

Visual Impact Assessment

Copenhagen Wind Project

Town of Denmark, Lewis County, and

Towns of Champion, Rutland, and Watertown, Jefferson County, New York

Prepared for:



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- Appendix A. Visual Simulations
- Appendix B. Sensitive Sites Table and Viewshed/Sensitive Site Maps (on enclosed CD)
- Appendix C. Photo Log and Field Notes (on enclosed CD)
- Appendix D. Visual Impact Assessment Rating Forms (on enclosed CD)

1.0 Introduction

edr Companies (**edr**) was retained by Copenhagen Wind Farm, LLC to prepare a Visual Impact Assessment (VIA) for the proposed Copenhagen Wind Project (the Project) located in the Town of Denmark, Lewis County and the Towns of Champion, Rutland and Watertown, Jefferson County, New York.. The purpose of this VIA is to:

- Define the visual character of the Project study area
- Inventory and evaluate existing visual resources and viewer groups
- Describe the appearance of the visible components of the proposed Project
- Identify key views for visual assessment
- Evaluate potential Project visibility within the study area
- Assess the visual impacts associated with the proposed Project

This VIA was prepared under the direct guidance of a registered landscape architect experienced in the preparation of visual impact assessments. It is also consistent with the policies, procedures, and guidelines contained in established visual impact assessment methodologies (see Literature Cited/References section).

2.0 Project Description

2.1 Project Site

The proposed Project is located on approximately 9,705 acres of leased public and private land (the Project Site) in the Town of Denmark, Lewis County and the Towns of Champion, Rutland and Watertown, Jefferson County, New York (see Figure 1). The Project Site is adjacent to, and surrounds, the Village of Copenhagen and is located approximately 1.6 miles southeast of the City of Watertown, roughly 3.5 to 5 miles south of the Villages of Black River, Great Bend and West Carthage, 2.5 miles west of the Village of Castorland and approximately 6 miles northwest of the Village of Lowville (as measured to the edge of the nearest proposed turbine site or transmission line structure). Specifically, the Project Site is bordered by State Route 12 and the Denmark/Harrisburg Townline to the south, State Route 26 to the east and local roads such as Middle Road and Stoddard Road to the north (see Figure 2).

The Project site consists of open fields, mature forests, areas of successional shrubland and wetlands, with elevations in the range of 835 to 1,500 feet above mean sea level (amsl). Land use within the Project Site is dominated by active and reverting agricultural land. With the exception of the Village of Copenhagen, the area surrounding the Project is primarily undeveloped, with farms and rural residences interspersed along area roadways. In addition to the Village of Copenhagen (population of approximately 800), more concentrated development also occurs in the nearby City of Watertown and Villages of Carthage, West Carthage and Castorland (see representative photos in Appendix C).

Figure 1. Regional Project Location.

2.2 Proposed Project

The proposed Project evaluated in this VIA is a wind-powered electric generating facility, consisting of 62 wind turbines and associated facilities (access roads, buried electrical gathering lines, two meteorological towers, collection and interconnection substations, an overhead transmission line, a construction staging area and an O&M building). The Project layout is illustrated in Figure 2. The major components of the Project are described below:

2.2.1 Wind Turbines

As presently envisioned, the Project will use the GE 1.6-100 wind turbine (or equivalent) with a rated capacity of 1.6 megawatts (MW), for a total generating capacity of 100.8 MW. For the purpose of the VIA, it is assumed that the GE 1.6-100 turbine is representative of what will be utilized for the Project in both size and appearance. Each wind turbine consists of three major components: the tower, the nacelle, and the rotor. The height of the tower, or "hub height" (height from the base of the tower to the center of the rotor hub on top of tower) will be approximately 328 feet (100 meters). The nacelle sits atop the tower, and the rotor hub is mounted on a drive shaft that is connected to the gearbox and generator contained within the nacelle. The rotor has a 328-foot (100-meter) diameter, and the total turbine height (i.e., height at the highest blade tip position) will be approximately 492 feet (150 meters). A diagram illustrating the appearance of the proposed turbine is shown in Figure 3. Descriptions of each of the turbine components are provided below:

Tower: The tubular towers used for this Project are conical steel structures manufactured in five sections, each of which are trucked separately to the site and bolted together using internal flanges. The towers have a base diameter of approximately 15 feet and a top diameter of approximately 8.5 feet. Each tower will have an access door, internal lighting, and an internal ladder to access the nacelle. The towers will be painted white to make the structure less visually obtrusive.

Nacelle: The main mechanical components of the wind turbine are housed in the nacelle. These components include the drive train, gearbox, and generator. The nacelle is housed by a steel reinforced fiberglass shell that protects internal machinery from the environment and dampens noise emissions. The housing is designed to allow for adequate ventilation to cool internal machinery, and is approximately 29 feet long, 12 feet tall, and 12 feet wide. The nacelle is externally equipped with an anemometer and a wind vane that measure wind speed and direction (information used by the turbine controller to turn the machine on and off, and to yaw it into correct position). Attached to the top of some of the nacelles will be a single, medium intensity aviation warning light, per specifications of the Federal Aviation Administration (FAA).

These will be synchronized flashing red lights (L-864 or similar) and operated only at night. The nacelle is mounted on a sliding ring that allows it to rotate or “yaw” into the wind to maximize energy capture.

Rotor: A rotor assembly is mounted on the drive shaft, and is operated upwind of the tower. Each rotor consists of three fiberglass composite blades approximately 160 feet (approximately 49 meters) in length (total rotor diameter of 328 feet). The rotor attaches to the drive shaft at the front of the nacelle. Electric servo motors within the rotor hub vary the pitch of each blade according to wind conditions, which enable the turbine to operate efficiently at varying wind speeds. The wind turbines begin generating energy at wind speeds as low as 3.0 meters per second (m/s) (7 mph) and automatically shut down at wind speeds above 25 m/s (56 mph). The maximum rotor speed is approximately 16 revolutions per minute (rpm).

Figure 2. Project Layout

Figure 3. Diagram of Proposed Turbine

2.2.2 Electrical System

To deliver power to the New York State power grid, the Project Sponsor proposes to construct a substation/switchyard facility located north of Route 12 in the Town of Denmark. This station will connect to the power grid via a newly constructed 115kV electrical interconnection line connecting to the National Grid East Watertown substation located in the Town of Watertown. The interconnection route will be comprised of approximately 9 miles of overhead line on wooden or steel pole structures, and located within the interconnection corridor located in the Towns of Rutland, Champion and Watertown, Jefferson County. See Figure 2 for the proposed Project layout.

The proposed Project is anticipated to have an electrical system that consists of the following parts: 1) a system of buried 34.5 kV shielded and insulated cables that will collect power from each wind turbine (“electrical gathering lines”), 2) a substation/switchyard to step up the power from 34.5 kV to 115 kV, 3) and a 115kV electrical interconnection line connecting to the National Grid East Watertown substation located in the Town of Watertown. Each of these components is described below:

Buried Electrical Gathering Line Collection System: A transformer located near the base of the tower, or the interior of the nacelle, will raise the voltage of electricity produced by the turbine generator up to the 34.5 kV voltage level of the collection system. From the transformer, three power cables along with the fiber optic communication cables will collect the electricity produced by wind turbine generators to be connected through underground circuits. The electrical gathering line system will total approximately 24 miles in length and will typically be installed adjacent to Project access roads, where feasible. Because buried lines will have little, if any visual impact, these components of the Project are not addressed in this VIA.

Substation/Switchyard: This is the terminus of the collection system, and will be located at the beginning of the proposed 115 kV transmission line within the Project site adjacent to New York State (NYS) Route 12. The substation/switchyard will transform the voltage of the buried gathering line system from 34.5 kV to 115 kV. The substation/switchyard will be approximately 250 by 400 feet in size, surfaced with crushed stone, and enclosed within a chain link fence. It will include 34.5 and 115 kV busses, a transformer, circuit breakers, towers, a control building, and related structures. It is anticipated that the substation/switchyard will be located approximately 25 feet from the nearest public road (NYS Route 12). Because the substation/switchyard has not been designed at this time, this component of the Project is not addressed in this VIA.

Overhead Transmission Line: This station will connect to the power grid via a newly constructed 115kV electrical interconnection line connecting to the National Grid East Watertown substation located in the Town of Watertown. The interconnection line will be approximately 9 miles long and within the interconnection corridor located in the Towns of Rutland, Champion and Watertown, Jefferson County. The line will traverse a forested slope and agricultural fields, and will be carried on wooden or steel pole structures that range from 50 to 80 feet in height. Because design of the transmission line has not yet been finalized, its visibility and visual impact are not addressed in this study.

2.2.3 Access Roads

The Project site includes an extensive network of existing state, county and local roads. Therefore, wherever it is practical, existing roads will be used to access the proposed Project. However, it is possible that some existing public roads will need to be improved to facilitate Project construction. Although the location and extent of these public road improvements is currently in the planning process, they would generally be temporary (e.g., intersection widening and “jug handles” to accommodate oversized vehicles), and are not anticipated to significantly change the character of the existing roads. Therefore public road improvements are not evaluated in this study.

In addition to using the existing public roads, the Project will require the construction of new or improved private roads to access individual turbine sites. The total length of access roads required to service all proposed wind turbine locations and substation is approximately 17 miles, much of which will be upgrades to existing farm lanes. The proposed locations of Project access roads are shown in Figure 2. During construction, access roads will be gravel surfaced and up to 40 feet wide to accommodate construction vehicles, component delivery and crane travel. Following construction, roads will be restored for use as permanent access roads. The permanent roads will be gravel-surfaced and approximately 16 feet in width. These access roads generally take on the appearance of farm lanes, and do not have a significant long-term visual impact. Access roads and associated clearing will be shown in any simulations where they would be visible, however, beyond this, the visibility and visual impact of Project access roads, on their own, are not evaluated in this study.

2.2.4 Wind Measurement Towers

Three permanent 328-foot (100-meter) tall wind measurement towers (“meteorological towers”) will be installed to collect wind data and support performance testing of the Project. The towers will be galvanized tubular or lattice steel structure, and will be equipped with wind velocity and directional measuring instruments at three different elevations. The permanent meteorological towers will be located on hilltops in the northern, eastern, and southwestern portions of the

Project site. A red aviation warning light will be mounted at the top of the towers. Meteorological towers typically have limited visibility and visual impact relative to the adjacent turbines, and are generally not included in visual impact assessments for wind projects. Consequently, this component of the Project is not addressed in this study.

2.2.5 Staging Area

Construction of the Project will require the development of a temporary construction staging area, which will accommodate construction trailers, storage containers, large project components, and parking for construction workers. The staging area is anticipated to be up to 11.5 acres in size, and will be located on participating land located on NYS Route 12 (see Figure 2). No fencing or lighting of the staging area is proposed. Because the staging area will be temporary, and the site restored following construction, the visual impact of this Project component is not being addressed in this study.

2.2.6 Operations and Maintenance Facility

An O&M building and associated storage yard will be constructed to house a temporary construction site office, parking, operations personnel, equipment, and materials and provide staff parking. The O&M facility is anticipated to be located within the staging area (including driveway and parking area) and will be located on participating land located approximately 200 feet from NYS Route 12 (see Figure 2). Due to its similarity in appearance to other pole barns and utility structures in the area, and relatively minimal visual effect relative to other project facilities, the O&M facility is not addressed in this study.

3.0 Existing Visual Character

3.1 Visual Study Area

The visual study area for the Project includes two components: the area within a five-mile radius of each of the proposed turbines and the area within a one-mile radius of the proposed transmission line. A five-mile radius study area for assessment of turbine visibility was adopted based on established state agency guidance (e.g. NYSDEC, 2000; NYSOPRHP, 2006). Although no formal guidance is available regarding an appropriate study area for assessment of transmission line visibility, a one-mile study area was adopted as it is typically used as an industry standard for visual assessments of small projects such as electrical utility lines, buildings, and/or communication towers. It is anticipated that visibility of the transmission line will be primarily limited to road crossings and areas adjacent to the proposed transmission line. The visual study area covers approximately 190 square miles and, within Lewis County, includes all or portions of the Villages of Copenhagen and Castorland, and the Towns of Denmark, Croghan, New Bremen, Lowville, Harrisburg and Pinckney. Within Jefferson County, the visual study area includes all or portions of the Villages of West Carthage and Carthage, and the Towns of Champion, Rutland, Watertown and Wilna. The visual study area is illustrated in Figure 4.

Figure 4. Visual Study Area

3.2 Physiographic/Visual Setting

3.2.1 Landform and Vegetation

The visual study area includes the northernmost extent of the Tug Hill Plateau physiographic region of New York (Reschke 1990), as well as portions of the Black River Valley. The Tug Hill Plateau is distinguished by elevated, but relatively level to undulating topography. The Black River Valley defines the northeastern perimeter of the plateau. Within the 5 mile-radius visual study area, steep slopes are confined to the ravines and gorges associated with streams such as the Deer River and Sandy Creek (or their tributaries). Elevations within the visual study area range from approximately 740 to 1,600 feet above mean sea level (amsl).

Vegetation in the study area is characterized by a roughly 60:40 mix of open fields and forest. Open fields include active cropland and pasture, as well as successional old fields and shrubland, and generally occur on the more level or gently sloping areas within the study area. Forest vegetation is primarily deciduous (northern hardwoods) mixed with some conifers (white pine, hemlock and spruce) and typically occurs in wooded wetlands, woodlots, hedgerows and along stream banks. Larger more contiguous areas of forest occur in the Tug Hill Plateau portion of the study area located south of the project site, and include Cobb Creek, Lookout, and Pinckney State Forests.

3.2.2 Land Use

Land use within the study area is for the most part agricultural and rural residential, interspersed with small, well defined hamlets. Rural portions of the area are dominated by open land (agricultural and undeveloped), farms and scattered rural residences. Dairy farming is the dominant agricultural use in the area, and contributes significantly to its bucolic character and open, long distance views that are available. Higher density residential and commercial development is concentrated in the Village of Copenhagen and in small hamlets such as Champion, West Carthage, Deer River, Castorland, and South Rutland, and along major roads such as New York State (NYS) Routes 12, 26, 126, 177, and 410. Copenhagen is the largest residential and commercial center within the study area. It includes older, but generally well-maintained homes along streets that are typically lined with mature trees. The Village includes a main commercial district along High Street (NYS Route 12), along with businesses and industries around the Village perimeter. Hamlets within the study area are relatively small pockets of development within a primarily rural/agricultural landscape. Outside of the Village of Copenhagen, commercial and industrial uses within the study area are generally limited to small rural businesses and communication antennas. The existing Maple Ridge Wind Farm, constructed in 2006 in the southeastern portion of the study area, is a notable and prominent commercial land use in the study area.

3.2.3 Water Features

Water features within the study area include the Black River, Deer River, Sandy Creek, numerous associated tributaries, Pleasant Lake and a few small ponds. The Black River and the associated broad valley are dominant landscape features running through the northeast periphery of the study area. Recreational use of the Black River (and other water features within the study area to a lesser extent) includes boating, swimming, fishing, bird watching, and hunting.

3.3 Landscape Similarity Zones

Within the visual study area, four distinct landscape similarity zones (LSZ) were defined. The approximate location of these zones is illustrated in Figure 5, along with representative photos of each. Their general landscape character, use, and potential views to the proposed Project are described below.

3.3.1 Zone 1: Rural Uplands

The Rural Uplands LSZ makes up the majority of the visual study area, and is characterized by open agricultural land on elevated level areas, rolling hills and slopes, with widely dispersed farms and rural residences along a network of county and local roads. Active agricultural fields (corn, hay, pasture, etc.), bordered by hedgerows and scattered deciduous woodlots, dominate the landscape. Topography is generally level or undulating throughout this zone. Views in the Rural Uplands are generally open, at times expansive on hilltops, and include a patchwork of fields, fenced pastures, and woodlots, punctuated by barns and silos. Livestock and working farm equipment are often seen in the fields. The existing Maple Ridge Wind Farm is a prominent commercial land use in the southeastern part of the study area. Due to the elevation and the abundance of open fields in this LSZ, foreground (<0.5 mile), mid-ground (0.5-3.5 miles), and background (>3.5 miles) views of the proposed Project will be available from many areas within the Rural Uplands LSZ.

3.3.2 Zone 2: Rural Valleys

This LSZ is located in the level, broad, more low-lying area within the Black River Valley. Some larger sized farms and broader flatter fields occur within this zone. The Rural Valley zone includes pastureland for livestock, hay and other feed crops, idle areas, river/stream channels with numerous turns and oxbows, and floodplain wetlands. Views in this zone generally include a relatively level and open foreground backed by hillsides that feature a patchwork of fields and woodlots, and an upward orientation. Under these viewer circumstances, structures and forest vegetation will generally not provide significant screening. However, hedgerows and small patches of vegetation frequently break up the agricultural fields, and may block or screen some longer-range views from within this zone. Typical views in this LSZ can be experienced along NYS Routes 126 and 410.

3.3.3 Zone 3: Forest Land

Forest land is another significant LSZ within the visual study area. It is characterized by the dominance of forest vegetation (mixed deciduous and coniferous tree species), and occurs on hillsides and in narrow ravines throughout the study area, and in larger blocks in the southern portion of the study area. Views in the Forest Land zone are typically limited due to the screening provided by overstory trees. Views are generally restricted to areas where small clearings and road cuts provide breaks in the tree canopy. Where long distance views are available within this zone, they are typically of short duration, limited distance, and/or framed by trees. Land use in this zone includes forestry, low-density residential development, and recreational use (hunting, snowmobiling, etc.). The largest area areas of contiguous forest occur in the southern portion of the study area and include Cobb Creek, Lookout, and Pinckney State Forests.

3.3.4 Zone 4: Village/Hamlet

This LSZ includes the Village of Copenhagen and hamlets of Champion, West Carthage, Deer River, Castorland, and South Rutland. This zone is characterized by low to moderate-density residential (and limited commercial retail) development, generally oriented along a primary road (typically a state highway). Vegetation and landform contribute to visual character in the village and hamlet areas, but within the majority of this zone, buildings (typically 1-2 stories tall) and other man-made features dominate the landscape. Structures are variable in their size and arrangement, but tend to be of an older/traditional architectural style in the village core, and of a more modern, commercial character on the peripheries of village/hamlet areas. Activities within this zone are primarily associated with residential use, small commercial businesses, and local travel. Views within this zone are typically focused on the roadways and adjacent structures, although outward views across yards and adjacent fields are also available. Open views are most likely from open road corridors and the edges of the Village/Hamlet zone, where housing and vegetation density decrease and therefore screening is reduced.

Figure 5. Landscape Similarity Zones

6 Sheets

3.4 Distance Zones

Three distinct distance zones are typically defined in visual studies. Consistent with well-established agency protocols (e.g., Jones and Jones 1977; U.S. Forest Service, 1995), **edr** generally defines these zones as follows:

- *Foreground:* 0 to 0.5 mile. At these distances, a viewer is able to perceive details of an object with clarity. Surface textures, small features, and the full intensity and value of color can be seen on foreground objects.
- *Mid-ground:* 0.5 to 3.5 miles. The mid-ground is usually the predominant distance at which landscapes are seen. At these distances a viewer can perceive individual structures and trees but not in great detail. This is the zone where the parts of the landscape start to join together; individual hills become a range, individual trees merge into a forest, and buildings appear as simple geometric forms. Colors will be clearly distinguishable, but will have a bluish cast and a softer tone than those in the foreground. Contrast in color and texture among landscape elements will also be reduced.
- *Background:* Over 3.5 miles. The background defines the broader regional landscape within which a view occurs. Within this distance zone, the landscape has been simplified; only broad landforms are discernable, and atmospheric conditions often render the landscape an overall bluish color. Texture has generally disappeared and color has flattened, but large patterns of vegetation are discernable. Silhouettes of one land mass set against another and/or the skyline are often the dominant visual characteristics in the background. The background contributes to scenic quality by providing a softened background for foreground and mid-ground features, an attractive vista, or a distant focal point.

3.5 Viewer/User Groups

Three categories of viewer/user groups were identified within the visual study area. These include the following:

3.5.1 Local Residents

Local residents include those who live and work within the visual study area. They generally view the landscape from their yards, homes, local roads, schools, and places of employment. Residents are concentrated in and around the Village of Copenhagen and various hamlets, but occur in relatively low density throughout the visual study area. Except when involved in local travel, residents are likely to be stationary, and have frequent or prolonged views of the landscape. Local residents may view the landscape from ground level or elevated viewpoints (typically upper floors/stories of homes).

Residents' sensitivity to visual quality is variable. However, it is assumed that residents may be very sensitive to changes in views from their homes and yards.

3.5.2 Through-Travelers/Commuters

Commuters and travelers passing through the area view the landscape from motor vehicles on their way to work or other destinations. Commuters and through-travelers are typically moving, have a relatively narrow field of view, and are destination oriented. Drivers on major roads in the area (e.g., NYS Routes 12, 26, 126, 177, and 410) will generally be focused on the road and traffic conditions, but do have the opportunity to observe roadside scenery. Passengers in moving vehicles will have greater opportunities for prolonged off-road views than will drivers, and accordingly, may have greater perception of changes in the visual environment.

3.5.3 Tourists/Recreational Users

Recreational users and tourists include local residents and out-of-town visitors involved in cultural and recreational activities at parks and historic sites, water bodies, and in undeveloped natural settings such as state forests. These viewers are concentrated on the major roadways and in the recreational facilities/cultural sites located within the visual study area, including Pleasant Lake, the Black River, various historic sites, and several state forests. Members of this group may view the landscape from area highways while on their way to these destinations, or from the sites themselves. This group includes snowmobilers, bicyclists, recreational boaters, hunters, fishermen, and those involved in more passive recreational activities (e.g., family vacations, picnicking, sightseeing, or walking). Visual quality may or may not be an important part of the recreational experience for these viewers. However, for some, scenery will be a very important part of their experience and in almost all cases enhances the quality of recreational experiences. Recreational users and tourists will often have continuous views of landscape features over relatively long periods of time. However, most recreational viewers and tourists will only view the surrounding landscape from ground-level or water-level vantage points.

3.6 Visually Sensitive Resources

To identify visually sensitive resources within the visual study area, **edr** consulted a variety of data sources including digital geospatial data (shapefiles) obtained primarily through the NYS GIS Clearinghouse or the Environmental Systems Research Institute (ESRI); numerous national, state, county and local agency/program websites as well as websites specific to identified resources; the DeLorme Atlas and Gazetteer for New York State; USGS 7.5-minute topographical maps; and web mapping services such as Google Maps. Identified aesthetic resources of statewide or local significance

and areas of intensive land use within five miles of the proposed Project are listed in Table A in Appendix B. The location of visually sensitive resources within the visual study area is illustrated in Figure 6, and on the viewshed/sensitive site maps included in Appendix B.

3.6.1 Aesthetic Resources of Statewide Significance

The Project's visual study area includes 54 sites (almost exclusively historic sites) that New York State Department of Environmental Conservation (NYSDEC) Program Policy DEP-00-2 *Assessing and Mitigating Visual Impacts* (NYSDEC, 2000) considers aesthetic resources of statewide significance (see Appendix B). These include the following:

Sites Listed on or Eligible for Listing on the State and/or National Register of Historic Places (NRHP):

edr reviewed the National Register of Historic Places (NRHP) and New York State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP) websites as well as NYSOPRHP shapefile for buildings, structures, objects and historic districts listed in the National Register of Historic Places to identify significant historic buildings and/or districts located within five miles of the Project (NRHP, 2012; NYSHPO, 2012a). The visual study area includes one property, the Hiram Hubbard House, that is listed on the NRHP. The Hiram Hubbard House is an eight-acre property with a gray limestone house constructed in 1820, located on State Route 126 in the Hamlet and Town of Champion. Currently, the structure is undergoing restoration by the 4 River Valleys Historical Society with intended future use as society headquarters, research center, meeting place and museum (4 River Valleys Historical Society, 2012).

Additionally, the Phase 1A Cultural Resources Survey prepared for the Project was consulted to identify resources that have been formally determined to be eligible for listing on the NRHP (**edr**, 2012). The visual study area includes four historic districts (that include a total of 36 contributing properties) and 12 individual properties that have formally been determined to be NRHP-Eligible¹. Of the four NRHP-eligible districts, two are located in the Village of Copenhagen and the remaining two are located in the Towns of Harrisburg and Lowville. Identified NRHP-eligible properties include residences, cemeteries, farms, bridges, parks, and various other structures. These properties are scattered throughout the study area, but are most heavily concentrated in the Village of Copenhagen and the Hamlet of Burrville.

State Parks:

Review of the NYSOPRHP website indicates that there are no New York State Parks located within the visual study area (NYSOPRHP, 2012b).

¹ Note that 11 of these NRHP-eligible properties are located within five miles of the proposed wind turbines. The other property is located within one-mile of the proposed transmission line corridor, but greater than five miles from the nearest proposed turbine.

Urban Cultural Parks/Heritage Areas:

Urban Cultural Parks are now known as Heritage Areas, which represent a “state-local partnership established to preserve and develop areas that have special significance to New York State” (NYSOPRHP, 2012c). Review of the NYSOPRHP Heritage Areas website indicates that there are no Heritage Areas located within the visual study area.

State Forest Preserves:

New York State Forest Preserves occur within the Adirondack and Catskill Parks, neither of which are located within the visual study area (NYSDEC, 2012a).

National Wildlife Refuges and State Wildlife Management Areas:

Review of the U.S. Fish and Wildlife Service National Wildlife Refuge System website and the NYSDEC website indicate that no National Wildlife Refuges or State Wildlife Management Areas are located within the visual study area (USFWS, 2012; NYSDEC, 2012e).

National Natural Landmarks:

Review of the National Park Service National Natural Landmarks Program website indicates that no National Natural Landmarks are located within the visual study area (NPS, 2012c).

National Parks, Recreation Areas, Seashores and/or Forests:

Review of the National Park Service and U.S. Forest Service websites regarding National Park Service Lands and National Forests (respectively) indicates that no National Parks, Recreation Areas, Seashores or Forests are located within the visual study area (NPS, 2012a; USFS, 2012).

National or State Designated Wild, Scenic and Recreational Rivers:

Review of the National Wild and Scenic Rivers website and the NYSDEC Wild, Scenic and Recreational Rivers website indicates that no formally designated wild, scenic or recreational rivers are located within the visual study area (National Wild and Scenic Rivers, 2012; NYSDEC, 2012e). However, The Nationwide Rivers Inventory (NRI) was also consulted, as it is somewhat equivalent to an eligible-for-listing designation. The NRI provides a listing “free-flowing river segments in the United States that are believed to possess one or more *outstandingly remarkable* natural or cultural values judged to be of more than local or regional significance” (NPS, 2012b). The portion of Black River flowing through the visual study area is included in the NRI for its “outstandingly remarkable” geologic, historic, hydrologic and recreational qualities. The geologic significance of this segment of the Black River (Carthage to Lyons Falls) is due to the location along the nearly straight divide between the Adirondack province and the Tug Hill section; historic significance is due to several

extant structures from the Black River Canal; hydrologic significance is due to this being the longest, least-developed, free-flowing river segment; and recreational significance is due to the outstanding walleye fishery in many areas and because the entire segment can be paddled, even in summer (NPS, 2012b).

Sites, Areas, Lakes, Reservoirs or Highways Designated or Eligible as Scenic:

There are no state or nationally designated scenic byways located within the visual study area (NYSDOT, 2012; USDOT, 2012).

Scenic Areas of Statewide Significance:

According to the NYS Department of State (2004), there are no Scenic Areas of Statewide Significance within the visual study area.

State or Federal Designated Trails:

No state or federally designated trails occur within the visual study area (NPS, 2012e; NYSOPRHP 2012d).

Adirondack Park Lands and Scenic Vistas:

No portions of the Adirondack Park are located within the study area.

Palisades Park Land:

No portions of the Palisades Park are located within the study area.

State Nature and Historic Preserve Areas and Bond Act Properties (Exceptional Scenic Beauty, Open Space):

Review of existing data did not identify any State Nature or Historic Preserve Areas or Bond Act Properties within the study area that were purchased under the Exceptional Scenic Beauty or Open Space Category.

3.6.2 Aesthetic Resources of Local Significance

In addition to the scenic resources of statewide significance listed above, the visual study area also includes areas that are regionally or locally significant, sensitive to visual impacts, and/or receive significant public/recreational use. These include recreation facilities, public open spaces, population centers, and heavily used transportation corridors. The most significant of these are listed below:

Areas of Intensive Land Use:

Several municipalities and areas of settlement within and adjacent to the visual study area are considered visually sensitive due to the concentration of residential development or the type/intensity of land use they receive. The Village of Copenhagen has a population of 801 and is surrounded by the Project, located 0.3 miles from the nearest turbine. The Village of Castorland has a population of 351 and is located 2.5 miles east of the Project (as measured to the nearest turbine), the Village of Carthage has a population of 3,747 and is located 3.9 miles north of the Project, the Village of West Carthage has a population of approximately 2,012, and is located 4.5 miles north of the Project (U.S. Census Bureau, 2010). Hamlets within the visual study area include Deer River, Denmark, Champion, South Rutland and Burrville.

Transportation Corridors:

The visual study area includes several highways that could be considered visually sensitive due to the number of drivers that travel these roads on a daily basis. See Table 1 for New York State Department of Transportation (NYSDOT) 2010 traffic counts for major roadways within the study area:

Table 1. Traffic Counts for Major Transportation Corridors within Study Area

Road	Total Length within the Study Area (miles)	Average Vehicles/Day on Segments within the Study Area
State Route 12	20.2	1,756 – 4,670
State Route 26	14.4	3,057 – 6,702
State Route 126	16.9	3,038 – 12,041
State Route 177	3.6	1,720
State Route 410	4.0	1,475

Source: NYSDOT, 2010

Recreational Resources:

Identified recreational areas within the visual study area include water resources such as Beaver River, Deer River, Black River and Rutland Lake; approximately 51 miles of snowmobile trails; NYSDEC-owned land including six state forests (covering 8,400 acres) and Black River Waterway Access and Fishing Access points; Carlowden Country Club and Cedars Golf Course. Two waterfalls, Kings Falls and High Falls, also occur on Deer River within the visual study area.

Public Schools:

Public schools within the visual study area include Copenhagen Central School, West Carthage Elementary School and Carthage Middle School. Copenhagen Central School is located on Mechanic Street in the Village of Copenhagen and serves 468 students pre-kindergarten through 12th grade. West Carthage Elementary School is located on Cole Road west of the Village of West Carthage and serves 494 students kindergarten through 4th grade. Carthage Middle and High Schools are located slightly northeast of West Carthage Elementary School, at the corner of Cole Road and State Route

26, and serve 1,015 students 5th through 8th grade and 976 students 9th through 12th grade, respectively (Great Schools, 2012).

Figure 6. Visually Sensitive Resources

4.0 Visual Impact Assessment Methodology

The Visual Impact Assessment (VIA) procedures used for this study are consistent with methodologies developed by the U.S. Department of the Interior, Bureau of Land Management (1980), U.S. Department of Agriculture, National Forest Service (1974), the U.S. Department of Transportation, Federal Highway Administration (1981), U.S. Army Corps of Engineers (Smardon, et al., 1988) and the NYSDEC (not dated, 2000). These procedures are widely accepted as standard visual impact methodology for wind energy projects (CEIWEP, 2007). The specific techniques used to assess potential Project visibility and visual impacts are described in the following section.

4.1 Project Visibility

An analysis of Project visibility was undertaken to identify those locations within the visual study area where there is potential for the proposed wind turbines to be seen from ground-level vantage points. This analysis included identifying potentially visible areas on viewshed maps and verifying project visibility in the field. The methodology employed for each of these assessment techniques is described below.

4.1.1 Viewshed Analysis

Topographic viewshed maps for the Project were prepared using 10-meter resolution USGS digital elevation model (DEM) data (7.5-minute series) for the visual study area, the location and height of all proposed turbines (see Figure 2), an assumed viewer height of 1.7 meters, and ESRI ArcGIS® software with the Spatial Analyst extension. Two five-mile radius topographic viewsheds were mapped, one to illustrate “worst case” daytime visibility (based on a maximum blade tip height of 492 feet, or 150 meters, above existing grade) and the other to illustrate potential visibility of turbine lights (based on an assumed height for the lights on top of the nacelle of 338 feet, or 103 meters, above existing grade). Note that viewshed analyses only take into account potential visibility of the proposed wind turbines. Other Project components (such as the proposed transmission line or substation) were not included in the viewshed analyses.

The ArcGIS program defines the viewshed by reading every cell of the DEM data and assigning a value based upon the existence of a direct, unobstructed line of sight to proposed facility location/elevation coordinates from observation points throughout the five-mile study area. The resulting viewshed maps define the maximum area from which any portion of any turbine in the completed Project could potentially be seen within the study area during both daytime and nighttime hours based on a direct line of sight, and ignoring the screening effects of existing vegetation and structures. A turbine

count analysis was also performed to determine how many wind turbines are potentially visible from any given point within the viewshed. The results of this analysis were then grouped by number of turbines potentially visible.

Because the screening provided by vegetation and structures is not considered in this analysis, the topographic viewshed represents a true "worst case" assessment of potential Project visibility. Topographic viewshed maps assume that no trees exist, and therefore are very accurate in predicting where visibility will not occur due to topographic interference. However, they are less accurate in identifying areas from which the Project could actually be visible. Trees and buildings can limit or eliminate visibility in areas indicated as having potential Project visibility in the topographic viewshed analysis.

To supplement the topographic viewshed analysis, a vegetation viewshed was also prepared to illustrate the potential screening provided by forest vegetation. A base vegetation layer was created using the 2006 USGS National Land Cover Dataset (NLCD) to identify the mapped location of forest land (including the Deciduous Forest, Evergreen Forest, Mixed Forest and Woody Wetland NLCD classifications) within the visual study area. Based on standard visual assessment practice, the mapped locations of the forest land were assigned an assumed height of 40 feet and added to the DEM. The viewshed analysis was then re-run, as described above. As with the topographic viewshed analysis, two vegetation viewsheds were mapped, one to illustrate "worst case" daytime visibility (based on a maximum blade tip height of 492 feet above existing grade) and the other to illustrate potential visibility of turbine lights (based on a nacelle height of approximately 338 feet above existing grade and the conservative assumption that all turbines could be equipped with FAA warning lights). Once the initial vegetation viewshed analysis was completed, a Spatial Analyst conditional statement was used to assign zero visibility to all areas of mapped forest, resulting in the final vegetation viewshed. The vegetation viewshed is based on the assumption that in most forested areas, outward views will be well screened by the overhead tree canopy. During the growing season the forest canopy will fully block views of the proposed turbines, and such views will typically be almost completely obscured, or at least significantly screened by tree trunks and branches, even under "leaf-off" conditions. Although there are certainly areas of mapped forest that have natural or man-made clearings that could provide open outward views, these openings are rare, and the available views would typically be narrow/enclosed and include little of the proposed Project.

Because it accounts for the screening provided by mapped forest stands, the vegetation viewshed is a much more accurate representation of potential Project visibility. However, it is important to note that because screening provided by buildings and street/yard trees, as well as characteristics of the proposed turbines that influence visibility (color, narrow profile, distance from viewer, etc.), are not taken consideration in the viewshed analyses, being within the viewshed does not necessarily equate to actual Project visibility.

4.1.2 Field Verification

Visibility of the proposed Project was evaluated in the field on October 18, 2012. Three large (15-foot by 6-foot), blimp-shaped helium-filled balloons were raised to a height of 492 feet above ground level (based on a maximum blade tip height at the 12 o'clock position) at the approximate locations of proposed Turbines 11, 32, and 37. The purpose of this exercise was to verify visibility of the Project, and provide locational and scale references in photographs for subsequent use in the development of visual simulations.

The balloons were raised between approximately 6:30 and 8:00 a.m. Weather conditions (relative to visibility) throughout the day were generally favorable. Clear skies in the morning gave way to partially cloudy skies in the afternoon, which resulted in good visibility and a representative variety of sky conditions. However, strong winds affected the height and position of the balloons throughout the day².

While the balloons were in the air, field crews drove public roads and visited public vantage points within (and beyond) the five-mile radius study area to document points from which the Project would be visible. Photos were taken from 230 representative viewpoints using Nikon (D50 and D200) and Cannon (EOS 20D) digital SLR cameras with a minimum resolution of six megapixels. All cameras utilized a focal length between 28 and 35 mm (equivalent to between 45 and 55 mm on a standard 35 mm film camera). This focal length is the standard used in visual impact assessment because it most closely approximates normal human perception of spatial relationships and scale in the landscape (CEIWEP, 2007). Viewpoint locations were determined using hand-held global positioning system (GPS) units and high resolution aerial photographs (digital ortho quarter quadrangles). The time and location of each photo were documented on all electronic equipment (cameras, GPS units, etc.) and noted on field maps and data sheets (see Appendix C). Viewpoints photographed during field review generally represented the most open, unobstructed available views toward the Project.

4.2 Project Visual Impact

Beyond evaluating potential Project visibility, the VIA also examined the visual impact of the proposed wind turbines on the aesthetic resources and viewers within the visual study area. This assessment involved creating computer models of the proposed Project turbines and layout, selecting representative viewpoints within the study area, and preparing computer-assisted visual simulations of the proposed Project. These simulations were then evaluated by a registered

² At around 10:15 a.m. a strong gust of wind pushed the mooring ropes of one of the balloons (balloon #3, at the proposed location of Turbine 32) into adjacent trees. While **edr** staff was attempting to disentangle the rope from the trees, the mooring rope snapped and the balloon was released. A replacement balloon was not erected at this location and for the remainder of the field review only two balloons (at the locations of Turbines 11 and 37) remained available to field crews for reference. However, existing communication towers located in the vicinity of Turbine 32 served as a viable proxy to evaluate potential visibility of this portion of the Project.

landscape architect to determine the type and extent of visual impact resulting from Project construction. Details of the visual impact assessment procedures are described below.

4.2.1 Viewpoint Selection

From the photo documentation conducted during field verification, **edr** selected a total of 10 viewpoints for development of visual simulations. These viewpoints were selected based upon the following criteria:

1. They provide open views of proposed turbines, as indicated by field verification (i.e., balloon visibility).
2. They illustrate Project visibility from sensitive resources with the visual study area.
3. They illustrate typical views from landscape similarity zones where views of the Project will be available.
4. They illustrate typical views of the proposed Project that will be available to representative viewer/user groups within the visual study area.
5. They illustrate typical views of different numbers of turbines, from a variety of viewer distances, and under different lighting conditions, to illustrate the range of visual change that will occur with the Project in place.
6. The photos obtained from the viewpoints display good composition, lighting, and exposure.

Locational details and the criteria for selection of each simulation viewpoint are summarized in Table 2, below:

Table 2. Viewpoints Selected for Simulation

Viewpoint Number	Location and/or Visually Sensitive Resource	LSZ Represented	Viewer Group Represented	Viewing Distance ¹	View Orientation ²
2	Fuller Road, Town of Denmark	Rural Uplands	Residents	0.7	SW
17	Copenhagen Central School, Village of Copenhagen	Village/Hamlet	Residents, Travelers	1.7	NE
49	Pleasant Lake, Town of Champion	Rural Uplands, Forestland	Residents, Tourists	1.4	SE
63	County Road 194, Town of Denmark	Rural Uplands	Residents	2.1	NE
86	NYS Route 12, Village of Copenhagen	Rural Uplands	Residents, Travelers	1.9	W
95	Maple Ridge Wind Farm, Porter Road, Town of Harrisburg	Rural Uplands	Residents, Tourists	4.8	N
125	Cook Road, Town of Rutland	Rural Uplands	Residents	4.1	E
155	Mud Street, Town of Denmark	Rural Uplands	Residents	0.3	NE
159	NYS Route 26, Town of Denmark	Rural Uplands	Residents, Travelers	0.8	SW
200	NYS Route 126, Town of Croghan	Rural Valley	Residents, Travelers	3.8	SW

¹Distance from viewpoint to nearest visible turbine (in miles)

²N = North, S = South, E = East, W = West

4.2.2 Visual Simulations

To show anticipated visual changes associated with the proposed Project, high-resolution computer-enhanced image processing was used to create realistic photographic simulations of the completed turbines from each of the six selected viewpoints. The photographic simulations were developed by constructing a three-dimensional computer model of the proposed turbines and turbine layout based on turbine specifications and survey coordinates provided by the Project developer. For the purposes of this analysis, it was assumed that all turbines would be GE 1.6-100 machines (see Figure 3). The next step in this process involved utilizing aerial photographs and GPS data collected in the field to create an AutoCAD Civil 3D 2011® drawing. The two dimensional AutoCAD data was then imported into AutoDesk 3ds MAX 2010® and three-dimensional components (cameras, modeled turbines, etc.) were added.

These data were superimposed over photographs from each of the viewpoints, and minor camera changes (height, roll, precise lens setting) made to align all known reference points (balloons, buildings, transmission line structures, etc...) within the view. This process ensures that Project elements are shown in proportion, perspective, and proper relation to the existing landscape elements in the view. Consequently, the alignment, elevations, dimensions and locations of the proposed structures will be accurate and true in their relationship to other landscape features in the photo. At this point, a “wire frame” model of the facility and known reference points is shown on each of the photographs. The proposed exterior color/finish of the turbines is then added to the model and the appropriate sun angle is simulated based on the specific date, time and location (latitude and longitude) at which each photo was taken. This information allows the computer to accurately illustrate highlights, shading and shadows for each individual turbine shown in the view. All simulations show the turbines with rotors oriented toward the west-northwest, which is generally the prevailing wind direction in the area (see illustration of methodology in Figure 7).

Figure 7. Visual Simulation Methodology

4.2.3 Visual Contrast Rating

To evaluate anticipated visual changes associated with the proposed Project, the photographic simulations of the completed Project were compared to photos of existing conditions. These “before” and “after” photographs, identical in every respect except for the Project components shown in the simulated views, were printed in 11 x 17 inch format for every viewpoint selected in the previously described process. A registered landscape architect was then asked to determine the effect of the proposed Project in terms of its contrast with existing components of the landscape. The methodology utilized in this evaluation is a simplified version of the U.S. Bureau of Land Management (BLM) contrast rating methodology (USDI BLM, 1980) that was developed by **edr** in 1999 for use on wind power projects. It involves using a short evaluation form, and a simple numerical rating process. Along with having proven to be accurate in predicting public reaction to wind power projects, this methodology 1) documents the basis for conclusions regarding visual impact, 2) allows for independent review and replication of the evaluation, and 3) allows a large number of viewpoints to be evaluated in a reasonable amount of time without “burn-out” of the evaluator. Landscape, viewer, and Project related factors considered by the landscape architects in their evaluation included the following:

- *Landscape Composition:* The arrangement of objects and voids in the landscape that can be categorized by their spatial arrangement. Basic landscape components include vegetation, landform, water and sky. Some landscape compositions, especially those that are distinctly focal, enclosed, detailed, or feature-oriented, are more vulnerable to modification than panoramic, canopied, or ephemeral landscapes.
- *Form, Line, Color, and Texture:* These are the four major compositional elements that define the perceived visual character of a landscape, as well as a Project. Form refers to the shape of an object that appears unified; often defined by edge, outline, and surrounding space. Line refers to the path the eye follows when perceiving abrupt changes in form, color, or texture; usually evident as the edges of shapes or masses in the landscape. Texture in this context refers to the visual surface characteristics of an object. The extent to which form, line, color, and texture of a project are similar to, or contrast with, these same elements in the existing landscape is a primary determinant of visual impact.
- *Focal Point:* Certain natural or man-made landscape features stand out and are particularly noticeable as a result of their physical characteristics. Focal points often contrast with their surroundings in color, form, scale or texture, and therefore tend to draw a viewer's attention. Examples include prominent trees, mountains and water features. Cultural features, such as a distinctive barn or steeple can also be focal points. If possible, a

proposed project should not be sited so as to obscure or compete with important existing focal points in the landscape.

- *Order*: Natural landscapes have an underlying order determined by natural processes. Cultural landscapes exhibit order by displaying traditional or logical patterns of land use/development. Elements in the landscape that are inconsistent with this natural order may detract from scenic quality. When a new project is introduced to the landscape, intactness and order are maintained through the repetition of the forms, lines, colors, and textures existing in the surrounding built or natural environment.
- *Scenic or Recreational Value*: Designation as a scenic or recreational resource is an indication that there is broad public consensus on the value of that particular resource. The particular characteristics of the resource that contribute to its scenic or recreational value provide guidance in evaluating a project's visual impact on that resource.
- *Duration of View*: Some views are seen as quick glimpses while driving along a roadway or hiking a trail, while others are seen for a more prolonged period of time. Longer duration views of a project, especially from significant aesthetic resources, have the greatest potential for visual impact.
- *Atmospheric Conditions*: Clouds, precipitation, haze, and other ambient air related conditions, which affect the visibility of an object or objects. These conditions can greatly impact the visibility and contrast of landscape and project components, and the design elements of form, line, color, texture, and scale.
- *Lighting Direction*: Backlighting refers to a viewing situation in which sunlight is coming toward the observer from behind a feature or elements in a scene. Front lighting refers to a situation where the light source is coming from behind the observer and falling directly upon the area being viewed. Side lighting refers to a viewing situation in which sunlight is coming from the side of the observer to a feature or elements in a scene. Lighting direction can have a significant effect on the visibility and contrast of landscape and project elements.
- *Project Scale*: The apparent size of a proposed project in relation to its surroundings can define the compatibility of its scale within the existing landscaping. Perception of project scale is likely to vary depending on the distance from which it is seen and other contextual factors.

-
- *Spatial Dominance*: The degree to which an object or landscape element occupies space in a landscape, and thus dominates landscape composition from a particular viewpoint.
 - *Visual Clutter*: Numerous unrelated built elements occurring within a view can create visual clutter, which adversely impacts scenic quality.
 - *Movement*: Moving project components can make them more noticeable, but in the case of wind turbines, have also been shown to also make them appear more functional and visually appealing. Numerous studies have documented that viewers prefer to see wind turbines in motion. The following quote and citations are taken from an on-line summary of perceptual studies of wind farms conducted by the Macaulay Land Research Institute (MLURI, 2010):

"Motion has also been indicated as a powerful predictor of preference (Gipe, 1993; Thayer and Freeman, 1987). This is a unique feature of wind turbines in comparison with other forms of static structures. People find wind farms that appear to be working by relating this with moving rotors as more attractive than those that do not. Motion is equated with lower perceived visual impact (Gipe, 1993). They are likely to find wind farms visually interesting because of their motion. In this mode, the turbines are perceived as abstract sculptures, arousing interest with their novel, unfamiliar forms and animation (Thayer and Hansen, 1988)."

5.0 Visual Impact Assessment Results

5.1 Project Visibility

Potential turbine visibility, as indicated by the viewshed analyses, is illustrated in Figure 8 and summarized in Table 3. As indicated by blade tip viewshed analysis based only on topography, some portion of the proposed Project could potentially be visible in approximately 90.1% of the five-mile study area (Figure 8, Sheet 1; Table 3). This "worst case" assessment of potential visibility indicates the area where any portion of any turbine could potentially be seen, without considering the screening effect of existing vegetation and structures. Areas where there is no possibility of seeing the Project include locations in narrow ravines and on hillsides oriented away from the Project site. These are concentrated in the outer portions of the study area, such as along the Deer River to the south of the Project and the slopes of the Tug Hill Plateau in the western and northwestern portions of the study area. Based solely on the results of topographic viewshed analysis, potentially visible areas are found throughout the five-mile study area, and more than half of the proposed turbines will be visible in the majority of areas where any portion of the Project will be visible. As indicated in Appendix B, 13 of the 17 identified aesthetic resources of statewide significance within the five-mile study area are indicated as having potential views of some portion of the Project (based on maximum blade tip height and screening provided by topography alone). Aesthetic resources of statewide significance within the study area that will be screened from view of the Project by topography and/or vegetation include the NRHP-listed Hiram Hubbard House and three of the identified NRHP-eligible sites.

Table 3. Summary of Viewshed Results for Five-Mile Study Area

Number of Turbines Visible	Five-Mile-Radius Study Area ¹ Viewshed Results							
	Blade Tip Topography Only		Blade Tip Topography and Vegetation		FAA/Nacelle Topography Only		FAA/Nacelle Topography and Vegetation	
	Square Miles	% of Study Area	Square Miles	% of Study Area	Square Miles	% of Study Area	Square Miles	% of Study Area
0	18.2	9.9	108.0	58.6	24.7	13.4	113.7	61.6
1-12	18.1	9.8	18.0	9.8	25.6	13.9	20.8	11.3
13-24	20.1	10.9	14.1	7.6	22.5	12.2	16.0	8.7
25-36	15.8	8.6	12.1	6.6	18.0	9.7	11.3	6.1
37-48	18.0	9.8	11.5	6.3	19.6	10.6	9.8	5.3
49-62	94.2	51.1	20.6	11.2	74.0	40.1	12.8	6.9
Total Visible	166.2	90.1	76.4	41.4	159.7	86.6	70.7	38.4

¹The viewshed analysis area, or area within 5-miles of proposed wind turbines, includes approximately 184.4 square miles, or 118,018 acres.

Figure 8. Viewshed Analyses

4 Sheets

Areas of potential nighttime visibility, as indicated by the FAA topographic viewshed analysis (Figure 8, Sheet 2; Table 3) include approximately 86.6% of the five-mile radius study area. This analysis indicates that the potential visibility of FAA warning lights at a height of 338 feet (103 meters) will generally be concentrated in the same areas where daytime blade-tip height visibility was indicated. As stated above, this topographic analysis presents a "worst case" assessment of potential nighttime visibility that does not take into account the screening effect of existing vegetation and structures, and is based on the conservative assumption that all turbines could be equipped with FAA warning lights (a more realistic assumption is that approximately half of the turbines will be lighted).

Factoring vegetation into the viewshed analysis significantly reduces potential Project visibility (Figure 8, Sheets 3 and 4). Within the five-mile study area, vegetation, in combination with topography, will serve to block daytime views of the Project from approximately 58.6% of the area (i.e., 41.4% of the study area is indicated as having potential Project visibility). Areas of potential nighttime visibility, as indicated by FAA vegetation viewshed analysis, are limited to approximately 38.4% of the five-mile radius study area. Based on the results of the viewshed analysis, visibility will generally be most available in open agricultural areas and along significant portions of NYS Routes 12, 26, 126, and 410 within the study area. Visibility is also indicated in most portions of the Village of Copenhagen, however buildings and street trees, which are not accounted for in this analysis, will likely screen many of those views. State forests and other forested areas in the southern portion of the study area fall outside the vegetation viewshed, as do wooded slopes and the backsides of hills throughout the study area. Factoring vegetation in the viewshed analysis substantially reduces the area of potential Project visibility throughout the study area. However, because they are primarily located in agricultural or village settings, factoring mapped forest vegetation into the viewshed analysis does not indicate reduced Project visibility at many of the aesthetic resources of statewide significance within the study area (see Table A in Appendix B). As mentioned previously, areas of actual visibility are anticipated to be more limited than indicated by the vegetation viewshed analysis, due to the slender profile of the turbines (especially the blade, which make up the top 160 feet of the turbine), the effects of distance, and screening from hedgerows, street trees and structures, which are not considered in the analysis.

Field review confirmed that actual Project visibility is likely to be more limited than suggested by viewshed mapping (Figure 8). This is due to the fact that trees within the study area provide more extensive and effective screening than assumed in these analyses (e.g., vegetation is more extensive than indicated on the USGS NLCD, and often taller than 40 feet in height), and screening provided by buildings is significant within more developed areas (e.g., the villages and hamlets). The result is that certain sites/areas where "potential" visibility was indicated by viewshed mapping were actually well screened from views of the proposed Project. For instance, although viewshed analysis indicates potential

visibility of the Project from throughout most portions of the Village of Copenhagen, the helium-filled balloons were screened by buildings and trees from many vantage points (Appendix C: Viewpoints 10, 13-22, 40, 59-61, and 85-86).

Field review also confirmed a lack of visibility (due the screening effects of adjacent buildings and/or vegetation) from areas that were heavily forested, from some locations within village and hamlet centers (including portions of the Village of Copenhagen and hamlets of Deer River, West Carthage, Champion, and Castorland), and from locations where hedgerows, yard vegetation, street trees, or other structures blocked views of the project. Sites of statewide significance where field review confirmed lack of visibility (due the screening effects of adjacent buildings and/or vegetation) included the NRHP-listed Hiram Hubbard House and NRHP-eligible Battle Cemetery (Viewpoint 89), 30497 NYS Route 12 (Viewpoint 121), and Louis J. Waite Farm. Existing buildings and vegetation will also screen most of the Project from many locations within the Copenhagen Village Historic Districts (North and South, see viewpoints listed above), although occasional, partial views of turbines (or turbine blades) will be available in gaps between buildings and trees. The Black River corridor is generally enclosed by vegetation that will screen views of the Project from many areas along this potentially eligible wild, scenic, or recreational river. However, partial or occasional views of the Project will be available through gaps in the vegetation.

The area with greatest Project visibility occurs in open agricultural areas, hilltops and slopes within the study area, including portions of NYS Routes 12 and 26. More distant views were available from the elevated open fields to the north, east, and southeast of the Project site. Views will also be available from open areas within the Black River Valley, including portions of NYS Route 126. However, throughout the study area, agricultural buildings, residences, hedgerows and trees not indicated on the USGS maps blocked/interrupted views toward the proposed turbines in many areas.

A comprehensive summary of potential Project visibility from all the sensitive sites considered in this VIA is presented in Appendix B.

5.2 Analysis of Existing and Proposed Views

To illustrate anticipated visual changes associated with the proposed Project, photographic simulations of the completed Project from 10 viewpoints indicated in Figure 9 (see also Table 2) were used to evaluate Project visibility and appearance. These simulations are included in Appendix A of this report. Review of these images, along with photos of the existing view, allowed for comparison of the aesthetic character of each view with and without the proposed Project in place. Results of this evaluation are presented below.

Figure 9. Viewpoint Location Map

Viewpoint 2: Fuller Road (Appendix A)*Existing View*

This viewpoint is on Fuller Road in the Town of Denmark, approximately 0.7 mile from the nearest proposed turbine, and is representative of a typical view experienced by residents in the area. The view is oriented to the southwest and includes a rural road flanked by agricultural fields in the immediate foreground. Poles carrying an overhead utility line and a concrete silo are on the right side of the road and large shade trees, a brown house or barn with green metal roof, and farmyard are on the left. The road disappears from view over the crest of a low hill, which is backed by a forested hillside in the mid-ground. The tops of the trees on the forested hillside form the horizon, which is broken by the trees, building, utility poles, and silo in the foreground. The clear, cloudless sky ranges from light blue to white at the horizon. The palette of gold, rust, and yellow hues in the farm fields and tree foliage indicate that the view is during autumn. The overall scenic quality is relatively low.

Proposed Project

With the proposed Project in place, two turbines can be seen in the near mid-ground and portions of six turbines are visible on the more distant ridge. Foreground trees screen some of the turbines, while others are fully visible. The turbines are front lit which makes them appear white, and minimizes their contrast with the sky. The turbines break the plane of the forested ridge and interrupt the horizon. The scale of the two turbines in the near foreground makes them a significant feature in the view. However, the height of the foreground trees, silo, and utility poles reduce the perceived scale contrast, and the varying height of the turbines at different distances reflects the rolling character of the landform. The overall effect on the view is minimal.

Viewpoint 17: Copenhagen Central School (Appendix A)*Existing View*

This viewpoint is on the campus of the Copenhagen Central School in the Village of Copenhagen, approximately 1.7 miles from the nearest proposed visible turbine. The view is oriented to the northeast and overlooks an active schoolyard. Middle-school-aged children play on three, chain-link-fence enclosed athletic courts in the immediate foreground, backed by a playground for elementary-school-aged children in the center of the view. A portion of a single-story, tan, brick school building frames the left side of the view, while evergreen trees define the perimeter of the schoolyard on the right side of the view. The upper stories and rooflines of residential structures interspersed with mature trees that occupy the center of the view in the distant foreground and mid ground indicate the densely settled village setting. The tops of trees rising amongst the houses form the horizon in the mid-ground of the view, which is interrupted by the tops of a few taller trees in the foreground and a church steeple in the mid-ground. The somewhat hazy sky ranges from pale-blue/gray to white at the horizon. The overall scenic quality is low.

Proposed Project

With the proposed Project in place, portions of 10 turbines are visible rising into the sky above the treetops in the mid-ground of the center of the view. The turbines are at the same height as existing trees that extend into the sky and interrupt the horizon. Although their novel form creates some contrast with the organic forms of the vegetation, their consistent height with the existing trees minimizes their scale contrast with the vegetation and buildings in the foreground of the view. The white turbines appear washed out against the hazy, light-colored sky at the horizon, which reduces their contrast with the sky under these conditions. The movement of the turbines will introduce motion into an otherwise static horizon, which could distract viewers engaged in athletic or recreational activities in the school yard. However, the schoolyard is already a very active scene, which should minimize any distraction or interruption resulting from their movement on the distant horizon.

Viewpoint 49: Pleasant Lake (Appendix A)*Existing View*

This viewpoint is located on Pleasant Lake Road in the Town of Champion, approximately 1.4 miles from the nearest proposed turbine. The view is oriented to the southeast, and includes an open, maintained lawn sloping down to a lake in the distant foreground of the view. The lawn is interrupted by an area of meadow with knee-high grasses that extends from the left side across the center of view in the immediate foreground. Two gray, ranch-style houses are located in the foreground, one of which is located in the center-left of the view on the slope overlooking the lake, and the other is located further from the viewer on the lake shore at the right side of the view. Stands of deciduous trees between the houses, and to the left of the house in the center of the view obscure the view of the lake. A single overhead utility pole is located adjacent to the more distant house on the right. A tree-covered hillside rises from the opposite side of the lake in the mid-ground. The treetops at the top of the ridge form a relatively uniform horizon across the view. The sky is partially cloudy with patches of medium blue and white clouds, with white, burnt-out sky near the horizon due to the southerly direction (i.e., into the sun) of the view. Because of the tranquil setting overlooking a lake, scenic quality in this view is high.

Proposed Project

With the proposed project in place, portions of two turbines are visible above the treetops on the opposite side of the lake in the center of the view. The nacelle and upright blade of one turbine rise above the tree line in the center of the view, and part of the upright blade of a second turbine is visible to the left of the first turbine. The form and verticality of the turbines interrupt the horizon formed by the relatively uniform height of the trees on the ridgetop, which results in appreciable contrast with the horizontal line of the landform and vegetation. However, because most portions of the turbines are screened by vegetation, their size is not readily apparent and they do not appear out of scale with other elements in the view (such as the trees featured in the foreground on the left side of the view). The backlit turbines appear dark against the light sky, but because only portions of two turbines are visible above the trees they have a minimal effect on the sense of openness in the sky. The industrial or utilitarian character of the turbines will have a minimal effect on the tranquility of the view, but will not affect recreational use of the lake.

Viewpoint 63: County Route 194 (Appendix A)*Existing View*

This viewpoint is located on County Road 194 in the Town of Denmark, approximately 2.1 miles from the nearest proposed turbine that will be visible in this view. The expansive view from the crest of a hill is oriented to the northeast with open agricultural fields on a gentle slope that descends away from the viewer in the immediate foreground. The road frames the right side of the view and draws the viewers' focus down the hillside. A white house with a green roof on the left side of the road in the distant foreground or near mid-ground provides a focal point among the rolling hills that extend from the mid-ground into the background. The hills are a mix of open fields, brush lots, and forest in warm autumn hues, and include scattered rural homes and farms. A series of utility poles along the roadside and scattered silos provide occasional vertical elements in the otherwise broad, open, horizontal character of the view. A distant background ridge has a bluish cast and forms a uniform horizon line. The sky features high, diffuse clouds and ranges from medium gray blue at the top of the view to hazy, light gray-white at the horizon. The rolling topography, color of the autumn foliage, and long-distance view contribute to an overall scenic quality of medium.

Proposed Project

With the proposed Project in place, eight turbines are visible on the crest of a ridge in the mid-ground. The turbines are regularly spaced across the view and all appear to be located at approximately the same distance from the viewer. The novel forms, bright white color (due to being front-lit in this view), and verticality of the turbines draw the viewer's attention. Although the turbines do not appear out of place in the working agricultural landscape, they stand out from the otherwise open, horizontal character of the landform in the view, which is accentuated by the turbines' moderate scale contrast with mature trees featured in the mid-ground. The vertical lines of the turbines interrupt the horizon and generate a strong contrast with the sense of openness created by the expansive view and sky. However, the regular spacing and consistent scale of the turbines introduces a sense of order to the view and is consistent with the perpendicular lines of field edges and wood lots in the working agricultural landscape.

Viewpoint 86: NYS Route 12, Copenhagen (Appendix A)*Existing View*

This viewpoint is located on New York State Route 12, on the southeastern outskirts of the Village of Copenhagen, approximately 1.9 miles from the nearest proposed turbine. The existing view is oriented to the west, and features an open view of a broad valley with strong rural character. A wire fence with wooden posts, and wooden snow fence, in the immediate foreground are backed by open, level agricultural fields that extend across a broad valley. A gently sloped, somewhat undulating ridge with a patchwork of fields and forested areas rises in the mid-ground. Wooden posts from other fences and an overhead utility line define the edges of agricultural fields and form a pattern of vertical elements arranged in neat rows, which along with the field edges and ridgetop create strong horizontal lines in the landscape. Scattered residences, farm buildings, and a water tower on the distant ridge add a sense of clutter and activity to the view. The large red and white communication tower and smaller, less discernible cellular tower (or similar) located on the ridgetop at the center-left and right sides of the view (respectively) are existing vertical elements in the landscape that interrupt the horizon. The clear, cloudless sky ranges from medium blue to light gray-white at the horizon.

Proposed Project

With the proposed Project in place, nine turbines can be seen rising above the forested ridge. The turbines are arranged in two rows, with four turbines closer to the viewer (and therefore appear larger) and a second row of five turbines further from the viewer. Their scale contrast with the forest vegetation on the ridge is notable in this view, and the number of visible turbines will draw viewer attention. Although the turbines appear to follow the undulating landform of the ridge, their scale and form attract the eye and the turbines will become a new focal point. The scale of the four closer turbines affects the sense of openness in the sky, although the turbines appear to be of a consistent size with the existing communication towers. The turbines for the most part appear evenly spaced and orderly in their respective rows. However, the apparent “stacking” of two turbines in the center left of the view (where the further turbine appears directly behind the nearer turbine) contributes to the sense of clutter in the landscape. The front-lit turbines appear bright white, which reduces their contrast in this view against the washed out sky at the horizon.

Viewpoint 95: Porter Road, Maple Ridge Wind Farm (Appendix A)*Existing View*

Viewpoint 95 is on Porter Road in the Town of Harrisburg, approximately 4.8 miles from the nearest proposed turbine. The elevated, open view from the crest of a hill is oriented to the north, with open agricultural fields on gently undulating slopes that descend away from the viewer in the immediate foreground. The view is along a rural, un-striped road that extends away from the viewer. Agricultural equipment and rolled hay bales in the immediate foreground on the left side of the road evoke a strongly rural character. Portions of 17 existing wind turbines from the Maple Ridge Wind Farm extend from the foreground into the mid-ground and are the dominant features in the view. The scale and bright white color of the front-lit turbines attract the viewer's gaze. A forested ridge in the distant mid-ground and hazy, bluish ridge in the background form the horizon. The clear sky ranges from bright blue at the top of the view to hazy, light gray-blue at the horizon.

Proposed Project

With the proposed Project in place, numerous turbines can be seen rising in the background above the forest ridge that forms part of the horizon. The turbines are front lit which makes them appear white, and accentuates their visibility. However, the fact that the existing wind turbines are located closer to the viewer diminishes the visual impact of the proposed wind turbines. Other than adding more turbines to the already cluttered view, the proposed turbines have little effect on the scene.

Viewpoint 125: Cook Road (Appendix A)*Existing View*

This viewpoint is located on Cook Road in the Town of Rutland, approximately 4.1 miles from the nearest proposed turbine. This elevated view is oriented to the east and features a broad, open agricultural field interspersed with clumps of mixed evergreen and deciduous trees in the foreground. The palette of muted greens, gold, yellow, brown, and rust indicate the fall season. The far end of the field (in the near mid-ground) is defined by a hedgerow. Although the land appears to drop down on the far side of the field, two agricultural silos rise above the hedgerow in the center of the view. A distant forested ridge (behind the hedgerow) defines the horizon. A communications tower (at the right) and silos (center) on the horizon provide scale and distance references that place the ridge in the background. The agricultural field, hedgerow, and ridgeline create strong horizontal lines. The sky is partly cloudy and ranges from pale blue at the top to blue-white at the horizon.

Proposed Project

With the proposed Project in place, 11 turbines can be seen rising from the ridge in the background. The white color of the turbines minimizes their contrast with the pale blue sky and haze at the horizon. However, the turbines are clearly the tallest structures in the view and their vertical lines that extend from the horizon attract the viewers' attention and contrast with the flat landform and open sky. The distance from the viewer and the rolling topography in the view reduce the scale of the turbines, and their overall effect on the view is minimal.

Viewpoint 155: Mud Street (Appendix A)*Existing View*

Viewpoint 155 is located on Mud Street in the Town of Denmark, approximately 0.3 miles from the nearest proposed turbine. The panoramic view is oriented to the northeast and features an open agricultural field in the foreground backed by a hedgerow (on the right hand side of the view) and clump (in the center left) of mature deciduous and evergreen trees. The immediate foreground features a wire fence supported on wooden posts that extends across the view. A small farm pond is located behind the wire fence at the right side of the view. A metal wind mill on a lattice structure located at the edge of the farm pond extends just above the hedgerow that forms the horizon. A cluster of white farm buildings in the near mid-ground occupies the opening between the hedgerow (right) and clump of trees (left) in the center-left of the view. The sky in this view is partly cloudy and ranges from medium blue to white at the horizon.

Proposed Project

With the proposed project in place, five turbines are visible. Two turbines rise in the foreground from the agricultural field in the center left and right side of the view, and three turbines are visible in the mid-ground above the hedge row and clump of trees that define the horizon. In addition to their scale and form, the bright white color of the front lit turbines draws attention to the two turbines in the foreground. Due to their distance from the viewer, the two foreground turbines create a strong scale contrast with the vegetation and the sky and are the dominant feature in the view. The trees, existing farm windmill, and farm buildings provide scale references within the view, which accentuates the scale of the turbines. However, the turbines contrast with the agricultural land use and viewer activity in this view is minimal.

Viewpoint 159: NYS Route 26 (Appendix A)*Existing View*

This view is from NYS Route 26 in the Town of Denmark, approximately 0.8-mile from the nearest proposed turbine. The existing view is to the southwest, and is representative of views available to passengers in vehicles traveling on Route 26. The view features a strong agricultural character that is typical of the study area. The immediate foreground of the view features a pasture enclosed by a wire fence on wooden posts, which is backed by two open-sided livestock barns that extend across the center left and right sides of the view. A large manure tank is visible behind the barn on the right side of the view. A forested ridge in the near mid-ground is visible through the open sides of, and in the gap between, the barns. The roofline of the barn on the left side of the view and the top of the ridge (on the right side) form a relatively level horizon across the view. The view is dominated by long, low, horizontal forms and lines. The sky is clear and ranges from medium blue at the top to light blue-gray at the horizon. The overall scenic quality of the view is low.

Proposed Project

With the proposed Project in place, portions of seven turbines are visible rising above the ridge in the near mid-ground. Three of the turbines appear to be located on the ridge-top and rise prominently into the sky. The other four turbines are located further away from the viewer, and only the uppermost portions (or single blades) of the turbines are visible. The three near turbines rise above the horizon and attract the viewer's gaze, resulting in strong contrast with the open sky. However, the three turbines are evenly spaced across the horizon and appear orderly. The visible portions of the turbines located further away reflect the rolling topography of the area and appear to undulate with the landform. Although their scale, form, and white color attract the viewer's gaze, the turbines do not appear out of place with the working agricultural character of the landscape in this view.

Viewpoint 200: NYS Route 126 (Appendix A)*Existing View*

This viewpoint is located on NYS Route 126 in the Town of Croghan, approximately 3.8 miles from the nearest proposed turbine. This open view is oriented to the southwest an open agricultural field or pasture that extends from the foreground into the mid-ground across a broad, level valley. The field is broken into sections by a perpendicular network of wire fences on wooden posts and irrigation ditches. A long, straight irrigation ditch flanked by high grasses extends away from the viewer and draws the viewer's gaze toward a hedgerow of mature deciduous and evergreen trees that extends across the view at the far end of the field. A long low ridge, which in this view has a hazy, bluish cast due to the effect of backlighting, extends cross the view behind the hedgerow and forms a gently undulating horizon line in the background. The sky in this view is hazy and cloudy with muted gray and white tones. The effect of the low sun in the sky at the left side of the view adds harsh, bright lighting to the low clouds in the sky and an overall haziness to the view. A few wind turbines are visible above the ridge in the far background at the left side of the view, and a communication tower rises above the ridge in the center-right. The muted green and brown vegetation, harsh lighting, and hazy features in the background indicate both the time of day (late afternoon) and season (fall) for this view.

Proposed Project

With the proposed Project in place, numerous turbines can be seen rising above the background ridge that forms the horizon line. Many of the turbines are fully visible, while others are partially screened by topography. The turbines' fluctuating height mirrors the undulating line of the landform. Because the turbines extend across the entire ridge in the view, they have the effect of raising the horizon above the natural horizontal line of the ridge resulting in appreciable contrast with the landform and sky. The hazy conditions somewhat reduces their visibility, although turbine visibility and contrast could be greater under different lighting conditions, and their movement will draw the viewers' eye. While their line and scale contrast with the background ridge is noticeable, the proposed structures are far away and do not have a strong presence. Overall, the effect of distance reduces their impact.

5.3 Visual Impact Assessment Rating

A registered landscape architects (LA) evaluated the visual impact of the proposed Project, as described in the Methodology section of this report. Utilizing 11 x 17-inch digital color prints of the 10 selected representative viewpoints described above, the LA evaluated the existing and proposed views, assigning landscape components (landform, vegetation, land use, water, sky, and viewer activity) in each view quantitative visual contrast ratings on a scale of 0 (insignificant) to 4 (strong). The average score of the landscape components evaluated by the LA was calculated for each viewpoint. Copies of the completed rating forms are included in Appendix D, and the results of this process are summarized below in Table 4.

Table 4. Summary of Results of Contrast Rating Panel Review of Simulations

Viewpoint #	Distance (Nearest Turbine in View)	Landscape Similarity Zone (LSZ)	Contrast Rating						Average
			Landform	Vegetation	Land Use	Water	Sky	Viewer Activity	
2	0.7 mile	Rural Uplands	0	1	0	n/a	3	0	0.8
17	1.7 miles	Village/Hamlet	0	0.5	0	n/a	0.5	3	0.8
49	1.4 miles	Rural Uplands, Forestland	3	3	0	0	1	0.5	1.25
63	2.1 miles	Rural Uplands	4	2	0	n/a	4	0	2
86	1.9 miles	Rural Uplands	3	3	0	n/a	2	0	1.6
95	4.8 miles	Rural Uplands	0	0	0	n/a	0	0	0
125	4.1 miles	Rural Uplands	2	0	0	n/a	3	0	1
155	0.3 mile	Rural Uplands	0	4	1	n/a	4	0	1.8
159	0.8 mile	Rural Uplands	1	2	0	n/a	4	0	1.4
200	3.8 miles	Rural Valley	3	1	0	n/a	3	0	1.2
Average			1.6	1.65	0.1	n/a	2.45	0.35	1.08

¹Contrast Rating Scale: 0 (insignificant contrast), 1 (minimal contrast), 2 (moderate contrast), 3 (appreciable contrast), 4 (strong contrast).

As Table 4 indicates, overall composite contrast ratings for the 10 selected viewpoints ranged from 0 (insignificant) to 2.0 (moderate). Six viewpoints received average scores in the range of 1.2 to 2.0 on the scale of zero to four, which indicates a minimal to moderate level of visual contrast. Four viewpoints received average scores of 1.0 or less, indicating insignificant to minimal visual contrast. The highest contrast rating was received by Viewpoint 63, with an average score of 2.0 (moderate contrast). The impact in this view is related to the relatively higher scenic quality of the existing view (relative to the other viewpoints), owing to the rolling landform, pleasant rural setting, autumn foliage, and composition of the view. Contrast with landform and sky was strong in this view, owing to the scale, form, and verticality of the proposed turbines.

The majority of the viewpoints received scores between 1.2 and 2.0, indicating minimal to moderate contrast with the existing view. These viewpoints provide foreground, mid-ground, and background views of the Project, primarily from rural residential/agricultural settings. Contrast in these views is attributable largely to the scale and form of the turbines relative to the existing landform, vegetation, and open sky in a largely undeveloped rural landscape. The only viewpoint with an appreciable contrast on viewer activity was Viewpoint 17 (Copenhagen Central School), where the moving turbines could distract students or visitors engaged in outdoor recreational or athletic activities. However, the turbines were not considered incompatible with current land use or viewer activity in views showing a working agricultural landscape, and their impact is significantly reduced with increasing distance from the viewer.

The lowest contrast rating (0) was received by Viewpoint 95. The rating for Viewpoint 95 was attributable to the presence of the existing Maple Ridge Wind Farm turbines in the foreground of the view as well as the effects of distance (the proposed turbines in the simulation were approximately 4.8 miles from the viewer). Relative lower contrast ratings (0.8) were also received for Viewpoints 2 and 17. For Viewpoint 2, the lack of visual impact was due to the remote location of the viewpoint, the presence of existing overhead utilities and tall agricultural structures, and the Project's perceived compatibility with the working agricultural character of the landscape. For Viewpoint 17, although the view is from an active schoolyard, the Project is substantially screened by vegetation and structures in the Village of Copenhagen. Where visible in gaps between existing trees and structures the turbines appear to be the same height as existing trees on the horizon, which minimizes their scale contrast. This view is representative of screening conditions that exist in the more densely developed portions of the study area where only limited, partial views of the turbines will be available between existing buildings, street trees, yard trees, or other structures.

Although at times offering appreciable contrast with elements of the landscape, the proposed Project will not necessarily be perceived by viewers as having an adverse visual impact. The nearby Maple Ridge Wind Farm, in operation since 2006 (Figure 10) has generally received a positive public reaction following their construction and are an accepted part of local landscape. This observation is supported by recent annual surveys conducted by Jefferson County Community College (JCCS), which revealed strong community support for wind power (JCCS, 2008, 2010, 2011, 2012). A significant majority (approximately 90%) of Lewis County residents who participated in these surveys expressed support for the development of additional wind energy projects (JCCS, 2010, 2011, 2012). Approximately 70% of respondents have consistently indicated that wind farms have had a positive impact on Lewis County (JCCS, 2008, 2010, 2012). The 2008 survey further characterized the individuals that were able to see and/or hear turbines from their homes to reveal that 77.1% of these individuals indicated that the wind farms have had a positive impact on Lewis County. Additionally, only 7.5% of participants who live within 1 mile of the nearest wind turbine felt that wind farms have had a negative impact (JCCS, 2008). Similar results have also been documented in public opinion/acceptance surveys regarding constructed

wind power projects in other locations (Bishop and Proctor, 1994; Gipe, 2003). A recent study of public perception of wind power in Scotland and Ireland (Warren, et. al., 2005) provided the following conclusions:

“A remarkably consistent picture is emerging from surveys of public attitudes to wind power, and the case studies provide further evidence that this picture is a representative one. Large majorities of people are strongly in favour of their local windfarm, their personal experience having engendered positive attitudes. Moreover, although some of those living near proposed windfarm sites are less convinced of their merits, large majorities nevertheless favour their construction. This stands in marked contrast with the impression conveyed in much media coverage, which typically portrays massive grassroots opposition to windfarms.”

It is expected that similar overall reactions, with some individual variability in acceptance, will be applicable for the Copenhagen Wind Project.

Nighttime photos from the Fenner Wind Power Project (Figure 11), which is located approximately 60 miles south of the Project are included to illustrate the type of nighttime visual impact that could occur at certain viewpoints. The contrast of the aviation warning lights with the night sky could be appreciable in dark, rural settings, and their presence suggests a more commercial/industrial land use. Viewer attention is drawn by the flashing of the lights, and any positive reaction that wind turbines engender (due to their graceful form, association with clean energy, etc.) is lost at night. While generally not an issue from roads and public resources visited almost exclusively during the day (parks, trails, historic sites, etc.), turbine lighting could be perceived negatively by area residents who may be able to view these lights from their homes and yards. However, this impact will be limited in areas of more concentrated human settlement, where existing light sources will limit the visibility and contrast of the aviation warning lights. In addition, because the Maple Ridge Wind Farm has been in operation since 2006, the appearance and effect of FAA warning lights are familiar to residents within the visual study area for the Copenhagen Wind Farm.

It should be noted that the size and brightness of the lights depicted in Figure 11 are due to the use of a long exposure during photography to ensure that the lights were visible in the photographs, and therefore, are not representative of what would be seen with the naked eye. It is also worth noting that FAA warning lights flash, which is not depicted in these photographs. In addition, the Fenner Wind Power Project pre-dates current FAA regulations, and all 20 turbines were required to be lit. The Copenhagen Wind Project will conform to current FAA regulations, which typically require that fewer than half of the turbines be lit. For all these reasons, the appearance of the lights presented in Figure 11 illustrates an extremely conservative (worst-case) analysis of potential nighttime visibility.

Figure 10. The Maple Ridge Wind Farm

Figure 11. Representative Evening/Nighttime Photos

6.0 Conclusions

The VIA for the Copenhagen Wind Project allows the following conclusions to be drawn:

1. Visibility analyses conducted as part of this VIA indicate that the Project has the potential to be visible from substantial portions of the five-mile radius study area, especially within the Rural Residential/Agricultural LSZ. However, vegetation viewshed analysis and field review suggest that significant areas (over 58% of the study area) are well screened by areas of forest vegetation, smaller woodlots and hedgerows, and/or structures. These areas include the portions of the Villages of Copenhagen and Carthage as well as hamlet centers such as West Carthage, Champion, Deer River and Castorland. Research suggests that significant visual effects of wind power projects are generally concentrated within 3.5 miles (6 kilometers) of a project site (Eyre, 1995; Bishop, 2002). **edr's** observations on existing wind power projects in New York (e.g., the Madison, Munnsville, Fenner, Hardscrabble, and Maple Ridge Wind Power Projects) indicate that under favorable conditions, views of the wind turbines will likely be available from certain viewpoints well over 10 miles from the Project site. However, visual impact at these distances is typically minimal.
2. Viewshed analysis indicates that the Project could be at least partially visible from many of the identified aesthetic resources of statewide and local significance that occur within the study area. This includes a number of NRHP-Eligible sites, the Black River, local recreational resources, transportation corridors and the Copenhagen Central School Campus. Field review confirmed that the area with greatest Project visibility occurs on open hilltops and slopes within and adjacent to the Project Site and from open areas within the adjacent Black River valley. Open views of the Project will also be available from more distant hilltop areas with open agricultural fields. From other sensitive sites within the study area, including most areas of concentrated human settlement (see above), the Project will either not be visible or will be significantly screened by foreground vegetation and structures. At least partial screening was documented at the majority of sensitive sites visited during field review. Sites of statewide significance where field review confirmed lack of visibility (due the screening effects of adjacent buildings and/or vegetation) included several NRHP-Eligible sites and many areas along the Black River.
3. The study area includes 22 properties that have been listed or determined eligible for listing on the NRHP. Scenic views and/or association with the landscape are not specifically identified as contributing to the significance of any of the historic properties located within or just beyond the limits of the study area. The Project's potential effect on a given historic property would be a change (resulting from the introduction of wind turbines) in the property's visual

setting³. The analyses included in this study indicate that the Project will generally be at least partially screened from most locations within the Village of Copenhagen, where most of the structures eligible for listing on the NRHP are concentrated. Views of the Project from the village areas will generally be fully or partially screened by structures and trees. However, occasional, partial views of turbines or turbine blades will be available from portions of the village, and open views of the Project will be available from the outskirts of the village. Therefore, views of the Project will be available from some historic properties. The simulations prepared for the Project illustrate a representative range of Project visibility and visual contrast that could be experienced at historic sites within the study area at various distances. It is worth noting that visibility of a project does not necessarily indicate that an adverse effect will occur⁴. The potential effect resulting from the introduction of wind turbines into the visual setting for any historic or architecturally significant property is dependent on a number of factors including distance, visual dominance, orientation of views, viewer context and activity, and the types and density of modern features in the existing view (such as prominent features like modern buildings/residences, overhead electrical distribution lines, cellular towers, billboards, highways, and silos). It is also worth noting that visual setting may not be an important factor contributing to a given property's historical significance. In many instances, the historic buildings within the study area that could be considered NRHP-eligible would be significant under NRHP Criterion C (i.e., they "embody the distinctive characteristics of a type, period, or method of construction" [CFR 2004]). These properties are typically determined NRHP-eligible because they are representative examples of vernacular nineteenth-century architectural styles that retain their overall integrity of design and materials. These properties would retain the characteristics that caused them to be recommended eligible after the introduction of wind turbines into their visual settings. For these types of resources, the potential change in the setting resulting from the Project will not necessarily result in diminished public enjoyment and appreciation of a given historic property, or impair its character or quality (per NYSDEC 2000, see above).

4. Simulations of the proposed Project indicate that the visibility and visual impact of the wind turbines will be variable, based on landscape setting, extent of natural screening, presence of other man-made features and/or visual clutter in the view, baseline scenic quality, viewer sensitivity, and distance of the viewer from the Project. Evaluation by a panel of registered landscape architects indicates that the Project's overall contrast with the visual/aesthetic

³ The Federal Regulations entitled "Protection of Historic Resources" (36 CFR 800) include in Section 800.5(2) a discussion of potential adverse effects on historic resources. The following types of effects apply to wind energy projects include: "Adverse effects on historic properties include, but are not limited to: [items i-iii do not apply]; (iv) Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance; (v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features; [items vi-vii do not apply]" (CFR 2004).

⁴ The New York State Department of Environmental Conservation (NYSDEC) guidance concerning visual impacts on aesthetic resources of statewide significance (which include NRHP-listed and NRHP-eligible structures) defines significant aesthetic impacts as those "that may cause a diminishment of the public enjoyment and appreciation of an inventoried resources, or one that impairs the character or quality of such a place... Mere visibility, even startling visibility of a project proposal, should not be a threshold for decision making. Instead a project, by virtue of its visibility, must clearly interfere with or reduce the public's enjoyment and/or appreciation of the appearance of an inventoried resource" (NYSDEC 2000:5).

character of the area will generally be minimal to moderate. However, based on the contrast rating scores and comments, greater levels of contrast can be anticipated where foreground views of turbines (i.e., under 1.0 mile) are available from residences or areas of relatively higher overall scenic quality. Conversely, contrast is reduced when turbines are partially screened, viewed at greater distances, seen in the context of a working agricultural landscape, or viewed in a setting with existing visual clutter. Based on experience with currently operating wind power projects elsewhere, public reaction to the Project is likely to be generally positive, but highly variable based on proximity to the turbines, the affected landscape, and personal attitude of the viewer regarding wind power. High contrast also does not always indicate adverse visual impact. The landscape architect evaluating the Project indicated that the turbines did not generally conflict with existing land use or viewer activity, and as Stanton (1996) notes, although a wind power project is a man-made facility, what it represents "may be seen as a positive addition" to the landscape.

5. Based upon the nighttime photos/observations of existing wind power projects, the red flashing lights on the turbines could result in a nighttime visual impact on certain viewers. The actual significance of this impact from a given viewpoint will depend on how many turbines are visible, what other sources of lighting are present in the view, the extent of screening provided by structures and trees, and nighttime viewer activity/sensitivity. However, night lighting could be somewhat distracting and have an adverse effect on rural residents and recreational users that currently experience (or expect) dark nighttime skies. It should be noted that nighttime visibility/visual impact will be reduced due to 1) FAA lighting guidelines (FAA, 2005) which typically result in aviation warning lights on only about one third to one half the turbines, 2) the abundance of woodlots and hedgerows that screen portions of the Project from many locations, and 3) the concentration of residences in villages, hamlets, and along highways where existing lights already compromise dark skies and compete for the viewer's attention. . In addition, because the Maple Ridge Wind Farm has been in operation since 2006, the appearance and effect of FAA warning lights are familiar to residents within the visual study area for the Copenhagen Wind Farm.
6. Mitigation options are limited, given the nature of the Project and its siting criteria (very tall structures typically located in open fields at the highest locally available elevations). However, in accordance with NYSDEC Program Policy (NYSDEC, 2000), various mitigation measures were considered. These included the following:
 - A. Professional Design. All turbines will have uniform design, speed, color, height and rotor diameter. Turbines will be mounted on conical steel towers that include no exterior ladders or catwalks. The placement of any advertising devices (including commercial advertising, conspicuous lettering, or logos identifying the Project owner or turbine manufacturer) on the turbines will be prohibited.

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- B. Screening. Due to the height of individual turbines and the geographic extent of the proposed Project, screening of individual turbines with earthen berms, fences, or planted vegetation will generally not be effective in reducing Project visibility or visual impact. However, if adequate natural screening is lacking at the proposed substation site, a planting plan should be developed and implemented to minimize the visibility of this facility.
- C. Relocation. Because of the limited number of suitable locations for turbines within the Project site, and the variety of viewpoints from which the Project can be seen, turbine relocation will generally not significantly alter visual impact. Moving individual turbines to less windy sites would not necessarily reduce impacts but could affect the productivity and viability of the Project. Where visible from sensitive resources within the study area, generally more than half of the proposed turbines will be visible, and relocation of individual machines would have little effect on overall visual impact. Additionally, throughout the study area, views of the Project are highly variable and include different turbines at different vantage points. Therefore, turbine relocation would generally not be effective in mitigating visual impacts. Additionally, the Project layout has been designed to accommodate set-backs from roads and residences. Options for relocation of individual Project components are constrained by compliance with these various setbacks.
- D. Camouflage. The white/off white color of wind turbines (as mandated by the FAA) generally minimizes contrast with the sky under most conditions. This is demonstrated by simulations prepared under a variety of sky conditions. Consequently it is recommended that this color be utilized on the Copenhagen Wind Project. The size and movement of the turbines prevents more extensive camouflage from being a viable mitigation alternative (i.e., they cannot be made to look like anything else). Nielsen (1996) notes that efforts to camouflage or hide wind farms generally fail, while Stanton (1996) feels that such efforts are inappropriate. She believes that wind turbine siting "is about honestly portraying a form in direct relation to its function and our culture; by compromising this relationship, a negative image of attempted camouflage can occur." Other components of the Project will be designed to minimize contrast with the existing agricultural character in the Project area. For instance, new road construction will be minimized by utilizing existing farm lanes wherever possible and electrical collection lines will be buried.
- E. Low Profile. A significant reduction in turbine height is not possible without significantly decreasing power generation. Less generating capacity (resulting from smaller turbines) could threaten the Project's economic feasibility. To avoid generation losses, use of smaller turbines would require that additional turbines be constructed. Several studies have concluded that people tend to prefer fewer larger turbines to a greater number of smaller ones (Thayer and Freeman, 1987; van de Wardt and Staats, 1988). There will be minimal

visual impact from the electrical collection system because the majority of the collection system will be installed underground.

- F. Downsizing. Reducing the number of turbines could reduce visual impact from certain viewpoints, but from most locations within the study area where more than one turbine is visible, the visual impact of the Project would change only marginally. Additionally, the elimination of turbines could significantly reduce the socioeconomic benefits of the Project and reduce the Project's ability to assist the State in meeting its energy policy objectives and goals.
- G. Alternate Technologies. Alternate technologies for power generation, such as gas-fired generation, would have different, and perhaps more significant, visual impacts than wind power. Viable alternative wind power technologies (e.g., vertical axis turbines), that could reduce visual impacts, do not currently exist in a form that could be used on a commercial/utility-scale project.
- H. Non-specular Materials. Non-specular conductors will be used on the proposed transmission line, but will not be necessary for the underground electrical collection lines, because they will be buried. Non-reflective paints and finishes will be used on the wind turbines to minimize reflected glare.
- I. Lighting. Turbine lighting will be kept to the minimum allowable by the FAA and is anticipated to include approximately half of the proposed turbines. Medium intensity red strobes will be used at night, rather than white strobes or steady burning red lights. Fixtures with a narrow beam path will be considered as a means of minimizing the visibility/intensity of FAA warning lights at ground-level vantage points. Lighting at the substation will be kept to a minimum, and turned on only as needed, either by switch or motion detector. Full cut-off fixtures will be utilized to the extent practicable (consistent with safety and security requirements).
- J. Maintenance. The turbines and turbine sites will be maintained to ensure that they are clean, attractive, and operating efficiently. Research and anecdotal reports indicate that viewers find wind turbines more appealing when the rotors are turning (Pasqualetti et al., 2002; Stanton, 1996). In addition, the Project developer will establish a decommissioning fund to ensure that if the Project goes out of service and is not repowered/redeveloped, all visible above-ground components will be removed.

- K. Offsets. Correction of an existing aesthetic problem within the viewshed is a viable mitigation strategy for wind power projects that result in significant adverse visual impact. Historic structure restoration/maintenance activities could be undertaken to off-set potential visual impacts on cultural resources.

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Appendix A

Visual Simulations

On Enclosed CD:

Appendix B

Sensitive Sites Table and Viewshed/Sensitive Site Maps

Appendix C

Photo Log and Field Notes

Appendix D

Visual Impact Assessment Rating Forms