2.11 Bird and Bat Resources: Environmental Setting

A Bird and Bat Risk Assessment was prepared as part of the Draft Environmental Impact Statement (DEIS) for this Project. That document, which is included as Appendix F, provides a detailed discussion of existing conditions for bird and bat resources in the Project Area and an assessment of the potential risks to these important resources. The discussions presented in this section and Section 2.12, Bird and Bat Resources: Impacts and Mitigation, summarize the information presented in Appendix F and the supporting field studies.

2.11.1 Birds

2.11.1.1 Seasonal Bird Overview

Migrating Birds (Spring and Fall)

The primary bird migration seasons in the Project Area are spring and fall. Typical of New York State (NYS) and the northeast in general, the migrations of certain bird groups are as follows:

- Raptors (e.g., hawks, falcons, eagles, and vultures) migrate primarily between mid-March and mid-May and then between September and early November;
- Passerines (i.e., songbirds) primarily migrate between mid-April through May and between late August through October; and
- Waterbirds (e.g., waterfowl, herons, and shorebirds) migrate primarily between March and mid-May and then between September and mid-November.

Raptor migration areas in NYS are well documented and locations where large numbers (thousands to tens of thousands) of migrating raptors occur are already known. There are 13 sites in NYS that regularly report results to the Hawk Migration Association of North America (HMANA) database (HawkCount 2007). Most of these prime raptor migration locations are along the Great Lakes (in spring) and in the lower Hudson Valley (in fall). In spring, raptor migration is concentrated along the southern shores of the Great Lakes as raptors avoid crossing large bodies of water. Migratory raptors are also found in concentrated numbers along prominent ridgelines. There are no raptor monitoring locations (i.e., "hawk watches") in Wyoming County (HawkCount 2007; Zalles and Bildstein 2000). The closest hawk watch is near the Lake Erie shoreline in Hamburg, approximately 31 miles northwest of the Project Area, where thousands are tallied each spring. As the Project Area is not proximate to the shorelines of the Great Lakes, large bodies of water, or lengthy ridgelines, raptor migration is diffuse and without regularly occurring concentration points. There are no geographical or topographical features in the Project Area that attract or concentrate large numbers of migrating raptors.

Migratory raptor surveys (spring and fall) were conducted in the Project Area. A total of five raptors of three species were recorded during three days of spring

2005 raptor surveys, two of which were considered to be migrants. The migratory passage rate was 0.1 raptor per hour. For comparison, at the Hamburg Hawk Watch in Hamburg, New York over two of the three survey days (surveys were not conducted in Hamburg on one of the days), 346 raptors were tallied with a passage rate of 29.5 raptors/hour. During Project surveys in fall 2006, Ecology and Environment, Inc. (E & E) observed a total of 231 raptors including 203 migrants and 28 local raptors of 11 species. The migratory passage rate was 9.7 raptors per hour. A hawk watch is not conducted at the Hamburg site in the fall; therefore, no comparison could be made for the fall. No concentrated flight paths were identified in either spring or fall and the findings were consistent with the existing knowledge of the bird resources in the region (see Appendix F).

Unlike most migrating raptors, migrating passerines (i.e., songbirds) do not generally avoid crossing large bodies of water or migrate in concentrated numbers along ridgelines. However, they do concentrate in stopover points following nocturnal migration. These stopover points are often along geographical or topographical features (i.e., shorelines of large lakes or oceans) or isolated patches of habitat. No geographical or topographical features in the Project Area that attract or concentrate migrating passerines in greater numbers than elsewhere in the region were identified. Outside of such concentration areas, passerine migration is typically diffuse over a broad front. Two nocturnal radar studies in proximity to the Project Area were conducted previously (i.e., an ABR, Inc. [ABR] study in Wethersfield in fall 1998 and spring 1999 and a limited study by Marine Services Diversified LLC in Eagle over eight nights in fall 2005) and were evaluated in the BBRA along with a nocturnal radar study conducted in the Project Area in 2006 (see Appendix F). Spring migratory bird surveys were conducted at 24 points in the Project Area on May 10 and 17, 2006. A total of 1,291 birds of 67 species were identified. The most numerous species recorded were Red-winged Blackbird (256 birds), American Crow (133 birds), and Bobolink (116 birds). The species observed were all expected based on the habitat, location, and time of year and the findings were consistent with the existing knowledge of the bird resources in the region (see Appendix F).

There are no large water bodies or extensive wetlands with open water in the Project Area to attract substantial numbers of waterbirds (i.e., waterfowl or shorebirds) during migration. Other than some small inland lakes and reservoirs (e.g., Attica Reservoir, Cuba Lake) that attract lesser numbers of migrant waterfowl, the closest area to the Project Area with wetland habitat conducive for concentrated waterfowl migration is the Iroquois National Wildlife Refuge complex (to the north and west of the Project Area); however, this location is relatively distant and does not result in strong passage of waterfowl or shorebirds through the Project Area. There is no strong passage of waterbirds in or near the Project Area, primarily because of the habitat and lack of large waterbodies in the Project Area.

Breeding Birds (Late Spring and Summer)

Late spring and summer is the primary season for avian breeding in the Project Area. Breeding activity in and/or near the Project Area has been documented by the NYS Breeding Bird Atlas projects and the North American Breeding Bird Survey (see Appendix F). E & E also conducted two breeding bird surveys in the Project Area on June 5 and 22, 2006, at 14 locations. A total of 408 birds of 54 species were identified during the two surveys and the findings were consistent with the existing knowledge of the bird resources in the region (see Appendix F). Typical for Wyoming County, a good diversity of breeding species is associated with the area, primarily in forested areas.

Wintering Birds

Large concentrations of birds do not winter in the Project Area and diversity is low because of the harsh climate and lack of sufficient food sources. Most species present in other seasons (e.g., warblers, flycatchers, and thrushes) migrate south for the winter, leaving only year-round species that are not seasonally displaced (e.g., Great Horned Owl and Pileated Woodpecker) and some species (e.g., American Tree Sparrow and Rough-legged Hawk) that travel south from more northern climates to winter in western New York. Regional Christmas Bird Count (CBC) data provide an overview of species that would be anticipated to occur in the Project Area during the winter in appropriate habitat (see Appendix F).

2.11.1.2 Nocturnal Radar and Visual Study

ABR conducted a nocturnal radar and visual study between April 16 and May 30, 2006, and between August 16 and October 14, 2006, to analyze the spring and fall nocturnal migration of birds and bats over the Project Area. The results of the study, including nocturnal radar passage rates, flight altitude, flight direction, weather influence, turbine passage, and visual findings, are summarized in this section and provided in Appendix F in further detail.

Nocturnal Radar

Passage Rates. Nocturnal radar observations indicate that passage rates in spring 2006 were 324 ± 27 targets per kilometer per hour (km/hr). Nocturnal passage rates were highly variable from night to night, ranging from 41 to 907 targets/km/hr. Nocturnal radar observations indicate that passage rates in fall 2006 were 256 ± 20 targets/km/hr. Nocturnal passage rates were variable from night to night, ranging from 31 to 701 targets/km/hr. Passage rates had some variation throughout the night during both the spring and fall studies; the lowest mean rates occurred during the first hour after sunset. The overall mean passage rates in spring and fall were above average, but well within the range of historical results from similar radar studies in the northeast (see Appendix F).

Flight Altitude. The mean nocturnal flight altitude based on vertical radar sampling <4,921 feet (1,500) meters agl in spring 2006 was 1,165 ± 6.5 feet (355 ± 2 meters) agl, with a range among nights of 318 to 1,801 feet (97 to 549 meters) above ground level (agl). The mean nocturnal flight altitude based on vertical radar sampling <4,921 feet (1,500) meters agl in fall 2006 was 1,129 ± 3 feet (344 ± 1 meters) agl, with a range among nights of 725 to 1,873 feet (221 to 571 meters) agl. The spring and fall results are very similar, and they are consistent with similar radar studies conducted in the northeast (see Appendix F) and existing literature regarding the flight of nocturnal migrants (Kerlinger 1989, Mabee et al. 2006a, b; Smithsonian Migratory Center 2006). Mean flight altitudes were variable throughout the study periods. There was no significant pattern as to the timing of the lowest altitudes. Approximately 19% of all nocturnal targets in spring 2006 and approximately 11% of all nocturnal targets in fall 2006 flew below 410 feet (125 meters) agl, a close approximation to the maximum turbine height. These percentages are consistent with similar radar studies conducted in the northeast. The mean flight altitudes were 776 feet (236.5 meters) and 740 feet (225.5 meters) higher than the maximum turbine height (389 feet/118.5 meters); therefore, the majority of migration occurs well above the height of the proposed turbines.

Flight Direction. The mean flight direction of targets observed on radar was 22º in spring and 203º in fall. This indicates that the predominant flight direction was northerly in spring and southerly in fall, which is consistent with the expected seasonal migration flight directions.

Weather Influence. The ABR study examined the influence of various weather conditions on the results for passage rates and flight altitudes using statistical methods. ABR investigated the importance of a number of parameters including weather (i.e., wind direction, wind speed, ceiling height [including fog], daily barometric pressure change, synoptic weather [days since favorable migration—passage rate models only]), lunar illumination, and date on both the passage rates and flight altitudes of nocturnal migrants. This was done by building a series of models using combinations of the various weather variables and dates, and then using a model-selection technique to quantify the statistical strength of those models. Please see Appendix F for a discussion of the methodology.

In spring, passage rates decreased when there was fog, low ceiling heights (<1,640 feet [500 meters] agl), and with increasing barometric pressure. In fall, passage rates increased with tailwinds, calm conditions, and during eastern crosswinds. Flight altitudes were not strongly associated with any of the parameters, indicating no strong patterns for flight altitudes in spring. In fall, flight altitudes increased when a high pressure system entered the area creating favorable winds and when ceiling height was <1,640 feet (500 meters) agl. Flight altitudes decreased when birds were north or west of a cold front and when wind speeds increased.

Turbine Passage. The ABR study estimated the turbine passage rate (i.e., the rate of migrants passing within the area occupied by each turbine) for bird/bat migrants in both seasons under existing conditions (i.e., without turbines). The turbine passage rate takes into account the (1) number of targets flying less than 410 feet (125 meters) agl; (2) turbine area that migrants would encounter when approaching turbines from the side or from the front; (3) number of nights during the migration period; and (4) number of hours of migration/night, which is the number of nocturnal hours (see Appendix F the methodology and assumptions). Passage rates are an index of the number of migrants flying past a given location. This rate can be used to assess the relative bird/bat use an area and make comparisons to other sites. This rate does not take into account avoidance behaviors; thus, it is a conservative value. Further, there is not a proven connection between increased abundance during pre-construction studies and fatality rates following construction.

The turbine passage rate in spring was estimated at 3.3 to 22.9 migrants per turbine per day. In fall, the turbine passage rate was estimated at 2.1 to 14.3 migrants per turbine per day. The turbine passage rate in Wethersfield was slightly higher than the few other studies conducted by ABR (see Appendix F) where an estimated passage rate was developed. Other nocturnal radar studies reviewed do not provide this metric.

Nighttime Visual Study

Based on sampling to an approximate altitude of 492 feet (150 meters) agl with night-vision goggles and spotlights, the proportions of birds and bats below 492 feet (150 meters) agl were:

- Eighty-two percent birds and 18% bats in spring 2006, and
- Ninety percent birds and 10% bats in fall 2006.

Due to the extreme difficulty in the speciation of bats through nocturnal visual surveys, bat targets that could be identified were categorized as small or large bats, allowing the surveyor to discriminate the larger (approximately greater than 2 inches) bats (e.g., Hoary, Eastern Red, Big Brown, and Silver-haired bats) from the smaller (approximately less than 2 inches) bats (e.g., *Myotis* sp.) of the region.

Nightly visual rates for bats (the number of bat targets observed per hour) was less variable compared to bird target rates during spring and fall observation. Overall, fewer bats (167) were identified in comparison to bird targets (1,114) during visual observations in spring and fall 2006. Although a similar number of bats were observed during spring (80 bats) and fall surveys (87 bats), nearly twice as many birds were observed in the fall (758 birds) compared to the spring (356 birds). Small bats dominated the two survey periods, as 52 of 80 bats in spring and 56 of 87 bats in fall were identified as small bats, with lesser numbers of large bats and unidentified bats.

2.11.1.3 Bird Species Identified and Review of Listed Species

During the bird surveys and other activities in the Project Area, Ecology and Environment, Inc. (E & E) identified a total of 106 species in the Project Area (see Table 2.11-1).

NYSDEC maintains a list of bird species that are considered endangered (nine species), threatened (10 species), or of special concern (19 species) within NYS, inclusive of several federally listed species. Information was reviewed from various sources, including E & E field surveys, Breeding Bird Atlas (BBA) projects, and Wyoming County birding references to determine the potential occurrence of endangered, threatened, or special concern species in the Project Area (see Appendix F for more detail).

Eight endangered, threatened, or special concern species have been documented in the Project Area in recent years, including:

- Bald Eagle (threatened): This species occurs as a migrant and transient over the Project Area; however, location/habitat within the Project Area is not ideal for breeding or foraging. An immature Bald Eagle was observed flying over the Project Area in April 2006 and another immature Bald Eagle was observed flying approximately 3 miles south of the Project Area in May 2005.

- Northern Harrier (threatened): It has bred in a number of locations in Wyoming County, including in the vicinity of the Project Area, where suitable foraging and breeding habitat exists. It was observed on several occasions during E & E surveys and field work in various open fields in the Project Area.

- Osprey (special concern): It is a migrant and transient over the Project Area; however, the habitat within the Project Area is unsuitable for breeding. E & E observed this species during the September 2006 fall raptor surveys.

- Sharp-shinned Hawk (special concern): It is considered fairly common in Wyoming County. It was confirmed breeding during the 2000-2005 BBA in blocks that include the Project Area. One was observed in May 2006 in the Project Area. One was also observed in the Project Area on September 21, 2006, during fall raptor surveys.

- Cooper's Hawk (special concern): It is considered fairly common in Wyoming County. It was confirmed breeding during the 2000-2005 BBA in blocks that include the Project Area. Four were observed during 2006 fall raptor surveys.

- Northern Goshawk (special concern): Although it was not observed during E & E surveys, Northern Goshawk was listed as a confirmed breeder during the 2000-2005 BBA in blocks several miles from the Project Area and a few individuals were observed in Wethersfield in the late 1990s.

- Red-shouldered Hawk (special concern): It is considered fairly common in Wyoming County. It was confirmed breeding during the 2000-2005 BBA in blocks that include the Project Area. E & E observed one in November 2006 in the Project Area.

- Horned Lark (special concern): It is a regular, often common, species in winter throughout NYS. It was listed as a possible breeder during the 2000-2005 BBA in blocks that include the Project Area. Eight were identified during E & E migratory surveys and other field visits in agricultural fields and as flyovers.

Many species (Pied-billed Grebe [threatened], Sedge Wren [threatened], Red-headed Woodpecker [special concern], Golden-winged Warbler [special concern], Cerulean Warbler [special concern], Yellow-breasted Chat [special concern], Vesper Sparrow [special concern], and Grasshopper Sparrow [special concern]) have been observed in nearby towns or counties and/or the habitat is suitable for breeding, but none were observed in the Project Area. Upland Sandpiper (threatened) and Henslow's Sparrow (threatened) have bred in Wyoming County historically, but no birds were observed when targeted searches were conducted for these species. Golden Eagle (endangered), Peregrine Falcon (endangered), Common Loon (special concern), and Common Nighthawk (special concern) likely migrate through the Project Area on occasion. Short-eared Owl (endangered) regularly winters in Wyoming County and may occur in the Project Area.

2.11.2 Bats

2.11.2.1 Regional Overview

This section discusses general bat ecology and habitat preference for bat species found in NYS. Very limited information specific to the Project Area was identified during the literature review. Nine species of bats utilize the various landscapes found in the State of New York (see Table 2.11-2).

Habitats utilized by these species include wetlands, agricultural and reverting fields, forests, and cities with a variety of micro-habitats used for foraging, roosting, and maternity roosting. Bats thrive in these various habitats as they are proficient predators of insect populations. Generally bats are solitary outside of mating, hibernation periods, and rearing of young, although some colonial roosting does occur. The most common species of bats (e.g., Little Brown Bat, Big Brown Bat, Eastern Pipistrelle, and Red Bat) have adapted to a multitude of habitat types including human-altered landscapes. As such, these species are assumed to utilize the Project Area.

The remaining bat species tend to be found only in densely forested stands and are not expected to be found regularly in the Project Area. The Indiana Bat, which is federally protected, has not been identified in the Project Area and is not expected to be present.

Specialized habitats required for bats include winter hibernacula, where bat species congregate during hibernation periods (November through March). Identified hibernacula include limestone caves, old mines, and old well shafts. Most bats require a moderated constant temperature and humidity provided by the hibernacula to survive over the winter. Measures have been taken by state and federal agencies in the last decade to protect important bat hibernacula habitats, as any disturbances during critical hibernation periods can be detrimental to large populations of bats, as well as individual bat species. Bats return in fall to established hibernacula. Some New York bats migrate relatively short distances to these locations, and some winter in small hibernacula near their summer roosting areas. Others migrate further south to warmer climates following foraging sources, where shorter periods of hibernation may occur.

Summer roosts are generally daytime or nighttime roosts, where bats will spend the entire day resting or portions of the night resting. Day roosts for New York bats can vary and include buildings, exfoliating bark, tree cavities, rock piles, and caves depending on species-specific preferences. No roosting areas were identified in the Project Area during site visits or as indicated in the literature.

No threatened or endangered bat species were specifically identified by the NYS Natural Heritage Program (NHP). Although no significant bat communities were identified within the Project Area, the NHP identified one bat colony within 10 miles of the Project Area at Letchworth State Park in the Town of Portage, Livingston County (Ketcham 2005, Seoane 2006).

2.11.2.2 Bat Habitat Surveys

Habitat surveys of the Project Area were conducted during various field efforts throughout spring, summer, and fall 2006. Surveys identified no major rock outcroppings, cave dwellings, or hibernacula where bats may roost within the Project Area. Based on the mosaic of habitat types found throughout the Project Area, suitable habitat was identified for the most common bat species that would be expected to occur in the Project Area. The acoustical monitoring surveys (see Section 2.11.2.3 confirmed their presence in the Project Area.

No suitable hibernacula were identified within the Project Area, nor were any areas found meeting the specific summer roost and maternity roost habitats, for the state- and federally endangered Indiana Bat. The Project Area does not contain significant timber stands of the necessary age or species composition to provide suitable habitat for this species. Silvicultural and agricultural practices have eliminated contiguous tracts of mature timber (with cavities and exfoliating bark). These current land use practices coupled with the lack of defined water courses largely eliminates the potential for suitable habitat to exist within the Project Area. Based on the known locations of Indiana Bat hibernacula, and the distance that separates the hibernacula from the Project Area, migration through the Project Area is unlikely.

2.11.2.3 Acoustical Monitoring for Bats

Woodlot Alternatives, Inc. (Woodlot) conducted an acoustical monitoring study in the spring and fall of 2006. The results of their study, including mean detection rate, species composition, and the relationship of the number of call sequences to weather variables, are summarized in this section. The reports prepared by Woodlot are included in Appendix F.

Spring 2006 Study

Two detectors were deployed at different heights in a met tower in the Project Area from the night of April 6 to the night of June 7, 2006, yielding a total of 126 detector-nights of recordings (63 nights with two detectors). The met tower was located in open agricultural field with some nearby woodlands. A total of 192 bat call sequences were recorded during the spring sampling. The mean detection rate of all detectors was 1.5 call sequences per detector-night. More than twice as many call sequences were recorded by the lower detector (132 call sequences), which was 10 meters (33 feet) above the ground, than by the upper detector (60 call sequences), which was 21 meters (69 feet) above the ground. The number of call sequences varied considerably from night to night (see Appendix F). The maximum number of call sequences occurred on April 30, 2006, when 14 call sequences were recorded at the low detector and on June 6, 2006, with nine call sequences at the high detector.

A large proportion (40% or 76) of the call sequences were identified simply as "unknown" due to poor call quality or too few call pulses on which to base identification. Approximately 32% of the calls were identified as myotids; 26% as the "Big Brown" guild that includes the Big Brown Bat, Silver-haired Bat, and Hoary Bat; and only 3% were that of the guild including Eastern Red Bat and Eastern Pipistrelle. Several of the recorded call sequences were distinct enough to identify to species, rather than just to guild. Five bat species were identified in this manner during the spring surveys, including the Little Brown Bat (24 calls), Hoary Bat (eight calls), Silver-haired Bat (seven calls), Eastern Red Bat (six calls), and Big Brown Bat (four calls). The 37 other call sequences in the myotid group could not be identified to species because the call sequences were too indistinct, and the 30 other calls in the big brown guild were either that of the Big Brown Bat or Silver-haired Bat, but definitely not from the Hoary Bat. All five species are found throughout NYS. The survey results (detections and species) were generally consistent, although slightly higher, than similar studies conducted in the spring in the northeastern United States.

Woodlot determined that there was not a significant relationship between weather variables and the number of bat call sequences. However, very few call sequences were detected when wind speeds were high (>23 feet [7 meters] per second) and greater numbers of call sequences were detected when temperatures were warmer (>10 ^{o}C; see Appendix F).

Fall 2006 Study

Detectors were deployed at different heights in the same met tower used during the spring 2006 study. Surveys were conducted from the night of July 25 to the night of October 9, 2006, yielding a total of 80 detector-nights of recordings (some nights of data were lost as a result of detector failure, which is common during remote studies). A total of 22 bat call sequences were recorded during the fall sampling. The mean detection rate for both detectors was 0.3 call sequences per detector-night. All 22 call sequences were detected by the upper detector, which was positioned 98 feet (30 meters) above the ground. No calls sequences were recorded by the lower detector, which was 49 feet (15 meters) above the ground. The number of call sequences varied and no calls were detected on a number of nights; consequently, no seasonal trends were observed. The maximum number of call sequences occurred on August 1, 2006, when three call sequences were recorded at the high detector.

The highest proportion (77% or 17 calls) of the recorded call sequences were labeled as unknown due to short call sequences, poor call signature formation, or static interference. Woodlot estimated that approximately 80% of the unknown calls were likely from the Myotis group. The composition of bat call sequences were two in the big brown guild, two in the Myotis guild, and one in the red bat/eastern pipistrelle guild. Only the Eastern Red Bat could be identified to species, rather than just to guild. This species is found throughout NYS.

The detection rates in fall 2006 were lower than in spring 2006 at this site, which was not anticipated as bat activity is often greater in the late-summer and fall, based on previous studies conducted in the northeast. Too few calls were recorded in the fall to make any conclusions about species presence. The fall survey results (detections and species) were generally much lower than with similar studies conducted in the fall in the northeast (see Appendix F).

There was not a significant relationship between bat call sequence detections and weather variables. In general, more calls were detected when wind speeds were low.

Table 2.11-1 Bird Species Identified during E & E Surveys and Site Work in the Project Area

Common Name[1]		
Canada Goose	Alder Flycatcher	Yellow Warbler
Wood Duck	Willow Flycatcher	Chestnut-sided Warbler
American Black Duck	Least Flycatcher	Magnolia Warbler
Mallard	Eastern Phoebe	Black-throated Blue Warbler
Ring-necked Pheasant	Great Crested Flycatcher	Yellow-rumped Warbler
Ruffed Grouse	Eastern Kingbird	Black-throated Green Warbler
Wild Turkey	Blue-headed Vireo	Blackburnian Warbler
Great Blue Heron	Warbling Vireo	American Redstart
Green Heron	Red-eyed Vireo	Ovenbird
Turkey Vulture	Blue Jay	Northern Waterthrush
Osprey (SC)	American Crow	Mourning Warbler
Bald Eagle (T)	Common Raven	Common Yellowthroat
Northern Harrier (T)	Horned Lark (SC)	Hooded Warbler
Sharp-shinned Hawk (SC)	Purple Martin	Scarlet Tanager
Cooper's Hawk (SC)	Tree Swallow	Eastern Towhee
Red-shouldered Hawk (SC)	Northern Rough-winged Swallow	Chipping Sparrow
Broad-winged Hawk	Cliff Swallow	Field Sparrow
Red-tailed Hawk	Barn Swallow	Savannah Sparrow
American Kestrel	Black-capped Chickadee	Song Sparrow
Merlin	Tufted Titmouse	White-throated Sparrow
Killdeer	White-breasted Nuthatch	Dark-eyed Junco
Ring-billed Gull	House Wren	Northern Cardinal
Rock Pigeon	Golden-crowned Kinglet	Rose-breasted Grosbeak
Mourning Dove	Ruby-crowned Kinglet	Indigo Bunting
Barred Owl	Eastern Bluebird	Bobolink
Northern Saw-whet Owl	Veery	Red-winged Blackbird
Chimney Swift	Hermit Thrush	Eastern Meadowlark
Ruby-throated Humming-bird	Wood Thrush	Common Grackle
Belted Kingfisher	American Robin	Brown-headed Cowbird
Red-bellied Woodpecker	Gray Catbird	Baltimore Oriole
Yellow-bellied Sapsucker	Brown Thrasher	Purple Finch
Downy Woodpecker	European Starling	House Finch
Hairy Woodpecker	Cedar Waxwing	American Goldfinch
Northern Flicker	Blue-winged Warbler	House Sparrow
Pileated Woodpecker	Tennessee Warbler	
Eastern Wood-Pewee	Nashville Warbler	

[1] Endangered (E) and threatened (T) species and species of special concern (SC) are noted with parenthesis after the common name.

Table 2.11-2 Bat Species of New York, Habitat Types, and Abundance

Common Name	Scientific Name	Average Body Size (inches)	Preferred Habitats: Summer	Preferred Habitats: Winter	Abundance
Small-footed Myotis	*Myotis leibii*	2.9-3.2	Hemlock stands, rock crevices, tree bark, urban structures	Regional hibernacula, rock outcropping	Uncommon; state species of special concern
Indiana Bat	*Myotis sodalis*	2.9-3.9	Exfoliating bark, cavities, dead trees in riparian corridors	Regional hibernacula	Uncommon; federally endangered
Little Brown Bat	*Myotis lucifigus*	2.4-4.0	Tree cavities, urban structures	Regional hibernacula	Most common
Eastern Long-eared Bat	*Myotis septentrionalis*	3.2-3.8	Tree cavities, exfoliating bark, barns, eves, shingles	Regional hibernacula	Uncommon to common
Eastern Pipistrelle	*Pipistrellus subflavus*	3.0-3.6	Tree foliage, leaf litter	Regional hibernacula	Uncommon to common
Eastern Red Bat	*Lasiurus borealis*	3.6-4.6	Dense riparian tree foliage	Migrates outside region?	Uncommon (status uncertain in New York); most common tree roosting bat
Hoary Bat	*Lasiurus cinereus*	5.1-5.9	Tree foliage	Migrates outside region?	Uncommon (status uncertain)
Silver-haired Bat	*Lasionycteris noctivagans*	3.6-4.6	Tree cavities, exfoliating bark in coniferous forested stands, and rock crevices	Migrates outside region?	Uncommon (status uncertain)
Big Brown Bat	*Eptesicus fuscus*	3.4-5.4	Tree cavities, exfoliating bark, urban structures	Regional hibernacula, buildings, urban structure	Common

Source: NYSDEC 2006d, Williams et al. 2002, Curtis and Sullivan 2001.

2.12 Bird and Bat Resources: Impacts and Mitigation

2.12.1 Wind Energy and Bird/Bat Issues

There are a number of positive impacts on bird populations that would result from an increased use of renewable energy, including wind energy. Air emissions and global climate change have been cited as serious concerns for North American bird populations (see *A Birdwatcher's Guide to Global Warming by the National Wildlife Federation and American Bird Conservancy* [Price and Glick 2004]). Increased renewable energy use would slow down the negative impacts of global climate change and air emissions on people and wildlife. In addition to the positive impacts noted above, operation of wind energy facilities also has the potential to result in some adverse impacts by causing injury or death to birds through collisions and resulting in habitat loss, degradation, or displacement. While studies have shown that these negative impacts have occurred at a few sites, the results from numerous studies and reviews of bird impacts from wind energy facilities in North America and Europe indicate that mortality rates are low (Erickson et al. 2001; NWCC 2004; GAO 2005).

In November 2004, the National Wind Coordinating Committee (NWCC), a consortium of wind energy developers, researchers, proponents, opponents, and agencies, issued the second edition of a fact sheet, "Wind Turbine Interactions with Birds and Bats: A Summary of Research Results and Remaining Questions" (2004). The following, taken from the fact sheet, is part of an overview on the status of bird and bat issues at wind energy facilities that aptly describes the current understanding:

> Wind energy's ability to generate electricity without many of the environmental impacts associated with other energy sources (air pollution, water pollution, mercury emissions, and greenhouse gas emissions associated with global climate change) can significantly benefit birds, bats, and many other plant and animal species. However, the direct and indirect local and cumulative impacts of wind plants on birds and bats continue to be an issue.

In a September 2005 report to congressional requesters, the United States Government Accountability Office (GAO) reviewed the impacts on wildlife from wind power. The GAO report concluded that outside of the Altamont site in northern California, the research to date has not shown bird kills in alarming numbers (GAO 2005). The GAO review of post-construction mortality studies found that bird fatalities ranged from 0 to 7.28 birds per turbine per year. Similarly, the 2004 NWCC fact sheet shows that an average of 2.3 birds per turbine per year (3.1 birds per megawatt [MW] per year) are killed at facilities outside of California. For eastern wind farms, the average was 4.3 birds per turbine per year (3.0 birds per MW per year).

The research regarding bats and wind turbines is much more limited. As of 2004, no known collisions of federally endangered or threatened bat species have been documented in conjunction with wind turbines (BCI 2006). Although this report only extends through 2004, anecdotal information from the most recent NWCC conference in November 2006 indicated that this conclusion is still valid. Collisions involving other bat species are typically on the same order as expected for birds with 3.4 bat kills per turbine per year as national average, although much higher rates were found during some studies in the Appalachian Mountains (NWCC 2004; GAO 2005). The significance of localized bat mortality from collisions on a population as a whole is largely not understood, and current research is aimed at addressing this issue.

The United States Fish and Wildlife Service (USFWS), state agencies, NWCC, and Bat Conservation International (BCI) are currently trying to determine the biological significance of the large number of bat fatalities at the Mountaineer Wind Energy Center in West Virginia in 2003 and 2004. More recently, additional reports of sizeable bat mortalities have been recorded at the Meyersdale facility in Pennsylvania, the Maple Ridge Project in northern New York, and the Summerview Wind Farm in southern Alberta, Canada. However, there is no generally accepted understanding of the interaction of bats and wind turbines. To date, there has been no confirmed correlation between habitat availability and specific atmospheric or seasonal conditions that result in increased mortality, although preliminary data seem to indicate that mortalities occur during periods of lower wind speed and that temperature, precipitation, and humidity may also be contributors. Continued monitoring and data analysis associated with operating wind parks is necessary to determine whether there are any such correlations and the actual biological significance of the local impacts. It is also anticipated that Windpark operators will need to implement management strategies that will evolve throughout the lifespan of windparks as more defined information is developed. As the breadth of knowledge regarding bat/turbine interactions increases, specific mitigation strategies can be developed to allow for the continued operation of windparks as a critical aspect of a global renewable energy approach, while reducing the potential impact on bats. See Appendix F for more overview information on collisions, habitat loss/degradation, and displacement.

2.12.2 Construction Impacts

Construction-related activities (e.g., clearing for road construction, infrastructure construction, equipment noise, and increased vehicle traffic) can potentially impact birds and bats. Displacement from habitat is the primary concern with construction-related impacts. However, potential impacts from construction are generally only temporary in nature.

2.12.2.1 Potential Impacts on Migratory Birds

Significant adverse impacts on migratory bird populations including raptors, passerines, and waterbirds are not expected as a result of construction of the Project. The Project Area is not located along a major migratory corridor for birds. Most species are expected to avoid the area of construction during the active construction period. Upon completion of construction, it is anticipated that migratory birds would resume use of the area during migration.

2.12.2.2 Potential Impacts on Breeding Birds

Breeding bird populations are not expected to be adversely affected significantly by construction of the Project. If construction begins before the breeding season, it is anticipated that breeding birds will likely avoid areas during the active construction period. If construction begins during the breeding season, because many breeding birds have been exposed to similar disturbance such as farming and logging, they will either be accustomed to disruption of this nature or they will relocate to other adjacent suitable habitat. Indirect impacts on breeding birds will occur as a result of habitat alteration in association with construction of the Project; however, these impacts are not expected to be significant because similar disturbances occur in the Project Area. Further, habitat loss should be minimal because of site planning (i.e., the placement of turbines in agricultural areas). Outside of localized construction disturbance, no significant adverse impacts on breeding birds are anticipated.

2.12.2.3 Potential Impacts on Threatened and Endangered Species

Based on consultation with the USFWS and New York State Natural Heritage Program (NHP), except for transient individuals, no threatened or endangered species or communities were identified within the Project Area. This conclusion was supported by the field surveys. During field surveys, two transient Bald Eagles (federally and state-threatened) and Northern Harriers (state-threatened) were seen in the Project Area. State species of concern, including Osprey, Sharp-shinned Hawk, Cooper’s Hawk, Red-shouldered Hawk, and Horned Lark, were also observed in the Project Area; all in low numbers. Little use of the Project Area is anticipated by endangered, threatened, and special concern species during construction as most of any occurrences would be related to migration or transient (i.e., limited) use. Therefore, no significant adverse impacts on these species are expected during construction. The potential impacts on individual species listed by USFWS and New York State Department of Environmental Conservation (NYSDEC) on the NHP reports are discussed in detail in Appendix F.

If construction takes place in suitable nesting habitat for endangered or threatened species in the spring to early summer – during breeding season – the work area will be surveyed and cleared by an environmental monitor in advance of construction. If nesting threatened or endangered species are found in the immediate proximity of a construction area, Noble will coordinate with the USFWS and/or NYSDEC to develop a mitigation plan to address site-specific occurrences of species of concern. Measures that may be implemented include delaying construction until the young have fledged from the nest or continual monitoring during the initial construction period to ensure the birds are not impacted. With implementation of monitoring activities, no significant adverse impacts from construction on threatened or endangered species are anticipated.

2.12.2.4 Potential Impacts on Bats
Significant adverse impacts on bat populations are not expected as a result of construction of the Project. Some potential indirect impacts on bats may occur as a result of habitat alteration or loss in association with construction of the Project; however, these impacts are not expected to have a significant adverse affect on bat populations. In addition, the potential impacts on habitat are consistent with activities and conditions that currently occur throughout the Project Area, such as ground disturbance and tree removal associated with farming and logging activities. It is anticipated that bats in the Project Area would return to temporarily disturbed areas upon completion of construction.

2.12.3 Project Facility Impacts
Operation of the wind turbines can potentially impact birds and bats through collisions with the rotors and towers, displacement from habitat, or influence on migration, etc. Collisions are typically the primary concern with operation-related impacts. Potential impacts can vary among different bird and bat populations and groups.

2.12.3.1 Potential Impacts on Migratory Birds
The dynamics of migration and the potential impacts from the operation of wind turbines differ among groups of birds. Therefore, this section contains separate discussions of the potential impacts on the migration of raptors, passerines, and waterbirds. The majority of passerines migrate during the night while raptors migrate almost exclusively during the day. Waterbirds migrate during the day and night (Richardson 1998).

Raptors
Raptor migration in the region is diffuse. There are no geographical or topographical features in the Project Area that attract or concentrate migrating raptors. The Project Area is not proximate to the recognized raptor migration pathways in New York State (i.e., near shorelines of the Great Lakes in spring or select mountainous ridges in fall). Results of the migratory raptor surveys demonstrate that migratory raptor use of the Project Area is low. No concentrated flight paths were identified in either spring or fall and the findings were consistent with the existing knowledge of the bird resources in the region. Therefore, low numbers of migrant raptors are anticipated in the Project Area.

As raptor use in the Project Area is low and the likelihood of turbine avoidance is high, the potential for impacts is very low. No biologically significant adverse impacts on migrant raptors are anticipated from operation of the Project.

Passerines
A collision risk exists for nocturnal migrant passerines at all tall structures, including wind turbines. Nocturnal migrant passerines comprised the greatest number of bird fatalities (34% to 59%) in a review of post-construction mortality studies by Erickson et al. (2001). However, there have been no documented large-

fatality events of nocturnal migrants at wind energy facilities, with the largest limited to 27 songbirds at a floodlit substation and nearby turbines in West Virginia on a night with heavy fog (NWCC 2004).

No dead or injured birds were found during the mortality study at the existing Wethersfield Wind Farm conducted during the spring and fall migration (2005) periods (see Appendix F for details). While it is possible that a few birds were consumed by scavengers prior to the surveys, it is highly unlikely that a large mortality event was missed. The results demonstrate that migrant passerines were not substantially impacted by the Wethersfield Wind Farm wind turbines.

There are no geographical or topographical features in the Project Area that attract or concentrate nocturnal migrant passerines. The Project Area is not proximate to any large waterbodies where nocturnal migrants tend to concentrate at stopover areas. Outside of such concentration areas, passerine migration is typically diffuse over a broad front. Results of the nocturnal radar study are generally consistent with this assessment. The migratory passage rates over the Project Area in spring and fall 2006 were above average but within the values of studies conducted at other locations (see Appendix F).

The mean flight altitudes were 777 feet (237 meters) and 742 feet (226 meters) higher than the maximum turbine height in spring and fall 2006, respectively; therefore, the majority of nocturnal migration occurs well above the height of the proposed turbines. The mean flight altitude in spring was similar to other locations studied and in fall was slightly lower than at the other locations in the east where similar studies have been conducted. Approximately 19% of all nocturnal targets in spring 2006 and approximately 11% of all nocturnal targets in fall 2006 flew below 125 meters above ground level (agl), a close approximation to the maximum turbine height. These findings are within the range of results from other radar studies in the northeast.

There are conditions when nocturnal migrants will be more susceptible to collision with wind turbines. There is an increase for potential impacts when adverse weather conditions cause birds to fly at lower altitudes. Studies have shown that bird collisions with communication and television towers (much taller than wind turbines) are increased during low cloud ceilings, heavy fog, and precipitation.

It is likely that nocturnal migrant passerines will make up the majority of the bird kills from the Project. However, the potential mortality risk to migrant passerines is considered low-to-moderate based on the Project location, the passage rate and altitude data from the radar study (and other regional radar studies), and the avoidance behavior of passerines typically exhibited at wind energy facilities. No biologically significant adverse impacts are anticipated for any species from operation of the Project.

Waterbirds

The Project Area is not located in an area where there are large numbers of migratory waterfowl or local movements. Post-construction studies at existing wind energy facilities have shown that waterfowl are less susceptible to collision than other species groups (Erickson et al. 2002; BirdLife International 2003). Therefore, the potential risk for waterfowl mortality from the Project is estimated to be very low.

2.12.3.2 Potential Impacts on Breeding Birds

Given the various habitats in the Project Area and site geography, there is a fairly high diversity of breeding species; however most turbines will be sited in agricultural fields and open areas which have a relatively low species diversity and density. There is some degree of habitat fragmentation already in the Project Area given the presence of agricultural fields. By minimizing the Project footprint near wetlands and mature forests, potential impacts on resident birds have been reduced.

Much of the Project will be constructed in agricultural and young woodland areas, and breeding birds in these habitats may demonstrate temporary displacement. Long-term displacement in wooded areas is unlikely as breeding species are anticipated to habituate to the turbines. The habituation of grassland-nesting species in agricultural areas is less certain, although displacement may be limited to the immediate area of each turbine. While habituation of grassland-nesting species is uncertain, and therefore the potential impacts of displacement are unknown, any potential impacts are anticipated to be much less than the impacts from existing hay mowing and pesticide practices in the same area.

There is a low risk of any substantial negative impact on habitat through loss, degradation, or displacement of breeding birds. No significant adverse impacts on breeding birds are anticipated from operation of the Project.

2.12.3.3 Potential Impacts on Threatened and Endangered Species

Based on consultation with the USFWS and NHP, except for transient individuals, no threatened or endangered species or communities were identified within the Project Area. This conclusion was supported by the field surveys. During field surveys, two transient Bald Eagles (federally and state-threatened) and Northern Harriers (state-threatened) were seen in the Project Area. Species of concern, including Osprey, Sharp-shinned Hawk, Cooper’s Hawk, Red-shouldered Hawk, and Horned Lark, were also observed in the Project Area (in low numbers). Little use of the Project Area is anticipated by endangered, threatened, and special concern species. Therefore, no significant adverse impact on these species is expected during operations. The potential impacts on these species and those listed by USFWS and NYSDEC on the NHP reports (i.e., Short-eared Owl, Upland Sandpiper, Pied-billed Grebe, Henslow’s Sparrow, and Eastern Small-footed Myotis) within 10 miles of the Project Area are discussed in detail in Appendix F.

2.12.3.4 Potential Impacts on Bats

Historically, the average number of bat kills from operation of wind turbines has varied from facility to facility and was considered a function of a number of factors including the proximity to hibernacula, known migration corridors, and topography. Until the Mountaineer (West Virginia) site bat kills in 2003 and 2004 the average had remained low; approximately fewer than three bats per turbine per year were killed. To date, the average has grown to approximately 3.4 bats per turbine per year with the inclusion of the Mountaineer results of 47 bats per turbine per year (NWCC 2004). This average is likely to increase as more post-construction mortality study results become available (e.g., Maple Ridge site). Multiplying the national average rate with the proposed number of turbines (85) provides an approximate number of annual bat fatalities for the Project (289). However, the number of bat fatalities could be substantially higher or lower, as it is difficult to predict whether large-scale fatality events will occur at a specific site based on preconstruction studies.

At the present time, a total of approximately 300 bat kills per year is not considered to be biologically significant, especially in consideration of other potential sources of bat mortality such as impacts from agricultural pesticide and herbicide uses and loss and degradation of foraging habitats. However, there are increasing concerns about the cumulative impacts of bat fatalities on specific species as the number of wind energy projects increases and data from ongoing mortality studies are made publicly available. Any impacts will likely be distributed among several species.

Based on the habitat within the Project Area, acoustical monitoring studies performed in and near the Project Area, and the limited post-construction data associated with other similar projects, the potential for significant adverse impacts on bats from the Project is considered low-to-moderate. The greatest concern would be to transient individuals, especially tree-roosting bat species (e.g., Hoary Bat, Eastern Red Bat, and Silver-haired Bat) colliding with wind turbines. Preliminary data collected at sites in the eastern United States as well as the Canadian prairie seem to indicate that these species are susceptible to collisions with wind turbines. It is anticipated that there would be much lower risk to the resident/summering populations occurring in the Project Area than to migrants.

New York State is not recognized as containing federal designated Priority 1 critical habitat, or for containing large populations of the federally protected Indiana Bat. The Indiana Bat is known to winter only in isolated hibernacula mostly within the eastern portion of New York State. Based on the known locations of hibernacula in New York counties (Albany, Essex, Warren, Jefferson, Onondaga, and Ulster Counties), coupled with the lack of recognized habitat for the Indiana bat in the Project Area, it is unlikely that Indiana Bats would be found residing in the Project Area and, therefore, any potential impacts are considered remote.

2.12.3.5 Bird and Bat Fatality Approximations

It is anticipated that the bird and bat fatality rates for the Noble Wethersfield Windpark will be near the national averages and within the range of the national and eastern results. This prediction is based on the results of the bird and bat studies and because there are no features in the Project Area that attract or concentrate large numbers of migrating birds or bats. Multiplying the national average and eastern fatality rates for bird kills with the proposed number of turbines provides an approximate number of bird fatalities for the Project (see Table 2.12-1). Likewise, multiplying the national average bat kill rate with the proposed number of turbines provides an approximate number of bat fatalities for the Project (see Table 2.12-2). These are only estimates and there can be considerable variation in fatality rates, especially for bats. The number of bird and bat fatalities can only be determined with post-construction mortality studies; however, this estimate allows an evaluation of the potential impacts.

2.12.4 Mitigation

2.12.4.1 Siting Approach

The primary mitigation to avoid or reduce potentially significant bird and bat impacts was Noble's approach to siting. Initially, a "fatal flaw" study was conducted to identify whether the Project Area held any potential issues related to birds and bats, among many other categories, that could result in unfavorable impacts. In the siting phase, Noble selected available and appropriate locations for turbines that minimized potential impacts on wetlands, habitat, and land use. These considerations will minimize potential impacts on birds and bats. See Section 1.3 for details on the siting approach and Project alternatives.

2.12.4.2 Lighting and Structural Mitigation

During nights of inclement weather and/or poor visibility, passerines may fly at lower altitudes and may be attracted to lights, especially steady (i.e., not blinking) lights. While the reasons for this attraction to lights are not certain, they coincide with evidence from tall structures (e.g., communication/television towers and buildings) that events of increased bird collisions occur on nights with poor visibility at structures with steady light. In order to reduce this potential, turbines will be equipped with slow-blinking lights.

In addition, Noble will:

- Provide the minimum allowable lighting as per Federal Aviation Administration (FAA) requirements;
- Install slow-blinking red lights rather than steady lights or blinking white lights;
- Avoid using non directional lighting at any structures on site or steady light sources near the turbines. Lighting required on site for safety or security rea-

sons will be directed downward and to the extent practicable, technology such as motion sensors will be used to minimize the use of steady light sources.

- Install modern turbines (i.e., solid tubular structures) that are designed to prevent birds from perching or nesting on them. No guy wires will be required for these turbines.

2.12.4.3 Post-construction Monitoring

Post-construction mortality monitoring will be implemented by Noble to evaluate the actual impacts of the Project on birds and bats. This will help assess the significance of the impacts and, potentially, what weather or environmental conditions, or other circumstances, contribute to such impacts. Based on real-time, site-specific data collected during the postconstruction mortality monitoring, Noble will coordinate closely with NYSDEC to identify and assess potential mitigation strategies that can be implemented to reduce potentially significant adverse impacts, if any. This management approach will allow mitigation measures to be developed/modified during the course of Windpark operation that are responsive to site-specific conditions and to the growing and evolving data base of information regarding bird/bat interactions with turbines. Noble's work plan for proposed post-construction bird and bat mortality studies is included in Appendix F.

Table 2.12-1 Approximate Number of Bird Fatalities Based on Average National and Eastern Fatality Rates

Project	Number of Turbines	Approximate Bird Fatalities per Year Based on National Average Rate[1]	Approximate Bird Fatalities per Year Based on Average Eastern Rate[2]
Noble Wethersfield	85	196	366

[1] 2.3 birds per turbine per year (NWCC 2004).
[2] 4.3 birds per turbine per year (NWCC 2004).

Table 2.12-2 Approximate Number of Bat Fatalities Based on National Average Fatality Rate

Project	Number of Turbines	Approximate Bat Fatalities per Year Based on National Average Rate[1]
Noble Wethersfield	85	289

[1] 3.4 bats per turbine per year (low = 0.7; high= 47) (NWCC 2004).

2.13 Visual Resources: Environmental Setting

To address issues of potential visual impacts associated with the Project, Noble retained the services of Saratoga Associates, Landscape Architects, Architects, Engineers, and Planners, P.C. (Saratoga) to conduct a thorough and detailed Visual Resources Assessment (VRA). The purpose of this VRA is to identify potential visual and aesthetic impacts and to provide an objective assessment of the visual character of the Project, using standard accepted methodologies of visual assessment, from which agency decision-makers can render a supportable determination of visual significance. A detailed discussion of existing visual resources and the VRA prepared by Saratoga is provided in Appendix G.

Methodology

Consistent with VRA practice, this report evaluates the potential visibility of the Project and objectively determines the difference between the visual characteristics of the landscape setting with and without the Project in place. The process used follows the New York State Department of Environmental Conservation (NYSDEC) Program Policy “Assessing and Mitigating Visual Impacts” (NYSDEC 2000) (NYSDEC Visual Policy) and New York State Environmental Quality Review Act (SEQRA) criteria to identify and minimize potential impacts on visual resources.

The VRA includes both quantitative (how much is seen and from what locations; or visual impact) and qualitative (how it will be perceived; aesthetic impact) aspects of visual assessment.

Specifically, the VRA includes the following steps:

- Define the existing landscape character/visual setting to establish the baseline visual condition from which visual change is evaluated;
- Conduct a visibility analysis (viewshed mapping and field investigations) to define the geographic area surrounding the proposed facility from which portions of the Project might be seen;
- Identify sensitive aesthetic resources to establish priority places from which further analysis of potential visual impact is conducted;
- Select key receptors from which detailed impact analysis is conducted;
- Depict the appearance of the facility upon completion of construction;
- Evaluate the aesthetic effects of the visual change (qualitative analysis) resulting from Project construction, completion and operation; and
- Identify opportunities for effective mitigation.

Consistent with the NYSDEC Visual Policy, the visual study area for this VRA generally extends to a 5-mile radius from the outermost turbines (hereafter referred to as the “5-mile radius study area” or “study area”). Beyond this distance it is assumed that natural conditions of atmospheric and linear perspective will significantly mitigate most visual impacts. However, considering the scale of the Project and recognizing the proposed wind turbines will, at times, be visible at distances greater than 5 miles, site-specific consideration is given to resources of high cultural or scenic importance that are located beyond the typical 5-mile radius.

Visual Character

The visual character of the landscape is defined by the patterns, form, and scale relationships created by lines, colors, and textures. The visible pattern found within the Project Area can best be described as representative of the agricultural landscape typical of the region. Given the rural nature of the study area, visible colors are natural, muted shades of green, brown, gray and other earth tones. When viewed from a distance, vegetated hillsides maintain a rather uniform and unbroken blending of colors, which tend to fade with hazing of atmospheric conditions. The often steep, rolling topography creates a sinuous naturalistic form.

With the exception of the more developed Village of Gainesville, and Hamlets of Bliss and North Java, built features typically include low-density single-family residential structures and farmsteads. An operating wind energy facility, the Wethersfield Wind Farm, is a 10-unit, 6.6-megawatt (MW) facility located in the Town of Wethersfield, approximately 1 mile north of the Project. Major roadways are typically two-lane asphalt roadways. The primary roadways that bisect the study area are (New York State) NYS Route 78 (east-west), and NYS Routes 238 and 362 (north-south). Several county designated routes, Town roads, and seasonal roadways traverse the study area.

Visibility Analysis

The first step in identifying potentially affected visual resources was to determine whether the Project would likely be visible from a given location. Viewshed maps were prepared for this purpose. Viewshed mapping identifies the geographic area within which there is a relatively high probability that some portion of the Project would be visible.

One viewshed map was prepared defining the area within which there would be no visibility of the Project because of the screening effect caused by intervening topography (see Figure 1 in the VRA provided in Appendix G). This treeless condition analysis is used to identify the maximum potential geographic area within which further investigation is appropriate. A second map was prepared illustrating the probable screening effect of existing mature vegetation (Figure 2 in the VRA provided in Appendix G). This treed condition viewshed, although not considered absolutely definitive, acceptably identifies the geographic area within which one would expect to be substantially screened by intervening forest vegetation in both leaf-on and leaf-off seasons. As discussed in Section 2.14, Visual Resources: Impacts and Mitigation, identified viewshed areas are further quantified to illustrate the number of turbines that may be visible from any given area.

Inventory of Visually Sensitive Resources

Because it is not practical to evaluate every conceivable location where the Project might be visible, it is accepted visual assessment practice to limit detailed evaluation of aesthetic impact to locations generally considered by society, through regulatory designation or policy, to be of cultural and/or aesthetic importance. The visually sensitive resources include:

- Resources of statewide significance (as required by the NYSDEC Visual Policy);
- Resources of Local Interest - Places of local sensitivity or high intensity of use (in accordance with the Wethersfield Local Law No. 1 and Eagle Local Law No. 3; and
- Other places for analysis including locations not rising to the threshold of statewide significance or local interest have been included to represent isolated pockets of visibility along sparsely populated rural roadways; most selected based on field observation of open vistas.

Resources of statewide significance, resources of local interest, and other places for analysis were identified though a review of published maps and other paper documents, online research, and an extensive windshield survey of publicly accessible locations. Sixty-nine visual resources were identified within the 5-mile study area. Two resources of statewide significance were identified: the Arcade and Attica Railroad in Java, and the Lost Nation State Forest in Centerville. Forty-five resources of local significance were identified including resources such as: Rose Acre Audubon Nature Preserve in Java; Wiscoy Creek NYSDEC Fishing Access in Eagle; the Village of Gainesville; and the existing Camp Weona in Wethersfield. The remaining 24 visual resources were identified as other places for analysis and included locations such as Faun Lake in Wethersfield, US Route 20A in Warsaw; and Java Lake in Java. All of the visual resources are identified in Table 5 of the VRA (Appendix G).

In addition to inventoried resources, additional resources were identified outside the study area during the research effort for the VRA. Although not all-inclusive, the following resources were identified:

- Carlton Hill State Multiple-Use Area/Sulphur Springs Cooperative Hunting Area (located approximately 9.2 miles from the nearest proposed turbine);
- Letchworth State Park (located approximately 8.8 miles from the nearest proposed turbine); and

- Silver Lakes State Park (located approximately 7.5 miles from the nearest proposed turbine).

Degree of Project Visibility

On November 22, 2006, a field crew drove public roads and visited most of the potentially affected visual resources (as determined through viewshed mapping) to document existing visibility in the direction of Project. Photographs were taken from affected visual resources throughout the study area. The location selected for each photograph was judged by the field observer to be the most unobstructed vantage point. To the degree possible, photographs were taken at a time of day when the sun was to the back of the photographer to minimize the effect of glare within the camera's field of view and to maximize visible contrast of the land-scape photographed. To demonstrate how the actual turbines will appear within the study area from a variety of representative distances and locations, 10 photo simulations were prepared and are discussed in Section 2.14, Visual Resources: Impacts and Mitigation.

The nighttime sky in the vicinity of the Project Area is typical of rural areas in western NYS. There are scattered vertical structures such as radio and cell towers throughout the region, as well as the existing Wethersfield Wind Farm to the north of the Project Area. These structures are illuminated at night with low-intensity flashing red lights for aviation safety. The degree of Project visibility at night was has been evaluated in the VRA and will be further discussed in Section 2.14, Visual Resources: Impacts and Mitigation.

2.14 Visual Resources: Impacts and Mitigation

As described in Section 2.13, Visual Resources: Environmental Setting, Saratoga Associates, Landscape Architects, Architects, Engineers, and Planners, P.C. (Saratoga) was hired by Noble to conduct a Visual Risk Assessment (VRA) for the Project (Appendix G). By their very nature, modern wind parks are large and highly visible facilities. The need to position these tall moving structures on hilltops and ridgelines cannot be readily avoided. The siting of wind turbines within a rural agricultural area provides increased opportunity for potentially discordant views both near and far. While the use of mitigation techniques will help minimize adverse visual impacts, the construction of the Project will be an undeniable visual presence on the landscape. The horizontal alignment of the proposed turbines is a linear pattern running in a north-south direction. Views from vantage points to the north or south will recognize a tightly spaced cluster of vertical turbines within a relatively narrow field-of-view. Views from the east or west (or other off-axis vantage points) will observe individual turbines spaced across the ridgeline.

This section includes a discussion of construction and operational impacts and mitigation associated with nighttime visibility and shadow flicker. Saratoga's Shadow Flicker Analysis and the Federal Aviation Administration (FAA) Lighting Plan are provided in Appendix G and summarized in the discussion below.

2.14.1 Construction Impacts

Construction of the Project will require use of mobile cranes and other large construction vehicles. Components will be delivered in sections via large semi-trucks. However, the construction period is expected to be relatively short. As such, construction-related visual impacts will be brief and are not expected to result in adverse prolonged visual impacts to area residents or visitors.

2.14.2 Project Facility Impacts

Visual Character

The Project, specifically the turbines, will be of similar scale to the existing Wethersfield Wind Farm, located to the north of the Project Area; however; the size of the proposed structures is much larger than the existing turbines. Although existing turbines are visible in the landscape, introduction of 85 new, large, clearly man-made structures will change the rolling agricultural landscape. When visible, the well-defined vertical form of turbines on the horizon introduces a contrasting and distinct perpendicular element into the landscape. The proposed turbines will be the tallest visible elements within view and will be disproportionate to other elements on the regional landscape. The distribution of turbines across an extended area will result in the Project being perceived as a highly dominant visual element. The moderately paced sweeping rotation of the turbine blades will heighten the conspicuity of the turbines; no matter the degree of visibility.

The neutral white or off white of the proposed turbine tower, nacelle, and blades will be most often viewed against the background sky. Under these conditions the turbines would be compatible with the hue, saturation, and brightness of the background sky and distant elements of the natural landscape under most conditions. Color contrast will decrease with increasing distance and/or periods of increased atmospheric haze or precipitation.

Visibility Analysis

The vegetated viewshed map indicates that one or more of the proposed turbines will be visible from approximately 31% of the 5-mile radius in the study area. Approximately 69% of the study area will likely have no visibility of any wind turbines. Visibility is most common in the agricultural uplands from cleared lands with vistas in the direction of turbine groupings. No views or limited views will occur on the backside of the many hills and within ravines found throughout the study area. Where topography is oriented toward turbine groupings, forest cover commonly prevents distant views. There are pockets of visibility along various roadways where it will be possible to experience panoramic views of the Project Area. This may occur along roadways including, but not limited to, New York State (NYS) Routes 78 and 98, and Mote Road. Many of these views may be long distant (background view) and fleeting.

While the viewshed map indicates some visibility from the Village of Gainesville, field confirmation determined the prevalence of mature street trees and site landscaping combined with one- and two-story residential and commercial structures. Views will be partially screened by intervening vegetation and localized structures. Although filtered or framed views are likely to be visible through foreground vegetation and buildings, they were found from isolated locations. Direct views are more prevalent on the outskirts of the Village where localized residential and commercial structures, street trees, and site landscaping are less likely to provide a visual barrier.

The area most directly affected by views of the Project will be the agricultural upland within immediate proximity of the Project. The rural areas along Mote, Wolcott, Maxwell, West Hill, and Hobday Roads, as well as other roads in these areas will experience a high degree of visibility. Residents and visitors will regularly encounter proximate views of one or more turbines within 0.5 mile to 1.5-mile distances, these distances are where the visual contrast of the turbines will be greatest. Along portions of NYS Routes 78 and 362, as well as Hobday, Maxwell, Poplar Tree, Pee Dee, Horton, and Flynn Roads turbines may be located on both sides of the viewer. Within such close proximity, turbines frequently appear and disappear behind intervening foreground landforms and vegetation as viewers move about the Project Area. Within this area, there are often views of the existing Wethersfield Wind Farm, which is located just north of the Project Area.

Visually Sensitive Resources

Sixty-nine visual resources were inventoried within the 5-mile study area. Based on the viewshed analysis, of these resources, 21 resources would likely be screened or eliminated from the Project by either intervening landform or vegetation/structures and were eliminated from further analysis. Table 6 of the VRA in Appendix G summarizes the factors that affect visual impact (e.g., landscape unit, viewer group, distance zone, and duration/frequency/circumstances of view) for each visual resource determined to have a potential view of the Project within the 5-mile study area.

Resources of Statewide Significance. The viewshed analysis and field investigation determined that the majority of visual resources of statewide significance would not be affected by the Project.

The one site that is listed on the National Register of Historic Places (NRHP), the Arcade and Attica Railroad, will generally not be affected. View of the Project Site from the Arcade and Attica Railroad will be screened by topography and vegetation. Turbines will likely be visible from the 80 National Register (NR) Eligible and potentially NR Eligible structures identified within the 5-mile study area by Panamerican Consultants, Inc. The visual impacts on these structures and potential mitigation measures are discussed in Section 2.31, Cultural Resources: Impacts; Appendix N.

Resources of Local Interest. Because of the number, scale, and geographic distribution of the proposed turbines, some portion of the Project will be visible from places of local interest that do not necessarily meet the broader statewide threshold for visual significance. Most commonly affected views are roadside views along various state and county highways.

Views were found along portions of NYS Routes 19, 39, 78, 98, 238, and 362. Several county and Town roads will have intermittent views of proposed turbines at varying distances. The prevalence of mature street trees and site landscaping combined with significant topographical changes, one- and two-story residential, and in some cases commercial structures substantially limit or screen distant views of local parks and recreational facilities, and residential neighborhoods in the hamlets and Village of Gainesville.

While few tourist facilities will be affected by the Project, numerous State, County, and local roads will have views of one or more turbines across agricultural lands. For many visitors, the scenic value of the drive is an important part of their trip. While some visitors may believe a wind farm is an unacceptable disturbance to an attractive agricultural landscape, others may find the presence of a large clean, renewable energy project an interesting and exciting part of their touring experience. For instance, promotional material exists highlighting the existing Wethersfield Wind Farm (Wyoming County Tourist Promotions Agency 2006).

Other Resources for Analysis. Portions of the turbines will be visible from some resources that represent isolated pockets of visibility along sparsely populated rural roadways. Many of the views along these roadways (e.g., Hobday Road, Mote Road, and Murphy Road) may be long distant (background view) and fleeting as viewers pass by in their vehicles. However, these may be 5 miles or more, and include current views of the existing Wethersfield Wind Farm. There will be no views of the Project from US Route 20A in Warsaw. Portions of the Project will also be viewed from other resources for analysis such as Java Lake and Faun Lake.

In addition to those resources inventoried, it is possible that the Project will be visible from the three resources identified outside the 5-mile study area. It is anticipated that most views of the Project from the Carlton Hill State Multi-Use Area/Sulphur Springs Cooperative Hunting Area, Letchworth State Park, and Silver Lakes State Park will be screened by topography and vegetation, and diminished due to distance.

Affected Viewers

The study area is decidedly rural. The number of recreational users impacted by the Project will be relatively small. Viewshed and field analysis determined that the Project would be visible from various fishing areas, Veterans Park, and portions of a Wyoming County Forest (e.g., perimeter of property). Hunters and snowmobile riders on private lands will most likely view multiple distant turbines across open agricultural fields and individual turbines in close proximity.

As previously discussed, views within the Village of Gainesville (population 304), which is approximately 5 miles from the nearest turbine, will be partially screened by intervening vegetation and localized structures. Filtered or framed views are possible through foreground vegetation in isolated locations. Direct views are more prevalent on the outskirts of the village where localized structures (e.g., residential and commercial), street trees, and site landscaping are less likely to provide a visual barrier. Overall, visual impacts from the Village of Gainesville should be substantially reduced by screening (e.g., structures and localized vegetation), the relatively long distance between the Village and the Project, and the generally low/slim profile of the Project components.

Views within the Hamlet of Bliss (population 465) will also be available. Similar to the Village of Gainesville, it is anticipated that many views will be partially screened by intervening vegetation and localized structures. However there will be open views of the Project along Main Street. With the exception of those attending a race or the Rita George Recreation Hall and Playground, views along Main Street will be relatively brief. For those with extended views, it is anticipated that the activity they are involved with will take precedence over the visibility of the turbines.

Photo Simulations

To demonstrate how the actual turbines will appear within the study area from a variety of representative distances and locations, 10 locations were identified for simulations. Table 2.14-1 provides a listing of Key Receptors that were selected for Photo Simulations. The Map ID corresponds to Figure 1 of the VRA provided in Appendix G. The specific location of these simulations was chosen for their relevance to the factors affecting visual impact (viewer/user groups, landscape units, distance zones, duration/frequency, and circumstances of view). Because the visibility of wind turbines will most commonly affect local residents from rural homes and during daily travel along local roads, and most open vistas of the Project typically occur in isolated locations along rural roadways, views selected for photo simulation favor such views even though the number of viewers will not be large. The appearance of the turbines is based on the specifications of General Electric (GE) 1.5-megawatt (MW) turbines with 263-foot (80–meter) high towers and 123-foot (77-meter) rotor diameter (123-foot long blades). To be conservative, the turbine model was constructed so that the apex of the blade is 393 feet above ground elevation. The detailed methodology and actual photo simulations can be found in the VRA provided in Appendix G.

Project Visibility (Lighting)

As previously stated, the turbines would be compatible with the hue, saturation, and brightness of the background sky and distant elements of the natural landscape under most conditions. In accordance with FAA regulations, turbines must be illuminated for aviation safety. Daytime lighting of the turbines is not required; however, the magnitude of the impact on nighttime visibility will depend on how many lighted turbines are visible at a specific location and existing ambient lighting conditions present within the view. Local residents quietly enjoying the rural nighttime setting will likely be more affected by this condition than would motorists traveling thorough the area after dark. These are federally mandated safety features and cannot be omitted or reduced.

A viewshed map was created to assist in evaluating potential nighttime visibility (see Figure 3 in the VRA provided in Appendix G). This map was created using the same methodology as described above. However, the map was created using the approximate height (265 feet) of the FAA required strobe lights as the control point for 36 turbines. These 36 turbines were selected based on a preliminary lighting plan prepared by Noble. In addition, the viewshed map took into account the screening potential of intervening topography and vegetation.

The viewshed map clearly indicates that one or more of the 36 proposed lights will be theoretically visible from approximately 26% of the 5-mile radius study area. Approximately 74% of the study area will likely have no visibility of any proposed light sources. Visibility will be most evident in the agricultural uplands from cleared lands with downslope vistas in the direction of the Project, participating Project properties with lit turbines, and along roadways such as NYS Routes 78, 239 and 362, Mote Road, and Maxwell Road. The night lighting of the Project will be similar to in character to the lighting of the existing Wethersfield Wind Farm. While aviation obstruction lighting is relatively low intensity and will not create atmospheric illumination (sky glow), 36 red lights flashing in unisons at close range or in the distance from any given location will be conspicuous and somewhat discordant with the current dark nighttime conditions.

Shadow Flicker

Wind turbines can cause a flickering effect when the rotating turbine blades cast shadows that move across the ground and nearby structures. This can cause a disturbance within structures when the repeating pattern of light and shadow falls across the windows of buildings; particularly when occupants are trying to read or watch television. The effect, known as shadow flicker, is most conspicuous when windows face a rotating wind turbine and when the sun is low in the sky (e.g., shortly after sunrise or shortly before sunset). Because of constantly changing solar aspect and azimuth, shadows will be cast on specific days of the year and will pass a stationary receptor relatively quickly. Flicker will not be an everyday event or be of extended duration when it does occur. For receptors located to the west of a turbine, a residence is more likely to fall within the shadow zone shortly after sunrise when affected residents are typically asleep with shades drawn. For receptors located to the east of a turbine, a residence is more likely to fall within the shadow zone area shortly before sunset.

There are no state or federal regulations or guidelines that establish an acceptable degree of shadow-flicker impact on a potential receptor. The Town of Wethersfield Local Law No. 1, limits shadow flicker at any residence to 30 hours per year and 30 minutes per day. Any sensitive area/locations within the Project Area that exceed the above standard will have this impact mitigated with every effort made to reduce it below the above standard unless waived in writing, in the form of an easement that is recorded in the Wyoming County Clerk's Office, by the affected landowner.

The methodology used for shadow flicker study is discussed in detail in the Shadow Flicker Analysis provided in Appendix G. The analysis conservatively evaluated receptors within 2,952 feet of the turbines. Because residences outside of the viewshed will not experience shadow caused by the Project, they were not included in the calculation. Table A1 in the Shadow Flicker Analysis, provided in Appendix G, summarizes the maximum number of potential hours per year and day that is expected for each shadow receptor (residence) that has visibility of the Project. It should be mentioned that the maximum potential hours per day, in theory, could occur only once or a few times per year and would not be a daily occurrence.

Based on the analysis, the following impacts are expected: 54% of the receptors will be impacted less than 10 hours per year; 25% will be impacted 10 to 20 hours per year; 13% will be impacted 20 to 30 hours per year; and 9% will be impacted greater than 30 hours per year. Those receptors located to the east of a proposed turbine will most likely experience shadow flicker during the morning hours, generally within an hour or two of sunrise. For those receptors west of a proposed turbine, flicker will generally occur prior to sunset.

As noted, there will be nine receptors that theoretically will be impacted greater than 30 hours per year, as established in the Town of Wethersfield Local Law No. 1 of 2006. These receptors include:

- Receptor No. 0 (35:55 hours per year [hrs/yr]) – West of Turbine T-72;
- Receptor No. 170 (37:23 hrs/yr) – East of Turbine T-7;
- Receptor No. 221 (30:15 hrs/yr) – East of Turbine T-25;
- Receptor No. 224 (35:27 hrs/yr) – East of Turbines T-25/T-24;
- Receptor No. 321 (50:36 hrs/yr) – East of Turbine T-52;
- Receptor No. 326 (33:13 hrs/yr) – East of Turbine T-48;
- Receptor No. 328 (37:29 hrs/yr) – West of Turbine T-67;
- Receptor No. 591 (38:08 hrs/yr) – East of Turbine T-53; and
- Receptor No. 640 (39:50 hrs/yr) – East of Turbine T-7.

For those nine receptors, identified above, where shadow flicker may exceed 30 hours per year, this impact might be considered a nuisance when noticed by residents. Eight of these residents have waived mitigation in writing, in the form of an easement that is recorded in the Wyoming County Clerk's Office, by the affected landowner. Receptor No. 221 is the only resident that is not under easement. Potential mitigation for this receptor is provided in Section 2.14.3.

The Town of Wethersfield Local Law No. 1 also requires that the shadow flicker analysis include fish hatcheries and trout streams within 0.5 mile of the Project Site. Two fish hatcheries (along Poplar Tree Road and NYS Route 362) are identified on Figures A1 through A3 in the Shadow Flicker Analysis provided in Appendix G. The fish hatchery along NYS Route 362 will experience up to approximately 21 hours of shadow per year, however, this will not be a daily event and will be short in duration during each event. It is not anticipated that the hatchery along Poplar Tree Road will experience any shadow flicker as a result of the Project.

Some of the New York State Department of Environmental Conservation (NYSDEC) mapped trout streams that run adjacent to the proposed turbines will experience shadows to various degrees (see Figure A3 in the Shadow Flicker Analysis Report located in Appendix G). The intensity of shadow flicker will impact discreet portions of a given stream for a short duration based on the angle of the sun. Based on Figure A3 in the Shadow Flicker Analysis Report provided in Appendix G, it is anticipated that approximately 4% of the NYSDEC mapped trout streams within 0.5-mile of the Project Area will experience 30+ hours of shadow per year. However, many of these streams do not actually support trout or may have sufficient shrub\forest cover to screen the streams from the effect of shadow flicker. Additional discussion of the impact of shadow flicker on trout streams and hatcheries is provided in Section 2.10, Biological Resources: Impacts and Mitigation.

2.14.3 Mitigation

The Project design has been continuously evaluated and the proposed location of turbines reflects guidance from landowners, agencies, local authorities, and Project consultants. By their very nature, modern wind power projects are large and highly visible facilities. The need to position wind turbines on hilltops and ridgelines cannot be readily avoided because those are the areas where the wind resources are the best. Given the scale of projects and character of the community overall visual impacts could not be noticeably reduced through the relocation of individual turbines. Turbines have been sited at a minimum setback from residential structures in order to reduce impacts on individual receptors. Such separation of uses assures maximum screening benefit of existing woodland vegetation where such exists, and minimizes the potential for extended duration shadow flicker on nearby residences. Furthermore, Noble has entered into easement agreements with property owners and adjacent land owners to compensate for potential impacts from development of the Project.

The Project was sited in the Towns of Wethersfield and Eagle for the following reasons:

- Favorable elevation and exposure of the Project Area, which is well suited for receiving prevailing winds;
- Reliable winds that meet the necessary criteria for a commercially viable wind energy project;
- The presence of an existing 230-kilovolt (kV) electric transmission line providing infrastructure necessary to deliver wind generated electricity to the grid; and
- The relatively low population of the surrounding region.

To minimize visual impacts, certain aspects were included in the professional design of the turbines. Tubular style towers have been specifically selected, instead of skeletal (or lattice) frame towers, to minimize textural contrast and provide a more simple visually appealing form. In accordance with the Town of Wethersfield Local Law No. 1, proposed turbines will not be used for commercial advertising, or include conspicuous lettering or corporate logos identifying the Project owner or equipment manufacturer. The color of the blades, nacelle, and tower will be a neutral light gray. While the FAA mandates that a neutral color be used for aviation safety, this color is also well suited to minimize visual contrast with the background sky. Wind turbine towers will be painted metal structures and blades will be painted fiberglass composite. Where specifications permit, non-specular paint will be used on all outside surfaces to minimize reflected glare.

How a landscape and structures in the landscape are constructed and maintained have aesthetic implications to the long-term visual character of a project. Roads have been designed to generally follow topographic contours to minimize cut and fill and will be located in agricultural lands to the greatest extent possible to minimize vegetative cuts. Noble places a high priority on facility maintenance, not only for operational purposes, but for aesthetic appearance as well. Recognizing that its public image will be directly linked to the outward appearance of its facilities and desire to be a welcomed member of the community, Noble will implement a strict policy of maintenance, including materials and practices that ensure a clean and well-maintained appearance over the full life of the facility.

Noble has developed a complete Decommissioning Plan which is included in Appendix M of this Draft Environmental Impact Statement (DEIS) to address the removal of turbines when the Project is taken out of service. The Decommissioning Plan for the Noble Wethersfield Windpark includes detailed cost estimates for the removal of the wind turbines, including the tower, nacelle, transformer, cabling substation, concrete foundations, and maintenance roads. The Plan also describes the specific steps that will be taken to remove the wind turbines, including the tower, nacelle, transformer, cabling, substation, transmission lines, switchyard, concrete foundations, and maintenance roads/rigging pads. Restoration of the areas after removal will include revegetation to return the area to as near its present condition as possible.

Shadow Flicker

In accordance with the Town of Wethersfield Local Law No. 1 of 2006, any sensitive area/location within the Project Area that exceeds the above standard will have shadow flicker mitigated with every effort made to reduce it below the above standard unless waived in writing, in the form of an easement recorded in the Wyoming County Clerk's Office, by the affected landowner. As previously mentioned, eight of the nine receptors are under easement with Noble; one receptor (No. 221) will exceed 30 hours per year. There are also receptors that may experience greater than 30 minutes of shadow per day, but not exceed the 30 hour per year threshold established by the Town of Wethersfield. It is likely that these receptors will only experience more than 30 minutes per day on one day or only a few occasions per year. For those landowners not under signed easement, Noble will provide mitigation as necessary if the maximum figures set forth in the Town of Wethersfield Town Law are exceeded based on field verifications. Potential mitigation measures for receptors that exceed 30/hours per year or 30 minutes per day may include window shades and strategically placed vegetative screening on impacted landowners' property.

Table 2.14-1 Key Receptors Selected for Photo Simulation

Map ID	Receptor Name
4	NYS Route 238
10	NYS Route 78
10b	Intersection of NYS Routes 78 and 362
16	Sheppard Road
23	Rita George Recreation Hall and Playground/Racetrack
26	Lyonsburg Road
41	Java Lake
42	NYS Route 98
49	Wethersfield Road – Residential
60	Wiscoy Creek – NYSDEC Fishing Access

2.15 Sound: Environmental Setting

Hessler Associates, Inc., was retained by Noble to evaluate potential noise effects from the operation of the Noble Wethersfield Windpark on sensitive receptors in the vicinity of the Project Area. The full report of Hessler's findings is found in Appendix H. A summary of the existing environmental setting with respect to sound is provided below.

2.15.1 Background Sound Level Survey

A sound level survey was completed to determine background sound levels in the Project Area. Sound levels were measured in consecutive 10-minute intervals over the 14-day survey.

In an effort to evaluate existing background sound levels over this fairly large area, six monitoring stations were selected to cover the site in a reasonably uniform manner with most of the monitors in the southern part of the site (south of New York State [NYS] Route 78) where most of the turbines are planned. It was not practical to measure at every house potentially affected by an extensive project such as this – nor was it typically necessary because rural areas, like the Wethersfield site, that are remote from any major sources of the man-made noise generally experience similar natural background sound levels over wide areas. Each measurement position is described in Appendix H.

The survey period began at noon on December 1, 2006, and continued for 24 hours a day for 14 days, or until 9:00 a.m. on December 14, 2006. Rion NL series integrating sound level meters were used to carry out the survey. The microphones were protected from rain and self-induced wind noise by special WS1-80T high density foam windscreens intended for long-term outdoor service. All equipment was calibrated at the beginning and end of the survey with a Brüel & Kjær Type 4230 Calibrator, which was recently laboratory tested for validity.

The weather conditions during the survey were generally overcast with periods of rain and snow. A particularly strong weather front passed over the area during the first night of the survey with wind gusts up 60 miles per hour (mph). There was a significant snowfall on the December 2 and 3 with about 1 foot of snow that stayed on the ground for a number of days thereafter.

2.15.2 Site Description

The Project Area lies within the corporate limits of Wethersfield on either side of NYS Route 78, the principal east-west road through the area. The 26 southernmost turbines are in the Town of Eagle. The overall Project covers a gross area that is about 6 miles north to south and 5 miles east to west. The Project Area can generally be characterized as a roughly equal mixture of open farm land and wooded areas. The site topography consists mostly of gently rolling hills that become more pronounced in the southern part of the Project Area. There are no densely populated towns, per se, within the Project Area, but there are numerous farms and individual residences distributed more or less uniformly along the roads that crisscross the site.

The existing Wethersfield Wind Farm is located approximately 1 mile to the north of the Project Area on a ridge line, just east of Poplar Tree Road and north of DeVinney Road. This Project consists of 10 Vesta units (with 154-foot [47-meter] rotors on 213-foot [65-meter] towers) in a north-south line. The existing wind farm may contribute to existing background noise within the Project Area.

2.15.3 Background Measurement Results

The 10-minute, A-weighted L90 sound levels for all six measurement positions were plotted below against the average on-site wind speed at 10 meters for the entire survey period. The plots are available in Appendix H. The sound levels at all six locations, some many miles apart and in diverse settings, follow nearly identical trends and have very similar values at any given time. This clearly demonstrates that the entire site area experiences a more or less uniform natural background level, often referred to as a “macro-ambient”, or wide area ambient. From the measurements at these six positions evenly distributed over the site, it can reasonably be assumed that the sound level at any location on the site would have a value similar to that at the discrete measurement points. In effect, this result indicates that if it was somehow practical to monitor at every potentially affected residence within the Project Area, a similar level vs. time plot would be produced.

Another important aspect revealed by the plots is that the sound levels clearly parallel the wind speed: generally rising when the wind increases and falling when the wind diminishes. This relationship shows that background sound levels in the site area are largely driven by natural, wind induced sounds, such as trees and grass rustling. The random spikes are most likely sporadic man-made noises.

From the data collected over the survey period, it was possible to determine the A-weighted residual (L90) sound levels that are likely to occur over all wind speeds up to about 17 meters per second (m/s) (as measured at the reference height of 10 meters). The wind speed range of interest with respect to noise from this particular turbine model is from the cut in speed of 3 m/s at 10 meters, when the turbines just begin to operate, up to about 7 m/s at 10 meters when the noise level essentially levels off at a constant, maximum value. The plots shown in Appendix H illustrate a clear trend of increasing background sound level with wind speed. A mean value for the L90 background level can be predicted with reasonable accuracy from the trend line shown at any wind speed up to about 17 m/s.

2.15.4 Regulatory Standards/Guidance

Local regulatory noise limits and the noise assessment guidelines published by New York State Department of Environmental Conservation (NYSDEC) establish quantitative standards applicable to the Project.

2.15.4.1 Local Regulatory Noise Limits

Nearly identical local laws have been adopted in the Towns of Wethersfield and Eagle that restrict noise from wind energy facilities.

Section V.B.15 of the "Town of Wethersfield Wind Energy Conversion Device/Farm Licensing, Siting and Design Regulations and Requirements Law" states that:

> Audible noise due to the operation of any part of a Wind Energy Conversion Device shall not exceed fifty (50) dBA for any period of time, when measured at any permanent, livable residence, school, hospital, church, public park or public library, unless the Project developer has obtained a noise easement, as recorded in the Wyoming County Clerk's Office.

The Town of Eagle similarly limits noise to a 50 A-weighted decibel level (dBA) except that the point of application is at any residences not participating in the Project.

> Wind Energy Conversion Facilities shall be operated so that the noise produced during operation shall not exceed fifty (50) dBA, measured at residential structures on parcels owned by persons not having a lease or noise easement with the project developer or owner.

There are no other overarching county, state or federal noise regulations that would apply to the Project.

2.15.4.2 NYSDEC Guidelines

In the Program Policy *Assessing and Mitigating Noise Impacts* published by NYSDEC (2001) a methodology is described for evaluating potential community impacts from any new noise source. As opposed to an absolute noise limit, the NYSDEC method is fundamentally based on the perceptibility of the new source above the existing background sound level at the nearest residences, or other potentially sensitive receptor locations, such as schools or churches.

It is a well established fact for a new broadband, atonal noise source, such as a wind turbine, that a cumulative increase in the total sound level of about 5 or 6 dBA at a given point of interest is required before the new sound begins to be clearly perceptible or noticeable to most people. Cumulative increases of between 3 and 5 dBA are generally regarded as negligible or hardly audible. Lower sound levels from the new source are completely "buried" in the existing background sound level and are totally inaudible. The specific language relating to these perceptibility thresholds in NYSDEC's program policy (Section V B(7)c) is a follows:

Increases ranging from 0-3 dB should have no appreciable effect on receptors. Increases from 3-6 dB may have potential for adverse noise impact only in cases where the most sensitive receptors are present. Sound pressure increases of more than 6 dB may require closer analysis of impact potential depending on existing SPL's [sound pressure levels] and the character of surrounding land use and receptors.

According to this policy, a cumulative increase in the total ambient sound level of 6 dBA or less is unlikely to constitute an adverse community impact. From a practical standpoint, this threshold means that noise from the Project could exceed the existing background level by up to 5 dBA (before these is a need for closer analysis). For example, a background sound level of 33 dBA plus a Project-only level of 38 dBA would yield a new total level of 39 dBA, or 6 dBA above the original level.

The program policy outlines an incremental approach towards evaluating cumulative increases and potential impacts. Once the background sound level is established by means of a field survey, a First Level Noise Impact Evaluation is carried out where noise from the future Project is modeled in an extremely simple and conservative manner considering only the reduction in sound level with distance in accordance with the inverse square law. All other natural forms of sound propagation loss, such as from intervening terrain, vegetation, etc., are ignored and the ground surface is assumed to be completely reflective as though it were the surface of a large, placid lake. The purpose of this first level analysis is to simply identify the area, defined by the 6 dBA cumulative increase contour line, that needs to be looked at in greater detail to see if any sensitive receptors are present.

If any residences or other potentially sensitive receptors are identified as being within the area of potential concern a Second Level Noise Impact Evaluation noise modeling study is carried out realistically considering all normal sound propagation loss mechanisms (in addition to pure distance losses). In this case, any receptors outside the 6 dBA cumulative increase contour are considered to have a low probability of disturbance while any receptors inside the contour might be adversely impacted and some form of mitigation should be investigated. Preliminary noise modeling carried out on this Project indicates that a First Level Noise Impact Evaluation would reveal that a potential for adverse impact exists at a number of residences in the site area. Consequently, the modeling analysis discussed in Section 2.16, Sound: Impacts and Mitigation, begins with a Second Level Impact Evaluation analysis.

2.16 Sound: Impacts and Mitigation

An evaluation of the potential operational noise impacts from the Project on residents in the vicinity of the Project Area began with the background sound level survey described in Section 2.15, Sound: Environmental Setting. The evaluation was completed using a computer modeling analysis of turbine sound levels based on the design of the Project. The model was used to predict the sound level contours associated with the Project over the Project Area, to determine if any residents will be able to hear the turbines above the pre-existing background levels and, if so, what adverse impacts might result. The results of this assessment are presented in detail in Appendix H and are summarized below.

An evaluation of construction impacts was performed using typical noise levels for construction equipment as reported in the *Power Plant Construction Noise Guide* (Empire State Electric Energy Research Corp. 1977).

2.16.1 Construction Impacts

Noise from construction activities associated with the Project is likely to temporarily constitute a moderate unavoidable impact at some, if not most, of the homes in the Project Area. Because construction activities will constantly move from place to place around the site, it is unlikely that there will be significant impacts at any single receptor for an extended period of time. The sound levels expected for each phase of construction are shown in Table 2.16-1 and are compared to local regulatory noise limits which impose a threshold of 50 A-weighted decibel level (dBA) at the nearest receptor.

As Table 2.16-1 indicates, depending on the particular activity, sounds from construction equipment are likely to be significant at distances of up to 5,500 feet. This indicates that construction noise will be noticeable during certain periods of construction at many homes within the Project Area. At a maximum, however, sound levels ranging from 52 to 59 dBA may occur at an individual residence on a temporary basis over a period of several weeks. Such levels would not generally be considered acceptable on a permanent basis, but as a temporary, daytime occurrence, construction noise of this magnitude should not pose a significant inconvenience. During much of the construction phase, the generated noise should be similar to the agricultural activities that occur in the area.

Noise from the very small amount of daily vehicular traffic to and from the Project Site during construction is expected to be negligible in magnitude relative to normal traffic levels (even given the rural nature of the roads in the Project Area). It will also be temporary in duration at any given location.

2.16.2 Project Facility Impacts

2.16.2.1 Noise Model Results and Impact Assessment

No significant or sustained adverse impact is expected at any home or other receptor in the Project vicinity. This subsection describes the turbine noise level, assessment criteria against which noise modeling was compared, and the noise modeling results.

Turbine Noise Level

The sound power level produced by the General Electric (GE) 1.5sle wind turbine as a function of wind speed is known from field tests carried out by independent acoustical engineers for GE in accordance with IEC 61400-11 (Ref. 1). The values are reported in a document entitled "Technical Documentation, Wind Turbine Generator System GE 1.5sl/sle 50 & 60 Hz," *Noise Emission Characteristics* (Appendix H, Ref. 7). Sound power level is based on the measured sound pressure level at a given point and effective radiating surface, or wave front area at that point. Knowledge of the sound power level allows the sound pressure level (SPL) of the source, the quantity perceived by the ear and measured with instruments, to be determined at any point.

The noise output of the GE 1.5sle turbine varies with wind speed. As shown in Table 2.16-2, for an 80-meter hub height, as is planned for this Project, the following sound power levels at the turbine tower are published as a function of wind speed at the standardized measurement height of 10 meters.

As seen in the table, the highest sound level of <104.0 occurs at a wind speed of 7 meters per second (m/s). This sound level and the associated octave band frequency sound levels in Table 2.16-3 were used in the analysis.

2.16.2.2 Assessment Criteria

There are two metrics against which the predicted noise from the Project were compared to determine if any adverse environmental impacts might occur. The first of these measures is the local regulatory noise limit and the second is a set of noise assessment guidelines published by the New York State Department of Environmental Conservation (NYSDEC). Each of these criteria is described in Section 2.15, Sound: Environmental Setting, and has been applied to the noise modeling results detailed in Appendix H and is summarized below.

From the field survey it was determined that the background sound level varies with wind speed. It was also determined that the turbine sound level also varies with wind speed. In order to carry out the ambient-based NYSDEC assessment procedure, some specific background levels were established against which to compare Project noise and calculate cumulative increases.

Using the sound power levels, several worst-case, maximum noise level contour plots for the site were calculated. The software used allows the Project and its surroundings to be realistically modeled in three-dimensions. Although the terrain at this site is relatively flat and inconsequential, the topography has been incorporated into the model. Each turbine is represented as a point noise source at a height of 80 meters above the local ground surface.

A somewhat conservative ground absorption coefficient of 0.75 was assumed in the model since all of the intervening ground between the turbines and potentially sensitive receptors essentially consists of open farm fields or pasture land with a few wooded areas. Ground absorption ranges from 0 for water or hard concrete surfaces to 1 for absorptive surfaces such as farm fields, sand, or dirt. Consequently, a higher absorption coefficient could be justified here; however, for conservatism a lower value was used. In addition, any additional attenuation that might result from wooded areas has been completely neglected in all calculations.

The noise level from each turbine was conservatively assumed to be the downwind sound level in all directions simultaneously. This approach yielded a contour plot that shows the maximum possible sound level at any given point and sometimes also shows levels that cannot possibly occur, such as between two or more adjacent turbines, since the wind would have to blow in two opposing directions at the same time.

The model also allows for certain atmospheric conditions that are likely to occur from time to time that may favor the propagation of sound relative to average conditions. Sound levels that are lower than those predicted in the modeling plots are actually expected to occur almost all of the time.

The model predictions indicate that although Project noise might be audible at a number of receptors, the circumstances required for this to occur would happen only rarely at best. To have any chance of actually occurring, the following conditions would be necessary:

- The wind would need to blow from all the nearest turbines towards the point of observation;
- The wind would need to blow at a speed of 6 m/s;
- The ground surface would need to be semi-reflective (as might happen when it is frozen or partially covered with ice or glazed snow);
- No leaves on the trees;
- Observer would need to be outside; and
- Environmental noise would temporarily be at a minimum.

Comparison to NYSDEC Guidance

Preliminary noise modeling using NYSDEC guidelines indicated that the potential for community noise impacts exists with this Project. This early modeling work essentially performed the function of the First Level Noise Impact Assessment in the NYSDEC assessment procedure and made it clear that a Second Level assessment was necessary because nominal increases of 6 dBA or more were evident at a number of residences. A Second Level noise model was performed to consider the actual circumstances of the site including any attenuation that might be afforded by such factors as terrain, vegetation or man-made barriers.

The overall results of the Second Level model show that the area inside of the 38 dBA sound contour line (shown in yellow) represents the region where noise from the Project may be audible above the residual (L90) background level (i.e., where the cumulative sound level may be 6 dBA or more above the pre-existing, or ambient, level). The plots clearly show that the region where turbine noise may be audible is extensive and essentially includes the entire Project Area. It is important to note that theoretical exposures are all below about 45 dBA at all residences, which is consistent with NYSDEC guidelines. A sound level of 45 dBA is normally considered "quiet" and is a value that commonly appears in regulatory standards and guidelines worldwide as an acceptable nighttime noise level.

Comparison to Local Regulatory Limits

Plots 1A and 1B (Appendix H) demonstrate that a Project-only sound level of 50 dBA or more will not occur at any homes or other sensitive receptors, such as churches or schools, within the Project Area as required by the Towns of Wethersfield and Eagle. The red-colored 50 dBA sound contours generally occur at a distance of about 350 feet from each turbine, which is well below the minimum setback distance of 1,320 feet from residences. As previously stated, the theoretical exposures are all below about 45 dBA at all receptors, and the 50 dBA contour associated with the local noise laws occurs at least 650 feet away from any residence (whether participating or not), or other potentially sensitive receptors.

Tonal Noise

The limited frequency resolution of the octave band power level spectrum for the GE 1.5sle wind turbine does not provide significant information as to whether the turbine noise is tonal or not. A finer 1/3 octave band, or better, spectrum is needed to see if any prominent discrete tones exist. A plot of the 1/3 octave spectrum published by GE for this model turbine during a 7 m/s wind indicates that the expected turbine noise is distinctly broadband in nature (i.e., evenly distributed over the audible frequency spectrum). Therefore, tonal noise is not expected to be an issue during Project operations.

2.16.2.3 Low Frequency Noise

Modern wind turbines of the type proposed for this Project do not generate low frequency or infrasonic noise to any significant extent and no impact of any kind is expected from this. Appendix H, Annex B contains an analysis performed by Dr. Geoff Leventhal, a highly respected acoustician in the field of low frequency noise. In this study measurements in the extreme low end of frequency spectrum were taken at four separate wind turbine sites including the Fenner Project in Madison County, New York, which uses the same GE 1.5sle turbine proposed for the Project. The data presented in this study show that the low frequency content in the sound level produced by a typical wind turbine at a few hundred feet is well below the audibility threshold and of insufficient magnitude to cause any sort of adverse impact.

2.16.3 Mitigation

Potential impacts from noise were considered and avoided to the extent possible during the Project design and turbine selection processes and through the development of responsible construction schedules. The Project Site was selected through a systematic process that considered the presence of environmental constraints including noise impacts. During the consideration of alternative Project designs (discussed in more detail in Section 1.3), areas were eliminated from consideration as turbine sites if they were located too close to a residence to comply with noise requirements. The final proposed location of turbines and associated facilities reflects input and guidance received from landowners and Project consultants focusing on noise impacts.

Impacts from noise were considered during turbine model selection. Economies of scale dictate that the largest proven turbines, that meet the regulatory requirements and fully utilize the available wind resource, be selected for the Project. GE 1.5 turbines were ultimately selected since they meet these criteria and are among the quietest operating machines currently available.

In advance of construction start-up, Noble will place notification as required by the Towns in the local newspapers no later than 10 days prior to the start of construction. Construction activities will generally be confined between the hours of 7:00 a.m. and 7:00 p.m. in order to minimize and avoid unnecessary impacts to the community from construction noise. If any construction activity is required outside of these hours, Noble will coordinate with the Towns prior to conducting such activities.

For the duration of the Project, an on-site contact person will be identified to address and resolve landowner complaints related to Project construction or operation, including any issues involving impacts from noise. Noble will work with a specialist, as required, to address and remediate any problems which shall be documented through the complaint resolution process.

Table 2.16-1 Construction Equipment Sound Levels by Phase

Equipment Description	Typical Sound Level at 50 feet, dBA (Ref. 6)	Estimated Maximum Total Level at 50 feet per Phase, dBA[1]	Maximum Sound Level at a Setback Distance of 1,320 feet, dBA	Distance until Sound Level Decreases to 40 dBA, feet
Road Construction and Electrical Line Trenching				
Dozer, 250 to 700 hp	88	92	59	5,500
Front-end loader, 300 to 750 hp	88			
Grader, 13 to 16-foot blade	85			
Excavator	86			
Foundation Work, Concrete Pouring				
Piling auger	88	88	55	4,200
Concrete pump, 150 cu yd/hr	84			
Material and Subassembly Delivery				
Off-highway hauler, 115-ton	90	90	57	4,800
Flatbed truck	87			
Erection				
Mobile crane, 75-ton	85	85	52	3,400

[1] Not all vehicles are likely to be in simultaneous operation. Maximum level based on reasonable expectation of simultaneous vehicle use.

Key:

cu/yd = Cubic yard.
dBA = A-weighted decibel.
hp = Horsepower.

Table 2.16-2 GE 1.5sle Sound Power Levels vs. Wind Speed

Wind Speed at 10-Meter Height, m/s	Sound Power Level, dBA re 1 pW
3 (Cut In)	< 96
4	<96
5	99.1
6	103.0
7 to Cut Out	104.0

Key:

dBA = A-weighted decibel.
m/s = Meters per second.
pW = Picowatt.

Table 2.16-3 GE 1.5sle Sound Power Level Spectrum during a 7 m/s Wind

Octave Band Center Frequency, Hz	63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Level, dB re 1 pW	111.3	110.1	105.8	101.8	97.9	93.3	86.3	79.2	104.0

Key:

dB = Decibel.
dBA = A-weighted decibel.
Hz = Hertz.
m/s = Meters per second.

2.17 Climate and Air Quality: Environmental Setting

2.17.1 Climate

The Project Area is located in the Western Plateau, which extends from the eastern Finger Lakes across the hills of southwestern New York to the narrow lake plain bordering Lake Erie. The annual average maximum temperature of the Project Area is approximately 56 degrees Fahrenheit (°F), with an annual average minimum temperature of 34.5°F. In January, the average maximum temperature is 30°F, with an average minimum temperature of 12.6°F. Summer daytime temperatures are usually in the upper 70s. The region has average accumulations of about 31 inches of rainfall annually. The bulk of the winter precipitation in the region comes as snow. Annual average snowfall ranges between 80 and 160 inches; some elevated locations may receive more than 200 inches of snow in a given year (National Weather Service 2006). Topography, elevation, and proximity to large bodies of water result in a great variation of snowfall even within relatively short distances. The average length of the freeze-free season in New York State (NYS) varies from 100 to 150 days (New York State Climate Office 2006).

2.17.2 Air Quality

Air quality data for NYS are published annually by the New York State Department of Environmental Conservation (NYSDEC) Division of Air Resources. The most recent summary of air quality data available in the vicinity of the Project Area is the 2004 Annual New York State Air Quality Report- Ambient Air Monitoring System (NYSDEC 2004b). The report includes most recent ambient air quality data and long-term monitoring trends in air quality collected and compiled from various monitoring stations in NYS. There are no ambient air quality monitoring stations in Wyoming County, therefore the Project Area and the county are considered in attainment/unclassified for all criteria pollutants. The nearest air quality monitoring stations are located in Erie County (Region 9) in the city of Lackawanna. The above report notes no recent violations of all of the criteria pollutants monitored (i.e., carbon monoxide, nitrogen dioxide, ozone, lead, particulates, and sulfur dioxide). The United States Environmental Protection Agency (EPA) has designated Erie County as a non-attainment area for ozone (EPA 2006c).

Although Wyoming County is designated as within attainment for criteria pollutants, NYS is non-attainment for ozone because it is located in an ozone transport region. In addition, a number of reports have noted the effects of acid rain deposition in the northeast (Johnson 2001). Federally mandated air-emissions standards and regulations (e.g., the Clean Air Act Amendments of 1990) have been enacted in an attempt to reduce air emissions from coal burning power plants, which are seen as primary acid-rain sources.

Air emissions in the Project Area are related primarily to farm operations, vehicular travel, and manufacturing. Emissions are typically produced from vehicle exhaust and dust from unpaved road surfaces; routine odors are typically associated with farming practices. None of these significantly affect local air quality.

Table 2.17-1 shows emissions of carbon dioxide (CO_2) (the leading greenhouse gas associated with global warming) from the leading fuel-based sources of electricity in the United States.

Table 2.17-2 shows sulfur dioxide (SO_2) emissions (the leading precursor of acid rain) with the largest source from fuel combustion.

Table 2.17-3 shows nitrogen oxide (NO_x) emissions (another acid rain precursor and the leading component of smog) with the leading source from motor vehicle use.

In the year 2000, about 79,000 gigawatthours (gwh) of electricity, or slightly more than 50% of the electricity used in NYS, was produced by fossil fuel-fired generating plants in the state. On a statewide basis, 25 % came from natural gas, 15.7 % from coal, and 9.8 % from oil (NYSERDA 2002).

Table 2.17-1 Carbon Dioxide Emissions[1]

Fuel	CO_2 Emitted Per kWh Generated (in pounds)	kWh Generated 2004 (billions)	CO_2 Emitted Total Generation (billion pounds)
Coal	2.13	1.978	4,213
Natural Gas	1.03	709	730
Oil	1.56	99.9	156

[1] USDOE 2005.

Key:

CO_2 = Carbon dioxide.
kWh = Kilowatt hours.

Table 2.17-2 Sulfur Dioxide Emissions[1]

Fuel	SO_2 Emitted Per kWh Generated (in pounds)	kWh Generated 2004 (billions)	SO_2 Emitted Total Generation (million pounds)
Coal	0.0134	1.978	26,505
Natural Gas	0.000007	709	5
Oil	0.0112	99.9	1,119

[1] USDOE 2005.

Key:

SO_2 = Sulfur dioxide.
kWh = Kilowatt hours.

Table 2.17-3 Nitrogen Oxide Emissions[1]

Fuel	NO_x Emitted Per kWh Generated (in pounds)	kWh Generated 2004 (billions)	NO_x Emitted Total Generation (million pounds)
Coal	0.0076	1,978	15,033
Natural Gas	0.0018	709	1,276
Oil	0.0021	99.9	210

[1] USDOE 2005.

Key:

NO_X = Nitrogen oxide.
kWh = Kilowatt hours.

2.18 Climate and Air Quality: Impacts and Mitigation

The United States Department of Energy (USDOE) and the New York State (NYS) Public Service Commission (PSC) have mandated that renewable energy sources, such as wind turbines, will provide an increasing percentage of the nation's electricity in the coming years. Meaningful development of renewable wind energy will reduce reliance on fossil fuel combustion and nuclear fission facilities and result in reduction of air pollutants and greenhouse gasses. This Project, as proposed, will help to meet a small part of this ambitious federal and state objective to provide an environmentally friendly and renewable energy source to help meet the growing energy needs for NYS residents and business.

2.18.1 Construction Impacts

Minor, temporary adverse impacts on air quality are anticipated during site preparation and construction. The operation of construction equipment and vehicles will produce emissions from engine exhaust and fugitive dust generation during travel on unpaved roads and construction activities. These operations will be temporary and distributed throughout the Project Site and, therefore, will not result in significant impacts on air quality.

2.18.2 Project Facility Impacts

Operation of the Project are expected to have a beneficial impact on air quality, by displacing emissions of competing fuel-burning power plants. Electric generation by fossil fuel-fired facilities contributes to serious environmental and health problems from carbon dioxide (CO_2), sulfur dioxide (SO_2), nitrogen oxides (NO_x), particulate matter, and mercury emissions. The adverse environmental and health effects of air emissions from combustion of fossil fuels are well documented and include global warming, acid rain, smog, respiratory health effects, and significant long-term impacts on wildlife. Air emissions and global warming have been cited as serious concerns for bird populations in North America in *A Birdwatcher's Guide to Global Warming* (Price and Glick 2004). Wind energy's most important environmental benefit is its complete lack of the emissions of both air pollutants and greenhouse gases that are associated with conventional fuel-based methods of generating electricity. Moreover, when wind-generated electricity displaces more costly fuel-based sources in the competitive electric power market, power plant pollution is reduced.

The Project will have a significant long-term beneficial impact on local and regional air quality and climate by producing 127.5 megawatts (MW) of electricity without any emissions to the atmosphere. Based on the expected total electricity generation, the Project could potentially reduce power plant air pollution in NYS by 5,823 tons of NO_x; 12,218 tons of SO_2; and 3,859,244 tons of CO_2 over 20 years, by displacing pollutant emitting fossil fuel-based electric generation (GE Energy 2005).

2.18.3 Mitigation

Best management practices (BMPs) will be followed during site preparation and construction to control fugitive dust emissions, including using water to wet down open soil surfaces to prevent dust emission. Water may be used only in periods of high heat and when the soil is deemed dry enough so as not to reach saturation during normal travel. To further control fugitive dust emissions and for safety reasons, the travel speed of vehicles will be reduced to a maximum of 15 miles per hour (mph) on unpaved surfaces during construction and subsequent operation of the facility.

2.19 Communication Signal Study: Environmental Setting

For the purpose of evaluating the interaction of wind turbines and communication signals, microwave signals in the Project Area are classified into two groups: those with narrow targeted paths of definable dimensions and those with broadcast (omni-directional or partially directional) characteristics. Due to their restricted pathway, the narrow beam signals are more susceptible to interference from an object, such as a wind turbine blade, placed in their path. This type of signal is present at higher frequencies, namely 940 megahertz (MHz) to 23 gigahertz (GHz).

Narrow Beam Microwaves

Noble engaged Comsearch of Ashburn, Virginia, to identify Federal Communications Commission (FCC)-licensed transmitters and repeaters whose definable paths crossed through the area planned for wind turbine development. The Comsearch study area actually covered two neighboring projects – the current Noble Wethersfield Windpark and the earlier Noble Bliss Windpark. Comsearch identified four beams occupying three pathways through the Project Sites, exhibiting Worst Case Fresnel Zones (WCFZ) of 9.7 to 73.6 meters. The WCFZ is essentially the radius of the beam's cross section. Noble took this information into account in the windpark design. Knowing the beam's dimension and location, an exclusion corridor with a width of two times the WCFZ was established for each pathway (20 to 148 meters). No turbines were sited within one blade radius (38.5 meters) of that corridor.

The microwave signals' exclusion corridor and Wethersfield wind turbine blade "footprints" are displayed in Comsearch's report, included as Appendix J.

In addition to licensed microwave transmitters, existing transmitters operated by departments of the United States Government are not subject to FCC licensing and, therefore, are not visible in the public record. Acting through the Department of Commerce National Telecommunications and Information Administration (NTIA), Comsearch advised federal government agencies of the planned wind turbine development area. This action allows government agencies to respond with any concerns over interference with their non-licensed installations, such as National Oceanic and Atmospheric Administration (NOAA) Doppler radar. By letter dated October 13, 2005, NTIA advised that, based on the information provided, no interference was anticipated. Correspondence between Comsearch and the NTIA is included in Appendix J.

The NTIA review process includes some government-operated radar sites, but does not include those radar sites operated by the Federal Aviation Administration (FAA), the United States Department of Defense (DOD), or the United States Department of Homeland Security (DHS). The FAA conducts its own review of radar obstruction when wind turbines are registered with them in the process of seeking a "Determination of No Hazard." As required, Noble will submit a Notice of Proposed Construction to the FAA for review. During the review process, the FAA also circulates the application data to DOD and DHS, which will have an opportunity to provide determination of potential interference or obstruction prior to construction.

Broadcast Microwaves

Because of the spreading or omni-directional nature of broadcast microwaves, it is not possible to select wind turbine locations that avoid their paths. However, the spreading nature of broadcast microwaves also means that the influence of potential obstructions is diminished. Consideration of the influence on specific types of broadcast communication signals is discussed below and in Section 2.20, Communication Signals: Impacts and Mitigation.

AM/FM Radio. Within 10 miles of the Bliss/Wethersfield Project Sites, there are no amplitude modulation (AM) radio broadcast transmitters and four frequency modulation (FM) radio transmitters. Comsearch's report on AM and FM radio signals is included in Appendix J.

TV. The stations that will most likely produce broadcast coverage to the Wyoming County area, including the Project Area, will be those stations at a distance of 40 miles or less. In this range, there are six full-power analog stations, three full-power digital stations, one low power Class A, and 16 station translators providing programming to the Bliss and Wethersfield area. All of these stations are within the United States. A full report on Wethersfield area television coverage is included in Appendix J.

Land Mobile Radio (LMR). Comsearch identified 54 LMR licenses located at 16 sites in the Bliss/Wethersfield Study Area. These sites are listed in the Comsearch report shown in Appendix J.

Mobile Phones. Two cellular and six personal communication system (PCS) operating licenses were identified in the Bliss/Wethersfield development area (see Appendix J, Exhibit 6). The details regarding coverage areas of these systems are proprietary and not available in the public record.

Communication Towers. Six communication towers are registered in the Comsearch database within 10 miles of the Bliss and Wethersfield development area (see Appendix J). These sites are simply registrations for the physical towers. Their licensed users would have been described in the text above.