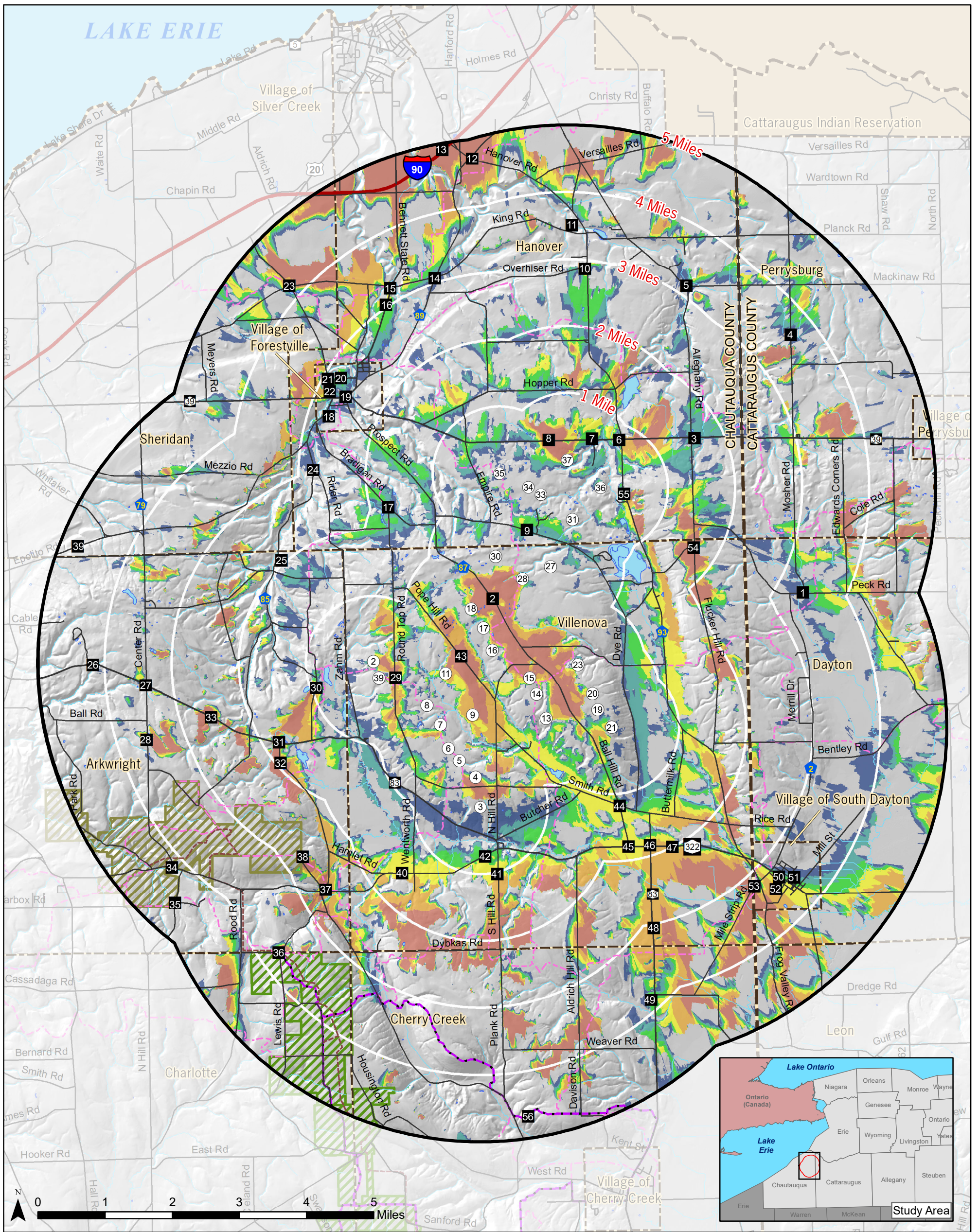
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- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 29

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# SARATOGA ASSOCIATES

Landscape Architects, Architects,  
Engineers, and Planners, P.C.

New York City > Saratoga Springs > Syracuse



# 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 A2  
June 2018

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect May 22, 2018 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

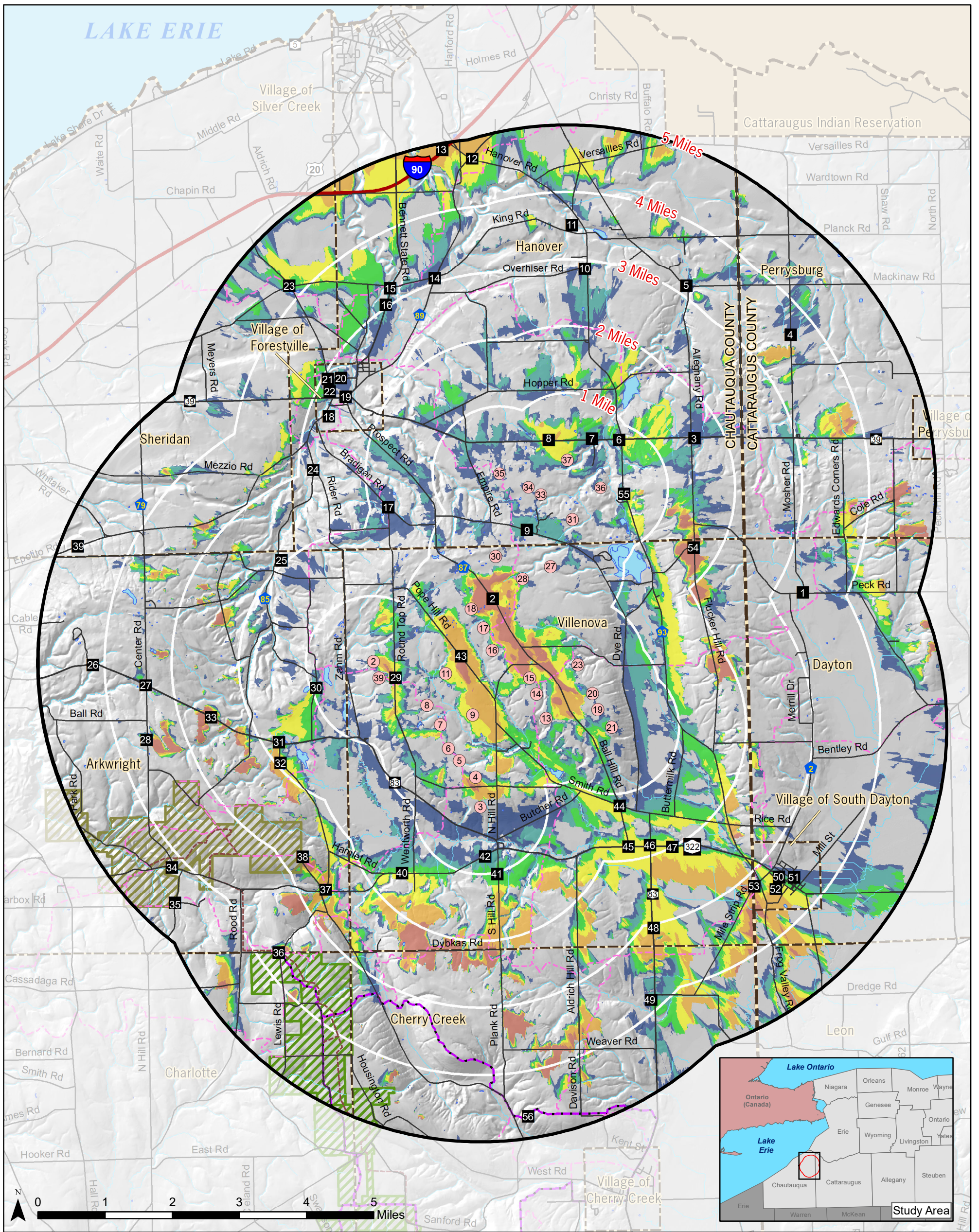
- 1 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 29

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**SARATOGA ASSOCIATES**

Landscape Architects, Architects, Engineers, and Planners, P.C.

New York City > Saratoga Springs > Syracuse



# 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 A3  
June 2018

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect May 22, 2018 layout.

### KEY

- Proposed Wind Turbine with FAA 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 - 25
- 26 - 29

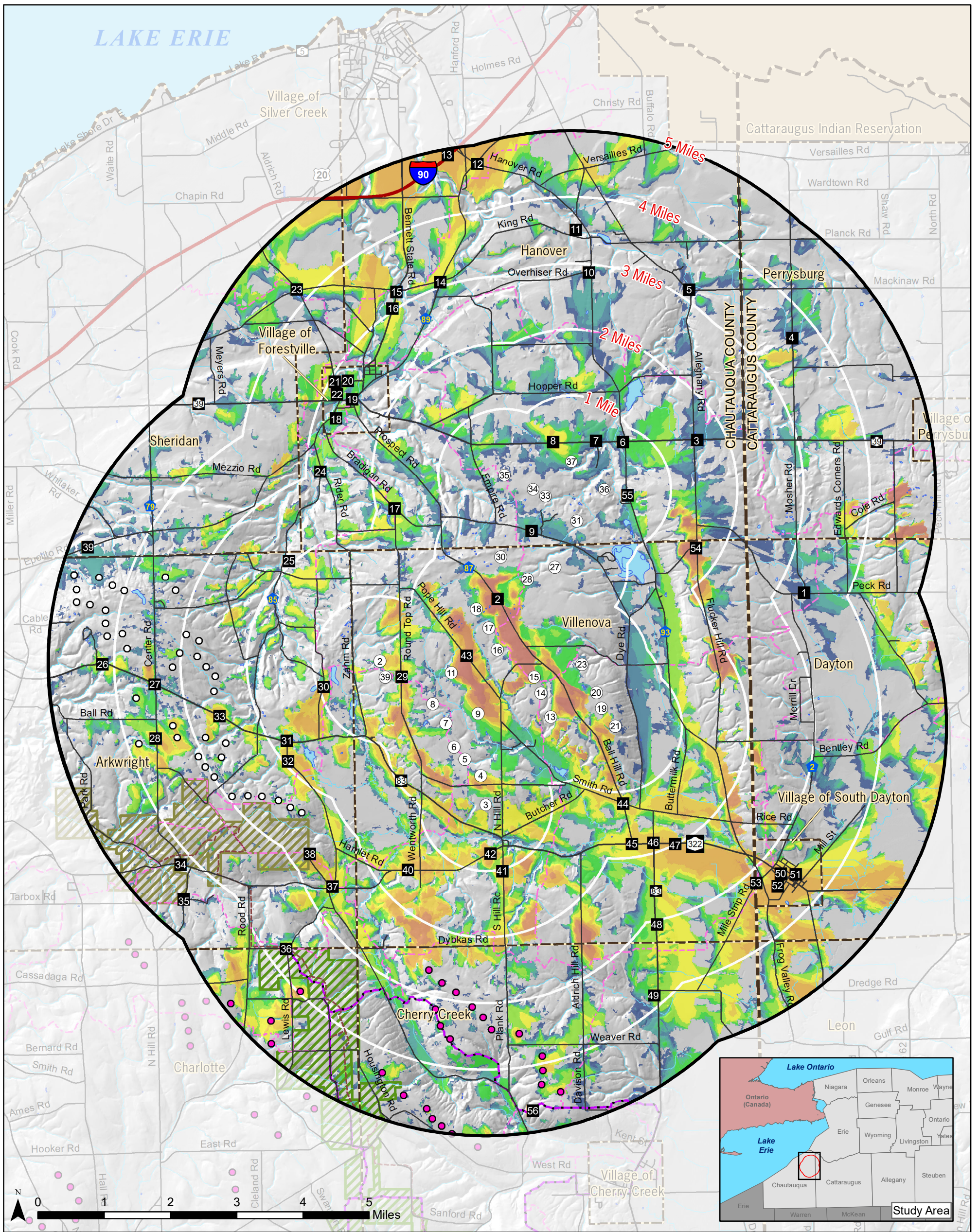
PROJECT # 2017 - 17026.20  
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File Location:  
B:\2017\17026\Maps\FAA180522\FAAVegViewshed.mxd

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Appendix B  
**Cumulative Viewshed Mapping**



# 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

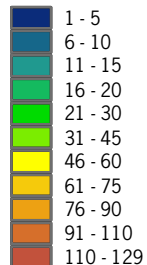
Figure B1  
June 2018

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect May 22, 2018 layout.

### KEY

- ① Proposed Wind Turbine
- Cassadaga Wind Turbine
- Arkwright 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



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File Location:  
B:\2017\17026\Maps\Cumulative180522\CumulativeVegViewshed.mxd

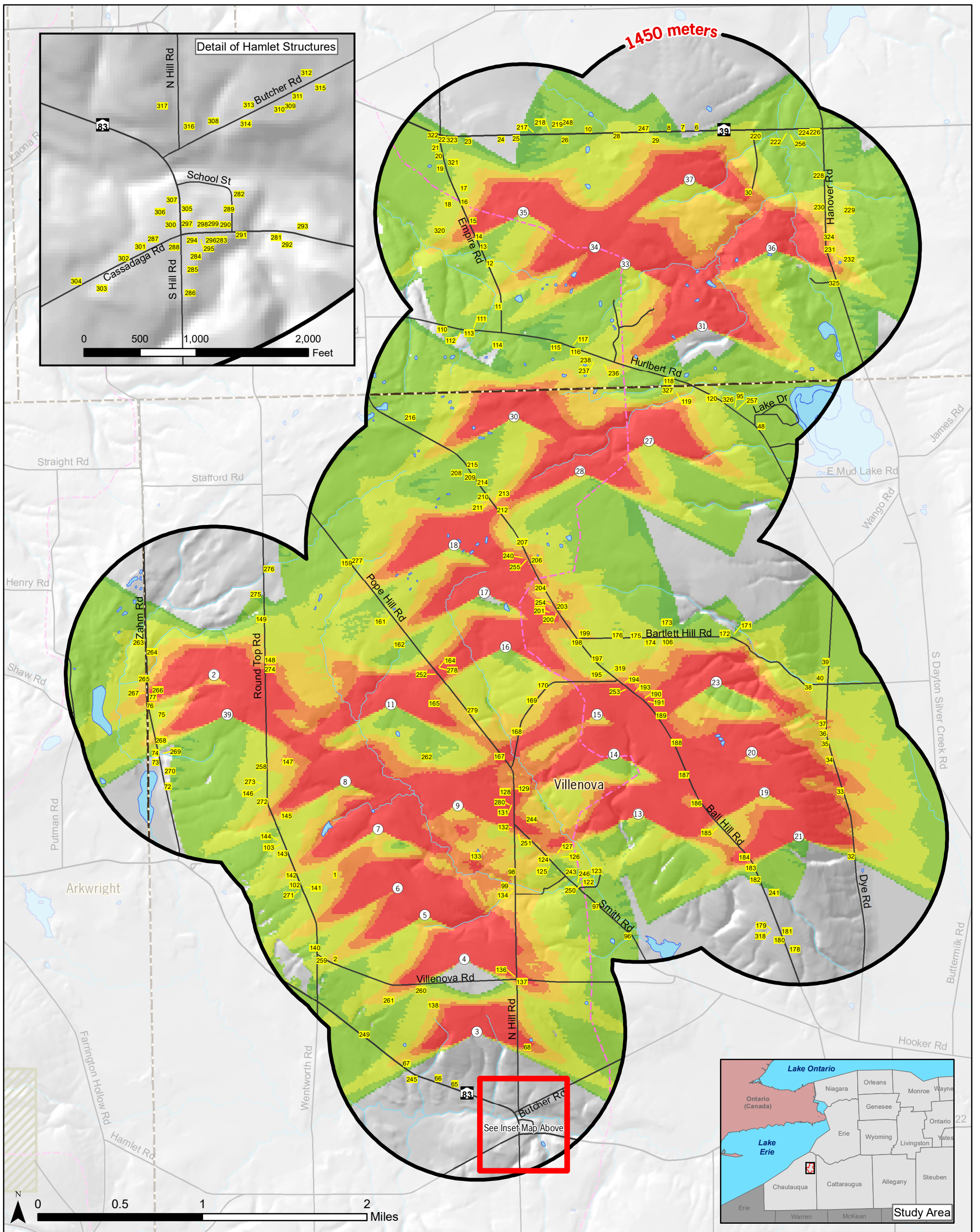
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Appendix C  
**Shadow-Flicker Map**



# TOPOGRAPHIC SHADOW FLICKER ANALYSIS

## Ball Hill Wind Project

Figure C1  
June 2018

Turbine locations, pads, access roads, transmission line ROWs, and collector line ROWs reflect May 22, 2018 layout.

- KEY**
- Proposed Wind Turbine
  - 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

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File Location:  
B:\2017\17026\Maps\Flicker180522\TopoFlicker.mxd

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# Appendix F

## MEMORANDUM

Date: October 23, 2017

To: Renewable Energy Systems Americas, Inc

From: Ryan Callahan, INCE & Rob O'Neal, INCE Bd. Cert. Epsilon Associates, Inc.

Subject: **Ball Hill Wind Acoustic Modeling Results – Layout 092617 & V136-3.45**

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This memorandum provides updated sound modeling results for the Ball Hill Wind Project (Layout 092617). A comprehensive sound level assessment report was provided to Renewable Energy Systems Americas Inc. on October 4, 2016.

Key changes between the October 4, 2016 report and this memo include:

- ◆ Small movements to four of the proposed turbines (T2, T4, T8, and T28).
- ◆ All turbines have been updated to Vestas model V136-3.45 with serrated trailing edge blades.
- ◆ All turbines have been updated to a hub height of 105 meters.
- ◆ The 120 MVA collector substation has been removed.

All turbines were modeled at a hub height of 105 meters. Maximum sound levels in the project area were predicted at the same set of 768 receptors used previously. A technical report from Vestas<sup>1</sup> documented the expected maximum sound power levels of the V136-3.45 with STE blades at 105.5 dBA. A manufacturer's uncertainty factor ("K") of 2.0 dBA was added to the sound power level for a total modeled sound level of 107.5 dBA.

The sound levels from the proposed wind turbines were predicted using the Cadna/A noise calculation software. This software uses the ISO 9613-2 international standard for sound propagation (Acoustics - Attenuation of sound during propagation outdoors - Part 2: General method of calculation).

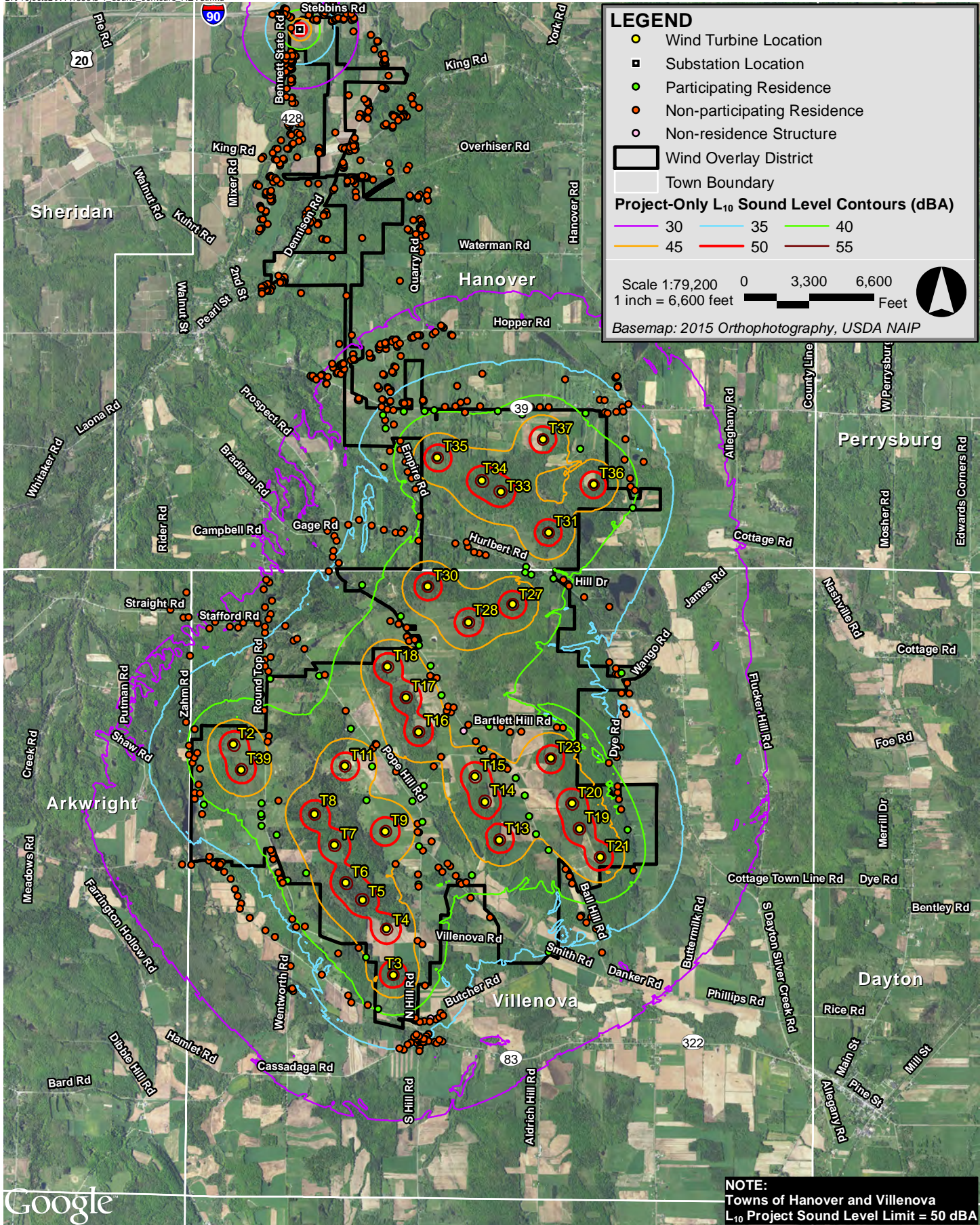
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<sup>1</sup> Vestas Wind Systems A/S, DMS 0055-9919\_V03, "V136-3.45 MW Third octave noise emission" February 15, 2017.

## Modeling Sound Level Results

Modeling results for the Vestas V136-3.45 turbine, representing maximum Project-only  $L_{10}$  sound levels, are shown in Figure 6-1 as sound contour lines overlaid on an aerial image of the Project area. Predicted maximum  $L_{10}$  sound levels for the Project area receptors range from 19 to 47 dBA. Predicted maximum  $L_{eq}$  levels range from 18 to 46 dBA. Complete results at all receptors are presented in Table A-1.

Maximum operational  $L_{10}$  sound levels at all of the nearest structures to the Project are predicted to be less than 50 dBA. Therefore, the Project is in compliance with local noise limits specified by the Towns of Hanover and Villenova. Additionally, the Project is expected to meet the suggested noise guidelines of a 6 dBA or less increase over background as recommended by the New York State Department of Environmental Conservation (NYSDEC) to avoid the potential for adverse noise impacts in the community.



**Ball Hill Wind Project Hanover & Villenova, New York**



**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
1	302835	265921	44	43
2	302817	265099	41	40
3	305211	265779	41	40
4	303337	270719	35	34
5	306582	273125	43	42
6	306448	273126	43	42
7	306310	273130	42	41
8	306063	273131	41	40
9	305523	273141	39	38
10	304592	271431	40	39
11	304524	271857	42	41
12	304464	272023	43	42
13	304408	272125	43	42
14	304370	272276	43	42
15	304291	272464	41	40
16	304288	272601	41	40
17	304129	272449	39	38
18	304063	272798	37	36
19	304054	272920	37	36
20	304025	273005	36	35
21	304089	273088	36	35
22	304345	273055	38	37
23	304667	273065	39	38
24	304815	273077	40	39
25	305292	273044	40	39
26	305322	273216	39	38
27	305800	273064	40	39
28	306179	273013	43	42
29	307071	272480	44	43
30	306588	264701	35	34
31	307892	265960	42	41
32	307805	266595	42	41
33	307706	266908	42	41
34	307670	267064	42	41
35	307651	267168	41	40
36	307650	267265	41	40
37	307520	267624	40	39
38	307696	267868	38	37
39	307640	267712	39	38
40	307788	268380	35	34
41	307746	268479	35	34
42	307714	268704	35	34

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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	35	34
44	307655	268993	35	34
45	307626	269084	35	34
46	307132	270187	38	37
47	301451	266094	34	33
48	301466	266093	34	33
49	301483	266092	34	33
50	301500	266093	34	33
51	301516	266092	34	33
52	301532	266092	34	33
53	301570	265944	34	33
54	301671	265836	34	33
55	301738	265672	33	32
56	301780	265566	33	32
57	301829	265450	33	32
58	301965	265234	33	32
59	302204	265039	33	32
60	302353	264933	33	32
61	303080	264353	36	35
62	303951	263822	40	39
63	303790	263883	40	39
64	303484	264028	38	37
65	304671	264182	42	41
66	301336	266118	34	33
67	301338	266177	34	33
68	301228	266832	38	37
69	301114	267071	38	37
70	301116	267164	39	38
71	301191	267536	42	41
72	301079	267623	41	40
73	301106	267708	41	40
74	301041	269283	33	32
75	302266	270414	32	31
76	302218	270455	32	31
77	302179	270309	32	31
78	302198	270031	34	33
79	302304	270136	34	33
80	302288	269923	34	33
81	302252	269847	34	33
82	303188	270587	35	34
83	303244	270812	35	34
84	303257	270903	35	34
85	303267	271364	34	33

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
86	303270	271133	34	33
87	303307	271057	35	34
88	306880	270386	40	39
89	305683	265239	38	37
90	305379	265538	40	39
91	304567	265903	43	42
92	304571	265747	42	41
93	302312	266233	41	40
94	302200	269222	36	35
95	306160	268107	43	42
96	303487	271309	35	34
97	303655	271379	36	35
98	303849	271296	37	36
99	304038	271224	38	37
100	304347	271236	39	38
101	304214	271187	39	38
102	304301	271181	39	38
103	304573	271057	41	40
104	305144	271018	42	41
105	305337	270967	42	41
106	305319	271039	42	41
107	306239	270659	44	43
108	306314	270535	44	43
109	306655	270474	42	41
110	305237	265757	41	40
111	305314	265779	41	40
112	305395	265887	42	41
113	304880	266010	42	41
114	304939	265943	41	40
115	305060	266030	42	41
116	305021	266071	42	41
117	304560	266685	44	43
118	304631	266714	44	43
119	304643	266268	43	42
120	304582	266553	44	43
121	304580	266336	44	43
122	304221	266066	45	44
123	304573	265716	42	41
124	304562	264878	44	43
125	304636	264824	43	42
126	303764	264620	45	44
127	302619	265214	39	38
128	302550	265807	41	40

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
129	302409	265930	41	40
130	302326	266139	41	40
131	302285	266277	41	40
132	302379	266514	43	42
133	302143	266794	42	41
134	302407	267041	44	43
135	302262	268044	44	43
136	302189	268440	41	40
137	302250	269039	37	36
138	302199	269120	37	36
139	302286	269264	36	35
140	302199	269635	35	34
141	302202	269733	35	34
142	302517	269746	35	34
143	302640	269518	36	35
144	302698	269540	36	35
145	302808	269389	37	36
146	303038	268970	39	38
147	303444	268430	42	41
148	303530	268156	43	42
149	303872	267853	45	44
150	303911	267922	45	44
151	303855	267569	46	45
152	304478	267032	44	43
153	304653	267271	43	42
154	304810	267574	45	44
155	304925	267717	45	44
156	306809	268168	43	42
157	306715	268173	43	42
158	306154	268298	41	40
159	305986	268102	42	41
160	305847	268175	42	41
161	305666	268187	42	41
162	307410	264695	34	33
163	307313	265066	36	35
164	307087	265268	38	37
165	307165	265160	37	36
166	307242	265245	38	37
167	306947	265758	43	42
168	306907	265874	44	43
169	306846	265982	44	43
170	306587	266276	45	44
171	306392	266522	45	44

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
172	306280	266803	46	45
173	306214	267120	46	45
174	306072	267387	46	45
175	305920	267565	46	45
176	305950	267530	46	45
177	305730	267653	47	46
178	305830	267632	46	45
179	305729	267720	46	45
180	305540	267818	46	45
181	305461	267962	44	43
182	305346	268213	43	42
183	305077	268412	44	43
184	305007	268430	45	44
185	305030	268499	44	43
186	305116	268483	43	42
187	304928	268671	45	44
188	304793	268945	45	44
189	304852	268940	44	43
190	304762	269125	44	43
191	304137	269816	42	41
192	304268	269771	43	42
193	304391	269573	44	43
194	304424	269508	44	43
195	304578	269443	44	43
196	304511	269528	44	43
197	304389	269720	43	42
198	304296	269893	43	42
199	303701	270372	38	37
200	304983	273128	39	38
201	305140	273136	39	38
202	305222	273197	39	38
203	307157	273030	39	38
204	307459	273045	38	37
205	307496	273029	37	36
206	307631	273047	37	36
207	307725	273122	36	35
208	307739	273054	36	35
209	307820	273167	35	34
210	307770	272626	38	37
211	308054	272278	38	37
212	307760	272313	41	40
213	307851	271897	41	40
214	307919	271835	40	39

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
215	307525	270039	36	35
216	306902	270361	40	39
217	305613	270835	42	41
218	305510	270866	42	41
219	305433	270887	42	41
220	303164	271210	34	33
221	304756	268970	45	44
222	307127	265624	42	41
223	305147	265883	41	40
224	304777	266410	43	42
225	303534	263922	38	37
226	302441	265831	41	40
227	305267	268124	44	43
228	302146	266999	43	42
229	302684	265087	39	38
230	303648	264766	45	44
231	303329	264680	42	41
232	303767	267050	45	44
233	300989	270263	28	27
234	300939	269870	27	26
235	300734	269991	29	28
236	301022	269877	27	26
237	300982	268255	38	37
238	301111	268150	41	40
239	301024	267891	40	39
240	301156	267779	42	41
241	301028	267753	40	39
242	301174	267287	41	40
243	301193	267155	40	39
244	301253	266981	39	38
245	301059	266053	34	33
246	300915	266057	34	33
247	301423	266076	34	33
248	301411	266064	34	33
249	301474	266013	34	33
250	301487	266028	34	33
251	301498	266042	34	33
252	301505	266053	34	33
253	301809	265370	32	31
254	302594	264485	33	32
255	302638	264095	35	34
256	302599	264129	35	34
257	302623	264141	35	34

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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	41	40
259	302146	266655	41	40
260	302141	266834	42	41
261	302241	267952	44	43
262	302140	268685	39	38
263	302277	268929	38	37
264	302169	269437	35	34
265	302088	269783	34	33
266	301866	269792	34	33
267	301782	269714	34	33
268	301654	269728	34	33
269	301431	269805	31	30
270	301343	269705	29	28
271	303123	268986	40	39
272	303921	267910	45	44
273	304227	267491	44	43
274	304561	266556	44	43
275	304942	263321	34	33
276	304823	263316	35	34
277	304725	263437	35	34
278	304669	263313	35	34
279	304602	263271	35	34
280	304593	263236	35	34
281	304584	263172	34	33
282	304488	263322	36	35
283	304544	263298	35	34
284	304696	263398	35	34
285	304686	263355	35	34
286	304728	263326	35	34
287	304851	263295	34	33
288	304895	263345	35	34
289	304593	263315	35	34
290	304617	263316	35	34
291	304645	263313	35	34
292	304581	263360	36	35
293	304627	263358	35	34
294	304653	263358	35	34
295	304537	263360	36	35
296	304453	263302	35	34
297	304406	263272	35	34
298	304345	263191	35	34
299	304276	263213	35	34
300	304583	263402	36	35

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
301	304509	263395	36	35
302	304542	263426	36	35
303	304661	263637	37	36
304	304864	263672	37	36
305	304841	263664	37	36
306	304892	263698	37	36
307	304917	263762	37	36
308	304758	263678	37	36
309	304749	263627	37	36
310	304954	263720	36	35
311	304594	263625	38	37
312	304523	263682	39	38
313	307076	265245	38	37
314	307835	268700	35	34
315	307798	268862	34	33
316	305581	267840	45	44
317	304039	272195	38	37
318	304193	272856	38	37
319	304005	273128	35	34
320	304187	273074	37	36
321	307847	272022	41	40
322	307885	271567	40	39
323	307710	269011	34	33
324	307523	269182	34	33
325	306815	270457	41	40
326	306226	270568	44	43
327	303952	278773	27	26
328	303934	278769	27	26
329	303935	278785	27	26
330	304005	278574	27	26
331	304041	278582	26	25
332	303890	278654	27	26
333	303403	279128	33	32
334	303832	278880	28	27
335	303275	279101	35	34
336	303091	279223	37	36
337	303100	279250	36	35
338	303538	279105	31	30
339	302881	279231	40	39
340	303566	278929	31	30
341	302951	279115	41	40
342	302998	279106	40	39
343	303006	279100	40	39



**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
344	302998	279118	40	39
345	303097	279223	37	36
346	303057	279270	32	31
347	303071	279258	37	36
348	303110	279185	37	36
349	303122	279219	36	35
350	303233	279088	36	35
351	303251	279094	35	34
352	303238	279099	35	34
353	303282	279118	35	34
354	303301	279125	34	33
355	303346	279129	33	32
356	303333	279140	34	33
357	303414	279115	33	32
358	303254	279332	33	32
359	303253	279352	33	32
360	303253	279279	34	33
361	303260	279244	34	33
362	303418	279128	32	31
363	303458	279204	27	26
364	303577	279117	31	30
365	303574	279138	31	30
366	303531	279202	26	25
367	302890	279200	41	40
368	302619	278608	38	37
369	302618	278611	38	37
370	302600	278617	38	37
371	302536	278563	37	36
372	302490	278574	36	35
373	302425	278783	39	38
374	302879	279189	41	40
376	302604	278985	47	46
377	302593	279152	42	41
378	302598	279152	42	41
379	302596	279146	42	41
380	302495	279286	38	37
381	302508	279284	38	37
382	302514	279263	38	37
383	302527	279271	38	37
384	302545	279181	41	40
385	302502	279197	39	38
386	302470	279144	40	39
387	302439	279096	40	39

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
388	302444	279126	39	38
389	302424	279132	39	38
390	302411	279141	38	37
391	302435	279216	38	37
392	302419	279197	38	37
393	302394	279207	37	36
394	302375	279201	37	36
395	302330	279194	36	35
396	302314	279193	36	35
397	302660	277826	28	27
398	302622	277825	28	27
399	302622	277912	29	28
400	302611	277896	29	28
401	302528	277916	29	28
402	302621	278357	34	33
403	302623	278150	31	30
404	302599	278137	31	30
405	302621	278208	32	31
406	302600	278189	31	30
407	302601	278340	33	32
408	302611	278359	34	33
409	302594	278377	34	33
410	302613	278425	35	34
411	302592	278441	35	34
412	302617	278450	35	34
413	302630	278469	36	35
414	302625	278479	36	35
415	302600	278486	36	35
416	302674	278547	37	36
417	302664	278554	37	36
418	302608	278545	37	36
419	302624	278556	37	36
420	302416	278043	29	28
421	302457	278037	29	28
422	302532	278046	30	29
423	302461	278204	31	30
424	302437	278232	31	30
425	302435	278240	31	30
426	302491	278276	32	31
427	302525	278289	32	31
428	302519	278290	32	31
429	302523	278305	33	32
430	302482	278396	34	33

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
431	302512	278421	34	33
432	302509	278476	35	34
433	302519	278494	35	34
434	302531	278548	36	35
435	303814	277735	25	24
436	303778	277598	25	24
437	303688	277646	26	25
438	303670	277655	26	25
439	303656	277599	25	24
440	303789	277581	23	22
441	303798	277696	25	24
442	303795	277810	26	25
443	303785	277852	26	25
444	303772	277832	26	25
445	303734	277884	26	25
446	303497	277946	27	26
447	303492	277948	27	26
448	304581	277748	22	21
449	304491	277803	23	22
450	304389	277614	21	20
451	304353	277657	22	21
452	304343	277644	22	21
453	304340	277620	22	21
454	304302	277600	22	21
455	304255	277573	23	22
456	304298	277736	24	23
457	304480	277933	24	23
458	304456	277901	24	23
459	304298	277747	24	23
460	304220	277620	19	18
461	304171	277641	23	22
462	304185	277629	22	21
463	304193	277614	24	23
464	304114	278250	25	24
465	304062	278044	25	24
466	304047	278062	26	25
467	304010	278061	26	25
468	304025	278433	26	25
469	304064	278417	26	25
470	304058	278432	26	25
471	304048	278455	26	25
472	304045	278488	26	25
473	304055	278488	26	25

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
474	304053	278499	26	25
475	303871	276634	21	20
476	304260	277555	23	22
477	304114	276890	21	20
478	304426	276850	21	20
479	304391	276793	21	20
480	304139	276763	21	20
481	304174	277440	21	20
482	304066	277477	23	22
483	304038	277478	23	22
484	304072	277506	24	23
485	304177	277467	23	22
486	303284	277367	26	25
487	302870	276586	22	21
488	303593	276574	21	20
489	303774	276667	21	20
490	303778	276677	21	20
491	303758	276693	21	20
492	303703	276700	21	20
493	303023	276577	23	22
494	303543	276674	22	21
495	303569	276654	21	20
496	303577	276637	21	20
497	303562	276614	21	20
498	303533	276627	21	20
499	303475	276619	21	20
500	303414	276817	22	21
501	303420	276831	22	21
502	303391	276833	22	21
503	303402	276867	22	21
504	303417	276872	22	21
505	303405	276903	23	22
506	303677	276940	22	21
507	303569	277166	24	23
508	303574	277167	24	23
509	303039	277134	25	24
510	303026	277080	25	24
511	303041	277068	25	24
512	303039	277049	25	24
513	303385	277133	24	23
514	303436	277123	24	23
515	303494	277078	23	22
516	303505	277077	23	22

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
517	303535	277098	24	23
518	303514	277141	24	23
519	303602	277112	23	22
520	303585	277102	23	22
521	303592	277177	24	23
522	303592	277165	24	23
523	303566	277158	24	23
524	303559	277257	24	23
525	303590	277285	24	23
526	302437	276861	23	22
527	302444	276583	24	23
528	302329	276605	24	23
529	302269	276682	24	23
530	302354	276951	23	22
531	302775	277268	25	24
532	302447	277249	23	22
533	302385	277112	25	24
534	302359	277114	25	24
535	302317	277052	25	24
536	302574	277464	26	25
537	302585	277491	26	25
538	302555	277494	26	25
539	302567	277548	26	25
540	302581	277522	26	25
541	302589	277345	24	23
542	302607	277328	23	22
543	302710	277501	26	25
544	302761	277502	26	25
545	302696	277368	26	25
546	302739	277344	26	25
547	302724	277233	25	24
548	302616	277181	20	19
549	302632	277198	20	19
550	302695	276984	25	24
551	302561	277113	20	19
552	302544	277123	20	19
553	302393	277115	23	22
554	302492	276944	21	20
555	302483	276963	21	20
556	302426	276888	23	22
557	302378	276946	23	22
558	302175	276994	24	23
559	302143	276966	24	23

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
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	24	23
566	302107	275843	24	23
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	21	20
584	302830	276122	21	20
585	302826	276059	21	20
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	24	23
593	302702	275709	21	20
594	303087	275724	22	21
595	303138	275715	22	21
596	302923	276004	21	20
597	303047	276313	21	20
598	303156	275712	22	21
599	302873	275849	21	20
600	303704	275741	26	25
601	302872	276178	22	21
602	303602	276452	21	20

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
603	303608	276369	21	20
604	303250	276479	21	20
605	303273	276502	21	20
606	303143	276144	21	20
607	303160	276093	21	20
608	303112	276107	21	20
609	303105	276084	21	20
610	303022	275973	21	20
611	303026	275955	21	20
612	303011	275949	21	20
613	302940	276007	21	20
614	302891	275962	21	20
615	302866	276041	21	20
616	302880	276073	21	20
617	302901	275980	21	20
618	304564	275585	27	26
619	304709	276334	26	25
620	304721	276467	26	25
621	304717	276314	26	25
622	304698	276396	26	25
623	304592	276412	26	25
624	304568	276352	26	25
625	304568	276378	26	25
626	304447	276374	26	25
627	304436	276397	25	24
628	304594	276036	27	26
629	304610	276009	27	26
630	304630	275944	27	26
631	304622	275922	27	26
632	304595	275900	27	26
633	304596	275886	27	26
634	304593	275781	27	26
635	304583	275785	27	26
636	304620	275871	27	26
637	304494	276013	26	25
638	304433	275853	26	25
639	304408	275874	26	25
640	304535	275796	27	26
641	304583	275611	27	26
642	304619	275749	27	26
643	304681	275775	27	26
644	304284	275074	29	28
645	304621	275515	28	27

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
646	304543	275188	29	28
647	303460	274849	27	26
648	303237	275436	26	25
649	302229	275008	21	20
650	302756	274888	26	25
651	302500	275138	22	21
652	302463	275086	22	21
653	302459	275095	22	21
654	302473	275057	22	21
655	302469	275046	22	21
656	302432	275049	22	21
657	302408	275159	22	21
658	302260	274966	22	21
659	302309	274975	22	21
660	302277	274948	22	21
661	302289	274924	22	21
662	302237	274924	22	21
663	302218	274937	22	21
664	302241	275031	21	20
665	302192	274991	21	20
666	302185	275005	21	20
667	302162	274974	21	20
668	302148	274978	21	20
669	302150	274913	22	21
670	302154	274882	22	21
671	303589	273856	31	30
672	303084	273630	30	29
673	303539	274238	30	29
674	303344	274105	30	29
675	303566	273944	31	30
676	303563	273943	31	30
677	303143	273583	30	29
678	302979	273579	30	29
679	302935	273579	30	29
680	302903	273610	30	29
681	302937	273604	30	29
682	303062	273617	30	29
683	303174	273595	30	29
684	303252	273734	30	29
685	303240	273795	30	29
686	303309	273650	31	30
687	303323	273659	31	30
688	303372	273636	31	30



**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
689	303408	273711	31	30
690	303426	273712	31	30
691	303360	273776	30	29
692	303371	273784	31	30
693	303379	273778	31	30
694	303400	273801	31	30
695	303410	273792	31	30
696	303530	273846	31	30
697	303564	273866	31	30
698	303847	273887	31	30
699	303825	273893	31	30
700	303812	273958	31	30
701	304296	273918	33	32
702	304200	273757	33	32
703	304214	273744	33	32
704	304183	273653	33	32
705	304164	273671	33	32
706	304044	273623	33	32
707	304022	273633	33	32
708	304793	274253	32	31
709	304598	274231	32	31
710	304596	274236	32	31
711	304512	274234	32	31
712	304678	274071	33	32
713	303961	274013	31	30
714	303955	274055	31	30
715	303976	274046	31	30
716	303986	274097	31	30
717	304070	274025	32	31
718	304060	274087	31	30
719	304074	274125	31	30
720	304060	274118	31	30
721	304169	274172	31	30
722	304163	274138	31	30
723	304229	274173	31	30
724	304217	274163	31	30
725	304244	274057	32	31
726	304237	274082	32	31
727	304287	274112	32	31
728	304462	274198	32	31
729	304490	274204	32	31
730	304561	274239	32	31
731	304838	274286	32	31

**Table A-1**

Predicted Sound Level Modeling Results - Layout 092617

Vestas V136-3.45

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)		
732	305074	274244	32	31
733	305560	273641	36	35
734	305097	274231	33	32
735	304962	274353	32	31
736	304938	274369	32	31
737	304924	274382	32	31
738	307620	273580	34	33
739	307632	273587	34	33
740	307635	273601	34	33
741	307656	273453	35	34
742	307654	273429	35	34
743	307379	273236	37	36
744	307447	273233	37	36
745	306837	273553	37	36
746	305172	273449	37	36
747	304420	273191	37	36
748	303963	273412	34	33
749	304145	273388	35	34
750	304648	273235	38	37
751	304655	273215	38	37
752	304640	273211	38	37
753	304640	273231	38	37
754	303943	273445	34	33
755	304097	273432	34	33
756	304103	273413	34	33
757	304139	273360	35	34
758	304031	273230	35	34
759	304012	273245	35	34
760	304133	273206	36	35
761	304136	273216	35	34
762	304324	273193	37	36
763	304354	273184	37	36
764	303636	273239	33	32
765	302990	273552	30	29
766	303145	273489	30	29
767	303149	273489	30	29
768	303655	273231	33	32
769	303649	273255	33	32

# Appendix G



# BUFFALO • TUSCALOOSA • MEMPHIS

Panamerican Consultants, Inc. • 2390 Clinton St. • Buffalo, NY 14227 • (716) 821-1650

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June 5, 2018

Mark Lyons  
RES Group  
455 Boston Post Road, Suite 206  
Old Saybrook, CT 06475

**Subject: Reduction of Visual Impacts to Historic Structures from the Ball Hill Wind Energy Project, Towns of Villanova (23 turbines/Lead Agency) and Hanover (6 turbines), Chautauqua County, New York. NYSHPO Number 08PR01814.**

Dear Mr. Lyons:

On May 16, 2018, I discussed the proposed modifications to the project design for Ball Hill Wind Energy Project ("Project") with Mr. John Bonafide, Historic Preservation Services Coordinator, Historic Preservation Field Services Bureau, New York State Historic Preservation Office (SHPO). These modifications include increase in turbine height, minimal turbine location changes, and placement of the transmission line underground.

To present these changes for comparative review with previous Project design submittals, Panamerican prepared an updated viewshed map which depicts the positive viewshed (Zone of Visual Influence) and negative viewsheds (i.e., no structures can be seen) for the current proposed Project design. The current viewshed utilizes a maximum 599-foot tall turbine. Specifically, 27 turbines will be at maximum height of 599 feet, one turbine at 586 feet and one turbine at 567 feet. This positive viewshed was overlaid with the previous positive viewshed (submitted to SHPO in 2016) to highlight the areas of the current viewshed that have not been surveyed for presence of historic structures.

The attached viewshed map compares the viewshed for the current APE and highlights the parts of the current viewshed where turbines would not have been visible in the 2016 project viewshed. The total area within a 5-mile radius of turbines and 3-miles of the transmission line is 170.1 sq. miles, of which turbines will be visible from 135 sq. miles. The 2018 increase to the turbine height makes turbines visible from 5.3 sq. miles more than in 2016 (the 2016 viewshed was 129.7 sq. miles with turbine heights of 492 feet tall). Both the 2016 and 2018 project configurations have 29 turbines. The additional area of positive viewshed does not appear to be significant impact as it is spread over 135 square mile area (see attachment viewshed map).

No structures or buildings will be demolished or physically altered in connection with the Project. No NRHP listed or eligible buildings will be directly affected by Project construction, as documented throughout the Project history (Longiaru et al. 2008; and Addenda 1, 2, 3). While there is some potential for visual and noise impacts to structures

potentially eligible for inclusion in the NRHP, due to construction activities, it is unlikely that these impacts will be significant due to their temporary nature.

In addition, Saratoga Associates submitted photo simulations from various historic sources throughout the proposed Project area in November of 2008. These simulations were updated in May 2016, and have been further updated to reflect design changes and present the impacts associated with the 2018 submittal. The report: Ball Hill Wind Project, Visual Resource Assessment – Technical Memorandum (Saratoga Associates), is included for your review with this letter as a supplement to our report.

### **Project Description Comparison prepared by Saratoga Associates**

The 2016 Layout included twenty-nine (29) turbines in the Towns of Villanova (23 turbines) and Hanover (6 turbines). The turbines then proposed were Vestas V126-3.45 MW, which had a hub height of 285 feet (87 meters), a rotor diameter of 413 feet (126 meters), and a maximum blade tip height of approximately 492 feet. A 5.7-mile overhead 115 kV transmission line was proposed to originate at a new 115/34.5kv collection substation and connect the turbines with an existing National Grid 230 kV transmission line in the Town of Hanover. The line included 60 tangent and angled structure, an 8.6-acre± switchyard, and an approximately 5-acre collection substation.

The 2018 Layout will consist of twenty-nine (29), taller, turbines. The proposed turbines would have a maximum hub height of approximately 360 feet (110 meters), a maximum rotor diameter of approximately 449 feet (137 meters), and a maximum allowable blade tip height of 599 feet. This new proposed turbine configuration represents a maximum increase of 75 feet (23 meters) in hub height and 36 feet (11 meters) to the rotor diameter. The turbine model proposed for the 2018 Layout will result in an increase in maximum blade tip height of 107 feet (33 meters) as compared to the 2016 Layout. (Saratoga Associated, Ball Hill Wind Project Technical Memorandum – February 2018 #2017-026.10 Page 2).

The proposed turbine locations are substantially similar in both layouts, with only three (3) turbines being marginally shifted in the 2018 Layout. It is not anticipated that the adjustments (turbine model and layout) will significantly change the appearance of the previously approved Project layout. The 2018 Layout also removes the above-ground 115 kV transmission line, undergrounds the electric intertie from wind turbine generators to the grid (“gen-tie”), and eliminates the collection substation. An approximate 80-foot-wide clearing will be required through vegetation, which is less than the previously proposed Project.

The placement of the gen-tie predominantly underground will reduce visual impacts from the project. While the underground placement required minor deviations from the previously proposed overhead alignment, the resulting deviations decreased the overall ground disturbance by approximately 10 acres. As no additional acreage has been added to the project, no additional archaeological investigation will be required, as confirmed by Dr. Herter of SHPO in a letter dated May 29, 2018.

The revised viewshed map documenting minimal increase in the positive viewshed and the Saratoga report concludes that it is not anticipated that the adjustments (turbine model and layout) will significantly change the appearance of the previously approved Project layout, or its impacts on historic structures. This recommendation will be submitted to the New York SHPO for their confirmation and concurrence.

If you have any questions, or require any additional information, please do not hesitate to contact me at your convenience.

Sincerely,

A handwritten signature in black ink that reads "Michael A. Cinquino". The signature is written in a cursive style with a clear, legible font.

Michael A. Cinquino, Ph.D., RPA  
Senior Vice President  
Director, Buffalo Branch Office



# Parks, Recreation, and Historic Preservation

ANDREW M. CUOMO  
Governor

ROSE HARVEY  
Commissioner

May 29, 2018

Mr. Mark Lyons  
Development Manager  
Renewable Energy Systems Americas Inc.  
455 Boston Post Road  
Suite 206  
Old Saybrook, CT 06475

Re: USACE  
Noble Ball Hill Wind Farm/94.5 MW/63 Turbines  
Chautauqua County  
08PR01814

Thank you for requesting the comments of the New York State Historic Preservation Office (SHPO). We have reviewed the information regarding changes to the project that include placement of the transmission line underground and reducing the project area required for the transmission line placement from 55.3 acres to 44.9 acres in accordance with Section 106 of the National Historic Preservation Act of 1966. These comments are those of the SHPO and relate only to Historic/Cultural resources. They do not include other environmental impacts to New York State Parkland that may be involved in or near your project. Such impacts must be considered as part of the environmental review of the project pursuant to the National Environmental Policy Act and/or the State Environmental Quality Review Act (New York Conservation Law Article 8).

The SHPO concurs that since there is a reduction in acreage, no additional impacts to archaeological resources will occur and no additional archaeological investigations are required.

If you have any questions, I can be reached at (518) 268-2179.

Sincerely,

Nancy Herter  
Archaeology Unit Program Coordinator



May 25, 2018

Dr. Nancy Herter  
Coordinator & Native American Liaison,  
Historic Preservation Program Analyst  
Historic Preservation Field Services Bureau  
NYS Office of Parks and Recreation, and Historic Preservation  
Peebles Island, P.O. Box 189  
Waterford, New York 12188-0189

**Subject: Project Component Changes and Archaeological Investigations for Ball Hill Wind Power Project, Towns of Villenova (23 turbines/Lead Agency) and Hanover (6 turbines), Chautauqua County, New York. NYSHPO Number 08PR01814.**

Dear Dr. Herter:

Per recent discussion, Panamerican Consultants, Inc. (Panamerican) wishes to inform you of current changes in project component design for Ball Hill Wind Power Project since Panamerican's last archaeological report submittal in October of 2016 (Hanley et al, 2016\*<sup>1</sup>). These current changes include placement of the transmission line underground and reducing the project area required for the transmission line placement from 55.3 acres to 44.9 acres for a reduction of 10.4 acres. Since there is a reduction in acreage, no additional impacts to archaeological resources will occur from the change in component design.

Therefore, Panamerican recommends that these component changes will result in no adverse impacts to archaeological resources and no additional archaeological investigation are required.

If you have any questions, or require any additional information, please do not hesitate to contact me or Senior Archaeologist Robert Hanley at your convenience.

Sincerely,

A handwritten signature in black ink that reads "Michael A. Cinquino".

Michael A. Cinquino, Ph.D., RPA  
Senior Vice President  
Director, Buffalo Branch Office

#### References

\*<sup>1</sup>Hanley, Robert J., Donald Smith, Mark A. Steinback, and Michael A. Cinquino  
2016 *Archaeological Survey for the Ball Hill Wind Project, Towns of Villenova and Hanover, Chautauqua County, New York: Addendum 3*. OPRHP #08PR01814. Panamerican Consultants, Inc., Buffalo Branch, Buffalo. Prepared for Ecology & Environment, Inc.



# Appendix H

# TYPE CERTIFICATE

Certificate No.:  
TC-DNVGL-SE-0074-02942-1

Issued:  
2017-11-15

Valid until:  
2022-05-28

Issued for:

## Vestas V136-3.45 MW / V136-3.60 MW

Specified in Annex 1 and Annex 2

Issued to:

## Vestas Wind Systems A/S

Hedeager 42  
8200 Aarhus N  
Denmark

According to:

## IEC 61400-22:2010-05 Wind turbines – Part 22: Conformity testing and certification

Based on the documents:

DB-DNVGL-SE-0074-02943-1

Design Basis Conformity Statement, dated 2017-11-15

DE-DNVGL-SE-0074-02745-2

Design Evaluation Conformity Statement, dated 2017-11-15

TT-DNVGL-SE-0074-02944-1

Type Test Conformity Statement, dated 2017-11-15

ME-DNVGL-SE-0074-02945-1

Manufacturing Conformity Statement, dated 2017-11-15

FER-TC-DNVGL-SE-0074-02942-1

Final Evaluation Report, dated 2017-11-15

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

Hellerup, 2017-11-15

For DNV GL Renewables Certification



**Christer Eriksson**  
Service Line Leader Type Certification



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, 2017-11-15

For DNV GL Renewables Certification



**Ramakrishna Parasarampuram**  
Project Manager

The accredited certification body is Germanischer Lloyd Industrial Services GmbH, Brooktorkai 18, 20457 Hamburg.

DNV GL Renewables Certification is the trading name of DNV GL's certification business in the renewable energy industry.

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# TYPE CERTIFICATE - ANNEX 1

Certificate No.: TC-DNVGL-SE-0074-02942-1

Page 2 of 7

Basic standard	IEC 61400-1 ed. 3 + A1
<b>General</b>	
Wind Turbine class	See Annex 2
Power regulation	pitch-controlled
Rotor orientation	upwind
Rotor tilt	6°
Cone angle	4°
Rated power	3450 kW / 3600 kW
Rated wind speed $v_r$	See Annex 2
Rotor diameter	136 m
Hub height(s)	See Annex 2
Hub height operating wind speed range $v_{in} - v_{out}$	See Annex 2
Design life time	20 years
Software version	VMP Global version/build 2017.01
<b>Wind conditions</b>	
Turbulence intensity $I_{ref}$ at $v_{hub} = 15$ m/s	See Annex 2
Annual average wind speed at hub height $v_{ave}$	See Annex 2
Reference wind speed $v_{ref}$	See Annex 2
Mean flow inclination	8°
<b>Electrical network conditions</b>	
Normal supply voltage and range	3 x 650 V 10.5-36 kV $\pm$ 10 %
Normal supply frequency and range	50 or 60 Hz $\pm$ 6 % Hz
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
<b>Other environmental conditions</b>	
Standard temperature ranges	Normal: -20°C to +45°C* Extreme: -30°C to +50°C (*de-rating strategy: refer Annex 2)
Low temperature range	Normal: -30°C to +45°C * Extreme: -40°C to +50°C (*de-rating strategy: refer Annex 2)
Relative humidity of the air	100% (max 40% of time) and 90% (rest of life time)
Air density	1.225 kg/m <sup>3</sup> (for normal operation) 1.325 kg/m <sup>3</sup> (for low temperature operation)
Solar radiation	1000 W/m <sup>2</sup>
Description of lightning protection system	Designed acc. to IEC 61400-24, Protection Level 1 and IEC 61312-1

# TYPE CERTIFICATE - ANNEX 1

Certificate No.: TC-DNVGL-SE-0074-02942-1

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## Major components

<b>Blade</b>	Type Manufacturer Material  Blade length Number of blades Drawing / Data sheet / Part no.	Infused structural airfoil shell Vestas Wind Systems A/S Fibreglass reinforced epoxy, carbon fibres and Solid Metal Tip (SMT). 66.65 m 3 V136 blade: 0055-0068 Rev. 2 Aero add-ons: 0059-6671, Rev. 0 - V136 STE kit 0056-5767, Rev. 1 - V136 Vortex Generator Assembly
<b>Blade bearing</b>	Type  Manufacturer Drawing / Data sheet / Part no.	Double row four-point contact ball bearing LGN/RLX/LBC/TMB 29058368, Rev.0
<b>Pitch system</b>	Type Pitch Actuation Module Hydraulic Cylinder (160/110X922) Hydraulic Cylinder (160/110X922)	Hydraulic power unit 29059706, Rev. 3 29060554, Rev. 1 FCE002458, Rev. B
<b>Main shaft</b>	Type Material Drawing / Data sheet / Part no.	Cast hollow shaft EN GJS-500-14 29085300, Rev. 1
<b>Main bearing</b>	Type  Manufacturer Drawing / Data sheet / Part no.	Double-row spherical roller bearing SKF/FAG SKF - 240/950 CA/C3LW 33VQ113 FAG - F-582562.PRL-WPO
<b>Gearbox</b>	Type  Manufacturer Gear ratio Drawing / Data sheet / Part no.	2 Planetary stages and one helical stage ZF 125.163 EH922A
<b>Yaw system</b>	Drive type  Yaw bearing type  Yaw drive type Yaw brake type  Yaw speed	Nacelle mounted electrical driven plain bearing with external toothing Friction bearing, permanently pre-tensioned Comer type PG 1903 Electrical disc brake in yaw motors 0.45 °/s for 50 Hz 0.55 °/s for 60 Hz

# TYPE CERTIFICATE - ANNEX 1

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<b>Generator</b>	Type	VND SFIG V2 - DASG 560/6M (Three phase induction generator with squirrel cage rotor)
	Rated power	3450 kW, 3650 kW, 3800 kW
	Rated voltage	750 V
	Rated power factor (VFD) - Cos phi	0.87
	Insulation class stator	H
	Protection class (acc. to IEC 529)	IP54
	Rated speed	1470 rpm
<b>Converter</b>	Type	Full-scale converter - cube power
	Manufacturer	Vestas
	Line side voltage level	650 Vac
	Machine side voltage level	750 Vac
	Nominal apparent power	4.4 MVA
	Line side AC Frequency	50 / 60 Hz
	DC-Link voltage	1150 Vdc
<b>Transformer</b>	Type	Dry-type transformer (ECO)
	Manufacturer	SGB
	Nominal power	4000 kVA
	Nominal voltages (HV)	33 kV
	Nominal voltage (LV)	650 V
	Frequency	50 Hz
	Vector group	Dyn5
	Environmental Tests	E2
	Climatic Tests	C2
	Fire class	F1
	Type	Dry-type transformer 3-Phase GEAFOL - Transformer (ECO)
	Manufacturer	Siemens
	Nominal power	4000 kVA
	Nominal voltages (HV)	34.5 kV
	Nominal voltage (LV)	650 V
	Frequency	60 Hz
	Vector group	Dyn5
Environmental Tests	E2	
Climatic Tests	C2	
Fire class	F1	
<b>Tower</b>	Type	Tubular Steel Tower
	Hub height (HH)	See Annex 2
	Drawing / Data sheet / Part no.	See Annex 2

# TYPE CERTIFICATE - ANNEX 1

Certificate No.: TC-DNVGL-SE-0074-02942-1

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<b>Manuals</b>	O&M manual	See list of manuals 0040-6996, Rev. 14
	Transport manual	See list of manuals 0040-6996, Rev. 14
	Installation / Commissioning manual	See list of manuals 0040-6996, Rev. 14
<b>Service lift</b>	Manufacturer Type	Avanti Avanti Shark or Power Lift Sherpa-SD
<b>Crane</b>	Manufacturer Type	Star 071/95 Liftket max 800 kg

# TYPE CERTIFICATE - ANNEX 2

Certificate No.: TC-DNVGL-SE-0074-02942-1

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## Configurations covered by this Type Certificate

Variants	HH (m)	IEC WT class	Rated wind speed $V_r$	Operating Wind Speed ( $V_{in} - V_{out}$ )	Mean wind speed $V_{ave}$	Iref	Reference wind speed $V_{ref}$	Tower drawing
V136-3.45 MW <sup>1</sup>	82	S (III A) <sup>3</sup>	10.0 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0060-8092, V00
V136-3.45 MW <sup>1</sup>	82	S <sup>4</sup>	10.0 m/s	3 m/s-27.5 m/s	8.6 m/s	14%	44 m/s	0060-8092, V00
V136-3.45 MW <sup>1</sup>	82	S (III A) <sup>3</sup>	10.0 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0065-7850, V01
V136-3.60 MW <sup>2</sup>	82	S (III A) <sup>3</sup>	10.2 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0065-7850, V01
V136-3.45 MW <sup>1</sup>	82	S (II B) <sup>5</sup>	10.0 m/s	3 m/s-30 m/s	8.5 m/s	14%	42.5 m/s	0065-7850, V01
V136-3.60 MW <sup>2</sup>	82	S <sup>6</sup>	10.2 m/s	3 m/s-30 m/s	8.0 m/s	14%	42.5 m/s	0065-7850, V01
V136-3.45 MW <sup>1</sup>	105	S (III A) <sup>3</sup>	10.0 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0060-6080, V00
V136-3.60 MW <sup>2</sup>	105	S (III A) <sup>3</sup>	10.2 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0060-6080, V00
V136-3.45 MW <sup>1</sup>	105	S (IEC III B) <sup>7</sup>	10.0 m/s	3 m/s-30 m/s	7.5 m/s	14%	37.5 m/s	0067-3835, V00
V136-3.60 MW <sup>2</sup>	105	S (IEC III B) <sup>7</sup>	10.2 m/s	3 m/s-30 m/s	7.5 m/s	14%	37.5 m/s	0067-3835, V00
V136-3.45 MW <sup>1</sup>	112	S (III A) <sup>3</sup>	10.0 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0064-9758, V00
V136-3.60 MW <sup>2</sup>	112	S (III A) <sup>3</sup>	10.2 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0064-9758, V00
V136-3.45 MW <sup>1</sup>	142	S (III A) <sup>3</sup>	10.0 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0056-3963, V00
V136-3.60 MW <sup>2</sup>	142	S (III A) <sup>3</sup>	10.2 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0056-3963, V00
V136-3.45 MW <sup>1</sup>	132	S (III A) <sup>3</sup>	10.0 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0064-8000, V00
V136-3.60 MW <sup>2</sup>	132	S (III A) <sup>3</sup>	10.2 m/s	3 m/s-27.5 m/s	7.5 m/s	16%	37.5 m/s	0064-8000, V00
V136-3.45 MW <sup>1</sup>	132	S (II B) <sup>5</sup>	10.0 m/s	3 m/s-30 m/s	8.5 m/s	14%	42.5 m/s	0064-8000, V00
V136-3.60 MW <sup>2</sup>	132	S <sup>6</sup>	10.2 m/s	3 m/s-30 m/s	8.0 m/s	14%	42.5 m/s	0064-8000, V00

# TYPE CERTIFICATE - ANNEX 2

Certificate No.: TC-DNVGL-SE-0074-02942-1

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## Notes:

- 1 De-rating strategy above +30°C for V136-3.45MW
- 2 De-rating strategy above +20°C for V136-3.60MW
- 3 Wind turbine class IEC III A except for the temperature ranges
- 4 The following are the deviations from standard Wind turbine class IEC IIB:
  - Deviation in the standard and operating temperature ranges as compared to the IEC II B wind turbine class.
  - Air density (1.11 kg/m<sup>3</sup>) has been used except for following DLCs - 12LT, 12Ic, 21RPY, 21PSBB, 21GRF, 31PR, 41RP, 41RC, 51RE (1.325 kg/m<sup>3</sup>).
  - Mean wind speed  $V_{ave}$  – 8.6 m/s
  - Reference wind speed  $V_{ref}$  – 44 m/s
- 5 Wind turbine class IEC II B except for the temperature ranges
- 6 Wind turbine class IEC II B except for the temperature ranges and with reduced mean wind speed (8 m/s).
- 7 Wind turbine class IEC III B except for the temperature ranges



# Appendix I



U.S. Department  
of Transportation  
**Federal Aviation  
Administration**

# Advisory Circular

---

**Subject:** Obstruction Marking and Lighting

**Date:** 10/8/2016

**AC No.** 70/7460-1L

**Initiated By:** AJV-15

**Change:** 1

1. **Purpose.** This Advisory Circular (AC) sets forth standards for marking and lighting obstructions that have been deemed to be a hazard to air navigation. The change number and date of the change material are located at the top of the page.
2. **Effective Date.** This change is effective October 8, 2016.
3. **Explanation of Changes.**
  - a. Page 2-2. Paragraph 2.4.3 Note 2 stated NOTAMS were automatically deleted from the system after 15 days and the sponsor was responsible for calling outage reporting to extend the outage date or to report a return to service date. This paragraph has been deleted. Tower owners now have the option to select the amount of time their NOTAMS remain active.
  - b. Page A-1. Appendix A, Specifications for Obstruction Lighting Equipment Classification, Table A-1 FAA-Approved Obstruction Lighting Fixtures indicated:

L-885 – *Low Intensity Flashing* – RED  
It has been changed to L-885 Flashing Obstruction Light (60 FPM) – RED
  - c. Entire publication. Additional editorial/format changes were made where necessary. Revision bars were not used because of the insignificant nature of these changes.

A handwritten signature in black ink, appearing to read 'Gary A. Norek'.

Gary A. Norek  
Director, Airspace Services



U.S. Department  
of Transportation  
**Federal Aviation  
Administration**

# Advisory Circular

---

**Subject:** Obstruction Marking and Lighting

**Date:** 10/07/2016

**AC No.** 70/7460-1L

**Initiated By:** AJV-15

**Change:** 1

4. **Purpose.**

This Advisory Circular (AC) sets forth standards for marking and lighting obstructions that have been deemed to be a hazard to navigable airspace. Advisory Circular 70/7460-1L is effective immediately.

5. **Cancellation.**

Advisory Circular 70/7460-1K, Obstruction Lighting and Marking, dated February 1, 2007, is cancelled.

6. **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.

7. **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.

8. **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.

9. **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

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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 <https://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 <https://www.fcc.gov.edgekey.net/licensing-databases/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:** When the primary lamp in a double obstruction light fails, and the secondary lamp comes on, no report is required.

## 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**

<b>If a structure is:</b>		<b>Then Band Width:</b>
<b>Greater Than</b>	<b>Equal to or Less Than</b>	<b>Band Width</b>
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)	1/11 of 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/](http://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 Office of Navigation Systems, United States (U.S.) Coast Guard before installing the lighting system. The contact information for the U.S. Coast Guard is:

Commandant (CG-NAV-1)  
U.S. Coast Guard  
2703 Martin Luther King Jr. Ave SE STOP 7418  
Washington, DC 20593-7418  
202-372-1546

## 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) ( $\pm 3$  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**

<b>Height of Light Unit Above Terrain</b>	<b>Degrees of Elevation Above the Horizontal</b>
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 subparagraph 10.4.4 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 7<sup>th</sup> Street NW  
Room 6109  
Washington, DC 20407  
Telephone: (202) 619-8925

URL: <https://gsafas.secure.force.com>

### 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/](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**

<b>Color</b>	<b>RAL Number</b>
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  $\pm 1/20$  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 ( $\pm 3$  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.






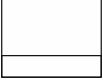
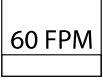
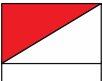

14.3.4 The audible message should consist of three quick tones, followed by a verbal message that describes the type of obstruction the system is protecting. Appropriate terms to be used include tower(s), wind turbine(s), or power line(s).

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.

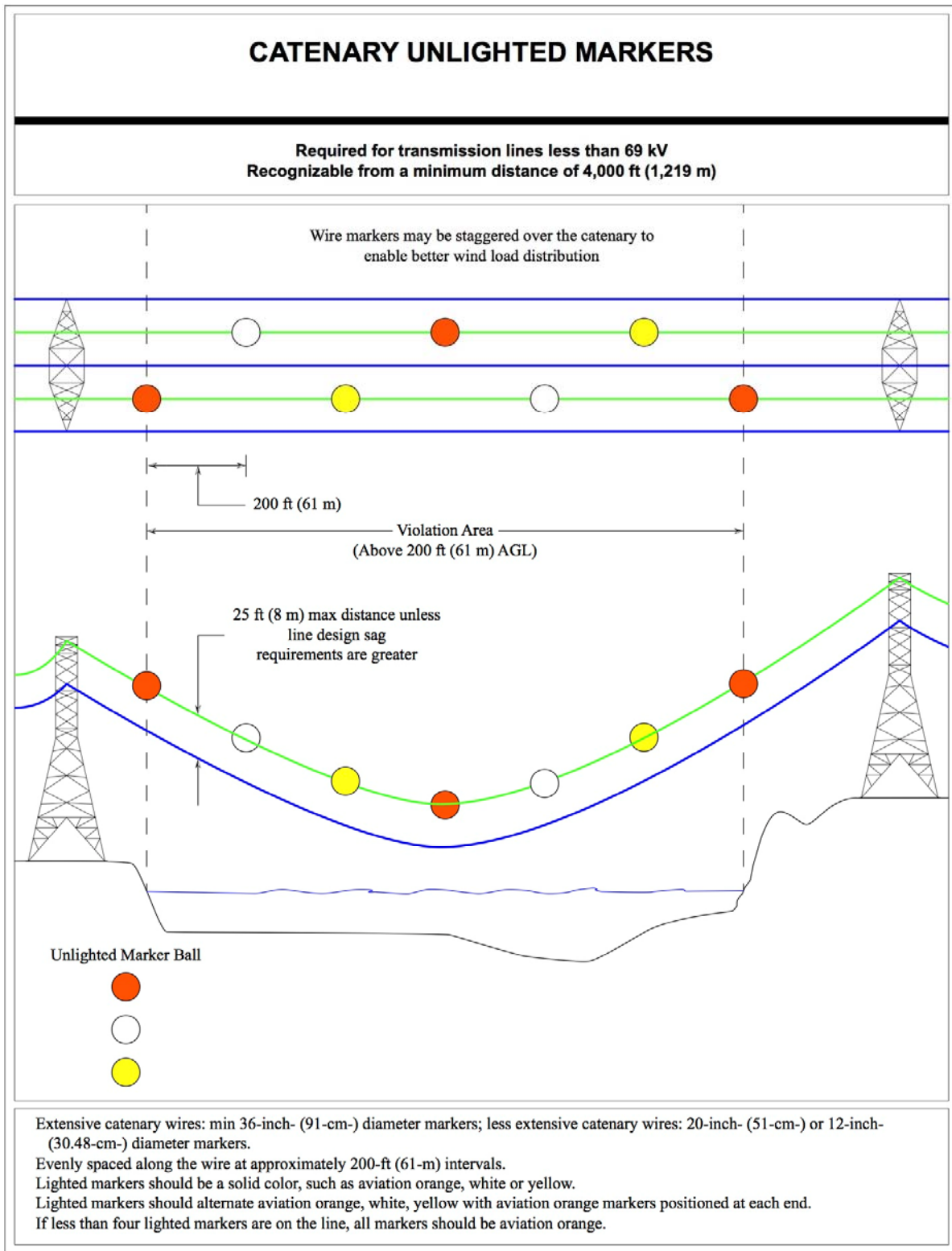
14.3.6 The audible message should be considered as a secondary, final warning and should be activated when an aircraft is within 1/2 NM (926 m) horizontally and 500 feet (152 m) vertically of the obstruction. The use of, or variation to, the audible warning zone may occur, depending on site-specific conditions or obstruction types.

**APPENDIX A: Specifications for Obstruction Lighting Equipment Classification**

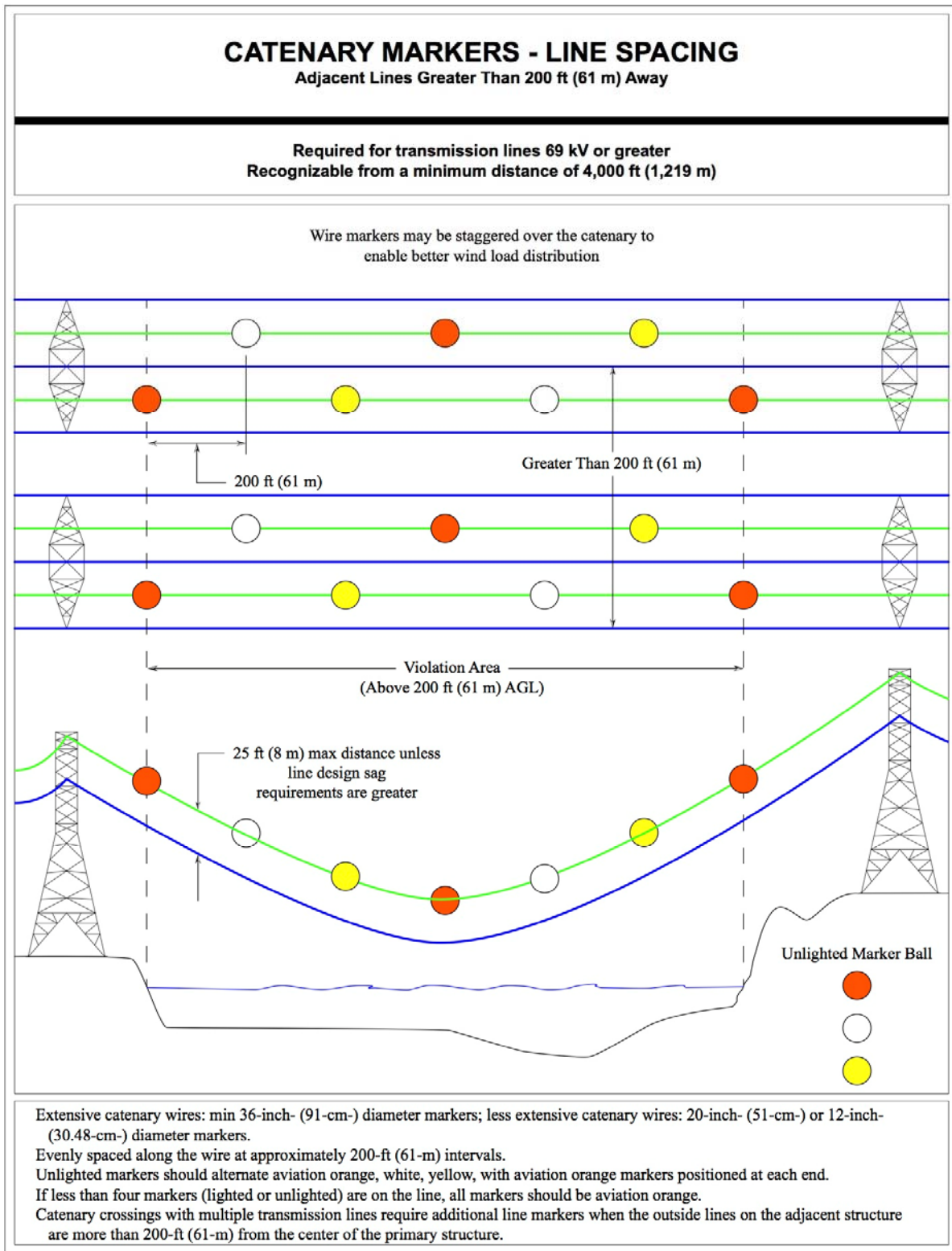
**Table A-1. FAA-Approved Obstruction Lighting Fixtures**

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		Flashing Obstruction Light - RED Obstruction Light (60 FPM)

FPM = Flashes Per Minute

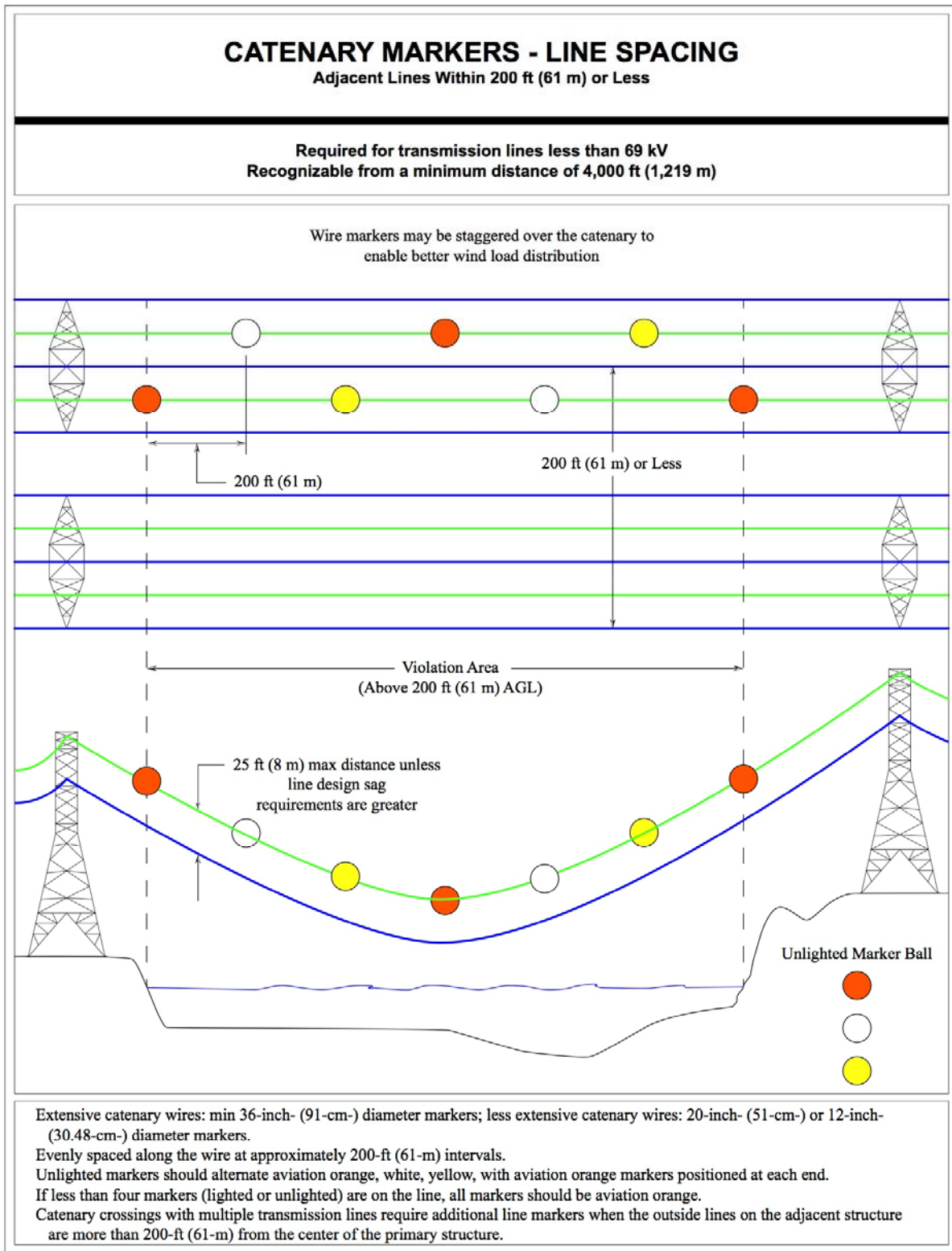


**Figure A-1. Catenary Unlighted Markers**

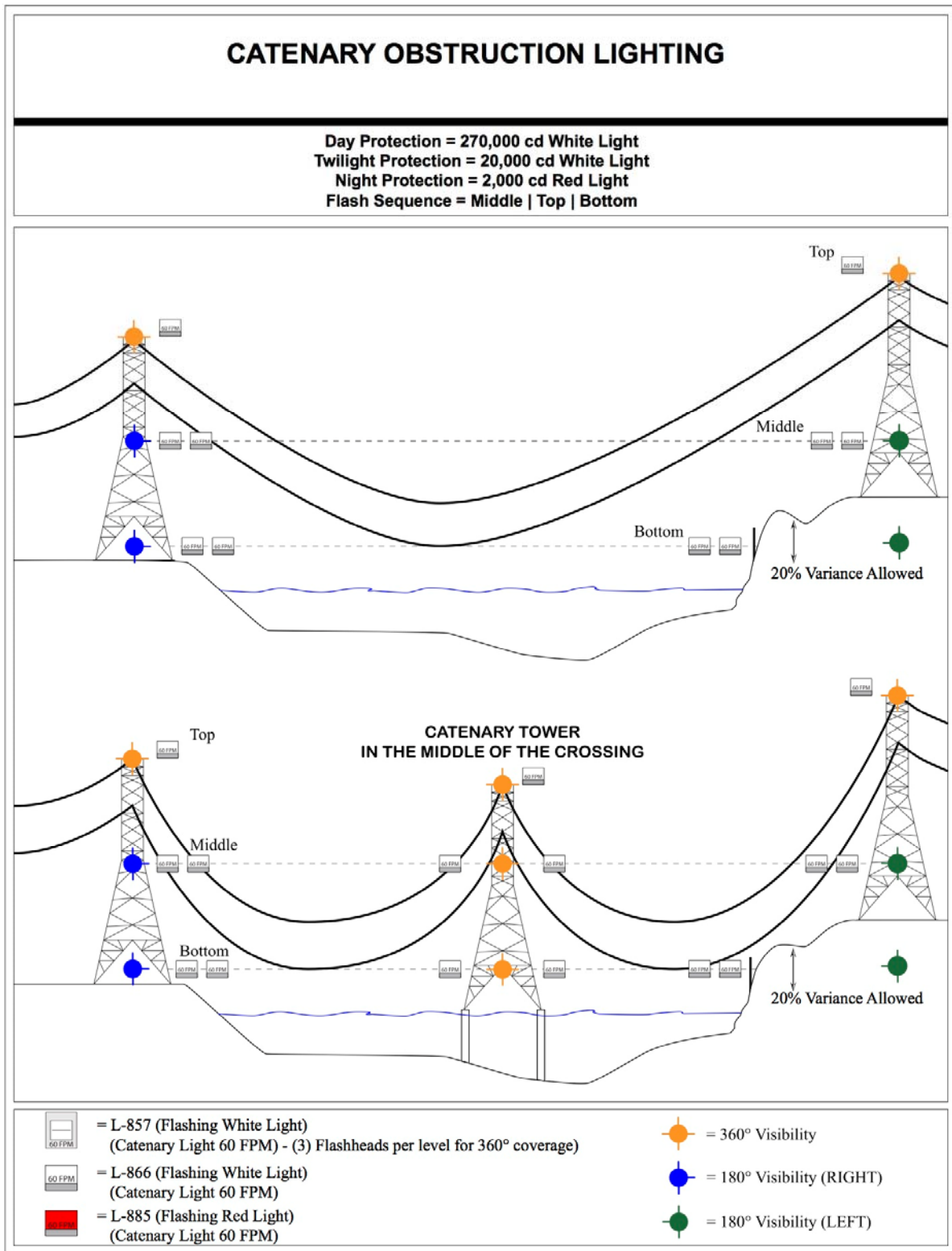


**Figure A-2. Catenary Markers - Line Spacing (Adjacent Lines Greater Than 200 ft (61 m) Away)**

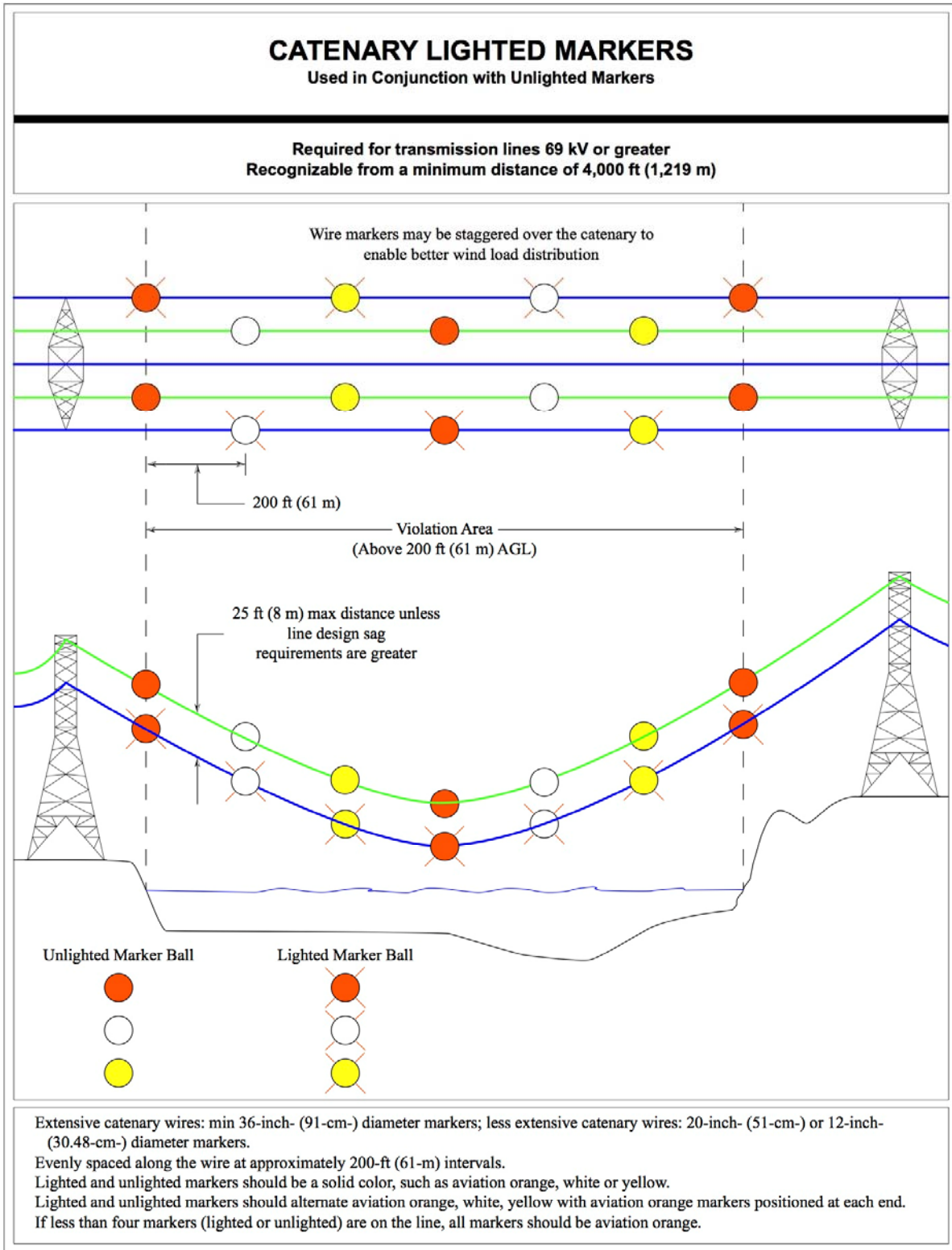




**Figure A-3. Catenary Markers – Line Spacing (Adjacent Lines Within 200 ft (61 m) or Less**



**Figure A-4. Catenary Obstruction Lighting**



**Figure A-5. Catenary Lighted Markers**

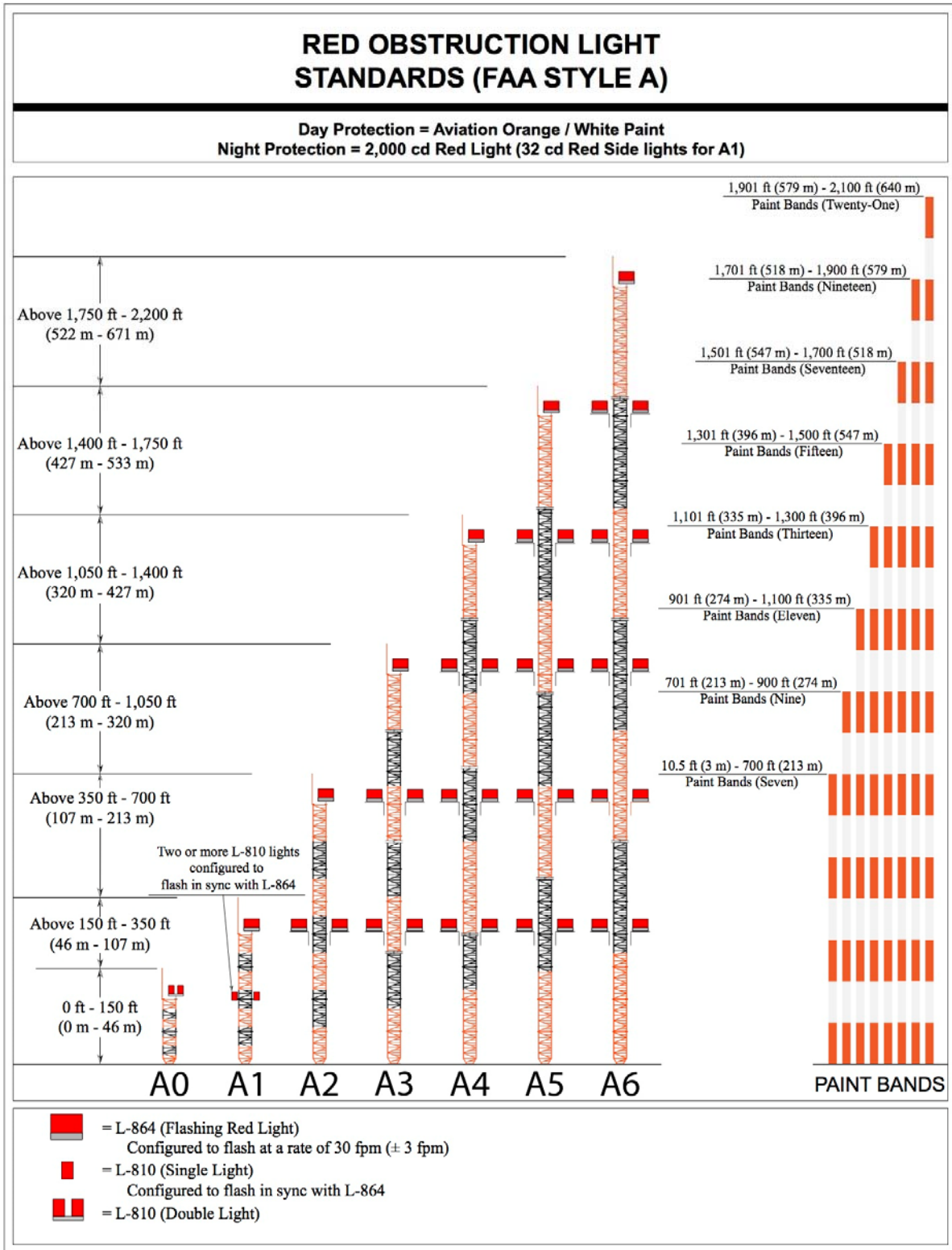
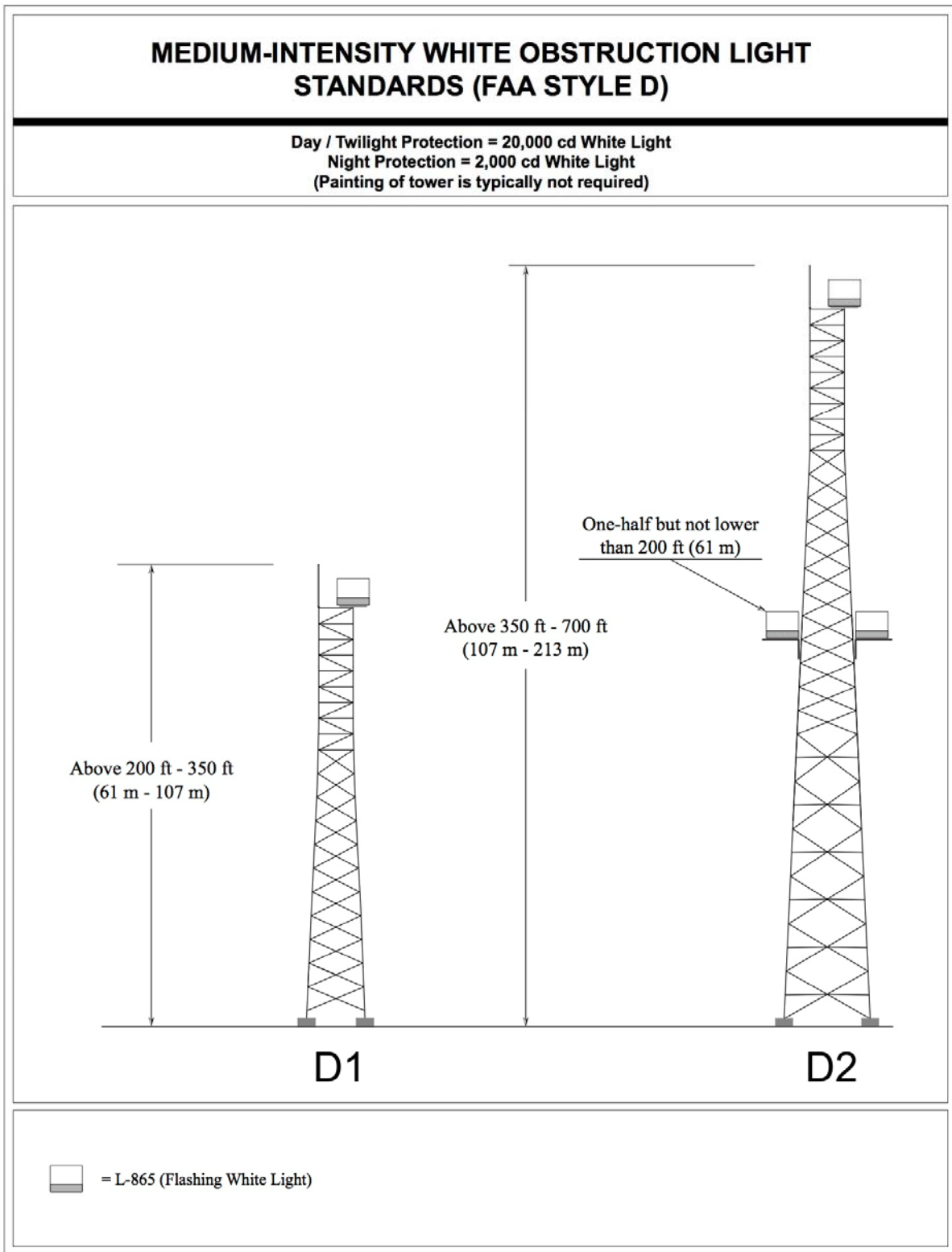
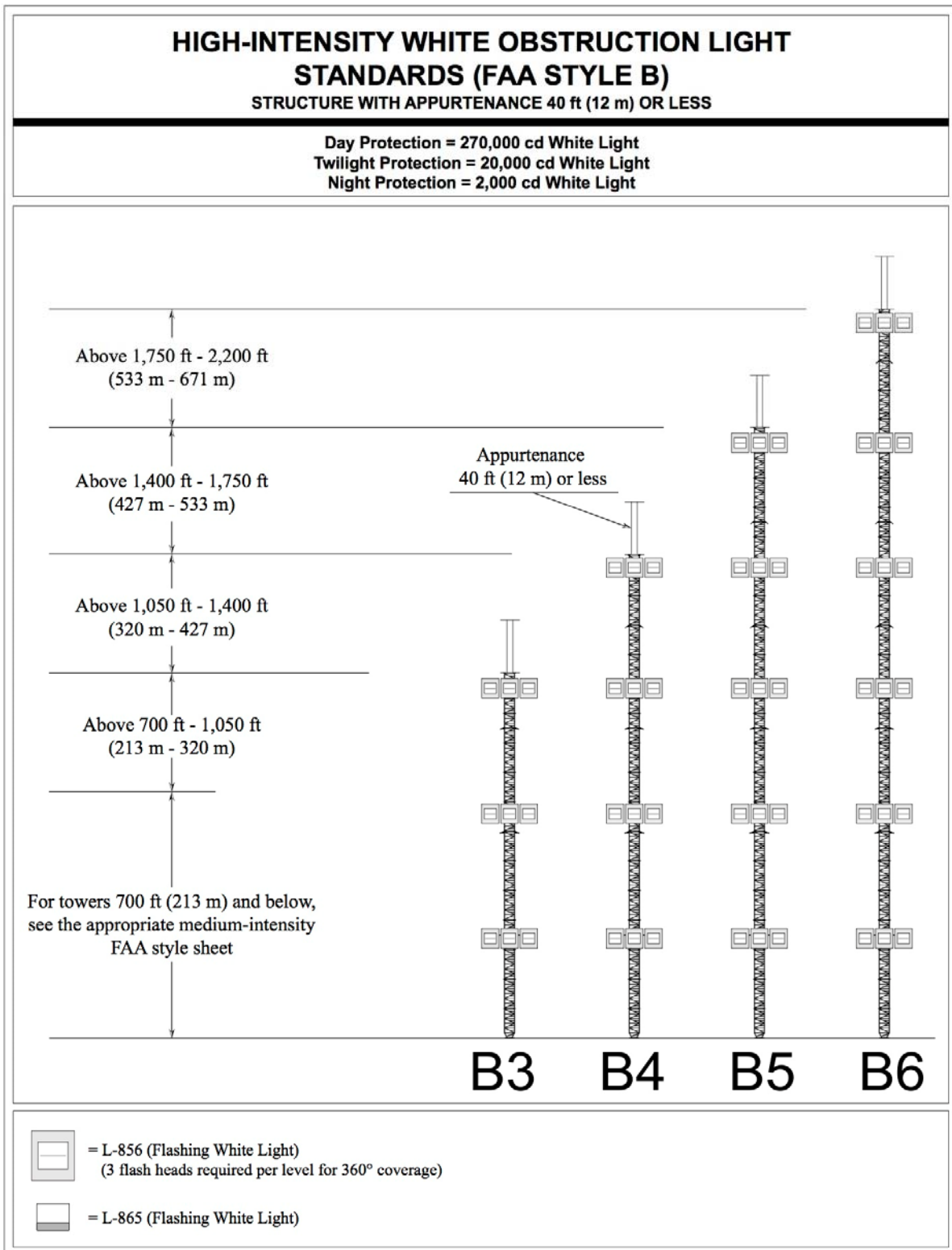


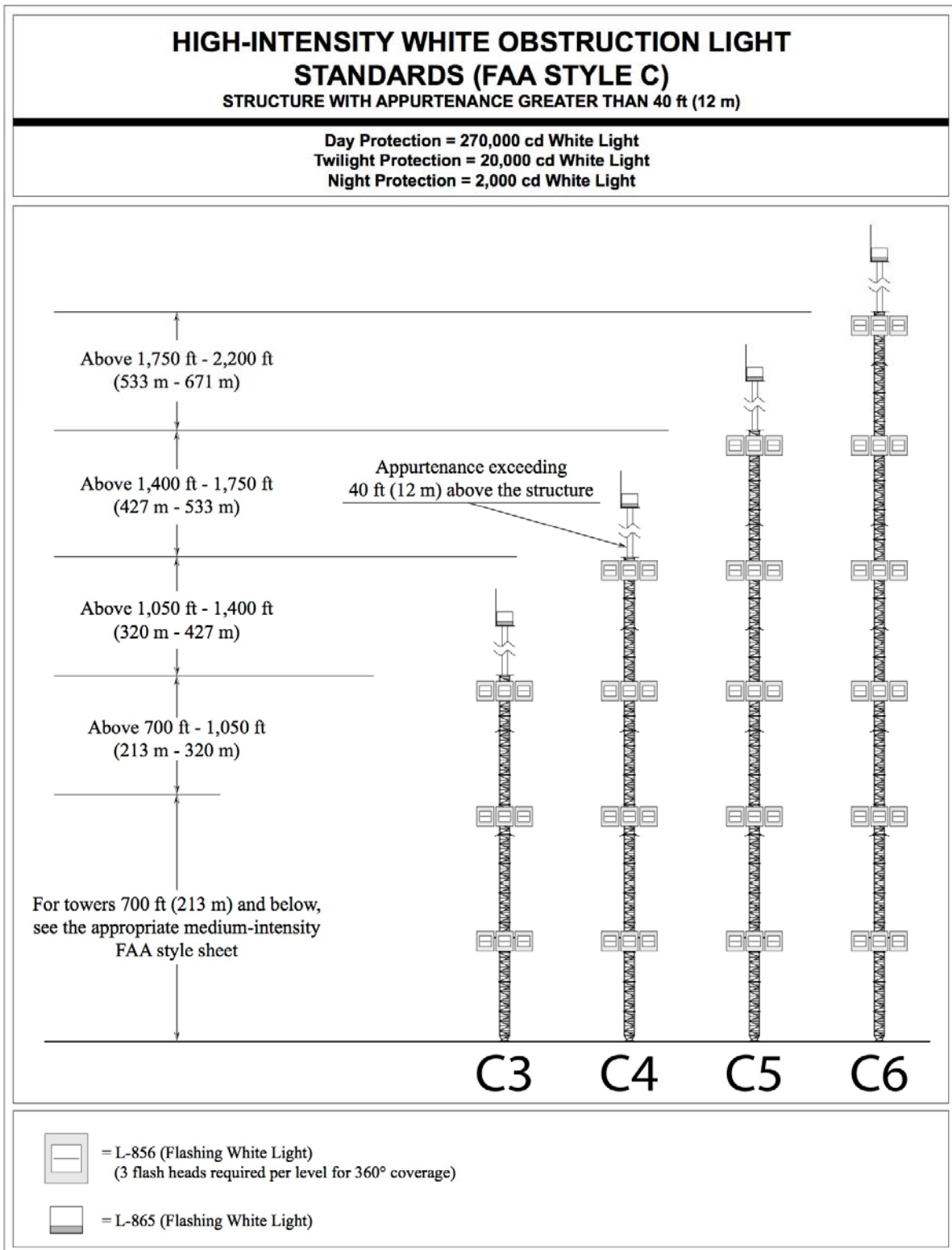
Figure A-6. Red Obstruction Light Standards



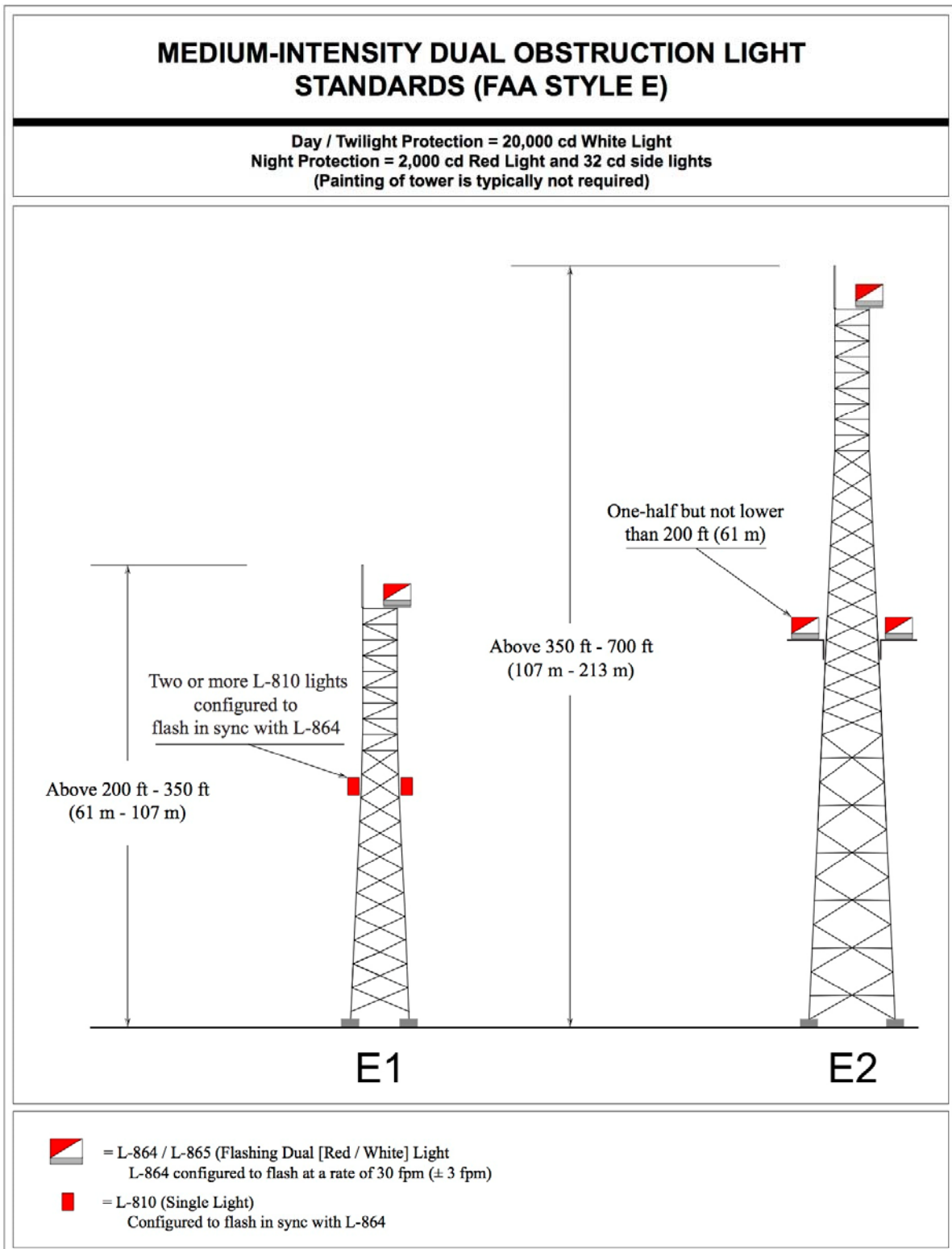
**Figure A-7. Medium-Intensity White Obstruction Light Standards**



**Figure A-8. High-Intensity White Obstruction Light Standards—Structures With Appurtenance 40 Feet or Less**

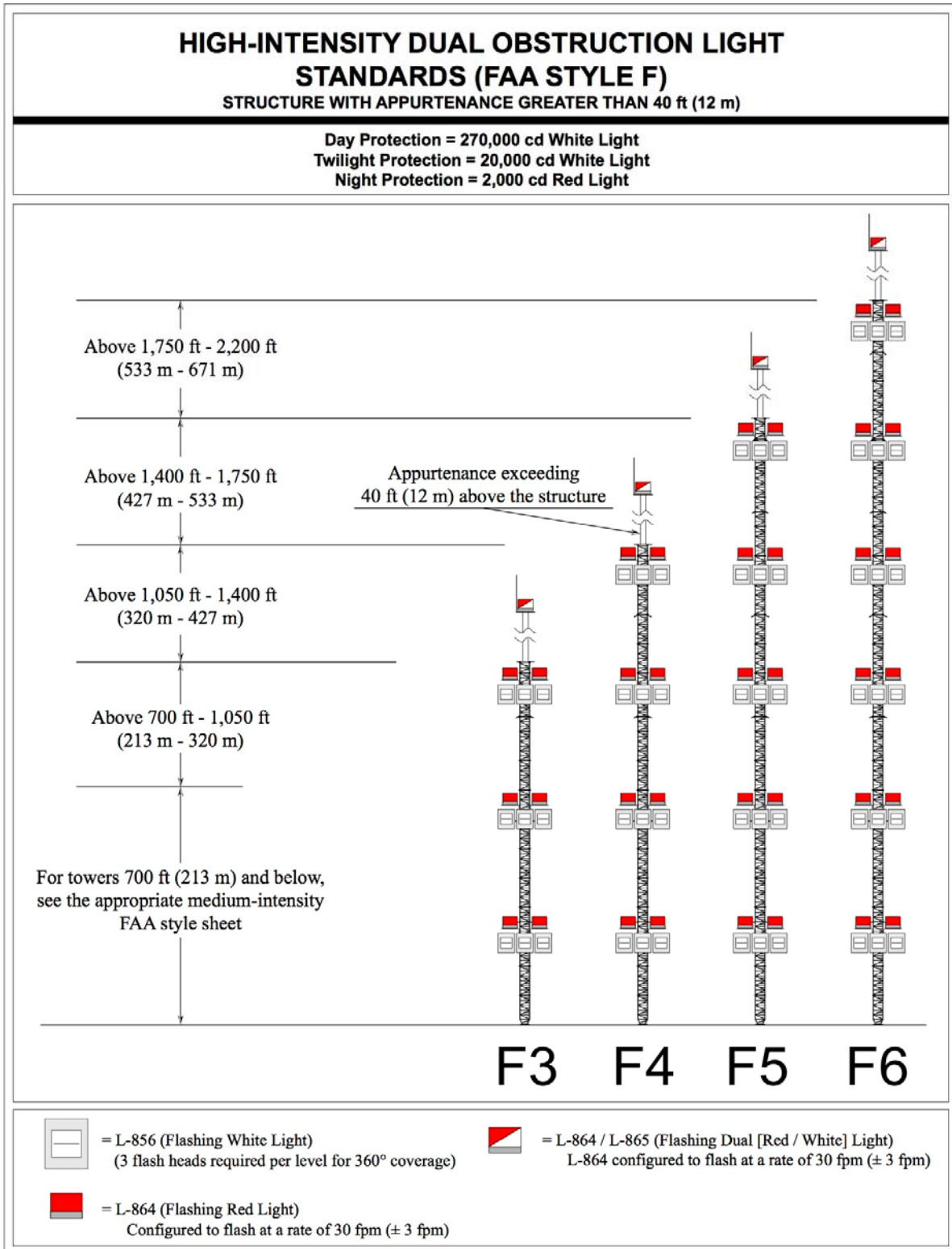


**Figure A-9. High-Intensity Obstruction Lighting Standards—Structures With Appurtenance Over 40 Feet High**

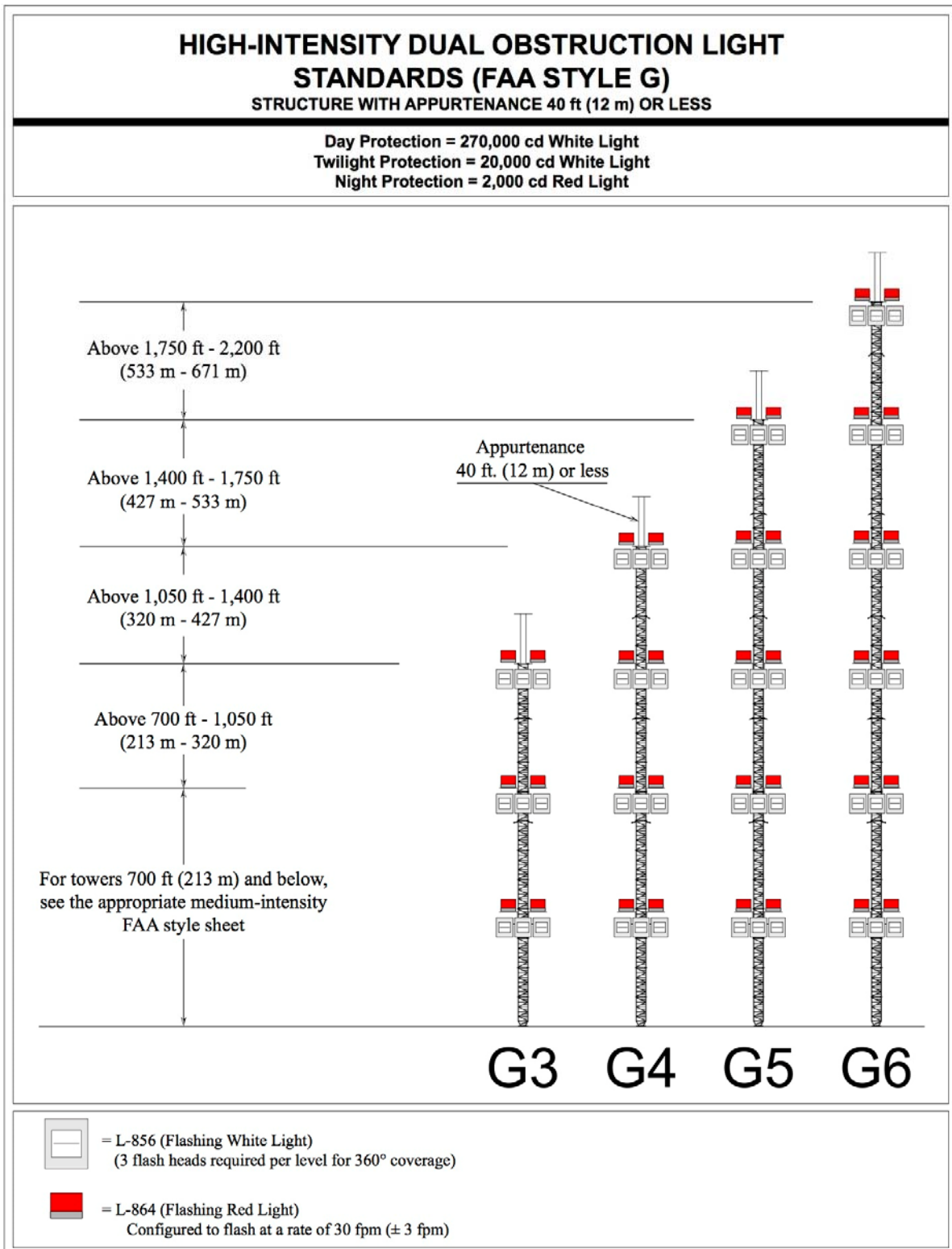


**Figure A-10. Medium-Intensity Dual Obstruction Lighting Standards**

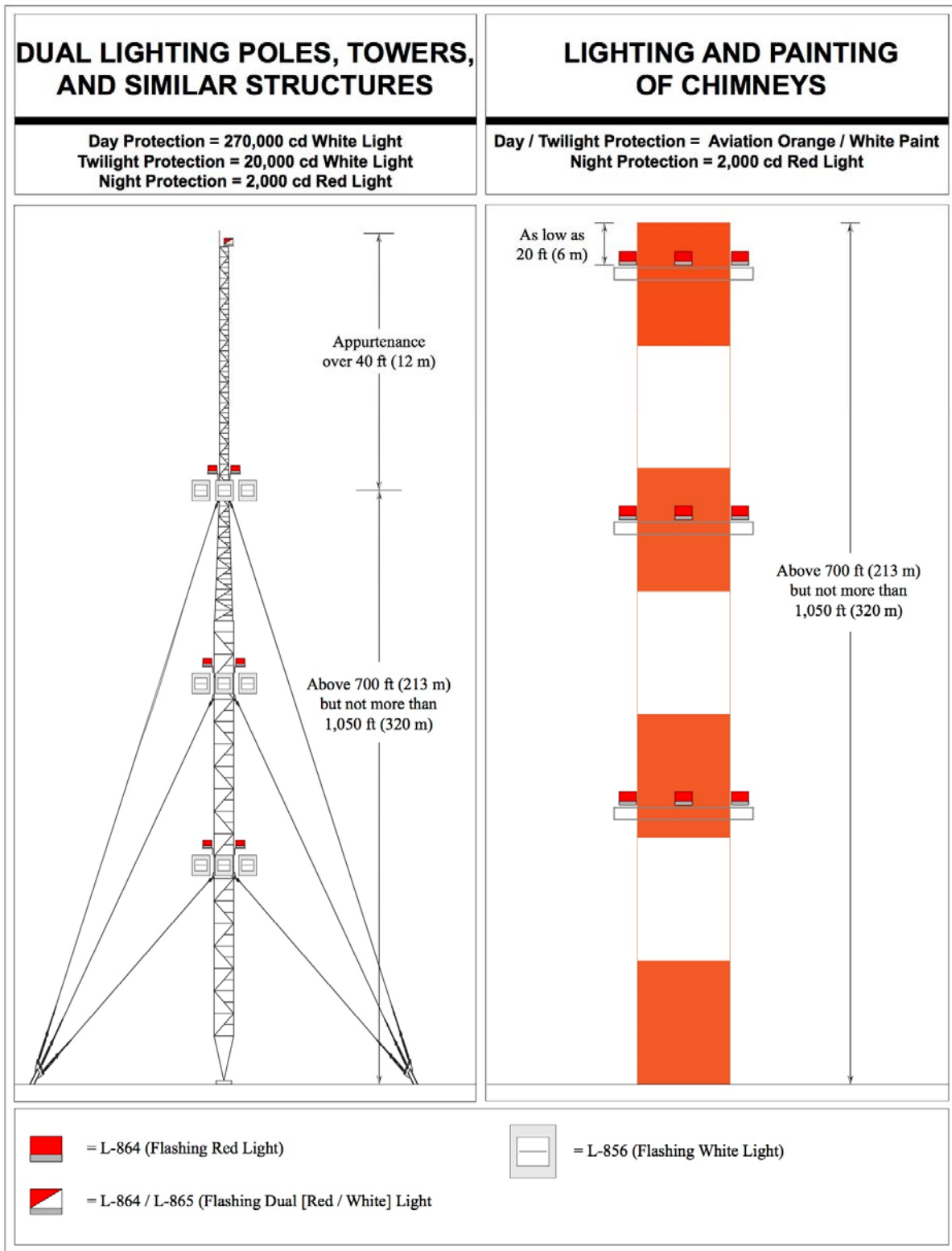




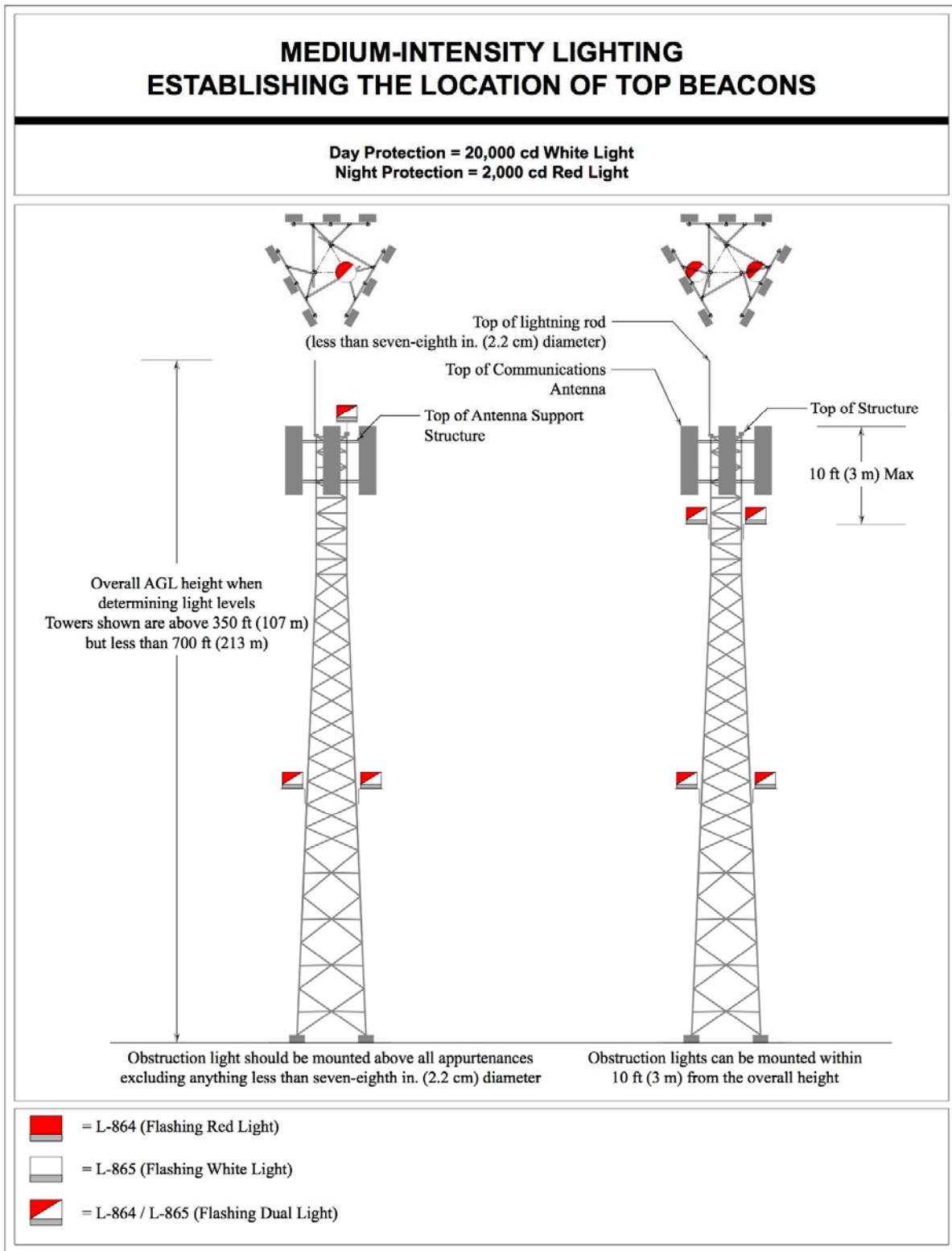
**Figure A-11. High-Intensity Dual Obstruction Lighting Standards—Structures With Appurtenance Over 40 Feet High**



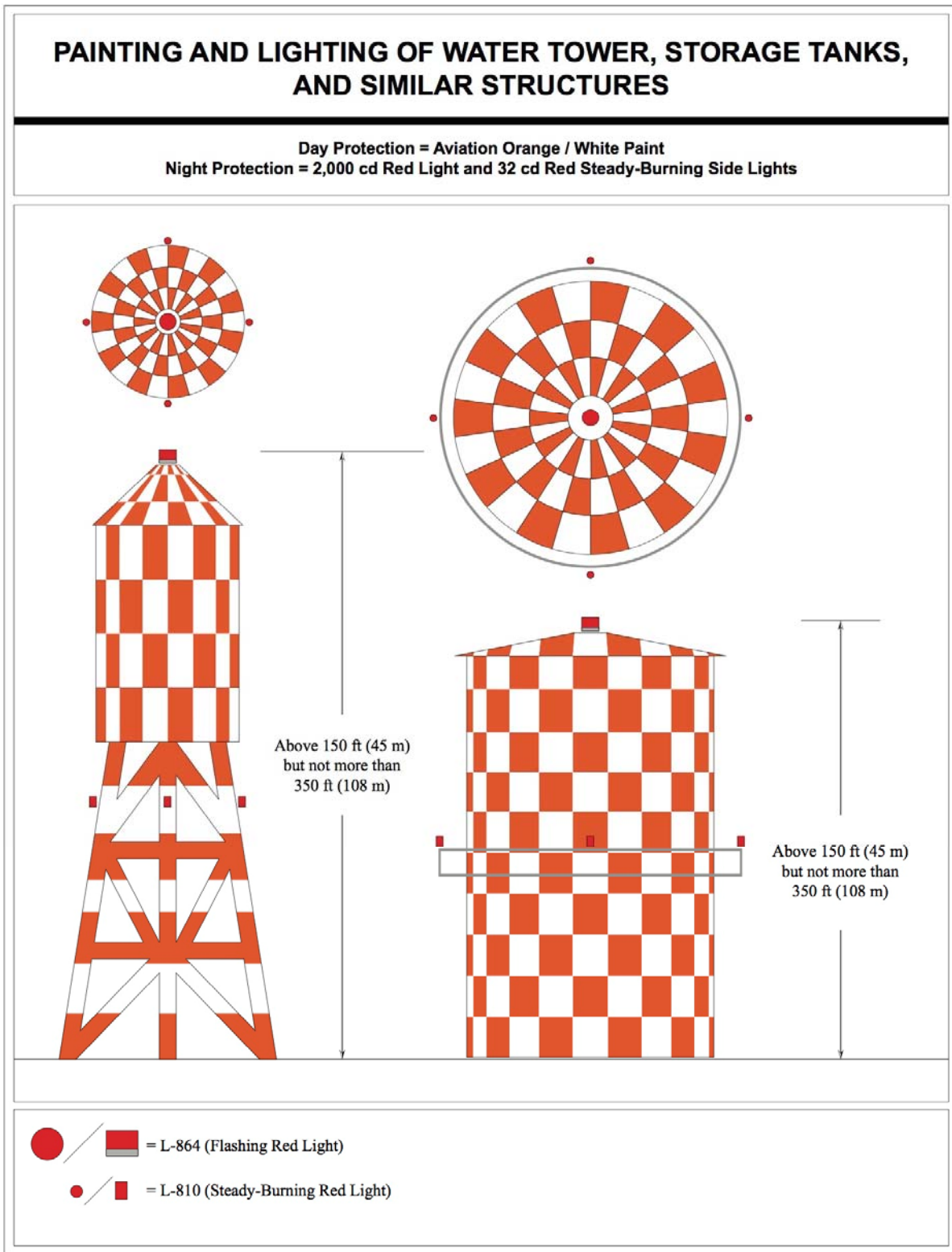
**Figure A-12. High-Intensity Dual Obstruction Lighting Standards—Structures With Appurtenance 40 Feet or Less**



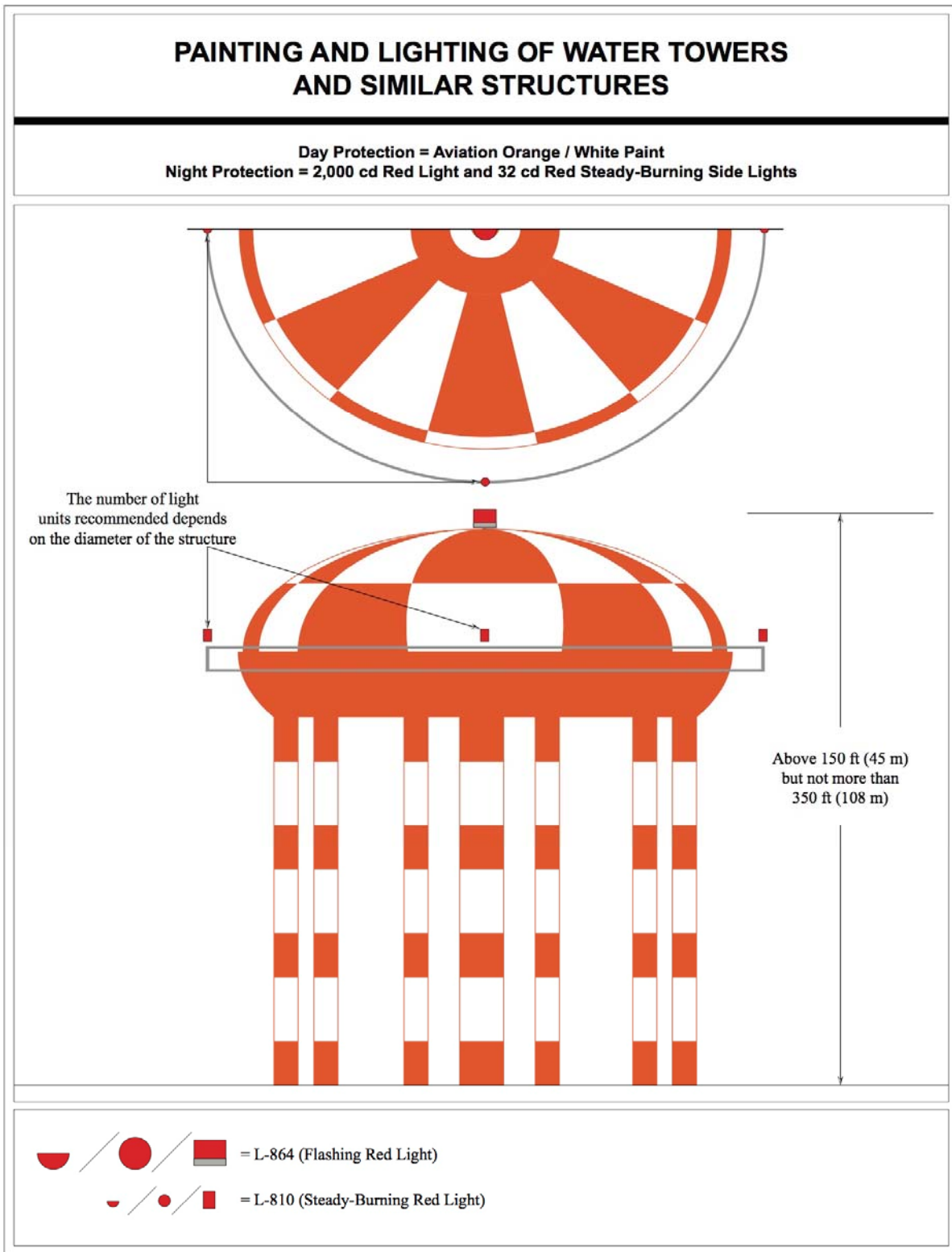
**Figure A-13. Painting and/or Dual Lighting of Chimneys, Poles, Towers, and Similar Structures**



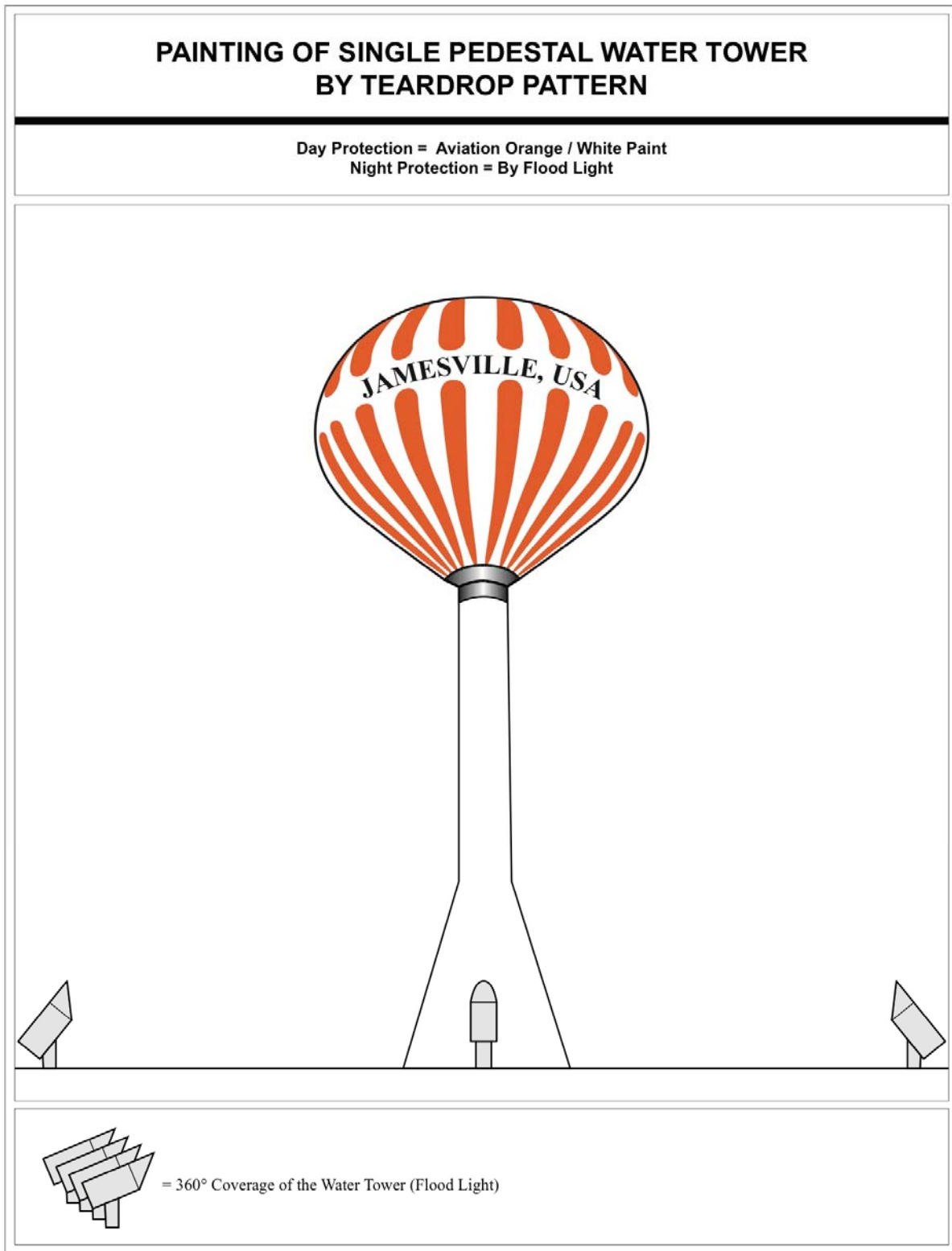
**Figure A-14. Medium-Intensity Lighting—Establishing the Location of Top Beacons**



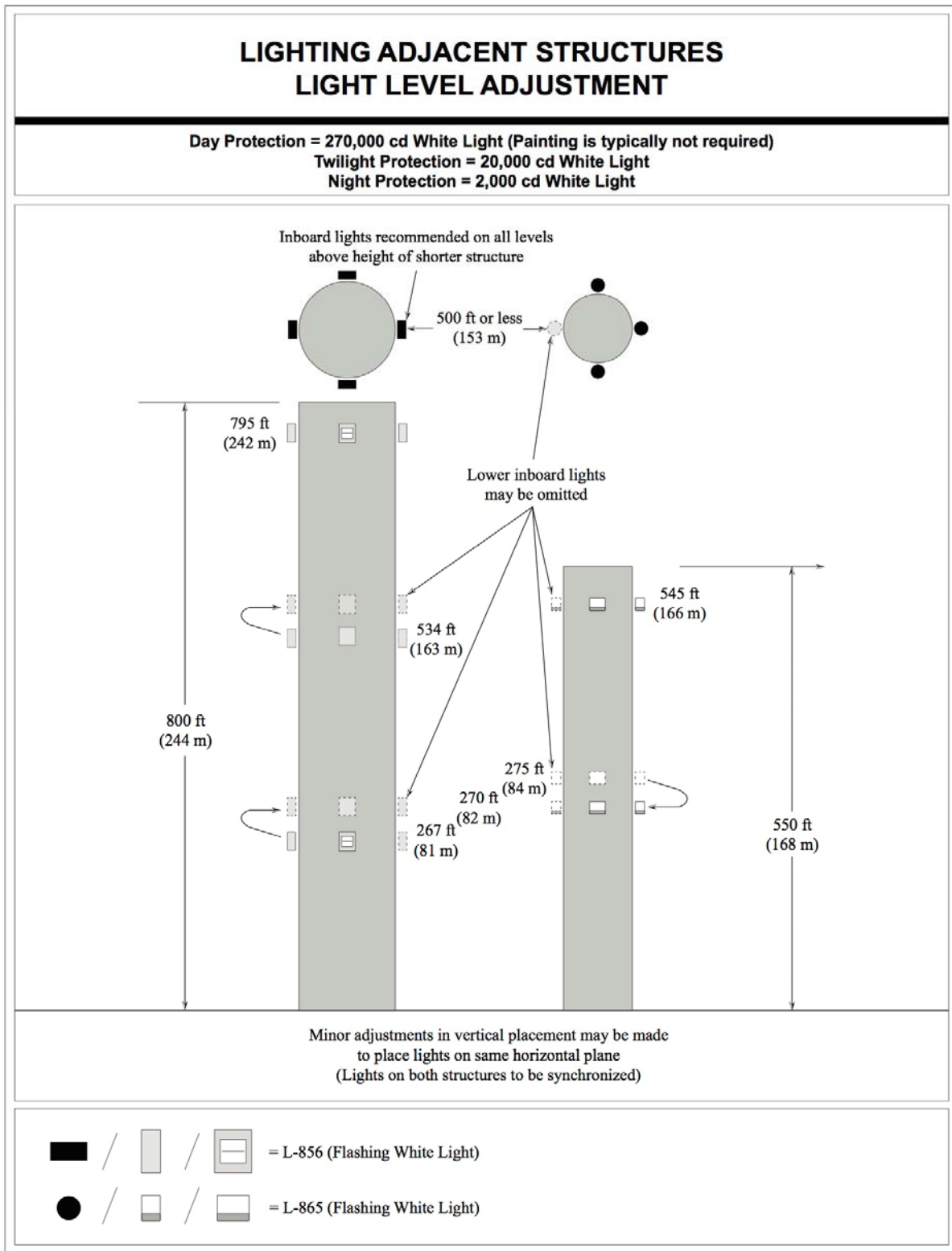
**Figure A-15. Painting and Lighting of Water Towers, Storage Tanks, and Similar Structures**



**Figure A-16. Painting and Lighting of Water Towers and Similar Structures**

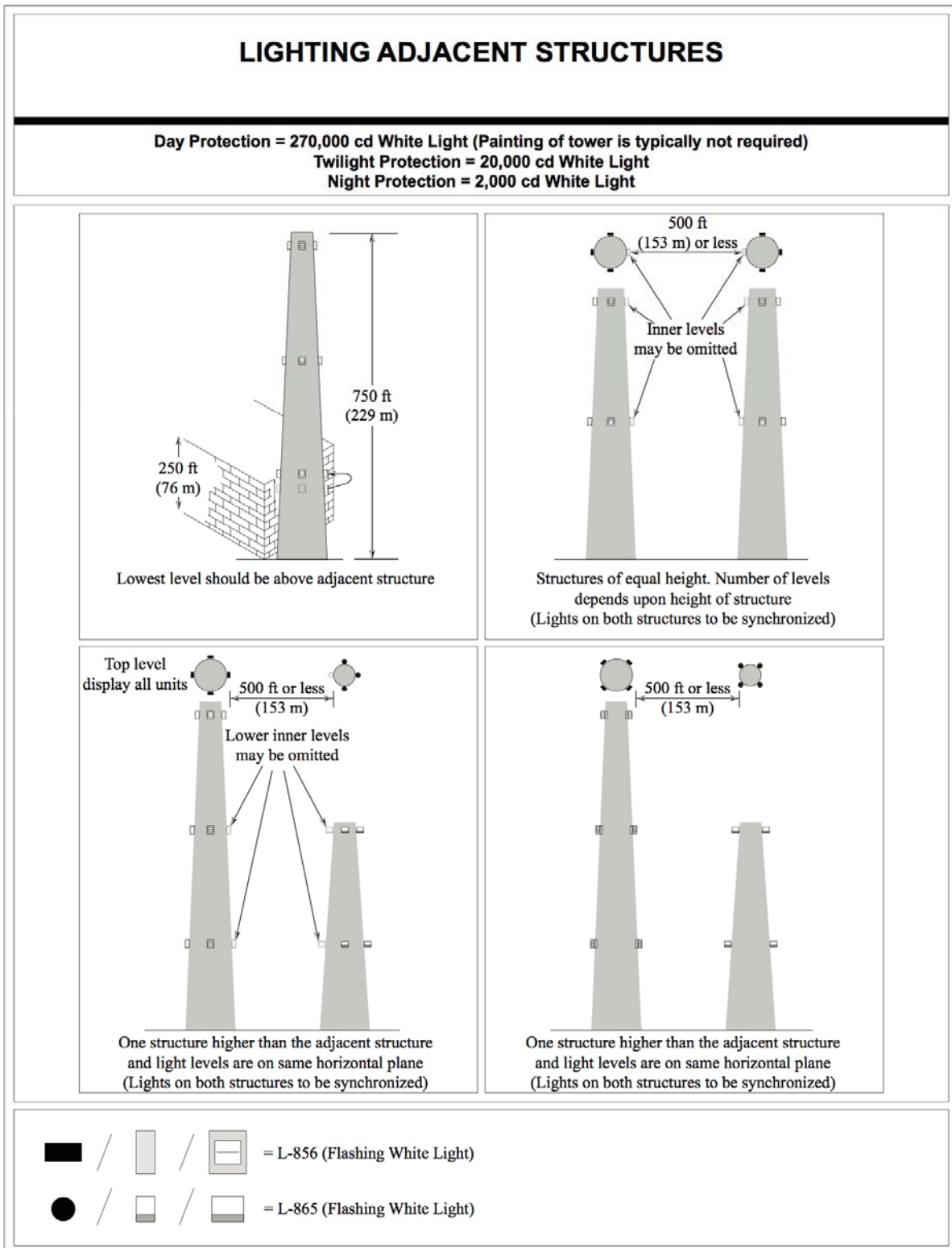


**Figure A-17. Painting a Single Pedestal Water Tower Using the Teardrop Pattern**

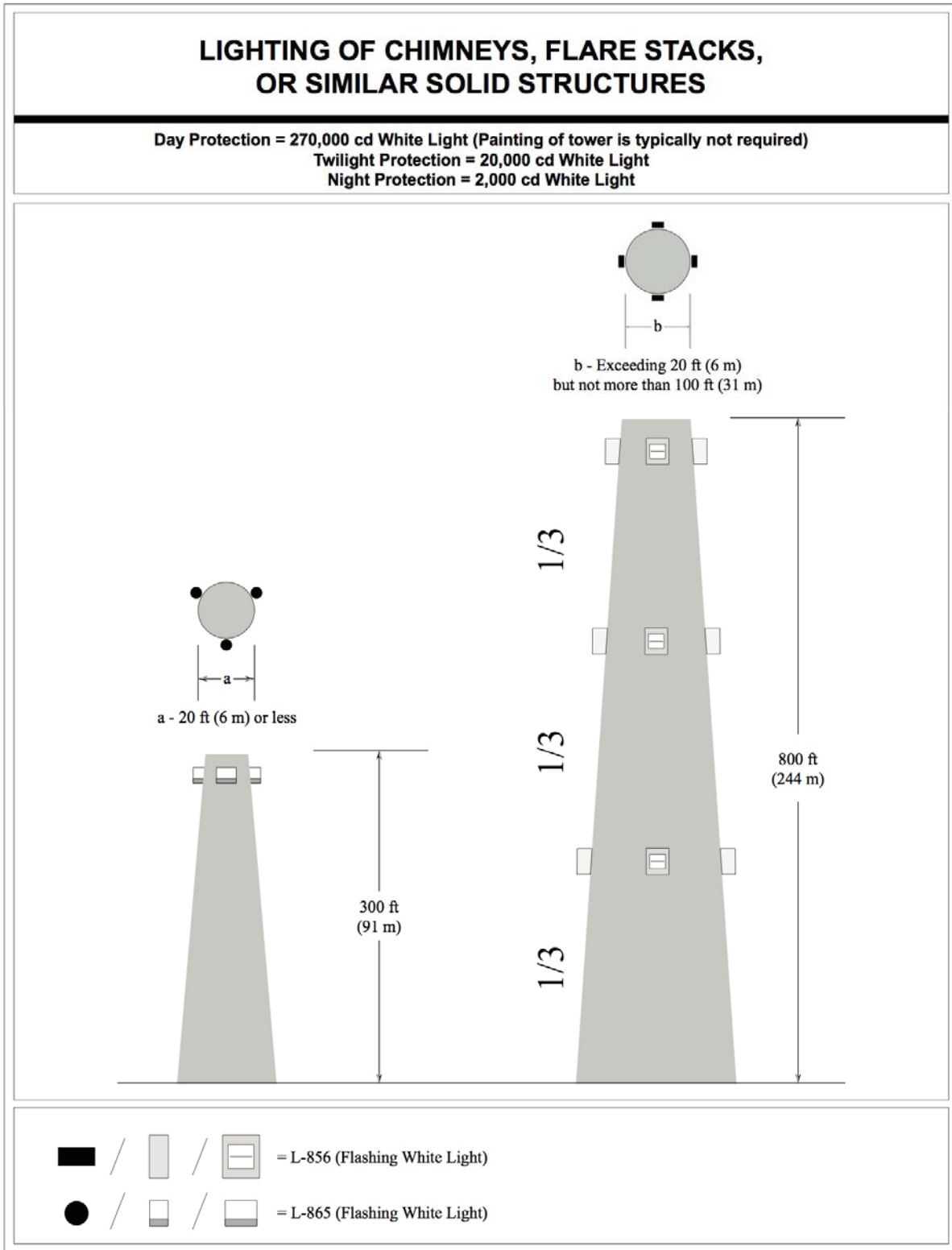


**Figure A-18. Lighting Adjacent Structures—Light Level Adjustment**

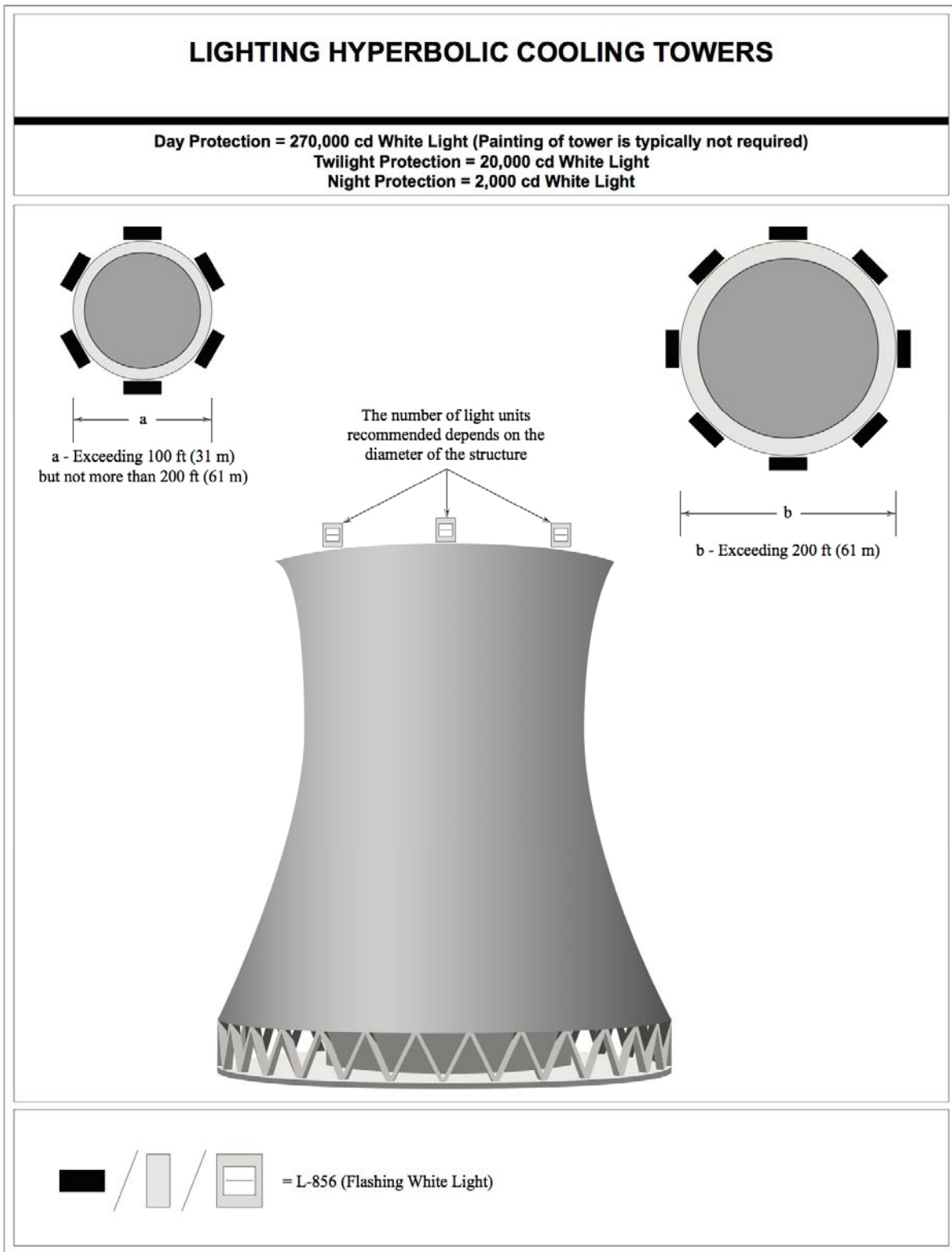




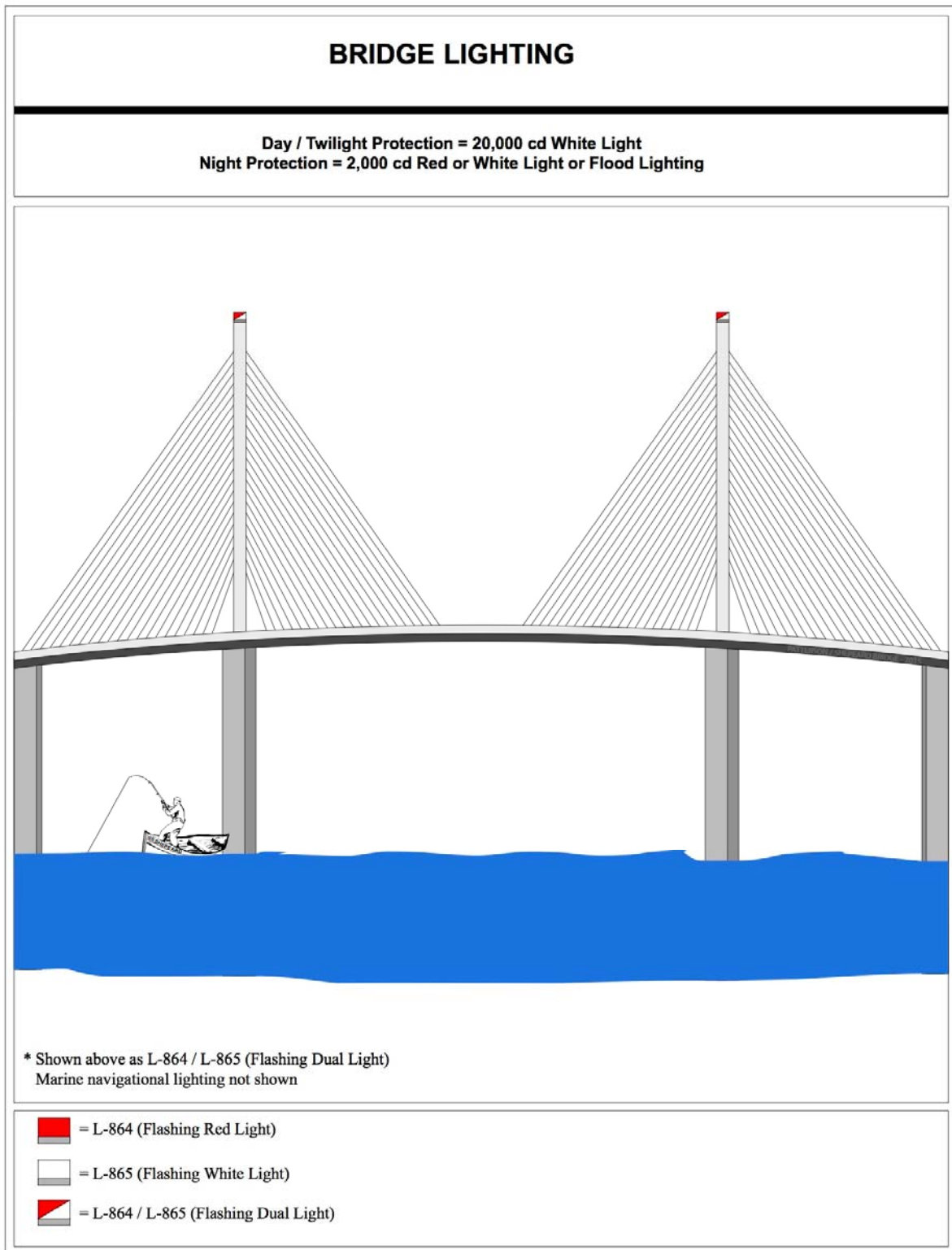
**Figure A-19. Lighting Adjacent Structures**



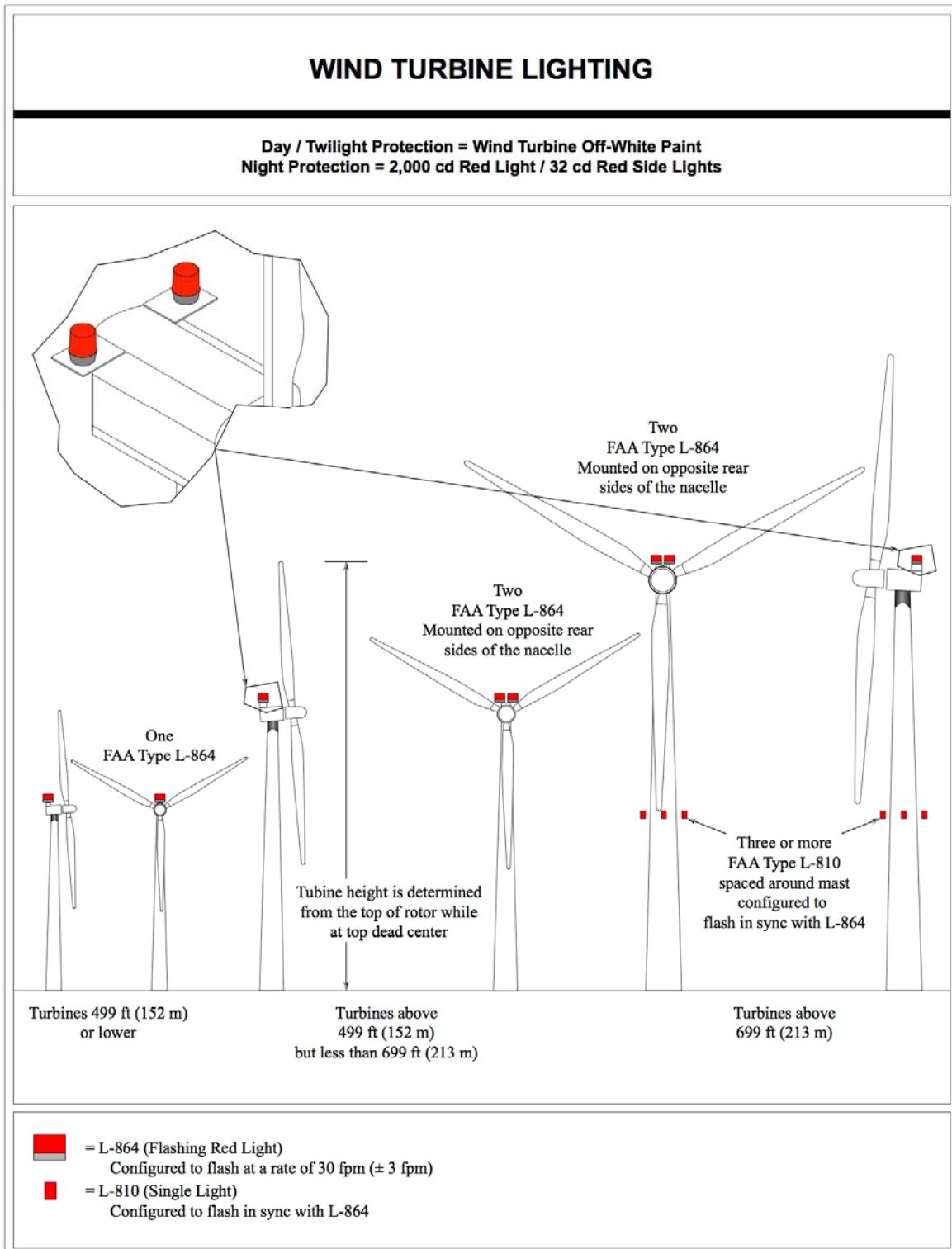
**Figure A-20. Lighting of Chimneys, Flare Stacks, or Similar Solid Structures**



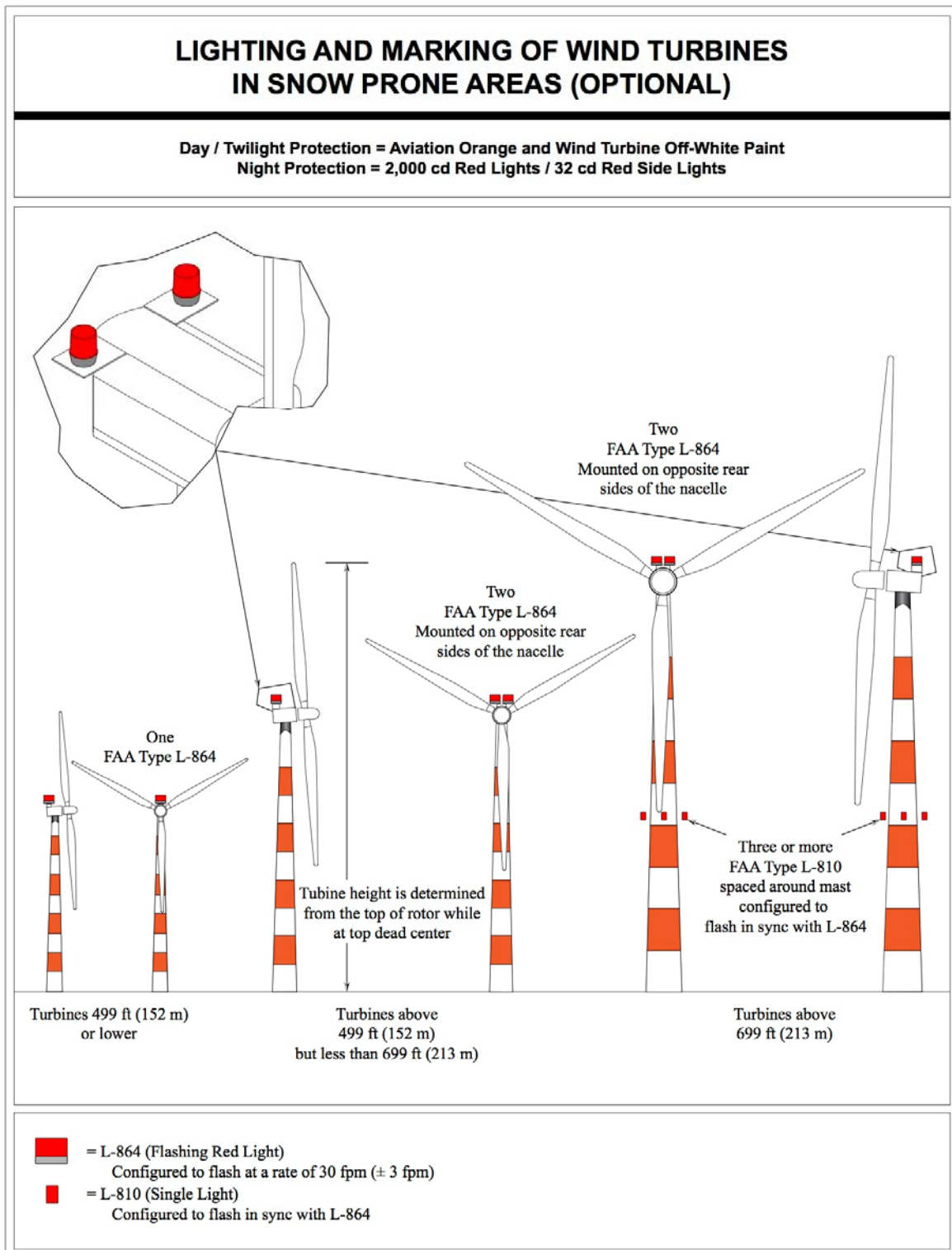
**Figure A-21. Hyperbolic Cooling Tower**



**Figure A-22. Bridge Lighting**



**Figure A-23. Wind Turbine Lighting**



**Figure A-24. Wind Turbine Lighting and Marking in Snow Prone Areas (Optional)**

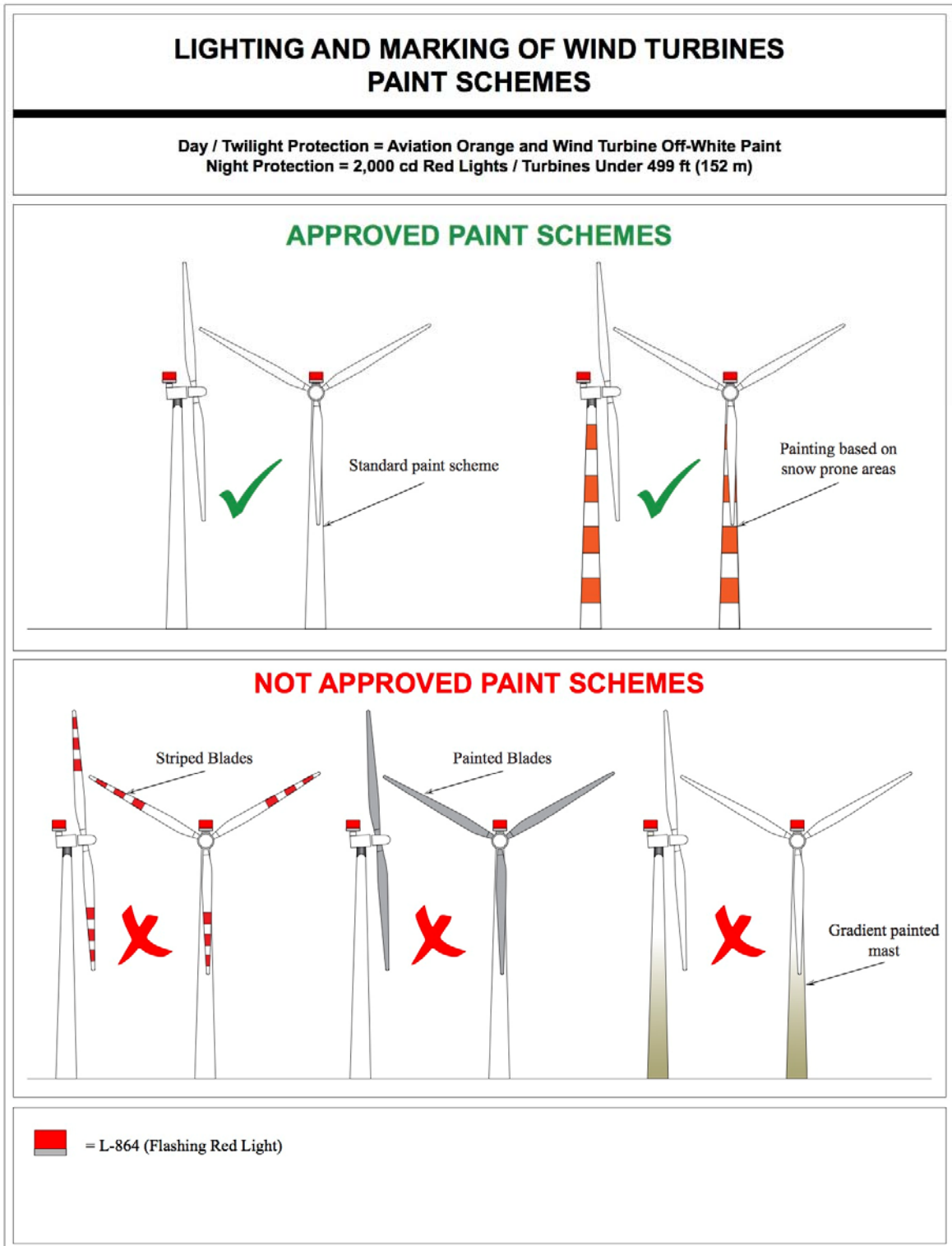
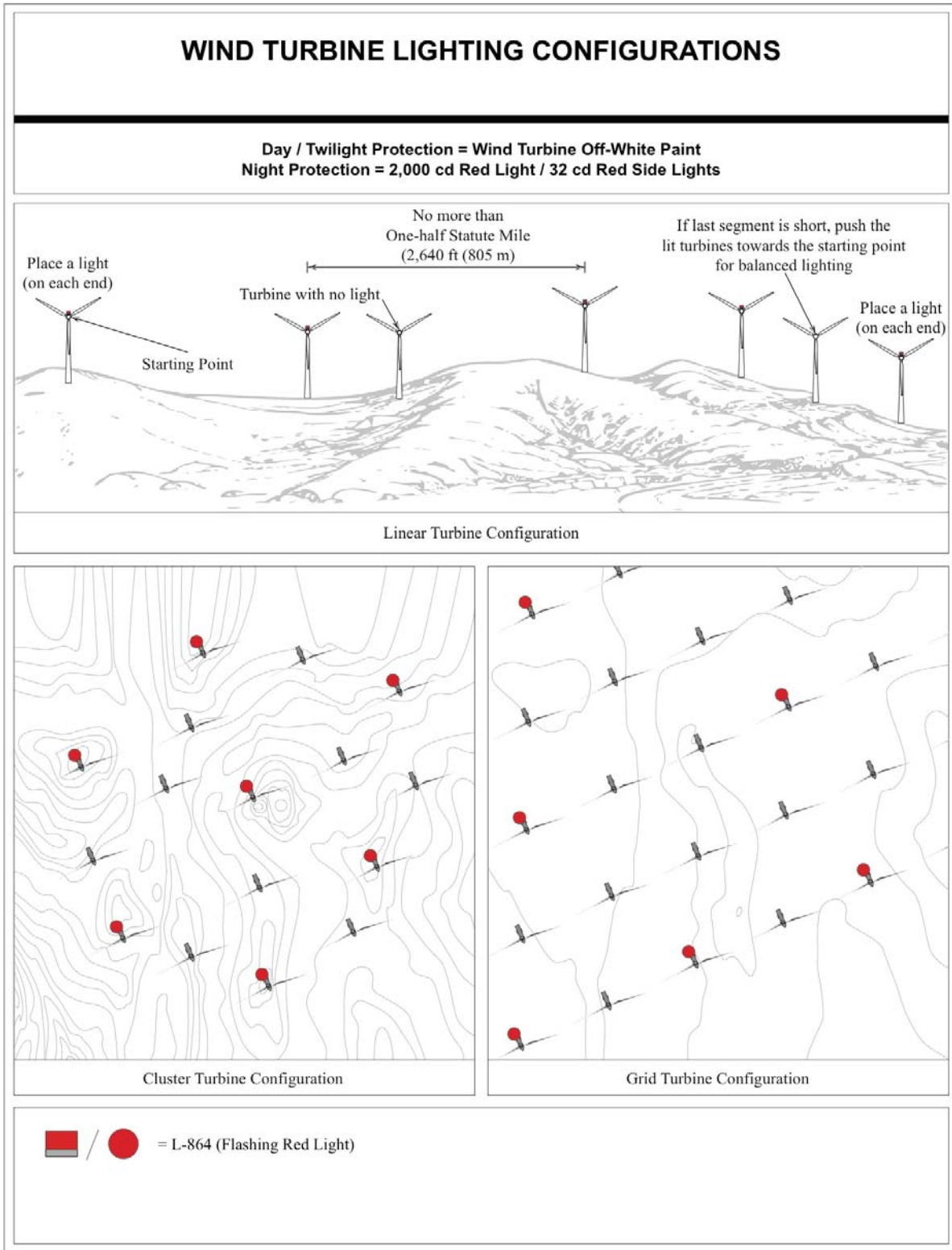


Figure A-25. Lighting and Marking of Wind Turbines – Paint Schemes

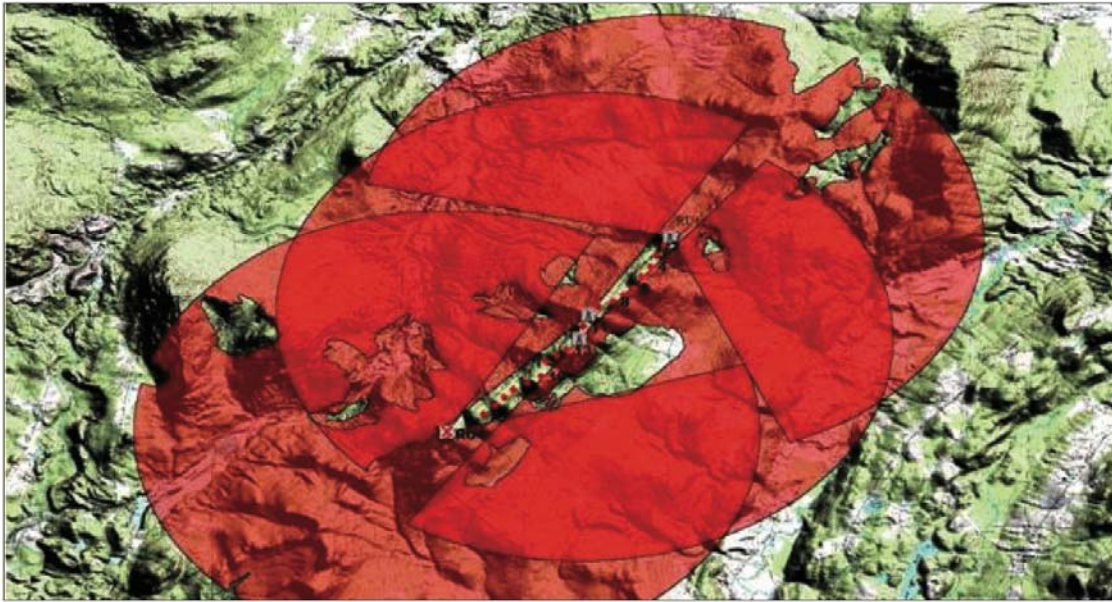


**Figure A-26. Wind Turbine Lighting Configurations**

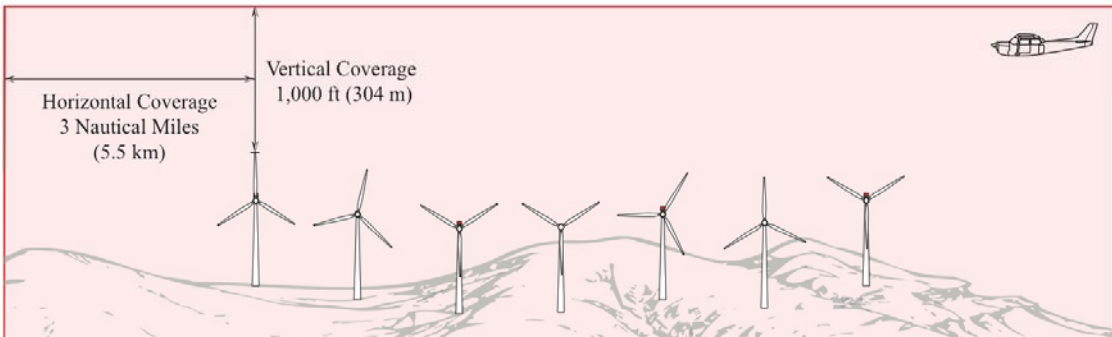


# AIRCRAFT DETECTION LIGHTING SYSTEM

(ADLS) SAMPLE WIND FARM COVERAGE MAP



\* Multiple ADLS units required for the above wind farm



\* System above shown in active mode with aircraft in coverage area

 = L-864 (Flashing Red Light)

**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:

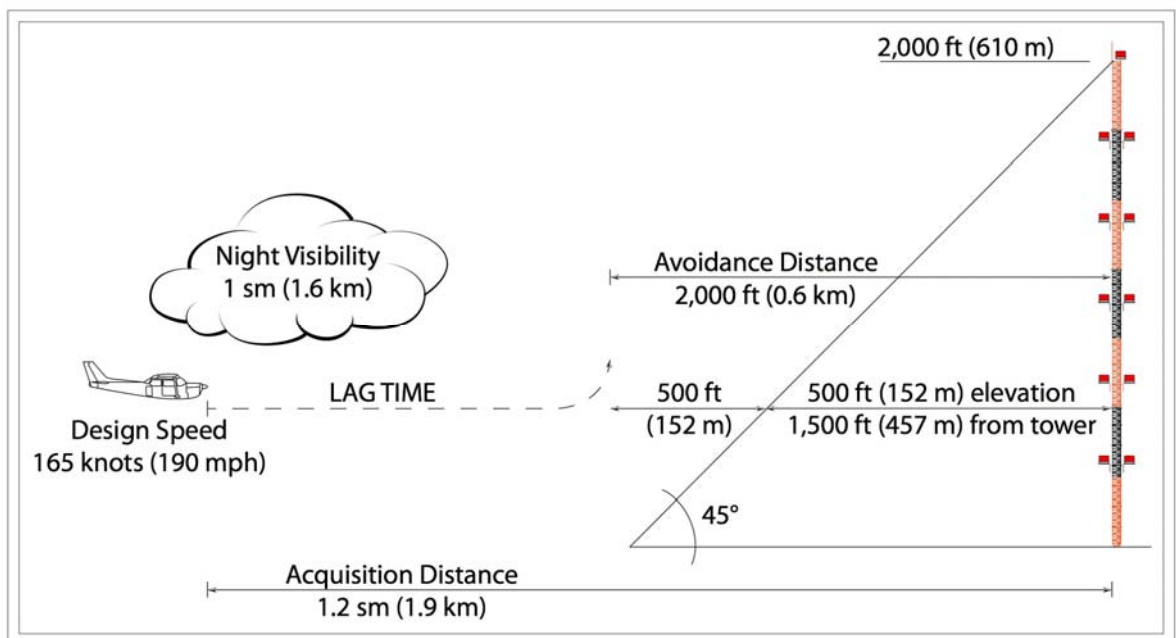
**Table B-1. Distance and Intensity**

<b>Time Period</b>	<b>Meteorological Visibility Statute Miles</b>	<b>Distance Statute Miles</b>	<b>Intensity Candelas</b>
Night		2.9 (4.7 km)	1,500 ( $\pm 25\%$ )
	3 (4.8 km)	3.1 (4.9 km)	2,000 ( $\pm 25\%$ )
		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 ( $\pm 25\%$ )
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 ( $\pm 25\%$ )
Twilight	1 (1.6 km)	1.0 (1.6 km) to 1.5 (2.4 km)	20,000 ( $\pm 25\%$ )
Twilight	3 (4.8 km)	1.8 (2.9 km) to 4.2 (6.7 km)	20,000 ( $\pm 25\%$ )

**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 J



Mail Processing Center  
 Federal Aviation Administration  
 Southwest Regional Office  
 Obstruction Evaluation Group  
 10101 Hillwood Parkway  
 Fort Worth, TX 76177

Aeronautical Study No.  
 2017-WTE-10098-OE  
 Prior Study No.  
 2017-WTE-865-OE

Issued Date: 05/22/2018

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: 42-24-39.61N NAD 83  
 Longitude: 79-10-12.10W  
 Heights: 1560 feet site elevation (SE)  
 599 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-10098-OE.

**Signature Control No: 351579781-365924290**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)



## Additional information for ASN 2017-WTE-10098-OE

### Abbreviations:

AGL, Above Ground Level

AMSL, Above Mean Sea Level

ASN, Aeronautical Study Number

CFR, Code of Federal Regulations

MVA, Minimum Vectoring Altitude

NEH, No Effect Height

NM, Nautical Mile

RWY, Runway

TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

All four of the proposed turbines, ASN's 2017-WTE-10098 thru 10101-OE, exceed this standard by 100 feet.

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-10098-OE would exceed the RWY 15 Diverse A departure area by 499 feet, requiring TAKE OFF AND MINIMUM (OBSTACLE) DEPARTURE PROCEDURES RWY 15, standard with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL. The NEH is 2,092 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-10098-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599 feet AGL, the structures would exceed altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

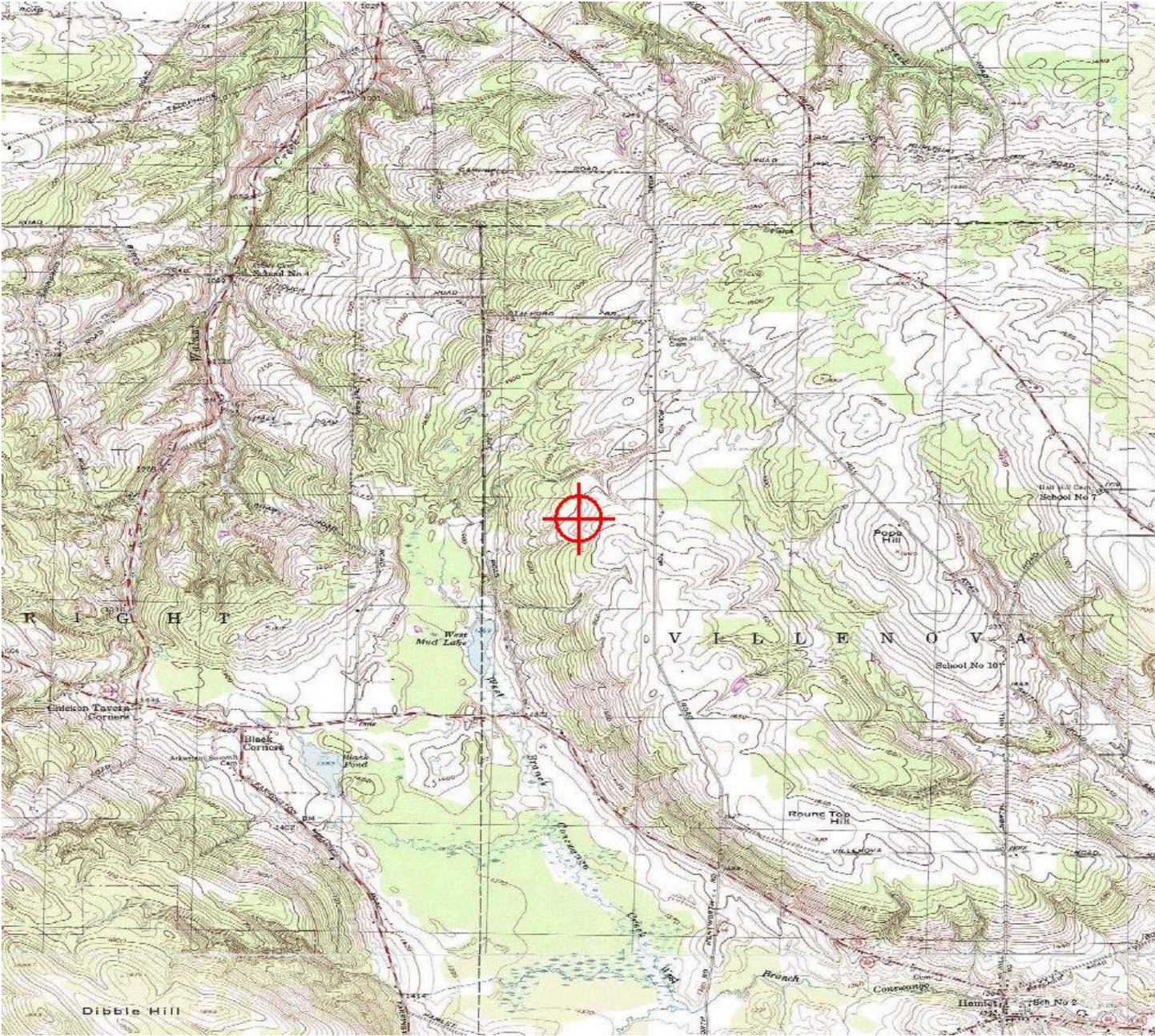
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

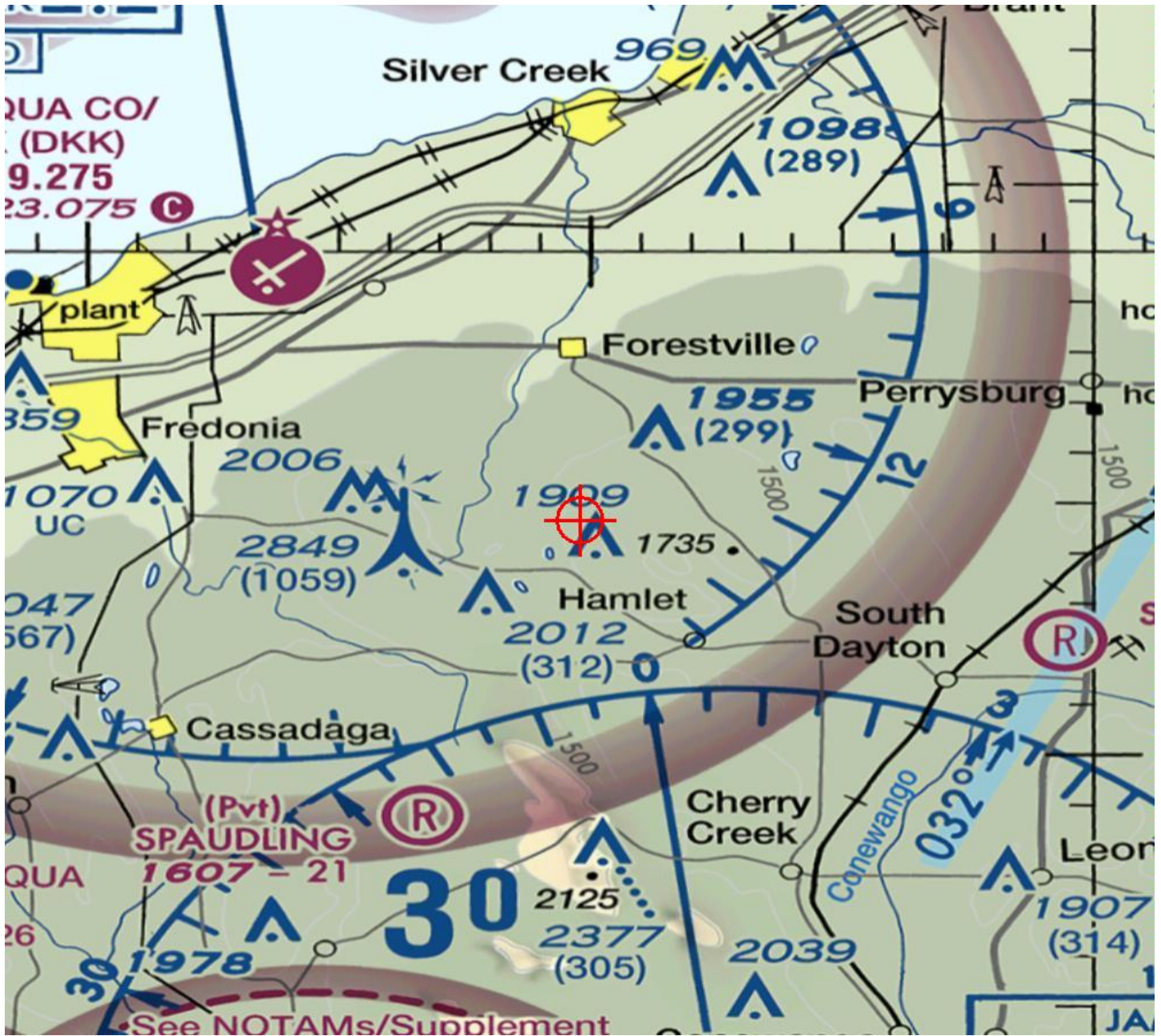
Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-10098-OE







Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-866-OE

Issued Date: 05/22/2018

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: 42-22-44.70N NAD 83  
Longitude: 79-08-22.89W  
Heights: 1604 feet site elevation (SE)  
599 feet above ground level (AGL)  
2203 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-866-OE.

**Signature Control No: 321543801-365922597**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-866-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.



ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

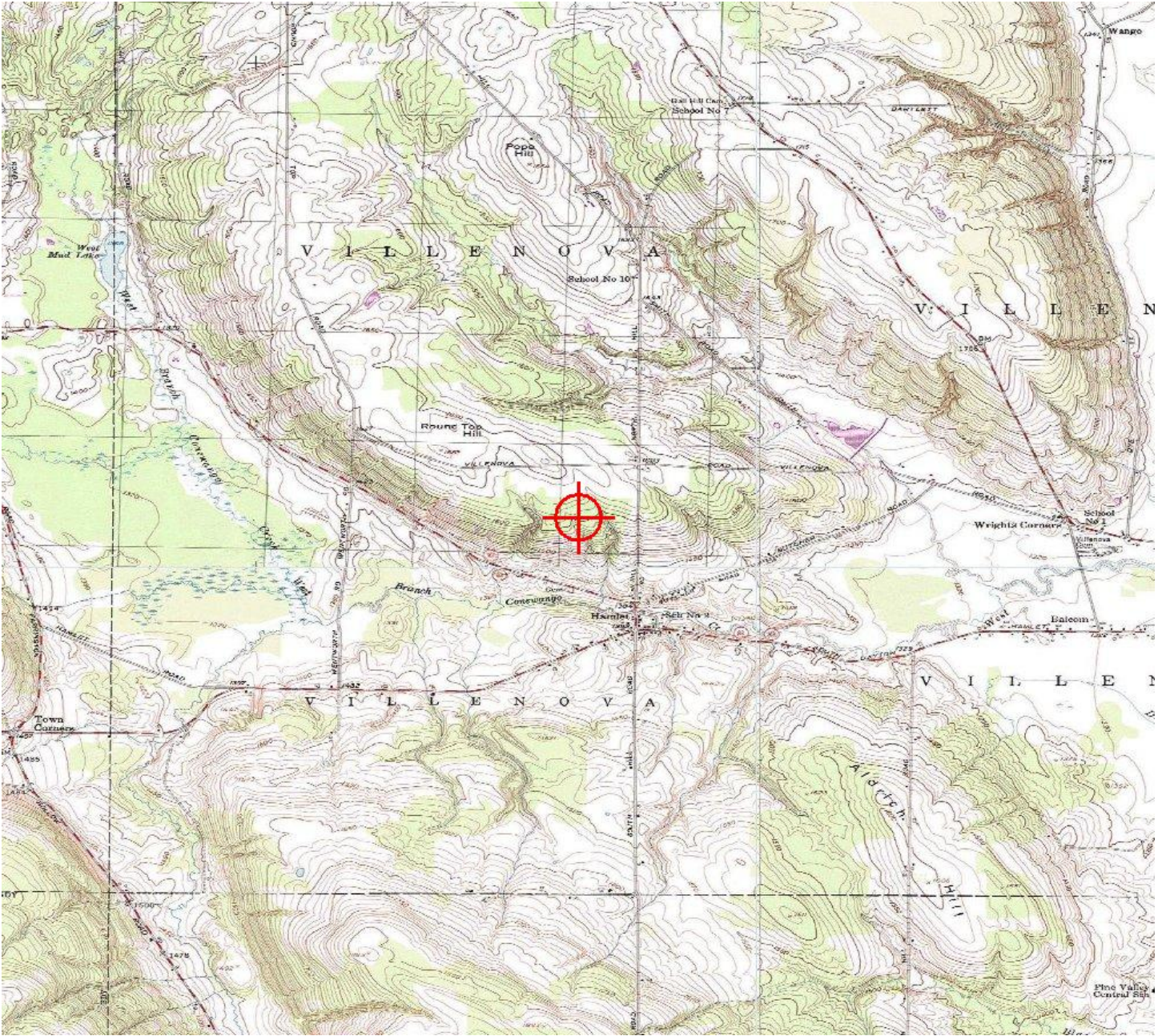
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

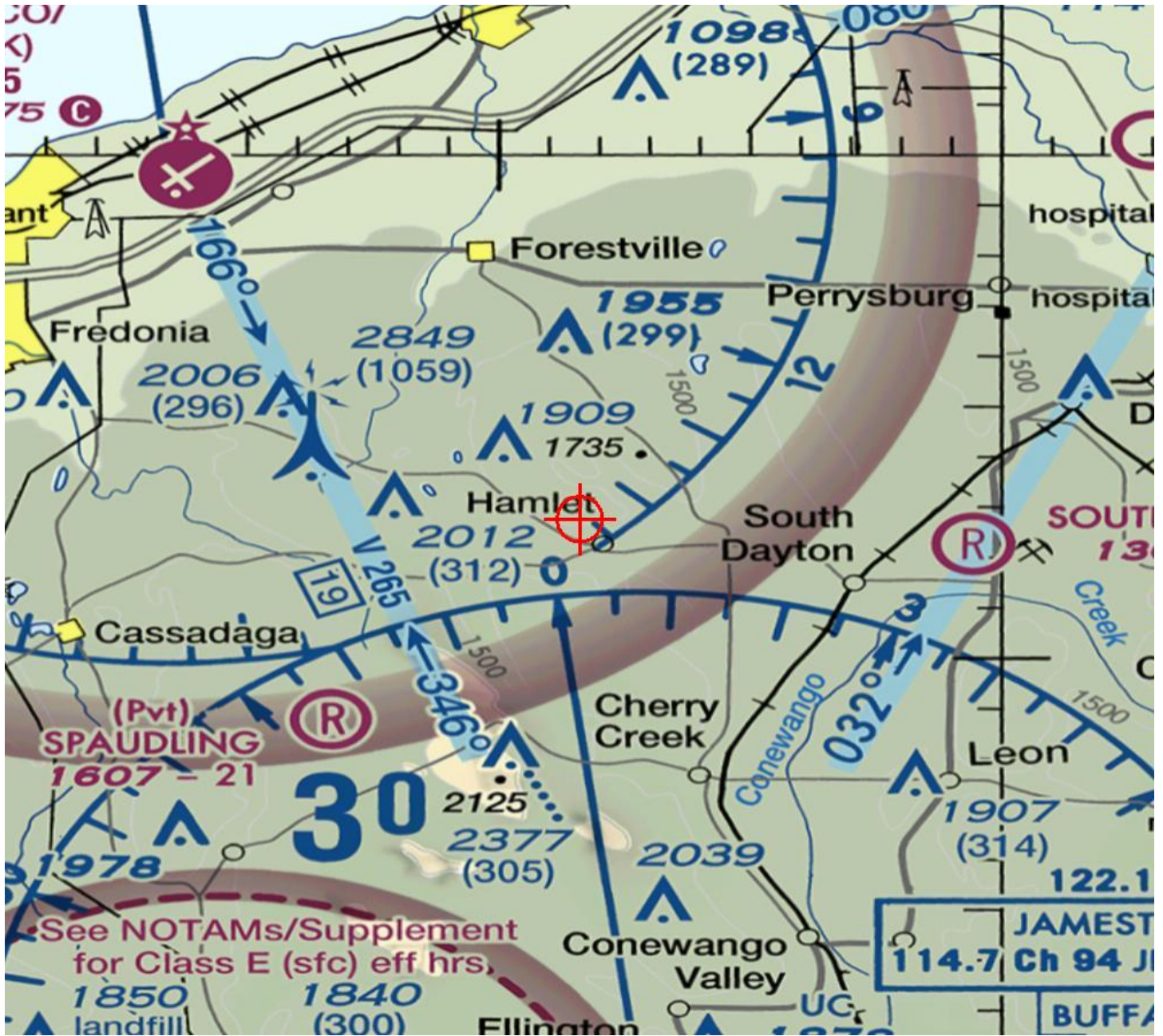
Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-866-OE



Sectional Map for ASN 2017-WTE-866-OE





Mail Processing Center  
 Federal Aviation Administration  
 Southwest Regional Office  
 Obstruction Evaluation Group  
 10101 Hillwood Parkway  
 Fort Worth, TX 76177

Aeronautical Study No.  
 2017-WTE-10099-OE  
 Prior Study No.  
 2017-WTE-867-OE

Issued Date: 05/22/2018

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: 42-23-07.83N NAD 83  
 Longitude: 79-08-27.63W  
 Heights: 1635 feet site elevation (SE)  
 599 feet above ground level (AGL)  
 2234 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-10099-OE.

**Signature Control No: 351579782-365924292**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-10099-OE

### Abbreviations:

AGL, Above Ground Level

AMSL, Above Mean Sea Level

ASN, Aeronautical Study Number

CFR, Code of Federal Regulations

MVA, Minimum Vectoring Altitude

NEH, No Effect Height

NM, Nautical Mile

RWY, Runway

TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

All four of the proposed turbines, ASN's 2017-WTE-10098 thru 10101-OE, exceed this standard by 100 feet.

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-10098-OE would exceed the RWY 15 Diverse A departure area by 499 feet, requiring TAKE OFF AND MINIMUM (OBSTACLE) DEPARTURE PROCEDURES RWY 15, standard with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL. The NEH is 2,092 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-10098-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599 feet AGL, the structures would exceed altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).









Mail Processing Center  
 Federal Aviation Administration  
 Southwest Regional Office  
 Obstruction Evaluation Group  
 10101 Hillwood Parkway  
 Fort Worth, TX 76177

Aeronautical Study No.  
 2017-WTE-868-OE

Issued Date: 05/22/2018

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: 42-23-22.04N NAD 83  
 Longitude: 79-08-44.04W  
 Heights: 1623 feet site elevation (SE)  
 599 feet above ground level (AGL)  
 2222 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-868-OE.

**Signature Control No: 321543804-365922605**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-868-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

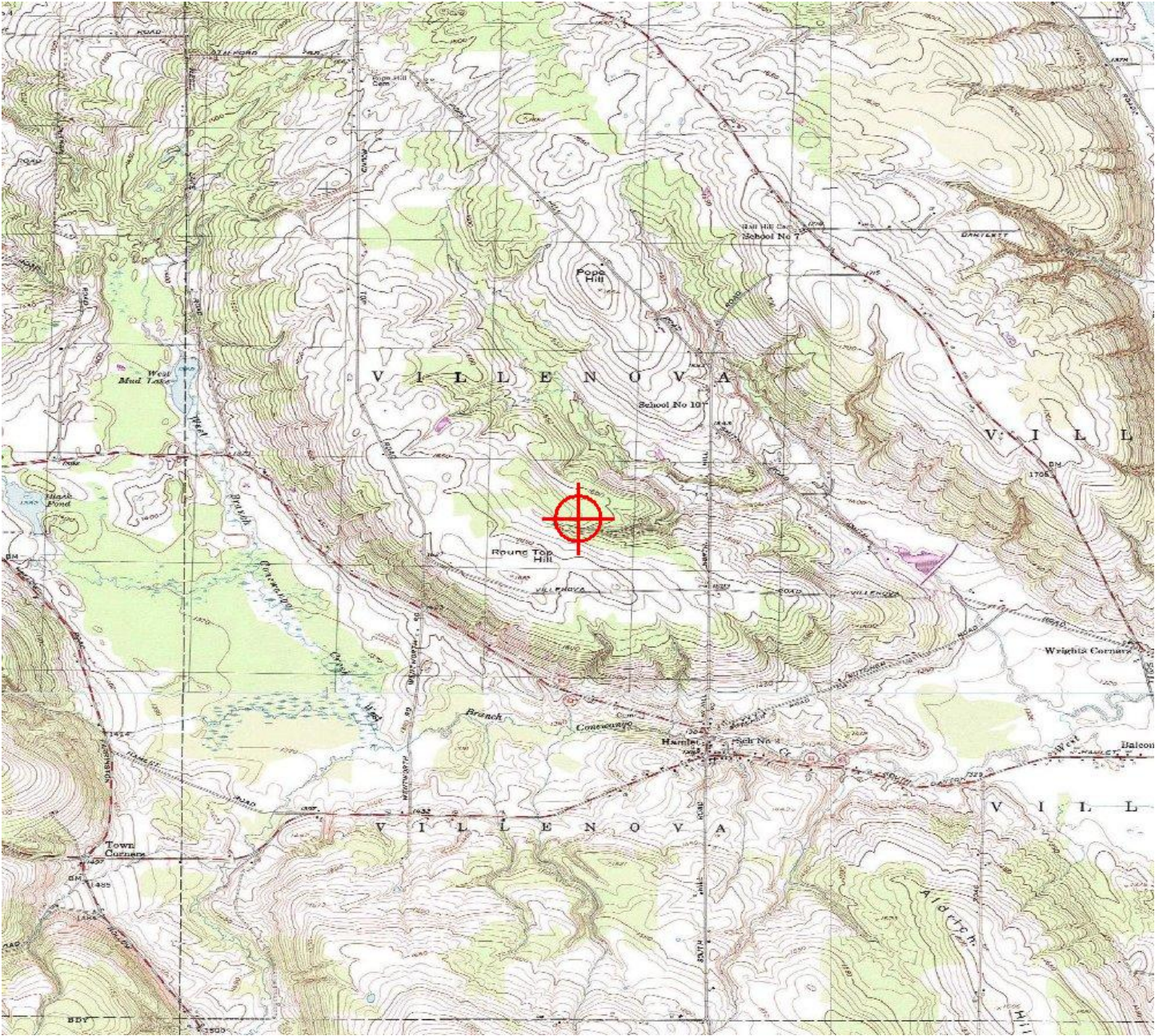
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-868-OE





Sectional Map for ASN 2017-WTE-868-OE





Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-869-OE

Issued Date: 05/22/2018

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:	42-23-30.75N NAD 83
Longitude:	79-08-55.38W
Heights:	1642 feet site elevation (SE) 599 feet above ground level (AGL) 2241 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-869-OE.

**Signature Control No: 321543805-365922598**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-869-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

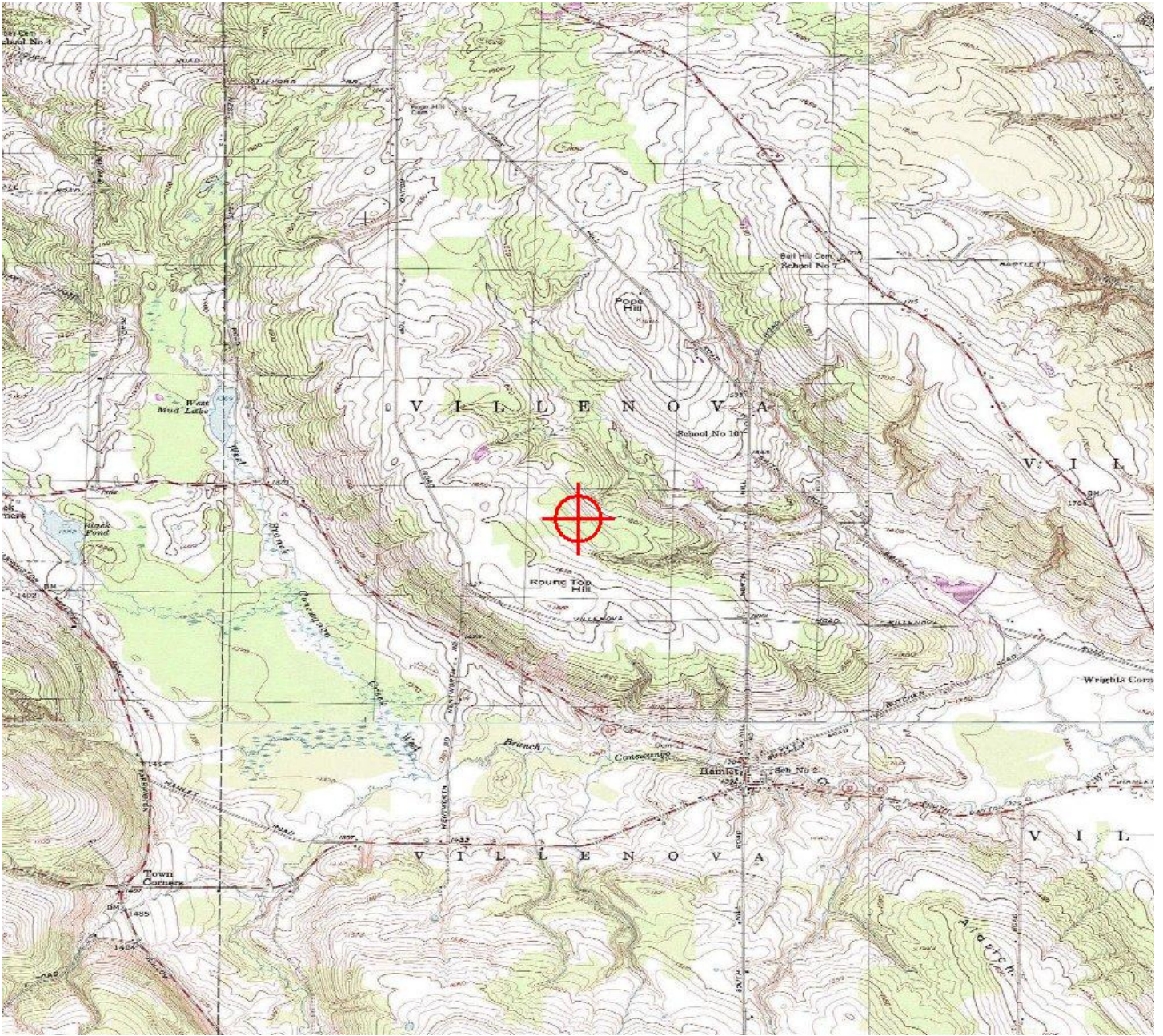
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-869-OE









Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-870-OE

Issued Date: 05/22/2018

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: 42-23-49.61N NAD 83  
Longitude: 79-09-03.26W  
Heights: 1599 feet site elevation (SE)  
599 feet above ground level (AGL)  
2198 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-870-OE.

**Signature Control No: 321543806-365922599**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-870-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

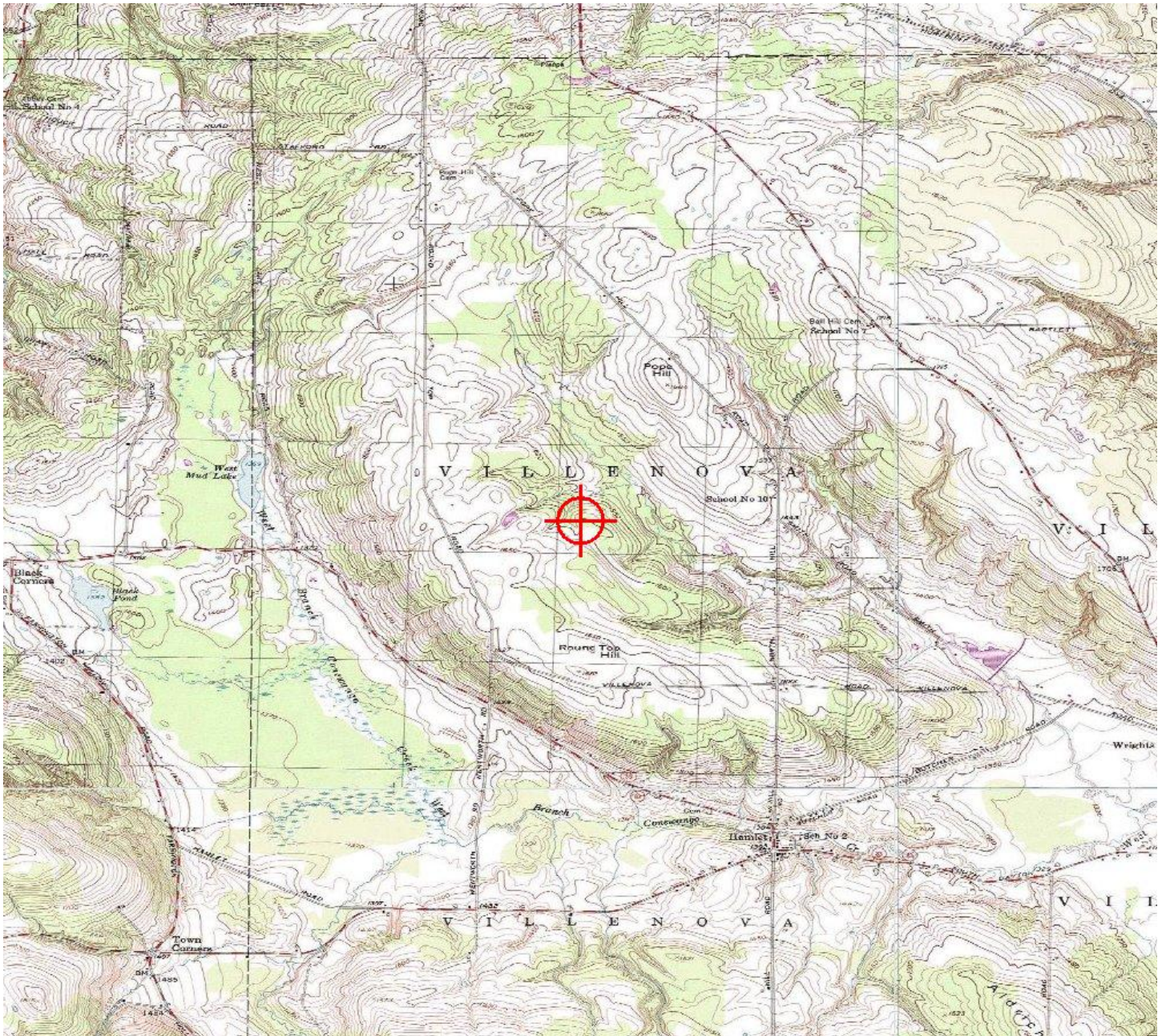
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-870-OE







Mail Processing Center  
 Federal Aviation Administration  
 Southwest Regional Office  
 Obstruction Evaluation Group  
 10101 Hillwood Parkway  
 Fort Worth, TX 76177

Aeronautical Study No.  
 2017-WTE-10100-OE  
 Prior Study No.  
 2017-WTE-871-OE

Issued Date: 05/22/2018

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: 42-24-04.91N NAD 83  
 Longitude: 79-09-16.90W  
 Heights: 1605 feet site elevation (SE)  
 599 feet above ground level (AGL)  
 2204 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-10100-OE.

**Signature Control No: 351579783-365924291**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-10100-OE

### Abbreviations:

AGL, Above Ground Level

AMSL, Above Mean Sea Level

ASN, Aeronautical Study Number

CFR, Code of Federal Regulations

MVA, Minimum Vectoring Altitude

NEH, No Effect Height

NM, Nautical Mile

RWY, Runway

TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

All four of the proposed turbines, ASN's 2017-WTE-10098 thru 10101-OE, exceed this standard by 100 feet.

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-10098-OE would exceed the RWY 15 Diverse A departure area by 499 feet, requiring TAKE OFF AND MINIMUM (OBSTACLE) DEPARTURE PROCEDURES RWY 15, standard with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL. The NEH is 2,092 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-10098-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599 feet AGL, the structures would exceed altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

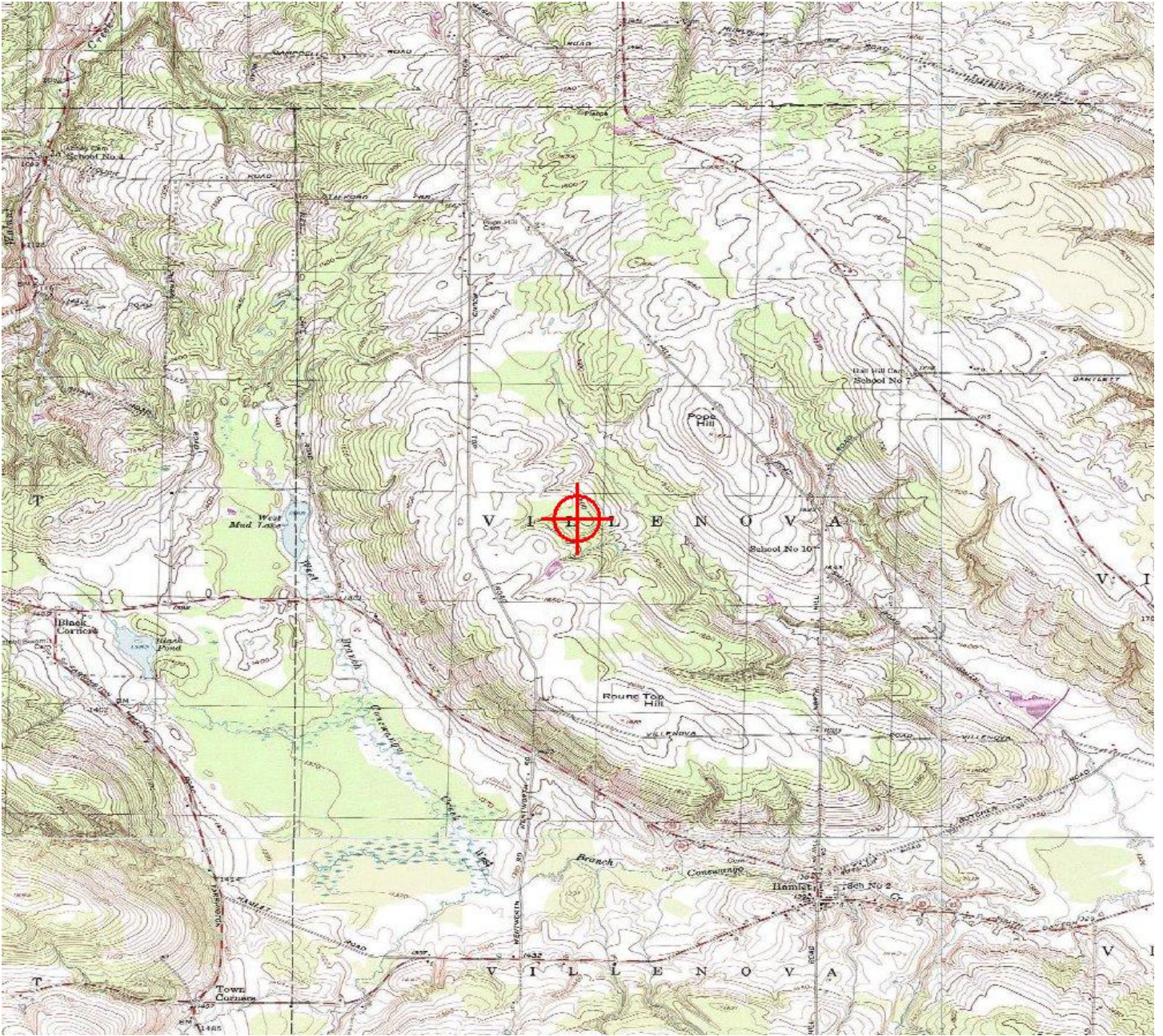
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

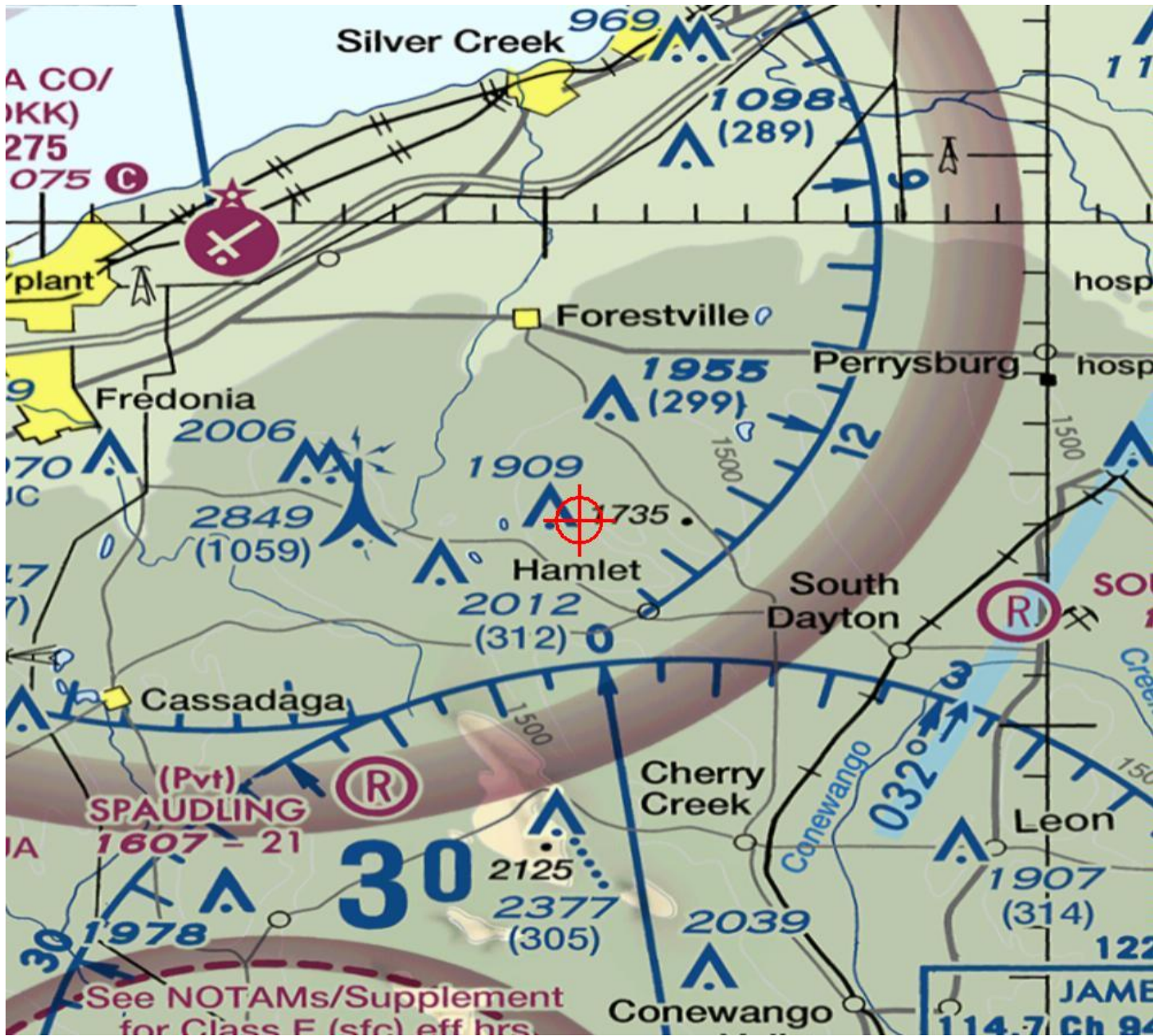
Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-10100-OE







Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-872-OE

Issued Date: 05/22/2018

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: 42-23-56.55N NAD 83  
Longitude: 79-08-28.99W  
Heights: 1550 feet site elevation (SE)  
599 feet above ground level (AGL)  
2149 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-872-OE.

**Signature Control No: 321543808-365922607**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-872-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

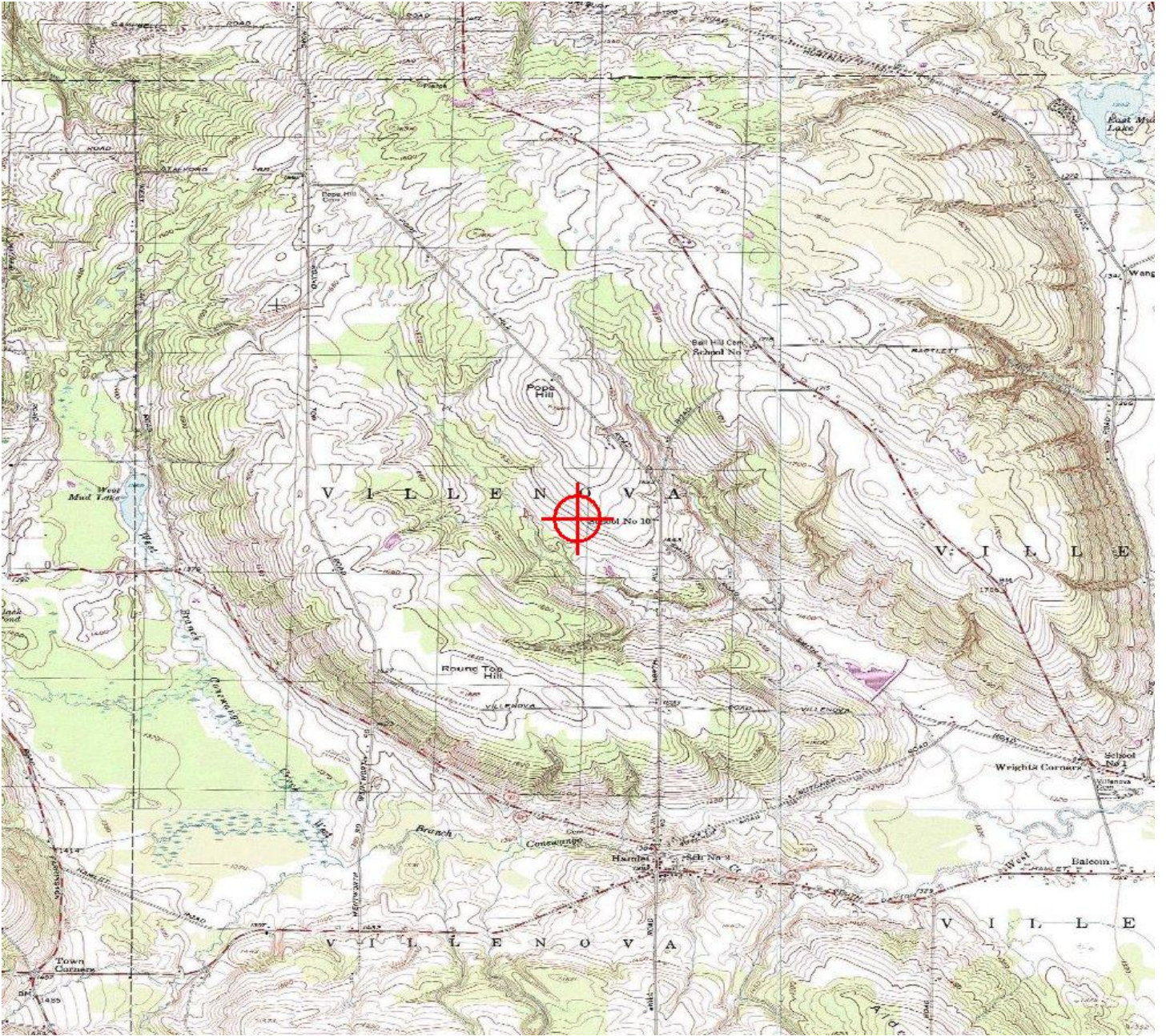
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-872-OE







Mail Processing Center  
 Federal Aviation Administration  
 Southwest Regional Office  
 Obstruction Evaluation Group  
 10101 Hillwood Parkway  
 Fort Worth, TX 76177

Aeronautical Study No.  
 2017-WTE-873-OE

Issued Date: 05/22/2018

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: 42-24-29.12N NAD 83  
 Longitude: 79-08-56.63W  
 Heights: 1590 feet site elevation (SE)  
 599 feet above ground level (AGL)  
 2189 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-873-OE.

**Signature Control No: 321543809-365922601**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)



## Additional information for ASN 2017-WTE-873-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
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NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
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The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

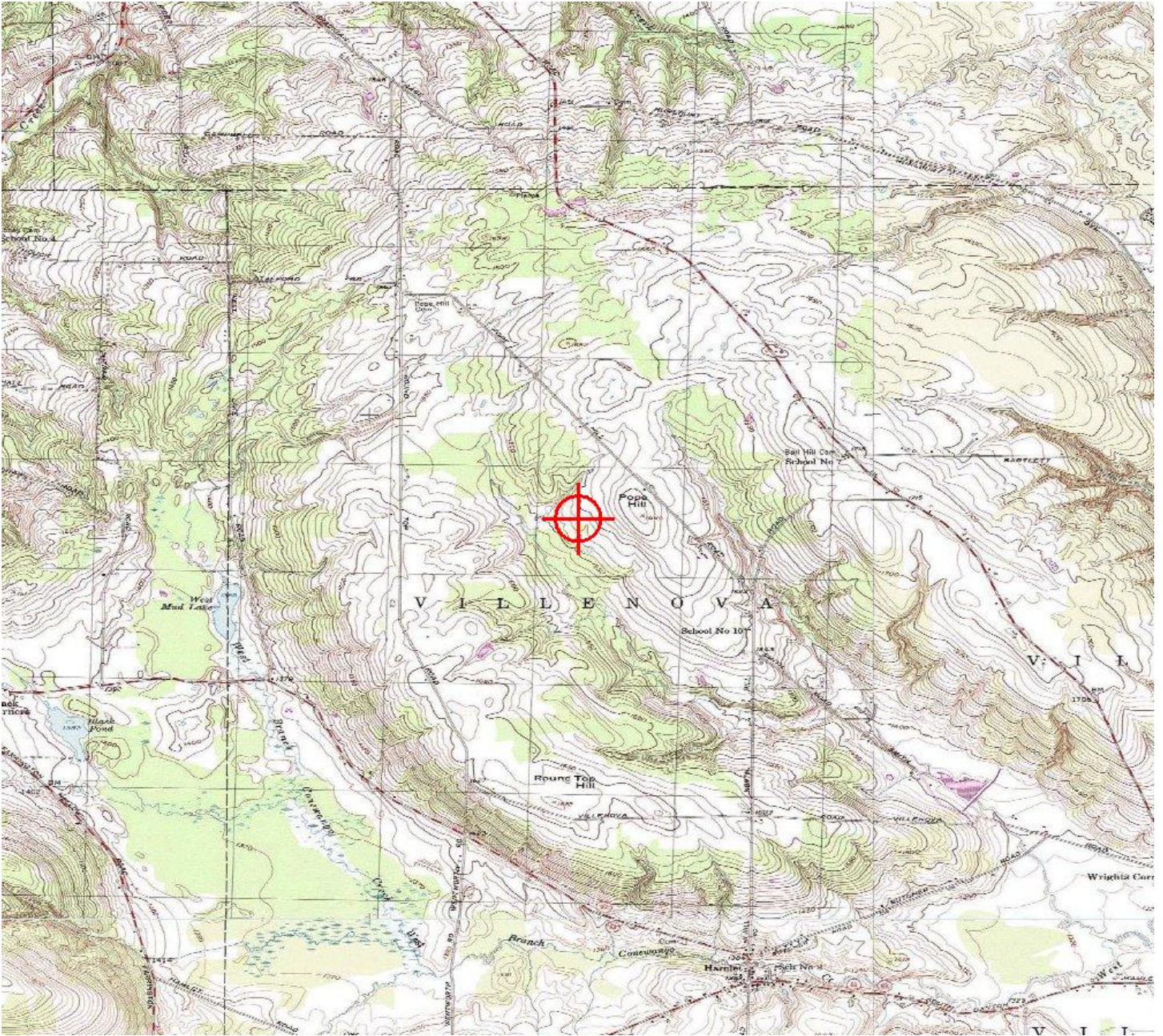
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-873-OE







Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-874-OE

Issued Date: 05/22/2018

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)  
599 feet above ground level (AGL)  
2242 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
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See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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.
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**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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

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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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**Signature Control No: 321543810-365922600**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-874-OE

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Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

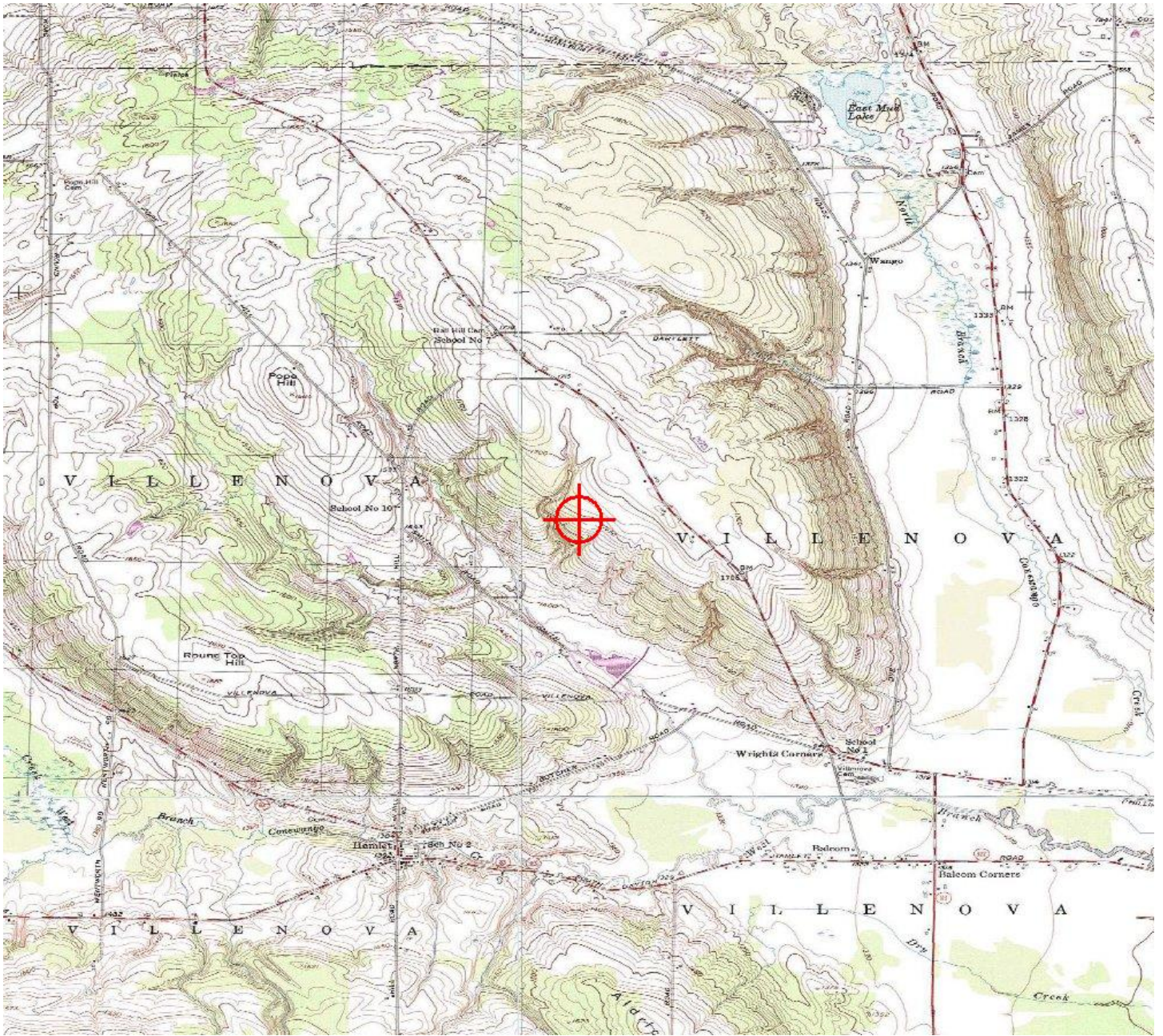
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-874-OE







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10101 Hillwood Parkway  
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Aeronautical Study No.  
2017-WTE-875-OE

Issued Date: 05/22/2018

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:	42-24-11.70N NAD 83
Longitude:	79-07-21.70W
Heights:	1698 feet site elevation (SE) 599 feet above ground level (AGL) 2297 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-875-OE.

**Signature Control No: 321543811-365922595**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-875-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

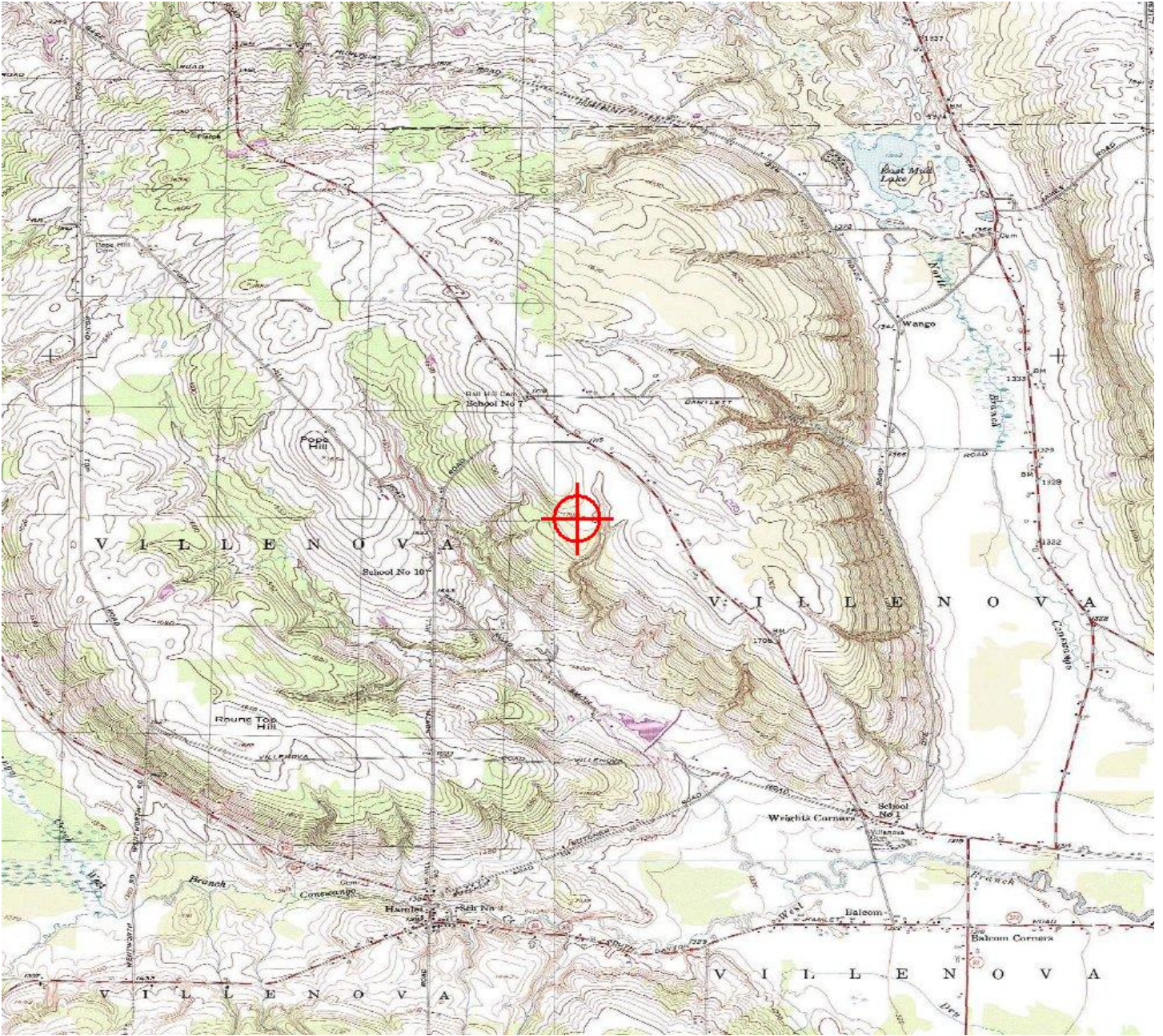
Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).



TOPO Map for ASN 2017-WTE-875-OE







Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-876-OE

Issued Date: 06/04/2018

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

**\*\* DETERMINATION OF NO HAZARD TO AIR NAVIGATION \*\* (CORRECTION)**

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:	42-24-24.45N NAD 83
Longitude:	79-07-28.49W
Heights:	1733 feet site elevation (SE) 566 feet above ground level (AGL) 2299 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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.
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This determination is subject to review if an interested party files a petition that is received by the FAA on or before June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

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**Signature Control No: 321543812-366767830**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-876-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
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Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

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The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

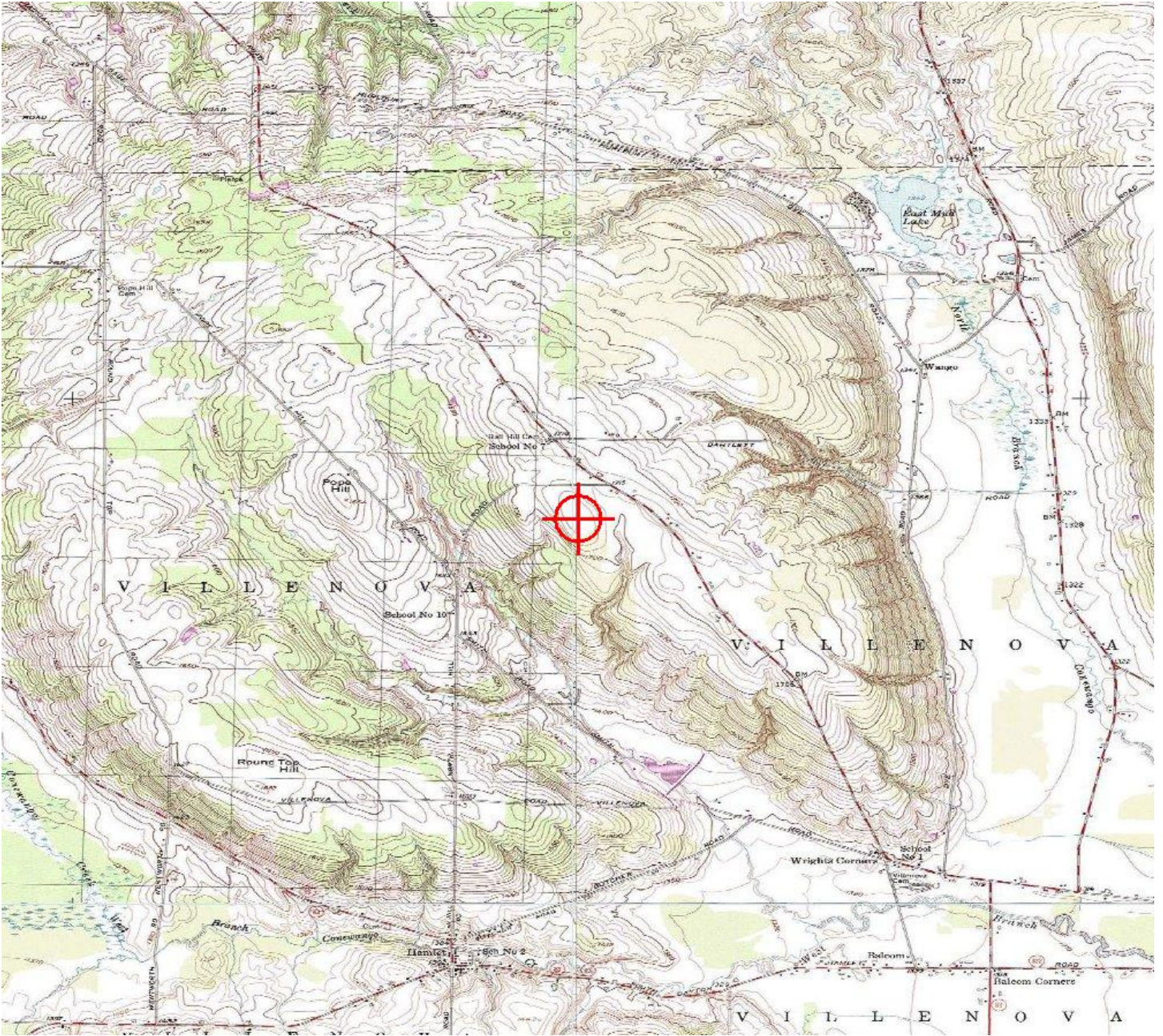
Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

TOPO Map for ASN 2017-WTE-876-OE









Mail Processing Center  
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Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-877-OE

Issued Date: 05/22/2018

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: 42-24-46.48N NAD 83  
Longitude: 79-08-07.04W  
Heights: 1642 feet site elevation (SE)  
599 feet above ground level (AGL)  
2241 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:

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**Signature Control No: 321543813-365922608**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-877-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

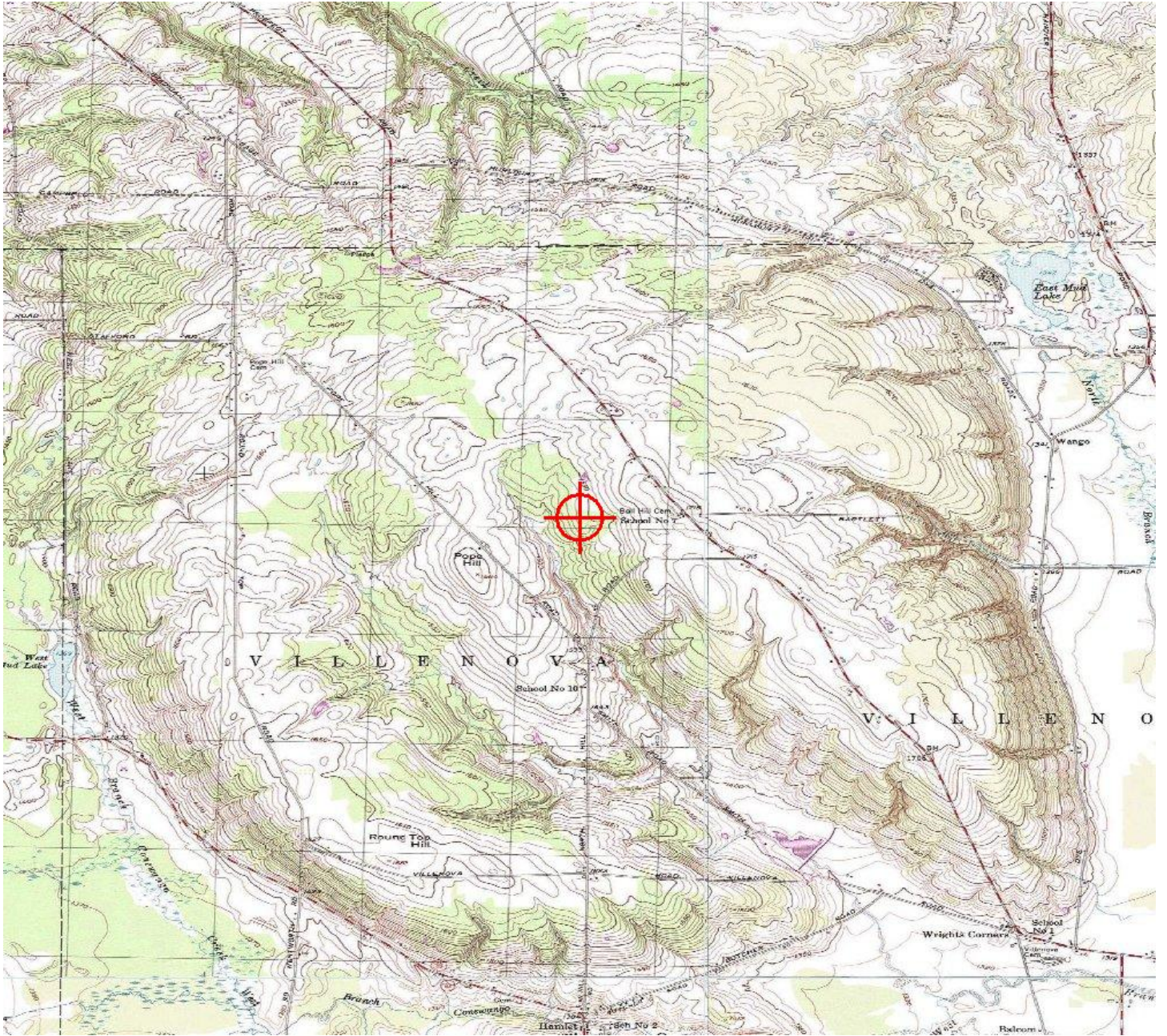
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-877-OE









Mail Processing Center  
 Federal Aviation Administration  
 Southwest Regional Office  
 Obstruction Evaluation Group  
 10101 Hillwood Parkway  
 Fort Worth, TX 76177

Aeronautical Study No.  
 2017-WTE-878-OE

Issued Date: 05/22/2018

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: 42-25-03.83N NAD 83  
 Longitude: 79-08-15.58W  
 Heights: 1644 feet site elevation (SE)  
 566 feet above ground level (AGL)  
 2210 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-878-OE.

**Signature Control No: 321543814-365922596**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-878-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

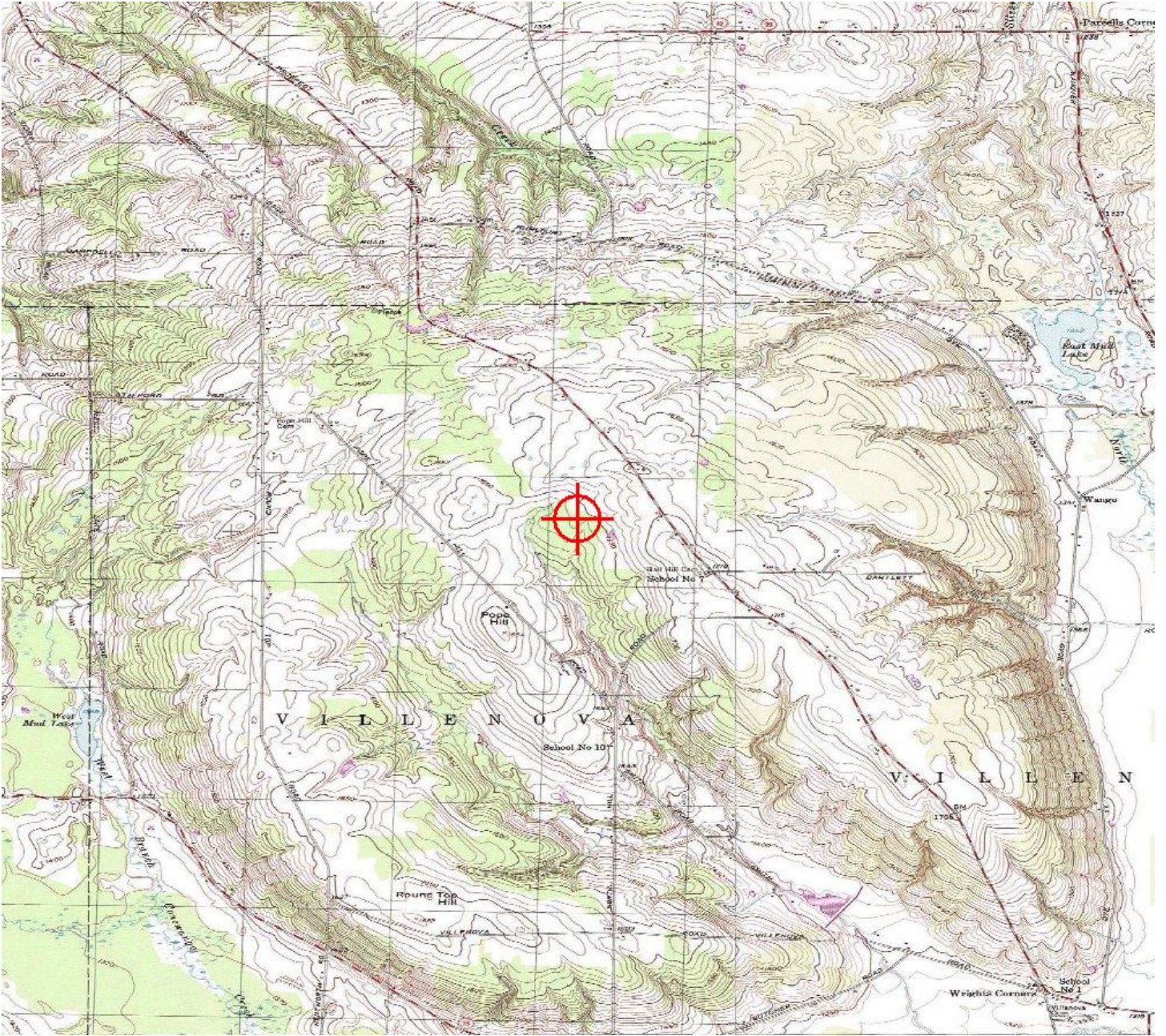
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-878-OE



Sectional Map for ASN 2017-WTE-878-OE





Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-879-OE

Issued Date: 05/22/2018

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: 79-08-28.17W  
Heights: 1660 feet site elevation (SE)  
599 feet above ground level (AGL)  
2259 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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See attachment for additional condition(s) or information.

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**Signature Control No: 321543815-365922606**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

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The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

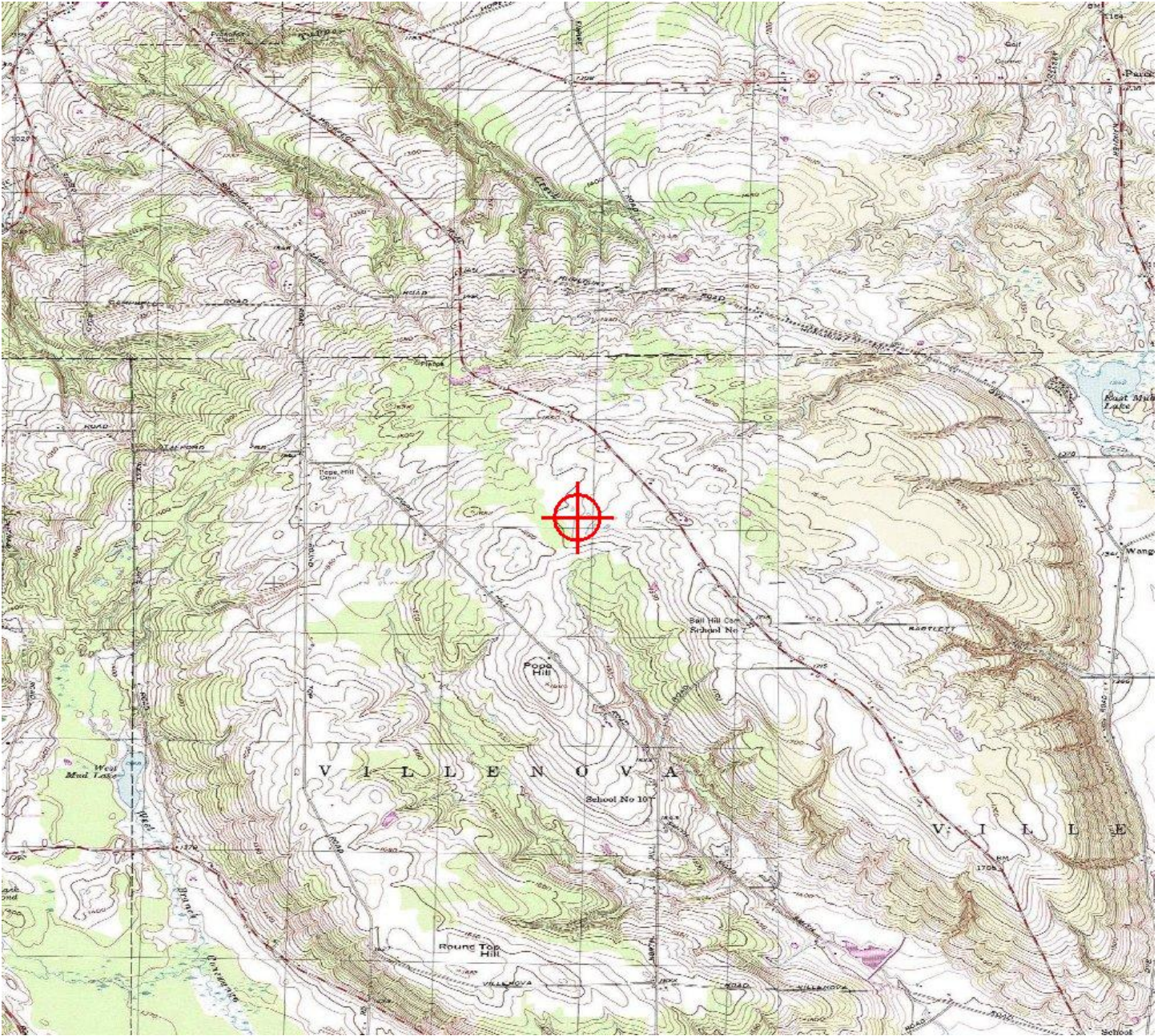
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-879-OE







Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-880-OE

Issued Date: 05/22/2018

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 T19  
Location: Hamlet, NY  
Latitude: 42-23-58.55N NAD 83  
Longitude: 79-06-17.70W  
Heights: 1712 feet site elevation (SE)  
587 feet above ground level (AGL)  
2299 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-880-OE.

**Signature Control No: 321543816-365922602**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-880-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

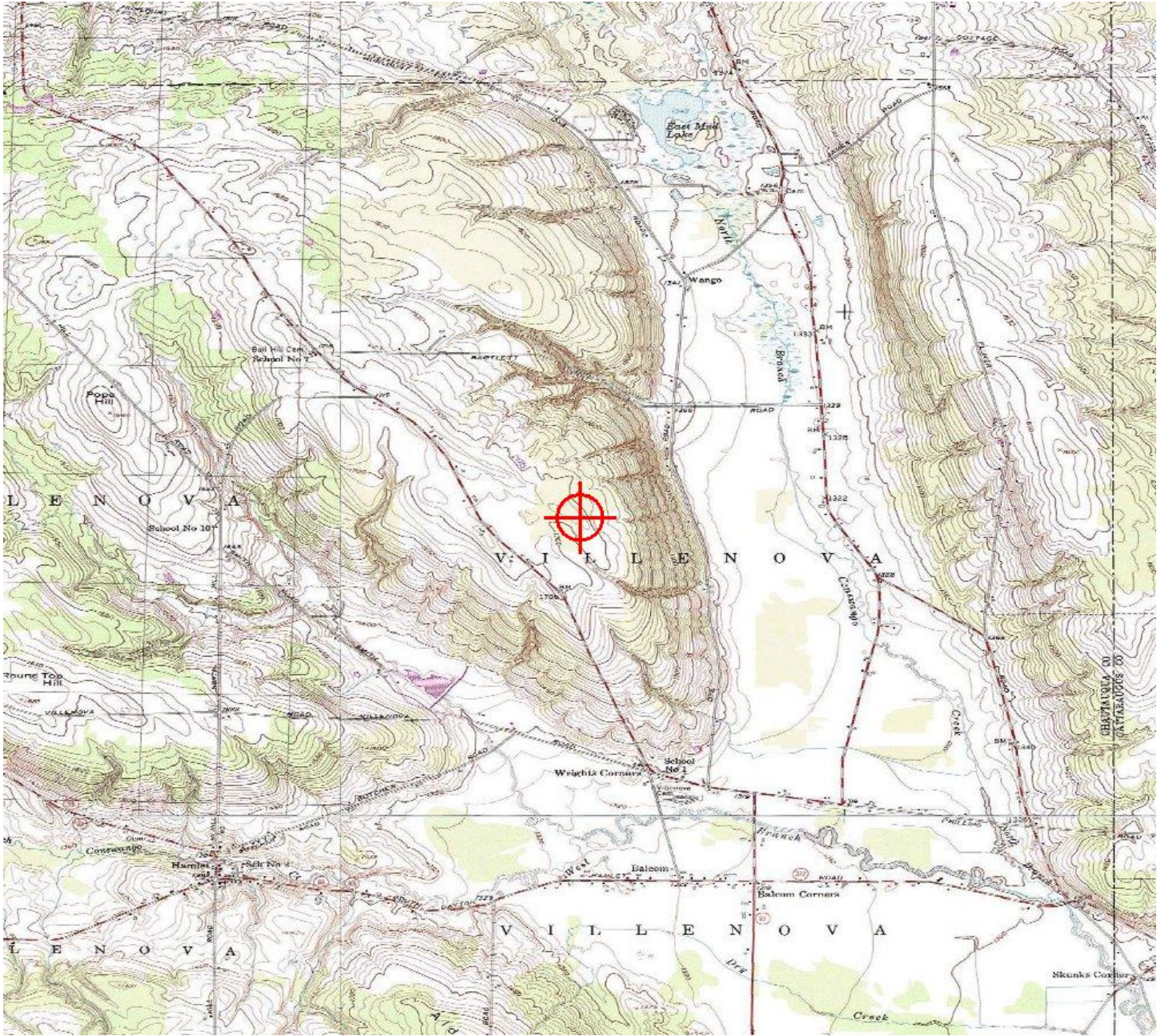
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-880-OE







Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-881-OE

Issued Date: 05/22/2018

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 T20  
Location: Hamlet, NY  
Latitude: 42-24-11.28N NAD 83  
Longitude: 79-06-22.74W  
Heights: 1698 feet site elevation (SE)  
599 feet above ground level (AGL)  
2297 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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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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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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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-881-OE.

**Signature Control No: 321543817-365922613**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)



## Additional information for ASN 2017-WTE-881-OE

### Abbreviations:

AGL, Above Ground Level

AMSL, Above Mean Sea Level

ASR, Airport Surveillance Radar

ASN, Aeronautical Study Number

CFR, Code of Federal Regulations

GPS, Global Positioning System

NA, Not Authorized

NEH, No Effect Height

NM, Nautical Mile

RNAV, Area Navigation

RWY, Runway

TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).







Mail Processing Center  
 Federal Aviation Administration  
 Southwest Regional Office  
 Obstruction Evaluation Group  
 10101 Hillwood Parkway  
 Fort Worth, TX 76177

Aeronautical Study No.  
 2017-WTE-882-OE

Issued Date: 05/22/2018

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 T21  
 Location: Hamlet, NY  
 Latitude: 42-23-44.37N NAD 83  
 Longitude: 79-06-03.43W  
 Heights: 1681 feet site elevation (SE)  
 599 feet above ground level (AGL)  
 2280 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:

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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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-882-OE.

**Signature Control No: 321543818-365922611**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-882-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
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RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.



ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

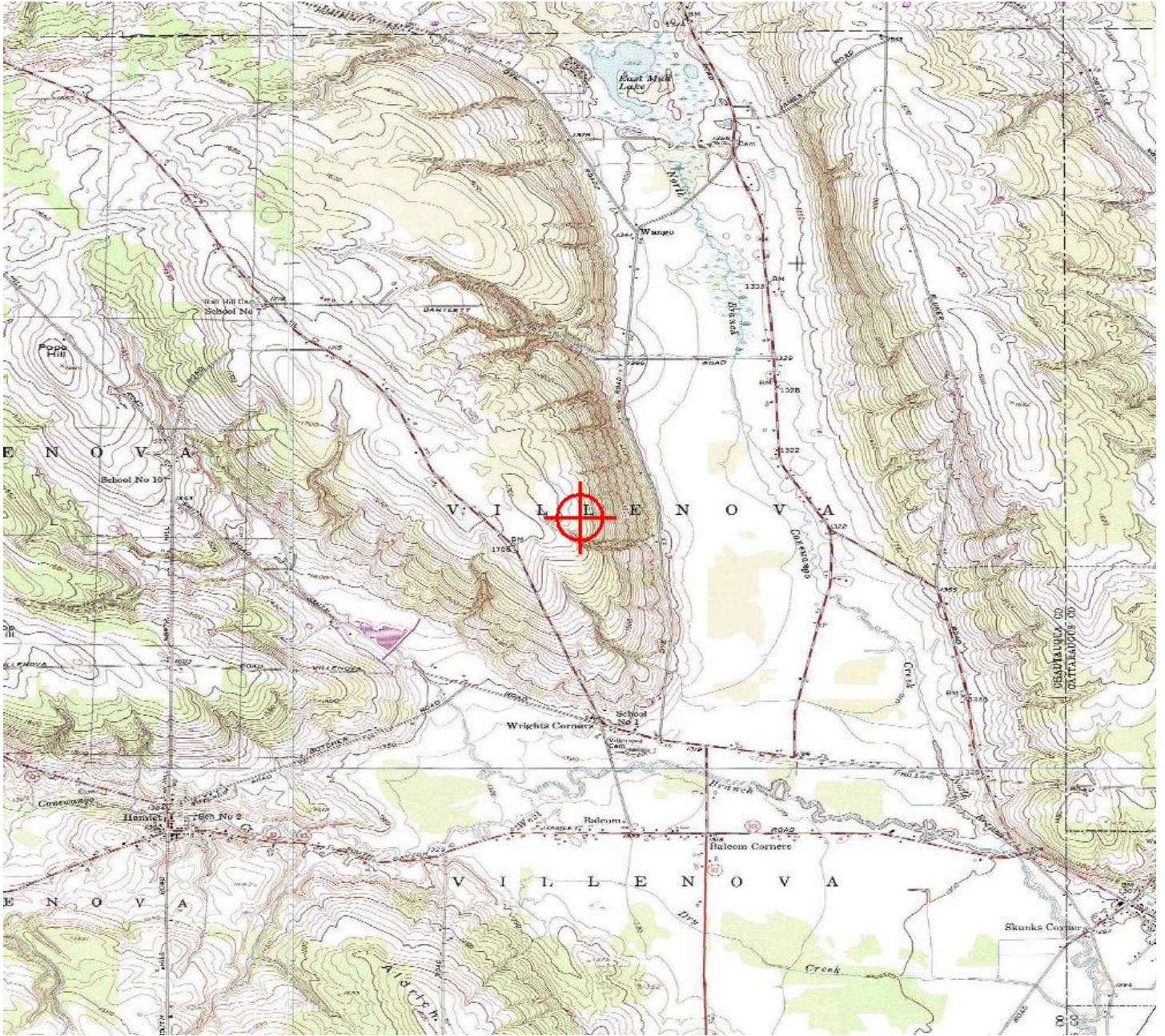
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-882-OE







Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-883-OE

Issued Date: 05/22/2018

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 T23  
Location: Hamlet, NY  
Latitude: 42-24-33.73N NAD 83  
Longitude: 79-06-37.34W  
Heights: 1642 feet site elevation (SE)  
599 feet above ground level (AGL)  
2241 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)  
 Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-883-OE.

**Signature Control No: 321543819-365922603**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-883-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

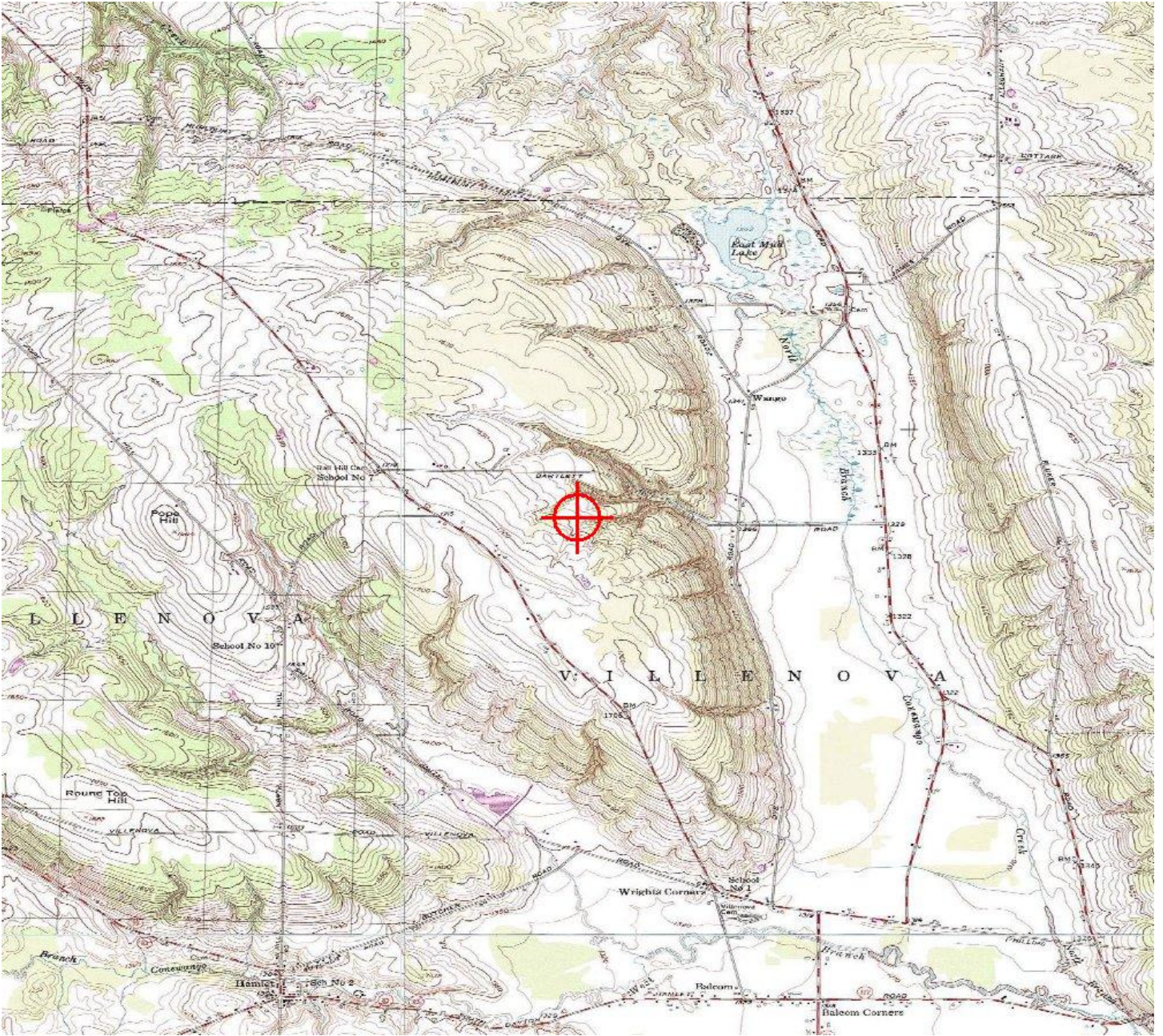
Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).



TOPO Map for ASN 2017-WTE-883-OE







Mail Processing Center  
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10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-884-OE

Issued Date: 05/22/2018

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 T27  
Location: Hamlet, NY  
Latitude: 42-25-50.77N NAD 83  
Longitude: 79-07-03.82W  
Heights: 1602 feet site elevation (SE)  
599 feet above ground level (AGL)  
2201 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)  
 Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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

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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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-884-OE.

**Signature Control No: 321543820-365922610**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-884-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

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Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

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ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

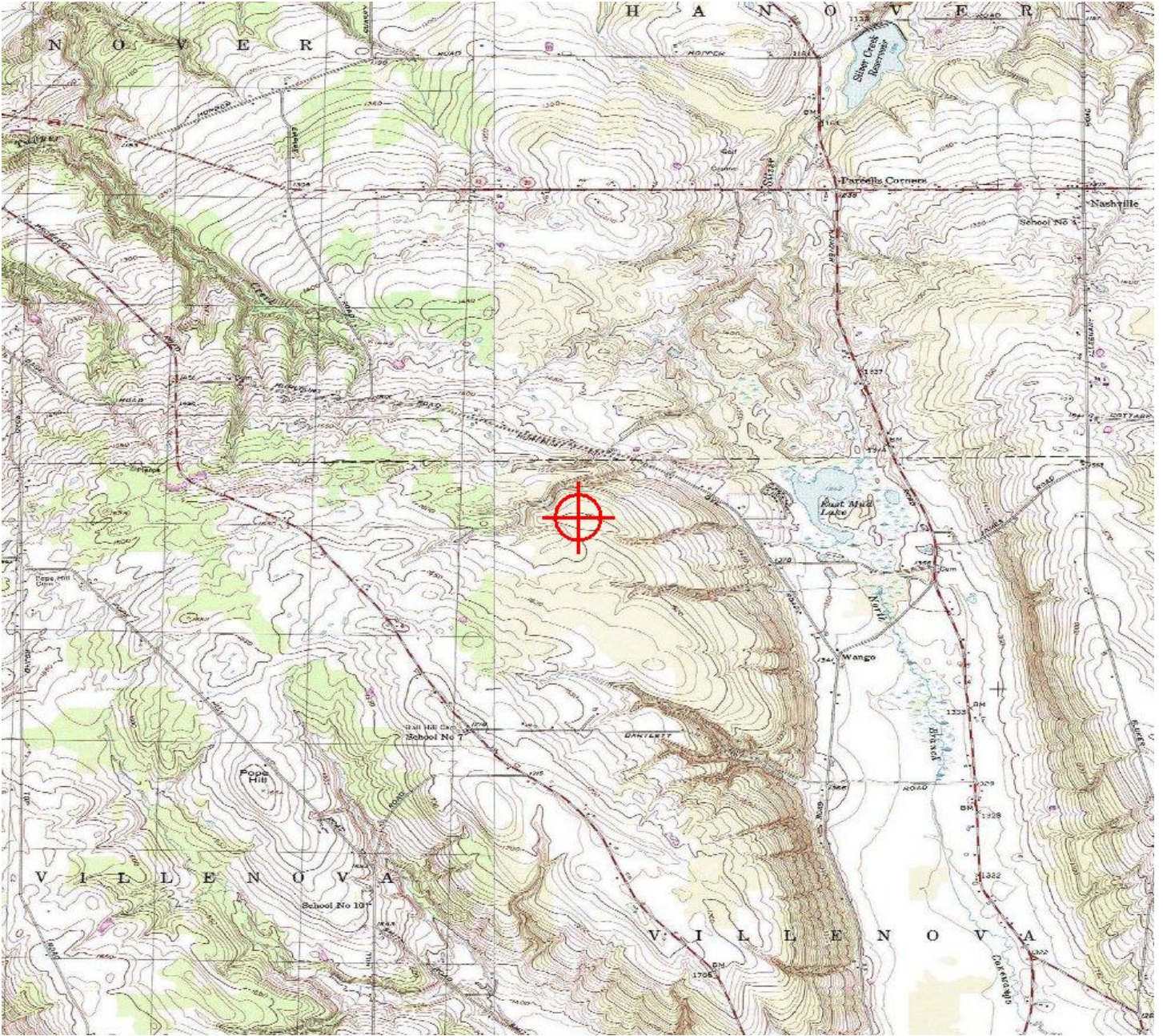
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-884-OE









Mail Processing Center  
 Federal Aviation Administration  
 Southwest Regional Office  
 Obstruction Evaluation Group  
 10101 Hillwood Parkway  
 Fort Worth, TX 76177

Aeronautical Study No.  
 2017-WTE-885-OE

Issued Date: 05/22/2018

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: 42-25-43.71N NAD 83  
 Longitude: 79-07-33.61W  
 Heights: 1602 feet site elevation (SE)  
 599 feet above ground level (AGL)  
 2201 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-885-OE.

**Signature Control No: 321543821-365922604**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-885-OE

### Abbreviations:

AGL, Above Ground Level

AMSL, Above Mean Sea Level

ASR, Airport Surveillance Radar

ASN, Aeronautical Study Number

CFR, Code of Federal Regulations

GPS, Global Positioning System

NA, Not Authorized

NEH, No Effect Height

NM, Nautical Mile

RNAV, Area Navigation

RWY, Runway

TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

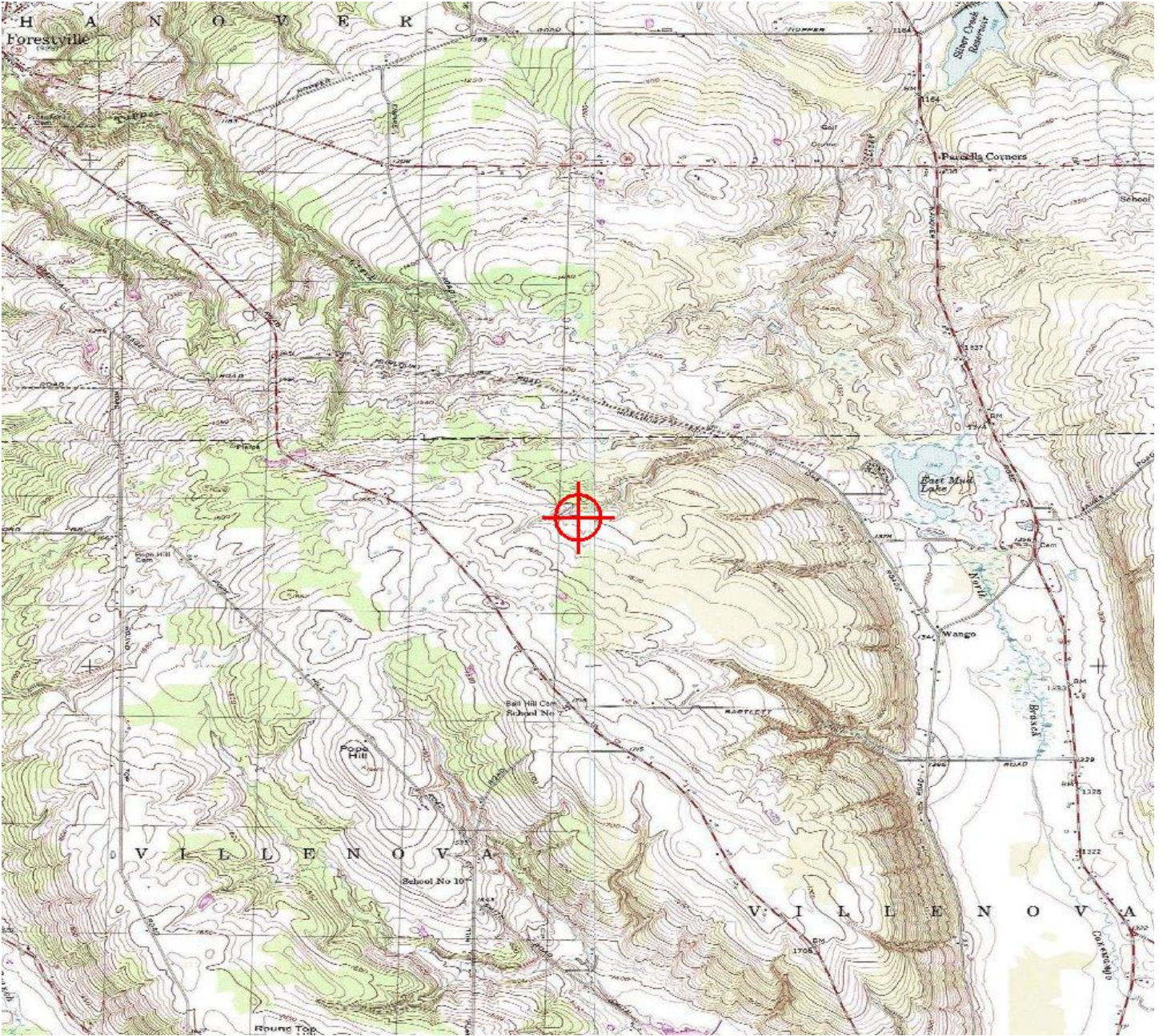
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

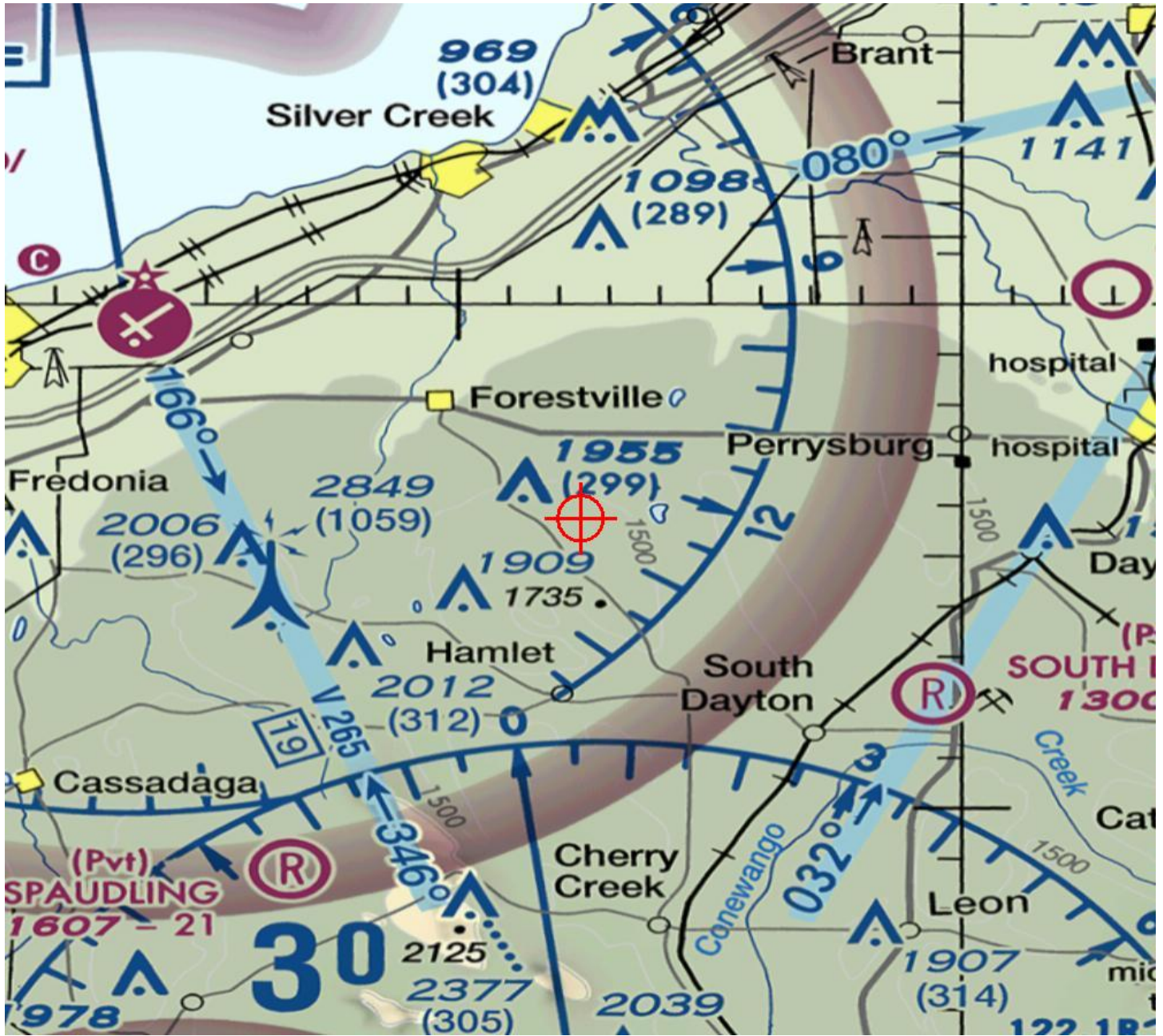
Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-885-OE









Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-886-OE

Issued Date: 05/22/2018

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: 42-25-59.46N NAD 83  
Longitude: 79-08-01.28W  
Heights: 1610 feet site elevation (SE)  
599 feet above ground level (AGL)  
2209 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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

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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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-886-OE.

**Signature Control No: 321543822-365922614**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-886-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

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ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

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The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

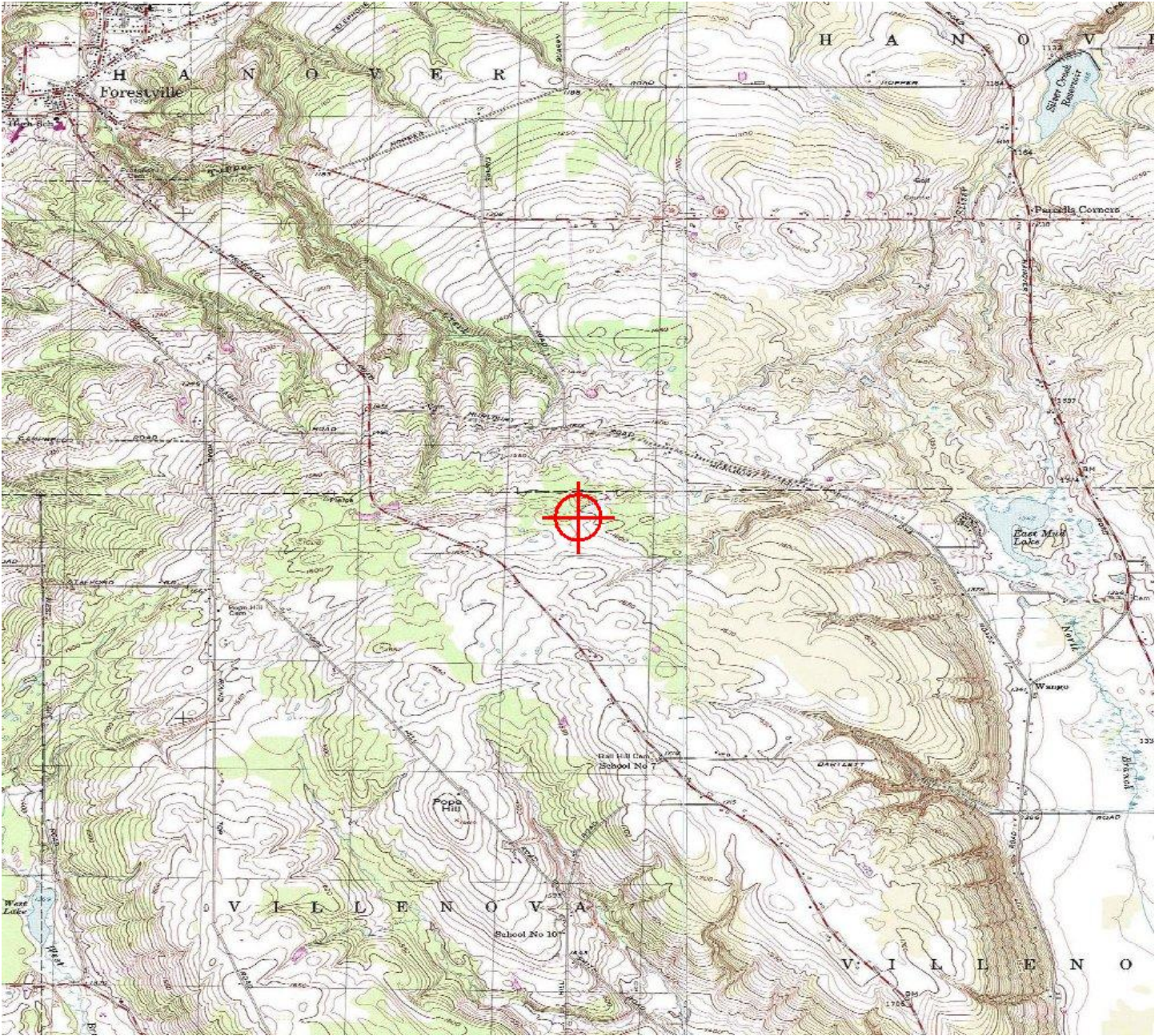
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-886-OE







Mail Processing Center  
 Federal Aviation Administration  
 Southwest Regional Office  
 Obstruction Evaluation Group  
 10101 Hillwood Parkway  
 Fort Worth, TX 76177

Aeronautical Study No.  
 2017-WTE-887-OE

Issued Date: 05/22/2018

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: 79-06-39.85W  
 Heights: 1450 feet site elevation (SE)  
 599 feet above ground level (AGL)  
 2049 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:

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This determination expires on 11/22/2019 unless:



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This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

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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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-887-OE.

**Signature Control No: 321543823-365922609**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-887-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

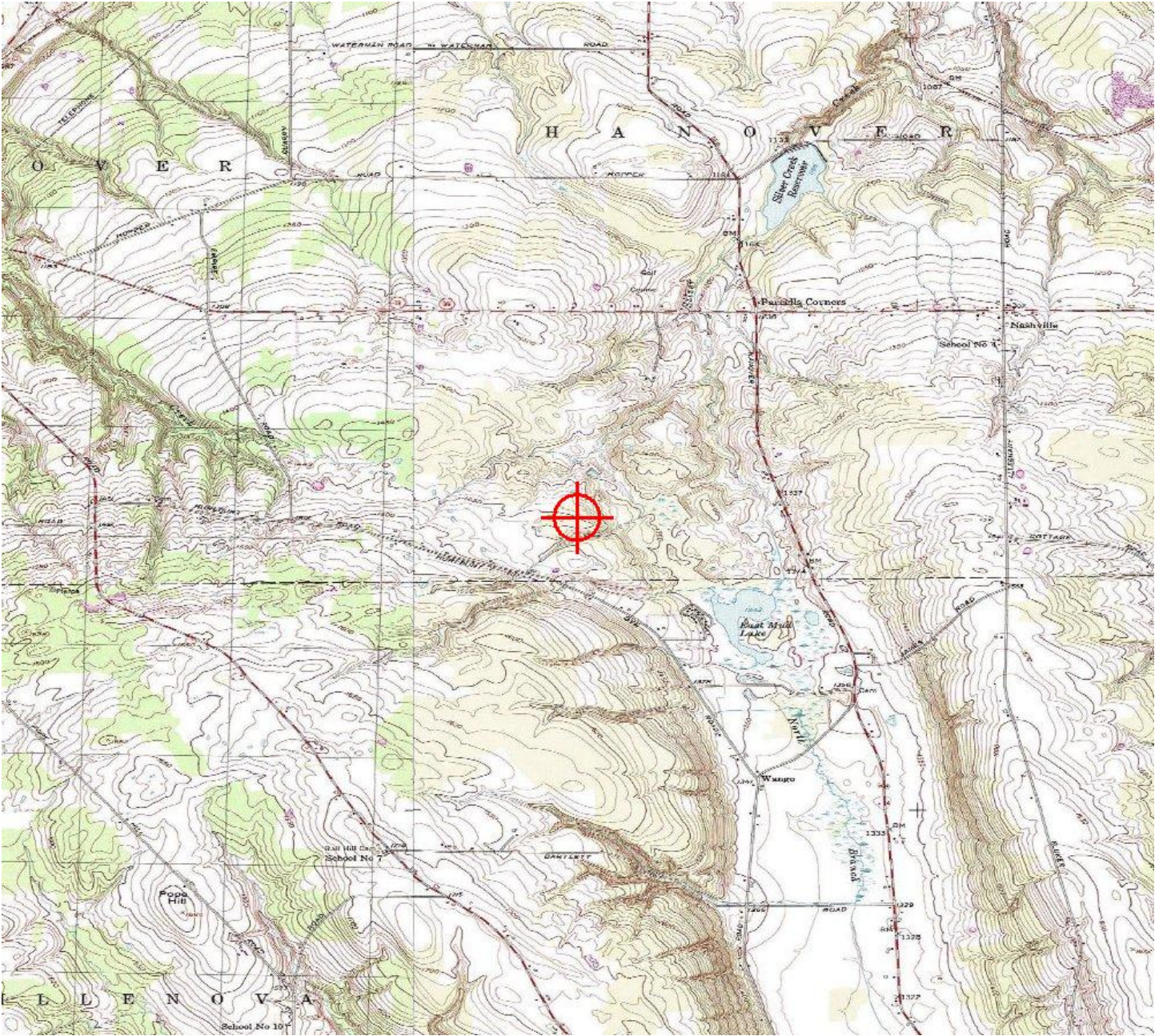
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-887-OE







Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-888-OE

Issued Date: 05/22/2018

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: 42-26-46.96N NAD 83  
Longitude: 79-07-12.25W  
Heights: 1440 feet site elevation (SE)  
599 feet above ground level (AGL)  
2039 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-888-OE.

**Signature Control No: 321543824-365922700**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-888-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
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GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.

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The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

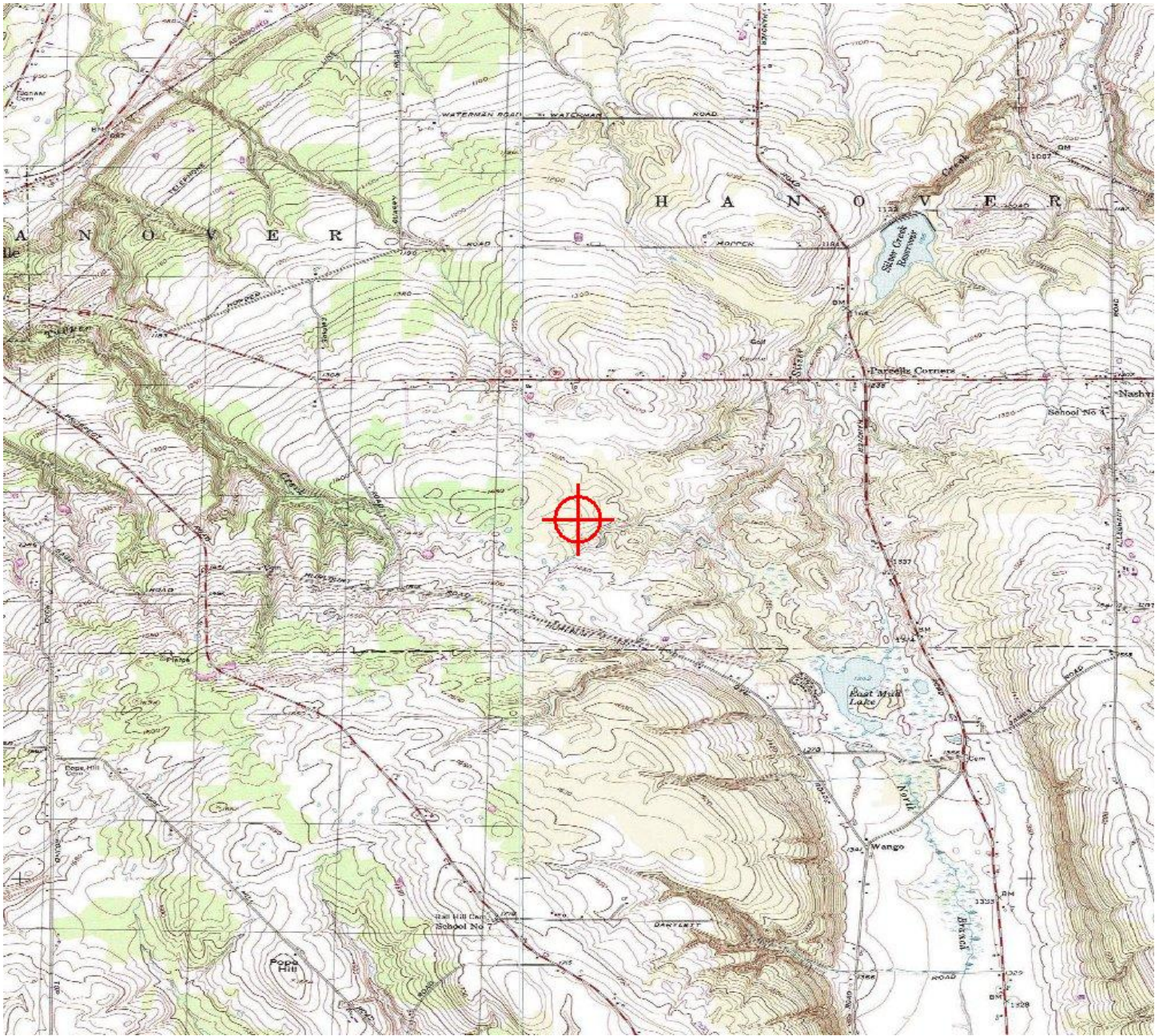
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

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Aeronautical Study No.  
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Issued Date: 05/22/2018

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: 42-26-52.62N NAD 83  
Longitude: 79-07-25.21W  
Heights: 1445 feet site elevation (SE)  
599 feet above ground level (AGL)  
2044 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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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:

- At least 10 days prior to start of construction (7460-2, Part 1)
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See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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.
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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.

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

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**Signature Control No: 321543825-365922702**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)



## Additional information for ASN 2017-WTE-889-OE

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The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

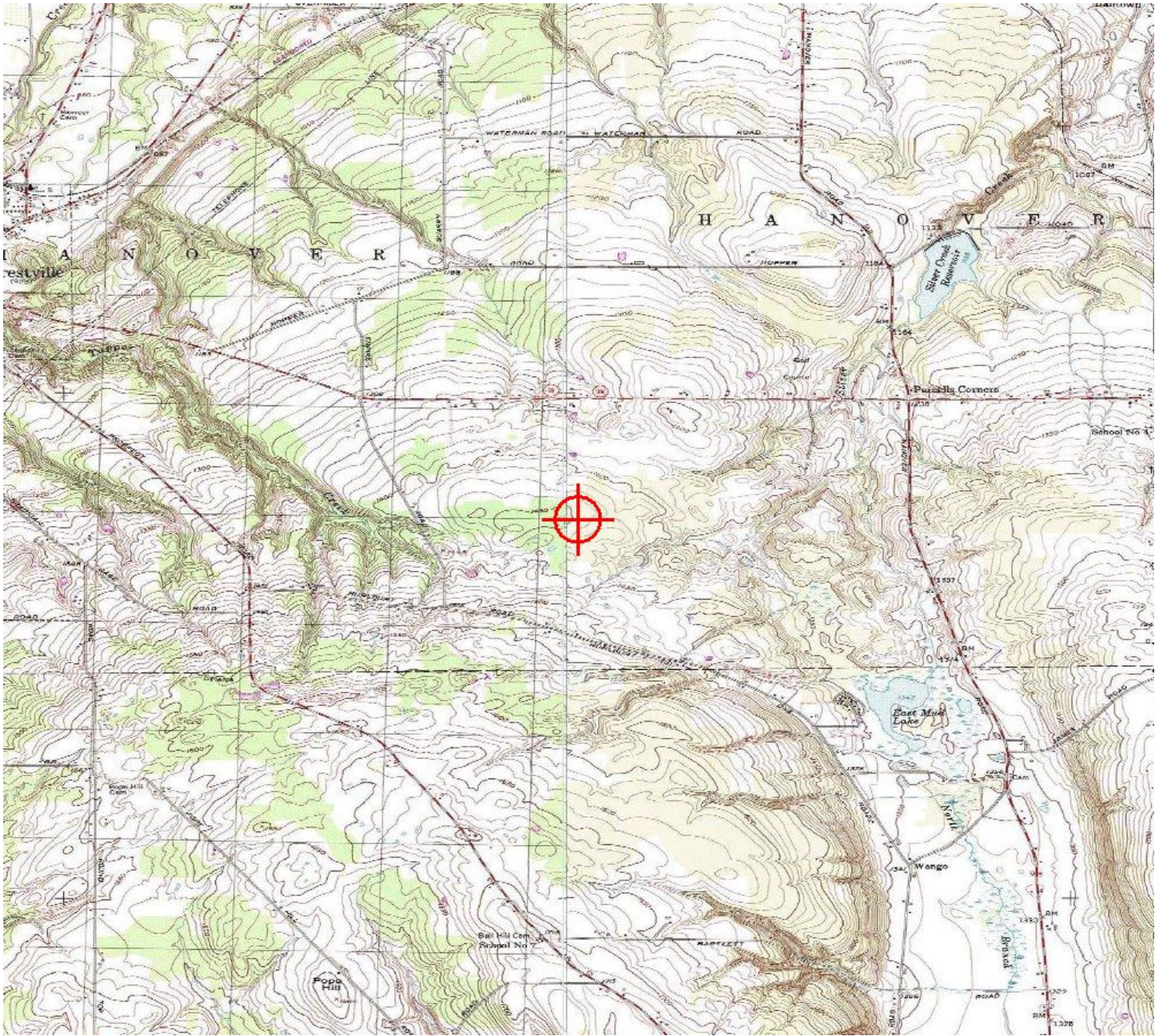
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

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10101 Hillwood Parkway  
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Aeronautical Study No.  
2017-WTE-890-OE

Issued Date: 05/22/2018

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: 42-27-04.07N NAD 83  
Longitude: 79-07-55.38W  
Heights: 1432 feet site elevation (SE)  
599 feet above ground level (AGL)  
2031 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-890-OE.

**Signature Control No: 321543826-365922706**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-890-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-878-OE exceeds the RWY 15 Diverse A departure area by 55 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,200 feet AMSL, an increase from 2,000 feet AMSL.

ASN 2017-WTE-893-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,300 feet AMSL, an increase from 2,000 feet AMSL.



ASN 2017-WTE-879-OE exceeds the RWY 15 Diverse A departure area by 84 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,400 feet AMSL, an increase from 2,000 feet AMSL.

The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

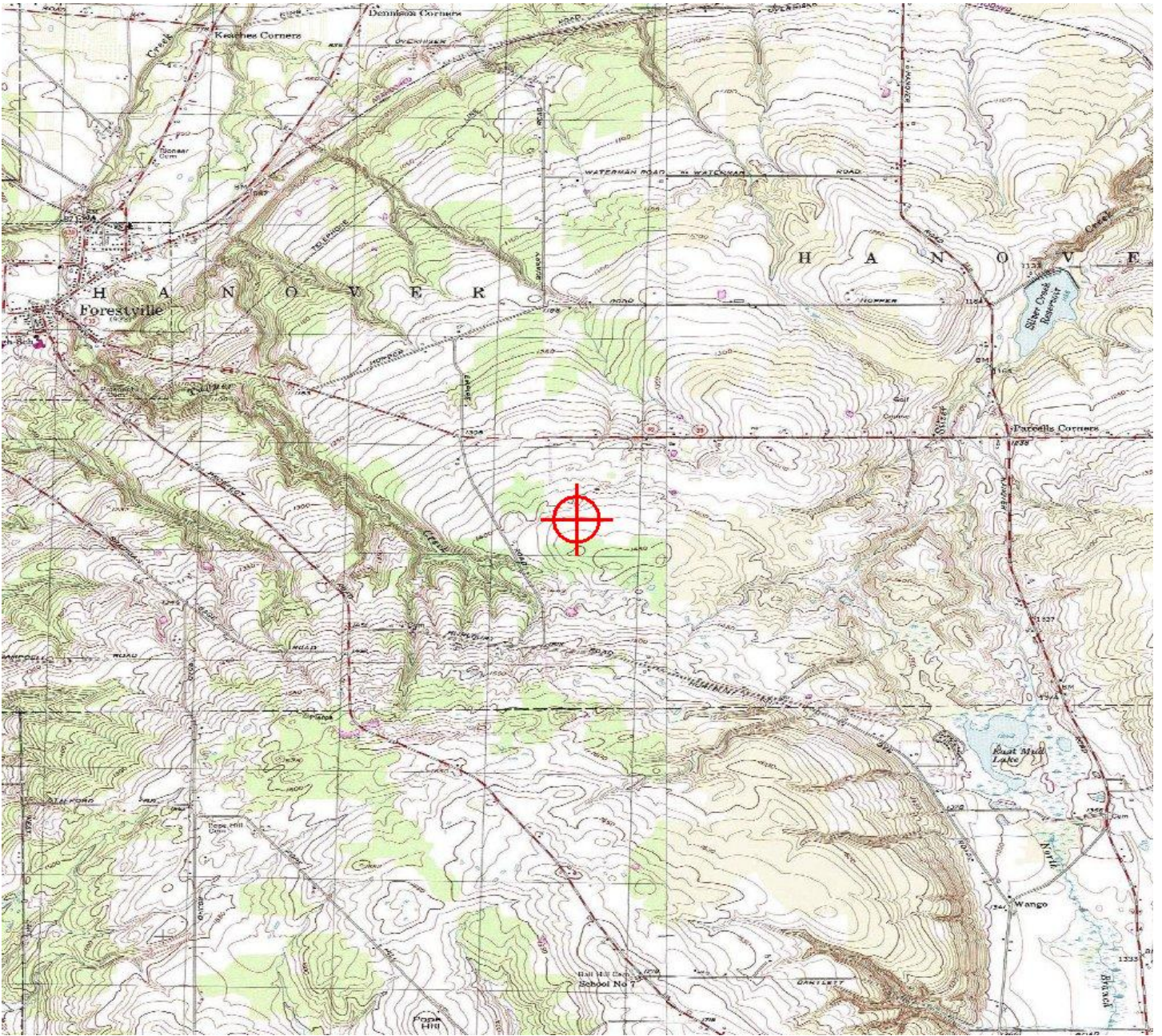
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).

TOPO Map for ASN 2017-WTE-890-OE



Sectional Map for ASN 2017-WTE-890-OE





Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-891-OE

Issued Date: 05/22/2018

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: 42-26-51.08N NAD 83  
Longitude: 79-06-09.39W  
Heights: 1371 feet site elevation (SE)  
599 feet above ground level (AGL)  
1970 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)
- Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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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.

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 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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-891-OE.

**Signature Control No: 321543827-365922711**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-891-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

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ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

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The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

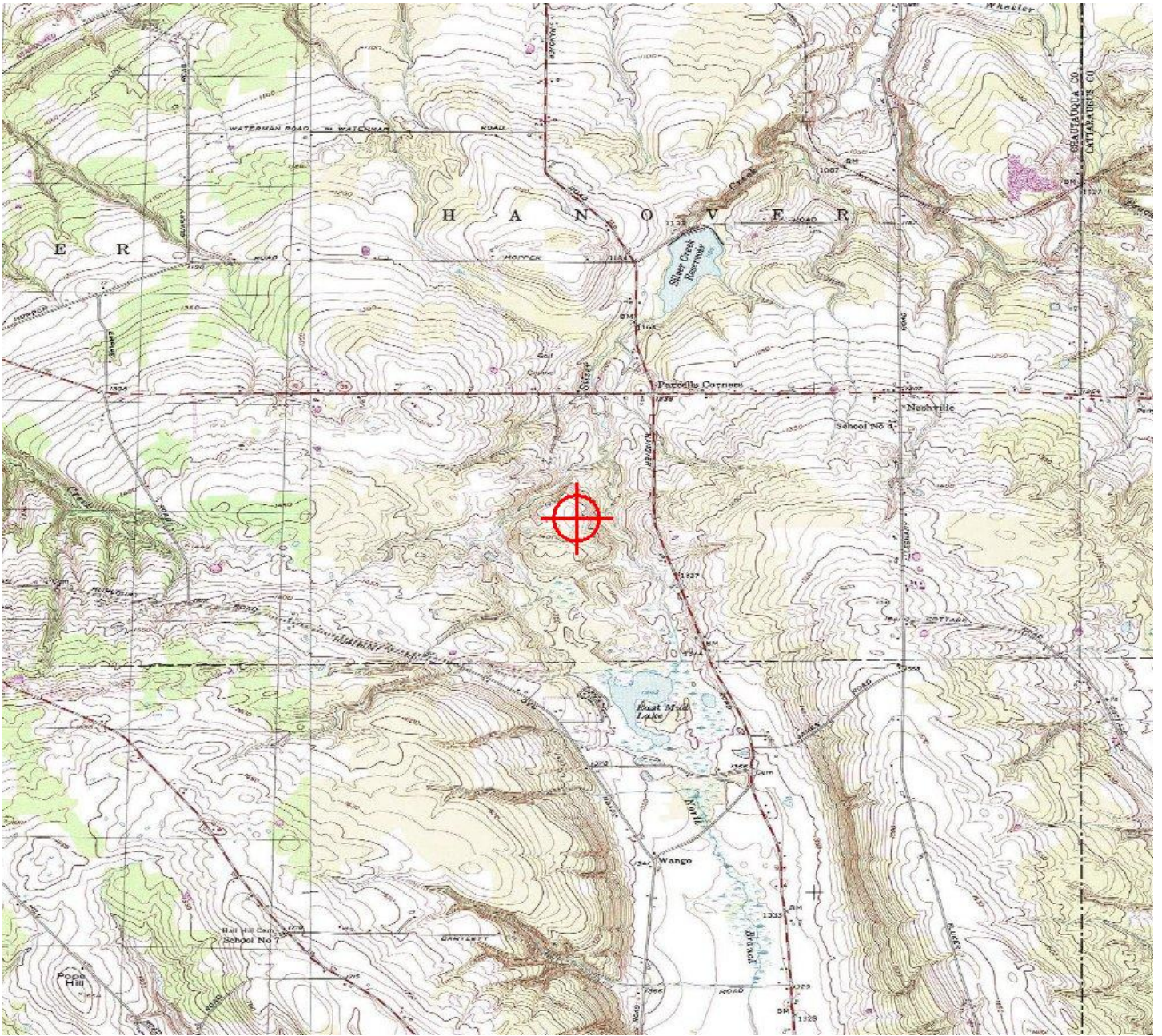
Therefore, it is determined that the proposed construction would not have a substantial adverse effect on the safe and efficient utilization of the navigable airspace by aircraft or on any air navigation facility and would not be a hazard to air navigation providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).



TOPO Map for ASN 2017-WTE-891-OE



Sectional Map for ASN 2017-WTE-891-OE





Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-892-OE

Issued Date: 05/22/2018

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:	42-27-13.41N NAD 83
Longitude:	79-06-43.92W
Heights:	1380 feet site elevation (SE) 599 feet above ground level (AGL) 1979 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:

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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

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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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-892-OE.

**Signature Control No: 321543828-365922712**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-892-OE

### Abbreviations:

AGL, Above Ground Level  
AMSL, Above Mean Sea Level  
ASR, Airport Surveillance Radar  
ASN, Aeronautical Study Number  
CFR, Code of Federal Regulations  
GPS, Global Positioning System  
NA, Not Authorized  
NEH, No Effect Height  
NM, Nautical Mile  
RNAV, Area Navigation  
RWY, Runway  
TERPS, Terminal Instrument Procedures

The proposed structures (Wind Turbines) would be located approximately 6.71 NM extending southeast to a point 9.59 NM of the Airport Reference Point for the Chautauqua County/Dunkirk Airport (DKK) Dunkirk, NY. For the sake of efficiency, the narrative below contains all of the proposed turbines that have similar impacts, the primary difference being the amount of penetration to 14 CFR Part 77 standards. Separate determinations are being made for each turbine and are available on our website at <http://oeaaa.faa.gov>. All of the proposed turbines were originally filed at 599 feet AGL. After initial review indicated considerable adverse effects, the proponent agreed to reduce the height of 2 of the turbines to what is now shown on page one.

The following would exceed the obstruction standards of 14 CFR Part 77 as follows:

Section 77.17(a)(1): A height more than 499 AGL

ASN's 2017-WTE-866, 868-870, 872-875, 877-879, 881-884, 886-893-OE exceed this standard by 100 feet. ASN 2017-WTE-876-OE exceeds by 67 feet. ASN 2017-WTE-880-OE exceeds by 88 feet

Section 77.17(a)(3): A height that increases a minimum instrument flight altitude within a terminal area (TERPS criteria).

ASN 2017-WTE-877-OE exceeds the RWY 15 Diverse A departure area by 9 feet requiring TAKE-OFF MINIMUM AND (OBSTACLE) DEPARTURE PROCEDURES RWY 15 std. with a minimum climb gradient of 354 feet per NM to 2,100 feet AMSL, an increase from 2,000 feet AMSL.

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The proposal was circularized on February 12, 2018 under ASN 2017-WTE-866-OE to all known aviation interests and to non-aeronautical interests that may be affected by the proposal. No letters of objection were received as a result of the circularization.

Aeronautical study disclosed that the proposed structure would not have a significant adverse effect on any existing or proposed arrival, departure, or en route IFR operations or procedures. No information was received indicating the penetration to the departure area would pose a problem for normal aircraft operations.

Study for possible VFR effect disclosed that the proposals would have no effect on existing or proposed VFR arrival or departure operations. The proposals are beyond traffic pattern airspace. No information was received to indicate this proposed structure would be a problem for aircraft operating in any traffic pattern. Therefore, the proposal would not have an effect on VFR traffic pattern operations at any known public use or military airports. At 599, 587, and 566 feet AGL, the structures would penetrate altitudes commonly used for en route VFR flight, however no information was received to indicate they would be located within any known regularly used VFR routes. Therefore, they would not have a substantial adverse effect on en route VFR flight operations.

The proposed structures would be appropriately obstruction marked/lighted to make them more conspicuous to airmen should circumnavigation be necessary.

The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

Therefore, it is determined that the proposed construction 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 providing the conditions set forth in this determination are met.

Additional conditions:

As a condition of this determination it is required that Notice of Actual Construction or Alteration (7460-2 Part 1) be E-filed at least 10 full days prior to the start of construction so that appropriate action can be taken to amend the effected procedure(s) and/or altitude(s).









Mail Processing Center  
Federal Aviation Administration  
Southwest Regional Office  
Obstruction Evaluation Group  
10101 Hillwood Parkway  
Fort Worth, TX 76177

Aeronautical Study No.  
2017-WTE-893-OE

Issued Date: 05/22/2018

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: 42-24-27.01N NAD 83  
Longitude: 79-10-06.69W  
Heights: 1608 feet site elevation (SE)  
599 feet above ground level (AGL)  
2207 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 to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 1, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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.

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)  
 Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

See attachment for additional condition(s) or information.

This determination expires on 11/22/2019 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 June 21, 2018. 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 of the Airspace Policy Group. Petitions can be submitted via mail to Federal Aviation Administration, 800 Independence Ave, SW, Room 423, Washington, DC 20591, via email at OEPetitions@faa.gov, or via facsimile (202) 267-9328.

This determination becomes final on July 01, 2018 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 Policy Group via telephone – 202-267-8783.

This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above. If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, 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.

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 Brian Barnes, at (816) 329-2524, or [brian.a.barnes@faa.gov](mailto:brian.a.barnes@faa.gov). On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2017-WTE-893-OE.

**Signature Control No: 321543829-365922714**

( DNH -WT )

Mike Helvey

Manager, Obstruction Evaluation Group

Attachment(s)

Additional Information

Map(s)

## Additional information for ASN 2017-WTE-893-OE

### Abbreviations:

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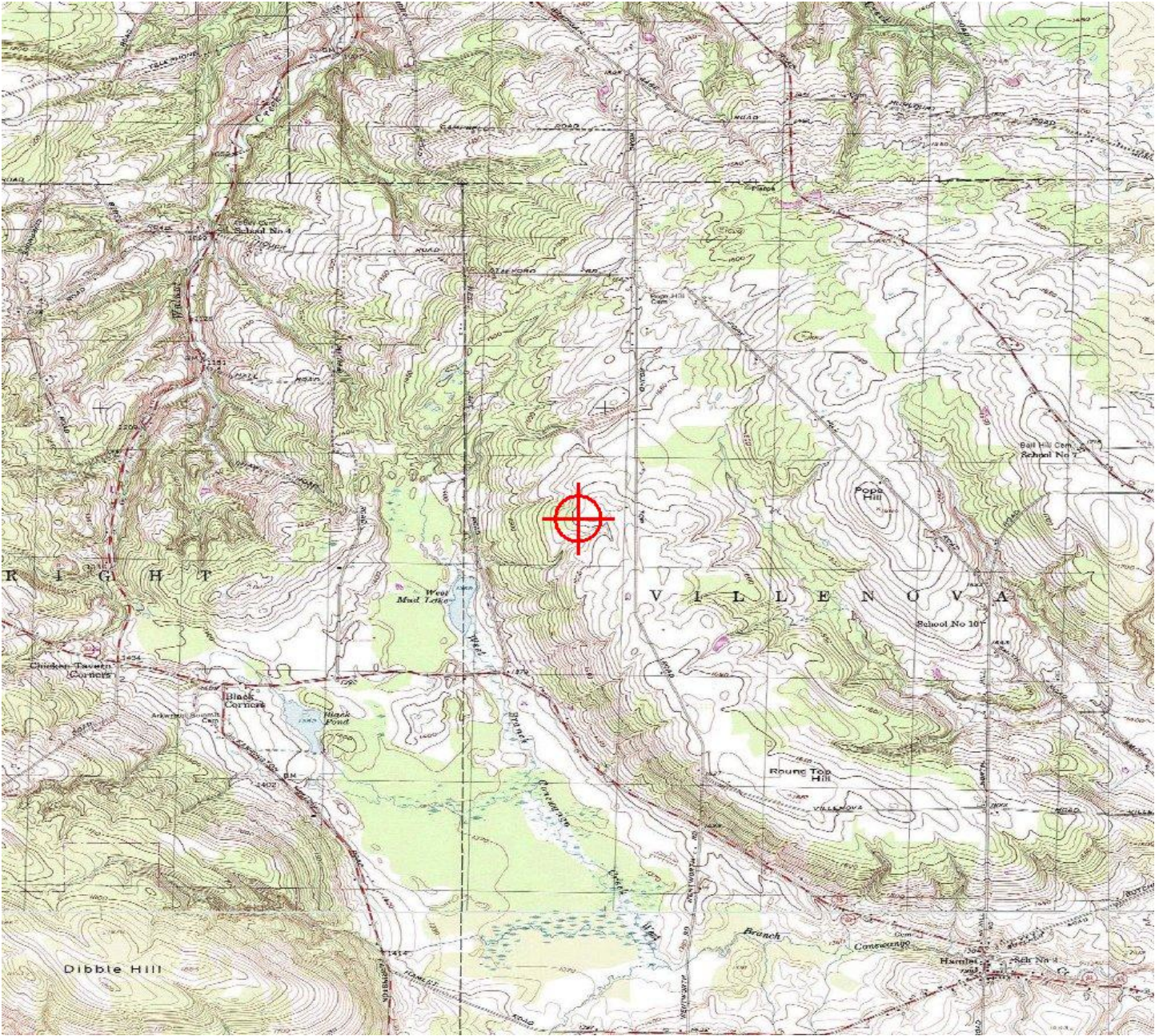
The cumulative impact of the structures, when combined with other proposed and existing structures, is not considered to be significant. Study did not disclose any significant adverse effect on existing or proposed public-use or military airports or navigational facilities, nor would the structure affect the capacity of any known existing or planned public-use or military airport.

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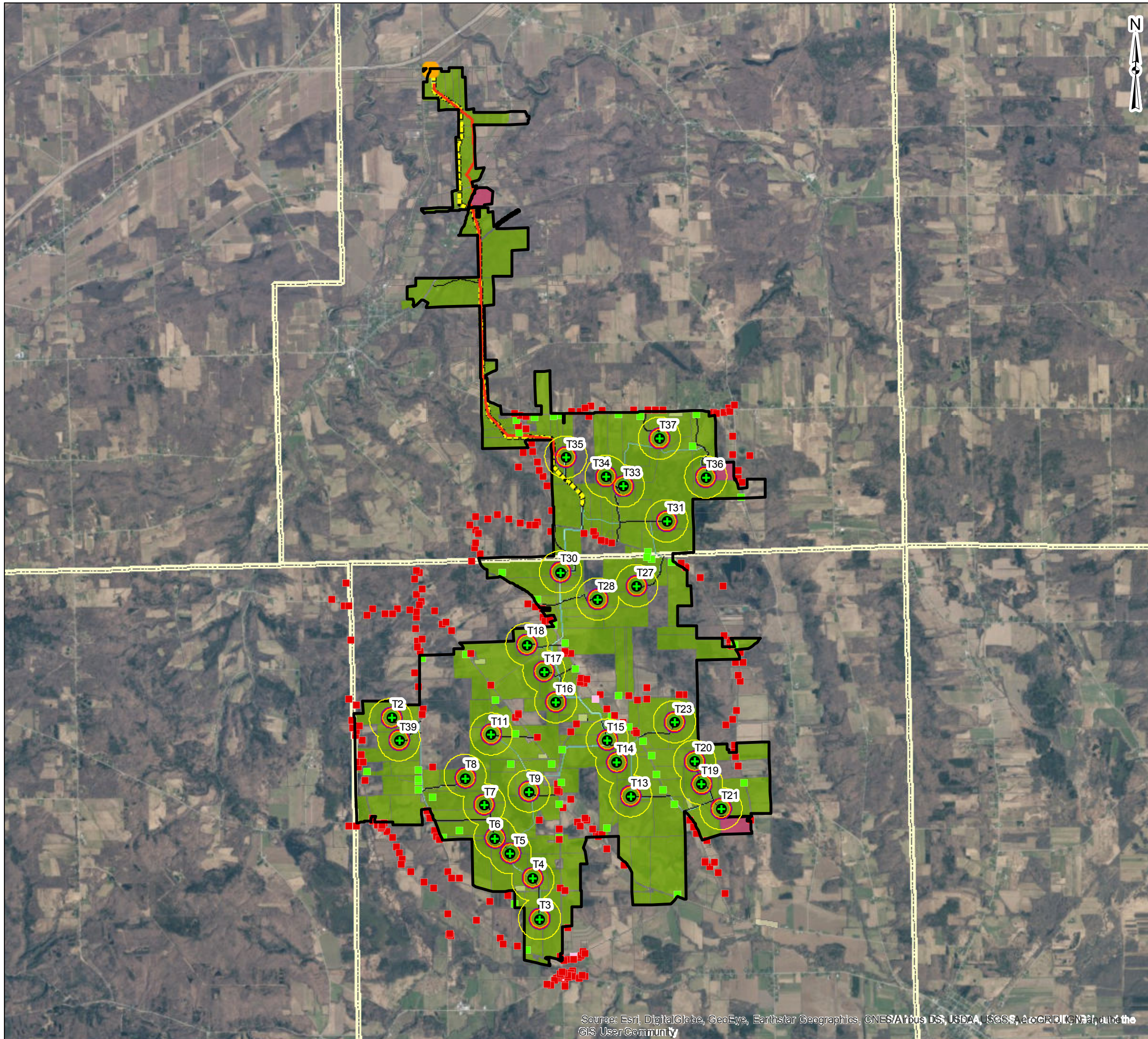
TOPO Map for ASN 2017-WTE-893-OE







# Figures



- + WECS
- 500' Buffer
- 541' Buffer
- 599' Buffer
- 1200' Buffer
- Project Boundary
- Participating Structure
- Nonparticipating Structure
- Nonparticipating Nonresidence Structure
- Point of Interconnect
- Ball Hill MW Lead Line
- Previous 115kV line
- Access Road
- Limits of Disturbance
- Collection Lines
- Town Boundary
- Additional Parcels
- Participating



SCALE 1:65,057


0 1,400 2,800 5,600 m

	FORMAT A3
DATE 07/06/2018	COORD NAD 1927 UTM Zone 17N

PROJECT New York - Ball Hill

TITLE Figure 1

**Renewable Energy Systems**



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

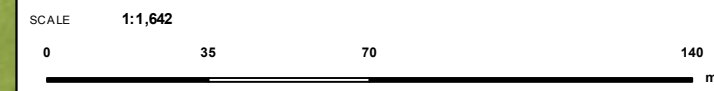
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



- 599' Buffer
- Old Location
- New Location
- Turbine Shifts
- Access Road
- Collection Lines
- Ball Hill Wind Energy Park ALTA
- Participating

Setback waivers were obtained for the instances where WECS are not in compliance with the proposed setback requirements.



FORMAT A3	
DATE 07/06/2018	COORD NAD 1927 UTM Zone 17N
PROJECT New York - Ball Hill	
TITLE Figure 2	

**Renewable Energy Systems**



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

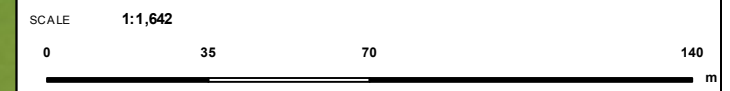
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- 599' Buffer
- + Old Location
- + New Location
- ↔ Turbine Shifts
- Access Road
- Collection Lines
- Ball Hill Wind Energy Park ALTA Parcels
- Participating

Setback waivers were obtained for the instances where WECS are not in compliance with the proposed setback requirements.



FORMAT A3	
DATE 07/06/2018	COORD NAD 1927 UTM Zone 17N
PROJECT New York - Ball Hill	
TITLE Figure 3	

**Renewable Energy Systems**

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

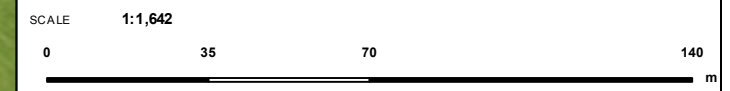
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Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community



- 599' Buffer
- + Old Location
- + New Location
- ↔ Turbine Shifts
- Access Road
- Collection Lines
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- Participating

Setback waivers were obtained for the instances where WECS are not in compliance with the proposed setback requirements.




	FORMAT A3
DATE 07/06/2018	COORD NAD 1927 UTM Zone 17N

PROJECT New York - Ball Hill

TITLE Figure 4

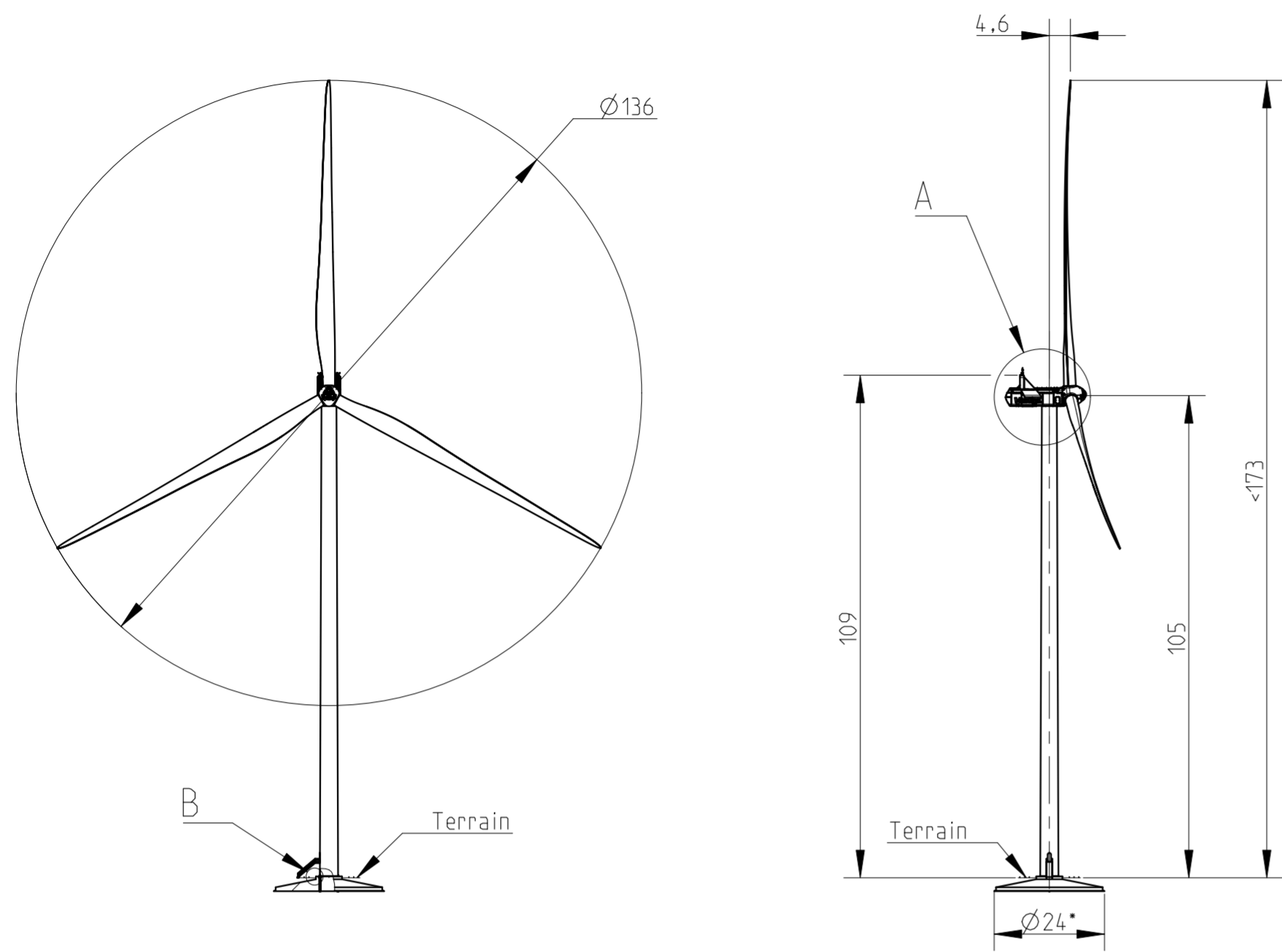
**Renewable Energy Systems**



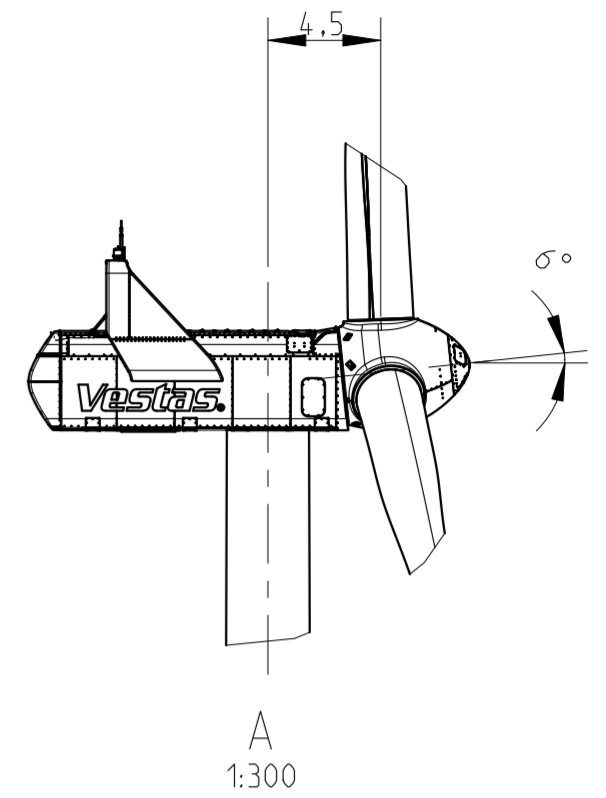
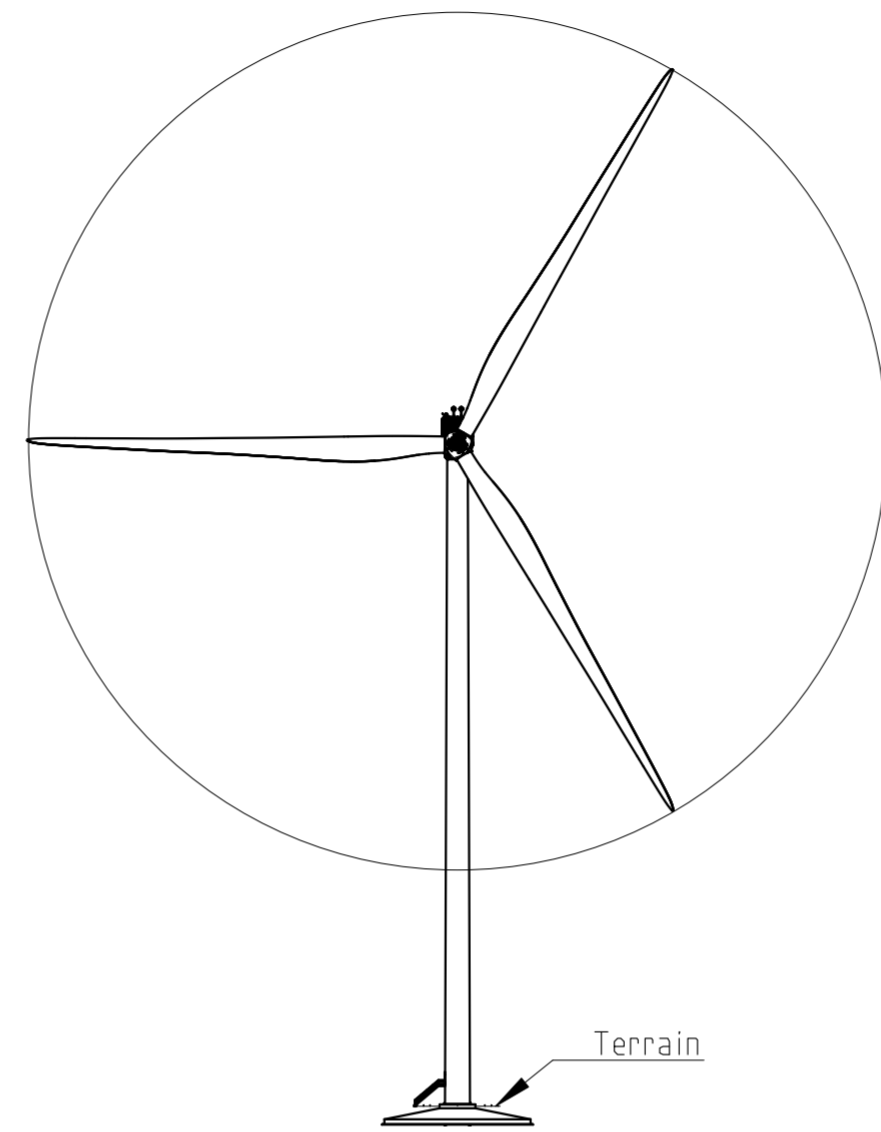
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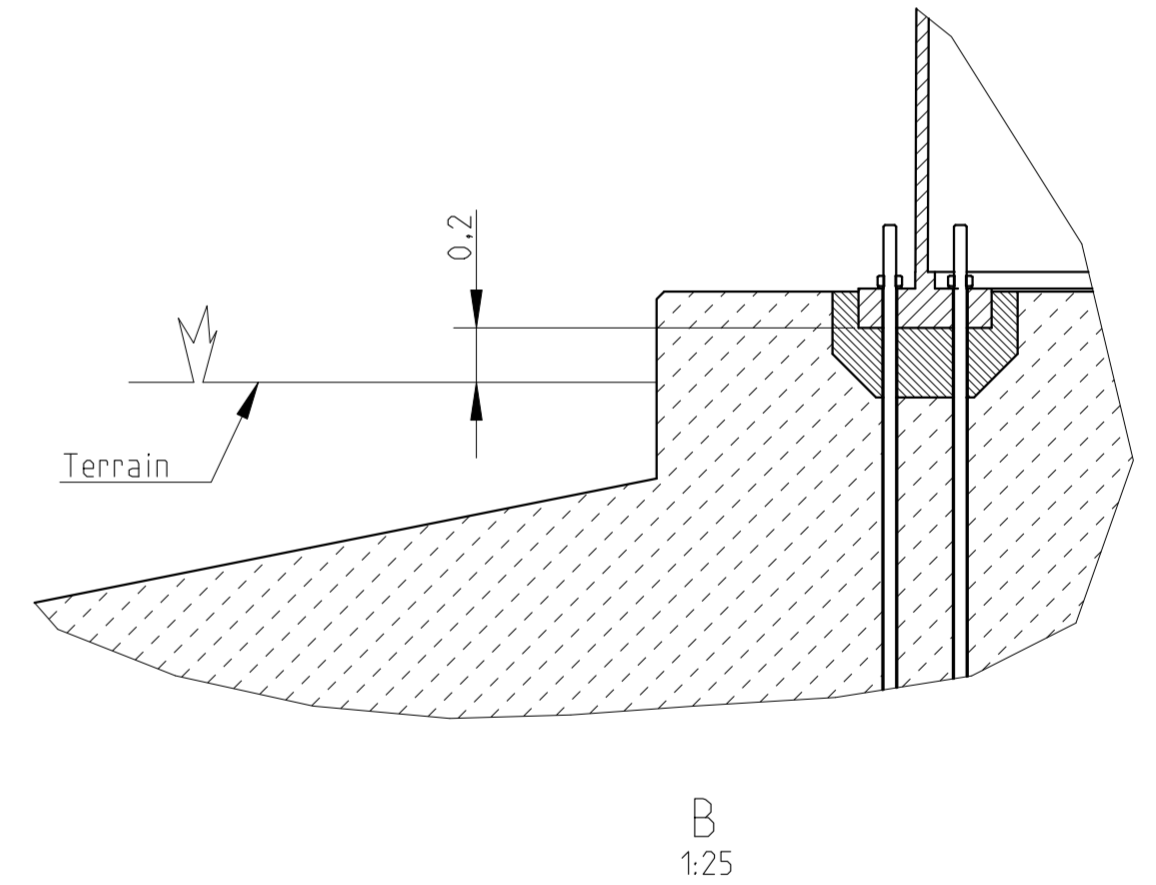
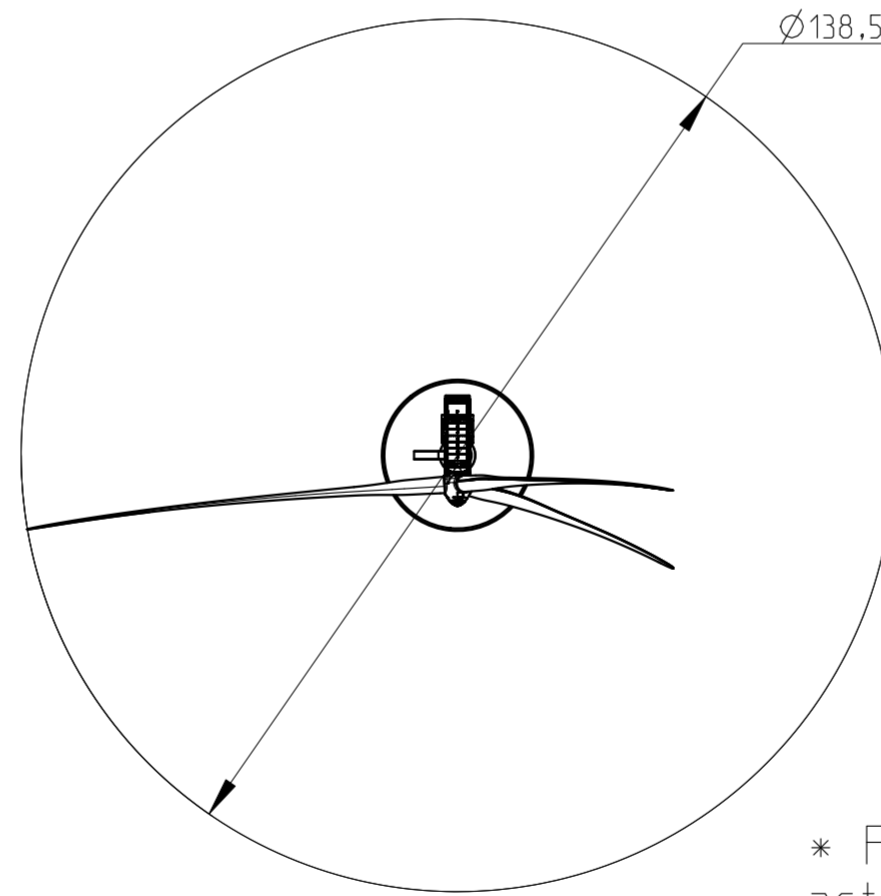
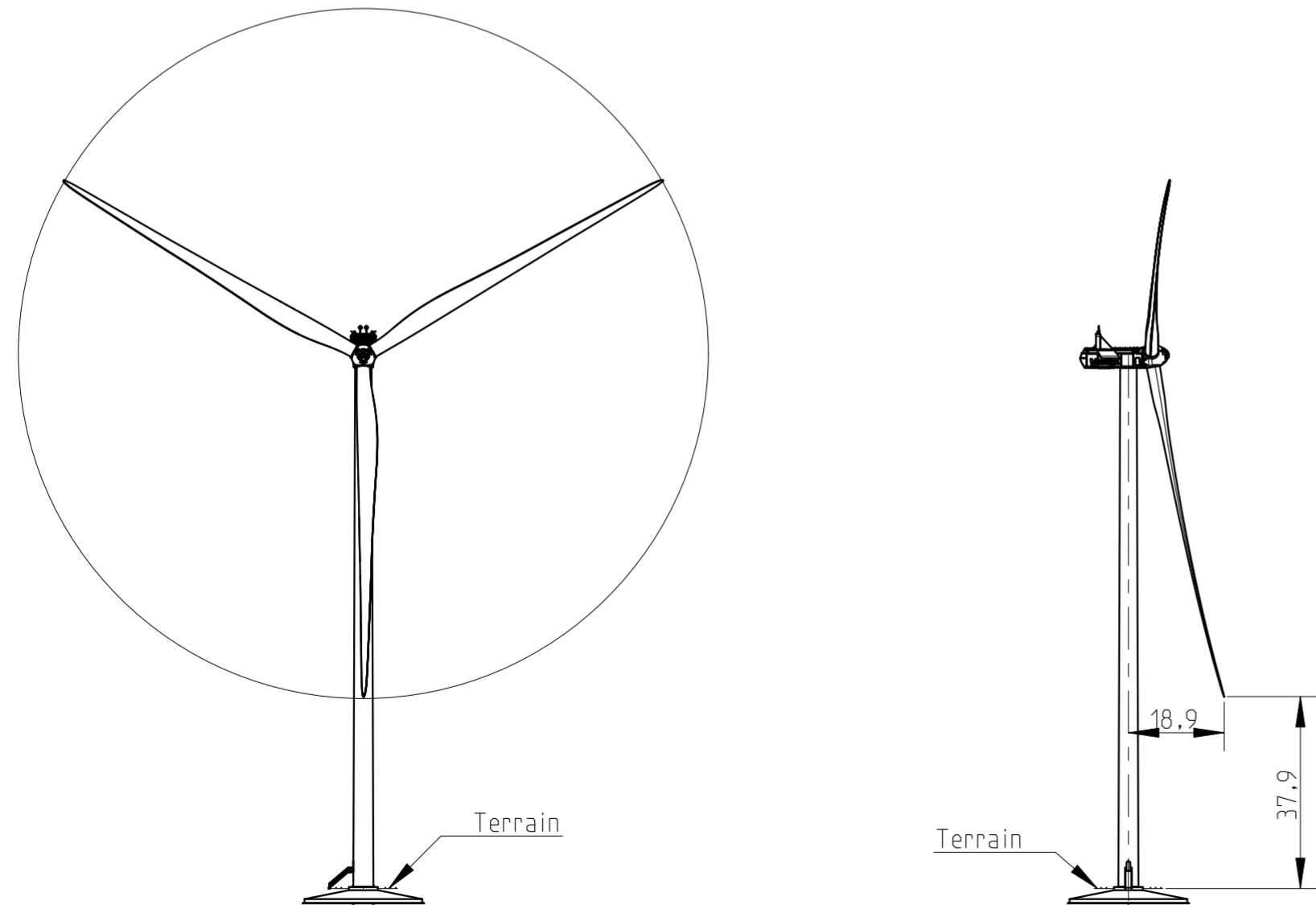
Blade in Inverted-Y Position



Blade in Horizontal Position



Blade in Y Position



\* Foundation diameter is indicative and depends on actual site condition

All dimensions are shown in meters

Item no. 0061-8179	Mass (kg) -	Certificate -	Format A2	Status -	Revised by -	Created date -	Created by -
Material / Specification -			Scale 1:1200	Change no. -	PDM ver. -	Reviewed date -	Reviewed by -
Proj. -			Item description V136 HH105				
Pro/E			Replaces / Copy of -		Drawing no. 0061-8179		Ver. 1
Metric Dimensions shown in mm unless otherwise specified			Ver. 1		Sheet 1 of 1		

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