3.5.2.2.1 Viewshed Analysis

Ten-mile radius viewshed maps were prepared to determine the extent of potential Project visibility based on existing topography and vegetation, and the location and height of the proposed wind turbines. Topographic viewshed maps were prepared using USGS digital elevation model (DEM) data (7.5-minute series), coordinates/dimensions of all proposed turbines, and ESRI ArcView® software with the Spatial Analyst extension. The viewshed analyses were based upon a 476 foot (145 meters) blade tip height (the largest turbine models contemplated for this Project so as to present a worst-case scenario), a 328 foot (100m) FAA mandated warning light height, and the location of all proposed turbines, as shown in Appendix K, Figure 8. The analyses run at blade tip height illustrates maximum potential day time visibility, while the analyses run at the height of the FAA aviation warning light defines maximum potential nighttime visibility (under the “worst case” assumption that all of the turbines would be equipped with aviation warning lights). The resulting topographic viewshed maps define the maximum area from which any turbine within the completed Project could potentially be seen within the study area. Because the screening provided by vegetation and structures is not considered in this analysis, the topographic viewsheds represent a "worst case" assessment of potential Project visibility.

To illustrate the potential screening effect of forest vegetation, a vegetative viewshed analysis was also performed. The vegetative viewshed was prepared in the same manner as the topographic viewshed, except that a base vegetation layer was created using USGS National Land Cover Data (2000) and assigning an elevation value (40 feet) to various forest cover types. This layer was then added to the digital elevation model to produce a base layer for the viewshed analysis, as described above (again, using the blade tip and FAA warning light heights as input data). Once the viewshed analysis was completed, the areas covered by the forest vegetation layer were designated as "not visible" on the resulting data layer.

Potential turbine visibility, as indicated by the viewshed analyses, is illustrated in Appendix K, Figure 8. The topographic viewshed maps (Appendix K, Figure 8, Sheets 1 and 2), define the maximum area from which any of the proposed turbines or FAA warning lights could potentially be seen within the study area absent the presence of any intervening vegetation or structures, or visual obfuscation as the distance between the viewer and the turbines increases. This "worst case" assessment of potential day time visibility revealed that the proposed Project could potentially be visible in approximately 86% of the 10-mile study area (discounting the screening effect of existing vegetation and structures). Areas where there is no possibility of seeing the Project are generally limited to narrow valleys, and hillsides and shorelines oriented away from the Project site. Potentially visible areas include the relatively level lands along State Routes 12 and 180, many of the County Routes in and around the Project site (County Routes 3, 5, 8, 12, 125, 179 and 181), Interstate 81 and the hamlets of Depauville and LaFargeville. As indicated in Appendix K, 71 of the 81 identified aesthetic resources of statewide significance within the 10-mile study area are indicated as having potential views of some portion of the Project (based on blade tip height and topography alone). Aesthetic resources screened from view of the Project by topography alone include portions of the Villages of Brownville, Dexter, and Evans Mills, portions of the St. Lawrence River waterfront between the Villages of Clayton and Cape Vincent, and portions of the Seaway and Olympic Trails. However, this analysis indicates that significant portions of the St. Lawrence River and Lake Ontario could have open, unobstructed views to the Project across the water. Areas of potential nighttime visibility based on the topographic viewshed analysis cover approximately 81% of the 10-mile radius study area, and are indicated in roughly the same locations indicated by the blade tip analysis.

However, factoring vegetation into the viewshed analysis significantly reduces potential Project visibility. Within a 10-mile radius, vegetation, in combination with topography, will serve to screen the Project from approximately 53% of the area (i.e., 47% visibility). Visibility will generally be most available in open agricultural areas that are concentrated in the central portion of the study area (extending roughly north-south on State Route 12, and east-west on County Route 125). Visibility becomes more scattered in the outlying regions, except on the open water of Lake Ontario and the St. Lawrence River. Forested sites in the west-northwest portion of the study area fall outside the vegetation viewshed, as do wooded slopes and the backsides of hills in the eastern portion of the study area. Vegetation viewshed analysis indicates that 62 (77%) of the identified aesthetic resources of statewide significance within the study area should be at least partially screened by vegetation and topography (see Table A in Appendix K). Areas indicated as being screened include portions of Dexter Marsh, northwestern portions of the City of Watertown, the Villages of Evans Mills, Dexter and Brownsville, portions of the Villages of Clayton and Chaumont, the majority of the French Creek WMA, large portions of the Seaway Trail, and significant portions of the southern extent of the St. Lawrence River and Lake Ontario Waterfront. However, some sensitive resources, such as Perch River Wildlife Management Area, Long Point State Park, open waters of Lake Ontario and the St. Lawrence River, the Stone Mills Agricultural Museum and several historic homestead sites within the vicinity of Project site are still indicated as having the potential for at least partial visibility of the Project. Visual simulations prepared for these sites are discussed in Section 3.5.2.2.3 (below) and included in Appendix K.

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 147.5 feet of the turbine), the effects of distance, and screening from hedgerows, street trees and structures, which are not considered in the viewshed analysis. For example, distance affects the apparent size and degree of contrast between an object and its surroundings (see Section 3.5.1.2 for a discussion of distance zones and their effects on visual perception).

3.5.2.2.2 Field Verification

Visibility of the proposed Project was evaluated in the field on December 10 2006, December 30, 2010 and January 11, 2011. The purpose of this exercise was to identify locations with open views toward the Project site and to obtain photographs for subsequent use in the development of visual simulations. During field review crews drove public roads and visited public vantage points within the 10-mile radius study area to document points from which the Project would likely be visible. Photos were taken from 191 representative viewpoints using digital cameras. 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. Viewpoints photographed during field review generally represented the most open, unobstructed available views toward the Project.

Field review confirmed that actual Project visibility is likely to be more limited than suggested by viewshed mapping. This is due to the fact that screening provided by buildings is significant within more developed areas (villages and hamlets), and 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). 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. Field review confirmed a lack of visibility from areas that were heavily forested, and village centers such as Brownville, Chaumont, Clayton, Dexter and LaFargeville, where buildings and street trees screen the Project. Structures also block outward views from the City of Watertown. Views from Fort Drum are generally screened by topography and vegetation, and views from Sackets Harbor are unlikely, expect possibly from some waterfront areas with views to the northeast across open water (limited number of locations). In general, shoreline areas along Lake Ontario and the St. Lawrence River were screened from view of the Project site by trees and a rise to topography along the shoreline. The area with greatest Project visibility occurs within two miles of the proposed turbines, including portions of NYS Routes 12 and 180. However, even in these portions of the study area, hedgerows and trees not indicated on the USGS maps blocked/interrupted views toward the proposed turbines in many areas. Open views (at about 3.5 miles) will also be available from portions of Interstate Route 81. Based on field review at Long Point State Park, some open water areas on Lake Ontario to the southwest have the potential for unscreened views of the Project. These views will be available to recreational boaters, and in many locations will include all of the proposed turbines. Views from the St. Lawrence River (including Wellesley Island) will be much more limited due to the narrower width of this waterway, the more effective screening provided by shoreline trees and topography, and the greater distance from which the Project will be viewed.

A comprehensive summary of potential Project visibility from sensitive sites is presented in Appendix K.

3.5.2.2.3 Visual Simulations

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

1. They provide clear, unobstructed views toward the Project site.
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.

Location of the selected viewpoints is indicated in Figure 9 of Appendix K. Locational details and the criteria for selection of each simulation viewpoint are summarized in Table 17.

Table 17. Viewpoints Selected for Simulations and Evaluation

Viewpoint Number	Visually Sensitive Resource	LSZ Represented	Viewer Group Represented	Viewing Distance	View Orientation[1]
4	Tracy Farm (NRHP-Listed)	Rural Residential/ Agricultural	Local Residents	0.5 mile	W-SW
10	Hamlet of Depauville, NYS Route 12	Village/Hamlet	Local Residents; Travelers/Commuters	0.9 mile	S
35	Perch River WMA (observation platform)	Rural Residential/ Agricultural	Tourists/Recreational Users; Local Residents	2.9 miles	W
40	Stone Mills Agricultural Museum, Stone Mills Union Church (NRHP-Listed)	Rural Residential/ Agricultural	Tourists/Recreational Users; Local Residents	2.2 miles	W
61	Perch River WMA (ice-fishing access, Perch Lake)	Water/Waterfront	Tourists/Recreational Users	5.7 miles	W
67	NYS Route 12	Rural Residential/ Agricultural	Local Residents; Travelers/Commuters	0.9 mile	E-SE
70	Village of Chaumont, NYS Route 12E (Great Lakes/ Seaway Trail National Scenic Byway), Chaumont River	Water/Waterfront; and Village/Hamlet	Local Residents; Travelers/Commuters	4.5 miles	NE
74	Long Point State Park, Lake Ontario/Chaumont Bay	Water/Waterfront	Tourists/Recreational Users	9.1 miles	NE
102	Wellesley Island, Thousand Island Park Historic District, Saint Lawrence River	Water/Waterfront	Tourists/Recreational Users; Local Residents	9.1 miles	S
110	-	Rural Residential/ Agricultural	Local Residents	2.4 miles	E

[1]N = North, S = South, E = East, W = West

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 10 selected viewpoints. The photographic simulations were developed by constructing a three-dimensional computer model of the proposed turbine and turbine layout in 3D

StudioMax® based on turbine specifications and survey coordinates of the proposed facility. For the purposes of this analysis, it was assumed that all new turbines would be Gamesa G90 machines.

Simulations of the proposed Project indicate that the visibility and visual contrast presented by the wind turbines will be highly variable based on landscape setting, extent of natural screening, presence of other man-made features in the view, weather and meteorological conditions, viewer sensitivity, and distance of the viewer from the Project. Visual contrast is most apparent in mid-ground views where the turbines scale contrast is most notable, and in views where large numbers of turbines are visible and/or land use contrast is apparent. More distant views, and those that include significant screening generally have more limited visual impact. These factors tend to decrease turbine visibility and/or contrast with the landscape.

3.5.2.2.4 Potential Visual Impact Evaluation

Based on NYSDEC's Visual Policy, visibility alone of the Project from any of the potentially affected resources does not necessarily result in detrimental effect on the perceived beauty of the place or structure. In order to assess the relative impact of the Project on resources, a panel of three registered landscape architects (LA) evaluated the visual impact of the proposed Project on the existing visual landscape in terms of its contrast with existing components of the landscape. Digital color prints (11 x 17-inch) of the before and after photos from each selected viewpoint were evaluated, assigning each view quantitative visual contrast ratings on a scale of 0 (insignificant) to 4 (strong contrast). Results of that evaluation are presented in Table 18.

Table 18. Visual Contrast Rating Results

Viewpoint #	Distance (Nearest Turbine in View)	Landscape Similarity Zone (LSZ)	Individual Overall Scores[1]			Composite Score
			LA 1	LA 2	LA 3	
4	0.5 mile	Rural Residential/Agricultural	0.9	2.0	3.2	2.0
10	0.9 mile	Village/Hamlet	1.5	1.3	3.4	2.1
35	2.9 miles	Rural Residential/Agricultural	1.8	2.3	3.1	2.4
40	2.2 miles	Rural Residential/Agricultural	0.4	1.4	3.7	1.8
61	5.7 miles	Water/Waterfront	0.3	2.5	1.7	1.5
67	0.9 mile	Rural Residential/Agricultural	0.7	2.5	3.8	2.3
70	4.5 miles	Water/Waterfront	0.1	0	0.5	0.2
74	9.1 miles	Water/Waterfront	0.4	2.6	2.8	1.9
102	9.1 miles	Water/Waterfront	0	0	0.2	0.1
110	2.4 miles	Rural Residential/Agricultural	0.5	1.1	2.1	1.2
Average			**0.7**	**1.6**	**2.5**	**1.6**

[1]On a scale of 0 (completely compatible) to 4 (incompatible).

Panel evaluation of the simulations indicated that the Project's overall impact on scenic quality within the visual study area is likely to be moderate. Of the 10 simulations evaluated, seven (70%) received a composite contrast rating of between 1.5 and 2.4 on a scale of 0 (insignificant) to 4 (strong), and the composite average score was 1.6 for all viewpoints evaluated. The highest individual and composite contrast ratings were received by views where the turbines presented appreciable scale, color, and/or line contrast, or were perceived as changing the existing land use. Turbine visibility against the sky, scale contrast with the existing vegetation, line contrast with the horizontal landform, and creation of a new focal point in the view were also indicated as factors that contributed to visual contrast. At greater distances, and with more screening, the contrast/impact of the Project was significantly reduced. However, there was a high degree of variability among the panel members' ratings, with the individual members reacting quite differently to individual simulations (see rating forms in Appendix K). Two panel members (LA1 and LA2) rated the Project as having a generally minimal to moderate contrast with the existing landscape, while the third (LA3) generally considered contrast to be more appreciable to strong. This likely reflects individual variability in perception/acceptance of the turbines. Similarly, public reaction to the Project is likely to be highly variable based on proximity to the turbines, the affected landscape, and personal attitude of the viewer regarding wind power.

As noted in the NYSDEC Visual Policy, significant visual impacts are those that cause a diminishment of the public enjoyment and appreciation of the identified resource or one that impairs the character or quality of such place. The panel evaluation generally does not indicate that an impact of this magnitude is likely. It is also worth noting that the panel's evaluation does not account for the distractions and ameliorating effects of less favorable atmospheric viewing conditions, which are predominant in this region. In addition, the simulated views do not account for the fact that in a "real world" view there are numerous other distractions that can reduce visual contrast and compete for the viewer attention. This serves to further reduce potential impacts resulting from the distant background views of the turbines. In any event, it is not anticipated that distant views to the wind farm will impair the use of the majority of sensitive resources identified within the study area. Most waterfront locations, including parks, are oriented to provide scenic views of the water which places the turbines behind the typical viewer (in most cases). In addition, although recreational users are considered sensitive to visual impact, those who are engaged in active recreational activities (e.g., boating, waterskiing, snowmobiling, etc.) or hunting, which are dominant activities in the study area, are unlikely to stop participating in these activities, or seek out new locations for these activities, or experience diminished enjoyment of these activities with the proposed Project in place.

3.5.2.2.5 Assessment of Shadow Flicker

In addition to the VIA, EDR conducted a separate assessment of the phenomenon known as "shadow flicker" (Appendix L). Shadow flicker is the alternating change in light intensity or shadows created by the moving turbine blades when back-lit by the sun. These flickering shadows may be perceived by some as annoying when cast on nearby residences; however, due to the turbines' low blade pass frequency, shadow flicker is not anticipated to have any adverse health effects (e.g., trigger epileptic seizures).

EDR used the following data to evaluate potential impacts related to shadow flicker:

- Proposed turbine locations (coordinates)
- Shadow flicker receptor (residence) locations (coordinates) within 1,000 meters of a turbine
- USGS 1:24,000 topographic and USGS DEM (height contours)
- Turbine rotor diameter and hub height for both of the turbines under consideration for the Project (Gamesa G-90 and G-97)
- Joint wind speed and direction frequency distribution
- Sunshine hours (long term monthly reference data)

For both turbine models, the model calculated shadow-flicker time at each assessed receptor location within 1,000 meters (3,281 feet) of a proposed turbine. This distance is the industry standard for shadow flicker studies, and exceeds the 10-rotor diameter distance (900m for the Gamesa G90 and 970m for the Gamesa G97) beyond which shadow flicker is essentially undetectable (U.S. Department of the Interior, 2005; BERR, 2009). The model presents the amount of shadow-flicker time (hours/year) in the areas surrounding the Project as an iso-line plot for each of the turbine models being considered.

Based on the shadow flicker analysis, of the 392 structures identified within 3,281 feet (1,000 meters) of any turbine, the following results are predicted:

Gamesa G-90 (90 meter rotor on 100 meter tower):

- 238 (61%) will experience no shadow flicker,
- 2 (1%) may be affected by >1 hour/year,
- 78 (20%) may be affected 1-10 hours/year,
- 54 (14%) may be affected 10-20 hours/year,
- 15 (4%) may be affected 20-30 hours/year,
- 5 (1%) may be affected by more than 30 hours/year (none by more than 37 hours/year).

Gamesa G-97 (97 meter rotor diameter on 90 meter tower):

- 237 (60%) will experience no shadow flicker,
- 1 (>1%) may be affected by >1 hour/year,
- 71 (18%) may be affected 1-10 hours/year,
- 56 (14%) may be affected 10-20 hours/year,
- 17 (4%) may be affected 20-30 hours/year,
- 10 (3%) may be affected by more than 30 hours/year, (none by more than 42 hours/year).

All shadow flicker receptors and the hours of shadow flicker they are predicted to receive are indicated in tables and maps included in Appendix L.

No consistent national, state, county, or local standards exist for allowable frequency or duration of shadow flicker from wind turbines at the proposed Project site. In general, quantified limits on shadow flicker are uncommon in the United States (USDOE, 2010). However, standards developed by some states and countries provide guidance in this regard. A model wind ordinance prepared by the North Carolina Wind Working Group in 2008 suggests a limit of 30 hours per year at any occupied building on a non-participating landowner's property (NCWWG, 2008). The Ohio Power Siting Board has also used 30 annual hours of shadow flicker as a threshold of acceptability in reviewing commercial wind power projects (OPSB, 2008). Additionally, international guidelines from Europe and Australia have suggested 30 hours of shadow flicker per year as the threshold of significant impact, or the point at which shadow flicker is commonly perceived as an annoyance (NRC, 2007). Thirty hours per year equates to approximately 0.7% of the total daylight hours in a year (approximately 4,461 hours) at the latitude and longitude of the Project site. As indicated above, using the Gamesa G-90, five of the 392 inventoried receptors are predicted to exceed the threshold of 30 hours of shadow flicker per year. Using the Gamesa G-97, 10 of the 392 inventoried receptors are predicted to receive in excess of 30 hours of shadow flicker per year.

3.5.3 Mitigation

Construction-related visual impacts will be avoided, minimized, and mitigated through 1) careful site planning/project layout, 2) development and implementation of various construction plans, and 3) a comprehensive site restoration process following completion of construction.

The proposed Project layout was developed so as to minimize the need for tree clearing and new road construction. The majority of the proposed access roads and turbines have been sited in open fields (agricultural and successional). Existing farm lanes will be upgraded for use as turbine access roads wherever possible, and buried collection lines will follow access roads to minimize required clearing. Where clearing of undisturbed forest is unavoidable, such sites are typically well removed from public roads and residences and therefore will not result in a significant adverse visual impact.

During construction, visual impacts associated with working construction equipment will be minimized through adherence to a construction routing and sequencing plan that minimizes impacts on local roads and residences. A dust control plan and a sediment and erosion control plan will be developed and implemented as described in Sections 3.4.3 and 2.7 respectively, to minimize off-site visual impacts associated with construction activities. As described in the impacts discussion, any unavoidable construction-related visual impacts will be short term.

Following completion of construction, site restoration activities will occur. These will include removal of access road material from Project access roads (i.e., going from approximately 50 feet to 16-25 feet in width), restoration of agricultural fields (including soil de-compaction, rock removal, and topsoil spreading – see Section 2.0), and re-vegetating/restoring disturbed sites through seeding and mulching. Because removal of mature trees along the access roads and along public roads is anticipated to be minimal, no tree planting is proposed as mitigation for construction-related visual impacts. Because Project access roads will receive very limited use once construction is complete, they will take on the appearance of farm roads, similar to those that currently are present within the area. These actions will assure that, as much as possible, the site is returned to its preconstruction condition and that long-term visual impacts are minimized.

The NYSDEC Visual Policy states that only where “significant impacts are identified” by the visual assessment is the applicant required to employ reasonable and necessary mitigation measures. The contrast rating panel included in the Visual Assessment for this Project (Appendix K) indicates that in most cases the Project is not expected to result in diminishment of the public enjoyment and appreciation of identified sensitive locations or impair the character or quality of such places. Nonetheless, the NYSDEC Visual Policy provides typical mitigation options that “may reduce or eliminate the visibility of the project or alter the project’s effect on the scenic or aesthetic resource in some way”. The applicability of these mitigation options were evaluated and are summarized below.

Mitigation options for the operating Project are limited, given the nature of the Project and its siting criteria (tall structures in open areas). It is also worth noting that for many individuals, views of wind power projects are not necessarily considered an adverse impact that requires mitigation (Warren, et al., 2005). 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. Towers will 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.

B. Screening. Due do 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, selective off-site planting could be effective in screening views from some historic sites in the area. A visual mitigation planting fund could be established to screen views of the Project from NHRP-listed or eligible historic sites within the study area.

C. Relocation. The Project is sited to access favorable elevation and maximize exposure to prevailing winds. These reliable winds meet the necessary criteria for a commercially viable wind energy Project. Because of the extent of the Project, the number of individual turbines, and the variety of viewpoints from which the Project can be seen, turbine relocation will generally not significantly alter visual impact. Where visible from sensitive resources within the study area, multiple turbines will typically be visible, and relocation of individual machines would have little effect on overall visual impact. Throughout the study area, views of the Project are highly variable and include different turbines at different vantage points. Additionally, the Project layout has been designed in compliance with all required set-backs from roads and residences. Options for relocation of individual Project components are constrained by compliance with setback requirements. Moreover, turbine relocation is likely to impact a number of other existing environmental constraints which have been considered in choosing the current location of turbines. Therefore, turbine relocation would generally not be effective in mitigating visual impacts.

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 Horse Creek 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). Other components of the Project have been designed to minimize contrast with the existing agricultural character in the Project area. These measures will include the design of the Project operations and maintenance building, which although not yet designed will reflect the vernacular architecture of the area (i.e., the building will resemble an agricultural structure). Additionally, new road construction will be minimized by utilizing existing farm lanes wherever possible.

E. Low Profile. A significant reduction in turbine height is not possible without significantly decreasing power generation. To off-set this decrease, additional turbines would be necessary. There is not adequate land under lease to accommodate a significant number of additional turbines, and a higher number of shorter turbines would not necessarily decrease Project visual impact. In fact, 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). The visual impact of the electrical collection system is being minimized by placing the majority of the collection system underground. Although the final locations of poles and pole design is not yet determined, based upon overhead line routing, these poles will be obscured from many viewpoints within the Project area by trees or other vegetation.

F. Downsizing. Reducing the number of turbines could reduce visual impact from certain viewpoints, but from most locations within the study area where numerous turbines are visible, the visual impact of the Project would change only marginally. As discussed in more detail in the Alternatives section of the DEIS (Section 5.0), a dramatic reduction in turbine number (e.g., reduction by 50%) would significantly reduce the socioeconomic benefits of the Project and reduce the Project's ability to assist the State in meeting State energy policies objectives and goals.

G. Alternate Technologies. Alternate technologies for power generation would have different, and perhaps more significant, visual impacts than wind power. Alternative utility-scale wind power technologies (e.g., vertical axis turbines), that could reduce visual impacts, are not commercially available.

H. Nonspecular Materials. Non-reflective paints and finishes will be used on the wind turbines to minimize reflected glare. Nonspecular conductor will be used on the above-ground sections of the electrical collection system.

I. Lighting. Turbine lighting will be kept to the minimum allowable by the FAA. Current FAA guidelines (FAA, 2005) do not require daytime lighting, and allow nighttime lighting of perimeter turbines only, at a maximum spacing of 0.5 mile. 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 from ground-level vantage points. Lighting at the substation will be kept to a minimum, and tuned 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 (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.

Regarding potential shadow-flicker impacts, additional investigation of the receptors that could receive more than 30 hours of shadow flicker annually will be undertaken. This investigation will determine if site-specific conditions (building/window orientation, tree screening, etc.) will prevent or reduce the predicted impact. In instances where such mitigating factors are not present, mitigation for potential shadow flicker impacts will be provided by the Project sponsor through the purchase of landscape screening (trees, shrubs) or window treatment such as curtains, blinds, or shutters.

3.6 SOUND

The sound or noise produced during construction and operation of wind power projects can be a significant concern to local residents. Noise is defined as any loud, discordant or disagreeable sound or sounds. More commonly, in an environmental context, noise is defined simply as unwanted sound. Certain activities inherently produce sound levels or sound characteristics that have the potential to create noise. The sound generated by proposed or existing facilities may become noise due to land use surrounding the facility, if these lands contain residential, commercial, institutional, or recreational uses, and the sound is perceived as noise by the users of the adjacent lands (NYSDEC, 2001).

To obtain background sound levels and evaluate potential sound impacts from the Project, an *Acoustical Analysis* was prepared by CH2MHILL (Appendix N; CH2MHILL, 2011). The two primary phases of the study included a background sound level survey and a computer modeling analysis of anticipated Project operation sound levels, which were compared to the noise thresholds set forth in the Town of Clayton Wind Energy Facilities law (TBTC, 2007) and NYSDEC guidelines (NYSDEC, 2001).

Acoustical terms used in this section are defined as follows (CH2MHILL, 2011; TBTC, 2007):

- *Ambient noise level*: The composite of noise from all sources near and far. The normal or existing level of environmental noise at a given location.
- *Decibel (dB)*: A unit describing the amplitude of sound.

- *A-weighted sound pressure level (dBA)*: The sound pressure level in decibels as measured on a level meter using the A-weighted filter network. The A-weighted filter de-emphasizes the very low and very high frequency components of the sound in a manner similar to the frequency response of the human ear and correlates well with subjective reactions to noise.
- *Equivalent Sound Level (L_{eq})*: The L_{eq} integrates fluctuating sound levels over a period of time to express them as a steady-state sound level. Equivalent Sound Level is considered to be related directly to the effects of sound on people since it expresses the equivalent magnitude of the sound as a function of frequency of occurrence and time.

In order to provide a frame of reference for noise levels presented in the following discussion, Table 19 lists examples of common noise sources and their respective dBA levels.

Table 19. Common Sources of Noise and Associated Typical Noise Levels (dBA)

Source/Activity	Indicative noise level (dBA)
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind farm at 350m	35-45
Car at 40 mph at 100m	55
Busy general office	60
Truck at 30 mph at 100m	65
Pneumatic drill at 7m	95
Jet aircraft at 250m	105
Threshold of pain	140

Source: The Scottish Office, Environment Department, Planning Advice Note, PAN 45, Annex A: Wind Power, A.27. Renewable Energy Technologies, August 1994. Cited in "Noise from Wind Turbines," British Wind Energy Association, http://www.britishwindenergy.co.uk/ref/noise.html .

3.6.1 Existing Conditions

The Project site is a rural, agricultural area with generally low ambient noise levels. Environmental variables that are expected to affect existing noise levels include the rustling of trees, wind blowing over fields of corn or grass, vehicle use on local roads, tractor/farming activity, and inclement weather (rainstorms and thunder). CH2MHILL measured the existing sound environment within the Project area during a two-week period (between November 13 and December 1, 2010) when leaves on the trees were minimal. In the winter when deciduous trees are bare of leaves, ambient sound level is generally lower, because rustling leaves and insect/bird sounds are absent, resulting in relatively low sound levels compared to other seasons. Therefore, by capturing the lowest level of natural masking noise that could hide or obscure potential noise from wind turbines, measurements taken during leaf-off conditions represent a conservative, worst-case scenario for modeling future noise impacts.

Ambient sound levels within the Project area were measured using Larson Davis 824 and 820 Type 1 (precision) sound level meters. All equipment had been factory calibrated within the previous 12 months and field calibrated both before and after the measurement period. Ambient sound level measurements were collected in 10-minute intervals six representative locations, which are distributed over the Project area and beyond (Monitoring Locations are depicted in Appendix N). The average ambient nighttime noise level (L_{eq}) under cut-in and full output hub height wind speeds at each of the six monitoring locations is listed in Table 20. The range of sound levels recorded at each monitoring location reflect typical variability within the Project area resulting from a variety of factors. These include that ambient sound levels generally increase with increasing wind speed, nighttime sound levels were generally less than daytime sound levels, and locations along more heavily traveled roadways generally had higher sound levels than locations on less traveled roadways.

Table 20. Summary of Ambient Nighttime L_{eq} Noise Levels (dBA)

Monitoring Location ID	L_{eq} Noise Level at Cut-in Wind Speeds (4.3 m/s)	L_{eq} Noise Level at Full Output Wind Speeds (8.7 m/s)
22	27 – 51	26 – 47
45	25 – 42	24 – 46
87	46 – 58	40 – 57
166	27 – 41	24 – 41
190	34 – 49	31 – 49
396	27 – 44	25 – 40

3.6.2 Potential Impacts

Virtually everything that has moving parts will make some sound, including wind turbines. No completely satisfactory way exists to measure the subjective effects of noise, or to measure the corresponding reactions of annoyance and dissatisfaction. This lack of a common standard is primarily due to the wide variation in individual thresholds of annoyance and habituation to noise. Thus, an important way of determining a person's subjective reaction to a new noise is by comparing it to the existing or "ambient" environment to which that person has adapted. The NYSDEC Program

Policy Memorandum, “Assessing and Mitigating Noise Impacts” (NYSDEC, 2001) suggests that new noise level increases exceeding 6 dBA above ambient should be assessed for adverse impacts. The Town of Clayton’s Wind Energy Facilities Law (TBTC, 2007) requires that the Project operate so that the maximum noise generated shall not exceed 50 dBA, as measured at offsite residences, schools, hospitals, churches, or public libraries. In the NYSDEC guidance this noise level is described as “quiet”.

In general, the more the level or the tonal (frequency) variations of a noise exceeds the previously existing ambient noise level or tonal quality, the less acceptable the new noise will be, as judged by the exposed individual. The general human response to changes in noise levels that are similar in frequency content (for example, comparing increases in continuous (L_{eq}) traffic noise levels) are summarized below (NYSDEC, 2001):

- A 3-dB change in sound level is considered a barely noticeable difference
- A 5-dB change in sound level will typically be noticeable
- A 10-dB change is considered to be a doubling in loudness

The potential noise-related impacts resulting from the construction and operation of the Project is described below.

3.6.2.1 Construction

Construction of wind power projects requires the operation of heavy equipment and construction vehicles for various activities including construction of access roads, excavation and pouring of foundations, the installation of buried and above ground electrical interconnects, and the erection of turbine components. These activities, although temporary, will produce the following types and levels of noise:

Truck traffic and heavy equipment operation: Heavy equipment, gravel, concrete and the wind turbine components must be delivered to the site by large trucks (including dump trucks, cement mixers, and tractor-trailers). Heavy equipment utilized on a wind power project includes bulldozers and rollers during site preparation and road construction, backhoes, hoe rams, and pneumatic jacks during foundation excavation, and cable plows, trenchers, and backhoes during electrical cable installation. A large erection crane is used to install the nacelle and rotor atop the turbine tower. Sound generated by truck traffic and heavy equipment ranges from 83 to 91 dBA at a distance of 50 feet (USEPA, 1971). This Project related sound will be intermittent and of short term duration – generally occurring during Project construction.

Blasting: Although not anticipated on this Project, blasting could be required if the turbines are being installed in areas where bedrock is close to the surface and cannot be broken up by other means. More frequently, foundation holes are excavated using backhoes or a pneumatic jack to break up subsoil bedrock. However, if blasting is required, the level of noise generated will be dependent upon technical specifications (size and depth of drilled holes, type and amount of explosive), atmospheric conditions (wind direction, temperature, humidity), and geologic conditions (soil type, bedrock type) (APAO website). In addition, any blasting-related noise will be temporary and infrequent.

Table 21 below shows the total composite noise level at a reference distance of 50 feet, based on the pieces of equipment operating for each construction phase and the typical usage factor for each piece. The noise level at 1,500 feet is also shown, which is likely a conservative prediction, because the only attenuating mechanism considered was geometric spreading, which results in an attenuation rate of 6 dBA per doubling of distance. However, attenuation related to the presence of sound dampening structures such as buildings, trees or vegetation, ground effects, and terrain was not considered.

Table 21. Composite Construction Site Noise Levels

Construction Phase	Composite Equipment Noise Level at 50 feet, dBA	Composite Equipment Noise Level at 1,500 feet, dBA
Clearing	88	58
Excavation	90	60
Foundation	89	59
Erection	84	54
Finishing	89	59

Noise from construction-related activities may cause some temporary annoyance at residences within and adjacent to the Project site. In some places these activities will occur relatively close to existing residences and, at distance of 1,500 feet, a total sound level ranging from 54 to 60 dBA might occur over several working days. Such levels would generally be unacceptable if they were occurring on a permanent basis or outside of normal daytime working hours. However, as a temporary, daytime occurrence, construction sound of this magnitude may well go unnoticed by many residents in the Project site as construction-related noise will not be significantly louder than everyday noise sources such as farm equipment and vehicles passing on the road.

3.6.2.2 Operation

The sources of sounds emitted from operating wind turbines can be divided into two categories: 1) mechanical sounds, from the interaction of turbine components, and 2) aerodynamic sounds, produced by the flow of air over the blades (NRC, 2007:157; Rogers et al., 2006). Mechanical sounds originate from the relative motion of mechanical components and the dynamic response among them. Since the emitted sound is associated with the rotation of mechanical and electrical equipment, it tends to be tonal (of a common frequency), although it may have a broadband component. Aerodynamic broadband sound is typically the largest component of wind turbine acoustic emissions, and is generally characterized as a “swishing” or “whooshing” sound. It originates from the flow of air around the blades, and generally increases with rotor speed.

In order to quantitatively look at potential impacts in absolute terms, a modeling study of worst-case Project sound levels was carried out to determine what specific sound levels could be expected at the nearest receptors. The *Acoustical Analysis* prepared by CH2MHILL (Appendix N; CH2MHILL, 2011) predicted operational sound from the built Project in order to evaluate potential impacts on adjacent residential structures. The noise analysis was conducted using standard acoustical engineering methods and in strict accordance with the international standards including ISO 9613, *Acoustics – Sound Attenuation during Propagation Outdoors* (ISO, 1993) and VDI 2714, *Outdoor Sound Propagation* (VDI, 1988). ISO 9613-2 (entitled “Part 2: General Method of Calculation”; ISO, 1993) is the primary worldwide standard for such calculations. The analysis was conducted using the following assumptions:

- “Standard Day” Conditions – The model assumes atmospheric absorption for a typical day as defined in ISO 9613-1 (entitled “Part 1: Calculation of the Absorption of Sound by the Atmosphere”; ISO, 1993) with conditions of 10°C and 70% relative humidity.
- Wind Direction – The model assumes a hypothetical situation where wind is blowing from all directions at the same time.
- Critical Wind Speed – The maximum sound power levels used in the analysis are generally realized at wind speeds of 6 m/s (13.4 mph) or greater; this speed represents the point where the least amount of masking noise is likely to be present relative to the turbine sound level.

- Wintertime Background Levels – The background survey was conducted under wintertime (leaf-off) conditions when ambient levels are normally at an annual minimum (without leaves rustling or summer insects/birds)
- Conservative L_{90} Background Level – The L_{90} is a measurement that represents the noise level that is exceeded during 90% of the measurement period. By definition, a higher background sound level will actually exist most of the time (90% of the time).
- Low Ground Porosity – Wooded areas and fields are normally more acoustically absorptive than assumed in the model.
- Observer Outside – The plotted sound levels assume that the receptor is located outside; sound levels inside of any dwelling will be 10 to 20 dBA lower.

In the model, each proposed wind turbine was considered to be a point source of noise at the hub height with an overall sound power level of 108 dBA under full power conditions. This overall sound power level represents the maximum turbine noise level determined in accordance with IEC61400-11, *Wind Turbine Generator Systems—Part 11: Acoustic Noise Measurement Techniques* (IEC, 2006) and includes a +2 dBA adjustment to account for typical vendor warranty or declared sound power levels. The majority of turbines are anticipated to operate at their expected value while a more limited number may operate above or below this expected value. Although it is statistically unlikely that all of the turbines would simultaneously operate above the expected sound power range for a Gamesa G90 turbine of 106 dBA, the +2 dBA adjustment (108 dBA) was included in the model to ensure a conservative analysis. The combination of the modeling parameters used and the inclusion of the +2 dBA term are expected to result in a reasonable and conservative assessment of the maximum project levels. When winds are slower than those that correspond to maximum noise emissions, the noise levels will be less.

The transmission line is 115-kilovolt (kV), therefore audible corona noise is anticipated to be negligible (corona noise generally is associated with voltages exceeding 345 kV). Transformers are expected to have a National Electrical Manufacturers Association (NEMA) sound rating of 87 dBA.

<u>Compliance with the Town of Clayton Wind Energy Facilities Law</u>

The Town of Clayton's Wind Energy Facilities Law states that the "sound level statistical sound pressure level (L_{10}) due to any [wind turbine] operation shall not exceed 50 dBA when measured at any off-site residence, school, hospital, church or public library" (TBTC, 2007:§15.A). The predicted Project noise levels under full power conditions are depicted in Appendix N: Figure 1. No residences/receptors are predicted to exceed the local ordinance threshold of 50 dBA, even at participating homes, during full power conditions. Lower sound levels should be anticipated when turbines are operating in a reduced power mode.

Conformance with NYSDEC Guidelines

The New York State Department of Environmental Conservation (NYSDEC) published guidance "Assessing and Mitigating Noise Impacts" (NYSDEC, 2001) does not provide quantitative noise limits but its key recommendations are briefly summarized below:

- New noise sources should not increase noise level above 65 dBA in non-industrial areas.
- The U.S. Environmental Protection Agency (EPA) found that 55 L_{dn} was sufficient to protect public health and welfare, and in most cases did not create an annoyance. (55 L_{dn} is equal to a continuous level of 49 dBA)
- Sound level increases of more than 6 dB may require a closer analysis of impact potential depending on existing sound levels and the character of surrounding land use and receptors.
- In determining the potential for an adverse noise impact, consider not only ambient noise levels, but also the existing land use, and whether or not an increased noise level or the introduction of a discernable sound that is out of character with existing sounds will be considered annoying or obtrusive.
- Any unavoidable adverse effects must be weighed along with other social and economic considerations in deciding whether to approve or deny a permit.

The NYSDEC guidance states that the L_{eq} "provides an indication of the effects of sound on people (and is) useful in establishing the ambient sound levels" and the L_{90} is "often used to designate the background noise level". The guidance also indicates "quiet seemingly serene setting such as rural farm land" will be 45 dBA while wilderness areas will be 35 dBA. As indicated in Appendix N, the winter time ambient levels for the Project area were found to fluctuate from less than 25 to over 50 dBA and nighttime levels were generally less than daytime levels. The fluctuation in existing ambient noise level is a function of many factors including but not limited to weather, wind conditions, presence of other noise sources (such as, road, rail and air traffic, wildlife (birds, insects and domestic dogs).

The *Acoustical Analysis* for the Project (Appendix N; CH2MHILL, 2011) acknowledges that NYSDEC's guideline for additional analysis (a 6 dBA increase over ambient) will be exceeded in some conditions. It is also acknowledged that ambient levels were found to vary over a wide range. As noted above, the NYSDEC guidance suggests that sound levels for wilderness areas will typically be 35 dBA while rural farm land will be 45 dBA. The Project area is clearly more rural farmland than wilderness, and consistent with the NYSDEC guidance, we have determined an approximate baseline of 37 dBA as the ambient condition in this assessment. This level falls between NYSDEC's suggested ambient levels for wilderness areas and rural farm land; and also corresponds to the average median L_{eq} for the wind speed corresponding to 8.7 m/s, the wind speed at which the turbine emit their full sound level. Therefore, the area of potential increases exceeding the 6 dBA guideline may at times be approximated by the 45 dBA contour depicted in Appendix N: Figure 1. It is important to note that this is representative of an expected project level of 43 dBA as the contours include a +2 dBA adjustment to the turbine sound power level (this was to clearly document that Project related sound levels are expected to satisfy the Town's 50 dBA requirement).

As to the additional analysis suggested in the NYSDEC guidance for areas exceeding the 6dBA threshold, we note that the NYSDEC's guidance states that "This guidance does not supersede any local noise ordinances or regulations." Accordingly, the Project must be operated in a manner which will comply with the noise ordinance limit of 50 dBA at sensitive receptors. The noise ordinance requirement is less than NYSDEC maximum guideline of 65 dBA for non-industrial settings. Moreover, as noted in Table E of the NYSDEC guidelines, the Project's maximum sound levels of 30 to 50 dBA at sensitive receptors, are considered "very quiet" to "quiet", respectively. It is acknowledged that such qualitative descriptions will vary among individuals and may be influenced by both acoustic and non-acoustic factors.

Based on this analysis, overall impacts from operational noise are not expected to be significant throughout the Project site. Nevertheless, some residents may find some dissatisfaction with the audible noise produced by the Project.

3.6.3 Proposed Mitigation

Although residential sound impacts are likely minor (and in no case are noise levels anticipated to exceed the locally established threshold of 50 dBA), mitigation measures for potential construction and operational impacts are proposed to include the following:

- Pursuing good neighbor agreements and/or noise easements with property owners of residences that fall within the area of predicted potential 6 dBA increase over ambient sound levels.

- Limiting hours of construction to between 7 a.m. and 7 p.m., Monday through Friday (in accordance with the Town of Clayton Wind Energies Facilities Law, §12.O). This includes conducting the nosiest activities between the hours of 8 a.m. and 5 p.m.
- Implementing best management practices for noise abatement during construction, including use of appropriate mufflers.
- Notifying landowners by mail or phone at least one week in advance of certain construction noise impacts (e.g., blasting, pile driving).
- Locating stationary construction equipment (air compressors/generators) as far away from residences as feasible. When possible, utilize equipment in acoustically designed enclosures and/or erect temporary barriers.
- Implementing a complaint resolution procedure to assure that any complaints regarding construction or operational noise are adequately and efficiently investigated and resolved.

3.7 TRANSPORTATION

The Project area is served by a network of state, county, and local roadways. Roads range from two-lane highways with paved shoulders to seasonally maintained, dirt/gravel roads. Wind power generating projects have the potential to create transportation impacts as a result of short-term construction activities (temporary impacts) and as a result of long-term operation and maintenance of the Project (permanent impacts). To evaluate the potential temporary and permanent impacts resulting from the proposed Project, Creighton Manning Engineers (CME) conducted a Route Evaluation Study in 2007. The purpose of this evaluation is to document the existing transportation conditions and identify probable travel routes, constraints, and proposed improvements. The Route Evaluation Study is included as Appendix O. In addition, Fisher Associates (FA) prepared a Structures Inventory and Assessment in 2010, which reviewed the existing bridge and drainage structure conditions along the proposed hauling route within the Project area and identified potential impacts and mitigation measures. The Structures Inventory and Assessment is included as Appendix P. Together, these studies provide a comprehensive inventory of transportation resources in the Project area (for all project alternatives considered), allow for quantitative and qualitative assessment of potential adverse impacts resulting from project construction and operation, and identify measures that adequately mitigate for unavoidable impacts.

3.7.1 *Existing Conditions*

CME conducted a field inventory and visual assessment and prepared a photo log of potential Project transportation routes within the study area. Included in this inventory is documentation of roadway characteristics and conditions. Table 22 provides a summary of the existing road conditions in the study area in terms of width, surface and posted traveling speed.

Table 22. Existing Road Characteristics

Road	From	To	Lane Width	Pavement Condition	Surface Type	Speed Limit
State Roads						
NY Route 3	Oswego	NY Route 180	24	Good	Asphalt	55-mph
NY Route 12	I-81 Exit 46	County Route 12	24	Good	Asphalt	55-mph
NY Route 12F	NY Route 180	I-81 Exit 46	24	Good	Asphalt	55-mph
NY Route 180	County Route 54	Dutch Gap Rd.	22	Good	Asphalt	55-mph
NY Route 180	NY Route 3	NY Route 12F	24	Good	Asphalt	55-mph
NY Route 342	I-81 Exit 48	NY Route 12	24	Good	Asphalt	55-mph
County Roads						
Route 12	NY Route 12	NY Route 180	20	Fair	Asphalt	Not Posted
Route 54	NY Route 180	Factory St.	20	Fair to Good	Asphalt	Not Posted
Local Roads						
Herbretch Rd.	NY Route 180	Woodard Rd.	14	Poor	Asphalt	Not Posted
Woodard Rd.	NY Route 12	NY Route 180	16	Fair	Asphalt	Not Posted
Tubolino Rd.	Miller Rd.	Woodard Rd.	16	Fair	Asphalt	Not Posted
Miller Rd.	NY Route 12	Hart Rd.	16	Fair	Asphalt	Not Posted
Lowe Rd.	County Route 54	NY Route 12	17	Poor	Asphalt	Not Posted
Sternberg Rd.	Lowe Rd.	Morris Tract Road	16	Fair to Poor	Asphalt	Not Posted
Hart Rd.	NY Route 12	Miller Rd.	16	Fair	Asphalt	Not Posted
Fox Corners Road	NY Route 12	NY Route 180	20	Fair to Good	Asphalt	Not Posted
Morris Tract Road	County Route 54	Fox Corners Road	18	Fair	Gravel/Asphalt	Not Posted
Haller Rd.	Dutch Gap Rd	County Route 12	17	Fair to Good	Asphalt	Not Posted
Wilder Rd.	County Route 12	Hart Rd.	17	Poor	Asphalt	Not Posted

Source: CME, 2007

FA conducted a site visit to compile an inventory of all the existing drainage structures in the Project area. In the Structures Inventory and Assessment, FA identified 30 different drainage structures within the Project area. Drainage structures with a span length greater than twenty feet were considered bridges. Each bridge is identified in the 2010 New York State Department of Transportation (NYSDOT) bridge inspection inventory by the Bridge Identification Number (BIN). There were three bridge structures reviewed as part of their study.

- BIN 3367270 – County Route 54 over Horse Creek;
- BIN 1077370 – Route 180 over Stone Mills Creek; and
- Bin Unknown – County Route 12 over Unnamed Stream.

The only bridge identified on the proposed hauling route is BIN 3367270 (CR 54 over Horse Creek). This structure is comprised of twin 96 inch corrugated metal pipes (CMP). Exact truck configurations for this Project are unavailable. However, based on typical trucks associated with other wind projects, it is anticipated that this structure will withstand the proposed hauling loads since the structure is buried under three feet of cover.

As part of the on-site inventory, it was assumed that all drainage structures with less than two feet of cover could potentially incur damage during construction. Table 23 below provides a summary of additional characteristics identified in the drainage structure inventory. See the full table included as Exhibit 3 and the location of these structures in Appendix P.

Table 23. Drainage Structure Inventory

ID	Type	Size (inches)	Cover (feet)	Length (feet)	Culvert Condition	Road Width	Road Type	Road Name	Concern
1	Twin CMP	96	3.0	60	Good	18	Asphalt	CR 54	None
2	CMP	36	3.0	28	Good	18	Asphalt	CR 54	None
3	Concrete Box	10'x6'	0.5		Good	30	Asphalt	CR 54	
4	Concrete Box	10'x6'	0.5		Good	30	Asphalt	CR 54	Cover
5	CMP	96	2.0	49	Good	18	Asphalt	Sternberg	Cover
6	Twin CMP	48	1.5	60	Good		Asphalt	Fox Corners Road	None
7	CMP	36	15.0	95	Fair	24	Asphalt	SR 12	Cover
8	CMP	36	15.0	95	Fair	24	Asphalt	SR 12	None
9	Concrete Box	3'x5'	1.0	54	Fair	24	Asphalt	SR 12	None
10	Twin CMP	84	5.0	55	Good	24	Asphalt	SR 12	Cover
11	CMP	72	0.5	34	Fair	16	Asphalt	Lowe	None
12	CMP	36	2.5	55	Fair	24	Asphalt	SR 12	Cover
13	Twin CMP	36	2.5	48	Fair	24	Asphalt	SR 12	None
14	Twin CMP	84	3.0	45	Good	24	Asphalt	SR 12	None
15	CMP	36	9.0	75	Good	24	Asphalt	SR 12	None
16	CMP	48	11.0	104	Good	24	Asphalt	SR 12	None
17	CMP	60	8.0	60	Fair	16	Asphalt	Woodard	None
18	CMP	36	3.0	40	Fair	19	Asphalt	Woodard	None
19	CMP	120	4.5	70	Good	16	Asphalt	Sourwine	None
20	Concrete Box	8'x4'	0.5		Poor	18	Gravel	White	Cover/Condition
21	Concrete Box	4'x4'	0.3	21	Poor	16	Asphalt	Miller	Cover/Condition
22	CMP	72	1.5	55	Good	16	Asphalt	Hart	Cover
23	CMP	72	2.5	60	Good	16	Asphalt	Tubolino	None
24	Steel	42	1.5	36	Good	18	Asphalt	Miller	Cover
25	CMP	36	2.0	40	Fair	16	Asphalt	Wilder	None
26	Concrete Box	30"x30"	4.0	36	Poor	19	Asphalt	CR 12	Condition
27	Concrete	4'x4'	0.3	20	Poor	16	Asphalt	Ridge	Cover/Con

ID	Type	Size (inches)	Cover (feet)	Length (feet)	Culvert Condition	Road Width	Road Type	Road Name	Concern
	Box								dition
28	Bridge			32		22	Asphalt	SR 180	None
29	Bridge			16		30	Metal Deck	CR 12	None
30	Twin CMP	36	3.0	45	Poor	16	Asphalt	Dutch Gap	Condition

Source: Fisher Associates, 2010

3.7.2 Potential Impacts

3.7.2.1 <u>Construction</u>

Some temporary impacts to transportation in-route (mobilizing to the Project site), as well as in and around the Project site will result from the movement of vehicles involved in Project construction. These vehicles and their role in the Project are described below. The exact construction vehicles have not yet been determined, however, it is known that transportation of turbine components and associated construction material involves numerous conventional and specialized transportation vehicles, including:

- Gravel trucks for access road construction.
- Concrete trucks for construction of turbine foundations and transformer pads.
- Specialized flatbed trucks (with articulating rear axles to allow maneuverability) for transporting turbine and primary substation components (tower sections, blades, nacelles, and hubs).
- Cranes for assembly of the wind towers. Cranes are transported in sections over numerous trips to the site.
- Variety of conventional semi-trailers for delivery of reinforcing steel and small substation components and interconnection facility material.
- Pickup trucks for employees, equipment and tools.
- Oversize equipment escort vehicles.

Based upon an assessment of the existing conditions, CME developed probable construction travel routes as well as potential alternate routes for each site. CME identified route options to access the general Project site as well as options to access each turbine site. Figure 13 illustrates the preferred travel routes.

To access the general Project area, CME identified a potential route using access from Oswego to NY Route 12 as follows: Travel north on NY Route 3 from Oswego to the Baggs Corner intersection.

Turn left onto NY Route 180 and continue north until it intersects NY Route 12F. Turn right onto NY Route 12F and travel east toward the City of Watertown. Turn left at the I-81 Exit 46 Northbound Ramp and travel north until Exit 48. Get off I-81 at Exit 48 and bear to the right onto NY Route 342. Travel eastbound on NY Route 342 for approximately 0.15-miles and turn right into "turn around" lot on the south side of NY Route 342. Make a left turn onto NY Route 342 and travel westbound. Make a right turn onto NY Route 12 and continue northbound toward the wind farm.

Once on-site, construction and delivery vehicles are anticipated to concentrate operations on select public roadways, as well as new, private access roadways specifically constructed to access turbine locations and to carry construction and delivery related traffic. The preferred routes based on the preliminary routes identified by CME in 2007 FA in 2010 are presented in Table 24.

Table 24. Preferred Access from NY Route 12 to Wind Turbines

Wind Turbine Sites	Travel Route Description
1-6, 7, 8, 10, 11 and 17	North on NY Route 12, west on Lowe Road, north on CR 54 to the site.
12-16 and 18	North on NY Route 12 and west on Lowe Road to the site.
19-22	North on NY Route 12, west on Lowe Road, south on Sternberg Road to the site.
48 and 41	North on NY Route 12, west on Lowe Road, south on CR 54 and east on Morris Tract Road to the site.
24-25, 35-36	North on NY Route 12, east on Hart Road to the site.
28-29	North on NY Route 12 to the site.
30-33	North on NY Route 12, east on Woodard Road to the site.
9 and 45	North on NY Route 12, northeast on Miller Road, and west on Hart Road to the site.
38-40, 49-50	North on NY Route 12, northeast on Miller Road, and east on Tubolino Road to the site.
47, 52-53	North on NY Route 12, northeast on Miller Road (continue as Miller Road becomes Wilder Road), north on Wilder Road to the site.
46, 54-55	North on NY Route 12, northeast on Miller Road (continue as Miller Road becomes Wilder Road), and north on Wilder Road and west on County Route 12 to the site.

Table 25 represents an estimate of the total number of loaded truck trips entering the site during the construction of the turbines. The estimates do not account for trips associated with the construction of Project access roads.

Table 25. Preliminary Trip Generation Estimate (loaded trucks entering)

Component/Truck Type	Assumption	Trips
Blades	One blade per truck	150
Towers	4 sections per tower	200
Nacelle	One nacelle per truck	50
Hub, Nose Cone, and other components	7 truck trips per tower	350
Road Construction	Gravel trucks 10 cubic yards per truck, plus other construction equipment.	Unknown
Crane	Several trips per access point depending on the degree of disassembly.	Unknown
Concrete	250 to 450 cubic yards per foundation, 8 cubic yards per truck. Assume 50 trips per tower.	2,500
Total Heavy Vehicle Trips		3250

Note: trips should be doubled to account for exiting.

Oversize construction vehicles could cause minor delays on Project area roadways, but these are unlikely to be significant given the relatively low traffic volume through the area. Each of the routes identified in Table 25 have a number of constraining features including turning radii. Improvement options for turning radii constraints include widening on the inside or the outside of the curve. The delivery and construction of the turbines may also require general roadway widening. It is assumed that a minimum 16-foot roadway and shoulder width will be necessary to accommodate construction of the Project.

The following construction activities will likely be required at the locations of road width and turning radii improvements:

- Clearing and grubbing of existing vegetation
- Grading of the terrain to accommodate the improvement
- Extension of existing drainage pipes and/or culverts
- Re-establishment of ditch line (if necessary)
- Construction of a suitable roadway surface to carry the construction traffic (based on the existing geotechnical conditions)

Improvements to public roads will be included among the initial stages of Project construction, and are anticipated to start in the spring of 2013.

The required improvements will be coordinated with state, county, and local highway departments (at no expense to these departments) prior to the arrival of oversize/overweight vehicles on-site. In addition, these improvements may create additional Project related impacts (i.e. wetlands, drainage, grading, etc.) that will be addressed in detail during the final Project design, and reviewed/approved during all Project permitting subsequent to this DEIS (i.e., SPDES General Permit, USACOE/NYSDEC wetland permits, highway work permits).

Twelve of the thirty drainage structures (pipes/culverts) surveyed by FA were determined to have less than two feet of cover or are in poor condition. Eight of these twelve structures are within the proposed transportation route. As a result these structures are susceptible to damage thus causing traffic disturbance and delay to local motorists, construction delay, and potential damage to construction vehicles and/or project components.

3.7.2.2 Operation

Once the Project is commissioned and construction activities are officially concluded, permanent impacts will likely be concentrated around the O&M facility. The Project will employ up to approximately eight to eleven individuals, all of who may drive separately to the O&M building. Some of these personnel will need to visit each turbine location and return to the O&M building. Each turbine typically requires routine maintenance visits once every three months, but certain turbines or other Project improvements may require periods of more frequent service visits should a problem arise. Such service visits typically involve one to two pick-up trucks.

Project personnel (or NYSEG personnel) may also need to service the Project substation. Routine servicing would likely be carried out on a similar quarterly basis (unless a non-routine maintenance matter occurs) and would involve a similar number of maintenance vehicles. In addition to maintenance activity, the operation of a wind power project typically increases tourist traffic, which can negatively impact certain roadways within the Project site.

The Project owner is responsible for the maintenance of all private access roads leading to the turbine sites, and does not anticipate plowing access roads during winter months. Therefore, it may become necessary for personnel to service turbines with snowmobiles or some other small track driven vehicles.

3.7.3 Proposed Mitigation

Special hauling permits are required when loads exceed legal dimensions or weights. Thus transport of the blades, nacelles, tower sections and crane will require a variety of special hauling permits. The types of permits depend on the characteristics of the vehicle and its cargo, number of trips, distance traveled and duration. The following list summarizes the driveway permits and special hauling permits that may be required as reported in the CME study:

Roadway Improvement/Driveway Permits

- NYSDOT – A Highway Work Permit (PERM 33) for any physical improvement within the NYSDOT right-of-way. This will apply to improvements on NY Route 12 at the proposed tower site access road locations and any state highway intersection or road improvements.
- Jefferson County – A work permit will be required for any improvements on County roads. A roadway use agreement will be drafted that will require the Project sponsor to restore any County road back to existing conditions or better after the completion of the project.
- Town of Clayton – Based on meetings with the Highway Superintendent, no permits are required. A roadway use agreement will be drafted that will require the Project sponsor to restore any Town road back to existing conditions or better after the completion of the project.

Overload Permits

- NYSDOT – NYSDOT permit package outlines the guidelines, types, and fees for various special hauling permits. Based on this outline and a discussion with NYSDOT special hauling permit representatives, it is expected that the Project will require the Type 13 Jobsite permit to cover most of the special hauling trips (not including super loads). Type 13 permits are issued at 6-month intervals and can be extended for up to a maximum of one year. Several Type 1 permits for individual convoys may also be required including special hauling, route approval, trailer attachment, vehicle configuration, and cranes (PERM 85, PERM 12, PERM 80, PERM 39-1, PERM 39-2k, PERM 39-3g, PERM 99, AND PERM 39-4).
- Jefferson County – A Divisible Load Permit will be required for this Project (see Appendix B of Appendix O).

Prior to construction, the applicant and/or contractor will obtain all necessary permits described above.

Final transportation routing will be designed to avoid/minimize safety issues associated with the use of the approved haul routes, which will confine the heavy truck travel to a few select roads. The Applicant will repair damage done to roads affected by construction within the approved haul route, at no expense to the Towns, County, or State. CME conducted a pre-construction photo log to inventory the current roadway conditions (Appendix C of Appendix O). Upon completion of the construction activities, Atlantic Wind, LLC will, at a minimum, return all roadways to their pre-construction conditions. The Applicant is committed to working with the Town, County, and State agencies to confirm necessary transportation improvements before and after completion of the Project, and that such improvements will be stipulated in the Project approval. This could include:

- Additional route and condition surveys.
- Bonding of improvements.
- Temporary removal of obstacles and replacement in kind.
- Completion of any necessary roadway improvements prior to Project construction.
- Restoration after the Project.

Delivery/haul routes may change during the design and construction preparation process; however, the municipalities will be notified of the changes throughout the continued development of the Project. Additionally, design plans will be completed for all public road improvements, and will be made available for the affected local towns (and to the owner/operator of the respective road) to review prior to construction activities.

The following outlines the proposed protocol for responding to traffic/transportation issues that arise during Project construction:

- Prior to construction Atlantic Wind, LLC will identify one or more construction managers as the primary traffic contact(s) for traffic/transportation concerns that may arise during the construction of the Project.
- The town, county, and state highway departments will be notified of the primary traffic contact(s).
- Atlantic Wind, LLC will consult with all town, county, and state highway departments prior to construction to identify potential traffic congestion areas and to develop potential detours.
- If construction-related congestion occurs, the primary traffic contact will call the appropriate town, county, or state highway department immediately and discuss the implementation of pre-determined detour routes.
- All construction personnel will be instructed to watch for traffic/transportation concerns and to contact the primary traffic contact immediately following identification of a traffic/transportation issue.
- The primary traffic contact will call the appropriate town, county, or state highway department immediately following identification of a congestion problem.

3.8 SOCIOECONOMICS

To understand the effects this Project will have on socioeconomic conditions within the Town of Clayton and the surrounding communities, it is important to understand the current state of the economy in the area. Thus, this section presents specific information regarding the labor force, including population and housing; the economy, in particular employment rates and opportunities; and municipal budgets and taxes, including the local school budgets and taxes. The potential impacts of the Horse Creek Wind Farm on these existing socioeconomic conditions, during both construction and operation, are then evaluated.

3.8.1 Existing Conditions

Existing population and housing, employment and income, and municipal budget and taxes in the Town of Clayton is described below.

3.8.1.1 Population and Housing Characteristics

From 1990 to 2009 the census data reveals that Jefferson County and the Town of Clayton have experienced a continuous increase in population (see Table 26). According to U.S. Census Bureau data from 1990-2009, Jefferson County and the Town of Clayton experienced modest overall population growth at 7.0%, and 11.4% respectively. The 2009 estimated population for Jefferson County is 118,719, and 5,158 for the Town of Clayton.

Table 26. Population Trends in the Project Area

	2009 Estimated Population	Estimated Change 2000-2009	2000 Population	Estimated Change 1990-2000	1990 Population
Jefferson County	118,719	6.2%	111,738	0.7%	110,943
Town of Clayton	5,158	7.1%	4,817	4.1%	4,629

Source: U.S. Census Bureau, 2009

A significant portion of available housing in Clayton is only utilized for seasonal, recreational or occasional uses. According to the 2005-2009 American Community Survey 5-year Estimates, the number of total available housing units in the Town of Clayton was 3,293, of which 64.5% (or 2,124) were occupied and 35.5% (or 1,169) were vacant (U.S. Census Bureau, 2009). However, the majority of the vacant houses are for seasonal, recreational or occasional use. As the town and county have experienced very little increase in population over the past few years it can be rationally assumed that the availability of housing remains strong.

Not only is housing available but local home ownership is fairly strong. Based on 2005-2009 American Community Survey 5-year Estimates, home ownership is 70.9% in the Town of Clayton. Home ownership in Jefferson County is less strong, at approximately 60.1% (U.S. Census Bureau, 2009). The percentage of ownership reflects the affordability of housing in the area.

Based on 2005-2009 American Community Survey 5-year Estimates, the median housing values in the Town of Clayton are comparable to the median value for Jefferson County, but are low when compared to the median value for New York State. The median housing value in the Town of Clayton was $119,000, whereas the County median value was $108,900. This compares to a statewide median value of $300,600.

3.8.1.2 Economy and Employment

According to the 2000 Census, the largest industry in Jefferson County was the educational, health, and social services industry, with approximately 23.2% of workers employed in this sector. The second largest industry was retail trade (15.0%), and the third was arts, entertainment, and recreation, and accommodation and food services (10.8%). Jefferson County is home to Fort Drum, and 7.5% of the County labor force is in the Armed Forces. Jefferson County is also a regional administrative center for New York State government programs, and home to two correctional facilities. Other top employers in Jefferson County include Samaritan Health System, Jefferson County Government, Stream International, Jefferson-Lewis BOCES, and Jefferson Rehabilitation Center. The Jefferson County unemployment rate in December 2010 was 10.4% (not seasonally adjusted). In comparison, the unemployment rate for New York State in December 2010 was 8.0% (NYS Department of Labor, 2010)

With respect to the agricultural industry within the county, in 2007 there were a total of 885 farms (262,331 acres). This represents a 63% decrease in farms since 1959, when the county had 2,390 working farms (515,905 acres), accounting for a significant percentage of the total employment in the county (USDA National Agricultural Statistics Service, 2007). Unfortunately, the decline in employment in the agricultural industry is a continuing trend. In 2009, there were 148 parcels in agricultural use in the Town of Clayton (assessed value of $20,150,900) (NYS Office of Real Property Services, 2010).

3.8.1.3 Municipal Budgets and Taxes

Municipalities (towns, villages, and counties) and school districts are responsible for providing specific services and facilities to those who live and work within their boundaries. Municipalities and school districts incur costs associated with providing these facilities and services, and to cover these costs, collect revenues by levying taxes. Tax revenues in the Project area accrue from both sales taxes and real property taxes. The taxing jurisdictions in the Project site include Jefferson County, the Town of Clayton, and the LaFargeville and Thousand Islands Central School Districts. Table 27 summarizes the total 2009 property tax levy for these taxing jurisdictions.

Table 27. 2009 Real Property Tax Levy Per Taxing Jurisdiction.

Taxing Jurisdiction	2009 Real Property Tax Levy
Town of Clayton	$827,107
Jefferson County	$44,417,886
LaFargeville Central School District	$2,709,788
Thousand Islands Central School District	$8,335,541

Source: NYS Office of State Comptroller, 2010

The distribution of broad land use categories within the towns is similar to that seen throughout Jefferson County. In 2009 the highest percentage of land use in both the towns and the county was classified as residential. The second highest percentage of land use was vacant land with agricultural land ranking third (NYS Office of Real Property Services, 2010). Type of land use contributes to the assessed value of property, and thus influences the total real property tax levy for the towns and county. The total assessed value of the land use classifications for each town is summarized in Table 28 below.

Table 28. Assessed Value of Property in the Town by Land Use Classification, 2009.

Type of Land Use	Town of Clayton	
	Total Assessed Value	Percent of Total Parcels
Residential	$546,330,810	63.6%
Commercial	$56,800,900	4.0%
Industrial	$1,391900	0.4%
Recreation & Entertainment	$19,876,400	0.7%
Community Service	$23,054,200	1.2%
Agricultural	$20,150,900	3.7%
Vacant Land	$56,733,835	24.8%
Public Service	$16,511,314	1.0%
Public Parks, Wild, Forested & Conservation	$2,639,300	0.6%
Total	**743,489,559**	**100%**

Source: NYS Office of Real Property Services, 2010

Another source of revenue is the local sales tax revenue. The current sales tax rate for the County is 7.75% (3.75% local tax plus 4% state tax) (NYS Department of Taxation and Finance, 2010). In 2009, the total sales tax revenue for the county was $60,755,262. The Town of Clayton collected $1,333,752 in sales tax revenue (NYS Office of the State Comptroller, 2010).

The county, town, and school district budgets are influenced by several factors, one of which is the annual real property tax levy. An increase in revenues raised through real property taxes has a positive effect on local municipal budgets. However, local business owners, farmers, or residents are directly impacted when their real property tax or sales tax obligations increase. Table 29 summarizes municipal budgets for 2009 at the town and county levels. Table 30 summaries the 2009 budgets for the LaFargeville and Thousand Islands Central School Districts.

Table 29. 2009 Municipal Budgets (County and Towns).

Taxing Jurisdiction	Total Revenue	Total Expenditures	Indebtedness
Town of Clayton	$3,713,001	$4,211,141	$2,169,750
Jefferson County	$190,615,672	$185,235,644	$23,003,627

Source: NYS Office of the State Comptroller, 2010

Table 30. 2009 School District Budgets.

District	Revenue (total)	Expenditure (total)	Indebtedness
LaFargeville CSD	$9,297,845	$8,963,223	$3,305,000
Thousand Islands CSD	$19,758,497	$26,125,594	$15,852,064

Source: NYS Office of the State Comptroller, 2010

The town, county, and local school districts face the yearly challenge of meeting their service obligations or expenditures through the collection of sales and real property taxes. Property tax is the largest single source of revenue that offsets the cost of providing local services. As with most taxing jurisdictions in upstate New York, the loss of (or lack of) commercial and industrial tax base, in combination with rising service and material costs, make it increasingly difficult to meet their budgets without significantly raising real property taxes.

3.8.2 Potential Impacts

The Project will have both direct and indirect positive economic effects on the towns, county, and school districts, as well as the individual landowners participating in the Project. These effects will commence during construction and continue throughout the operating life of the Project. In the short term, benefits will include additional employment and expenditures associated with Project construction. In the long term, the Project will generate significant additional revenue through a

PILOT agreement with local tax jurisdictions, purchases of goods and services, and lease payments to participating landowners. The Project will also provide full-time employment for a limited number of individuals and likely result in some increased visitation to the Project area by tourists interested in the wind power facility. All of these results could have a beneficial effect on local businesses. The overall socioeconomic impact of Project construction and operation is discussed in detail below.

3.8.2.1 Construction

3.8.2.1.1 Population and Housing

As mentioned previously, the towns located within the Project site experienced a modest growth rate from 1990 to 2009. This population trend will likely continue regardless of whether the proposed Project is built. The Project will not generate construction employment at a level that would significantly increase population in either the towns or county. Even though employment during the construction period will be significant (on the order of 100 to 150 full-time jobs), this employment is relatively short term, and is not expected to result in workers permanently relocating to the area. For the expected nine-month construction period, there could be a temporary increase in local population and demand for temporary housing by out-of-town workers. However, this demand will be relatively modest, and can easily be accommodated by the available housing in towns and surrounding communities. Beyond this relatively minor (and positive) short-term impact, Project construction will have no significant impact on population and housing.

3.8.2.1.2 Economy and Employment

It is anticipated that construction of the proposed Project will employ a total work force of up to 150 employees, and that the majority of this employment will be drawn from the Thousand Islands labor market. Local employment will primarily benefit those in the construction trades, including equipment operators, truck drivers, laborers, and electricians. Project construction will also require workers with specialized skills, such as crane operators, turbine assemblers, specialized excavators, and high voltage electrical workers. It is anticipated that the majority of these specialized workers will originate from outside the area and will remain only for the duration of construction.

In addition to the jobs created during construction and the wages paid to the work force, this Project will have a direct economic effect (or impact) from the first round of buying/selling, which includes the purchase of goods from local sources (such as fuel), the spending of income earned by workers, annual labor revenues, and the income effect of taxes. These direct effects will result in additional, subsequent rounds of buying and selling in other sectors. Thus, the Project will have an indirect effect (or impact) through the increase in sales of other industry sectors in the county (NWCC, 2004).

3.8.2.1.3 Municipal Budgets and Taxes

During construction, the Project will not impact municipal budgets and taxes. Temporary construction workers will not create significant demand for municipal or school district services or facilities. These workers will also not generate significant revenue through payment of property taxes. However, sales tax revenue will increase through the purchase of local goods and services. The Project will result in impacts to the local road system (see discussion of transportation impacts in Section 3.8.2). This has the potential to affect local highway department expenditures/budgets. However, as will be discussed in the mitigation section, cost of any construction-related road repairs/improvements will be borne by the Project developer.

3.8.2.2 Operation

3.8.2.2.1 Population and Housing

Approximately eight to eleven full-time jobs will be created once the Project is fully operational. These will include wind technicians, a project manager, and administrative support people. These employees are expected to reside locally, which could translate into purchase of a few homes and addition of a few families to the towns and/or the surrounding communities. Although this represents a positive economic impact, long-term employment associated with the Project is not large enough to have a significant impact on local population or housing characteristics.

Factors beyond property values have an effect on population and housing. For example, the upgrade of some local roads could conceivably promote access to areas that were previously undeveloped. With some minor exceptions, much of the public road system within the Project area consists of improved, year round roads. Therefore, the improvement of existing road systems to accommodate Project component delivery (e.g. turning radii, culvert replacement, etc.) is not anticipated to substantially promote additional residential or commercial growth (area is not currently zoned commercial) within the Project area than currently exists. Project access roads that will be constructed will be located within private easements, and therefore will not induce growth in the area. Other factors having an effect on population and housing could result from an aversion to living near wind energy facilities. It may be reasonable to assume that some area residents could relocate due to an objection to the presence of a wind turbine, dependent upon individual personal acceptance. No published studies could be found that document a reduction in occupied houses in a given area after the construction of a wind turbine project.

Local residents often express concern over the potential for local property values to depreciate as a result of a proposed wind power project. This issue has come up during the siting and review of other wind power projects in New York and throughout the United States. In order to address this concern, the Renewable Energy Policy Project (REPP) conducted a quantitative study in 2003 (REPP, 2003). REPP assembled a database of real estate transactions adjacent to every wind power project in the United States (10 MW or greater) that became operational between 1998 and 2001 (a total of 10 projects, including the Madison and Fenner projects in Madison County, New York). For this study, data was gathered within 5 miles of the wind projects, as this was determined to be the potential area of visual impact (viewshed). For each of the 10 projects, similar data was also gathered for a comparable community that was located outside of the project viewshed (comparable communities were based on interviews with local assessors as well as analysis of U.S. Census demographic data). The goal of the data collection was to obtain real estate transaction records for a time period covering roughly 6 years (3 years pre-construction and 3 years post-construction). The data was then analyzed in three different ways: Case 1 examined the price changes in the viewshed and the comparable community for the entire period of the study; Case 2 examined how property values changed in the viewshed before and after the project became operational; and Case 3 examined how property values changed in the viewshed and the comparable community after the project became operational.

The results of these analyses showed no negative affect on property value from existing wind farms. Of the 10 projects examined in the Case 1 analysis, property value actually increased faster within the wind power project viewshed in eight of the ten projects. The Case 2 analysis revealed that the property values also increased faster after the wind farms became operational in nine of the ten projects examined. In the Case 3 analysis, property values increased faster in the wind power project viewshed than in the comparable community in nine of the ten projects. More specifically (and perhaps more relevant to the proposed Horse Creek Wind Farm) is the fact that these positive results apply to the Madison Wind Power Project and the Fenner Wind Power Project in New York State. The results from the Madison and Fenner analysis revealed a generally positive affect on property value. In five of the six case studies (Case 1, 2, and 3 analyses for both projects), the monthly average sales price grew faster or declined slower in the viewshed communities than in the comparable communities outside the project viewshed. The REPP study therefore concluded that there is no evidence that the presence of the Madison and Fenner wind farms had a significant negative effect on residential property values in Madison County, New York (REPP, 2003).

However, it should be noted that the REPP study has been criticized because it assumes that all properties within the study area have a view of the respective wind farm, does not account for property distance to the wind farm, uses not ideal statistical analysis, and includes inappropriate transactions (e.g., estate sales, sales between family members, sales due to divorce, etc.). To present a clearer understanding of the actual effects of existing wind farms on property values, a master of science thesis was prepared by Ben Hoen (2006). The purpose of this study was to analyze if the transaction value of homes within 5 miles of the existing Fenner Wind Farm was significantly affected by views of the wind farm. "View" is defined using a continuous variable from 0 (no view) to 60 (a full view of all 20 turbines). The study additionally investigates how this effect varies with distance (spatially), time (temporally) and house value. Lastly, the effect and degree of the PILOT payment to Fenner Township is investigated. The study utilized the hedonic pricing model, which, given enough data, is sensitive enough to allow sales to be grouped temporarily (e.g., by year), spatially (e.g., by distance), and economically (by the value of the home).

The data concerning transaction values and assessor information was collected from the Madison County Real Property Tax Office. From January 1, 1996 through June 1, 2005, 452 sales took place that were coded "arms-length" transactions by county assessors, and were within 5 miles of Fenner Wind Farm. Of these 167 were removed as land-only sales (i.e., sale of parcel that did not contain a house), and five were removed as non arms-length sales, resulting in a total of 280 sales. Of these, 140 occurred after construction of the Fenner Wind Farm began (2001). A field analysis was conducted on October 30 and 31, 2005 to ensure complete accuracy of the "view" variables used in the model. Visits were made to those homes sold after January 1, 2001 (138 homes visited) to assess the degree to which the home could see the wind farm. By standing at or near the house a rating of 1 to 60 was established for each home. This rating was based on the degree to which viewers could see each of the 20 windmills in the Fenner Wind Farm. A total of 3 points per turbine were possible (one point if only the blade above the nacelle was visible, two points if the nacelle was also visible, and three points if the tower below the rotor swept area was also visible), for a cumulative maximum of 60 points.

The analysis of 280 home sales within 5 miles of the Fenner Wind Farm did not reveal a statistically significant relationship between either proximity to or visibility of the wind farm and the sale price of homes. Additionally, the analysis failed to uncover a relationship even when concentrating on homes within one mile of the wind farm that sold immediately following the announcement and construction of the project. This study therefore concluded that in Fenner, a view of the wind farm does not produce either a universal or localized effect, adverse or not. To the degree that other communities resemble the Fenner rural farming community, similar conclusions are anticipated (Hoen, 2006).

Also worth noting is a June 28, 2005 press release from the Madison County Public Information and Services Department. This press release discussed a recent study published in *Progressive Farmer* (a national publication), which ranked Madison County as the fourth best place to live in the northeast in their list of Best Places to Live in Rural America. The rankings for each county were based upon healthcare, education, climate, pollution, crime, and tax burden (Madison County, 2005).

A more recent study sponsored by the United States Government focused specifically on impacts of wind farm projects on residential property values. The report *The Impact of Wind Power Projects on Residential Property Values in the United Sates: A Multi-Site Hedonic Analysis,* released in December 2009 explains the study and the conclusions drawn from the study (Hoen *et al.*, 2009). A more broad approach to assessing potential impacts on property values of residences near wind farm projects was undertaken for this study and consequently it is the "most comprehensive and data-rich analysis to date in the U.S. or abroad on the impacts of wind projects on nearby property values." (Hoen *et al.*, 2009). This study's analysis is based on information from 10 communities surrounding 24 existing wind power facilities spread across nine states. Homes included in the study were located from 800 feet to over five miles from the nearest wind energy facility. This study used a methodology based on the hedonic pricing model to identify the marginal impacts of different housing and community characteristics on residential property values. Analysis of possible impacts on property values was undertaken by dividing the impacts into three non-mutually exclusive categories, area stigma, scenic vista stigma, and nuisance stigma. An explanation of each identified stigma, as used in this study is: Area stigma may occur regardless of whether the wind facility is within view of the home. The mere fact that a wind farm is generally nearby may adversely affect a home's value. Scenic vista stigma is based on the concern that a home may be devalued because a wind facility is within view and/or interrupts an existing scenic vista. A nuisance stigma can occur because of the potential for extenuating factors from a nearby wind facility, such as noise or shadow flicker (regardless of whether they actually occur). Exploration of the effects of all three stigmas resulted in finding no persuasive evidence that neither the view of the wind facilities nor the distance of the home to the facilities is found to have any significant effect on home sales prices. The study recognizes the possibility that the value of an individual home (or small numbers of homes) has been or could be negatively impacted by a nearby wind farm facility (Hoen *et al.*, 2009). However, even if such occurrences do exist "they are either too small or too infrequent to result in any widespread, statistically observable impact." (Hoen *et al.*, 2009).

Given the results of the REPP (2003) and Hoen studies (Hoen, 2006; Hoen *et al.*, 2009), and the similarity of the Madison County sites to the Horse Creek Wind Power Project area, it is reasonable to conclude that the proposed Project will not have an adverse impact on local property value.

3.8.2.2.2 Economy and Employment

Total wages and benefits for these Project's eight to eleven full-time employees are estimated to be approximately $750,000-$950,000 per year. It is anticipated that these jobs will have a spin-off effect on the local economy, through local expenditures on goods and services associated with Project operation and maintenance. Expected lease payments will range between approximately $8,000-$12,000 per wind turbine (totaling approximately $400,000-600,000 per year), will be provided to local landowners participating in the Project. Also, one-time access easement and construction payments will be approximately $500,000 paid at commencement of construction. These lease payments are a direct financial benefit to all participating landowners and will enhance the ability of those in the agricultural industry to continue farming. Russell Cary, Supervisor of the Town of Fenner, New York believes that lease payments from the wind power project in his town are preserving a rural life style and protecting family farms from being taken over by large-scale commercial farming operations (R. Cary, pers. comm.). Local lease payments will also enhance the ability of participating landowners to purchase additional goods and services. To the extent that these purchases are made locally, they will have a broader positive effect on the local economy.

With respect to tourism in the region, it is worth noting that other wind power projects in New York have resulted in a significant increase in visitation from tourists interested in the projects. This has certainly resulted in increased local expenditures for goods and services, but these have not been quantified, and are probably fairly modest. It should also be acknowledged that this effect is likely to diminish as wind power projects become more common in the state and their novelty decreases.

Despite potential concerns, there is no evidence to indicate that the presence of wind turbines will have a negative impact on tourism. A 2002 study conducted in the Argyll Region of Scotland, involving interviews with over 300 tourists, found that 91% said the presence of wind farms in the area would not influence their decision about whether to return to the area (MORI Scotland, 2002). Almost half (48%) of the tourists interviewed were visiting the area because of the 'beautiful scenery and views'. Of those who had actually seen wind farms, 55% indicated that their effect was "generally or completely positive", 32% were ambivalent, and 8% felt that the wind farms had a negative effect. Similar positive effects have been reported from various wind farm locations in Australia. According to the Australian Wind Energy Association (AusWEA), initial concerns that wind turbines would negatively impact tourism in that country have proven unfounded (AusWEA, 2003). Similarly, a recent survey of visitors to Vermont's Northeast Kingdom found that 95% would not be deterred from further visits by the existence of a proposed wind farm (Institute for Integrated Rural Tourism, 2003). This is also evident in the resort community of Palm Springs, California, where there are over 3,500 wind turbines. Tours of this wind farm regularly draw 10,000 to 12,000 curious tourists every year according to Christy Regaldo of PS Windmill Tours (Clean Power Now, 2006).

3.8.2.2.3 Municipal Budgets and Taxes

According to New York State Real Property Tax Law, Article 4, Section 487, real property, which includes a wind energy system, shall be exempt from local real property taxation. However, since local municipalities and school districts both have the option to disallow this tax-exempt status for properties that lie within their jurisdiction (See RPTL §487[8]), as a practical matter these local taxing authorities generally require that the sponsor of a wind project enter into a PILOT agreement as a condition for not "opting out" of the section 487 exemption. The sponsors of the Horse Creek Wind Farm expect to enter into a PILOT agreement with the Town of Clayton, and other local tax jurisdictions.

The section 487 exemption only applies to the wind project facilities; turbines, towers and the "balance of plant" (collection system, access roads and utility interconnection), and does not affect the tax status of the underlying property. Atlantic Wind will endeavor to have the wind turbines treated as "suffix" parcels, for local real property tax purposes, however this treatment needs to be approved by local tax authorities. A "suffix parcel" is an arrangement that has been used for cell towers and billboards in which a unique tax ID is created for each WTG tower, but without any legal attachment to the underlying tax parcel so the suffix parcel is associated with the coordinates of the tower, but not the underlying tax parcel on which it is located. The taxes due on a suffix parcel are solely the responsibility of the project company, without any recourse to the "underlying" landowner.

Studies of the impact on property values of wind projects in NYS (and elsewhere) indicate that these projects typically do not have an adverse effect on the assessed value of other properties in the vicinity of the wind project (REPP, 2003; Hoen, 2006; Hoen *et al.*, 2009). Thus Clayton should not expect to see any diminution of local tax receipts related to this wind Project, and in fact should see these tax revenues increase as a result of the PILOT agreement. The Project should not negatively affect the total amount of real property taxes levied by the local taxing jurisdictions or the budgets of these jurisdictions.

According to the Town of Fenner Supervisor Russell Cary, the wind farm in his town has required the town to purchase additional road maintenance equipment to service roads that have been improved or are more heavily traveled as a result of the project (R. Cary, pers. comm.). However, the improved roads are a benefit to the community, and represent the only significant municipal service required by the Project, which makes an annual PILOT payment to the town. The Horse Creek Wind Farm will place similar, limited demand on municipal services, and probably no new impacts on the local school districts.

The Project will have a beneficial impact on municipal budgets and taxes in that the taxing jurisdictions will receive additional revenue from the Project in the form of PILOT payments. (The total amount of these payments in lieu of tax, as well the local sharing arrangement of these payments among the several local tax jurisdictions, is yet to be determined.) Through the PILOT agreement, the Project will more than offset any limited impact on municipal budgets by generating additional revenue. The details of the PILOT agreement are described in Section 3.9.3.2.3 below.

3.8.3 Mitigation

3.8.3.1 Construction

As described in the Impacts discussion, construction of the proposed Project will not have a significant impact on local population and housing, and will have a short-term beneficial impact on the local economy and employment. Consequently, no mitigation is necessary to address these impacts. The Project sponsors anticipate that a road use agreement will be put in place with the host communities, and Jefferson County. This agreement will specify both a) the local and county roads that can be used by the Project company and its contractors for the hauling of the heavy loads required to construct the wind Project, and b) the extent to which these roads will be replaced and/or repaired by the Project company.

3.8.3.2 Operation

3.8.3.2.1 Population and Housing

As discussed in Section 3.9.2.1, the operating Project is not anticipated to adversely affect population or housing availability in the towns or the surrounding area. Nor is it expected to have a depressing effect on local property values. Consequently, mitigation measures to address population and housing impacts are not necessary.

Property owners within the viewshed of proposed wind power projects are often concerned about the possibility that these projects could at some point be abandoned, and that the derelict facilities will have a depressing effect on local property values. To address this concern, the Project developer will establish a decommissioning fund. This fund will assure that the proposed wind power facility will be dismantled and removed at the end of its useful life--or in the event that it is abandoned before completion or later proves economically unviable. Prior to the start of construction the Project developer will submit evidence of the mechanisms that are in place to satisfy this decommissioning requirement.

3.8.3.2.2 Economy and Employment

As described previously, the operating Project's potential impact on the local economy and employment will be positive, in that additional jobs will be created and additional local expenditures made (lease payments to participating landowners, as well as local purchase of goods and services). However, the number of permanent jobs created is not large enough to create a financial burden on the towns, county, or school districts by requiring provision of additional services and/or facilities. Thus, mitigation measures to address either loss of jobs or increased demand for municipal services are not necessary.

3.8.3.2.3 Municipal Budgets and Taxes

Operation of the proposed Project will not create a significant demand for additional municipal or school district services and facilities, and therefore it will have no adverse impact on municipal or school budgets. Atlantic Wind plans to enter into a PILOT agreement with local tax jurisdictions that will likely have a 20-year term. Although the specific terms of the PILOT agreement have not been negotiated, Atlantic Wind anticipates that the annual PILOT payment will be approximately $8,000 per MW of installed generation capacity, escalating with inflation. At that rate, and assuming that 96 MW of generation is installed, the PILOT payments would average approximately $768,000 per year for a minimum of $15 million over the life of the contract. Atlantic Wind anticipates that the annual PILOT payments would be shared amongst the Town of Clayton, Jefferson County, and the local school districts, in accordance with the terms of the PILOT agreement. After expiration of the PILOT the facility will be taxed at the value determined by the local assessor.

The PILOT payments will increase the revenues of the local taxing jurisdictions, and will represent a significant portion of their total tax levy. Further, the PILOT payments will more than offset any minor increases in community service costs that may be associated with long-term operation and maintenance of the Project (e.g., small number of additional school children, slightly increased road maintenance costs).

Because the wind farm facility will generate a predictable source of additional revenue for all of the affected municipalities and school districts over the next 20-plus years, the Project will positively impact municipal and school district revenues. This will enhance the type and level of services these jurisdictions provide to local residents for the duration of the Project's operational life.

3.9 PUBLIC SAFETY

This section addresses concerns regarding public safety at the proposed Project site. Background information on public health and safety issues associated with wind energy projects is presented first, followed by a discussion of potential impacts associated with the Project, and proposed mitigation measures.

3.9.1 Background Information

Public safety concerns associated with the construction of a wind power project are fairly standard construction-related concerns. These include the potential for injuries to workers and the general public from 1) the movement of construction vehicles, equipment and materials, 2) falling overhead objects, 3) falls into open excavations, and 4) electrocution. These types of incidents are well understood, and do not require extensive background information. With proper safety precautions, such construction-related injuries can be prevented.

Public safety concerns associated with the operation of a wind power project are somewhat more unique, and are the focus of this section. In many ways, wind energy facilities are safer than other forms of energy production since a combustible fuel source and fuel storage are not required. In addition, use and/or generation of toxic or hazardous materials are minor when compared to other types of generating facilities. However, wind turbines are generally more accessible to the public, and risks to public health and safety can be associated with these facilities. Examples of such safety concerns include ice shedding, tower collapse/blade throw, stray voltage, fire, lightning strikes, electrocution, and electro-magnetic fields. In addition, there has been much debate over the alleged negative health effects caused by low frequency sound produced by operating wind turbines. Each of these concerns is discussed individually below.

3.9.1.1 Ice Shedding

Ice shedding and ice throw refer to the phenomena that can occur when ice accumulates on rotor blades and subsequently breaks free and falls to the ground. Although a potential safety concern, there has been no reported human injury caused by ice being "thrown" from an operating wind turbine (Global Energy Concepts, 2005). However, ice shedding does occur, and could represent a potential safety concern.

Under certain weather conditions, ice may build up on the rotor blades and/or sensors, changing the aerodynamics of the blades, slowing the rotational speed, and potentially creating an imbalance in the weights of the individual blades. Such effects of ice accumulation can be sensed by the turbine's computer controls and would typically result in the turbine being shut down until the ice melts. Field observations and studies of ice shedding indicate that most ice shedding occurs as air temperatures rise and the ice on the rotor blades begins to thaw. Therefore, the tendency is for ice fragments to drop off the rotors and land near the base of the turbine (Morgan *et al.*, 1998). Ice can potentially be “thrown” when ice begins to melt and stationary turbine blades begin to rotate again (although turbines usually do not restart until the ice has largely melted and fallen straight down near the base).

The distance traveled by a piece of ice depends on a number of factors, including: the position of the blade when the ice breaks off, the location of the ice on the blade when it breaks off, the rotational speed of the blade, the shape of the ice that is shed (e.g., spherical, flat, smooth), the surrounding terrain (e.g. nearby elevation changes), and the prevailing wind speed. Data gathered at existing wind farms have documented ice fragments on the ground at a distance of 50 to 328 feet from the base of the tower. These fragments were in the range of 0.2 to 2.2 pounds in mass (Morgan *et al.*, 1998). Ice throw observations are also available from a wind turbine near Kincardine, Ontario, where the operator conducted 1,000 inspections between December 1995 and March 2001. Only 13 of the 1,000 inspections noted ice fragments, which were documented on the ground at a distance up to 328 feet (100 meters) from the base of the turbine, with most found within 164 feet (50 meters) (Garrad Hassan, 2007).

3.9.1.2 Tower Collapse/Blade Throw

Another potential public safety concern is the possibility of a wind turbine tower collapsing or a rotor blade dropping or being thrown from the nacelle. While extremely rare, such incidents do occur. For example, a tower collapsed at the Klondike III Wind Farm in Oregon in August 2007, resulting in the death of one worker and injury to another. In addition, a wind turbine collapse occurred at the Altona

Windpark in Clinton County, New York in March 2009. The incident occurred during unintended loss of electric power, during which two turbines failed to switch into safe mode (i.e. shut down) as designed, due to incorrect wiring (Cartledge, 2010). As a result, the rotors of these two turbines spun freely at three times their designed speed, causing the collapse of one turbine and damage to the other (Cartledge, 2010). According to Noble, the turbine collapse caused a small fire and scattered debris up to 345 feet from the base of the turbine (The Press Republican, 2009). No one was injured as a result of the incident and local setbacks proved sufficient to protect area homes and public roads. In December of 2009, a turbine collapsed at the Fenner Windpower Project in Madison County, New York.

Such incidents can be dangerous for project personnel, and potentially for the general public, as well. The reasons for a turbine collapse or blade throw vary depending on conditions and tower type. Past occurrences of these incidents have generally been the result of design defects during manufacturing, poor maintenance, wind gusts that exceed the maximum design load of the engineered turbine structure, or lightning strikes (AWEA, 2008a). Most instances of blade throw and turbine collapse were reported during the early years of the wind industry. Technological improvements and mandatory safety standards during turbine design, manufacturing, and installation have largely eliminated such occurrences.

3.9.1.3 Stray Voltage

Stray voltage is a phenomenon that has been studied and debated since at least the 1960's. It is an effect that is primarily a concern of farmers whose livestock can receive electrical shocks. Stray voltage can be defined as a "low level of neutral-to-earth electrical current that occurs between two points on a grounded electrical system" (Schmidt, 2000). The term stray voltage can be further defined as a "continuous voltage sources of less than 10 volts between two objects that are likely to be contacted simultaneously by livestock". Most stray voltage problems have been traced to either National Electric Code wiring violations or poorly grounded electric services serving the farms in question (J. Barrett, pers. comm.). Wind power projects and other electrical facilities can only create stray voltage if they are not properly designed, or during unusual circumstances.

3.9.1.4 Fire

Wind turbines, due to their height, physical dimensions, and complexity, have the potential to present response difficulties to local emergency service providers and fire departments. Although the turbines contain relatively few flammable components, the presence of electrical generating equipment and electrical cables, along with various oils (lubricating, cooling, and hydraulic) does create the potential for fire or a medical emergency within the tower or the nacelle. This, in combination with the elevated location of the nacelle and the enclosed space of the tower interior makes response to a fire or other emergency difficult, and beyond the capabilities of most local fire departments and emergency service providers.

Other Project components create the potential for a fire or medical emergency due to the storage and use of diesel fuels, lubricating oils, and hydraulic fluids. Storage and use of these substances may occur at the substation, in electrical transmission structures, staging areas, and the O&M building/facility. The presence of high voltage electrical equipment also presents potential safety risks to local responders. See Section 3.11 for detailed information regarding emergency response services.

3.9.1.5 Lightning Strikes

Due to their height and metal/carbon components, wind turbines are susceptible to lightning strikes. Statistics on lightning strikes to wind turbines are not readily available, but it is reported that lightning causes four to eight faults per 100 turbine-years in northern Europe, and up to 14 faults per 100 turbine-years in southern Germany (Korsgaard & Mortensen, 2006). Most lightning strikes hit the rotor, and their effect is highly variable, ranging from minor surface damage to complete blade failure. All modern wind turbines include lighting protection systems, which generally prevent catastrophic blade failure.

3.9.1.6 Electrocution

Due to the generation and transmission of electricity, a wind power project poses the risk of electrocution. Because power generation and transmission does not occur until after the wind project has been constructed, this concern is primarily associated with an operating wind power project. The electricity generated by each turbine will be transmitted through buried and overhead 34.5 kV electric lines to the proposed substation. Buried lines will be placed at least four feet below grade in active crop/hay fields and at least three feet below grade in other areas; therefore, any earthwork conducted at or below these depths (and in the immediate proximity of the buried lines) will introduce the risk of electrocution by accidental contact. Transmission lines that run above ground along will be constructed in accordance with all applicable industry codes and standards.

3.9.1.7 Electric and Magnetic Fields

Electric power lines can create electric and magnetic fields (EMF) because they operate at high voltages and carry electric currents. EMF levels decrease as the distance from the source increases. For an electric transmission line, EMF levels are highest next to the transmission lines (typically near the center of the transmission line right-of-way) and decrease as the distance from the transmission corridor increases. Electric fields are attenuated by objects such as trees and the walls of structures, and are completely shielded by materials such as metal and the earth. Thus, underground electric transmission lines do not produce electric fields at the ground surface. The strength of the magnetic fields, on the other hand, depend on the current in the conductor, the geometry of the construction, the degree of cancellation from other conductors, and the distance from the conductors or cables.

The strength of an electric field depends on the voltage of the conductor, the degree of shielding, and the distance from the conductors or cables. Underground electric cables do not produce electric fields at the ground surface because electric fields are attenuated by objects such as trees and the walls of structures, and are completely shielded by materials such as metal and the earth. The electric field produced immediately below a 34.5-kV overhead conductor (typically 30 to 40 feet above ground level) is quite low and the electric field decreases with lateral distance from the line.

The strength of magnetic fields, on the other hand, depends on the current in the conductor, the geometry of the construction, the degree of cancellation from other conductors, and the distance from the conductors or cables. Magnetic fields near underground cables are higher than overhead conductors, but fall off more rapidly with distance because of magnetic field cancellation from the close proximity of the buried cables. At distances greater than about 30 feet from the centerline, the underground cables produce fields lower than those of the overhead conductors, but both types of circuits have extremely low levels, far below applicable health-based exposure guidelines for public exposure.

3.9.1.8 Low Frequency Sound and Vibrations

Low frequency sound is somewhat arbitrarily defined, to be between 20 Hz and 200 Hz. There has been much debate over the alleged negative health effects caused by low frequency sound produced by operating wind turbines. As stated in Colby et al. (2009), the National Research Council reports that low frequency sound was a concern for older wind turbines where the blades were downwind of the turbine but not the modern upwind turbines. Work by Dr. Nina Pierpont postulates that there is a “Wind Turbine Syndrome” that affects some individuals living in the vicinity of modern wind turbines. The reported symptoms include headaches, nausea, sleep disturbance, tinnitus, ear pressure, vertigo, visual blurring, tachycardia, irritability, trouble with concentration and memory, panic attacks, internal pulsation, and quivering. These hypothesis have not been broadly accepted by the international medical community. An independent review by the Chief Medical Officer of Ontario (2010) concludes: "While some people living near wind turbines report symptoms such as dizziness, headaches, and sleep disturbance, the scientific evidence available to date does not demonstrate a direct causal link between wind turbine noise and adverse health effects…Low frequency sound and infrasound from current generation upwind model turbines are well below the pressure sound levels at which known health effects occur. Further, there is no scientific evidence to date that vibration from low frequency wind turbine noise causes adverse health effects". In addition, "Community engagement at the outset of planning for wind turbines is important and may alleviate health concerns about wind farms [and] concerns about fairness and equity may also influence attitudes towards wind farms and allegations about effects on health. These factors deserve greater attention in future developments. Reviews by Leventhall (2009), Roberts and Roberts (2009) and Colby et al. (2009) reached similar conclusions.

3.9.2 Potential Impacts

3.9.2.1 Construction

As previously mentioned, public safety concerns associated with Project construction include 1) the movement of large construction vehicles, equipment and materials, 2) falling overhead objects, 3) falls into open excavations, and 4) electrocution. These issues are most relevant to construction personnel who will be working in close proximity to construction equipment and materials, and will be exposed to construction related hazards on a daily basis. However, risk of construction related injury would be minimized through regular safety training and use of appropriate safety equipment.

The general public could also be exposed to construction-related hazards due to the passage of large construction equipment on area roads and unauthorized access to the work site (on foot, by motor vehicle, ATV, or snowmobile). The latter could result in collision with stockpiled materials (e.g., soil, rebar, turbine/tower components), as well as falls into open excavations. Because construction activities will occur primarily on private land, and be well removed from adjacent roads and residences, exposure of the general public to construction-related risks/hazard is expected to be very limited.

3.9.2.2 Operation

3.9.2.2.1 Ice Shedding

As stated previously, while turbine icing certainly will occur at times, any ice that accumulates on the rotor blades will likely cause an imbalance, or otherwise alert sensors, and result in turbine shutdown. As the ice begins to thaw, it will typically drop straight to the ground. Any ice that remains attached to the blades as they begin to rotate could be thrown some distance from the tower. However, such a throw will usually result in the ice breaking into small pieces, and falling within 300 feet of the tower base. The Project's minimum setback distance of 500 feet between proposed turbines and public roads and non-participating property lines, and the typically observed setback of 1,250 feet between the proposed turbines and occupied residences, should adequately protect nearby residents and motorists from falling ice of any significant size.

In addition, unauthorized public access to the site will be limited by posting signs to alert the public and maintenance workers of potential ice shedding risks. Based upon the results of studies/field observations at other wind power projects, the Project's siting criteria, and the proposed control of public access to the turbine sites, it is not anticipated that the Project will result in any measurable risks to the health or safety of the general public due to ice shedding.

3.9.2.2.2 Tower Collapse/Blade Throw

Modern utility-scale turbines are certified according to international engineering standards. These include ratings for withstanding different levels of hurricane-strength winds and other criteria (AWEA, 2008b). The engineering standards of the wind turbines proposed for this Project are of the highest level and meet all federal, state, and local codes. In the design phase, state and local laws require that licensed professional engineers review and approve the structural elements of the turbines. State of the art braking systems, pitch controls, sensors, and speed controls on wind turbines have greatly reduced the risk of tower collapse and blade throw. The wind turbines proposed for the Project will be equipped with two fully independent braking systems that allow the rotor to be brought to a halt under all foreseeable conditions. In addition, the turbines will automatically shut down at wind speeds over the manufacturer’s threshold of 25 m/s or 56 mph**.** They will also cease operation if significant vibrations or rotor blade stress is sensed by the turbines' blade monitoring systems. For all of these reasons, the risk of catastrophic tower collapse or blade failure is minimal.

3.9.2.2.3 Stray Voltage

While the concerns surrounding stray voltage are legitimate, it is important to note they are largely preventable with proper electrical installation and grounding practices. The Project’s power collection system will be properly grounded, and will not be connected to the local electrical distribution lines that provide electrical service to on-site structures or off-site buildings and homes. It will be physically and electrically isolated from all of the buildings in and adjacent to the Project area. Additionally, the Project’s buried electrical collection lines will be located a minimum of three feet below ground (four feet in crop/hay fields), and will use shielded cables with multiple ground points. This design eliminates the potential for stray voltage (J. Barrett, pers. comm.).

3.9.2.2.4 Fire

All turbines and electrical equipment will be inspected by the utilities (for grid and system safety) prior to being brought on line. This, along with implementation of built-in safety systems, minimizes the chance of fire occurring in the turbines or electrical stations. However, fire at these facilities could result from a lightning strike, short circuit or mechanical failure/malfunction. Any of these occurrences at a turbine would be sensed by the System Control and Data Acquisition system and reported to the Project control center. Under these conditions, the turbines would automatically shut down and Project maintenance personnel would respond as appropriate.

In the event that a wind turbine catches fire, it is typically allowed to burn itself out while maintenance and fire personnel maintain a safety area around the turbine to protect against the potential for spot ground fires that might start due to sparks or falling material. Power from the circuit of the Project with the turbine fire is also disconnected; however, the other circuit(s) remains connected and operational. An effective method for extinguishing a turbine fire from the ground does not exist, and the events generally do not last long enough to warrant attempts to extinguish the fire from the air (Global Energy Concepts, 2005). However, since the public does not have access to the private land on which the turbines are located, risk to public safety during a fire event is essentially non-existent. This system should quickly extinguish any fires that occur at the Project substation and shut down power to the facility.

Generally, any emergency/fire situations at a wind turbine site or substation that are beyond the capabilities of the local service providers will be the responsibility of the Project owner/operator. Construction and maintenance personnel (and properly trained and equipped regional responders) will be trained and will have the equipment to deal with emergency situations that may occur at the Project site (e.g., tower rescue, working in confined spaces, high voltage, etc.). Consequently, such an incident would generally not expose local emergency service providers or the general public to any public health or safety risk.

3.9.2.2.5 Lightning Strikes

Lightning protection systems were first added to rotor blades in the mid 1990s, and are now a standard component of modern turbines (Korsgaard & Mortensen, 2006). These systems rely on lightning receptors and diverter strips in the blades that provide a path for the lightning strike to follow to the grounded tower. Lightning is effectively and safely intercepted at several receptor points including the outermost blade tip and the blade root surface, and transmitted to the wind turbine's lightning conductive system. The turbines' blade monitoring system provides documentation of all critical lightning events. If a problem is detected, the turbine will shut down automatically, or at a minimum, be inspected to assure that damage has not occurred.

3.9.2.2.6 Electrocution

As previously mentioned, buried electric lines will be at least three feet deep (four feet in crop/hay fields). This depth (4 feet in agricultural land), which conforms to NYSA&M guidelines, is below the plow depth of farm equipment. Therefore, agricultural activities are not anticipated to pose any risk of electrocution. Above ground electric lines will be installed complying to all codes and standards to minimize the potential risk. Therefore, the general public will not be exposed to risk from electrocution.

3.9.2.2.7 Electric and Magnetic Fields

As described in Section 3.10.1.7, EMFs are a combination of electric and magnetic fields generated by the operation of various Project components, including the turbine generator, electrical collection lines and transformers. The strength of an EMF is inversely proportional to the distance a sensor is from the Project component, so that the electric and magnetic field strengths decline as the distance from the component increases. The height of the turbine generator (over 300 feet) above the ground, the location of most electrical collection cables underground, and the location of substation transformers and other electrical equipment inside a fenced yard provide separation of these components from the general public to limit EMF exposure.

3.9.2.2.8 Low Frequency Sound and Vibrations

To determine potential sound impacts from the Project, a Noise Impact Assessment was conducted and results were presented in the Section 3.7.

The project will be designed and operated in accordance with the applicable code requirements.

3.9.3 Proposed Mitigation

3.9.3.1 <u>Construction</u>

Contractors will comply with Occupational Safety and Health Administration (OSHA) regulations, in addition to state worker safety regulations, regarding electricity, structural climbing, and other hazards, during construction of the Project. To minimize safety risks to construction personnel, all workers will be required to adhere to a safety compliance program. The safety compliance program will address appropriate health and safety related issues including:

- personal protective equipment such as hardhats, safety glasses, orange vest, and steel-toed boots
- job safety meetings and attendance requirements
- fall prevention
- construction equipment operation
- maintenance and protection of traffic
- hand and power tool use
- open hole and excavation area safety
- parking
- general first aid
- petroleum and hazardous material storage, use, containment and spill prevention
- posting of health and safety requirements
- visitors to the job site
- local emergency resources and contact information
- incident reporting requirements

As mentioned in Section 3.8, a construction routing plan will be developed to assure that construction vehicles avoid areas or schedule deliveries where public safety could be a concern (schools, clusters of homes, etc.). To minimize safety risks to the general public, over-sized construction vehicles will be accompanied by an escort vehicle or flagman, as necessary to assure safe passage of vehicles on public roads. The general public will not be allowed on the construction site. After hours, vehicular access to such sites may be blocked by parked equipment, and temporary construction fencing or other visible barriers will be placed around excavations that remain open during off hours. The contractor will coordinate with local fire and emergency personnel to assure that they are aware of where various construction activities are occurring, and avoid potential conflicts between construction activity and the provision of emergency services (e.g., road blockages, etc.).

3.9.3.2 Operation

3.9.3.2.1 Ice Shedding

As stated previously, compliance with required setbacks and measures to control public access (gates, warning signs, etc.) should minimize any public safety risk associated with ice shedding. Atlantic Wind will also meet with local landowners and snowmobile clubs to explain the risks of ice shedding and proper safety precautions. Relocation of designated snowmobile trails that occur within 200 feet of a proposed turbine (if any) will be undertaken in coordination with the local snowmobile clubs and affected landowners. Additionally, icing of the sensors on the wind turbines will result in automatic turbine shutdown.

3.9.3.2.2 Tower Collapse/Blade Throw

The setbacks included in the Town of Clayton Wind Energy Facilities Law should assure that a tower failure would not endanger adjacent properties, roadways, or utilities. In addition, members of the public do not have access to the private land on which the turbines are located, and as previously stated, distance to the nearest public road/non-participating residence essentially eliminates risk to the public due to tower collapse/blade throw. Therefore, mitigation is not proposed.

3.9.3.2.3 Stray Voltage

Stray voltage will be prevented through proper design and grounding of the Project's electrical system. Although not anticipated, any reported stray voltage problems will be addressed through the Project's Complaint Resolution Procedure. Beyond this, additional mitigation is not proposed.

3.9.3.2.4 Fire

An employee safety manual will be incorporated into the overall operating and maintenance policies and procedures for the Project. Included in that manual will be specific requirements for a fire prevention program. In addition, a Fire Protection and Emergency Response Plan will be developed for the Horse Creek Wind Farm, and will include the following components:

- Initial and refresher training of all operating personnel (including procedures review) in conjunction with local fire and safety officials.
- Regular inspection of transformer oil condition at the step-up transformer installed at the main substation.
- Regular inspection of all substation components, including thermal imaging and other continuous monitoring techniques.

- Regular inspection of fire extinguishers at all facility locations where they are installed.
- All Project vehicles will be equipped with fire fighting equipment (fire extinguishers and shovels) as well as communications equipment for contacting the appropriate emergency response teams.
- The MSDS for all hazardous materials on the Project will be on file in the construction trailers (during construction) and the O&M facility (during operation), and provided to local fire departments and emergency service providers.
- The facility Safety Coordinator shall notify the local fire department of any situation or incident where there is any question about fire safety, and will invite an officer of the fire department to visit the workplace and answer any questions to help implement a safe operating plan.

Development and implementation of this plan will assure that Project construction and operation will not have a significant adverse impact on public safety, or the personnel and equipment of local emergency service providers.

3.9.3.2.5 Lightning Strikes

Beyond the turbines' lightning protection system, and the fire/emergency response plan described previously, no additional measures to mitigate the effects of lightning strikes are proposed.

3.9.3.2.6 Electrocution

Atlantic Wind has committed to burying all electric lines a minimum of three feet below grade (four feet in crop/hay fields). All above ground lines will be constructed in strict accordance with all relevant regulations. Beyond these activities, no additional measures to mitigate the potential for electrocution are proposed.

3.9.3.2.7 Electro-magnetic Fields

Because no significant impacts from EMF are expected, no mitigation is necessary.

3.9.3.2.8 Low Frequency Sound

As mentioned previously, the automated vibration detection and shut down process provided by the SCADA system in addition to adherence to all appropriate design standards will effectively avoid and/or minimize any noise-related health risks during Project operation. Additional operational noise mitigation measures include siting turbines typically least 1,250 feet from all off-site residential structures and keeping turbines in good running order throughout the operational life of the Project. However, if complaints should arise, they will be addressed through a complaint resolution procedure.

3.10 COMMUNITY FACILITIES AND SERVICES

Community facilities and services provided within and the vicinity of the Project area include public utilities, police and fire protection services, emergency medical services (EMS), health care facilities, education facilities, waste disposal, and recreational facilities. The level of services provided to the Project site was determined through review of publicly available online data or through telephone communications with State, County, Town, and School District personnel, including the State Police Department, County Sheriff's Department, County Emergency Services Coordinator, and local volunteer fire department.

3.10.1 Existing Conditions

<u>Public Utilities and Infrastructure</u>

Public utilities and infrastructure in the Project area include various overhead and underground facilities. Above-ground components include electric distribution and telephone lines, located along most of the public roads within the Project site. Cable television lines and communications towers, including radio broadcast antennas and cellular phone communications towers, also occur in and around the Project site. Underground utilities may include telephone and cable television lines and natural gas transmission lines.

<u>Police Protection</u>

The Jefferson County Sheriff and New York State Police have jurisdiction over the Project site. Both departments provide 24-hour coverage seven days per week. Jefferson County has a 911 Dispatch Center that dispatches all police, rescue, and fire calls and is located in the Metro-Jeff Public Safety Building on Waterman Avenue in Watertown.

The Clayton Village Police Department is located in the Clayton Municipal Building located at 425 Mary Street in Clayton. They have three part-time officers, three full-time officers, and one Department Chief. The Department provides law enforcement only to the Village of Clayton from 11 a.m. to 3 a.m. There is one patrol car on shift during the day, and two patrols cars during nighttime hours including one sergeant and one K-9 unit (Chief Patnode, pers. comm.).

The Jefferson County Sheriff's Department is located at 753 Waterman Drive in Watertown. They have twenty-six Deputy Sheriff's, nine detectives, five sergeants, and one lieutenant (www.co.jefferson.ny.us/index.aspx?page=105). There is one patrol car on duty for each shift for the Clayton area (Sgt. Cullen, pers. comm).

The New York State Police (Troop Division D, Zone 3) provides concurrent police service to the Project site and operates out of the primary station located in Alexandria Bay, as well as from their satellite station located in the Town of Orleans.

Fire Protection and Emergency Response

The Thousand Islands Emergency Rescue Service (TIERS) is the ambulance provider for the Town of Clayton. They are also the ambulance provider for the Clayton and LaFargeville Fire Departments. With 48 current members, TIERS paid staff paramedics provide coverage 24 hours a day, seven days per week and supplement their crews with volunteer EMTs and drivers. TIERS operates with three Advance Life Support Ambulances, all located at the Union Street headquarters in Clayton. They also have an ATV/snowmobile rescue trailer, Paramedic level fully-equipped fly car, three-unit TIERS EMS Bike Team, as well as advance life support equipment on Clayton Fire Department's "Last Chance" Maritime Unit. In 2006, TIERS had 29 calls in the town of Clayton and 13 mutual aid calls to surrounding areas (www.ti-rescue.org).

The Clayton Fire Department and the Depauville Fire Department provide fire protection services to the Project site. Fire and emergency services are provided 24 hours per day, seven days per week by volunteers dispatched from the Jefferson County 911 Center. The Clayton Fire Department is located on Graves Street in the Town of Clayton. The department has approximately 90 firefighters that respond to fire and rescue calls. The Clayton Fire Department apparatus includes one 1250 gpm pump Engine with 1000 gallons of water, one 1000 gpm pump mini type Engine, one 2000 gallon Tanker, one Heavy Rescue, extrication and high angle equipment onboard, one 100' ladder Aerial Truck with a 1000 gpm pump, and two Maritime boat units (www.claytonfiredepartment.org). The Depauville Volunteer Fire Department is located on School Street and serves approximately 1,000 residences (www.depauvillefd.org). The volunteer department provides fire and emergency support to 37 square miles surrounding the Hamlet of Depauville. Other nearby fire departments include the Dexter Fire Department on Canal Street in the Village of Dexter, the Brownville Fire Department on Brown Boulevard in the Village of Brownville and the LaFargeville Fire Department on Sunrise Avenue in LaFargeville.

Health Care Facilities

There are three hospitals in Jefferson County that provide health care services to the residents and visitors of the county. River Hospital, Inc. is located on Fuller Street in Alexandria Bay and is approximately 12.2 miles from the Project site. The hospital operates a primary care clinic, as well as emergency room, laboratory, physical therapy, respiratory therapy, radiology, ambulatory surgical care, and nutrition counseling services. The hospital provides 15 acute care beds and 9 swing beds and approximately 18 physicians on staff (http://www.riverhospital.org).

Samaritan Medical Center is located on Washington Street in Watertown and is approximately 10 miles from the Project site. This hospital is a member of the Samaritan Health System. This is a 287 bed acute care hospital that provides a wide range of services to the community, also serving as a regional referral center for Northern New York. There are approximately 166 physicians on staff who provide medical services including comprehensive cancer treatment, physical medicine and rehabilitation, high risk maternity and level II neonatal intensive care, neurosurgery, cardiac rehabilitation, trauma care, cardiac and pulmonary care, diagnostic cardiac catheterization and ambulatory surgery (www.samaritanhealth.com).

Carthage Area Hospital is located on West Street in Carthage and is approximately 21.2 miles from the Project site. This is a 78 bed, acute care hospital, and services including anesthesia, dentistry, family medicine, cardiology, emergency services, general surgery, internal medicine, ob/gyn, ophthalmology, orthopedics, pathology, pediatrics, podiatry, psychiatry, radiology, therapy services, urology, and vascular. The facility employs approximately 100 physicians (www.carthagehospital.com).

Educational Facilities

Two public school districts provide educational services to the population residing within and adjacent to the Project site. However, there are no public schools or facilities located in the Project site. The two school districts are LaFargeville Central School District (CSD) and Thousand Islands CSD. LaFargeville Central School (568 student population) is the only school within this district and is located in the Village of LaFargeville. The Thousand Islands CSD has four schools; Cape Vincent Elementary School (118 student population) located in Cape Vincent, and Guardino Elementary School (364 student population), Thousand Islands Middle School (255 student population), and Thousand Islands High *School* (358 student population), all located in the Town of Clayton. LaFargeville Central School is the closest school to the Project site, at a distance of approximately 2.4 miles (www.p12.nysed.gov).

Solid Waste Disposal

The nearest solid waste disposal facility is the Jefferson County transfer station located at 27138 NYS Route 12, approximately 13.2 miles southeast of the Project site. This facility accepts solid wastes and recyclables for county residents (http://www.co.jefferson.ny.us).

Parks and Recreation

Recreational opportunities in the vicinity of the Project site include bird watching, snowmobiling, bicycling, hiking, jogging, boating, hunting, fishing, picnicking, and sight seeing. Parks and recreational areas within 5 miles of the Project site include the Chaumont Bay, French Creek Wildlife Management Area (WMA), Perch River WMA, Ashland Flats WMA, Great Lakes/Seaway Trail, Chaumont River, Lucky Stars Lake, and numerous historic sites in the Village of Chaumont and Hamlets of LaFargeville and Stone Mills.

3.10.2 Potential Impacts

3.10.2.1 Construction

During construction, the Project will result in no significant increase in the demand for utilities such as telephone, natural gas, electric, water, or sanitary sewer. However, the Project will have a beneficial impact by generating a total of up to 96 MW of clean renewable energy.

Short term and minor impacts to existing electric distribution facilities may occur during the construction phase of the Project. National Grid owns the majority of the local overhead distribution poles and lines. Prior to the development of Project construction drawings, Atlantic Wind will share the Project layout with National Grid representatives in order to determine potential areas of conflict between existing utility lines and construction activities. Atlantic Wind will then contract a detailed survey (pole locations, line height, etc.) of all lines identified to have potential conflict. If conflicts cannot be avoided through minor shifts in access road alignment or the delivery route, National Grid will either have to temporarily raise, drop, or relocate any unavoidable lines. None of these activities will require new utility easements/rights of way.

The police, fire, and emergency response departments have adequate personnel and equipment to respond to basic emergency needs during construction of the Project. However, during construction, access to some area roadways may be temporarily blocked due to the presence of large construction and delivery vehicles. In addition, damage to the roadways caused by oversized/heavy equipment has the potential to reduce the response time of emergency personnel. This is not anticipated to be a significant problem due to the small number of residents within the Project site, the general availability of alternate access routes, and correspondence and coordination that will occur between construction managers and local police and fire departments. The construction site could also experience vandalism/trespass problems that would require involvement of local police. However, based on experience with other wind power projects in New York State, this is not anticipated to be a significant impact.

Project construction will generate some solid waste, primarily plastic, wood, cardboard and metal packing/packaging materials, construction scrap, and general refuse. This material will be collected from turbine sites and other Project work areas, and disposed of in dumpsters located at the construction staging area(s). A private contractor will empty the dumpsters on an as-needed basis, and dispose of the refuse at a licensed solid waste disposal facility.

During construction, the Project will not adversely impact the local school districts, beyond the possible delay of school bus pick-ups and drop-offs at homes within the Project area due to construction traffic/activity. Atlantic Wind will coordinate construction travel routes with local school districts. Temporary construction workers will not create significant demand for school district services or facilities. These workers will also not generate a significant demand on local recreational facilities or other community services/facilities.

3.10.2.2 Operation

Once in operation, the Project will not result in any significant impacts to local utilities. Facility operation and maintenance will require energy use, but this impact will be minor because the amount of required electricity and fuel is small, and local fuel suppliers and utilities have sufficient capacity available to serve the Project's needs. As a result, no improvements to the existing energy supply system will be necessary. In addition, the Project will generate up to 96 MW of electric power and will advance New York State's goal of having 25% of the state's power provided by renewable sources by 2013.

No significant problems that would require response by local police, fire, and emergency service personnel are anticipated to result from Project operation. The wind turbines are located at least 500 feet from property lines and public roads, and 1,250 feet from off-site residences (unless the affected property owner provides written permission for a reduced setback). This is well outside of any area that could be affected in the unlikely event of a tower collapse or catastrophic blade failure. Although operation of the proposed Project could result in accidents that result in personal injury and/or property damage, their occurrence is relatively unlikely, and well within the response capabilities of local emergency service providers. Local providers have experience in responding to fire and accidents in rural locations, including off-road areas used by hikers, ATV users, and snowmobilers. Public safety is discussed in detail in Section 3.10.

As described in Section 3.10, local fire departments do not have the specialized equipment necessary to respond to a fire in one of the turbines. Generally, any emergency/fire situations at a wind turbine site or substation will be the responsibility of the Project owner/operator. Operations and maintenance personnel will be trained and equipped to deal with emergency situations that may occur at the Project site (e.g., tower rescue, working in confined spaces, high voltage, etc.), and will coordinate such efforts with the local fire departments.

During Project operation, very little solid waste will be generated. Any waste that is generated will be placed in containers or dumpsters at the O&M facility and hauled away on a regular basis (e.g., weekly) by a private contractor. The waste will be disposed of at a licensed solid waste disposal facility.

The Project is not anticipated to result in a significant increase in the demand for educational services/facilities. While the operating Project will require up to eleven full-time employees, existing educational facilities/staff within the school districts are adequate to accommodate the addition of up to eleven families to the area.

3.10.3 Mitigation

The impacts to community services resulting from the proposed Project are not of the type or magnitude to require mitigation. In fact, development of the proposed Project will have a negligible impact on population, and place little demand on community services. At the same time, the Project will provide significant income and tax revenue to the Town, county, and school districts. This income will more than offset any incurred costs, and will assist with the financing of community services that benefit all residents of the town and county.

To mitigate any potential concerns regarding Project construction, Atlantic Wind will meet with the local emergency service personnel (fire, police, and EMS) prior to initiation of construction activities to review the planned construction process. During this meeting, unique construction equipment/material, construction traffic routing, and construction scheduling/phasing will be discussed. Prior to construction, Atlantic Wind will implement a coordinated emergency response plan, which will be developed in consultation with local emergency service personnel. The distance and response time of some of the emergency response personnel will be taken into account when initially developing the coordinated emergency response plan, along with identifying where various construction activities will be concentrated, the provision of maps and other related materials requested by emergency responders, and the development of alternate response routes in the event that the primary route is blocked by construction activities. On-going communication between Atlantic Wind and local police, fire, and emergency services officials will help assure adequate levels of protection related to operation of the Project. The coordinated emergency response plan is anticipated to include:

- Initial and refresher training of all operating personnel (including procedures review) in conjunction with local fire and safety officials.
- Regular inspection of transformer oil condition at each step-up transformer installed at the main substation.
- Regular inspection of all substation components.
- Regular inspection of fire extinguishers at all facility locations where they are installed.
- All Project vehicles will be equipped with fire fighting equipment (fire extinguishers and shovels) as well as communications equipment for contacting the appropriate emergency response teams.
- The MSDS for all hazardous materials on the Project will be on file in the construction trailers (during construction) and the O&M facility (during operation).
- The facility Safety Coordinator shall notify the local fire department of any situation or incident where there is any question about fire safety, and will invite an officer of the fire department to visit the workplace and answer any questions to help implement a safe operating plan.

Atlantic Wind will coordinate with the local fire departments and emergency service agencies with regard to training, practice drills and documentation of appropriate actions in case of emergency circumstances at the Project site. Such documentation will include the locations of all emergency shutdown controls, location of any potentially hazardous materials, and site maps showing access routes. The Project sponsor will provide emergency plan updates to the Town of Clayton within four weeks after any changes in operation or facility occur.

Because the solid waste impacts of the Project will be minimal, and because the Project will utilize existing permitted disposal facilities (in accordance with applicable laws and the local town ordinances), the Project will not create any conflict with the county's solid waste management plan.

3.11 COMMUNICATION FACILITIES

To evaluate the potential for the Project to impact existing telecommunication signals, Comsearch was contracted to conduct analyses of AM/FM broadcast station operations and off-air TV reception in the vicinity of the Project site, and to notify the National Telecommunications and Information Administration (NTIA) of the proposed Project (see reports in Appendix Q).

3.11.1 Existing Conditions

3.11.1.1 Microwave Analysis

Microwave telecommunication systems are wireless point-to-point links that communicate between two sites (antennas) and require clear line-of-sight conditions between each antenna. Comsearch identified one microwave path in the vicinity of the Project site, that is located just beyond the southwest corner of the Project boundary (approximately 3.5 miles from the nearest turbine) (see Figure 1 in the Licensed Microwave Search and Worst Case Fresnel Zone Study in Appendix Q).

3.11.1.2 Off-Air Television Analysis

Comsearch conducted a television reception analysis and identified all off-air television stations within a 100-mile radius of the proposed Project (as measured from the approximate center of the Project site). Off-air television stations transmit broadcast signals from terrestrially located facilities that can be received directly by a television receiver or house-mounted antenna. The results of the study indicate that there are 217 off-air television stations within 100 miles of the Project site (see Appendix Q). One hundred twenty-seven of these are US stations and 90 of them are Canadian.

The most likely stations that will produce off air coverage to the Project site are those within a distance of approximately 40 miles or less. Comsearch concludes that given the service and coverage of the stations identified, the number of US stations available to the local communities is extremely limited. As a result, most residents in the area likely view television programming through the use of cable or a satellite dish.

3.11.1.3 AM and FM Broadcast Analysis

The Comsearch analysis determined that there are three AM stations and ten FM stations licensed within approximately 15 miles of the proposed Project. The three AM station antennas are located 10.84, 12.85, and 12.89 miles away from the nearest proposed wind turbine. Of the ten FM stations, five are low power, four are medium power, and one is high power. The minimum distance between an FM station and a proposed wind turbine is 5.9 miles.

3.11.1.4 NTIA Notification

Comsearch sent a written notification of the proposed Project to the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce on December 28, 2006 (See Appendix H, Agency Correspondence), and an updated written notification was sent on January 4, 2011. Upon receipt of notification, the NTIA provides plans for the proposed Project to the federal agencies represented in the Interdependent Radio Advisory Committee (IRAC), which include the Department of Defense (DOD), Department of Education (DOE), Department of Justice (DOJ), and the Federal Aviation Administration (FAA). The NTIA then identifies any Project-related concerns during a 60-day review period.

3.11.1.5 Cellular, PCS, and LMR Systems

No formal study of cellular, personal communication system (PCS), or land mobile radio (LMR) coverage/use in the area was conducted. However, the area does have some cell phone coverage, and LMR is used by state, county, and local agencies and departments (police, fire, etc.) for vehicle-to-vehicle communications

3.11.2 Potential Impacts

3.11.2.1 Construction

Temporary communication interference as a result of Project construction may occur. Cranes used during construction activities (and the individual turbine components being raised by the cranes) can cause temporary obstruction of microwave links as well as some degradation to television and radio signals (L. Polisky, pers. comm.). However, because individual turbines have been sited to avoid interference with microwave paths that cross the Project, the potential for microwave interference by equipment assembling and erecting these turbines should be minimal. Any impact on television or radio reception caused by construction equipment would be temporary, as turbine assembly and erection at each turbine site is typically completed within 1 to 3 days.

3.11.2.2 Operation

3.11.2.2.1 Microwave Communication Systems

To assure an uninterrupted line of communications, a microwave link should be clear, not only along the axis between the center point of each antenna, but also within a mathematical distance around the center axis known as the Fresnel Zone. A Worse Case Fresnel Zone (WCFZ) was calculated for the microwave path identified to the southwest of the Project site. The WCFZ calculation only includes a horizontal analysis for each microwave path (i.e., its width). An analysis of the vertical limits of the Fresnel zone, to determine if it is actually above or below the proposed height of the turbines, was not conducted). The WCFZ was provided as a digital shapefile, which was used to guide initial turbine layout and will be used to guide final turbine layout (i.e., assuring that no turbine component is sited within the limits of the WCFZ). Therefore, Project operation is not anticipated to result in any interference to the microwave path that crosses southwest of the Project site (approximately 3.5 miles from the nearest turbine).

3.11.2.2.2 Television Systems

Comsearch examined the coverage of the identified off-air television stations within a 100-mile radius of the Project site and the potential for degraded television reception as a result of Project operation. The Comsearch report indicated that off-air stations located within 40 miles of the Project site are most likely to provide serviceable coverage for local residents. Of the 217 stations initially identified, 35 stations are located within the 40-mile range, 15 of which are Canadian stations. Of the 20 US stations located within the 40-mile range, only eight were licensed and operational at the time of the Comsearch analysis (December 2006). Of the eight licensed and operational US stations, three are full power analog stations, two are full power digital stations, and three are low power stations with limited coverage. Of the 15 Canadian stations, eight are analog and seven are digital stations. According to the Comsearch study, only the full power/full service analog and digital stations are capable of providing coverage to the area in the vicinity of the Project. The study concludes that due to the low number of US stations in the area and the potential lack of interest in the programming content of the Canadian stations, it does not appear that the off-air television stations are the primary mode of delivering television service to the local communities. Television service is more likely delivered through TV Cable service and/or direct satellite broadcast. Given that, the Project is not likely to result in significant impacts to television reception in the area. However, because some level of off-air coverage is provided to the area, impacts to existing television reception for some communities and/or individual receptors as a result of the Project are possible (i.e., those that rely exclusively on off-air coverage). Specifically, the loss of one or more of these stations to residents who rely only on off-air reception for television programming would likely represent a significant impact. These impacts would most likely include noise generation at low VHF channels within 0.5 mile of turbines, reduced picture quality (ghosting, shimmering), and signal interruption (NWCC, 2005).

3.11.2.2.3 Cellular, PCS and LMR Systems

Telephone mobile communications in the cellular and PCS frequency bands will not be significantly affected by the presence of the wind turbines. This is because the blockage caused by wind turbines is not destructive to the propagation of signals in these frequency bands. In addition, these systems are designed so that if the signal from (or to) a mobile unit cannot reach one cell, it will be able to reach one or more other cells in the network. Therefore, local obstacles are not normally a problem for these systems, whether they are installed in urban areas near large structures and buildings, or in a rural area near a wind energy facility. Similarly, the frequencies of LMR repeaters are generally unaffected by the presence of wind turbines. Very little, if any, change in the coverage of the repeaters will occur when the wind turbines are installed (L. Polisky, pers. comm.).

3.11.2.2.4 AM and FM Broadcast

Generally, the FM broadcast audio signal is not noticeably affected by wind turbines because the signal modulation is frequency modulated (FM) and the wind turbines have the affect of varying the amplitude of the signal, which will produce distortion to an amplitude modulated (AM) signal but not to a FM signal. Also, changes to audio coverage or distortion are not readily apparent to a listener when factored together with other causes of degradation such as being out of range of the station or signal fades. Since the FM Station antennas are located greater than 5.9 miles from the Project site, impacts to the coverage of these stations will be essentially non-existent. Additionally, AM Station antennas are at least 10.8 miles from the Project turbines, therefore no degradation of the AM broadcast coverage is anticipated to occur.

3.11.2.2.5 NTIA Notification

In a letter sent to Comsearch (dated February 2, 2007), the NTIA stated that they did not identify any concerns related to signal blockage following their review. Therefore, impacts to the IRAC radio frequency transmissions are not anticipated. This letter is included in Appendix H. The Project sponsor sent an updated NTIA Notification on January 4, 2011, which is currently undergoing a 60-day review process. No impacts to the IRAC radio frequency transmissions are anticipated.

3.11.3 Proposed Mitigation

3.11.3.1 Construction

If disruptions to existing communication systems occur as a result of Project construction, they will be temporary, and will only occur during the erection of specific turbines. Because turbine installation/crane activity will occur at different locations and at different times during the construction period, any degradation/disruption to existing communications will not represent a constant interference to a given television/radio reception area or microwave signal (L. Polisky, pers. comm.). In addition turbine erection will be performed as efficiently as possible (under favorable conditions, one turbine can be erected in one day). Therefore, mitigation for construction interference is not warranted.

3.11.3.2 Operation

3.11.3.2.1 Microwave Communication Systems

The Project, as currently proposed, will not impact existing microwave communications. If future turbine layout revisions are necessary, the new layout will be designed so as not to interfere with existing microwave paths. Beyond this, additional mitigation is not necessary and is therefore not proposed.

3.11.3.2.2 Television Systems

If Project operation results in any impacts to existing off-air television coverage, the developer/operator will address problems through a compliant resolution process coordinated with the Town of Clayton. Mitigation actions could include adjusting existing receiving antennas or possibly upgrading either the antenna or the cable connecting the antenna to the television. In addition, the FCC's mandate to transition all off-air television broadcasts from analog signals to digital signals by February 2009 will eliminate any turbine-related contrast variation (shimmering), thus reducing the potential for television signal interference from wind turbines (L. Polisky, pers. comm.).

3.11.3.2.3 Cellular, PCS and LMR Systems

If a cellular or PCS company were to claim that their coverage had been compromised by the presence of the proposed Project, coverage could be restored by installing an additional cell or an additional sector antenna on an existing cell for the affected area. Utility, meteorology, and/or the turbine towers within the Project site could serve as the structure platforms for the additional cellular or PCS base station or sector antennas. Similarly, if there is a reported change in LMR coverage in the area, it can be easily corrected by repositioning or adding repeaters that operate with the LMR mobile systems. This could be accomplished by adding or positioning the repeaters at locations within the Project site. Repeater antennas could also be installed on utility or the meteorological tower within the Project site, if needed.

3.12 LAND USE AND ZONING

Land use and zoning in the Project site was determined through review of local town codes, tax parcel maps, aerial photographs, and field review conducted during 2006 and 2010. Land use and zoning are discussed in terms of regional land use patterns, Project site land use and zoning, agricultural land use, and future land use.

3.12.1 Existing Conditions

3.12.1.1 Regional Land Use Patterns

The Town of Clayton is located in western Jefferson County, northwest of Watertown and the Fort Drum area (the two Jefferson County major population areas). The inland areas in this portion of Jefferson County are primarily rural and dominated by active and reverting agricultural land, forestland, and widely scattered rural homes and farms. Most of the agricultural land in this region of New York State is devoted to dairy farming, and to a smaller extent livestock and crop production, and a significant amount of agricultural land has gone out of production over the last 20 years. Much of this land has succeeded back to shrub or forest land (or is in the process), and many forested tracts are managed for the production of timber products (saw logs, chips, pulp, etc.), and are being actively logged. Areas of Jefferson County along the St. Lawrence River and Lake Ontario are characterized by waterfront recreational, residential and retail tourism activity. Areas of development are concentrated in small hamlets and villages, in waterfront communities, and along the existing network of state, county, and local roads. Most of this development is residential, but also includes recreational and retail business associated with tourism activity in the Thousand Islands Region and along Lake Ontario communities.

3.12.1.2 Project Site Land Use and Zoning

Active farms, reverting agricultural land, managed forestland, and single-family rural residences are the dominant land uses within the Project site. The majority of the area consists of open crop fields (primarily hay and corn) and pastures, with forested areas generally confined to small woodlots and stream corridors. However, a few areas of relatively large, contiguous forest tracks (up to approximately 500 acres) can be found. The Project site also includes successional old-field, hedgerow, successional shrubland, residential yards, farms, streams and ponds. These land uses are consistent with the regional land use characteristics described above, and together define community character within the majority of the Project site. Existing built features within the Project site include roads, single-family homes, barns, silos, and other agricultural buildings. Within and immediately adjacent to the Project site, residential and small commercial development is primarily concentrated in the hamlets of Depauville and LaFargeville. Rural residential development within the area, consisting primarily of individual single-family homes and farmhouses, generally occurs along the frontage of state and county highways and local public roads. Many of these homes are of an older vintage with new home construction being fairly limited. Other than farms, commercial and industrial development within the Project site appears to be limited to resource extraction (logging) and scattered rural or home-based businesses (e.g. sawmills, lumber yards, auto salvage yards, etc.).

According to the New York State Office of Real Property Services (NYSORPS), the Project site consists of seven distinct land use types. The majority of the Project site (approximately 5,056 acres [53.5%]) is categorized as agricultural, which is described by the NYSORPS as "property used for the production of crops or livestock". Approximately 2,526 acres (26.7%) of the Project site is characterized as residential, which is described as "property used for human habitation." Vacant land, which constitutes approximately 1,513 acres (17.3%), is described as "property that is not in use, is in temporary use, or lacks permanent improvement." Other land uses on-site include commercial (4 acres or <0.1%) described as "property used for the sale of goods and/or services," community services (8 acres or 0.1%) described as “property used for the well being of the community,” and public services (8 acres, or 0.1%) described as “property used to provide services to the general public”. Additionally, 130 acres (1.4%) of the Project site is categorized as wild, forested, conservation lands and public parks, defined as "Reforested lands, preserves, and private hunting and fishing clubs. The remaining 1.1% of the Project area is occupied by public roads. (NYSORPS, 2008).

The Town of Clayton Land Use Regulations (1999, amended 2005) define eight land use management districts within the town: 1) Residential, 2) Marine Residential, 3) Marine Development, 4) Agricultural and Rural Residential, 5) Hamlet, 6) Business, 7) Industrial, and 8) Conservation. The Residential district was established to provide a residential district of moderate density and limited accessory uses. The Marine Residential district allows for seasonal and year round waterfront setting residential development compatible with protection of the aesthetic and environmental quality of the St. Lawrence River and its tributary waters. The Marine Development district is intended to provide marine-dependent and commercially related uses in the St. Lawrence River area and its tributaries. The Agricultural and Rural Residential district (which covers the entire Project area within the Town of Clayton) was established to provide a low-density mix of agricultural and rural residential uses with compatible accessory structures in an effort to maximize preservation of rural open space. The Hamlet district allows a compatible mix of residential and commercial uses in rural population centers. The purpose of the Business district is to provide a safe and efficient setting for business and commercial uses while minimizing conflicts with residential areas. The industrial district allows for industrial activities that are compatible with the overall nature of the Town of Clayton. Finally, the Conservation district secures the appropriate use of environmentally sensitive or scenic lands, and preserves other natural areas.

The Town of Clayton also has a local law governing Wind Energy Facilities (Local Law No. 1 of 2007). Accompanied by the establishment of a Wind Power Overlay District, this ordinance provides the Town of Clayton Planning Board with the authority to regulate the placement of wind energy conversion systems (WECS). Wind energy facilities are allowed, pursuant to the approval of a wind energy facility application by the Planning Board and subsequent issuance of a permit. If approved, the permit allows for the construction, maintenance, and operation of a Wind Energy Facility. The requirements of the Wind Energy Facilities Law in the Town of Clayton is summarized as follows:

- The maximum total height of any WECS shall be 500 feet
- Setback of 500 feet from the nearest public highway
- Setback of 1,250 feet from any the nearest offsite residence, hospital, school, church or public library
- Operating WECS sound pressure levels (L_{10}) shall not exceed 50 dBA as measured at any off-site residence, school, hospital, church or public library existing on the date of the WECs application.
- The applicant shall submit and receive approval for a decommissioning plan.
- The applicant shall submit a complaint resolution process and make every reasonable effort to resolve complaints.
- The WECs should be lit only to the minimum level to comply with FAA requirements.
- Stormwater run-off and erosion control shall be managed in a manner consistent with State and Federal laws and regulations.
- Turbine blades shall pass no closer than 30 feet to the ground during operation.

3.12.1.3 Agricultural Land

The 2007 Census of Agriculture reported that 890 working farms occupied 259,600 acres in Jefferson County, or 22% of the land in the county. Of the total farmland in the county, 63% is classified as cropland (USDA NASS, 2010). According to the U.S. Census Bureau, less than 1% of the Jefferson County population (436 residents) listed farming, fishing, or forestry as their occupation. Similarly, 11 residents within the Town of Clayton (>1%) indicated farming, fishing, or forestry as their primary occupation (U.S. Census Bureau website).

Jefferson County has a total of 16 designated agricultural districts, and portions of two districts (Districts 08 and 09) occur within the Project site. Approximately 32.8% of the Project site is located within these districts. Agricultural land is a significant component of the Project site with approximately 4,155 acres of the 9,450-acre area (44%) in row crops, field crops, or pastureland (existing conditions based upon vegetative community mapping is discussed in Section 3.3).

3.12.1.4 Future Land Use

Other than the proposed Project, future land use patterns in the area are anticipated to remain largely unchanged for the foreseeable future. The Jefferson County Chamber of Commerce continues to promote agriculture, tourism, and recreation as growth opportunities. In response to an increased population in the Watertown and Fort Drum areas of Jefferson County, and an overall aging population in the region, an economic development strategy committee was formed and in 2006 circulated a “blueprint” for county economic development action. The goals of the action plan include retaining a young local work force, sustaining local tourism and recreational infrastructure, and promoting encourage investment in agri-tourism and the agricultural industry.

Current land use patterns in the Town of Clayton are expected to remain, with a future emphasis on those uses defined in the local zoning ordinance.

3.12.2 Potential Impacts

The Project will be compatible with the agricultural land use that dominates the Project site. However, there will be temporary, construction-related impacts, as well as permanent impacts (operation related) to land uses within the Project site and the larger community. Anticipated land use and zoning impacts are described below.

3.12.2.1 Construction

Construction-related disturbance to lands classified as agricultural use, will total approximately 349.5 acres (impacts based upon vegetative community mapping are discussed in Section 3.3). Along with this direct impact to agricultural land, movement of equipment and material could result in damage to growing crops, damage to fences and gates, damage to subsurface drainage systems (tile lines), and temporary blockage of farmers’ access to agricultural fields. However, wind turbines and associated facilities have been located so as to minimize loss of active agricultural land and interference with agricultural operations, and construction activities will be in accordance with the NYSA&M Guidelines for Agricultural Mitigation for Wind Power Projects.

In addition, construction will result in disturbance of approximately 78.5 acres of land categorized as residential, and 70.5 acres of land categorized as vacant. Impacts to residential land are confined to the properties of participating landowners. No impacts to land categorized as commercial, community services, public services, or wild, forested, conservation lands & public parks are anticipated.

Construction activities could have temporary impacts on forest management/timber harvest activities. Movement of equipment and materials could temporarily block or damage forest access roads. Timber harvest activities may also need to be curtailed/rescheduled in certain areas to avoid interfering with Project construction. It is anticipated that any marketable timber that results from forest clearing activities will be salvaged and stockpiled for use/removal by the landowner. Construction impacts to forestland have also been minimized by siting turbines in previously disturbed areas and using the existing network of forest roads, log landings, and skid trails to accommodate proposed access road and interconnect routes. Improvements to existing roads to accommodate construction activity will ultimately enhance access to these properties for future forest management activities.

Construction activity will be in compliance with the requirements of the local Wind Energy Facility ordinance of Clayton. No variance from the construction-related requirements of the local law is anticipated.

3.12.2.2 Operation

The Project as proposed is consistent with existing land use patterns within the Town of Clayton and will be constructed in compliance with the Town's zoning/wind energy facility regulations. The Project will occur entirely on private land in areas dominated by active and reverting agricultural land and managed forestland. Project components will be sited in accordance with local setback requirements and no public lands or recreational facilities will be impacted. Therefore, impacts to residential, commercial, and recreational land use will be minimized. The operating Project will be largely compatible with agricultural land use, which dominates the central and southern portions of the Project site, and may serve to help keep land within agricultural use. Russell Cary, Supervisor of the Town of Fenner, New York, believes that lease payments from the wind power project in Fenner are helping to preserve a rural lifestyle and protect family farms from being taken over by large-scale commercial farming operations (R. Cary, pers. comm.), which is also a goal of the Town of Clayton and Jefferson County.

Only very minor changes in land use within the Project site are anticipated as a result of Project implementation. The 48 turbine sites, substation, and other ancillary facilities represent the cumulative conversion of approximately 48.5 acres of land from its current use. Of these 48.5 acres, approximately 40 acres are categorized as agricultural by the NYSORPS, 6.5 acres are categorized as residential, and 6 acres are categorized as vacant.

During Project operation, additional impacts on land use should be infrequent and minimal. Other than occasional maintenance and repair activities that could have impacts similar to those described in Section 2.5 (Project Construction), the Project should not interfere with on-going land use (e.g., farming activities). As mentioned, by supplementing the income of participating farmers, the Project will help keep farms in operation and the land in agricultural use. The presence of wind turbines may also limit or prevent the conversion of agricultural land to seasonal or permanent residential use.

However, as noted in the visual impact assessment in Section 3.5, the Project will result in a perceived change in land use in many areas of the town. The remote or rural character of the area will be impacted in those locations where a significant number of the proposed turbines can be seen, or where the turbines can be viewed from foreground distances (i.e., under 0.5 mile).

3.12.3 Proposed Mitigation

The Project is generally consistent with existing zoning and is compatible with the agricultural and vacant land use that dominates the Project site. However, the Project will impact agricultural activities (at least temporarily) and will result in a significant change to community character and perceived land use throughout the area.

To minimize and/or mitigate impacts to active agricultural land and farming operations, Project siting and construction will fully comply with NYSA&M Guidelines for Agricultural Mitigation for Wind Power Projects. These protection measures include:

- Limiting permanent road widths to a maximum of 16 feet, and where possible, following hedgerows and field edges to minimize loss of agricultural land.

- Having roads that must cross agricultural fields stay on ridge tops and other high ground to minimize cut and fill as well as potential drainage problems.
- Avoiding disturbance of surface and subsurface drainage features (ditches, diversions, tile lines, etc).
- Prohibiting vehicular access to turbine sites until topsoil has been stripped and permanent access roads have been constructed.
- Constructing roads only in a location and manner approved by the environmental monitor.
- Prohibiting stripping of topsoil or passage of cranes across agricultural fields during saturated conditions when such actions would damage agricultural soils.
- Avoiding blocking of surface water drainage due to road or installation or stockpiled topsoil.
- Maintaining access roads throughout construction so as to allow continued use/crossing by farmers and farm machinery.
- Temporarily fencing open excavation areas in active pastureland to protect livestock.
- Disposing of excess concrete offsite (unless otherwise approved by the environmental monitor and the landowner). Under no circumstances shall excess concrete be buried or left on the surface in active agricultural areas.
- Washing of concrete trucks outside of active agricultural areas in locations approved by the environmental monitor.
- Restricting erection cranes to designated access roads, crane paths, and work pads at the structure sites for all set-up, erection, and breakdown activities.
- Stabilizing restored agricultural areas with seed and/or mulch.
- Removing and disposing of all construction debris offsite at the completion of restoration.

Beyond reducing impacts to agricultural land, other mitigation measures will be undertaken to reduce the impact of the wind energy facilities on land use and zoning (including full compliance with the Town of Clayton local law regulating the development of Wind Energy Facilities). These include:

- Locating all electrical collection (interconnect) lines underground to the maximum extent practicable, or siting above ground lines in hedgerows or out of areas being actively cultivated, where possible.
- Lighting towers only to the extent necessary to comply with FAA requirements. Lighting for the substation and other ground level facilities will be kept to a minimum and generally operated by switch or motion detector.
- Utilizing tubular towers and finishing structures with a single, non-reflective matte finish color.
- Avoiding use of guy wires on permanent wind measurement towers.

- Installing turbines in locations where proximity to existing fixed broadcast, retransmission, or reception antenna for radio, television, or wireless phone or other personal communications systems will not produce electromagnetic interference with signal transmission or reception.
- Designing all Project components in a way that minimizes the impacts of land clearing and the loss of open space. Land protected by conservation easements is being avoided.
- Locating Project components so as to minimize impacts on state and federal jurisdictional wetlands.
- Managing storm water run-off and erosion control in a manner consistent with all applicable state and federal laws and regulations.
- Removing all solid waste, hazardous materials, and construction debris from the site and managing its disposal in a manner consistent with all appropriate rules and regulations.
- Generally limiting construction to the hours of 7 a.m. to 7 p.m., in accordance with the local laws.

These actions will assure that adverse impacts on land use and zoning are minimized or mitigated to the extent practicable.