3.0 ENVIRONMENTAL SETTING IMPACT ANALYSIS AND MITIGATION MEASURES

3.1 Physiography, Geology, and Soils

3.1.1 Existing Conditions

Information for this section was compiled from published federal and state geologic maps, reports and technical studies (as referenced herein and listed in the References section) and field observations in the Project Area.

3.1.1.1 Physiography

The Project is located along the highlands that define the boundary between the Adirondack Uplands to the south and St. Lawrence-Champlain lowlands to the west, north and east. The Project Area is located in an area of level to gently rolling topography on a subtle lobe of the Adirondack massif. This plateau extends northeasterly to Covey Hill in Quebec, which is considered to be the only Adirondack Mountain in Canada and also marks the northern extent of the Appalachian Mountain chain (Isachsen et al, 2000; MacClintock and Stewart, 1964). The plateau forms the divide between the surface waters that flow westerly via the Chateaugay River to the St. Lawrence and the waters that flow easterly via the Chazy River to Lake Champlain as shown in Figure 9 (MacClintock and Stewart, 1964).

3.1.1.2 Bedrock Geology

Uppermost bedrock within the majority of the Project Area is the Cambrian-age Potsdam Sandstone (Isachsen and Fisher, 1970). The sedimentary flat-lying strata regionally dip gently down to the north. Elevations within the Project Area range from a high of approximately 1,640 feet above sea level (asl) in the southwestern Project Area to a low of approximately 900 feet asl in the northwestern Project Area near the Canadian border.

To the south, the beds of the Potsdam overlap the older Precambrian-age metasediments and metaigneous rocks of the Adirondack Mountains (Cadwell and Pair, 1991). These resistant pre-Potsdam rocks are now exposed due to their relatively recent Tertiary tectonic uplift and doming, which created the Adirondack Mountains. During the uplift, which is believed to continue today, overlying younger softer rocks, including the Potsdam, fractured and eroded off the Precambrian formations as the rocks bowed up. A small area of the older metasediments and gneiss that are exposed in the Adirondacks are mapped in the southwestern corner of the Project Area (Isachsen and Fisher, 1970).

Although bedrock outcrops are not widespread in the Project Area due to the lack of relief, the Potsdam is intermittently exposed, especially in stream cuts and in the eastern portion of the Project Area, where the flat-flying rocks are termed sandstone pavements. Various types of unconsolidated glacial sediments have been deposited in the Project Area, as described below.

3.1.1.3 Surficial Geology

The unconsolidated surficial sediments overlying bedrock in the Project Area were deposited primarily by various glacial processes during the Wisconsinan Stage, the last of repeated glaciations during the Pleistocene Epoch. The numerous northeasterly-oriented glacial striations found on exposed bedrock and narrow similarly-oriented valleys denote the past advance of the glaciers from northeast to southwest across the area (MacClintock and Stewart, 1964). Glacial till comprises the surficial sediments in the western portion of the Project Area; a northwesterly-trending till moraine outcrops sporadically in the east, north of Ellenburg (Cadwell and Pair, 1991). The till thins to the east in the Project Area, and is scattered with bedrock rubble (MacClintock and Stewart, 1964). These deposits were generally pressed beneath glaciers as they flowed or were deposited at the front of stalled glaciers, and were not significantly reworked and sorted by meltwater. As a result, tills and morainal sediments often contain a wide range of tightly packed grain sizes, and can be dense and poorly drained.

As the climate warmed toward the end of the Wisconsinan glaciation, meltwaters flowing through lowlands and valleys were frequently impounded by ice dams and topographic highs, creating glacial lakes. One of these, Glacial Lake Iroquois, formed to the west and north of the subtle plateau that contains the Project Area. The Chateaugay Channels are a series of westerly-draining narrow channels eroded into till that carried meltwater from the receding ice margins into Glacial Lake Iroquois (Isachsen et al, 2000; Cadwell and Pair, 1991). These unusual geologic features are located in Franklin County, west and outside of the Project Area. Small areas of relict lacustrine beaches mark Glacial Lake Iroquois's former shorelines in the northwest corner of the Project Area (MacClintock and Stewart, 1964).

Other features that formed as the glaciers receded across the Project Area are kame deposits and eskers. These sands and gravels were sorted and winnowed of finer materials during glacial melting, and are often mined for aggregate. These geologic deposits have been mined for sand and gravel south of Churubusco and north and south of Clinton Mills (MacClintock and Stewart, 1964).

Once the ice at the headwaters of Glacial Lake Iroquois receded north of the regional plateau at Covey Hill in Quebec, Glacial Lake Iroquois drained abruptly into Glacial Lake Vermont, which occupied the Champlain Valley to the southeast (Rayburn, et al, 2002). The catastrophic floods swept away soils and sediments, exposing the flat pavement surfaces of the Potsdam sandstone in some areas of the Project vicinity. The floodwaters also carved deep channels in the sandstone at Flat Rocks near Altona (see Section 3.1.1.5), northeast and outside of the Project Area (Isachsen et al 2000; MacClintock and Stewart, 1964).

3.1.1.4 Soils

The Clinton County Soil Survey, originally published in 1914, is now out of print, and no paper copies, CD-ROMs or web surveys are available for the county from the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS). NRCS is currently converting the published soil survey information into an electronic format for each county across the U.S., but has not completed Clinton County. However, some information is available from NRCS.

Major soil series mapped within the overall Project Area were identified from the NRCS web site, and are shown in Figure 10 and listed on Table 3.1.1.4-1 with key characteristics pertaining to construction from NRCS's Official Soil Series Descriptions. In brief, the acidic soils within the Project Area developed primarily from thin deposits of glacial till or outwash over sandstone bedrock, with occasional patches of bedrock rubble scattered on the surface and intermittent exposed bedrock ledges (MacClintock and Stewart 1964). Soils are poorly drained (especially over till in level areas) to moderately well drained. Erosion risk is largely dependent on slope, with soils on slopes presenting a higher erosion risk than soils in level areas.

Table 3.1.1.4-1: Characteristics of Major Soils in Project Area

Soil Series	Class and Parent material	Percent Slope and Setting	Depth to Bedrock (inches)	Drainage and Permeability	Potential for Runoff	Typical Use	Other
Chazy	Loam over glacial till	0-8% on level or gently sloped uplands	20-40″	Somewhat poorly drained; Moderate	Negligible to very high	Woodland; pasture and hay if cleared of rocks	5-35% rock fragments
Conic	Loam over firm glacial till	2-35% on ground moraines	12-30″ to firm till; 20-40 ‟ to bedrock	Well drained; Moderate (in friable soils) to slow (in till) saturated hydraulic conductivity	Medium to very high	In forests	2-20% rocks in upper layers; 15 to 35% rocks in firm till
Irona	Loamy over till and sandstone	0-15% on level to strongly sloping soils on ridges and hillsides	10 to 20″	Well drained; moderate permeability	Negligible to medium	Woodland; Pasture reverting to brush. Hay or silage corn if cleared of rocks.	2-35% rock fragments
Peasleeville	Coarse loamy over till	0-8% on level to gently sloping till uplands	>60″	Somewhat poorly drained; moderate permeability	Negligible to very high	Hayland often reverting to brush and forest	10-30% rock fragments
Rune-berg	Coarse loamy over till	0-2% in drumlin valleys and moraines	Not reported	Poorly to very poorly drained; moderately slow to slow permeability	Low to very low; Perched or standing water table	Pasture; grasslands	3 to 20% rock fragments
Suna-pee	Coarse loamy over till	0-60% in level to very steep slopes	Not reported	Moderately well drained; moderate permeability	Low to moderate	Forests; pasture or hay when cleared of rocks	5 to 55% rock fragments
Top-knot	Loamy over till	0-8%	10 to 20″	Somewhat poorly drained; moderate permeability	Negligible to very high	Woodland; pasture or hay when cleared of rocks	20-25% rock fragments

Source: Information on major soil series within Project Area obtained from Official Soil Series Descriptions (OSD) on National Soil Conservation Service website accessed January 13, 2006 at http://websoilsurvey.nrcs.usda.gov/app/

As reported in the Land Use Section 3.5.1.3, portions of four of the 11 agricultural districts designated in Clinton County occur within the Project Area. Approximately 16 percent of the proposed 19,310-acre Project Area is in active agricultural use, for row crops, field crops or pastureland. Active agricultural areas contain soils that require special consideration during construction, to retain the characteristics favorable for agriculture. Farmland soils are mapped as soil resources by the NRCS, and may include those in active and former agricultural areas. Soils designated by NRCS as Prime Farm Soils, Prime Farmland Soils Where Drained, and Farmland Soils of Statewide Significance were obtained from the NRCS soil scientist for the regional area (Trevail, 2006 email correspondence). The NRCS-designated soils in the overall Project Area in Clinton County are:

Prime Farmland Soils
Bice fine sandy loam, 3 to 8 percent slopes (BrB)
Monadnock fine sandy loam, 3 to 8 percent slopes (MtB)
Mooers loamy sand, 3 to 8 percent (MvB)
Occur fine sandy loam, 3 to 8 percent (OcB)
Schroon fine sandy loam, 3 to 8 percent slopes (ShB)
Skerry fine sandy loam, 3 to 8 percent slopes (SrB)
Sunapee fine sandy loam, 3 to 8 percent slopes (SwB)

Prime Farmland Where Drained
Hailesboro silt loam (Ha)
Malone gravelly loam, 0 to 3 percent (MeA)
Malone gravelly loam, 3 to 8 percent slopes (MeB)
Muskellunge silty clay loam, 3 to 8 percent slopes (MwB)
Peasleeville loam, 0 to 3 percent (PeA)
Peasleeville loam, 3 to 8 percent slopes (PeB)
Sciota fine sand (Sn)

Farmland Soils of Statewide Importance
Adams loamy sand, 3 to 8 percent slopes (AbB)
Adijdaumo silty clay (Ak)
Bice fine sandy loam, 8 to 15 percent slopes (BrC)
Colosse-Hermon complex, gently sloping (CmB)
Colton gravelly loam coarse sand, 0 to 3 percent slopes (CoA)
Colton gravelly loam coarse sand, 3 to 8 percent slopes (CoB)
Coveytown loamy sand, 0 to 3 percent slopes (CvA)
Deinache fine sand (Df)
Fahey gravelly fine sandy loam, 3 to 8 percent slopes, loamy substratum (FeB),
Lyonmounten loam (Lv)
Nicholville very fine sandy loam, 3 to 8 percent slopes (NoB)
Schroon fine sandy loam, 8 to 15 percent slopes (ShC)

Sheddonbrook gravelly loam fine sand, 3 to 8 percent slopes (SpB)
Waddington gravelly loam, 3 to 8 percent slopes (WdB)

Locations of these soils and soils within active agricultural fields will be identified in areas of proposed ground disturbance on final Project plans for application of Best Management Practices (BMPs) for agricultural soils, to minimize construction impacts, as summarized in Section 3.1.3.2.

3.1.1.5 Unusual Landforms or Geologic Formations

No National Natural Landmarks have been designated by the National Park Service in Clinton or Ellenburg Counties (web site National Historic Landmarks accessed January 11, 2006 http://www1.nature.nps.gov/nhl). No unique geologic features are identified within or near the Project Area on the New York State Geological Highway Map (Rogers et al, 1990).

No critical environmental areas (CEAs) are presently designated by New York State in Clinton County or the westerly-adjacent Franklin County. Lake George in Essex County to the south of Clinton County is listed as a CEA, but it is more than 50 miles south of the Project Area (New York State Department of Environmental Conservation web site accessed February 21, 2006 at http://www.dec.state.ny.us/website/dcs/seqr/cea/index.html).

However, the Flat Rock Gulf State Forest (also called the Gulf State Forest or Gulf Unique Area), located just east and outside of the northeast boundary of the Project Area was acquired in four separate parcels and designated in the early 1980s as a "Unique Area" by New York State (Barnard, 2006 email communication). Under New York State's Environmental Conservation Law (ECL 51-0703(4), a Unique Area is "a parcel of land owned by the state acquired due to its special natural beauty, wilderness character, or for its geological, ecological or historical significance for the state nature and historical preserve, and may include lands within a forest preserve county outside the Adirondack and Catskill Parks" (New York State Department of Environmental Conservation web site accessed January 11, 2006 at http://www.dec.state.ny.us/website/dlf/publands/landclass.html).

The Gulf Unique Area, just east and outside of the northeast Project Area, contains an east-west oriented narrow gorge over 100 feet deep, with deep channels and plunge pools. The gorge was carved into the flat-lying Potsdam Sandstone during the catastrophic floods that occurred when Glacial Lake Iroquois suddenly drained (see Section 3.1.1.3). The floods also stripped soils and glacial sediments overlying the shallow sandstone bedrock surfaces, exposing flat sandstone pavements. These exposures were the prime impetus for the protection of the Gulf Unique Area, as well as the ecological habitats associated with the Gulf and wetlands to the east (Barnard, 2006 email communication).

No oil and gas fields and no metallic mineral deposits are mapped in or near the Project Area (Isachsen et al, 2000). Glacial kame deposits have been mined for sand and gravel within the Project Area, as shown on Figure 1.

3.1.2 Potential Impacts

The Project will have no effect on area physiography, due to its dispersed layout and the return of surface topography generally to pre-existing grade following construction. Potential Project short-term, long-term and cumulative impacts to soils and geology are described below. Mitigation measures are proposed in Section 3.1.3, and will be detailed in erosion control, stormwater management, and spill containment plans to be filed for the Project.

3.1.2.1 Potential Short-Term Impacts

Soils: Approximately 590 acres of surface soils will be disturbed during Project construction. Approximately 80 percent of this surface area will be stabilized, revegetated and restored following construction. Approximately 135 acres of land surface will be permanently occupied by Project structures. Approximate extent or the areas of temporary and permanent impacts to surface soils are reported by Project component type on Table 3.1.2.1-1. The temporary turbine footprint impact is based on a 200 foot radius from the turbine. This radius is required to allow the rotor assembly, which has blades of 144 feet in length, to be laid down. The additional fifty feet is required for the stock piling of surface soils. It is also based on the Applicants experience gained during construction of the Maple Ridge Wind Farm.

Table 3.1.2.1-1: Approximate Area of Temporary and Permanent Soil Impacts

Project Component			Temporary				Permanent			
Item	Number	Units	Number	Units	Total	Units	Number	Units	Total	Units
Turbines										
Turbine Footprint	109		2.9	acres	316.1	acres	0.065	acres	7.1	acres
Gravel Crane Pad	109						0.138	acres	15.0	acres
Access Roads	41	miles	40	feet wide	198.8	acres	20	feet wide	99.4	acres
Crane Walks	5.9	miles	34	feet wide	24.3	acres			0	acres
Interconnect Cable	55	miles	3	feet wide	20.0	acres			0	acres
Substation										
Facility	1		184230	sq ft	4.2	acres	184230	sq ft	4.2	acres
Collector Stations	1		23528	sq ft	1.1	acres	23525	sq ft	1.1	acres
Storage Area	1				3	acres			3	acres
Maintenance Building	1				5	acres			5	acres
Staging Areas	1				15	acres			0	acres
Met Towers	1				1	acres			0	acres
Total					**588.5**	**acres**			**134.8**	**acres**

Potential short-term impacts to soils due to Project construction include soil erosion, compaction, changes to soil drainage patterns through grading, mixing of agricultural topsoils and subsoils, siltation and sedimentation of downgradient wetlands and water bodies, and the potential release of oil or hazardous materials by heavy equipment. Potential short-term impacts to the soil surface during construction are estimated in Table 3.1.2.1-1.

Bedrock: Because bedrock is relatively shallow in the Project Area (see Table 3.1.4-1), blasting may be necessary to install turbine footings. Blasting can cause impacts to nearby sensitive receptors, such as structures and drinking water wells.

Potential Releases of Oil and Hazardous Materials: Operation of construction equipment can potentially release oil or hazardous materials to soil, the land surface and other environmental resources. Proposed mitigation measures are presented in Section 3.1.3.

3.1.2.2 Potential Long-Term Construction

Approximately 135 acres of land surface will be permanently occupied by Project structures. Approximate extent of the area of permanent impacts to surface soils is reported by Project component types on Table 3.1.2.1-1.

Northern New York State regularly experiences low levels of earthquake activity. Project structures will be designed and constructed in accordance with up-to-date seismic design provisions applicable to the area to minimize structural impacts in the event of ground motion at magnitudes predicted for the area over the life of the Project.

Adherence to applicable design and construction standards, as well as BMPs and plans pertaining to erosion control, stormwater management and potential releases of oil or hazardous materials will ensure that there are no long-term Project impacts to or due to geologic and soil resources.

Likewise conformance with the applicable design and construction standards, as well as ongoing inspections by an environmental inspector to ensure that all BMPs and plans are followed during construction will result in no significant adverse impacts to or due to geologic and soil resources.

3.1.3 Proposed Mitigation

To avoid, minimize and/or mitigate Project impacts to and due to soil and geology, construction activities will be overseen by a qualified environmental monitor, who will have the authority to stop work and authorize appropriate corrective action.

In active agricultural land and farming operations, construction activities will fully comply with NYS Department of Agricultural & Market (NYSA&M) agricultural protection guidelines. Proposed agricultural protection measures and a Preliminary Notice of Intent to Undertake an Action within an Agricultural District have been prepared in accordance with NYSA&M guidelines, and are included as Appendix D. These will be filed with NYSA&M and the Clinton County Agriculture and Farmland Protection Board. Mitigation measures will also be detailed in erosion control and stormwater management plans to be filed for the Project. Mitigation measures are presented by potential impact below:

3.1.3.1 Soil Erosion and Siltation

Mitigation measures include:

- Soil protection and restoration measures will be shown on Project plans and documentation, copies of which will be provided to the general contractor and all subcontractors.
- Prior to the start of work, all wetlands, surface water bodies and identified sensitive resources within and adjacent to construction activities will be delineated and surveyed in the field and shown on plans. Erosion control measures will be placed in the field in accordance with the plans. The controls will be regularly inspected, maintained and modified, as needed, to avoid erosion and siltation until construction is completed and soils are stabilized.

- Erosion control measures will include staked hay bales, siltation fencing, temporary siltation basins, temporary slope breakers, temporary earthen berms, sand bags and other appropriate materials.
- Blocking of existing surface water drainage and subsurface drainage features will be avoided during road construction or stockpiling of topsoil. Any damage to surface and subsurface drainage features will be repaired or replaced.
- Restoration and revegetation will be performed by personnel familiar with local horticultural and turf establishment procedures.
- Disturbed areas will be reseeded with appropriate temporary or permanent seed mix following backfilling and final grading. Follow-up inspections of all disturbed areas will be done after the first and second growing seasons to determine the success of revegetation, and to correct problems as needed.

More detailed information to avoid or minimize potential erosion and siltation will be included in the Erosion Control Plan and Stormwater Management Plan to be filed for the Project, after a FEIS is submitted by the Applicant.

3.1.3.2 Soils in Agricultural Areas

As noted above, in active agricultural areas and areas with NRCS-designated farmland soils (listed in Section 3.1.1.4), construction will fully comply with NYSA&M agricultural protection guidelines. Mitigation measures are outlined in the Agricultural Protection Measurers in Appendix D and include:

- In active agricultural fields and areas of NRCS-designated farmland soils, topsoil and subsoil will be segregated in separate stockpiles and protected by erosion controls prior to replacement following construction.
- Soil compaction will be minimized by maintaining stockpiles of appropriate size and by avoidance of heavy equipment. Stockpiles will be regularly monitored and corrective actions taken o ensure that both minimal erosion and proper drainage are occurring.
- Cranes and other heavy equipment will use existing paved and farm roads to access each turbine location, to the extent possible. Heavy equipment will not cross agricultural fields during saturated conditions. Topsoil will not be stripped from agricultural fields during saturated conditions.
- New access roads will be sited to avoid agricultural fields to the extent possible, to minimize loss of agricultural land.
- Access roads that must cross agricultural fields will stay on ridge tops or other high ground to minimize cut and fill as well as potential drainage problems.
- Access roads and turbine structures on slopes will be designed and constructed in accordance with site specific conditions, to minimize potential effects such as slumping, increased runoff, rock slides and erosion of soils.
- Access roads will be maintained throughout construction so as to allow continued use/crossing by farmers and farm machinery.

- Open excavation areas in active pastureland will be bounded by temporary fencing to protect livestock.
- If crushed stone access pads are needed in active agricultural and residential areas, the stone will be placed on synthetic fabric to facilitate complete removal.
- Topsoil from active agricultural fields will be replaced following construction to the property from which it was removed. Subsoil will be plowed before replacing the segregated topsoil, or, if the landowner agrees, a "green manure" crop such as alfalfa will be planted then plowed under, to decrease soil bulk density and improve structure.
- After restoration, soils on agricultural fields will be graded to pre-existing contours, and to effect proper drainage. Efforts will be made to avoid soil compaction and runoff.
- Restored agricultural areas will be stabilized with seed and/or mulch.
- All construction debris and excess concrete will be disposed outside of active agricultural areas.

3.1.3.3 Blasting of Shallow Bedrock

Based upon the width and proposed depth selected for the footings, footings may be drilled or hammered in, or bedrock may be ripped or blasted in the discrete area to allow for installation. The following measures will be taken to avoid or minimize Project impacts to or due to shallow bedrock.

- If blasting is found necessary, it will be conducted in compliance with a Blasting Plan developed by an experienced blasting professional and in accordance with all applicable laws to avoid impacts to sensitive receptors. The Blasting Plan will be included in an Addendum to this filing, if needed.
- Pre- and post-blasting inspections of all sensitive receptors in the potential impact areas will be conducted, to document any changes that may be due to blasting.
- Blasting activities will be overseen by a qualified blasting contractor, and in compliance with the Blasting Plan.
- Excavated or spoil rock will be used as backfill and for the construction of access roads.
- Once the depth and width of footings has been determined by the design engineers, the volume of excavated material will be calculated and reported in an Addendum to this filing.

Blasting guidelines can be found in Appendix A.

3.1.3.4 Management of Oil and Hazardous Materials

Though construction and operation of the Project will not require significant use of oil or hazardous materials, use of heavy equipment can lead to inadvertent spills or releases of oil and hazardous materials. The risk of releases will be minimized through adherence to a Spill Prevention Control and Countermeasure Plan (SPCC), which will detail mitigation measures such as:

- Fueling or maintenance of equipment (including washing) will only be performed in specified areas well away from agricultural resources and surface water bodies.
- Any releases of oil or hazardous materials will be remediated immediately upon detection in accordance with all applicable laws and regulations.
- Waste will be disposed of properly, and in accordance with all applicable laws and regulations.

In summary, mitigation measures proposed for the Project, including those summarized above and additional measures which will be detailed in compliance plans, filings and other documentation, will serve to avoid, minimize, or mitigate potential Project impacts to or due to soil, geologic and geophysical conditions.

3.2 Water Resources

3.2.1 Existing Conditions

3.2.1.1 Surface Waters

The Project area is located in the English-Salmon and Great Chazy-Saranac drainage basins (USGS Hydrologic Units 04150307 and 02010006, respectively. Within the English-Salmon hydrologic unit, the Project area is drained by Marble River, Hinchinbrook Brook, and Dry Brook to the west and the English River to the east. The southern portion of the Project area is within the Great Chazy-Saranac hydrologic unit and is drained by Brandy Brook and Carew Brook.

Tetra Tech EC, Inc. (TtEC) conducted an extensive wetland survey within the Project area, providing site-specific information regarding surface waters and wetlands (Appendix E). According to TtEC's Fall 2005 survey, the Project area contains intermittent and perennial streams with depths ranging from 0.3 feet to 3.0 feet (although generally 1.0 foot or less), and widths ranging from 1.5 feet to 21.0 feet (although generally 5 feet or less). These streams range from moderate gradient pool and riffle streams with rocky substrate, to low gradient channels with slow moving water and mud/silt substrate. Appendix E, Table 5.3 provides further information on flow speed, bank vegetation, substrate, and wetland association for these streams. Figure 11 illustrates the variety of hydrologic and morphologic characteristics displayed by streams within the Project area. The English River, Marble River, and an unnamed tributary of Marble River are classified as C(t) streams by the NYSDEC, indicating that they support trout populations (Figure 12).

USGS mapping indicates 2 unnamed ponds and one unnamed lake within the Project area. Several additional open water areas (ranging from less than 0.5 acres to 25 acres in size) have been identified through review of aerial photography and through the TtEC investigation. These areas include manmade impoundments as well as beaver-created ponds and naturally occurring open-water habitats. Ponds identified by TtEC generally were associated with wetlands, had a silt substrate, and vegetation types included emergent, scrub-shrub, upland forest, and combinations thereof. Water body widths ranged from 20 feet to 900 feet and depths ranged from 1 foot to greater than 30 feet.

3.2.1.2 Wetlands

Wetlands within the Project area have been examined through review of existing mapping, aerial photography interpretation, field reconnaissance, and on-site wetland inventory conducted by TtEC. The results of this data collection effort are described below.

Existing Information: The U.S. Fish & Wildlife Service (USFWS) National Wetlands Inventory (NWI) has mapped over 800 wetlands, totaling approximately 5,670 acres, within the proposed Project area (Figure 13). The NWI indicates that a wide variety of palustrine forested, scrub-shrub, emergent and unconsolidated bottom wetlands with varying vegetation and hydrologic regimes are present. The five wetland types that dominate in terms of acreage are: scrub-shrub, broad-leaved deciduous, seasonally flooded/saturated (PSS1E); forested, broad-leaved deciduous, seasonally flooded/saturated (PFO1E); forested broad-leaved deciduous, saturated (PFO1B); scrub-shrub, broad-leaved deciduous, seasonally flooded/saturated (PSS1E); forested, needle-leaved evergreen, seasonally flooded/saturated (PFO4E); and emergent, persistent, seasonally flooded/saturated (PEM1E). Although there is a diversity of wetland types throughout the Project area, the following general trends can be ascertained from the NWI data: Scrub-shrub wetlands are prevalent throughout the Project area, particularly in the northeast; large forested wetlands are found in the west; emergent wetlands are common throughout; and open water wetlands are more common in the northeast than in other areas.

Review of NYSDEC freshwater wetlands mapping indicates that 28 state-regulated wetlands, totaling approximately 8,000 acres, are located within the Project area (Figure 14). Table 3.2.1.2-1 provides a summary of these state-regulated wetlands.

Table 3.2.1.2-1: State-Regulated Wetlands Within the Project Area

Wetland	Class[1]	Total Size (Acres)	Size Within Project Area (Acres)
CB-40	III	877.42	877.42
CB-41	III	176.01	176.01
CB-42	II	47.85	47.85
CB-43	III	81.48	81.48
CB-44	III	450.87	252.91
CB-45	III	627.45	529.75
CB-46	II	947.41	357.91
CB-47	II	1693.2	1064.61

Wetland	Class[1]	Total Size (Acres)	Size Within Project Area (Acres)
CB-48	II	178.49	102.83
CB-49	III	835.89	322.18
CB-55	III	818.84	539.39
CB-57	III	10.76	10.6
CB-58	II	1548.56	1063.24
CB-59	III	104.39	104.39
CB-60	II	20.83	20.83
CB-61	II	711.47	580.11
CB-62	II	16.20	16.20
CB-63	II	1348.03	672.40
CB-64	II	218.67	208.73
CB-67	III	26.35	15.89
EC-10	II	113.99	32.50
EC-11	II	256.10	61.80
EC-6	II	202.31	29.03
EC-7	II	47.5	1.10
ED-69	II	631.93	27.63
ED-75	II	84.90	84.90
ED-76	III	647.12	633.77
ED-78	II	69.14	66.32
TOTAL		12,793.16	7,981.76

[1]NYS classification system. Four classes that rank wetlands according to their ability to provide functions and values (Class I having the highest rank, descending through Class IV).

A review of the New York portion of the National Hydric Soil List indicates that the Project area contains areas of hydric soils, as determined by the USDA Natural Resources Conservation Service (NRCS). Hydric soils are poorly drained, and their presence is also indicative of the likely occurrence of wetlands. A list of these hydric soils and their characteristics is provided in the TtEC report. Hydric soils found in the Project area occur primarily within NYSDEC mapped wetlands.

Field Review: Prior to the initiation of formal wetland delineation work, a reconnaissance-level investigation of wetlands was undertaken by the Applicant during the siting of project components (turbines, access road, etc.) in the summer and fall of 2005. This wetland reconnaissance revealed that the extent of wetlands within the Project area was generally less extensive than indicated on the NYSDEC maps. In many places, mapped wetlands extended well out into active agricultural fields and other upland communities. In addition, this reconnaissance effort revealed numerous existing roads, areas of previous disturbance, and/or narrow points where wetland crossings could be installed/utilized with minimal additional impact. This reconnaissance work resulted in the siting of Project turbine and access roads as currently proposed.

Three wetland determination methods were used in the wetland review conducted by TtEC during the fall and winter of 2005 (as weather permitted). Field delineations were conducted until the first snowfall (November 7, 2005), at which point field review/limited delineations were continued until the effort became infeasible due to snow accumulation (December 8, 2005). Wetlands were determined in the remainder of the Project area through desktop review of NYSDEC freshwater wetlands mapping, NWI mapping, and aerial photograph interpretation. Wetlands characterized by field review and desktop review methods will be delineated in the spring of 2006. Wetland delineation methods followed the three-parameter approach as described in the U.S. Army Corps of Engineers (USACOE) Wetlands Delineation Manual (Environmental Laboratory, 1987) and the 1987 New York State Freshwater Wetlands Delineation Manual (Brown et al., 1995). This methodology uses vegetation, soils, and hydrology to determine the presence of wetlands and delineate their boundaries. These wetland determination methods were applied to areas within a 150-foot radius of proposed wind turbines, 20 feet on either side of the centerline of proposed access roads, 20 feet on either side of the centerline of proposed crane paths, 1.5 feet on either side of the centerline of proposed interconnection lines, and the footprints of the O&M building (0.23 acre), substation (8 acres), storage area (3 acres), and laydown areas (9.7 acres and 5.1 acres, respectively). Based on previous experience at other wind power projects (e.g., Maple Ridge), these areas represent the likely extent of soil disturbance anticipated for each construction activity. The USACOE has also indicted on previous projects that these areas of disturbance will be the basis for subsequent wetland permitting. Collectively, these areas are referred to as the Potential Impact Area. However, it should be noted, that some additional areas of temporary disturbance to wetland vegetation (e.g., a total of 15 feet along interconnect routes) is anticipated to occur during construction (see discussion in Section 3.2.2.1.1).

Wetland Community Types: Based on TtEC's field review, wetlands within the Potential Impact Area are one of the following six types: red maple hardwood swamp, shrub swamp, shallow emergent marsh, northern white cedar swamp, balsam flats, and open peatland. Representative photos of wetlands within the Project area are included in Figure 15. TtEC's descriptions of each of these communities are presented below and complete lists of plant species found in these wetlands and adjacent uplands are provided in Appendix E, Tables 5.4 and 5.5, respectively.

Red Maple Hardwood Swamp – Red maple hardwood swamp is the one of the most common wetland covertypes occurring within the Potential Impact Area. These areas may consist of a monoculture canopy of red maple or a co-dominance of red maple and gray birch. American elm, yellow birch, and balsam fir occasionally occur as sub-dominants. These swamps often have gaps in the canopy allowing for a dense understory with many saplings and a thick shrub layer containing species such as speckled alder, beak willow, silky willow, and meadowsweet. The herbaceous layer can be quite diverse, with ferns like sensitive fern and cinnamon fern having a high percent cover. Characteristic herbs include soft rush, northern bugleweed, rough-stemmed golden rod, flat-topped aster, sphagnum moss, and sedge species including bladder sedge, shallow sedge, and pointed broom sedge.

Shrub Swamp – Shrub swamps are dominated by tall shrubs that occur along the shore of lakes or rivers, in a wet depression not associated with lakes, or in a transitional zone between a marsh, swamp, or bog and an upland community. This is a broadly defined, highly variable covertype that includes several distinct communities and many intermediates. Shrub swamps may have a single dominant shrub species or be co-dominated by a mixture of species. Speckled alder, beak willow and silky willow are the most frequently occurring shrubs of this community within the Potential Impact Area. Other shrub species with occasional occurrence include highbush cranberry, steeplebush, meadowsweet, and red osier dogwood. These wetland communities are frequently associated with stream complexes and may contain emergent wetland sedges and grasses.

Shallow Emergent Marsh – Shallow emergent marshes are permanently saturated and seasonally flooded wetlands that are dominated by herbaceous vegetation. Common dominant herbaceous plants within the Potential Impact Area include soft rush, green bulrush, wool-grass, bladder sedge, shallow sedge, pointed broom sedge, fox sedge, rush aster, flat-topped aster, New York aster, arrow-leaf tearthumb, marshpepper smartweed, eastern Joe-Pye-weed, lance-leaf goldenrod, rough-stemmed goldenrod, jewelweed, rattle snake grass, fowl meadow grass, cattails, and reed canary grass. Marshes must have less than 50 percent cover of peat and tussock-forming sedges such as tussock sedge; otherwise they are classified as sedge meadows. Other plants characteristic of shallow emergent marshes include blue flag iris, sensitive fern, cinnamon fern, and rushes. Shallow emergent marshes commonly have scattered shrub species including speckled alder, dogwoods, willows, and spireas.

Northern White Cedar Swamp – The northern white cedar swamp is a conifer or mixed conifer swamp that occurs on organic soils in cool, poorly drained depressions, and along lakes and streams. Co-dominants at the Site included balsam fir, gray birch and trembling aspen. The understory included tree saplings, mountain alder and speckled alder, in the moderate shrub strata and spinulose woodfern, sensitive fern and moss in the somewhat sparse herbaceous layer.

Balsam Flats – Balsam flats are generally an upland conifer forest community that occurs on well drained soils of low flats adjoining swamps, gentle low ridges, and knolls within swamps. Within the Potential Impact Area, a balsam flat was observed at one location (along the proposed access road between Turbines 174 and 5A) as a wetland community in conjunction with a shallow emergent swamp. Co-dominants in this community include gray birch and elm. Sensitive fern and sphagnum moss are present in the herbaceous layer.

Open Peatlands – These communities are characterized by an open canopy of trees, dominant vegetation including shrubs, herbs or mosses and a peat layer greater than eight inches in depth. Two open peatlands communities were observed within the Potential Impact Area, one between Robare Pond Road and Turbine 10A and the other along Bootleg Road. At the former, the sparse tree, moderate shrub and dense herbaceous layers are dominated by northern white cedar, speckled alder and sphagnum moss, respectively. At the second wetland, red maple spruce and fir trees and gray birch saplings are prevalent along the wetland edge. The wetland is dominated by shrub and emergent plant species including sheep laurel, broad leaf meadowsweet and steeplebush in the shrub layer and grasses and sphagnum moss in the herbaceous layer.

Wetlands can provide a variety of important functions and values, including flood attenuation, groundwater recharge, water quality improvement, wildlife habitat, rare species (plant and animal) habitat, recreational opportunities, and venues for scientific research and education. Many of the wetlands within the potential Project Impact Area provide limited functions and values, due to their small size, disturbed character, and/or limited habitat diversity. Within the Project area, the highest-value wetlands are the larger, more diverse wetlands regulated by NYSDEC. NYSDEC-regulated wetlands near proposed Project components include wetlands with well-defined basins and sizable watersheds, providing significant flood storage, wildlife habitat, water quality, and groundwater benefits. The larger forested wetlands and bogs (peatlands) also have the potential to provide habitat for certain rare or interesting plant species. A formal analysis of wetland functions and values will be conducted during the wetland permitting process (see Section 3.2.2.1.1).

3.2.1.3 Groundwater

According to the USGS Ground Water Atlas of the United States, the Project area is located over the Cambrian Potsdam Sandstone Aquifer (Figure 16), which borders the Adirondack Mountains to the north and west (USGS, 1995). This aquifer is typically hydraulically connected to overlying carbonate aquifers, and in many areas these two aquifers are confined by overlying glacial deposits. The USGS reports that yields from this northern New York aquifer range from 3 to 30 gallons per minute. The USGS also states that the water quality of this aquifer is typically suitable for drinking although the low to moderate yields limit its uses to primarily domestic and small business/industry with relatively low water requirements (1995).

A hydrogeologic evaluation of the Project area conducted by ESS Group, Inc. (ESS) states that groundwater likely occurs both in the glacial till deposits and the underlying Potsdam Sandstone except in areas of shallow bedrock (Appendix E). Groundwater is expected to have similar flow direction to surface water drainage in the area, and well yields are anticipated to be less than 10 gallons per minute. ESS also concludes that the majority of residences in the vicinity of the Project area obtain their water from either shallow wells within the glacial till or deeper wells completed within the underlying bedrock. The relatively shallow bedrock in the eastern portion of the Project area indicates that wells in that area are more likely to be completed in the bedrock. Geotechnical investigations taking place prior to construction will provide on-site confirmation of this desktop review conducted by ESS and will determine depth to water table within the Project area.

3.2.2 Potential Impacts

3.2.2.1 Construction

3.2.2.1.1 Surface Waters and Wetlands

To avoid or minimize overall permanent impact on streams and wetland areas, Project design was guided by the following criteria during the siting of wind turbines and turbine infrastructure:

- Large built components of the Project, including staging areas, wind turbine generators and the substation, either avoided wetland areas or were sited to minimize impacts to wetlands, based on wetland field reconnaissance or actual delineation.
- Number and overall impacts due to service road crossings were minimized by avoiding wetlands whenever possible and utilizing existing road crossings, previously disturbed areas, and narrow crossing locations whenever possible.
- Buried electric interconnect lines will generally be installed beneath or adjacent to access roads when crossing wetlands. These lines also avoided crossing forested wetlands whenever possible, crossed wetlands at narrow points, and will utilize installation techniques that minimize temporary wetland impacts.

Opportunities for additional wetland avoidance and impact minimization will be identified and evaluated during the wetland permitting process, following receipt of a jurisdictional determination from the USACOE and NYSDEC.

During construction, potential direct or indirect impacts to wetlands and surface waters may occur as a result of the installation of access roads, the upgrade of local public roads, the installation of buried electrical interconnects, and the development and use of temporary workspaces around the turbine sites. Direct impacts, including clearing of vegetation, earthwork (excavating and grading activities), and the direct placement of fill in wetlands and surface waters, are typically associated with the development of access roads and workspaces. The construction of access roads, and possibly the upgrade of local public roads will result in both permanent (loss of wetland/surface water acreage) and temporary impacts to wetlands. The development and use of temporary work spaces will result in only temporary impacts to either streams or wetlands. The installation of buried electrical interconnects will temporarily disturb streams and wetlands during construction as a result of clearing (brushogging, or similar clearing method requiring no removal of rooted woody plants), and soil disturbance from burial of the electrical interconnects. Indirect impacts to wetlands and surface waters may result from sedimentation and erosion caused by removal of vegetation and soil disturbance required to install Project components. This indirect impact may occur at wetlands adjacent to work areas where no direct wetland impacts are proposed including areas adjacent to proposed access road upgrade/construction, buried electrical interconnect, turbine sites, staging areas, met towers, or the substation.

In locations without wetlands, impacts resulting from installation of wind turbines could disturb a radius of 200 feet (workspace area). The wetland delineation conducted by TtEC examined the area within a 150-foot radius of the towers. Although additional wetland is likely to occur between 150 and 200 feet of the tower, any wetlands in this area will be identified through wetland delineation (to be conducted during the spring of 2006), and avoided during construction. Thus, there will be no wetland impacts (temporary or permanent) beyond 150 feet from the tower. Along with turbine workspace areas, it is assumed that access roads and crane walks will disturb a width of 40 feet (fill area) Although a corridor of vegetation clearing up to 75 feet in width is anticipated in most areas (to accommodate the access road plus stockpiled topsoil and/or cut vegetation), within wetland, all construction-related disturbance will be confined to a 40 foot wide corridor. Any soil or woody debris will be stockpiled outside of the wetland boundaries. It is assumed that installation of buried electrical interconnects could disturb vegetation within a 15 foot wide corridor (due to the passage of machinery), but the actual excavation of soil within wetlands will be limited to an area of 3 feet. Wherever feasible, buried electrical interconnects will be installed in the alignments of access roads or crane walks to minimize disturbance to wetlands.

Based on the assumptions described above, TtEC identified 29.6 acres of potential wetland impact during field efforts and 11.3 acres of potential wetland impact through desktop review for a total of approximately 41 acres of construction-related wetland impacts (see Figure 5 in Appendix E). This total would represent less than 0.01% of the wetlands indicated as occurring within the Project area on the NWI maps. Furthermore, based on the results of wetland field reconnaissance and delineation/inventory work conducted to date, it is assumed that impacts identified through the desktop analysis represent a "worst case" scenario. Construction of access roads could impact approximately 21.5 acres of wetland, wind turbines could impact 12.1 acres, crane walks could impact 5.2 acres, and interconnect could impact 1.8 acres. The impact associated with interconnect installation would increase by 11.6 acres, assuming a 15-foot wide corridor of vegetation disturbance. Appendix E Tables 7.0 and 7.3 provide detailed information on impacts to specific cover types. Scrub-shrub and forested wetlands receive the majority of construction impacts with 11.4 and 9.5 acres of disturbance, respectively. Construction is anticipated to impact 22.5 acres of NYSDEC wetland, with 54.5 acres of impact to NYSDEC wetland buffer areas. Buffer impacts would increase by about 1.1 acres assuming a 15 foot corridor of vegetation disturbance along the interconnect lines. Impacts to buffer areas were calculated as follows:

- Delineated, field reviewed and desktop reviewed wetlands that occurred in the same geographic region as NYSDEC mapped wetlands were identified as NYSDEC wetlands.

- The 100 foot adjacent area to each wetland identified as a NYSDEC wetland (i.e., a delineated, field reviewed or desktop reviewed wetland that occurred within the area of a mapped NYSDEC wetland) was tallied.
- Overlapping adjacent areas from more than one wetland were "cut" and only tallied once, preventing a double counting of wetlands.

Buffer impact calculations will be refined following issuance of a jurisdictional determination by the NYSDEC.

Additionally, TtEC identified 84 surface waterbody crossings within the potential impact area. Fifty-three of these crossings were identified during field efforts and 31 were identified through desktop review. Eight of these crossings involve NYSDEC C(t) classified streams. Of these eight regulated crossings, three are associated with access roads, three are associated with crane walks, and two are associated with interconnects. Appendix E Table 7.4 provides the NYSDEC stream ID number, waterbody name, NYSDEC classification, TtEC channel identifier, and location by township for all surface waterbody crossings. Seventy-two percent (29.4 acres) of the estimated construction-related wetland impacts are temporary disturbances and will be restored following Project construction. Proposed wetland restoration areas include:

- Turbine workspaces will be restored to preconstruction conditions, except for a 50-foot radius around the turbine pedestal which includes foundation back-fill and a gravel crane pad (including road width of 16 feet plus 2 foot shoulders on either side).
- 40-foot wide access roads will be reduced to a maximum width of 20 feet, except where unstable soil conditions or severe erosion hazard preclude restoration.
- Buried electrical interconnect routes will be allowed to regenerate naturally.

Permanent loss of surface water/wetland acreage will result from the development of permanent access roads to accommodate long-term maintenance and operation activities (11.6 acres of wetland impact and 56 stream crossings). Other long-term impacts to wetlands will result from limited vegetation management activities (e.g. brush hogging buried electrical interconnect routes and selective tree clearing around tower sites) in forested wetlands. These activities will not result in a loss of wetland acreage, but will result in the conversion of forested wetlands to systems dominated by shrub and herbaceous vegetation (scrub-shrub /wet meadow/emergent).

Wetlands and surface waters occurring within a 50-foot radius of proposed wind turbines and 10 feet on either side of the centerline of proposed access roads will be permanently impacted due to the presence of wind turbine foundations and structural fill. TtEC detected 1.1 acres of permanent wetland impact due to wind turbines given the current Project layout. Permanent impacts resulting from access roads are estimated to total 10.4 acres. It is anticipated that NYSDEC wetlands and adjacent areas will incur 6.5 acres and 20.0 acres of permanent impacts, respectively. Additionally, 56 surface water crossings will have permanent impacts, three of which are state-protected waters (i.e., trout streams).

As stated previously, the wetland impacts described above will be re-evaluated (and likely reduced) during the state and federal wetland permitting process. This process, referred to as the Joint Application process, will involve the following steps:

1. Submission of a final wetland delineation report to the USACOE and NYSDEC, along with a request for jurisdictional determination by these agencies.
2. Site visits by USACOE and NYSDEC representatives to verify the boundaries of delineated wetlands and determine which wetlands are under the jurisdiction of each agency (pursuant to Section 404 of the Clean Water Act and Article 24 of the Environmental Conservation Law).
3. Evaluation of opportunities for further wetland impact avoidance and minimization through minor adjustments in the proposed location of project components.
4. Preparation of a Joint Application for Permit, including an analysis of wetland functions and values, a description and quantification of wetland and stream impacts (temporary and permanent), an alternatives analysis, and suggested mitigation plans. Wetland mitigation will involve in-kind replacement of all permanently impacted wetlands at a ratio of at least 2 to 1 (mitigation to impact).
5. USACOE and NYSDEC processing/review of the permit application, including public notice and consultation with other state and federal agencies (EPA, USFWS, SHPO).
6. Permit issuance, including conditions for wetland protection, impact minimization, mitigation, and monitoring.
7. Preparation and submittal of final wetland mitigation plans to the agencies.

3.2.2.1.2 Groundwater

The Project's effect on groundwater recharge will be minimal, based on the spacing between individual Project components, the size of the Project area, and the relatively small acreage of impervious surface resulting from the Project. However, construction of the proposed Project could result in certain localized impacts to groundwater. These could include the following:

- Minor and localized lowering of the water table through dewatering of foundation holes, thereby impacting the yield of nearby water supply wells;
- Very minor and localized disruption of groundwater flows down-gradient of proposed turbine foundations;
- Minor and very localized alteration of groundwater chemical quality from installation of concrete foundations; and
- Minor impacts to groundwater recharge areas from filling of wetlands.

However, given the small, localized and/or temporary nature of these impacts, it is unlikely that any will result in an effect on neighboring water supply wells, as discussed below.

Installation of turbine foundations has the greatest potential for impacts to groundwater. If blasting is determined to be necessary, it can generate ground vibration, fracture bedrock, and impact adjacent wells. However, based on the depth and extent of excavation proposed, and the distance of the excavations from existing structures (a minimum of 1,200 feet), these risks are considered minimal and unlikely to have an affect on private wells in the area. This assertion is based on the assumption that private wells are typically located within 100 feet of existing structures. This construction activity could also impact groundwater flow paths in areas where excavation or blasting occur below the water table, although water is anticipated to flow around the disturbance and resume its original flow direction down gradient of the disturbance. Groundwater that infiltrates into the excavation may require removal by pumping, which could have a short-term and very localized effect on the elevation of the water table in the immediate vicinity of the dewatering. However, this water will be pumped to the surface and allowed to infiltrate back into the ground with negligible loss of volume due to evaporation. Therefore, any effect will be very localized and temporary. Additionally, installation of the concrete foundations may cause a temporary, localized increase in groundwater pH during the curing process. This effect will not extend beyond the immediate area of the foundation and will not adversely affect groundwater quality.

In addition to impacts to groundwater due to turbine foundation installation, minor impacts could result from other Project activities. Construction of access roads, crane pads, and other compacted surfaces will result in a minor increase in storm water runoff that otherwise would have infiltrated into the ground at these locations. Buried transmission lines may facilitate groundwater migration along trench backfill in areas of shallow groundwater. Construction of other Project components that require the placement of fill in wetlands may also have an impact on groundwater as many wetlands serve as groundwater recharge areas. All of these impacts are minor and localized, and will not significantly affect groundwater quality, or use by area residents.

A final potential impact to groundwater is the introduction of pollutants to groundwater from the discharge of petroleum or other chemicals during construction. Such discharges could occur in the form of minor leaks from fuel and hydraulic systems, as well as more substantial spills that could occur during refueling or due to mechanical failures and other accidents.

3.2.2.2 Operation

3.2.2.2.1 Surface Waters and Wetlands

Impacts to surface waters and wetlands primarily occur during Project construction. The operation of the constructed facility is not anticipated to have significant adverse impacts to streams, ponds or wetlands within the Project area. Vehicular access to the turbines, substation, met towers, and O&M facility will be well established and other routine operation and maintenance procedures are not anticipated to result in significant adverse impacts. It is possible that large equipment will be required for unforeseen maintenance issues, in which case a permit addressing the impacts of that action would be required. Minor and isolated incidences of impact may occur which have a minimal impact to surface waters or wetlands in or adjacent to the Project area including buried electrical interconnect maintenance, access road washouts, culvert replacement/maintenance, or accidental fuel/chemical spills.

The proposed Project will not result in wide-scale conversion of land to built/impervious surfaces. The tower bases, crane pads, access roads, and O&M building in total will add approximately 133 acres of impervious/compacted surface to the 19,310-acre Project area (i.e., conversion of 0.7%). Consequently, no significant changes to stormwater runoff volumes are anticipated. However, installation of permanent Project components could result in localized changes to runoff/drainage patterns.

3.2.2.2.2 Groundwater

Most impacts to groundwater, which are anticipated to be very localized and of a short-term nature, will occur during construction only. Over the long term, addition of the small areas of impervious/compacted surfaces previously mentioned will not have a significant effect on groundwater recharge. Turbine foundations installed below the water table are not anticipated to have any measurable effect on groundwater levels or flow patterns. The migration of groundwater along buried interconnect trenches could have a minor effects on groundwater flow paths, and the potential for petroleum/chemical spills exists during operation.

3.2.3 Proposed Mitigation

As stated previously, during the wetland permitting process, opportunities for additional wetland impact avoidance and minimization will be identified. These actions could include road, turbine and interconnect relocation, or the decision to install certain sections of interconnect through directional drilling. Such actions will assure that wetland impacts are minimized to the extent practicable, and will not exceed the total assumed in this DEIS. To mitigate for unavoidable permanent wetland and stream impacts associated with the Project, the Applicant will undertake a suitable on-site or off-site compensatory mitigation Project, likely through the creation of an in-kind wetland, at a minimum ratio of 2 to 1 (mitigation to impact). This suitable compensatory mitigation Project will be developed in consultation with the NYSDEC and USACOE during the Joint Application for Permit process, as previously described. Based on the current anticipated level of permanent impacts, this mitigation is anticipated to total on the order of 22+ acres. However, the final mitigation proposal will be determined in consultation with the agencies during permitting and will include any currently undetermined wetland/stream impacts including those areas associated with public road improvement efforts.

No mitigation for indirect or temporary impacts is proposed, given the fact that these impacts will not result in any loss of wetland acreage. However, temporary impacts to streams and wetlands in the Project area will be minimized during construction as discussed below:

The direct impacts of wetland and stream crossings will be minimized by utilizing existing/narrow crossing locations whenever possible. Upgrading under-maintained/undersized crossings will have a long-term beneficial effect on water quality as it will keep farm equipment and other vehicles out of the streams. Special crossing techniques, equipment restrictions, herbicide use restrictions and erosion and sedimentation control measures will be utilized to reduce impacts to water quality, surface water hydrology and aquatic organisms. Clearing of vegetation along stream banks and in wetland areas will be kept to an absolute minimum.

Where crossings of surface waters and wetlands are required, the Developer will employ the Best Management Practices associated with particular, applicable streamside and wetland activities, as recommended by the NYSDEC and the USACOE and required by the issued wetland/waters permits. Specific mitigation measures for protecting wetlands and surface water resources will include the following:

- No Equipment Access Areas. Except where crossed by permitted access roads wetlands, streams, waterbodies will be designated "No Equipment Access," thus prohibiting the use of motorized equipment in the areas.
- Restricted Activities Area. A buffer zone of 100 feet, referred to as "Restricted Activities Area", will be established where Project construction traverses streams, wetland and other bodies of water. Restrictions will include:
    - No deposition of slash within or adjacent to a waterbody;
    - No accumulation of construction debris within the area;
    - Herbicide restrictions within 100 feet of a stream or wetland (or as required per manufacturer's instructions);
    - No degradation of stream banks;
    - No equipment washing or refueling within the area; and
    - No storage of any petroleum or chemical material.
    - Access Through Wetlands - When crossing wetlands, skirting around edges, utilizing higher ground, and crossing the narrowest portion of the wetland will be the preferred crossing options. Wherever feasible, low impact crossing methods will be used such as timber mats or similar materials. Geotextile mats, corduroy and/or gravel may also be used to create temporary wetland road widening. Where permanent roadways are installed and impoundment of water is possible, the installation of culverts will be used to maintain the natural water levels on each side of the road.
    - Sediment and Siltation Control - A stringent soil erosion and sedimentation control plan will be developed and implemented as part of the State Pollutant Discharge Elimination System (SPDES) General Permit for the Project to protect surface waters, wetlands, groundwater, and stormwater quality. Silt fence, hay bales, and temporary siltation basins will be installed and maintained throughout site development. The location of these features will be determined by the environmental monitor and reviewed with the

contractor prior to construction. The environmental monitor will also inspect these features throughout the period of construction to assure that they are functioning properly until completion of all restoration work (final grading and seeding).

The Applicant will adhere to any permit special conditions pertaining to low impact stream crossing techniques, including seasonal restrictions and/or alternative stream crossing methods, such as temporary bridging and installation of crossings "in the dry" on protected streams. Open-bottomed or elliptical culverts could be required on certain streams to minimize loss of aquatic habitat and restriction of fish passage. Adherence to these restrictions should avoid or minimize any adverse impacts on trout and other aquatic organisms. Wetlands temporarily disturbed during construction will be restored to their original grade. This will allow wetland areas to redevelop naturally following construction.

Any increase in stormwater runoff will be negligible, as Project construction will result in limited addition of impervious surface. Nevertheless, specific means of avoiding or minimizing stormwater-related adverse impacts during construction and operation of the Project include adhering to a detailed soil erosion and sedimentation control plan, as described previously. Additionally, a Spill Prevention, Containment, and Countermeasure (SPCC) Plan that outlines procedures to be implemented to prevent the release of hazardous substances into the environment will be developed and implemented. This plan will require that refueling of construction equipment not be allowed within 100 feet of any stream or wetland, and all contractors will be required to keep materials on hand to control and contain a petroleum spill. These materials will include a shovel, tank patch kit, and oil-absorbent materials. Any spills will be reported in accordance with NYSDEC regulations. Contractors will be responsible for ensuring responsible action on the part of construction personnel.

To avoid localized drainage problems, the environmental monitor will identify the need for ditches, water bars, culverts, and temporary sediment retention basins at each road and tower site prior to the initiation of construction. If drainage problems develop during or after construction, the environmental monitor will evaluate the problem (in consultation with the contractor, landowner and/or agency representative) and recommend a solution. Corrective actions will be taken by the contractor within one week of receiving the recommendation.

Many of the mitigation/impact reduction measures discussed in this section that protect surface waters indirectly protect groundwater as well. The following additional mitigation measures specific to groundwater will be taken:

- Low-permeability barriers will be installed in the trenches of buried transmission lines at regular intervals in appropriate areas to minimize groundwater migration.
- An inventory of private water wells will be conducted and assessed prior to construction to ensure that impacts to wells are avoided during Project construction and operation.
- If blasting is required, it will be done in compliance with a site-specific blasting plan designed with appropriate charge weights and detonation delays to localize bedrock fracturing to the

proposed foundation area, minimizing the already unlikely chance of impacting water levels in residential wells.

- A Complaint Resolution Plan (included in Appendix D) will be implemented to establish an efficient process by which to resolve any construction or operational related complaints (e.g. changes in residential well yields).

To assure compliance with proposed mitigation measures during construction, the Applicant will provide the construction contractor copies of all applicable NYSDEC (Article 24 and 15, Section 401 Water Quality Certification) and USACOE (Section 404) permits and site specific plans detailing construction methodologies, sediment and erosion control plans, and required natural resource protection measures. The Applicant will also employ one or more environmental monitors during construction to ensure compliance with all plans and permit conditions.

3.3 Ecological Resources

This section describes ecological resources within the Project area, including vegetation, ecological communities, wildlife, and listed threatened and endangered species.

3.3.1 Existing Conditions

3.3.1.1 Vegetation

Plant species and communities found within the Project area were identified and characterized during wetland inventory/delineation conducted by Tetra Tech EC, Inc. (TtEC) and field surveys conducted by EDR during the fall of 2005. A total of 295 plant species are considered likely to occur within the Project area based on the results of these field surveys. A list of these species (including scientific names) is included in Appendix F. All of the plant species identified during the course of field surveys are common to the region and the state.

3.3.1.1.1 Ecological Communities

Vegetative communities within the study area were mapped based on interpretation of aerial photography and field verification. Community boundaries were then digitized, and approximate acreages were calculated through the use of Geographic Information System (GIS) analysis. All identified ecological communities within the Project area are depicted in Figure 17. Inventoried wetlands within the Project area have been mapped and described separately (see Section 3.2 and Appendix E).

Most of the major ecological communities found within the Project area are common to New York State. Agricultural fields and forestland are the dominant community types, while successional communities (shrubland and old field), open water, and developed/disturbed communities occur to a lesser extent. Small areas of unique natural communities, including sandstone pavement barrens and bogs/peatlands also occur within the study area (see Section 3.3.1.1.2). Brief descriptions of the major ecological community types that occur within the Project area are provided below.

Agricultural Land: Totals approximately 2,790 acres (14.4%) of the Project area. This community includes in row crops, field crops, and pastureland. Corn is the primary row crop, while field crops include alfalfa, oats, and wheat. Hayfields are typically rotated into (and out of) row crop production (typically corn), and less often into pastureland. Consequently, the percentage in each agricultural type is constantly changing. Pastureland is used for the grazing of livestock and is characterized by mixed grasses and broad-leafed herbaceous species, including clovers, plantains, and dandelion.

Successional Old Field: Constitutes approximately 265 acres (1.4%) of the Project area. It is defined by Reschke (1990) as "a meadow dominated by forbs and grasses that occurs on sites that have been cleared and plowed (for farming or development), and then abandoned." This ecological community is scattered throughout the Project area, primarily in the form of abandoned agricultural fields. Species found in these areas include grasses such as orchard grass, timothy, and perennial rye, and broad-leaved herbaceous species, including goldenrods, clovers, milkweed, thistles, asters, Queen Anne's lace, hawkweed, and bracken. Shrubs (including gray dogwood, meadowsweet, and brambles) and tree saplings occur in this community, but represent less than 50% of total vegetative cover.

Successional Shrubland: Occurs on approximately 2,530 acres (13.1%) of the Project area. This community includes successional uplands (older abandoned agricultural fields) as well as scrub-shrub wetlands. Areas of young trees and shrubs are also found in some forested areas where logging and associated activities have resulted in the removal of overstory trees. Herbaceous species similar to those found in successional old fields also occur in these areas. However, young tree and shrub species dominate this community. In upland areas these species include meadowsweet, brambles, apple, highbush cransberry, gray dogwood, aspen, gray birch, and red maple. Shrub-dominated wetland communities include species such as willows, alders, silky dogwood, and red osier dogwood.

Forestland: Totals approximately 13,145 acres (68.1%) of the Project area. Hardwood forests within the Project area resemble the spruce-northern hardwood and successional northern hardwood communities described by Reschke (1990). Forested areas in the northeastern portion of the Project area have been significantly disturbed by past and ongoing logging activity. Vegetation in this area is typically dominated by regenerating saplings and pole sized trees, generally less than 40 feet in height. Common tree species include gray birch, big toothed aspen, and red maple. Understory species include tree seedlings, wood fern, ground pine, bracken, blueberry, dewberry, and other species of shrubs and forbs characteristic of successional old fields. This upland forest vegetation is interspersed with beaver ponds and associated wetlands, including wooded swamps dominated by red maple, gray birch, and American elm.

Areas of mixed deciduous/coniferous forest are also found throughout the Project area. These forests are generally more mature then those in the northeastern portion of the Project area, but many have also been logged in the recent past. These areas are dominated by balsam fir, big toothed aspen, and red maple, but also include American beech, hophornbeam, white pine, American elm, and white ash. The understory includes tree saplings, Christmas fern, and wood fern. Also included are areas of typical northern hardwoods dominated by sugar maple, beech, and black cherry.

Open Water: Accounts for approximately 340 acres, (1.8%) of the Project area. Surface water features are fully described in Section 3.2. Some of the water bodies within the Project area are man-made excavations or impoundments (e.g., farm ponds). However, the majority of open water areas are beaver ponds that are components of larger wetland systems. These occur primarily in the northeastern portion of the Project area.

The project area also includes approximately 240 acres (1.2%) of Disturbed/Developed land. This community is a combination of several "cultural communities", as defined by Reschke (1990), and is characterized by the presence of buildings, paved areas, and lawns. It includes residential yards, farmyards, storage yards, and roads.

3.3.1.1.2 Significant Natural Communities/Rare Plant Species

Written requests for information regarding listed threatened and endangered plant species, and unique or significant natural communities were sent to the United States Fish and Wildlife Service (USFWS) and the NYS Natural Heritage Program (NHP) on September 19, 2005. Earlier enquiries to these agencies regarding the northeastern portion of the Project area were sent by TtEC in February 2004. According to the agency response letters, no state- or federally-listed threatened or endangered plant species, or unique/significant natural communities are known to exist within the Project area (see Agency Correspondence in Appendix G).

However, during wetland delineations conducted by TtEC and ecological field surveys conducted by EDR during the fall of 2005, two unique/unusual natural community types were observed within the study area. TtEC documented the presence of two open peatland wetlands in the northern portion of the study area that exhibited characteristics similar to those of a perched bog, as described by Reschke (1990). This community has a state rarity ranking of S1S2, indicating that it is very vulnerable in New York State. These wetlands were located along the proposed access road between turbines 9A and 10A, off of Robare Pond Road. The other peatland wetland is located along Bootleg Road which is proposed as an access road to Turbines 120-126. These wetlands are dominated by shrub and herbaceous plant species including northern white cedar, speckled alder, sheep laurel, meadowsweet, steeple bush, sedges, and sphagnum moss.

EDR documented two sites within the northern portion of the Project area that displayed characteristics of sandstone pavement barrens (Reschke, 1990). These areas were located in the vicinity of proposed turbines 116 and 5A, and were characterized by very shallow soils over sandstone bedrock (plus areas of exposed bedrock). A thin/broken overstory of white pine or gray birch occurs in places, but these communities are dominated by low shrubs and herbaceous vegetation including lowbush blueberry, huckleberry, chokeberry, reindeer moss, and other mosses and likens. This community has a state rarity ranking of S1, indicating that it is especially vulnerable in New York State.

3.3.1.2 Fish and Wildlife

Fish and wildlife resources within the Project area were identified through analysis of existing data sources, such as the North American Breeding Bird Survey (BBS), the New York State Breeding Bird Atlas (BBA) and the New York State Amphibian and Reptile Atlas, along with an on-site breeding bird survey conducted by Woodlot Alternatives, Inc. (Woodlot) during June, 2005, a migratory raptor survey conducted by Woodlot during the spring and fall of 2005, and reconnaissance-level field surveys conducted by ecologists from Curry & Kerlinger, LLC and EDR during the fall of 2005. This information was supplemented through correspondence received from the New York State Natural Heritage Program (NHP) and the U.S. Fish & Wildlife Service (USFWS) (Appendix G), as well as site-specific avian and bat studies conducted by Woodlot (Appendix F).

A total of 62 wildlife species (or sign of these species, such as identifiable tracks, feathers, and/or scat) were observed within the Project area during various on-site field surveys conducted during 2004 and 2005. In addition, based on existing data sources and observed habitat conditions, it is estimated that approximately 311 different species could potentially be found at some time within the Project area. These species, including scientific names, are listed in Appendix F. More specific information regarding wildlife within the Project area is presented below.

3.3.1.2.1 Birds

Based on the results of on-site field surveys, along with information from existing data sources, it appears that approximately 203 avian species could occur within the Project area at some time throughout the year. Details on the site's avian community are presented below.

Breeding Birds: The New York State Breeding Bird Atlas (BBA) is a comprehensive, statewide survey that indicates the distribution of breeding birds in New York State. The Project area is covered by 14 BBA survey blocks, each of which covers a 5 square kilometer

(km^2) area. These data indicate that a total of 135 species occur within, or adjacent to, the Project area. Of these 135 species, 68 were confirmed as breeding birds, 37 were recorded as probable breeding birds, and 30 were recorded as possible breeding birds. Included among these species are one state-listed endangered species, two state-listed threatened species, and nine species of special concern in New York State (see discussion in Section 3.3.1.3). The majority of bird species documented in the BBA are common inhabitants of woodland, woodland edge, shrubland, agricultural, and grassland, habitats. Given the extensive wetlands that occur in the northeast section of the Project area, waterbirds were also fairly well represented in the BBA survey. Confirmed and probable breeders included American bittern, great blue heron, Canada goose, wood duck, mallard, Virginia rail, spotted sandpiper, Wilson's snipe, and American woodcock.

The Breeding Bird Survey (BBS) is a long-term, large-scale avian monitoring program that tracks the status and trends of North American bird populations. Four BBS routes are located within 15 miles (24 km) of the Project site in Clinton and Franklin Counties and in adjacent Quebec. One of these routes (Ellenburg) crosses or abuts a portion of the Project area. The list of birds recorded along these BBS routes is essentially the same as that derived from the BBA data. The most common species on the Ellenburg route were pigeon, mourning dove, alder flycatcher, red-eyed vireo, blue jay, American crow, tree swallow, barn swallow, eastern bluebird, American robin, European starling, yellow warbler, chestnut-sided warbler, ovenbird, common yellowthroat, song sparrow, white-throated sparrow, bobolink, red-winged blackbird, common grackle, American goldfinch, and house sparrow.

The breeding bird field survey conducted by Woodlot documented 53 species, the most abundant of which were song sparrow, white-throated sparrow, black-capped chickadee, and black and white warbler. Based on the results of this survey, along with the BBA and BBS data, it appears that the Project area has a diverse breeding bird community made up of mainly common species of field and woodland habitats. The most common field species are song sparrow, red-winged blackbird, American robin, and bobolink, while the most common woodland species are white-throated sparrow, black-capped chickadee, black-and-white warbler, veery, and yellow warbler (Woodlot Alternatives 2005b).

Migrating Raptors: Field surveys conducted by Woodlot in 2005 included a raptor migration survey (see Appendix F). This survey involved visually observing raptor migration within the Project area for a total of 20 days (10 days in the spring and 10 days in the fall). The spring survey revealed a total of 170 raptors (representing 11 species) and a passage rate of 2.83 birds per hour, while the fall survey revealed a total of 217 raptors (representing 15 species) and a passage rate of 3.62 birds per hour. Both surveys included some state and federally-listed species, including bald eagle and peregrine falcon.

During both the spring and fall surveys, raptor migration occurred over a broad front, and flight pathways did not appear well correlated with physiographic or vegetative conditions on the ground. Overall, approximately 69% of the observed raptors were flying less than 120 m

(400 feet) above the ground (i.e., below the height of the proposed turbines). According to the Project Avian Risk Assessment (ARA), hawks generally migrate at much higher altitudes, ranging from 600 up to 1,500 feet or even higher at midmorning, and up to altitudes of 3,500 to 4,000 feet or higher by mid-afternoon, when rising columns of air (thermals) reach their maximum (Kerlinger and Guarnaccia, 2006 – see Appendix F). Woodlot's finding of low migration altitude may be a function of using direct visual observations, which rarely detect higher flying birds, suggesting that such counts are biased in both numbers and in the impression they give of migration flight behavior (Kerlinger, 1989).

The results of the 2005 surveys indicate that passage rate of raptors in the Project area is low relative to other sites in the region, and an order of magnitude lower than at significant hawk watch sites (see Table 3.3.1.2.1-1 below). This is likely due to a lack of landscape features that would tend to concentrate migration activity, and because the Project area occurs at the northern range of most migrating raptor species (Kerlinger and Guarnaccia, 2006).

Table 3.3.1.2.1-1: Comparison of Hawk Migration Counts at the Marble River Site, with Data from Well Known Hawk Migration Sites in Pennsylvania and New York State[1].

Site	Season	Numbers of Hawks Counted[1]	Hawks Per Hour
Marble River, NY	Spring	170	2.8
	Fall	217	3.6
Hawk Mountain, PA	Fall	~18,300	16
Little Gap, PA	Fall	~15,800	28
Derby Hill, NY	Spring	~23,600	60
Braddock Bay, NY	Fall	~30,800	66

[1]Source: www.hawkcount.org (2005)

Migrating Songbirds: Woodlot also conducted spring and fall nocturnal radar surveys to characterize songbird migration within the Project area (see Appendix F).

The spring study included 39 nights of radar data, collected between April 15 and May 29, 2005. Data on passage rates, flight altitude, and flight direction were obtained over the course of the study. These data indicated that passage rates ranged from 3 avian targets/kilometer/hour (t/km/hr) to 728 t/km/hr, with a mean nightly passage rate of 254 t/km/hr. Based on ceilometer surveys, almost all of these radar targets are assumed to be night-migrating songbirds. The average nightly flight altitude ranged from 172 meters (564 feet) to 831 meters (2,726 feet), with a mean flight altitude of 432 meters (1,417 feet). The seasonal average percentage of avian targets flying below 120 meters (approximate height of the proposed turbines) was 11%. Based upon survey results, spring songbird migration was characterized as broad front, and in general, the flight direction was to the northeast.

The fall study included 38 nights of radar data, collected between September 1 and October 15, 2005. Fall passage rates ranged from 9 t/km/hr to 429 t/km/hr, with a mean nightly passage rate of 152 t/km/hr. The average nightly flight altitude ranged from 259 meters (850 feet) to 704 meters (2,309 feet), with a mean flight altitude of 438 meters (1,437 feet). The seasonal average percentage of avian targets flying below 120 meters was 5%. As in the spring, avian migration during the fall survey was characterized as broad front, and in general, the flight direction was to the south. Both the spring and fall data were consistent with results from other New York sites, as indicated in Table 3.3.1.2.1-2 below.

Table 3.3.1.2.1-2: Summary of Migration Characteristics at the Marble River Site and Several Other Sites in New York State.[1]

Site	Targets Per Kilometer Per Hour	Mean Altitude of Flight	Percent Targets Lower than ~125m	Mean Direction of Flight
Spring				
Marble River	254	422 m – 1,384 feet	11%	40°
Cape Vincent	473	130 m – 426 feet	65%	18°
Chautauqua	395	528 m – 1,732 feet	4%	29°
Copenhagen	280	~136 m – 446 feet	62%	12°
Wethersfield	42	178 m – 584 feet	59%	21°
Fall				
Marble River	152	438 m – 1,437 feet	5%	193°
Chautauqua	238	532 m – 1,745 feet	4%	199°
Copenhagen	371	148 m – 485 feet	49%	184°
Flat Rock	158	415 m – 1,361 feet	8%	184°
Harrisburg	135	182 m – 597 feet	45%	181°
Martinsburg	661	154 m – 505 feet	47%	191°
Prattsburgh	200	365 m – 1,197 feet	9%	177°
Wethersfield	175	154 m – 505 feet	57%	179°

[1]Sources: Marble River – Woodlot Alternatives 2005a, 2005b; Cape Vincent, Copenhagen, Martinsburg – Cooper, Johnson, and Ritchie 1995; Flat Rock – Mabee, Plissner and Cooper, 2005; Prattsburgh – Mabee, Plissner, and Cooper 2005; Wethersfield and Harrisburg – Cooper and Mabee 1999; and Chautauqua – Cooper, Mabee, and Plissner 2004, Cooper, Stickney, and Mabee 2004.

Migrating Waterbirds: Although the Project area includes several larger man-made ponds, stream, and wetlands, none of these nearby water bodies is large enough or productive enough to attract significant numbers of waterbirds (ducks, geese, rails, shorebirds, etc.) during fall and spring migration. The Project site is about equidistant from two major water bodies for waterfowl – the St. Lawrence River and Lake Champlain. These water bodies are about 20 miles away, to the northwest and east respectively, and likely serve to funnel waterfowl away from the Project area. However, it should be noted that migrating geese do make stopovers to feed in agricultural fields during fall and spring migration. During the fall site visits snow geese and Canada geese were recorded in area farm fields.

Wintering Birds: The Project site is subject to strong northwest winds, low temperatures, and deep snow during the winter season. Food for most birds is likely to be scarce at this time, and therefore, a low diversity and density of wintering birds would be expected in and around the Project site. Christmas Bird Count (CBC) data indicate that a total of 90 wintering species have been documented in the area over the last ten years. The most common wintering bird species are Canada goose, mallard, pigeon, mourning dove, American crow, European starling, snow bunting, common redpoll, and house sparrow.

3.3.1.2.2 Mammals

Due to a lack of existing data regarding mammals within the Project area, the occurrence of mammalian species was documented through reconnaissance-level field surveys and evaluation of available habitat by EDR during the fall of 2005. This effort suggests that up to 45 species of mammal could occur in this area, of which 14 species (or sign of their occurrence) were actually observed. These species included whitetail deer, raccoon, northern red squirrel, black bear, and beaver. Species not observed, but likely to occur in the area, include striped skunk, mink, weasels, woodchuck, red fox, coyote, gray fox, gray squirrel, muskrat, eastern cottontail, and a variety of small mammals (mice and shrews). All of the observed species, and those likely to occur in the area based on habitat conditions, are common and widely distributed throughout New York State.

To characterize and document bat activity within the Project area, Woodlot conducted field surveys during the spring, summer, and fall of 2005 (see Appendix F). Spring and fall studies were conducted by deploying Anabat® acoustic detectors, on Project met towers to record bat vocalizations. The spring study was conducted for 46 nights (April 14 to May 30, 2005), and identified a total of 12 bat call sequences were recorded, all of which were identified as species within the genus *Myotis*.

The fall Anabat survey was conducted for 91 nights (August 1 – October 11, 2005) and documented a total of 506 bat call sequences. Approximately 51% of these were identified as species within the genus *Myotis* and 17% were identified as big brown bat. The majority of mytoid call sequences most closely resembled the calls of little brown bat, a species expected to be common in the area. Approximately 20% of the recorded vocalizations were unidentifiable, and therefore classified as unknown. However, many of these were assumed to be either big brown bat or silver-haired bat.

A summer field survey involved documenting bat activity during a nine-night sampling period (July 5 – July 31, 2005). This survey included deploying an Anabat bat detector in a met tower and carrying a detector while walking or driving various landscape features in the Project area where bat activity was most likely (including field edges, hedgerows, roadsides, streams, and wetlands). A total of 341 bat call sequences were recorded (319 calls from active surveys and 22 calls from passive surveys). Of these, 55% were hoary bats, 29% were identified to the genus *Myotis*, and 8% were identified as big brown bat, with a few calls identified as an Eastern red bat and silver-haired bats also detected.

3.3.1.2.3 Reptiles and Amphibians

Reptile and amphibian presence within the Project area was determined through reconnaissance-level field surveys conducted by EDR and review of the New York State Amphibian and Reptile Atlas. The Atlas Project was a ten-year survey (1990 through 1999) designed to document the geographic distribution of the state's herptofauna. Atlas data was collected and organized according to USGS 7.5-minute quadrangles (NYSDEC, 2006). Based on this data, along with documented species ranges and field observations of species and existing habitat conditions, it is estimated that over 25 reptile and amphibian species could occur in the area (Appendix F). However, due to the time of year at which field surveys were conducted (late fall), only three of these species (eastern garter snake, mink frog, and green frog) were actually observed on site. Species not observed, but likely to occur in the Project area based on existing range and habitat conditions, include spotted salamander, painted turtle, northern water snake, bullfrog, and northern spring peeper. All of these species are common and widely distributed throughout New York State.

3.3.1.2.4 Fish

Ponds and streams within the Project area likely support both warm water and cold-water fish populations (some native and some stocked). Although no fisheries data were obtained or field surveys conducted, fish species such as largemouth bass, smallmouth base, sunfish, brook trout, brown trout, creek chub, shiners, and dace most likely occur within the Project area. A relatively small number of state-classified trout streams occur in the Project area. These streams, which include the headwaters and tributaries of English River, Marble River, and the North Branch of the Great Chazy River, support a coldwater fish community including trout, creek chub, and slimy sculpin. Ponds within the area likely support a warm water fish community (e.g., bass, sunfish, and shiners), and it is possible that several larger/deeper ponds may be stocked with trout. Ponds and streams within the Project area are generally on private property and lack any provisions for public access (i.e., public fishing easement). Consequently, they receive relatively little use as recreational fisheries. The most significant fisheries in the region include the Great Chazy River and Lower Chateaugay Lake. The closest of these waterbodies is approximately 4 miles from the nearest proposed turbine.

3.3.1.2.4 Wildlife Habitat

As previously described, the Project area includes a variety of ecological community types. The value of these communities to various wildlife species is summarized below.

Hayfields, Successional Old Field, and Wet Meadow Habitats: These grass/forbs dominated areas provide preferred nesting and foraging habitat for open country bird species such as bobolink, red-winged blackbird, horned lark, eastern meadowlark, savannah sparrow, and song sparrow. The vegetation in these areas provides forage in the form of seeds and foliage, which is utilized by birds as well as, small mammals (mice, shrews, etc.), woodchucks, whitetail deer, and eastern cottontail. Birds of prey, such as northern harrier, and mammalian predators, such as red fox and eastern coyote also use open fields as hunting areas.

Successional Shrubland and Scrub-Shrub Wetland Habitats: Shrub-dominated habitats (both wetland and upland) provide nesting and escape cover for a variety of wildlife species. Various songbirds, such as gray catbird, American goldfinch, indigo bunting, and yellow warbler, require low brushy vegetation for nesting and escape cover. Whitetail deer and eastern cottontail are also typically found in brushy edge habitat. In addition, many of the shrub species found in these areas produce berries that are a food source for birds and mammals such as raccoon, striped skunk, and opossum.

Forest Habitat: Some of the larger areas of forest habitat within the Project area may provide habitat for wildlife species that require forest interior conditions, such as wood thrush, veery, eastern wood pewee, red-eyed vireo, black-capped chickadee, rose-breasted grosbeak, black-and-white warbler, and pileated woodpecker. However, much of this forest land has been (and continues to be) disturbed by logging activity. This activity has resulted in the clearing of overstory trees and the development of forest roads and clearings in many of the larger forested areas. Consequently, these areas are often characterized by a broken canopy and an abundance of young saplings, as well as periodic human activity/disturbance. Therefore, many of these areas have already experienced forest fragmentation and do not currently provide the forest interior conditions required by the afore-mentioned bird species.

Ruffed grouse prefer habitat that includes mixed-age stands of aspen (including dense sapling stands) similar to those seen in the northeastern portion of the Project area. This species was observed frequently during EDR's fall 2005 field surveys. Many of the forested areas also include extensive wetland systems (including forested swamps) and therefore provide habitat for wading birds and waterfowl, including great blue heron and wood duck. Mammals that utilize forested habitat include gray squirrel, red squirrel, eastern chipmunk, beaver, black bear, and whitetail deer. Smaller areas of contiguous woodland are found adjacent to active agricultural fields within the Project area and provide habitat for forest edge species.

Emergent Marsh and Open Water Habitats: In the Project vicinity, there are no large lakes, marshes, mudflats, or other types of wetlands that would attract waterbirds, including ducks, rails, and shorebirds, in significant numbers. However, emergent marsh and open water habitats in the Project area are used as a source of food, water, and/or cover by waterbirds and many of the upland species mentioned previously. These water bodies support fish, amphibians, and a diversity of insects and aquatic invertebrates. They are preferred foraging areas for aerial insectivores, including songbirds and bats. In addition, these areas provide habitat for various wetland/aquatic wildlife species, including great blue heron, mallard, wood duck, painted turtle, bullfrog, mink, muskrat, and beaver. A large nest, that appeared to be an osprey's nest, was observed adjacent to one pond in the northeastern portion of the Project area.

The Avian Risk Assessment prepared for the Project (Kerlinger and Guarnaccia, 2006, contained in Appendix F) indicates that there are no designated Important Bird Areas, reserves, or sensitive habitats within or adjacent to the Project area. In addition, there are no federal, state or private protected areas that include significant or essential bird habitat. The ARA concludes that there is nothing about habitat in the Project area that is distinguishable in character or ornithological significance from the surrounding agricultural and wooded landscape. Nor is there any indication that habitat within the Project area would be an ecological magnet that attracts or concentrates birds.

3.3.1.3 Threatened and Endangered Wildlife Species

Written requests for listed species documentation were sent to the USFWS and the NHP on September 19, 2005. According to the agency response letters, no state- or federally-listed threatened, endangered or special concern wildlife species are known to occur within the vicinity of the Project area. Responses to similar letters sent to these agencies by TtEC in February 2004, indicated that Indiana bat (state- and federally-listed as endangered) and small-footed bat (state-listed special concern) hibernate in three caves within 75 miles of the Project site and could disperse from these caves into the Project area. The presence of common loon (state-listed special concern) at Upper Chateaugy Lake and Ragged Lake, and least bittern (state-listed threatened) at a wetland in the Town of Belmont (Franklin County) was also noted (see Agency Correspondence in Appendix G). It is worth noting that all of these water bodies are over 5 miles from the nearest proposed turbine.

According to the BBA, no federally-listed threatened or endangered wildlife species have been documented in the area. However, one state-listed endangered species (peregrine falcon), one state-listed threatened species (northern harrier), and eight state-listed species of special concern (Cooper's hawk, sharp-shinned hawk, grasshopper sparrow, American bittern, whip-poor-will, horned lark, osprey and vesper sparrow) have been documented on

BBA blocks that include the Project area. BBS data in the vicinity of the Project area indicate the presence of two state-listed threatened species (northern harrier and upland sandpiper) and six species of special concern (American bittern, sharp-shinned hawk, Cooper's hawk, red-shouldered hawk, common nighthawk, and horned lark).

The presence of state- and/or federally-listed threatened and endangered species was also determined during on-site surveys conducted during 2005. No listed endangered species were observed on site, or are considered likely to nest within the Project area (Woodlot, 2005). However, two state-listed threatened species (northern harrier and bald eagle) and five state-listed species of special concern (sharp-shinned hawk, Cooper's hawk, horned lark, grasshopper sparrow, and osprey) were observed during the field surveys. All state-listed bird species documented in or adjacent to the Project area are listed in Table 3.3.1.3-1, below. Of these, it appears that seven are likely to be nesting within the Project area based on the availability of suitable habitat (Kerlinger and Guarnaccia, 2006).

Table 3.3.1.3-1: Documented State-listed Species in the Vicinity of the Project Area[1]

Common Name	Scientific Name	NYS Legal Status
Common Loon	*Gavia immer*	Special Concern
Red-Shouldered Hawk	*Buteo lineatus*	Special Concern
Northern Harrier*+	*Circus cyaneus*	Threatened
Peregrine Falcon	*Falco peregrinus*	Endangered
Cooper's Hawk*+	*Accipiter cooperii*	Special Concern
Sharp-shinned Hawk*+	*Accipiter striatus*	Special Concern
Grasshopper Sparrow*+	*Ammodramus savannarum*	Special Concern
American Bittern+	*Botaurus lentiginosus*	Special Concern
Least Bittern	*Ixobrychus exilis*	Threatened
Whip-poor-will	*Caprimulgus vociferus*	Special Concern
Horned Lark*+	*Eremophila alpestris*	Special Concern
Osprey*+	*Pandion haliaetus*	Special Concern
Vesper Sparrow+	*Pooecetes gramineus*	Special Concern
Pied-billed Grebe	*Podilymbus podiceps*	Threatened
Upland Sandpiper	*Bartramia longicauda*	Threatened
Sedge Wren	*Cisthothorus platensis*	Threatened
Northern Goshawk	*Accipiter getilis*	Special Concern
Common Nighthawk	*Chordeiles minor*	Special Concern
Golden-winged Warbler	*Vermivora chrysoptera*	Special Concern
Bald eagle*	*Haliaeetus leucocephalus*	Threatened
Short-eared Owl	*Asio flammeus*	Endangered
Loggerhead Shrike	*Lanius ludovicianus*	Endangered
Henslow's Sparrow	*Ammodramus henslowii*	Threatened

[1]Source: BBA, BBS, Agency Correspondence, and On-site Surveys
*Observed on site in 2005
+Likely nesting on site (Kerlinger and Guarnaccia, 2006)

No listed endangered, threatened, or special concern mammal species were observed within the Project area during the site visits conducted by EDR, and based upon existing habitat conditions, are considered unlikely to occur there. However, as indicated in the agency correspondence to TtEC, concerns exist regarding potential impacts to Indiana bat and small-footed bat. The Indiana bat is a state- and federally-listed endangered species. Approximately 42,000 Indiana bats reside within New York State and the population appears to be growing (A. Hicks, personal communication). These bats winter (hibernate) in 10 known locations (caves and mines) throughout the state. They emerge in the spring and disperse on average up to 30 miles to their summer range. The nearest wintering cave (hibernaculum) used by Indiana bats is located 30-60 miles southeast, in Essex County (Woodlot, 2005a).

To assess the potential for Indiana bat to be found on-site, and in accordance with guidance provided by the NYSDEC. Woodlot conducted spring, summer, and fall acoustic monitoring (Anabat) surveys in 2005. A total of approximately 370 bat call sequences from species within the genus *Myotis* were recorded during the 2005 field surveys. While current technology does not allow for definitive species identification within the genus *Myotis*, most of these are assumed to be little brown bat, which is likely to be one of the most common bat species in the area. The preferred habitat of small-footed bats is rocky talus slopes, which do not occur within or adjacent to the Project area. Thus, this species is not anticipated to occur in the area with any frequency. Various factors also suggest that the occurrence of Indiana bat is unlikely within the Project area, as discussed in Section 3.3.2.2.3.

According to the data obtained from the NYS Amphibian and Reptile Atlas, no state- or federally-listed reptile or amphibian species have been documented within the Project area, and none were observed during the course of field surveys.

3.3.2 Potential Impacts

3.3.2.1 Construction

3.3.2.1.1 Vegetation

Project construction will result in temporary and permanent impacts to vegetation within the Project area. However, no plant species occurring in the Project area will be extirpated or significantly reduced in abundance as a result of construction activities.

Construction-related impacts to vegetation include cutting/clearing, removal of stumps and root systems, and increased soil disturbance (exposure, compaction, etc.). Along with direct loss of (and damage to) vegetation, these impacts can result in a loss of wildlife food and cover, increased soil erosion and sedimentation, and a disruption of normal nutrient cycling. Impacts to vegetation will result from site preparation, earth-moving, and excavation/backfilling activities associated with construction/installation of staging areas, access roads, foundations, buried electrical interconnect, and crane path routes. Based on the area of impact assumptions described in Section 2 (Project Construction), these activities will result in disturbance to approximately 243 acres of agricultural land, 11 acres of successional old-field, 87 acres of successional shrubland, and 479 acres of forest. As indicated in Table 3.3.2.1.1-1, the majority of these impacts will be temporary, and native vegetation will be allowed to regenerate in areas disturbed during construction, following site restoration. Construction-related impacts to wetlands were previously discussed in Section 3.2.2.

Table 3.3.2.1.1-1: Impacts to Vegetative Communities

Community[1]	Total Disturbance	Temporary Disturbance	Permanent Loss
Agricultural Land	243	204	39
Successional Old Field	11	6	5
Successional Shrubland	87	74	13
Forest land	479	405	74
Disturbed/Developed	17	14	3
TOTAL	**837**	**703**	**134**

[1]Excludes wetland and open water communities

3.3.2.1.2 Fish and Wildlife

In general, construction-related impacts to wildlife will be minimal as a result of siting Project components away from sensitive habitats and in areas where previous or ongoing disturbance has occurred. Construction-related impacts to wildlife are anticipated to be limited to incidental injury and mortality due to construction activity and vehicular movement, construction-related silt and sedimentation impacts on aquatic organisms, habitat disturbance/loss associated with clearing and earth moving activities, and displacement of wildlife due to increased noise and human activity. Each of these potential impacts is described below.

Incidental injury and mortality should be limited to sedentary/slow-moving species, such as small mammals, reptiles and amphibians, which are unable to move out of the area being disturbed by construction. If construction occurs during the nesting season, wildlife subject to injury or mortality could also include the eggs and young offspring of nesting birds, as well as immature mammalian species that are not yet fully mobile. More mobile species and mature individuals should be able to vacate areas that are being disturbed.

Significant portions of the Project occur in or adjacent to agricultural fields, or on forest land that has been severely disturbed by logging activity. These areas provide habitat for a limited number of wildlife species, and are subject to periodic disturbance in the form of mowing, plowing, harvesting, vehicle movement, and human activity. To the extent practicable, Project access roads (including stream and wetland crossings) will utilize existing farm lanes and forest roads, thus further reducing habitat loss. As discussed for vegetation, approximately 820 acres of habitat will be disturbed during construction, and permanent loss of natural habitat to built facilities will total 134 acres. The majority of this impact will occur in forested habitat. Creating breaks in a large area of contiguous forest can alter the secluded forest interior conditions required by songbirds such as wood thrush, rose-breasted grosbeak, and pileated woodpecker. However, forest fragmentation impacts are not anticipated to be significant. This is due to the fact that most of the forested areas where turbines are proposed are either 1) relatively small woodlots that lack forest interior conditions, or 2) have already been disturbed/fragmented through past and ongoing logging activity.

Earth moving activities, including construction of new access roads and associated stream and wetland crossings may result in sediment and siltation impacts to aquatic habitat. These impacts could occur in the vicinity of proposed wetland and stream crossings by Project access roads, or down slope of areas subject to significant earth-moving activity (e.g., turbine sites). Siltation and sedimentation of water bodies can adversely affect water quality and aquatic habitat. It can also interfere with the respiration of aquatic organisms, and the survival of fish and amphibian eggs and larvae

Some wildlife displacement will also occur due to increased noise and human activity as a result of Project construction. The significance of this impact will vary by species, and the seasonal timing of construction activities. However, species most likely to be disturbed/displaced by Project construction include open country/grassland avian species (such as savannah sparrow, bobolink, and red-winged blackbird).

None of the construction-related impacts described above will be significant enough to affect local populations of any resident wildlife species.

3.3.2.1.3 Threatened and Endangered Species/Unique Natural Communities

Because rare plants have not been documented in the Project area, construction-related impacts to listed threatened and endangered plant species are not anticipated. However, as mentioned in Section 3.3.1.1.2, two unique natural communities do occur within the area and could be subject to disturbance during construction. The open peatland wetland along the access road to Turbine 10A will be avoided by shifting the proposed access road to the west. Impacts to the open peatland wetland along Bootleg Road cannot be avoided. However, impacts to this wetland are being minimized by utilizing an existing road crossing. Widening of Bootleg Road to accommodate construction vehicles could result in disturbance of approximately 90.9 acres in this community. This disturbance would be restricted to areas already somewhat disturbed/altered by the existing road crossing. Of this total, at least 0.45 acre of disturbance will be temporary, as fill used to accommodate large construction vehicles will be removed following construction. However, placement and removal of this fill, as well as use of the road crossings by construction vehicles, has the potential to result in sediment/siltation impacts. Temporary road widening is also likely to change the soil and hydrologic conditions of the impacted area of these wetlands even after the excess fill is removed. To avoid these impacts, the feasibility of utilizing Bootleg Road in its existing condition (i.e., without any widening) will be evaluated during the wetland permitting process.

Two areas of sandstone pavement barrens occur in the vicinity of Project components, and could also be impacted by construction. However, these impacts should be avoidable through minor relocation of turbines and access roads. Consequently, no direct impacts to sandstone pavement barrens are currently anticipated.

As mentioned previously, listed wildlife species observed within the Project area, and likely to be nesting, include one state-listed threatened species (northern harrier) and five state-listed species of special concern (horned lark, grasshopper sparrow, vesper sparrow, sharp-shinned hawk, and Cooper's hawk). In addition, the unoccupied nest of what appeared to be an osprey (state-listed special concern) was also observed on site. These species utilize a variety of habitats, including open grassland (northern harrier, horned lark, vesper sparrow, and grasshopper sparrow), forest (Cooper's hawk and sharp-shinned hawk) and open water/wetlands (osprey). Because the proposed Project will occur in or adjacent to all of these habitat types, construction-related impacts to these species are possible. Disturbance/displacement, habitat loss, and/or mortality impacts to eggs or young of these species could occur. However, avoidance of wetlands and areas of undisturbed forest should avoid or minimize impacts to the three listed raptor species. Given the relatively small area of grassland habitat that is being directly or indirectly impacted by Project construction, any impacts to the other listed species will be minor and largely temporary. Because listed mammals, reptiles and amphibians are not likely to occur to site, construction-related impacts to such species are not anticipated.

3.3.2.2 Operation

3.3.2.2.1 Vegetation

As indicated in Table 3.3.2.1.1-1, Project construction will result in permanent conversion of approximately 134 acres of vegetated land to unvegetated/built facilities (access roads, turbines, crane pads, substation, O&M building, etc.) within the Project area. This total will include approximately 39 acres of agricultural land, 5 acres of successional old-field, 13 acres of successional shrubland, 74 acres of forest and 11.6 acres of wetland and 56 surface water crossings. It should be noted that for forest vegetation, permanent impact will also occur through conversion of one vegetative community to another (i.e., forest to successional shrubland or old field). This conversion will occur within a 200-foot radius of all tower sites located in forested areas. A total of 180 acres of forestland will be converted to successional communities for the duration of Project operation. Other than minor disturbance associated with routine maintenance and occasional repair activities, other disturbance to plants and vegetative communities are not anticipated as a result of Project operation.

3.3.2.2.2 Wildlife

As with construction-related impacts, operational impacts to wildlife are generally anticipated to be minor, as a result of siting Project components away from high quality habitat such as large areas of grassland, wetland, and tracts of mature forest. Operational impacts to wildlife are expected to be limited to minor loss of habitat, possible forest fragmentation, some wildlife displacement due to the presence of the wind turbines, and some avian and bat mortality as a result of collisions with the wind turbines. Each of these potential impacts is described below.

Habitat Loss: A total of 131 acres of wildlife habitat will be permanently lost from the Project area (i.e., converted to built facilities). As mentioned in the previous section, the majority of this loss (approximately 74 acres) will occur in forest land. In addition, approximately 180 acres of forest will be maintained as a successional community (old field, shrubland, or saplings) for the life of the Project. Most of this habitat was already disturbed due to agricultural and forest management (logging) activities, and therefore is of limited value to forest interior and grassland nesting species. In addition, the total acres of wildlife habitat that will be lost due to Project development are not significant from a local or regional perspective.

Forest Fragmentation: As mentioned in the discussion of construction-related impacts, the proposed Project will result in permanent loss or conversion of 254 acres of forest habitat. However, the forested habitat being impacted by the Marble River Project is generally young/successional, and already highly disturbed by logging activities. Thus it is questionable as to whether forest interior conditions exist in these areas. In most places the proposed turbines and access roads are utilizing existing clearings (e.g., woods roads, skid trails, and log landings), which will minimize additional fragmentation of the forest. The forests on site are probably not receiving significant use by forest interior songbirds species, and will not be significantly fragmented by the proposed Project.

Disturbance/Displacement: While wildlife will likely become habituated to the presence of wind turbines within a few years, the rate (and degree) of habituation, is currently unknown because long-term studies have not been conducted. Forest and forest edge birds are not likely to be significantly disturbed because these species are familiar with tall features (i.e., trees) in their habitat (Kerlinger and Guarnaccia, 2006). However, evidence indicates that some grassland species do not respond favorably to the introduction of tall elements into in their habitat. Studies conducted at the Buffalo Ridge Wind Power Project in southwest Minnesota, and the Foote Creek Rim Project in Wyoming, revealed that grassland nesting birds are found in reduced numbers as the proximity to wind turbines increases (Leddy *et. al.* 1999; Johnson *et. al.*, 2000). Assuming similar behavior by grassland species within the Project area, the Marble River Wind Farm may result in a reduced number of nesting grassland species in open fields that contain wind turbines.

Other proposed wind power projects in New York State have raised public concerns regarding the potential displacement effect of wind turbines on Canada geese that forage in harvested crop fields. Kerlinger and Guarnaccia (2006) indicate that Canada geese readily habituate to man-made structures, and that geese have been observed foraging in fields that contain operating wind turbines at the Fenner Wind Power Project in Madison County, New York. This observation is also supported by a study conducted by the Iowa Cooperative Fish and

Wildlife Research Unit at the Top of Iowa Wind Farm located in Worth County, Iowa. Due to its proximity to three state-owned Wildlife Management Area's (WMA), the Top of Iowa Wind Farm experiences very high use by waterfowl (over 1.5 million duck and goose use days per year). Observations at this site revealed that the wind turbines did not affect the use of the fields by Canada geese or other species of waterfowl. In addition, over the two year course of this study, no turbine-related waterfowl or shorebird mortality was documented (Koford *et. al.*, 2005). Based on these study results, and observations at other wind power projects, the proposed Project is not anticipated to have a significant, long-term displacement or mortality effect on resident or migrating Canada geese.

Landowners are also often concerned over the potential displacement effect of wind turbines on game species such as deer and wild turkey. While habituation to the presence of the turbines may not be immediate, species such as deer and wild turkey generally adapt quickly to the presence of man-made features in their habitat (as evidenced by the abundance of these species in suburban settings). Significant displacement of game species from a wind power site has not be reported, and the primary landowner at the existing Madison Wind Power Project in Madison County, New York, has indicated that he has not detected any apparent decline in game species on his property (C. Stone, personal communication).

Collision: Collision with man-made structures has been documented as a significant source of songbird mortality (Erickson *et. al.*, 2001). According to the Project ARA (Appendix F), avian fatalities at wind plants can result from collisions with turbine rotors, guy wires of on-site met towers, and, perhaps, wind turbine towers. An estimated 28,000 to 33,000 birds were killed at about 15,000 wind turbines in the United States in 2001 (Erickson et al. 2001). Fatalities ranged from zero to about 7 birds per turbine per year, yielding an average of 2.1 birds per turbine per year. Recent studies, in the Western and Midwestern United States have confirmed these fatality levels, while studies from the Eastern United States reveal slightly higher fatality levels than those observed farther west. A study conducted in 2003 at the Mountaineer Wind Energy Center in West Virginia found an average mortality rate of about 4 birds per turbine per year (Kerns and Kerlinger 2004). The greatest fatality rate found for birds at turbines in the United State was about 7 birds per turbine per year at a small project in eastern Tennessee. The two-year study at this site revealed several dozen fatalities, mostly night migrating songbirds (Nicholson 2002). As mentioned previously, a study at the Top of Iowa Wind Power Project site revealed no fatalities to Canada Geese or other waterfowl (Koford et al. 2005). Fewer than 1.5 birds per turbine per year were found to be killed at this site.

As these study results illustrate, bird collisions are relatively infrequent events at wind farms. No federally-listed endangered or threatened species have been recorded, and only occasional raptor, waterfowl, or shorebird fatalities have been documented. In the Midwestern and Eastern United States, night migrating songbirds have accounted for a majority of the fatalities at wind turbines. In general, the documented level of fatalities has not been large in comparison with the source populations of these species, nor have the fatalities been suggestive of biologically significant impacts to species (Kerlinger and Guarnaccia, 2006). The observed level of mortality is minor when compared to other potential sources of avian mortality (Erickson, et al. 2001).

Although collision risk is likely to be low, data on avian migration at the Project site were collected to determine if site-specific migration characteristics might suggest an elevated level of risk relative to other sites. As indicated in Table 3.3.1.2.1-2, radar data collected at the Project site are similar to data from other sites in New York in terms of passage rates, flight altitudes, and flight directions. These results are also similar to those seen at other Northeastern sites (e.g., Searburg, Vermont; Mt. Storm, West Virginia; Casselman, Pennsylvania; Dans Mountain, Maryland). Perhaps most important, in terms of the potential for collision impacts, is the flight altitude of migratory birds. Data from radar studies at proposed and existing wind power project sites across the Eastern United States consistently show mean flight altitudes well above the height of the proposed wind turbines. Radar data from Northeastern sites typically show mean songbird flight altitudes in the range of 1,200 to 2,000 feet with between 1% and 13% flying below the 125-meter (410 foot) altitude. Data collected at the Project site are consistent with these observations.

Because there currently is no predictive model available to quantify expected avian collision mortality as a result of wind power project operation, risk assessments must be based on pre-construction indices and indicators of risk (e.g., breeding bird survey and radar data) at the proposed Project site, along with empirical data from operating projects (e.g., avian mortality surveys). Because pre-construction surveys revealed no indicators of elevated risk (e.g., abundance of rare species, unusually high numbers, unusually low flight altitude, habitat that would act as an ecological magnet), it appears that avian collision mortality rates at the Project site should be similar to the relatively low rates seen at other Eastern sites (i.e., 1 to 7 fatalities per turbine per year). Even if as many as 7 birds per turbine per year are killed (i.e., the high end of what has been observed at other projects), total annual collision mortality would be approximately 763 birds. Although this number may appear large, as the radar data indicate, it is a tiny fraction of the population that migrates through the area, and is not considered a biologically significant impact.

With the exception of the Altamont Pass Project in California, documented raptor fatalities at wind power projects are virtually non-existent. In fact, just more than ten raptor fatalities have been documented from all the mortality studies conducted outside of California (R. Roy, personal communication). In addition, studies conducted at operating wind power projects that are near concentrated hawk migration corridors indicate that raptors rarely collide with wind turbines (DeLucas *et. al.*, 2004; Kerns and Kerlinger, 2004). Based on the results of published collision mortality studies and the results of on-site raptor migration surveys, Project operation is not expected to result in significant collision mortality to migrating raptors. On-site surveys determined that raptor passage rates were low, and that migration occurred across or broad front (Woodlot, 2005a and 2005b). The Project ARA concludes that risk to listed and unlisted raptors at the Project is not likely to be biologically significant. The numbers of fatalities will probably be small and limited primarily to American kestrel, red-tailed hawk, and perhaps other species in rare instances. The species most likely to be impacted are those that forage in open country, as opposed to migrating raptors that pass through the site or general area.

The northern harrier (threatened) forages and probably nests on site, as was evident from BBA data, and on-site observations. These birds are at some risk of collision with turbines, although documented fatalities involving northern harriers at wind power facilities are relatively rare. Harriers occur regularly at wind power sites in the Western and Midwestern United States, yet there are only a few records of collisions. The foraging flight of these birds is generally below the rotor-swept height, but their aerial displays ("sky dancing") during the nesting season may put them at rotor height and at increased risk of collision (Kerlinger and Guaruaccia, 2006).

Findings from the Mountaineer Wind Facility in West Virginia and the Meyersdale Wind Facility in Pennsylvania have heightened concerns regarding collision risk to migratory bat populations. While few studies have been conducted to document bat mortality at operating wind power sites, Johnson and Strickland (2004) documented bat mortality rates of 46.2 fatalities per turbine per year at wind projects sited along forested ridgelines in the Appalachians. This differs from the much lower rates (ranging from 0.07 to 2.32 fatalities per turbine per year) documented at more open Midwest and western sites (Erickson *et al.* 2002).

As previously mentioned, the on-site acoustic monitoring studies conducted by Woodlot in 2005 revealed bat call sequence rates that are relatively low when compared to other sites in the Northeast. This, along with the fact that the Project site lacks some of the characteristics of sites where high numbers of bat collisions have been documented (i.e., forested Appalachian ridge tops) and is at the northern limit of some bat species range suggests that bat collision mortality at this site is not likely to be high. However, the site does include a significant amount of forest land and wetlands where bats like to forage. In fact, the interspersion of forest and open water/wetland areas in the northeastern portion of the Project area probably represents preferred habitat for some bat species. Therefore, the proposed Project is also unlikely to exhibit the very low mortality rates typically seen at Western and Midwestern wind power projects. Until reliable predictive models can be developed, no more definitive assessment of risk to bats at wind power projects can be provided.

3.3.2.2.3 Threatened and Endangered Species

As previously mentioned, no state- or federally-listed threatened or endangered plant species are known to occur within the Project area, and sandstone pavement barrens that occur in the area will be avoided. Therefore, impacts to rare plant species and this unique ecological community are not expected. Although the Project could result in the permanent loss or alteration of up to 0.45 acre of open peatland wetlands, ongoing Project operation is not anticipated to result in additional impacts to this ecological community. In fact, if the existing road crossing is improved, (i.e., using better road material and improving drainage), sediment and siltation impacts that are currently occurring should be reduced.

Operational impacts to listed grassland bird species, such as northern harrier, horned-lark and grasshopper sparrow, could include occasional collision mortality and disturbance/displacement of nesting individuals. Of the listed grassland species documented within the Project area, only horned lark is considered susceptible to significant collision risk. This is due to the aerial courtship displays performed by males of this species. Regularly flying in circles at 100-200 feet (30-60 m) above the ground would put these species at risk of colliding with turbine rotors. This has been documented for horned larks at several Western wind power facilities. None of the other listed species have been documented to experience significant collision mortality at operating wind power projects, or occur in the Project area frequently enough to be exposed to significant risk (Kerlinger and Guarnaccia, 2006).

Because grassland birds have evolved in a habitat that lacks large overhead structures (i.e., trees), it is possible that the presence of wind turbines in open field could have a disturbance/displacement effect on listed grassland species (horned lark, grasshopper sparrow, vesper sparrow, and northern harrier). However, the siting of wind turbines for the most part at field edges and outside of the open meadow/pastureland habitat typically utilized by these species should result in very limited disturbance/displacement impacts on grassland birds.

As mentioned previously, the NYSDEC and the USFWS have expressed concerns regarding potential impacts to Indiana bats as a result of wind power projects in New York State. This concern has resulted primarily from sizeable bat kills that have occurred at wind power projects in recent years at the Mountaineer site in West Virginia and the Meyersdale site in Pennsylvania (although no Indiana bats are known to have been killed at these sites). Specific to this Project, correspondence received from the USFWS and the NYSDEC did not indicate any concern over the Project's potential to impact Indiana bat. Regardless, an analysis of potential impacts to Indiana bat is provided below.

The nearest wintering cave (hibernaculum) used by Indiana bats is located 30-60 miles southeast, in Essex County. While the proposed Project site is within the potential dispersal distance of Indiana bats, Project-related impacts on this species are not considered likely for a variety of reasons, including:

1. On-site acoustic monitoring did not document any calls that could be identified as Indiana Bats, and in fact is at the northern limit of this species' range.
2. The Project area is not in an area designated by regulatory agencies as critical habitat for Indiana bats.

3. Bats utilizing the Essex County hibernaculum are likely to be widely dispersed once they leave the cave. NYSDEC telemetry studies also indicate that most Indiana bats in New York breed within 30 miles of their hibernacula (A. Hicks, personal communication). Thus, relatively few individuals are likely to occur in the vicinity of the proposed Project.
4. There are no physiographic landscape features (e.g., abrupt ridge lines or water courses) that might direct or concentrate bats migrating to and from the Essex County hibernaculum toward the Project area.
5. High winds and low temperatures make the Project site less likely to receive use by Indiana bats, when compared to warmer, less exposed valley and lake plain areas located closer to the hibernaculum. Based on the results of previous NYSDEC studies of Indiana bats elsewhere in the state, it is reasonable to expect that Indiana bats (especially reproductive females) will remain within suitable habitat at lower elevation (e.g., large valley and lake plain areas along Lake Champlain, Lake Ontario, and the St. Lawrence River). A 2005 radio telemetry study of Indiana bats at the Glen Park hibernaculum (Jefferson County) revealed that none of the bats traveled further than 17 miles from the cave.
6. The majority of documented turbine-related bat mortality has involved three species of migratory tree bat (hoary bat, red bat, and silver-haired bat). An Indiana bat fatality has never been documented at any wind power project site in the United States, even those in proximity to Indiana bat hibernacula and summer maternity roosts, and where sizable numbers of other bat species have been killed.

Based on all of the information presented above, the Project is not expected to result in any impacts to the Indiana bat.

3.3.3 Proposed Mitigation

The development of wind power projects can legitimately be considered a form of mitigation, in that power generated from the wind can satisfy demand that would otherwise utilize power generated by other means. All electric generating facilities have impacts on ecological resources (fish, wildlife, natural communities). However, as indicated in Table 3.3.3-1 below, environmental impacts that result from more traditional power generating facilities (fossil fuel, hydroelectric, nuclear) are much more significant than the impacts caused by wind power projects.

Table 3.3.3-1: Environmental Impacts of Electricity Sources.

	Wind	Hydro	Nuclear	Coal	Natural Gas
Global Warming Pollution	None	None	None	Yes	Yes
Air Pollution	None	None	None	Yes	Limited
Mercury	None	None	Non	Yes	None
Mining/Extraction	None	None	Yes	Yes	Yes
Fuel Transportation and Storage	None	None	Yes	Yes	Yes
Fuel Waste	None	None	Yes	Yes	None
Habitat Impacts	Limited	Yes	Limited	Yes	Yes

Source: AWEA Factsheet. (www.awea.org/pubs/factsheets.html)

When all the environmental impacts are factored in, these sources of electric energy generation include a larger project footprint. This is due to direct habitat loss; the use of surface waters for generation and/or thermal regulation and resulting thermal discharge, fish entrainment, and impingement and habitat disturbance and air pollution related to the extraction and transportation of raw materials. Waste disposal effectively increases the footprint of a project and presents pollution/contamination concerns and air pollution, including acid precipitation and global warming have secondary effects on ecological (and human/cultural) resources worldwide.

3.3.3.1 Vegetation

Mitigation of impacts to vegetation will be accomplished primarily through careful site planning. Undisturbed forest and wetland areas are being avoided to the extent practicable. Therefore, the most ecologically significant communities within the Project area will be largely protected from disturbance. Project access roads will be sited on existing farm lanes and logging roads to the extent practicable, and areas of disturbance will be confined to the smallest area possible. In addition, a comprehensive sediment and erosion control plan will be developed and implemented to protect adjacent undisturbed vegetation and other ecological resources.

Mitigation measures to avoid or minimize impacts to vegetation will also include delineating sensitive areas (such as wetlands) where no disturbance or vehicular activities are allowed, educating the construction workforce on respecting and adhering to the physical boundaries of off-limit areas, complying with guidance provided by environmental monitors, employing best management practices during construction, and maintaining a clean work area within the designated construction sites. Following construction activities, all temporarily disturbed areas will be seeded (and stabilized with mulch and/or straw if necessary) to reestablish vegetative cover in these areas. Other than in active agricultural fields, native species will be allowed to revegetate these areas.

3.3.3.2 Fish and Wildlife

As previously discussed, construction-related impacts to fish and wildlife should be limited to incidental injury and mortality due to construction activity and vehicular movement, construction-related silt and sedimentation impacts on aquatic organisms, habitat disturbance/loss associated with clearing and earth moving activities, and displacement due to increased noise and human activities. Mitigation of impacts related to construction activity will be accomplished through careful site design (e.g., utilizing existing roads, avoiding sensitive habitat, and minimizing disturbance to the extent practicable). In addition, the contractor will assure that all work remains within the designated construction limits and does not encroach upon off-limit sensitive areas.

To avoid and minimize impacts to aquatic resources resulting from construction-related siltation and sedimentation, an approved sediment and erosion control plan and Storm Water Pollution Prevention Plan (SWPPP) will be implemented. The sediment and erosion control plan and SWPP were previously described in Section 3.2 (Water Resources). Proper implementation of these plans will assure compliance with NYSDEC State Pollutant Discharge Elimination System (SPDES) regulations and New York State Water Quality Standards. In addition, a Spill Prevention, Containment and Counter Measures (SPCC) Plan will be developed and implemented to minimize the potential for unintended releases of petroleum and other hazardous chemicals during Project construction and operation. To protect fish and aquatic organisms, all stream crossings by proposed road and interconnect lines will be installed "in the dry". This will be accomplished either by conducting the installation when the streams are dry (in the case of intermittent streams), or by using temporary dikes and pumping water around the work site. If conditions are appropriate, directional drilling may also be used to avoid disturbance of some surface waters during interconnect installation. On all protected trout streams, seasonal work restrictions (i.e., no construction during the spawning season) will be adhered to, in accordance with the requirements state and federal permits. The Applicant will consult with NYSDEC, and will utilize elliptical culverts, open-bottomed culverts, or other appropriate materials and installation techniques to minimize any long-term adverse impact to fish habitat or fish passage associated with the stream crossings.

Mitigation for impacts related to permanent habitat loss and forest fragmentation will be accomplished through careful site design (i.e., avoiding wetlands and areas of mature forest, and minimizing the permanent footprint of Project components to the extent practicable) and restoration of all temporarily disturbed areas. In addition, cleared forest land along Project access roads and at the periphery of turbine sites will be allowed to grow back and reestablish forest habitat in these areas.

The Project has been designed to minimize bird and bat collision mortality. The turbines will be placed much further apart than in older wind farms where avian mortality has been documented, such as northern California. They will also be mounted on tubular towers (rather than lattice), which prevent perching by birds. In an effort to reduce avian and bat impacts, all electrical lines between the turbines will be buried and any new above ground lines from the generating site and/or substation to the transmission lines will follow Avian Power Line Interaction Committee (APLIC) guidelines for insulation and spacing. Permanent meteorological towers will be freestanding and un-guyed, and lighting of the turbines (and other infrastructure) will be minimized to the extent allowed by the FAA and follow specific design guidelines to reduce collision risk (e.g., using flashing lights with the longest permissible off cycle). In addition, sodium vapor lamps and spotlights will not be utilized at the proposed substation or O&M facility, except in emergency situations.

Despite the fact that significant impacts to birds and bats are not anticipated, a one year post-construction avian and bat fatality monitoring program will be implemented. Although this study will not directly mitigate Project-specific impacts, it will help to advance understanding of avian and bat collision impacts. The purpose of the post-construction monitoring program will be to determine if avian and/or bat collision fatalities are occurring as a result of Project operation, and if so, the rate of mortality. This data can then be correlated with pre-construction data, and ultimately this information can help to develop models that will more precisely predict the impact of future wind power projects. The protocols and study design will follow established/accepted procedures for monitoring collision mortality at wind power facilities and other tall structures. These methods include searches under turbines, coupled with analysis of carcass removal rates (scavenging) and searcher efficiency rates. A one year study is proposed, with additional years possible if first year results indicate that mortality rates are outside of the expected range. It is proposed that all components of the monitoring study, from defining the scope of work to reviewing all reports, be monitored by a Technical Advisory Committee (TAC) consisting of members of environmental organizations, regulatory agencies, academia, and the wind power industry.

3.3.3.3 Threatened and Endangered Species

To assure that impacts to rare plants and unique natural communities will not occur, a rare plant/community survey will be conducted during the spring and summer of 2006, and the results of this survey incorporated into the FEIS for the Project. This survey will involve investigation of all proposed areas of disturbance. If rare plants or unique natural communities are identified as a result of this survey, Project components will be relocated so as to avoid or minimize direct or indirect adverse impact on these resources. As stated previously, an attempt will be made to avoid widening Bootleg Road where it crosses an open area of peatland wetland.

By supplementing the income of area farmers, the proposed Project will encourage continued farming activity and the maintenance of open grassland habitat. This will have a direct benefit on listed grassland bird species such as northern harrier, grasshopper sparrow and horned lark.

To avoid impacting listed threatened and endangered bird species, a preconstruction breeding bird survey will be undertaken. This survey will include the northeastern portion of the Project area, and would focus on the identification of listed species, especially those associated with grassland and wetland habitat (e.g., pied-billed grebe, northern harrier, upland sandpiper, American bittern). Any areas where northern harriers or other listed threatened or endangered species are nesting within or adjacent to proposed areas of disturbance will be avoided until after the nesting season, to the extent practicable.

The Applicant will also undertake a post-construction habitat displacement study to ascertain whether, and to what extent, the operating turbines are disturbing/displacing nesting grassland birds. This study is anticipated to occur over a 6 year time frame, with surveys of breeding grassland birds conducted at selected turbine sites in suitable habitat, prior to construction, and in years 1, 3, and 5, following construction. The primary goal of this study is to determine the extent of operational displacement impacts and whether or not grassland nesting species become habituated to wind turbines. Although this study will not directly mitigate Project-specific impacts, it will serve to provide post-construction data that can be correlated with pre-construction data, and ultimately used to develop predictive models for use in the siting of future wind power projects.

3.4 Traffic and Transportation

Clinton County is served by a network of state, county and local highways and roads in the Project area range from two-lane highways to gravel roads. The New York State (NYS) Highway system in and adjacent to the Project area includes NYS Route 190, NYS Route 189 and U.S. Route 11. The existence of the extensive road network provides advantages to siting a wind farm in the Towns of Ellenburg and Clinton in terms of site access and equipment and material transport to the site. The following section describes the proposed Projects effects the local road network, including oversize/overweight (OS/OW) vehicle use potential impacts and planned mitigation strategies. Two specific routes to the Project were analyzed and are presented in the Transportation Assessment Report in Appendix H. Additionally, a follow up Material and Equipment Delivery Route Report is also included in Appendix H.

3.4.1 Existing Conditions

3.4.1.1 Transportation Routes Outside the Project Area

Equipment and material will be brought to the site using standard construction vehicles and OS/OW Tractor-trailers for transporting wind turbine components with special heavy hauling vehicles of various lengths, widths and weights. Two OS/OW truck routes were identified and evaluated to determine the safest and most feasible route to the Project area. Each route was videotaped and a mileage log was kept to record the locations of potential roadway deficiencies along the routes. Both routes are primarily flat, 2-lane highways with posted speed limits of 45-55 MPH with excellent visibility for stopping sight-distance. In general, no vertical curbing is present along the pavement edges to collect stormwater run-off. As a result, there are very few catch basins or drain manholes along the routes. All stormwater sheets off the paved surface and is either collected in drainage ditches and cross-culverts or simply infiltrates into the ground. MAP 1 in Appendix H depicts these routes.

The easterly limit of the OS/OW route planning is I-87 (The Northway). It is assumed that I-87 will be part of the approved truck route from the point of origin. This study only covers the final leg of the truck route from I-87 to the Clinton/Franklin county line.

The planning parameters used to evaluate potential OS/OW routes included:

a.) Traffic Safety (i.e. accident data);
b.) Traffic Capacity (i.e. traffic volume as a function of roadway capacity); and
c.) Structural Capacity (e.g. roadway width, roadway condition, drainage structures, bridges, intersection geometry and roadway alignment).

3.4.1.1.1 Oversize/Overweight Truck Route No.1

Route No. 1 begins at the intersection of Route 9N (Exit 34 off I-87, Keeseville) and State Route 22 (SR 22) North and goes through the following eight communities in Clinton County: Ausable, Peru, Schuyler Falls, Plattsburg, Beekmantown, Altona, Ellenburg and Clinton. The route proceeds on SR 22 north for 7.2 miles to Military Turnpike (also known as Old Turnpike Extension), which it follows for 7.0 miles to an intersection with SR 3 where it changes to SR 190 West. The route follows SR 190 west for, 31.4 miles to the County Line Road (Clinton/Franklin). The total distance is 45.6 miles.

Traffic Safety: Accident Data requested from the NYSDOT (Region 7) Traffic & Safety Office covered a period of approximately 3 years (July 9, 1999 and May 31, 2002). This data showed there were a total of 480 accidents with 125 occurring at intersections and 355 at non-intersection locations (includes 63 collisions with animals).

This data includes accidents that occurred early in the morning, late at night, in the rain, snow and ice with poor visibility. The NYSDOT Special Hauling permit specifically prohibits operating in these conditions. The NYSDOT Special Hauling permit requires several full-time vehicle escorts, several police escorts, requires speed limit restrictions and hours of operation limited to daytime-only, preferably in the summer. Additional information is available in the Transportation Assessment Report in Appendix H.

Traffic Capacity: Highway Sufficiency Ratings data (through 2003) was obtained from NYSDOT to determine if any sections of the truck route were experiencing traffic capacity problems that may adversely impact the decision to select this as the primary truck route.

The data shows lower range of the Annual Average Daily Traffic (AADT) is at the west end of the truck route at the Clinton/Franklin county line in the middle of farm country. The upper range of the AADT is in the Plattsburgh area of the truck route. Even at the upper range of the AADT, the estimated traffic volume is still very low and would not pose a problem during OS/OW load transport. Conversations with the NYSDOT Planning and Programs Office (Region 7) confirm that there are no current problems with traffic capacity along this route.

Structural Capacity: In general, the roadway width is at least 26 feet (two 12-foot lanes with a 1-foot shoulder). In areas approaching populated urban centers and busy intersections, the shoulders are widened up to 8-feet resulting in roadway width of 40-feet (two 12-foot lanes with 8-foot shoulders). Field inspection indicated the condition of the pavement was very good and the pavement markings were clear and well defined (e.g. double-yellow centerlines, painted white edge lines). Advance warning and regulatory signs were in good condition and properly located to notify motorists of upcoming roadway changes and conditions. No railroad crossings or bridge underpasses are present on the route.

Although physical characteristics such as allowable weight loads, bridge type and condition will be evaluated by NYSDOT Structures Division during the actual Special Hauling Permit application process, a general survey of bridges and culverts along the route was conducted. Six culverts and 10 bridges were observed along this route. More detail can be found in Appendix H –Transportation Assessment Report and included Maps.

Intersection Geometry and Roadway Alignment: The preliminary assessment of OS/OW Route No.1 identified several locations where the roadway geometry appears problematic for construction vehicle turning movements. The locations are as follows:

- SECTION 1 (mile 0.0). Left turn from SR 9N to SR 22 North. There appears to be insufficient roadway width and intersection fillet radius on the inside corner for an oversize construction vehicle turning left. Detailed intersection geometry is required to engineer a solution.
- SECTION 2 (mile 6.4). Immediately following the intersection of SR 22B, there is a sharp bend to the right (approx. 45-degrees). The paved width at the apex of the curve is approximately 36 feet. It is likely that the vehicle path of the oversize construction vehicle may not be able to stay within the paved roadway.
- SECTION 3 (mile 7.2). Left turn from SR 22 North to Military Turnpike. There appears to be insufficient roadway width and intersection fillet radius on the inside corner for an oversize construction vehicle turning left.
- SECTION 4 (mile 37.3). Left turn from SR 190 West to SR 190 West (just before US 11, Ellenburg Corners). There appears to be insufficient roadway width and intersection fillet radius on the inside corner for an oversize construction vehicle turning left.
- SECTION 5 (mile 37.7) Right turn from SR 190 West to SR 190 West (leaving Ellenburg Corners). There appears to be insufficient roadway width and intersection fillet radius on the inside corner for an oversize construction vehicle turning right.

Examples of possible solutions to tight-radius 90-degree turns for oversize construction vehicles are shown in Appendix H – Transportation Assessment Report and included figures.

3.4.1.1.2 Oversize/Overweight Truck Route No. 2

Route No. 2 begins at I-87 North at Exit 42, then follows US 11 south. The route goes through the following three communities in Clinton County: Champlain, Mooers, and Clinton. The route proceeds from the I-87 North to US 11 South for 6.5 miles to Mooers Center. The route continues for 14.3 miles on US 11 South to Ellenburg Corners (JCT SR 190 West) and then straight on US 11 South for 9.6 miles to County Line Road (Clinton/Franklin). The total length of the route is 30.5 miles.

This route is the most direct route from I-87 to the Project area and has fewer obstacles to avoid along the route. It has fewer 90-degree tight-radius turns, fewer bridge and drainage structures to examine, and fewer intersections and low overhead wire crossings as shown in the Transportation Assessment Report on Map 1 in Appendix H

Traffic Safety: Accident Data requested from the NYSDOT (Region 7) Traffic and Safety Office covered a period of approximately 3 years (July 9, 1999 and May 31, 2002). This data showed there were a total of 265 accidents reported according to NYSDOT SIMS database. Of the 265 accidents, 52 occurred at intersections and 213 accidents occurred at non-intersection locations (including 29 collisions with an animal).

As described under Route 1, this data includes accidents that occurred early in the morning, late at night, in the rain, snow and ice with poor visibility. The NYSDOT Special Hauling permit specifically prohibits operating in these conditions. The NYSDOT Special Hauling permit requires several full-time vehicle escorts, several police escorts, requires speed limit restrictions and hours of operation limited to daytime-only, preferably in the summer. Additional information is available in the Transportation Assessment Report in Appendix H.

Traffic Capacity: Highway Sufficiency Ratings data (through 2003) was obtained from NYSDOT to determine if any sections of the truck route were experiencing traffic capacity problems that may adversely impact the decision to select this as the primary truck route No. 2.

The lower range of the AADT is at the west end of the truck route at the Clinton/Franklin county line in the middle of farm country. The upper range of the AADT is the east end of the truck route at the "Mall Entrance" at the I-87 interchange. Here the roadway widens to a 4-lane section to accommodate turning lanes into and out of the retail shopping area. Even at the upper range of the AADT, the estimated traffic volume is still very low and would not pose a problem during OS/OW load transport. Conversations with the NYSDOT Planning and Programs Office (Region 7) confirm that there are no current problems with traffic capacity along this route.

Structural Capacity: In general, the roadway width is at least 40 feet (two 12-foot lanes with 8-foot breakdown lanes) for the first 10 miles then the width narrows to 32 feet (two 12-foot lanes with 4-foot paved shoulders) for the remainder of the route. Field inspection indicated the condition of the pavement was very good and the pavement markings were clear and well-defined (e.g. double-yellow centerlines, painted white edge lines). Advance warning and regulatory signs were in good condition and properly located to notify motorists of upcoming roadway changes and conditions. No railroad crossings or bridge underpasses are present on the route.

Although physical characteristics such as allowable weight loads, bridge type and condition will be evaluated by NYSDOT Structures Division during the actual Special Hauling Permit application process, a general survey of bridges and culverts along the route was conducted. Two culverts and 10 bridges were observed along this route. More detail can be found in the Transportation Assessment Report found in Appendix H.

Intersection Geometry and Roadway Alignment: The preliminary assessment of OS/OW Route No. 2 identified only 2 locations where the roadway geometry appears problematic for construction vehicle turning movements. The locations are as follows:

- MILE 0.1/OFF-RAMP. Left turn from end of I-87 NB off-ramp to US 11 South. There appears to be insufficient roadway width and intersection fillet radius on the inside corner for an oversize construction vehicle turning left.
- MILE 6.6/MOOERS CENTER. Right turn on US 11 in the center of town. There appears to be insufficient roadway width and intersection fillet radius on the inside corner for an oversize construction vehicle turning right. .

3.4.1.2 Transportation Routes Within the Project Area

The general project boundary of the proposed Marble River Wind Farm includes State Roads 189, 11 and 190. Route 189 intersects the northern portion of the Project, going north from the NYSDOT Garage to the Canadian border. Route 11 intersects the Project boundary from east to west and represents a major supply artery for the construction phase of the Project. Route 190 intersects the southern portion of the Project from east to west within the Town of Ellenburg. The proposed substation will be accessed from NYS Route 190. Table 3.4.1.2-1 shows the local roads within the Project area.

Table 3.4.1.2-1: Local Roads Within the Project Area

Road Name	Length	Type
Clinton Mills Road	6.2	Paved collector
Canaan Road	4.2	Paved collector
Bohen Road	1.1	Paved collector
Campbell Road	3.2	Paved collector
Gagnier Road	2.4	Paved collector
Looby Road	2.4	Paved collector
Patnode Road	3.6	Paved/gravel minor
LaFrancis Road	4.2	Paved/gravel minor
Bull Run Road	4.4	Paved minor
Rogers Road	0.6	Broken paved, minor
Soucia Road	0.2	Gravel/unsafe/dead end
Colgan Road	0.4	Gravel minor, dead end
Lagree Road	1.6	Gravel minor
Swamp Road	0.3	Gravel minor, dead end
Whalen Road	1.3	Paved minor
Mercia Road	2.4	Paved minor
Number 5 Road	1	Paved minor
Jones Road	1	Paved minor, dead end
Liberty Pole Road	1.6	Paved minor, dead end

The paved and unpaved roads are generally in good condition and capable of supporting the anticipated heavy construction vehicle loads with the exception of the following: Soucia Road, Colgan Road, Swamp Road, Liberty Pole Road, Roger Road and Patnode Road (southern section).

Soucia, Colgan Swamp and Liberty Pole Roads are all dead ends that terminate at private property boundaries. No maintenance on these roads is performed between December and April (with the exception of Liberty Pole Road). Rogers Road is a short half-loop road beginning and ending on Clinton Mills Road, the width is classified as narrow and the pavement can be classified as broken. The southern section of Patnode Road that intersects with Star Road is a narrow gravel road in poor condition. Soucia Road is a dead end that is in poor condition.

In general, the existing roads are suitable for the proposed construction and operations phase of the Marble River Wind Farm. The primary deficiencies observed in the field were:

1. Insufficient intersection geometry on roadway approach widths of less than 20 feet
2. Shallow cover over drain pipe culverts

A total of 35 culverts were located along these local roads that had 18 inches of cover or less. Of the 35 culverts, 8 culverts crossed gravel roads (4 on Lagree, 2 on Patnode South and 2 on LaFrancis). The other 27 culverts crossed paved roads. The culverts are shown on Map 2 in the Transportation Assessment Report in Appendix H. In conversation with the Clinton County Highway Department, they expressed a preference for using steel plates to cross over shallow-cover culverts on county roads.

Extensive field review revealed seven bridges spanning brooks and streams, which are detailed in the following table:

Table 3.4.1.2-2: Local Roads Within the Project Area

Local Road	Mile	Description
SR 189	5.5	Concrete bridge over brook
SR 189	5	Concrete Bridge over brook
Looby Road	0.6	Concrete Bridge over brook
Clinton Mills Road	4.0	Concrete Bridge over stream
Bohen Campbell Road	2.7	Concrete bridge over brook
Bohen Campbell Road	3.9	Concrete bridge over brook
Soucia Road	.01	Steel grate bridge over stream

Of the seven bridges listed above, two of them will not be used for construction or operational traffic.

1. SR 189 (mile 5.5) is further north than the most northern access point of the Project.
2. Soucia Road is a steel grate bridge with steel grate deck on steel I-beam supports. The abutment walls are fieldstone. This bridge will likely need to be replaced to accommodate heavy equipment.

Due to the large number of overhead utility lines along the routes a visual assessment was initially performed to identify wires that may hang exceptionally low. Some low hanging electric service lines were found, but in most instances, the lowest utility wire crossing the preferred route was for telephone service. Utility wire heights in some locations were between 14 feet and 16 feet above the centerline of the road, while in most other areas they were more that 17 feet above the centerline.

3.4.1.3 School Bus Routes

The Northern Adirondack Central School (NACS) District, the fourth largest in New York State, uses the local roads within Ellenburg and Clinton. The buses leave school at 6:30 a.m., travel to the furthest point and then return to the school as they pick up students, where they arrive to start classes at 8:00 a.m. In the afternoon, the schedule is reversed:

School is dismissed at 2:30 p.m, and the buses leave school and drop off students as they pass along the roads to the furthest point, and then they return to school by 4:00 p.m.

There are 21 buses in the Towns of Ellenburg and Clinton; 18 deliver to Ellenburg and three to Clinton. The roads affected by school bus travel are listed below:

1. Route 11 (from Bull Run Road to Lost Nation Road)
2. Lost Nation Road (from Frontier Road to Star Road)
3. Tacey Road (From Star Road to West Hill Road)
4. Harrigan Road
5. Star Road (From Rt. 190 to the County Line)
6. Campbell Road
7. Number Five Road (From Lost Nation to Campbell Road)
8. Santamore Road
9. Frontier Road
10. Poupore Road
11. Jones Road (From Clinton Mills to Frontier)
12. Merchia Road (From 189 to Whalen Road)
13. Patnode Road (From 189 to Gagnier Road)
14. Gagnier Road (From Campbell Road to Rt. 11)
15. Whalen Road (From Clinton Mills to Merchia Road)
16. Clinton Mills Road
17. Route 189
18. Brandy Brook Road
19. LaFrancis Road
20. Bull Run Road
21. Baker Road (From Bull Run Road to Plank Road)

Please refer to Figure 19 for a map showing the NACS school bus routes within Ellenburg and Clinton.

3.4.2 Potential Impacts

Field review has revealed that most major material suppliers are located in Malone, NY, west of the Project area, and Plattsburgh, NY, south of the Project area. Materials coming from Plattsburgh, NY will be delivered by way of NYS Route 190, and materials from Malone, NY will be delivered by way of NYS Route 11. There are also numerous smaller material suppliers located within and in proximity to the Project area that may be used to supply the Project. These suppliers will use the local road network to bring the materials to the locations needed.

3.4.2.1 Transportation Routes Outside the Project Area

Based on available traffic safety data, OS/OW Route No. 2 (Route 11) appears to experience fewer accidents than Route No. 1. This may be attributed to the following reasons:

1. Route No. 2 is 15 miles shorter.
2. Route No. 2 avoids Plattsburgh, which has heavier traffic volume and more accidents.
3. Route No. 2 has fewer intersections along its route where the potential for accidents resulting in injury is higher.

It should be noted that both routes would be very safe for OS/OW truck transport given the amount of effort required to execute the NYSDOT Special Hauling Permit to guarantee public safety during OS/OW transports.

Preliminary estimates indicate that up to 981 OS/OW truck trips will be required for this project. This is based on 109 turbines requiring 9 truck trips to bring the component parts to the site. There would also be the same number of return trips for the empty delivery vehicles. Available traffic capacity data indicates Route No. 2 (Route 11) appears to have better physical roadway characteristics to support multiple OS/OW hauling trips than Route No. 1. This is attributed to the following reasons:

1. Route No. 2 is wider and has more capacity to handle the large number of OS/OW loads required to complete the job.
2. Route No. 2 has only three signalized intersections and two of those are at the very beginning of the route at the I-87 off-ramps. Route No. 1 has seven signalized intersections, several of which go through Plattsburgh. Hundreds of OS/OW truck trips would be delayed as they move through the signalized portion of the route causing substantial frustration for motorists over an extended period of time.

It should be noted that both routes currently have very low traffic volumes and the roadway infrastructure has plenty of capacity to handle the additional 981 OS/OW truck trips generated by this project. However, selecting a final truck route should take into account the magnitude of delays caused by multiple signalized intersections spaced relatively close together.

Based on the number of problematic 90-degree tight-radius turns for each OS/OW route examined in this study, Route No. 2 is the preferred route. Route No. 2 has only two problem intersections where the roadway geometry appears to be insufficient for large-radius turns. Route No. 1 has five problem intersections.

Finally, based on the number of bridge and culvert crossings encountered along each route, Route No. 2 appears to be the preferred route. The extreme gross vehicle weight of the OS/OW loads being considered requires the complete and thorough inspection of each bridge and culvert crossing along the route. It was observed (but not confirmed) that Route No. 2 has 12 such crossings whereas Route No. 1 has 16 crossings.

3.4.2.2 Transportation Routes Within the Project Area

The roads within the Project area vary in surface type between gravel and asphalt. It was determined that the majority of the roads had an overall condition of fair with areas of good pavement or gravel, while other areas had very poor surface conditions, which consisted of severe cracking, potholes and rippling for the asphalt roads, and potholes and rippling on the gravel roads.

As a result of the preceding investigation, the Applicant concluded that not all of the roads in the Project area will require modification. The following roads were considered in acceptable condition to handle the turbine component deliveries: NYS Route 189, NYS Route 190, Brandy Brook Road and Ryan Road (due to the limited number of deliveries). Only four roads are known to require modification: Liberty Pole Road, LaGree Road, and Soucia Road and the gravel portion of Patnode Road. These modifications will include gravel overlay to reduce rippling and smooth grade changes; raising the profile of the road to provide additional structural capacity and sufficient surface drainage; adding larger culverts to smooth grade changes; and, though not currently anticipated by the Applicant, possible road widening.

It should be noted that Liberty Pole, Lagree Road and Patnode Road are not wide enough to allow vehicles traveling in opposite directions to easily pass each other. Consequently, though not currently anticipated, it may prove necessary to widen these roads to accommodate delivery trucks. The Applicant will make a determination whether or not to widen these roads on a road-by-road basis. Should widening be required it would be done using gravel to increase the width of the road to approximately 20 feet, providing two 10-foot travel lanes. Additional gravel will be used to create two-foot shoulders for the roads. Should widening prove necessary, it is likely that Liberty Pole Road would be widened almost its entire length beginning approximately two-tenths of a mile east of NYS Route 189. Also, Lagree Road would be widened from NYS Route 189 west to Access Road 19. Patnode Road would be widened between Gagnier Road and Access Road 8. In addition, Patnode Road may require a culvert to smooth the grade changes in the areas of Access Roads 8 and 9. The exact requirements will be determined after a topographic survey has been performed to determine the exact grade changes in the area.

The lengths of the turbine component delivery vehicles dictate that delivery route intersections will require modification. The existing intersection geometry is insufficient to accommodate the large turning radii of these vehicles, and the majority of the intersection approach roads vary in width from 18 to 20 feet. The exceptions are NYS Route 11 (which is 24 feet away from intersections and wider where there are turning lanes); and at the seasonal roads of Lagree Road and Patnode Road (which are seasonal roads and have widths of approximately 10 feet to 15 feet).

Modifications to the intersections will include increasing the corner radii, adding road width upstream of the intersection, adding road width downstream of the intersection, or some combination of all three. Houses, bridges or culverts located in proximity to the intersections will limit the amount the corner radii can be enlarged, making it necessary to increase the road width either upstream or downstream of the intersection. Intersection modifications may require the acquisition of additional property and, in some cases, relocation of utility poles and/or guide rails. Where there are culverts or ditches crossing under the existing intersection, the culverts will have to be extended. If ditches run along the intersection culverts for these ditches will need to be added or new ditches have to be created along the edge of the new road to maintain proper drainage.

All intersections were evaluated using a maximum truck turning radius of 140 feet, which will be the turning radius of the truck carrying the turbine blades. Figures showing the modifications at each intersection can be found in the Materials and Equipment Delivery Route Report in Appendix H.

The materials used for construction of this project, because of its size, will be obtained from many locations. The material will include gravel, concrete, reinforcing bar, electrical materials, and miscellaneous materials. The volume of material needed may require stockpiling some material at the laydown area located off of NYS Route 189. There will also be a need to set up of a concrete batching plant at the laydown area because of the amount of concrete needed for each turbine foundation (approximately 320 cubic yards).

Vehicles used for delivery of material to the Project will be of a standard type that normally used the roads within the Project area. These vehicles include dump trucks, 18-wheel tractor-trailers, which will include flatbed and dump types, and concrete trucks. Since these vehicles are standard the routes will, in most cases, follow the preferred routes established for delivery of the turbine components. However, since these vehicles are standard sizes some deviation from these routes may be made. An example of this deviation will be at the intersection of NYS Route 189 and Looby Road/Clinton Mills Road.

The Applicant does not anticipate any adverse safety impacts to the area due to material delivery vehicles. Vehicles of similar types were observed using the local road network during the investigations for this report and other elements of the Project. Although there will be a significant number of vehicles in the area during construction activities, project safety features will be implemented to reduce the potential for adverse traffic conditions; the most significant safety measure being a project speed limit.

Nine vehicles will be required for turbine component delivery. This will result in 18 trips (in and out) for each turbine, and overall approximately 2,000 delivery trips for component delivery.

The number of material delivery vehicles will be fairly large. It is estimated that 35 to 40 concrete trucks will be required for each turbine foundation. This will result in 70 to 80 delivery trips for each wind energy conversion system (WECS) or approximately 10,000 trips over the duration of the Project. In addition, material delivery will include gravel for creation of access roads, road improvements and intersection modification, and other material deliveries will include reinforcing bar for each foundation, and electrical equipment and materials for each WECS and the Project transmission system. The total number of delivery trips will be approximately 17,000 trips over the life of the construction period of the Project due to the Project's expected material requirements.

The Applicant investigated several routes throughout the Project area that could be used for delivery of WECS components and construction materials. The WECS component delivery vehicles will be of an oversize/overwidth type, requiring modification to intersections on the preferred routes. Therefore, routes investigated were evaluated for possible intersection impacts, road type, surface condition, intersection geometry and proximity of structures and sensitive properties to the road. It is expected that delivery of WECS components and materials will come from the east or west along NYS Route 11. From NYS Route 11, five north-south delivery routes have been established into the Project area. The WECS access roads will be accessed directly from one of these north-south routes or continue from these primary routes to secondary routes intersecting the WECS access roads.

3.4.2.3 School Bus Traffic

Of the 21 local and state roads cited as "affected by school bus travel", 15 of them are within the Project boundary and 12 of them fall along the "preferred WECS delivery routes." These roads include:

1. Campbell Road
2. Frontier Road
3. Liberty Pole Road
4. Merchia Road
5. Patnode Road
6. Gagnier Road
7. Whalen road
8. Route 189
9. Brandy Brook Road
10. Looby road
11. NYS Route 1
12. NYS Route 189

Given the low frequency of bus traffic along these roads (approximately twice per day). The applicant predicts no impact to local traffic conditions or school bus safety conditions as a result of the construction related traffic along the preferred delivery routes.

During stated school bus hours, the Applicant will make efforts to avoid scheduling component deliveries. When necessary, the Applicant will provide notice of deliveries to NACS' officials.

3.4.3 Proposed Mitigation

Project delivery routes have been selected to minimize impacts to the local roads and communities. The number of roads used for these deliveries have been minimized and steps will be taking during construction to make certain that safety is a priority along the routes. Material delivery routes will in most cases follow the routes established for WECS component delivery. However, because of the nature of these vehicles, standard construction or delivery, standard intersection configuration can be used resulting in the combination of some routes. These vehicles will be similar in nature to vehicles currently using the local road network and will require no special safety measures.

As NYS Route 11 is the preferred access road into the region, the Applicant selected several north-south delivery routes intersecting NYS Route 11 to gain access into the site. These delivery routes were selected to reach the largest number of access road entrances possible while impacting the least amount of road. For those access roads that didn't intersect the primary routes, secondary east-west routes were selected.

The delivery routes can be found in the Material and Equipment Delivery Route Report on Maps 1 and 2 in Appendix H and are described in more detail below.

- **Delivery Route No. 1** will deliver WECS components to access roads intersecting NYS Route 189 and the laydown area. It will follow NYS Route 189 northbound and intersect Access Roads 21, 22, 23, 24, 30, 34, 35, 36, and 37 (by way of Robare Pond Road).
- **Delivery Route No. 2** will use NYS Route 189 as the primary north-south route. The route will follow NYS Route 189 northbound to Liberty Pole Road, and then follow Liberty Pole Road eastbound to Access Roads 38, 40, 41 and 42.
- **Delivery Route No. 3** will also use NYS Route 189 as the primary north-south route. The route will follow NYS Route 189 northbound to Frontier Road, and then follow Frontier Road westbound to Access Road 33.
- **Delivery Route No. 4** will use NYS Route 189 as the primary north-south route. The route will follow NYS Route 189 northbound to Merchia Road, and then follow Merchia Road westbound to Access Roads 31 and 32.
- **Delivery Route No. 5,** like routes 1 through 4, will use NYS Route 189 as the primary north-south route. The route will follow NYS Route 189 northbound to LaGree Road, and then follow LaGree Road westbound to access roads 19 and 20; Access Road 25, off of LaGree Road, will not be used on this route. Delivery of turbine components to turbines located along Access Road 25 will be made by Access Road 26, located on Looby Road.

- **Delivery Route No. 6** will use Looby Road as the primary north-south route. The route will follow Looby Road northbound to Whalen Road; at this point Looby Road turns east-west. The route will continue eastbound on Looby Road to Access Roads 26, 28 and 29. The route will continue eastbound and cross NYS Route 189. At NYS Route 189, Looby Road becomes Clinton Mills Road. The route continues eastbound on Clinton Mills Road to Access Roads 39, 43 (by way of Rogers Road), 44, 45 (by way of Soucia Road) and 46. A short stub of Route No. 6 will follow Whalen Road northbound to Access Road 27.
- **Delivery Route No. 7** will use Brandy Brook Road as the primary north-south route. The route will follow Brandy Brook Road southbound and intersect Access Road 12. It will continue southbound on Brandy Brook Road to NYS Route 190, and then follow NYS Route 190 to Access Roads 3, 4, 6 and 7. A stub of Route No. 7 will follow Sancomb Road southbound from NYS Route 190. Access Road 5 is located off of Sancomb Road.
- **Delivery Route No. 8** will use Patnode Road as the primary north-south route. The route will follow Patnode Road southbound, where it will intersect Access Roads 14 and 15, and cross Gagnier Road to the season/gravel section of Patnode Road, where it will intersect Access Roads 8 and 9.
- **Delivery Route No. 9** will use Ryan Road as the primary north-south route. The route will follow Ryan Road southbound to Access Road 1. A stub of Route No. 9 will follow Number 5 Road eastbound to Access Road 2.
- **Delivery Route No. 10** will follow Gagnier Road eastbound from NYS Route 11, to Access Roads 10, 11, 13 and 16. It will continue eastbound to Campbell Road then turn northbound on Campbell Road to Access Road 17.

These routes are the preferred routes based on extensive field surveys and conversation with local residents and officials within the county Highway department. The preceding delivery routes were selected to minimize the number of roads being used for delivery as well as to minimize the required improvements to individual roads.

The Applicant will obtain all the necessary permits from the town and county highway departments and from NYSDOT to operate oversize vehicles on the highways. The Applicant will also coordinate and consult with the town highway departments regarding final routing plans on local roads that will be used to bring equipment and material to the construction sites. A road improvement plan will be developed for each town that defines the various upgrades required to accommodate construction vehicles. Any necessary improvements or repairs will be completed at the Applicants expense. Confining vehicles to only "approved" roads will minimize transportation impacts. Anticipated improvements may include shoring up abutments, adding steel plates or gravel road surfaces, widening roads, and reconfiguring intersection geometry to accommodate the turning radius of large construction vehicles. The following are some of the mitigating measures that may be applied to avoid or minimize impacts related to transportation and/or to provide long-term improvement to the local road system:

- Road widening or adding turning radii;
- Adding cover over structures;

- Reinforcing or bracing;
- Using bridge jumpers to clear structures;
- Replacing structures prior to construction or after if damaged;
- Rerouting traffic;
- Replacing of inadequate bridge components; and
- Reinforcing of existing bridges.

The final improvement plan will identify specific locations where certain improvements will be made.

The Applicant will also consult with the local highway and public safety agencies regarding the need to prepare a traffic management plan to manage the flow of traffic on transportation routes.

3.5 Land Use and Zoning

Land use and zoning in the Project area was determined through review of local town codes, tax parcel maps, aerial photographs, and field review conducted during 2005. Land use and zoning are discussed in terms of regional land use patterns, Project area land use and zoning, agricultural land use, and future land use.

3.5.1 Existing Conditions

3.5.1.1 Regional Land Use Patterns

The Towns of Clinton and Ellenburg are located in northwest Clinton County, along the Canada-United States border. This area is primarily rural and dominated by active and reverting agricultural land, managed forest land, large wetland areas, and widely scattered rural homes and farms. Most of the agricultural land in this region of New York is devoted to dairy farming, and a significant amount of agricultural land has gone out of production over the last 20 years. Much of this land is currently in various stages of secondary succession back to forest land. Forest land in the region includes State Forest Preserve lands (which are protected as "forever wild" under the NYS constitution) as well as private lands. Many of these private forest lands are managed for the production of timber products (saw logs, chips, pulp, etc.), and are being actively logged. Areas of development are concentrated in small hamlets and villages and along the existing network of state, county, and local roads. Most of this development is residential, but also includes nodes and strips of commercial land use, as well as occasional industrial (manufacturing, quarries) and institutional (correctional, school, and government) facilities. The City of Plattsburgh is the center of commerce and industry for Clinton County and the surrounding region.

3.5.1.2 Project Area Land Use and Zoning

Active farms, managed forest land, and single-family rural residences are the dominant land uses within the Project area. The central and southern portions of the Project area are characterized by active and reverting agricultural land. Active agricultural land in the area is primarily associated with dairy farming, and includes cropland (primarily corn, and hay) as well as pasture land. Reverting agricultural fields are those that have gone out of production, and are in various stages of secondary succession back to forest land. Most of these fields are dominated by shrubs and tree saplings, and many include areas that have reverted to wetland. The northern portion of the Project area is dominated by managed forest land. This area is primarily private land that includes upland forest, as well as forested wetlands, beaver marshes and ponds. Much of the forest land in this area has been logged and is currently dominated by young saplings and pole-sized trees. However, conditions range from active clear cuts to mature second growth stands. These two land uses are consistent with the regional land use characteristics described above, and together define community character within the majority of the Project area.

Within and adjacent to the Project area, residential and commercial development is primarily concentrated in the Village of Chateaugay, in the Hamlets of Churubusco, Ellenburg, Ellenburg Depot, and Ellenburg Center, and along NYS Route 11. Rural residential development within the area, consisting primarily of individual single-family homes, mobile homes, and farmhouses, generally occurs along the frontage of state and county highways and local public roads. Most of these homes are of an older vintage with new home construction being very limited. Newer residential structures are primarily mobile homes, modular homes, and seasonal camps. Other than farms, commercial and industrial development within the Project area appears to be limited to a resource extraction (quarries and logging) and scattered rural businesses (e.g. retail stores, used car and equipment dealerships, dining establishments, etc.). A number of communication antennas have also been erected within the Project area. The area also receives significant recreational use in the form of hunting camps, commercial campgrounds, and snowmobile riding.

Zoning within the Project area varies according to municipality. The Town of Ellenburg Zoning Law (April 1991) defines seven zoning districts within the Town: Hamlet Residential (HR), Hamlet Commercial (HC), Rural Use (RU), Rural Arterial (RA), Lake Area Residential (LR), Lake Area Commercial (LC), and Lake Area Conservation (CON) (see Figure 20). All of these zoning districts allow agricultural use, outdoor recreation, single-family residential and seasonal residential use. Lake Area Conservation is the most restricted district; the only conditional use allowed is cluster development. All districts except Lake Area Conservation consider churches, home occupations, and roadside produce stands as allowable uses, while public facilities, child care centers and essential services are allowed as conditional uses. Lake Area Residential and Hamlet Residential districts are both fairly restrictive, allowing certain types of residential development and associated neighborhood uses. Lake Area Commercial is also somewhat restrictive, allowing some residential uses as well as neighborhood commercial services, such as retail businesses and repair shops. Hamlet Commercial is much less restrictive, allowing most of residential and commercial development. Rural Use and Rural Arterial are the least restricted zones, allowing all residential types, and all commercial uses, either as allowable or conditional uses. Rural Use conditionally allows some industrial uses, such as sawmills and laboratories, while Rural Arterial conditionally allows additional industrial uses, such as warehousing and manufacturing. Not allowed in any zone are: solid and hazardous waste disposal facilities, motor vehicle racetracks and amusement parks. Disposal of construction and demolition debris from outside Ellenburg is also not allowed. Such material from within Ellenburg is allowed in Rural Use and Rural Arterial zones.

In addition, the Town of Ellenburg recently adopted a Wind Energy Facility Law (Local Law No. 4 of 2005) that allows for the creation of Wind Overlay Zones in the Rural Use and Rural Arterial zoning districts (see Appendix I). Wind-powered electric generating facilities (referred to as a Wind Energy Conversion System [WECS] in the local law) can be developed within a Wind Overlay Zone. However, a Wind Overlay Zone cannot be created until a request for such designation is submitted to the Town of Ellenburg. This request must be simultaneously submitted with a WECS Special Use Permit Application.

The Town of Clinton does not currently have a zoning law, but does have a local law governing Wind Energy Facilities (Law Local Law No. 1 of 2005). This local law provides the Town of Clinton with the authority to approve or deny applications for Wind Energy Permits (see Appendix I). A Wind Energy Permit, if approved, allows for the construction, maintenance and operation of a Wind Energy Facility.

Table 3.5.1.2-1 summarizes the requirements and approvals necessary to permit a wind-powered electric generating facility in the Towns of Ellenburg and Clinton.

Table 3.5.1.2-1: Local Wind Energy Facility Laws

Municipality	Requirements	Approvals
Town of Ellenburg	• Wind energy conversion systems are allowed in a Wind Overlay Zone, pursuant to an application for rezoning and special use permit approval by the Town Board. Wind overlay zones are allowed in designated Rural Use (RU) and Rural Arterial (RA) districts. • Overlay guidelines for WECS include: - Setback of 500 feet from the side and rear of non-participating property line boundaries. - Setback of 500 feet from the nearest public road right of way. - Setback of 1,000 feet from the nearest residence - Setback of 1.5 times the total height a wind turbine from any non-WECS structure or any above-ground utilities - Setback of 100 feet from state-protected wetlands - Maximum total height cannot exceed 440 feet - Maximum of 50 Decibels impact to non-participating residence	• Approval of Wind Overlay Zone by Town Board • Approval of Special Use Permit by Town Board
Town of Clinton	• Wind energy conversion systems are allowed in the Town, pursuant to the approval of a Wind Energy Facility Permit by the Town Board. • Guidelines for WECSs include: - Setback of 500 feet from the nearest site boundary property line - Setback of 1000 feet from the right-of-way of State Route 11, and 500 feet from the right-of-way of all other public roads - Setback of 1,200 feet from the nearest non-participating residence - Setback of 2,500 feet from the property line of any school, church, hospital or nursing facility - Setback of 1.5 times the total height of the wind turbine from any non-WECS structure or any above-ground utilities - Setback of 100 feet from state-protected wetlands - Maximum total height cannot exceed 400 feet - Maximum of 50 decibels at any non-participating residence	• Approval of Wind Energy Facility Permit by the Town Board

A portion of the Town of Ellenburg is included within the Adirondack Park. Although private lands within the park are subject to the land use regulations of the Adirondack Park Agency (APA), none of the proposed Project area falls within the park boundaries ("blue line").

3.5.1.3 Agricultural Land

The 2002 Census of Agriculture reported that 604 working farms occupied 168,536 acres in Clinton County, or 25.3% of the land in the county (USDA National Agriculture Statistics Service website). Of that total, 69,124 acres were classified as harvested cropland (USDA NASS website). According to the U.S. Census Bureau, 1% of the Clinton County population (357 residents) listed farming, fishing or forestry as their occupation. Similarly, 25 residents within the Town of Clinton (8.4%) and 17 residents within the Town of Ellenburg (2.1%) indicated farming, fishing or forestry as their primary occupation (U.S. Census Bureau website).

Clinton County has a total of 11 designated agricultural districts, and portions of four districts (Districts 00, 03, 08, and 10) occur within the Project area (see Figure 21). Approximately 58% of the Project area (including significant areas of managed forest land) is located within these districts. Agricultural land use is a significant component of the Project area with approximately 3,190 acres of the 19,310-acre area (16%) in row crops, field crops, or pastureland.

3.5.1.4 Future Land Use

Other than the proposed Project, future land use patterns in the area are anticipated to remain largely unchanged for the foreseeable future. The Clinton County Chamber of Commerce continues to promote agriculture, forestry, manufacturing, and recreation as growth opportunities. Current land use patterns in the Towns of Clinton and Ellenburg are expected to remain largely unchanged, with an emphasis on agricultural, recreational, and forestry uses. However, land use within the Project area is anticipated to undergo some degree of change as farms are sold and agricultural land goes out of production.

3.5.2 Potential Impacts

Because the proposed Project occurs entirely within the RU and RA zoning districts in the Town of Ellenburg, and because it will be in compliance with the Ellenburg Wind Energy Facility Law, it will be in conformance with local zoning. The Project will have impacts on land use. These will include temporary, construction-related impacts, as well as permanent impacts (operation related). These impacts are described below.

3.5.2.1 Construction

Construction-related disturbance to agricultural land will total approximately 173 acres (of which 134 acres will be restored to agricultural use). Along with this direct impact to agricultural land, movement of equipment and material could result in damage to growing crops, damage to fences and gates, damage to subsurface drainage systems (tile lines), and temporary blockage of farmers' access to agricultural fields. However, wind turbines and associated facilities have been located so as to minimize loss of active agricultural land and interference with agricultural operations.

Construction activities could have a similar temporary impact of forest management/timber harvest activities. Movement of equipment and materials could temporarily block over or damage forest access roads. Timber harvest activities may also need to be curtailed/rescheduled in certain areas to avoid interfering with project construction. Construction will result in clearing of approximately 332 acres of forest land. However, it is anticipated that any marketable timber will be removed by the landowner prior to construction. Construction impacts to forest land have also been minimized by siting turbines in previously disturbed areas and using the existing network of forest roads, log landings, and skid trails to accommodate proposed access road and interconnect routes. Improvements to existing roads to accommodate construction activity will ultimately enhance access to these properties for future forest management activities.

Construction activity will be in compliance with requirements of the local Wind Energy Facility ordinances in Clinton and Ellenburg. No variances or waivers from the requirements of these local laws are anticipated for the construction phase of the Project. Because the Project will occur entirely outside of the Adirondack Park, no land use permits or approvals will be required from the APA.

3.5.2.2 Operation

The Project as proposed is consistent with existing zoning/wind energy facilities regulations and land use patterns within the Towns of Clinton and Ellenburg (although it is anticipated that the Applicant will request a variance from the Town of Clinton to exceed the maximum allowable height of 400 feet). The Project will occur entirely on private land in areas dominated by active and reverting agricultural land and managed/disturbed forest land. Project components will be sited in accordance with local set-back requirements and no public lands or recreational facilities are anticipated to be impacted. Therefore, impacts to residential, commercial, and recreational land use will be minimized. The operating Project will be largely compatible with agricultural land use, which dominates the central and southern portion of the Project area, and may serve to help keep land within agricultural use. Russell Cary, Supervisor of the Town of Fenner, New York, believes that lease payments from the wind power project in his town are helping to preserve a rural lifestyle and protect family farms from being taken over by large-scale commercial farming operations (R. Cary, personal communication). The Project is also compatible with forestry practices and the managed forest land that dominates the northeastern portion of the Project area.

Only very minor changes in land use within the Project area are anticipated as a result of Project implementation. The 109 turbine sites, substation, and other ancillary facilities represent the cumulative conversion of approximately 133 acres of land from agricultural land, meadow/brushland, or forest land to developed land use. Only 10 acres of residential land will be impacted by the Project, but these impacts will be confined to the properties of participating landowners, and largely temporary in nature (construction activity).

During Project operation, adverse impacts on agriculture and forest land should be minimal. Other than occasional maintenance and repair activities that could have impacts similar to those described in the 'Construction' section, the wind power project should not interfere with on-going farming and forest management operations. In fact, by supplementing the income of participating farmers and forest landowners, the Project will help keep farms in operation and the land in agricultural or forest management use. The presence of wind turbines may also limit or prevent the conversion of agricultural and forest land to seasonal or permanent residential use.

However, as noted in the Visual Impact Assessment prepared for the Project (Appendix K), the Project may result in a perceived change in land use in many areas of the two Towns.

3.5.3 Proposed Mitigation

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

To minimize and/or mitigate impacts to active agricultural land and farming operations, project siting, and construction will fully comply with NYS Department of Agricultural & Markets (NYSA&M), agricultural protection guidelines. A Notice of Intent to Undertake an Action within an Agricultural District will be filed with the NYS Department of Agriculture & Markets and the Clinton County Agriculture and Farmland Protection Board. Proposed agricultural protection measures have been prepared in accordance with NYSA&M guidelines, and are included as Appendix D. These mitigation measures include:

- Limiting permanent road widths to a maximum of 16 feet or less, and where possible, following hedgerows and field edges to minimize loss of agricultural land.
- Having roads that must cross agricultural fields stay on ridge tops and other high ground to minimize cut and fill as well as potential drainage problems.
- Avoiding disturbance of surface and subsurface drainage features (ditches, diversions, tile lines, etc.).

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

Beyond reducing impacts to agricultural land, other mitigation measures that will be undertaken to reduce the impact of the wind energy facilities on land use and zoning include full compliance with the local laws regulating the development of WECS. These include:

- Locating underground all electrical collection (interconnect) lines between individual turbines.
- Lighting towers only to the extent necessary to comply with FAA requirements. Lighting for the substation and other ground level facilities will be kept to a minimum and generally operated by switch or motion detector.
- Not affixing television, radio or other communication antennas or advertising signs to the towers or any other Project structures.
- Utilizing tubular towers and finishing structures with a single, non-reflective matte finish color.
- Avoiding use of guy wires on permanent meteorology towers.
- Installing turbines in locations where proximity to existing fixed broadcast, retransmission, or reception antenna for radio, television, or wireless phone or other personal communications systems will not produce electromagnetic interference with signal transmission or reception.
- Designing all Project components in a way that minimizes the impacts of land clearing and the loss of open space. Land protected by conservation easements is being avoided.
- Locating Project components so as to minimize impacts on state and federal jurisdictional wetlands.
- Managing storm water run-off and erosion control in a manner consistent with all applicable state and federal laws and regulations.

- Removing all solid waste, hazardous materials and construction debris from the site and managing its disposal in a manner consistent with all appropriate rules and regulations.
- Generally limiting construction to the hours of 6 am to 8 pm in Ellenburg, and 7 am to 7 pm in Clinton, except for certain activities that require cooler temperatures than possible during the day.

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

3.6 Community Facilities and Services

3.6.1 Existing Conditions

3.6.1.1 Community Facilities and Services

The Towns of Clinton and Ellenburg are served by a range of community facilities and services. These services are discussed briefly below, and are generally considered adequate for the area's population. The locations of various community facilities/services are indicated on Figure 22.

Public Utilities and Infrastructure: Public utilities and infrastructure in the Project area include various overhead and underground facilities. Aboveground components include electric distribution and telephone lines along most of the public roads within the Project area. Cable television lines and communications towers, including television and radio broadcast antennas and cellular phone communications towers, also occur in and around the Project area. Underground utilities include sewer and water mains, telephone and cable television lines, and natural gas transmission lines.

Studies by Brian Webster Consulting evaluated communications and television (TV) reception in the Project area (see Appendix N). The studies identified several TV station and radio (AM and FM) transmitters within 35 miles of the Project area. Most of these transmitters are located to the southeast and southwest of the Project area, and are well over 7 miles from the center of the Project area (see Section 3.12 Telecommunications).

Police and Fire Protection and Emergency Response: There is an active 911 emergency response system in place in the Project area for fire, rescue, police, sheriff, highway patrol, and ambulance. The New York State Police cover the Project area, which is a part of Troop B's Zone 1. Troop B is headquartered at 1097 NYS Route 86 in Ray Brook, NY. Zone 1 includes Ellenburg; there are also State Police offices in neighboring locales including Chazy, Malone, and Dannemora. The main police offices for the Project area include:

New York State Police Department
Troop B, Ellenburg Station
PO Box 102
5534 State Route 11
Ellenburg, NY 12933
518-563-3761

Clinton County Sheriff's Department
25 McCarthy Drive
Plattsburgh, NY 12901
Sheriff: David Favro
518-565-4300

A Fire Prevention and Control Plan has been developed for the Project to ensure the safety of company employees and local residents, visitors, and their property. The Plan is included as Appendix O. Local fire departments in the Project area include the following:

Town of Clinton Volunteer Fire Department
1301 Clinton Mills Road
Churubusco, NY 12923
Chief: Mike Perrault
518-497-6623

Ellenburg Center Volunteer Fire Department
1 Church Street
Ellenburg Center, NY 12934
Chief: Daniel Barcomb
518-594-3850

Ellenburg Center Fire Department
Jim Tourville, Treasurer
49 West Hill Road
Ellenburg Center, NY 12934
518-594-3879

Ellenburg Depot Volunteer Fire Department
87 Green Valley Way
Ellenburg Depot, NY 12935
Chief: Richard Manor
518-594-7010

Prior to the commencement of construction the Applicant will present, review and finalize the Fire Prevention and Control Plan (Appendix O) in cooperation with local fire departments.

Educational Facilities: The project is located in the NACS District . Public schools include Northern Adirondack Elementary School and Northern Adirondack Junior-Senior High School (http://www.emsc.nysed.gov/repcrd2004/links/d_090901.shtml). Total enrollment for kindergarten through 12th grade for the period 2003 to 2004 was 1,128 students (http://www.emsc.nysed.gov/repcrd2004/cir/090901040000.pdf). This is a rural school district with high student needs in relation to district resource capacity (http://www.emsc.nysed.gov/repcrd2004/cir/090901040000.pdf). The NACS District schools are located southeast of the Project area at the intersection of Route 190 and Route 11 in Ellenburg. Figure 19 depicts the NACS school bus routes as they pertain to the Project area and preferred delivery routes. Upon commencement of Construction the Applicant will provide the NACS school bus operator a copy of the construction schedule and advise as to the primary component and materials delivery routes.

Parks and Recreation: The project area and vicinity includes several parks and recreational facilities, including a State Forest Preserve in the Town of Clinton, Miner Lake State Park, Adirondack Park, and a recreational facility owned by the Clinton Volunteer Fire Department in the Hamlet of Churubusco.

Military trail, a State designated scenic byway, transects the Project area. A designated scenic overlook is located in the Adirondack Park, approximately 0.5 miles south of the Project area.

Areas of public recreational land in the vicinity of the Project area that are administered by NYSDEC include portions of the State Forest Preserve in Clinton and Ellenburg. Recreational activities that typically occur on state forest land include hunting, trapping, fishing, hiking, bird watching, cross-county skiing, and snowmobiling.

Other parks and recreational facilities within 5 miles of the Project area are discussed in the Visual Impact Assessment (see Appendix K).

3.6.2 Potential Impacts

3.6.2.1 Community Facilities and Services

The project is not expected to result in significant adverse effects on community facilities or services within the Project area, including utilities, provision of emergency services, libraries, park and recreational areas, and health care and public education facilities.

Public Utilities and Infrastructure: The project will result in no significant increase in the demand for utilities such as telephone, natural gas, electric, water, sanitary sewer, etc.

The project will result in minor short- and long-term increases in energy usage associated with construction and operation of the Project. Short-term impacts during construction of the Project will be limited to minor increases in the demand for fossil fuels and petroleum products necessary for the operation and maintenance of construction equipment, machinery, and vehicles. Energy use will also increase as a result of construction personnel traveling to and from the site. However, neither of these represents significant impacts on energy resources.

The project will not result in any significant adverse long-term impacts to energy resources. Long-term energy use will increase slightly as a result of facility maintenance. However, this impact will be minor because the amount of required electricity and fuel is small, and local fuel suppliers and utilities have sufficient capacity available to serve the Project's needs. As a result, no improvements to the existing energy supply system will be necessary.

It is anticipated that some overhead electrical distribution lines will have to be temporarily or permanently relocated to accommodate crane routes. The Applicant will collaborate with the utility owners to reduce impacts to their facilities to the maximum extent practicable. Impacts to existing utility distribution facilities are not anticipated as a result of project operation and maintenance.

Refer to Section 3.12 and Appendix N for information on potential impacts to microwave radio and television signals.

Emergency Services: The project will not have a significant adverse impact on the demand for emergency services. Existing services (e.g., police, fire, ambulance, and health care) have the personnel and equipment necessary to respond to emergencies that could occur during both construction and operation of the Project. However, certain project-related activities could affect the ability of emergency service providers to perform their duties. For instance, during construction large vehicles and temporary roads closures could block emergency vehicle access to area farms and homes. This is not anticipated to be a significant problem due to the small number of residents within the Project area, the general availability of alternate access routes, and correspondence and coordination that will occur between construction managers and local police departments. The project could also experience vandalism/trespass problems that would require involvement of local police. Based on experience with other wind power projects in New York, this is not anticipated to be a significant impact. See Section 3.13 Safety and Security, for more information.

Residences are located, in no case, less than 1,200 feet from the nearest turbine.

The wind turbines themselves also pose a slight collision risk related to falling ice that may accumulate on rotor blades during the winter. Although ice can fall off the turbine blades under certain conditions during the winter, the maximum distance ice has been observed to be thrown from wind turbines is under 400 feet (Morgan, Bossanyi, and Seifert, 1998). A more typical scenario would involve any accumulated ice falling straight down and landing around the tower base. This is consistent with the findings of Morgan et al. (1998) and with anecdotal reports from other operating wind projects in the Northeastern U.S.

Educational Facilities: The NACS District will not be significantly affected by the addition of school-age children. As mentioned previously, construction workers will either be residents of the area or will stay only for the duration of construction (6-9 months). These workers will generally not relocate their families to the area. Similarly, some or most of the 13 to 18 employees of the operating project will be local residents, with children already enrolled in area schools.

Other community services and facilities, such as park and recreation facilities, libraries, and senior/youth services, will not be adversely affected by the Project. In fact, the additional municipal and county revenue generated by the Project will help maintain and possibility expand these services and facilities.

3.6.3 Proposed Mitigation

Additional tax revenue generated by the Project will help support community facilities or services within the Project area, including utilities, provision of emergency services, libraries, park and recreational areas, and health care and public education facilities and services without significantly drawing upon them.

The project will have a beneficial impact on public utilities and infrastructure by generating a total of up to 218 MW of clean renewable energy that can be used by the people of Clinton County and New York State. In addition, this will advance the governor's goal of having 25% of the state's power provided by renewable sources by 2013.

The additional municipal and county revenue generated by the Project will help maintain and possibility expand these services and facilities.

3.7 Cultural Resources

The cultural resource studies are intended to assist the Towns of Clinton and Ellenburg in evaluating the potential effects of the Project on archeological sites and/or historic properties in accordance with their obligations under the New York State Environmental Quality Review Act (SEQRA). Consultation about the Project was initiated with the State Historic Preservation Office (SHPO) at a January 17, 2006 meeting at the New York State Office of Parks, Recreation and Historic Preservation (OPRHP). Consultation with the USACOE is also anticipated under Section 106 of the National Historic Preservation Act of 1966, as amended.

3.7.1 Existing Conditions

To identify existing conditions, including previously recorded archeological sites and historic structures and sites (cultural resources) that may be affected by the construction and/or operation of the proposed Project, a Phase IA cultural resources survey of the Project Area and vicinity was completed in the fall of 2005 by John Milner Associates, Inc. (JMA) of Croton-on-Hudson, New York. The survey was conducted in accordance with the New York Archaeological Council's *Standards for Cultural Resources Investigations and the Curation of Archaeological*

Collections (1994). JMA's report entitled *Phase IA Cultural Resources Survey: Marble River Wind Farm, Towns of Clinton and Ellenburg, Clinton County, New York* is included in Appendix J.

The survey also evaluated the potential for previously unrecorded archeological or historic resources to be present within the areas that will be potentially affected by the Project. The report was submitted in February 2006 to OPRHP and the Towns of Clinton and Ellenburg for review and comment. JMA recommended that a Phase IB archeological field survey and an historic-architectural survey be conducted in the Spring of 2006 after the ground surface has thawed sufficiently. The Applicant met with OPRHP officials in January of 2006 to agree on a Phase IB scope. The Applicant will submit a completed Phase IB with the FEIS. A Work Plan detailing the scope of the Phase IB is in preparation, and will be submitted to OPRHP for SHPO review and approval prior to the start of the field survey.

For purposes of the Phase IA research, the overall Project Area was considered to be an approximately 30,000-acre polygon that contains the individual leased land parcels (totaling approximately 19,310 acres), small portions of which are planned to house Project components. Within these leased land parcels, a total of approximately 120 acres is planned for direct permanent ground disturbance for the construction and operation of the Project. For visual impact assessment purposes, a Study Area was established within a five-mile radius of the perimeter of the Project Area within the U.S.

The Phase IA included background research on the environmental setting and area history, and a records review to identify previously recorded cultural resources. JMA reviewed available cultural resource studies, historic documents, maps and atlases at the New York Public Library, OPRHP, the New York State Museum and other repositories. JMA also consulted with local individuals knowledgeable about historic sites in the area including the Clinton County Historian's Office at Plattsburg, the Town of Clinton Historian's Office in Churubusco, and the Department of Anthropology at SUNY Plattsburgh. References are listed in Section 5.0 of JMA's report in Appendix J.

3.7.1.1 History of the Project Area

Historical accounts and early archeological reports reviewed by JMA for the Phase IA indicate that principal Iroquois villages were located along the shoreline of Lake Champlain, well to the east of the Project Area. There are relatively few known Native American sites in the interior and upland portions of Clinton County, and no known habitations sites in the Towns of Clinton or Ellenburg. Traces of former Native American activity have been found along Chateaugay Narrows, approximately five miles south of the Project Area. The ca. 1817-1826 Old Military Turnpike (now NY Route 11) reportedly followed an earlier Native American trail, and therefore small camps or other ephemeral types of sites may be located along this route.

Early colonial settlement in the vicinity of the Project was focused along the Old Military Turnpike between Plattsburgh and Chateaugay. Many of the pioneers who originally settled what was then a vast forested wilderness were veterans of the War of 1812 and/or Yankees from Vermont, who established farms and other enterprises in the area during the late 1810s through 1830s.

Primary economic pursuits in 19th-century Clinton County included lumbering, raising livestock, dairying and growing fruits. Construction of the railroad through the area in 1853 provided a means to transport local lumber products to distant markets. An important lumberyard was established at the hamlet of Clinton Mills, but burned to the ground in 1877 and was never fully rebuilt. The area has remained largely rural and focused on agricultural, recreational and forestry uses.

3.7.1.2 Previously Recorded Cultural Resources

JMA's review of available records found no previously recorded Native American archeological sites located within the Project Area or within the Towns of Clinton and Ellenburg. The nearest previously recorded Native American archeological site is located along Chateaugay Narrows (NYSM Site 9087), approximately five miles south of the Project Area.

There are no structures or properties presently listed on, or determined eligible for listing on, the State and/or National Registers of Historic Places located in or within five miles of the Project Area. Local historians identified the ca. 1888 Immaculate Heart of Mary Catholic Church, a former schoolhouse (now an apartment building), and the Town hall, all in Churubusco, as three locally significant structures, and suggested that some of the residences and farm structures in the vicinity of the Project Area may possess historic characteristics (see Figure 23).

A previous cultural resources survey associated with proposed improvements to NY Route 11 between Ellenburg and the Franklin County line resulted in the identification and documentation of 31 structures that were built prior to approximately 1945. This previous study area traversed the central portion of the Project Area. Most of the documented structures are 19th-centruy rural residences or farms. None of the properties received formal evaluations by OPRHP to determine State/National Register eligibility. JMA has requested that OPRHP staff provide formal determinations of eligibility for these structures.

Within the five-mile Study Area for potential visual impacts, the OPRHP Building-Structure Inventory includes 60 previously recorded structures or properties in the Town of Clinton and 31 properties in the Town of Ellenburg. According to the OPRHP on-line inventory, the only structure within these two towns that has been determined eligible for listing on the State and/or National Registers of Historic Places is the Merrill Schoolhouse, which is located approximately six miles south of the Project Area. Among the remaining 90 properties on the inventory within these two towns, six have been determined ineligible for listing on the registers. The remaining 84 properties have not received formal evaluations to determine historic significance and/or State or National Register eligibility.

The five-mile Study Area also includes portions of the Towns of Chateaugay and Bellmont in Franklin County. The OPRHP inventory for Chateaugay includes nine previously identified structures or properties. One of these, the Chateaugay Border Station located on NY Route 374 at the Point of Entry on the Canadian Border (west of and outside the five-mile Study Area) has been determined eligible for listing on the State/National Register. The remaining eight properties include four structures that have been determined ineligible and four that have not received formal evaluations to determine eligibility.

The OPRHP inventory for the Town of Bellmont includes 16 previously identified structures or properties. One (The First Union Protestant Church of Mountain View) is listed on the National Register but is located outside the five-mile Study Area, approximately 10 miles southwest of the Project Area. The remaining 15 properties in the inventory for the Town of Bellmont include three structures that have been determined ineligible and 12 structures that have not received formal evaluations to determine eligibility.

Immediately south of the Project Area is the northern boundary (termed the "blue-line" approximate boundary) of the Adirondack Forest Preserve, which is a National Historic Landmark and is listed on the National Register of Historic Places. Portions of the preserve are located within the viewshed Study Area for the Project.

No historic architectural survey of the Study Area appears to have been undertaken to date, though one is planned to be conducted by JMA for the Project in Spring 2006.

3.7.1.3 Sensitivity Assessment and Recommendations

In JMA's opinion, Native American settlement in the Project Area would likely have been relatively sparse throughout the prehistoric period, although the apparent absence of known archeological sites may in part be due to the lack of any previous substantive effort to locate these in the vicinity.

Historical atlases show the locations of 19^{th} century farms and rural industries located throughout the Project Area, which may contain historic period archeological deposits.

JMA recommended that a Phase IB archeological survey be conducted to determine the presence or absence of previously unrecorded archeological deposits within the Project's area of physical disturbance. JMA also recommended that a historic-architectural survey be conducted to identify and document historically significant structures that may be located in the Project viewshed within five miles of the limits of the Project Area. These studies are planned for the Spring of 2006, pending approval by OPRHP of a Work Plan detailing the scope of studies of the Phase IB archeological survey and historic-architectural survey.

The Work Plan is being prepared by JMA in accordance with the *Guidelines for Wind Farm Development Cultural Resources Survey Work* issued by the NY SHPO in January 2006 and discussed at the Project meeting with OPRHP staff on January 17, 2006. The Work Plan and Phase IB will include a GIS model identifying types of environmental zones (such as sloped areas, wetlands, etc.) within the Project Area that will be directly affected by construction and operation. An archeological testing program will be devised that includes intensive survey (either through excavation of shovel test units or pedestrian surface survey of plowed fields) of each type of environmental zone. Once the Work Plan detailing the Phase IB scope is approved by OPRHP, the field surveys will be conducted by JMA (see Appendix J).

3.7.2 Potential Impacts

Following completion of the Phase IB archeological survey and historic-architectural survey, potential impacts will be assessed on significant cultural resources (i.e. those that meet eligibility criteria for listing on the National Register of Historic Places) within the Project's areas of potential effect.

Potential impacts may include direct physical impacts, such as destruction of archeological sites and historic structures within the Project's physical area of disturbance during construction. Potential impacts also may include visual impacts to historic structures. These can be caused by visual introduction of the Project's aboveground components into the resource's historic setting.

Consideration of adverse effects will be limited to significant historic properties (i.e. those listed or found eligible for the National Register of Historic Places). Potential adverse impacts could include destruction or demolition of the resource, or introduction of visual elements that alter those qualities or characteristics that contribute to the historical significance of the property. The Applicant will continue to correspond with the proper state agencies to approve avoidance strategies.

3.7.3 Proposed Mitigation

The Applicant and its team will continue to work with involved agencies to identify significant cultural resources (i.e. those that meet eligibility criteria for listing on the National Register of Historic Places) that may be affected by the Project, and, if found, to avoid or minimize impacts to the extent feasible. In the event that avoidance or minimization measures of specific impacts are not found to be feasible, then appropriate mitigation measures will be developed in consultation with the applicable regulatory agencies that could include removal. These strategies will reduce any potential adverse impacts and are well accepted mitigation strategies. The findings of Phase IA and sparse topography of the site suggest that artifacts of historical significance are unlikely. A Phase IB will be submitted with the FEIS.

3.8 Visual Resources

3.8.1 Existing Conditions

Existing visual and aesthetic resources within a 5-mile radius of the Project area were assessed as part of a Visual Impact Assessment (VIA) conducted by EDR (Appendix K). Due to the proximity of Adirondack Park, areas within the Park, up to 15 miles from the proposed Project, were also examined. The VIA included review of existing data and field reconnaissance to identify landscape similarity zones, viewer groups, and sensitive visual resources within the visual study area. These existing visual/aesthetic components of the study area are described below.

3.8.1.1 Landscape Similarity Zones

Based on established visual assessment methodology (NYSDEC, not dated) the visual study area for the Project was defined as the area within a 5-mile radius of each of the proposed turbines, and includes 155 square miles in Clinton County, 40 square miles in Franklin County, and 65 square miles in the Province of Quebec, Canada (see Figure 3 in Appendix K) Land use within this area is characterized by a mix of active and reverting agricultural land, forest land, rural residential development, and several small villages and hamlets. Within this visual study area, three distinct landscape similarity zones were defined. The general landscape character of these zones is described below:

Zone 1. Rural / Agricultural Zone: This zone occurs primarily in the west-central U.S. and Canadian portions of the visual study area. It is characterized by open agricultural land with widely dispersed farms and rural residences along a network of rural roads. Active agricultural fields (corn, hay, pasture, and in Canada, apple orchards) bounded by hedgerows and scattered woodlots dominate the landscape. The land form within this zone consists primarily of level to gently rolling plateaus and valleys. Long-distance, panoramic views are available from elevated portions of this zone. Views typically include a patchwork of fields and woodlots, punctuated by houses, barns, and silos. Views in this zone also occasionally include roadside commercial development and communication towers. Examples of this landscape occur throughout the visual study area, especially outside the hamlets of Churubusco and Ellenburg Depot, and around the Canadian Villages of Havelock and Franklin.

Zone 2. Village/Hamlet Zone: This zone includes the larger hamlets and villages in both the U.S. and Canadian portions of the study area. This zone is characterized by moderate to high-density residential and (limited) commercial development. Vegetation and landform may contribute to visual character in this zone, but buildings (typically 1-3 stories tall) and other man-made features dominate the landscape. These features can be highly variable in their size, architectural style, and arrangement. However, they are typically arranged along an organized street pattern that tends to screen outward views and focus views along the streets or crossroads. However, at the periphery of this zone, and in most of the smaller hamlets, outward views to the greater landscape are available. Examples of this zone include the U.S. Village of Chataeugay and Hamlets of Churubusco, Ellenburg Depot, and Ellenburg, and the Canadian Hamlet of Franklin and Village of Saint Antione-Abbé.

Zone 3. Forestland Zone: Forestland is characterized by the dominance of native forest vegetation (mixed deciduous and coniferous tree species) in various stages of regeneration/maturity. The forestland zone occurs primarily in the northeastern and southern portions of the U.S. study area. It includes upland forest, as well as forested wetlands, beaver marshes and ponds. This zone is made up primarily of private forest land, much of which has been (or is being) logged and is currently dominated by young saplings and pole-sized trees. Views in the forestland zone are typically limited to areas where small clearings, wetlands, ponds, and road cuts provide breaks in the tree canopy. Where long distance views are available, they are typically of short duration, limited distance, and/or framed by trees. Prime examples of this zone include large tracts of managed forestland northeast of the Hamlet of Churubusco in the Town of Clinton (Clinton Mills), and Adirondack Park lands in the Town of Ellenburg.

These landscape similarity zones are illustrated in Figure 4 in Appendix K.

3.8.1.2 Viewer/User Groups

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

Local Residents: Local residents include those who live and work within the study area. They generally view the landscape from their yards, homes, local roads, and places of employment. Residents are concentrated in the villages and hamlets, but occur throughout the study area (although minimally in the forested northeastern and southern portions). Except when involved in local travel, these viewers are likely to be stationary, and have frequent or prolonged views of the landscape. Local residents may view the landscape from ground level or from the upper floors/stories of homes and buildings. Residents' sensitivity to visual quality is variable, however it is assumed that residents may be very sensitive to changes in particular views that are important to them.

Commuters/Through-Travelers: Commuters and travelers passing through the area view the landscape from motor vehicles on their way to work or other destinations. This group is concentrated on the major roads that traverse the study area, including U.S. Route 11, NYS Route 190, and Canadian Highway 202. Commuters and through-travelers are typically moving, have a relatively narrow field of view, and are destination-oriented. For the most part, drivers' attention is focused on the road and traffic conditions, but they do have the opportunity to observe roadside scenery. However, travelers along most of the roads within the study area will generally have limited views due to the flat terrain and abundance of roadside trees.

Tourists/Vacationers: Tourists and vacationers come to the area for the purpose of experiencing its cultural, scenic, or recreational resources. These viewers include hikers, hunters, fishermen and sight-seers involved in passive or active outdoor recreation activities. They may view the landscape from local roads while on their way to a destination, or from the destination itself. Some, such as weekend and seasonal home owners, may spend extended time in the area. Tourists' and vacationers' sensitivity to visual quality and landscape character will be variable (depending on their reason for visiting the area), although this group is generally considered to have relatively high sensitivity to aesthetic quality and landscape character. The forested character of most public and private recreation areas that are frequented by this viewer group generally limits long-distance visibility from these sites.

3.8.1.3 Visually Sensitive Resources

The area within a 5-mile radius of the proposed Project includes several sites that NYSDEC Visual Policy (DEP-00-2) considers scenic resources of statewide significance (NYSDEC, 2000). These are sites are illustrated in Figure 24, and described below:

Sites listed on the National or State Register of Historic Places: The study area includes only one site that is currently listed on the State and National Register of Historic Places (NYSOPRHP Website). This site is the Adirondack Park in the Town of Ellenburg. Approximately 31,000 acres of the Park fall within the 5-mile radius visual study area. The Phase 1A Cultural Resources Survey conducted for the Project (Heaton, 2006) concluded that there are no structures or properties eligible for listing on the State or National Register within 5 miles of the Project area.

State Forest Preserve: The central and eastern portion of the study area includes several areas of State Forest Preserve land located outside of the Adirondack Park boundary. These isolated parcels are located in the Towns of Clinton and Mooers, and do not include any recreational or public access features.

Designated Scenic Roads/Byways:

1. Military Trail Scenic Byway – This 84-mile stretch of State Route 37 and U.S. Route 11 connects Massena and Rouses Point along the historic military route used to transport troops and equipment along the Canadian border, between the Saint Lawrence River and Lake Champlain.
2. Le Circuit du Paysan – This 194-km (121-mile) scenic roadway traverses the southwestern portion of the Montérégie Region, in the Province of Quebec, Canada between the Richelieu River and Lake Saint-Francis. Multiple provincial routes and roadways make up the circuit.

Adirondack Park Lands and Scenic Vistas:

1. As mentioned above, approximately 31,000 acres of the visual study area falls within the Adirondack Park boundary ("blue line") in Clinton and Franklin County. Although within the Park, the vast majority of this land is in private ownership and not available for use by the public. The only public lands within this area are isolated parcels (included within the Debar Mountain Wild Forest) and Moon Pond State Forest. The Adirondack Park State Land Master Plan (APA, 2001) identifies a "potential" Adirondack Park scenic pull-off on County Route 54, near the Hamlet of Harrigan in the Town of Ellenburg.
2. Adirondack Park Travel Corridors. These corridors are identified in the Adirondack Park State Land Master Plan (APA, 2001), and include the major travel corridors and principal segments of the local highway network that contribute to the visual integrity of the Park. Within the study area, these include:
   - State Route 190 – The Adirondack Park State Land Master Plan includes a reference to approximately 8-miles of State Route 190, from the northern park boundary line to State Route 374, as being an Adirondack Park travel corridor. However, map review indicates that only approximately 1,500 feet of State Route 190 occur within the park boundary near the Hamlet of Brainardsville.
   - State Route 374 – Approximately 27-miles from the northern park boundary to the Village of Dannemora. Approximately 4.5 miles of this corridor occur within the visual study area.

Other scenic resources of statewide significance do not occur within the visual study area. There are no State Parks, Urban Cultural Parks, National Wildlife Refuges, State Wildlife Management Areas, National Park System lands, State Nature and Historic Preserve Areas, Palisades Park land, or Bond Act properties acquired under the scenic beauty category. None of the water bodies within this area are protected under the state's Wild, Scenic and Recreational Rivers Act (ECC Article 15, Title 27) and there are no designated state or federal trails, National Natural Landmarks or designated Scenic Areas of Statewide Significance. However, the area does include several resources considered visually sensitive from a local perspective. These resources, include the following:

State Forests and Unique Areas: Along with the Forest Preserve lands described above, the study area also includes the Gulf State Unique Area (Flat Rock Gulf). This 627-acre NYSDEC property is located in the Town of Mooers (Clinton County), adjacent to the U.S./Canadian Border, off Rock Road. It includes a 2.6 mile hiking trail that extends through hardwood forest, pine barrens, and marshland to the Gulf (a rocky chasm with waterfalls).

Parks and Recreational Areas: The study area includes several additional park and recreational areas, including the following:

- Lake Roxanne – Town of Ellenburg
- North Branch Great Chazy River – Town of Ellenburg
- Blue Haven Campsite – Town of Ellenburg
- Ranch Side Park – Town of Ellenburg

- Chateaugay Fish Hatchery – Town of Chateaugay (Franklin County)
- Lower Chateaugay Lake – Town of Bellmont (Franklin County)

Areas of Intensive Land Use: Several settlements within the study area are considered visually sensitive due to the concentration of residential development in these areas and intensity of land use they receive. These include the following:

- Hamlet of Churubusco
- Hamlet of Ellenburg
- Hamlet of Ellenburg Center
- Hamlet of Ellenburg Depot
- Village of Chateaugay (Franklin County)
- Hamlet of Brainardsville (Franklin County)
- Hamlet of Rockburn (Quebec Province, Canada)
- Hamlet of Franklin (Quebec Province, Canada)
- Hamlet of Covey Hill (Quebec Province, Canada)
- Hamlet of Havelock (Quebec Province, Canada)
- Village of Saint-Antoine-Abbé (Quebec Province, Canada)

Local Historic Sites: Local historians have identified the following as locally significant structures:

- Immaculate Heart of Mary Catholic Church (Churubusco)
- Former school house (Churubusco)
- Town hall (Churubusco)

Transportation Corridors: The visual study area includes several highways that could be considered visually sensitive due to the number of drivers that travel these roads on a daily basis. These include:

- U.S. Route 11
- State Route 189
- State Route 190
- State Route 374

The nearest scenic resources of statewide significance (as defined by NYSDEC policy) that occur outside the 5-mile radius but within the Adirondack Park include the following:

Wild, Scenic and Recreational Rivers: A 12.3-mile segment of the Salmon River in the Town of Belmont is the nearest river included within the NYS Wild, Scenic and Recreational River System (ECL Title 27, Article 15). This Recreational river is approximately 15 miles from the nearest proposed turbine.

State or Federal Designated Trails: The two nearest designated trails within the Adirondack Park include the following:

1. Lyon Mountain Trail – Approximately 6 miles south of the study area boundary. The 2.5-mile hiking trail is located on private property, but is available for use by the public. The trail begins at the Chazy Lake parking area and terminates at the Lyon Mountain lookout tower. This trail accommodates both hiking and snowshoeing activities.
2. DeBar Game Management Area Trail and Beaver Valley Trail – Approximately 15 miles southwest of the study area boundary. Approximately 13 miles of hiking trails occur within the DeBar Mountain Wild Forest area, beginning at the State Route 26 parking area and terminating at the DeBar Mountain Trail junction. These multi-use trails allow hiking, biking, horseback riding, snowshoeing, cross-country skiing, and snowmobiling.

Adirondack Park Scenic Vistas: Designated scenic vistas occur in valley areas near Owls Head and Lyon Mountain, over 11 miles from the nearest proposed turbine. The nearest open mountain top view is from the Lyon Mountain lookout tower (almost 12 miles from the nearest proposed turbine).

3.8.2 Impacts

3.8.2.1 Construction

Visual impacts during construction will include the addition of construction material and working construction vehicles and equipment to the local roads and landscape. Construction activity will also result in visible site disturbance, such as tree clearing, earth moving, soil stockpiling and road building, all of which will alter the character of the landscape, at least on a temporary basis. Dust generated by the movement of construction vehicles and sediment-laden storm water run-off could also potentially have an adverse impact on aesthetic resources. However, all of these activities will be relatively short term (i.e., generally restricted to the construction season), and at any one site, will generally occur on only a few days during the course of Project construction. Once construction activity ceases and site restoration activities are complete, construction-related visual impacts will no longer occur.

3.8.2.2 Operation

Impacts to visual resources resulting from Project operation were evaluated primarily through the VIA prepared by EDR (see Appendix K).

The VIA procedures utilized on this Project were based on visual impact assessment methodologies developed and/or accepted by various state and federal agencies. Potential Project visibility was evaluated using viewshed mapping, line-of-sight cross section analysis, and field verification (ballooning). Visual impact was evaluated by preparing computerassisted visual simulations of the Project from representative/sensitive viewpoints from throughout the 5-mile-radius study area. The Project's visual impact on the landscape was evaluated by an in-house panel of registered landscape architects with experience in visual impact assessment.

3.8.2.2.1 Viewshed Analysis

Viewshed maps for the study area were prepared using USGS digital elevation model (DEM) data (7.5-minute series) and the ArcView Spatial Analyst® computer program. Two 5-mile radius viewsheds were mapped, one to illustrate "worst case" daytime visibility (based on a maximum blade tip height of 410 feet above existing grade) and the other to illustrate potential visibility of turbine lights (based upon the nacelle height of 262 feet above existing grade). The viewshed analysis was based upon the location of 109 proposed turbines, as show in Figure 6. Because the screening provided by vegetation and structures is not considered in this analysis, the viewsheds represent a "worst case" assessment of potential project visibility. To evaluate potential long distance visibility, a 10-mile radius viewshed map was also prepared. To determine potential visibility from sensitive sites within the Adirondack Park, the viewshed distance was extended to 15 miles within the blue line, and the areas of potential visibility were mapped and quantified. The methodology employed on these viewshed analyses was the same as described above.

Disregarding the screening effect of vegetation and structures, viewshed analysis revealed that the proposed project has the potential to be visible in approximately 90% of the visual study area. The only areas where potential project visibility is lacking is in the northeastern portion of the area (primarily in Canada) and in valley areas around the Chateaugay River and Lower Chateaugay lake. The backside of a few hills and some stream valleys/ravines are also indicated as being fully screened by topography (see Figure 6 in Appendix K). Most of the visually sensitive sites in the study area fall within the Project viewshed (again, disregarding the screening effect of vegetation and structures), including land within the Adirondack Park, Moon Pond State Forest, Lake Roxanne, the Gulf State Unique Area, all of the U.S. hamlets, and most of the heavily-traveled roadways (including the Military Trail Scenic Byway). However, the proposed Adirondack Park scenic overlook on County Route 54, Lower Chateaugay Lake, the Chateaugay River, the Route 374 and Route 190 Adirondack Park Travel Corridors, the Hamlets of Franklin, Havelock and Covey Hill, Quebec, and portions of the Circuit du Paysan in Canada are indicated as being screened by area topography. In most areas where potential visibility is indicated, the viewshed analysis suggests that views to multiple turbines could be available. Areas of potential night time visibility cover approximately 85% of the study area, and generally occur in the same areas where potential daytime visibility is indicated. Areas of actual visibility will be much more limited than indicated by the viewshed analysis, due to the light color and slender profile of the turbines (especially the blades, which comprise approximately the top 148 feet of the turbine), the effects of distance, and screening provided by trees and structures, which are not considered in this analysis.

Extending the viewshed to 10 miles shows a similar pattern of potential visibility, except in the Adirondack Park to the south/southwest (see discussion below). In general, most of the area between 5 and 10 miles from the Project is indicated as having potential Project visibility. This includes the Villages of Chateaugay, Burke, and Altona. The only areas where visibility will be blocked by topography alone are the back sides of some hills and steep stream valleys/ravines.

The 15 mile viewshed analysis of the Adirondack Park revealed that potential Project visibility decreases dramatically within the Park (see Figure 6, Sheet 3 in Appendix K). This is due to the rugged topography in this area, which screens views of the proposed Project from approximately 75% of the Park (i.e., that portion within 15 miles of the nearest turbine). Areas where potential visibility is indicated are concentrated in the Town of Ellenburg and a corridor along Bradley Pond Road, down to the Hamlet of Lyon Mountain. Potential visibility is also indicated on the north-facing slopes and peaks of certain mountains (e.g., Ellenburg Mountain, Ragged Lake Mountain, Figure Eight Mountain, Soulia Mountain, Pinnale, West Mountain, and Lyon Mountain). More distant views are largely blocked by Ellenburg Mountain, Spruce Hill, and Soulia Mountain. Review of 2003 aerial photographs and a site visit on February 8, 2006, indicate that almost the entire viewshed within the Park (including the previously mentioned mountain peaks) is forested. Therefore, actual visibility will be much less than indicated by viewshed mapping.

3.8.2.2.2 Cross Section Analysis

To illustrate the screening effect of vegetation within the study area, four representative line-of-sight cross sections (each approximately 6-7-miles long) were cut through the study area. Cross section locations were chosen so as to include visually sensitive areas (e.g., villages, historic sites, parks, and water bodies) and various roads and local landmarks (see Figure 7, Sheet 1 in Appendix K). The cross sections are based on forest vegetation and topography as mapped on the 7.5-minute USGS quadrangle maps and digital aerial photographs. For the purposes of this analysis, a uniform 40-foot tree height was assumed. A 10 fold vertical exaggeration was used to increase the accuracy of the analysis.

Cross section analysis results suggest that along selected lines of sight, vegetation and structures will significantly decrease potential Project visibility, when compared to the results of the viewshed analysis (see Figure 7 in Appendix K). On average, approximately two thirds of each section shows ground-level views being screened. The sections confirmed a lack of visibility from the Adirondack Park scenic overlook, Lower Chateaugay Lake, State Route 374, and most of the land within the Adirondack Park. They also indicated that woodlots and areas of forest effectively screen significant portions of the study area, including Moon Pond, the North Branch of the Great Chazy River, and portions of area roadways. The sections also indicate that buildings will effectively screen ground-level views from portions of the Hamlets of Churubusco and Ellenburg Center. In regard to visually sensitive sites, the sections indicated that views of the turbines are likely to be available from portions of the Hamlet of Churubusco, areas of open land inside the Adirondack Park boundary, many of the heavily-traveled roads within the study area (including sections of Routes 11, 189 and 190), and the upper floors of some homes in the villages and hamlets.

3.8.2.2.3 Field Verification

Actual visibility of the proposed Project was evaluated in the field on October 21, 2005. Four 15-foot by 6-foot helium-filled balloons were tethered at the approximate location of proposed turbines 11, 58, 91, and 122, and raised to a height of approximately 410 feet above the existing grade, thus approximating the maximum finished elevation of the turbine blade tip when oriented straight up. The purpose of this exercise was to provide a locational and scale reference for verification of turbine visibility and to obtain photographs for the subsequent development of visual simulations.

While the balloons were in the sky, three field crews drove public roads and visited public vantage points within the 5-mile radius (260 square mile) study area to document points from which the balloons could or could not be seen. Photos were taken from 195 representative viewpoints within the study area (see Figure 8 in Appendix K). Balloon visibility (or lack of visibility) was documented at each viewpoint with photos and field notes. Viewpoint locations were determined using hand-held global positioning system (GPS) units and high resolution aerial photographs (digital ortho quarter quadrangles). The time and location of each photo were documented on all electronic equipment (cameras, GPS units, etc.) and noted on field maps and data sheets.

To evaluate long distance visibility from the Adirondack Park, a single EDR staff member hiked in to the Lyon Mountain lookout tower on February 8, 2006. This site is the nearest publicly accessible mountain top that offers open views toward the proposed Project site.

Field review indicated that actual Project visibility (as indicated by visibility of helium-filled balloons raised at four proposed turbine sites) is likely to be much more limited than suggested by viewshed mapping and cross section analysis (see Photo Log in Appendix K). This is due to the fact that screening provided by buildings and trees within the study area is more extensive and effective than assumed in the previous analyses. The result is that certain sites/areas where "potential" visibility was indicated by viewshed and cross section analysis, were actually well screened from views of the proposed Project. Field review confirmed a lack of visibility from areas in the southeastern portion of the study area along the Chateaugay River corridor, the far western and eastern portions of the Town of Clinton, and those portions of the Towns of Chateaugay and Mooers that occur within the study area. It also confirmed that ground-level views within villages and hamlets were typically blocked by buildings and street/yard trees. In the rural/agricultural portions of the study area, hedgerows and trees not indicated on the USGS maps also blocked/interrupted views of the balloons in many areas. Views were available from several sensitive sites, including portions of Route 11 (Military Trail Scenic Byway), portions of the Hamlets of Churubusco and Ellenburg Center and portions of several heavily traveled highways, including Route 189 and Route 190. However, the balloons could not be seen from areas around Lake Roxanne, Moon Pond State Forest, State Forest Preserve lands, the proposed Adirondack Park scenic overlook on Route 54, the two designated Adirondack Park Travel Corridors, the Hamlets of Ellenburg and Ellenburg Deport, and the Village of Chateaugay.

Field review from the Adirondack Park confirmed that most of the area where viewshed mapping indicates potential visibility is solidly wooded, and that long-distance views in this area are rare. This includes the peaks of most of the mountains within 15 miles of the proposed Project, including Soulia Mountain, Ellenburg Mountain, East Mountain, and Pinnacle. At the top of Lyon Mountain, open views are available from some areas of exposed rock, and from the lookout tower. From the tower, views north toward the Project site are available on clear days, however, the primary view is toward Chazy Lake and the High Peaks to the east.

3.8.2.2.4 Visual Simulations

Ten viewpoints were selected to show representative views of the Project from various distances and directions. The selected viewpoints also include each of the identified viewer/user groups and landscape similarity zones within the study area, as well as various sensitive resources. The selected viewpoints provide a sense of the scale/extent of the Project, and show the full range of visual change that will occur with the Project in place. The 10 selected viewpoints included the following (refer to Appendix K or Figure 28):

Viewpoint 3 View from Moore Road near the State Route 190 (Star Road) intersection in the Town of Ellenburg, looking north (Figure 25).

Viewpoint 8 View from Gagnier Road near the Patnode Road intersection in the Town of Clinton, looking south.

Viewpoint 15 View from State Route 190 (Old Military Turnpike) near the Hamlet of Ellenburg looking west (Figure 25).

Viewpoint 34 View from Tacey Road near the County Route 54 intersection outside the Hamlet of Harrington, looking north.

Viewpoint 38 View from the intersection of Campbell Road and Gagnier Road in the Town of Clinton, looking northeast (Figure 25).

Viewpoint 74 View from the intersection of State Route 189 and Clinton Mills Road in

	the Hamlet of Churubusco, looking southwest (Figure 25).
Viewpoint 81	View from Poupore Road near the U.S./Canadian border, looking west.
Viewpoint 165	View from Provincial Route 201 near the Village of St. Antoine-Abbé in Quebec looking southwest.
Viewpoint 170	View from the intersection of Clinton Road and Pollica Road near the Hamlet of Rockburn, Quebec, looking southeast.
Viewpoint 179	View is from U.S. Route 11 (Military Trail Scenic Byway) near the State Route 189 intersection in the Town of Clinton, looking west.

To show anticipated visual changes associated with the proposed Project, high-resolution computer-enhanced image processing was used to create realistic photographic simulations of the completed Project from each of the 10 selected viewpoints. The photographic simulations were developed by constructing a three-dimensional computer model in 3D StudioMax®, based on turbine specifications and survey coordinates of the proposed facilities. For the purposes of this analysis, it was assumed that all new turbines would be Gamesa Eolica G90 machines.

Because clear photos of the Project site could not be obtained from Lyon Mountain during field review, a "virtual image" of this view was created by using a digital model of the landscape and adding the proposed turbines. The terrain model was created by draping overlaying aerial photography on a mesh model generated from the 7.5 minute Digital Elevation Models (DEM's). Models of the turbines/turbine layout were added to the view, as described above. The view is looking north and nearest turbine is approximately 12 miles away. Viewer elevation is approximately 30 feet above ground level.

Simulations of the proposed Project indicate that the Project will result in a significant change to the existing visual setting/landscape (see Figure 25 and Figures 9-18 in Appendix K). However, the visibility and visual impact of the wind turbines will be highly variable based on distance, weather conditions, sun angle, the extent of visual screening, viewer sensitivity, and/or existing land use characteristics. The greatest impact occurs when the turbines are close to the viewer (less than 0.5 mile), which heightens the Project's contrast with the landscape in color, line, texture, form, and especially scale. In such views, the turbines become focal points, and begin to alter the perceived land use in the view. In views where superior viewer position, level topography, and lack of foreground screening provide open views of numerous turbines, the size and expansiveness of the Project becomes evident. The expanse of the Project results in a perceived incompatibility with the rural land use evident in these views. Views that include significant screening and/or the presence of other man-made features in the view generally have more limited visual impact. These factors tend to decrease turbine visibility and/or color, line, texture, and scale contrast with the landscape.

The "virtual image" created to simulate the view from the Lyon Mountain lookout tower confirms that unobstructed views toward the Project site will be available. Under clear sky conditions, the proposed Project will be visible in its entirety. The turbines will be viewed against the backdrop of the ground, which heightens their contrast in line, form, and color. However, the slender form and the effects of distance (atmospheric moisture/background haze) will minimize their visibility and visual impact.

3.8.2.2.5 Visual Impact Evaluation

An in-house panel of three EDR landscape architects was asked to rate the proposed Project in terms of its contrast with existing components of the landscape. Digital color prints (11 x 17-inch) of the before and after photos from each selected viewpoint were evaluated by the panel. Using a rating form developed by EDR, the Project's contrast with existing vegetation, landform, land use, water resources, and user activity was then rated on a scale of 1 (completely compatible) to 5 (strong contrast). For each viewpoint, these scores were added and averaged to provide an overall contrast rating.

This evaluation revealed that individual contrast ratings ranged from 1.0 (completely compatible) to 4.25 (high visual contrast). Composite scores (i.e., the average of individual rating panel members) ranged from 1.5 to 3.42, and averaged 2.52. Scores in this range indicate a moderate level of visual contrast. The lowest contrast ratings (2.0 and under) were received by viewpoints that were characterized by more distant views (1.6 to 4.1 miles), significant screening by vegetation and/or landform, and the presence of other man-made features in the view. Higher contrast ratings were typical where turbines were in proximity to the viewer (i.e., under 0.5 mile), extended across broad expanses of the view, or appeared out of context/character with the landscape. Based on the panels evaluation, as well as viewer reaction to operating wind power projects elsewhere, public reaction to the Marble River Wind Farm is likely to be generally positive, but highly variable based on proximity to the turbines, the affected landscape, and personal attitude regarding wind power.

Based upon review of night time photos and observations of existing wind power projects, the panel felt that the red flashing lights have the potential to create a significant nighttime effect. The potential significance of this impact depends on how many turbines are visible, what other sources of lighting are present in the view, the extent of screening provided by structures and trees, and night time viewer activity/sensitivity. However, it was felt that night lighting could be distracting and have an adverse impact on rural residents that currently experience dark nighttime skies, especially from sites where a significant portion of the Project is visible. It should be noted that night time visibility/visual impact may be reduced on this Project due to 1) new FAA guidelines that will result in somewhat fewer aviation warning lights then required on earlier projects, 2) an abundance of forestland that will significantly screen views to the Project, and 3) the concentration of residences in hamlets and along highways where existing lights already compromise dark skies and compete for the viewer's attention. Panel members also felt that new FAA guidelines requiring synchronization of the flashing lights would help reduce adverse visual impact.

3.8.2.2.6 Assessment of Shadow Flicker

In addition to the VIA prepared by EDR, a separate assessment of the phenomenon known as "shadow flicker" was conducted by Wind Engineers, Inc. (WEI) (see Appendix K). Shadow flicker is the alternating change in light intensity or shadows created by the moving turbine blades when back-lit by the sun. Shadow flicker can occur in Project area homes when a turbine is located near a home and is in a position where the blades interfere with low angle sunlight. At distances of 1,000 feet or more, shadow flicker usually only occurs immediately after sunrise or before sunset, when shadows are sufficiently long. The most typical effect is the visibility of an intermittent light reduction in the rooms of the home facing the wind turbine(s) and subject to the shadow flicker (i.e., a receptor). At distances from 1,000 to 1,500 meters between the turbine and a receptor, there will be virtually no distinct "chopping" of the sunlight. Obstacles such as hills, trees, or buildings between the turbine and a potential shadow flicker receptor significantly reduce or eliminate shadow flicker effects. Where shadow flicker is perceptible, it can cause an annoyance to nearby or residences, however, due to the turbines' low blade pass frequency (less than 1 Hz), shadow flicker is not anticipated to have any adverse health effects (e.g., trigger epileptic seizures). Although setback distances for turbines (more than 1,200 feet from adjacent residences) will significantly reduce shadow flicker impacts to potential receptors, some limited impact will occur.

To calculate potential shadow flicker impacts, WEI used the following data to evaluate potential impacts related to shadow flicker:

- Turbine locations (coordinates)
- Shadow flicker receptor (residence) locations (coordinates)
- USGA 1:24,000 topographic and USGS DEM (height contours)
- Turbine rotor diameter
- Turbine hub height
- Joint wind speed and direction frequency distribution
- Sunshine hours (long-term monthly reference data)

The model calculated shadow-flicker time at each assessed receptor location and the amount of shadow-flicker time (hours/year) everywhere surrounding the Project (on an iso-line plot).

WEI's modeling indicated that of 358 potential receptors, almost half (175) will experience no effect, and only 11 could experience over 25 hours of shadow flicker throughout a year (typically around sunrise or sunset). At no receptor location would these impacts exceed 34 hours per year. Because they are generally closest to the turbine, most of these receptors will also experience more relatively high intensity shadow flicker than other receptors. However, WEI indicates that the number of shadow flicker hours calculated for the Marble River Project is lower than that calculated for most U.S. wind projects. They also note that these model results do not reflect many of the local conditions at the receptor site that could further reduce shadow flicker, such as trees and neighboring structures. This model also assumes that the turbine rotor is always turning, the receptor always has a window facing the direction of the sun, and that the receptor dwelling is occupied at all hours when shadow flicker may occur (i.e., at sunrise and sunset). Results thus represent a "near worst case" shadow flicker scenario (worst case would assume that the sun is always shining during daylight hours, and the turbines are always running during these hours). Site-specific factors such as terrain, trees, buildings, and window location would further reduce impacts from shadow flicker.

3.8.3 Proposed Mitigation

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

The proposed Project layout was developed so as to minimized the need for tree clearing and new road construction. The majority of the proposed turbines and other Project components have been sited in open fields (agricultural and successional) or previously logged/cleared forest land. Mature forest and wetland communities have been avoided to the extent practicable. Existing farm lanes and woods roads will be upgraded for use as turbine access roads wherever possible, while buried interconnect lines will follow access roads and field edges to minimize required clearing. Where clearing of undisturbed forest is unavoidable, such sites are typically well removed from adjacent roads and residences and therefore will not result in a significant adverse visual impact.

During construction visual impacts associated with working construction equipment will be minimized through adherence to a construction routing and sequencing plan that minimizes impacts on local roads and residences. A dust control plan and a sediment and erosion control plan will be developed and implemented to minimize off-site visual impacts associated with construction activities. Also, in accordance with the requirements of the local wind power ordinances, a complaint resolution procedure will be implemented to investigate and address problems, which could include adverse visual impacts (see Appendix C). As described in the impacts discussion, any unavoidable construction-related visual impacts will be short term.

Following completion of construction, site restoration activities will occur. These will include removal of access road material from Project access roads (i.e., going from a 40 foot width in places to 16 feet in width), restoration of agricultural fields (including soil decompaction, rock removal, and topsoil spreading), and stabilizing/revegetating all disturbed sites through seeding and mulching. These actions will assure that, as much as possible, the site is returned to its preconstruction condition.

Mitigation options for the operating Project are limited, given the nature of components and its siting criteria (tall structures on high elevation sites). However, in accordance with DEC Program Policy (NYSDEC, 2000), various mitigation measures were considered. These included the following:

A. Screening. Due do the height of individual turbines and the geographic extent of the proposed Project, screening with earthen berms, fences, or planted vegetation will generally not be effective in reducing Project visibility or visual impact. However, if adequate natural screening of the proposed substation site cannot be preserved, a planting plan will be developed and implemented to minimize visibility and visual impact associated with this component of the Project.
B. Relocation. Again, because of the extent of the Project, the number of individual turbines, and the large number of viewpoints from which the Project can be seen, turbine relocation will generally not significantly alter the visual impact of the Project.
C. Camouflage. The white or off-white color of wind turbines generally minimizes contrast with the sky under most conditions. Consequently, this color be utilized on the Project. The size and movement of the turbines prevents more extensive camouflage from being a viable mitigation alternative (i.e., they cannot be made to look like anything else).
D. Low Profile. A significant reduction in turbine height is not possible without significantly decreasing power generation. To off-set this decrease, additional turbines would be necessary. There is not adequate land under lease to accommodate a significant number of additional turbines, and a higher number of shorter turbines would not necessarily decrease Project visual impact. In fact, several studies have concluded that people tend to prefer fewer larger turbines to a greater number of smaller ones (see Appendix K). The visual impact of the electrical collection system is being minimized by placing the lines underground rather than on overhead poles.
E. Downsizing. Reducing the number of turbines could reduce visual impact from certain viewpoints, but from most locations within the study area, unless this reduction were drastic, the visual impact of the Project would change only marginally. A dramatic reduction in turbine number (e.g., reduction by10% to 30%) could make the Project economically unviable.
F. Alternate Technologies. Alternate technologies for power generation would have different, and perhaps more significant, visual impacts than wind power. Alternative utility-scale wind power technologies, that would significantly reduce visual impacts, do not currently exist.
G. Nonspecular Materials. Non-glossy paints and finishes will be used on the wind turbines to minimize reflected glare. Galvanized substation components will rapidly weather to a non-reflective gray color.
H. Lighting. Turbine lighting will be kept to the minimum allowable by the FAA. New FAA guidelines (FAA, 2005) do not require daytime lighting, and allow nighttime lighting of perimeter turbines only, at a maximum spacing of 0.5 mile. Medium or low intensity pulsing

red lights will be used at night, rather than white or red strobes, or steady burning red lights. Lighting at the substation will be kept to a minimum, and turned on only as needed, either by switch or motion detector.

I. Maintenance. The turbines and turbine sites will be maintained to ensure that they are clean, attractive, and operating efficiently. Research and anecdotal reports indicate that viewers find wind turbines more appealing when they are operational and the rotors are turning. In addition, the Applicant will establish a decommissioning fund to ensure that if the Project goes out of service and is not repowered/redeveloped, all visible above-ground components will be removed.

J. Offsets. Correction of an existing aesthetic problem within the viewshed is a viable mitigation strategy for projects that result in significant adverse visual impact. However, results of this VIA do not suggest that such mitigation measures are warranted for the Marble River Wind Farm.

In addition to the Project's visual impact include the following:

- Compliance with all required set-backs from roads and residences.
- All turbines will have uniform design, speed, height, and rotor diameter.
- Towers will include no exterior ladders or catwalks.
- The Project operations and maintenance building, although not yet designed, will reflect the vernacular architecture of the area, such as resembling an agricultural structure).
- New road construction will be minimized by utilizing existing Town roads, woods roads and farm lanes whenever possible.
- No placement of any advertising devices on the turbines.
- A parking/viewing location, with an informational kiosk, will be developed to enhance public understanding and appreciation to the Project.
- It is anticipated that the Applicant will enter into an agreement with the OPRHP to undertake various activities to mitigate potential visual impacts on historic structures. Based on experience elsewhere, this mitigation is anticipated to involve establishment of a historic property visual mitigation program that would fund historic structure protection/restoration projects within the Project viewshed. In many respects this is comparable to the offset mitigation described in the NYSDEC visual policy.
- Additional investigation of the 11 receptors that could receive more than 25 hours of shadow flicker annually will be undertaken. This investigation will determine if site-specific conditions (building/window orientation, tree screening, etc.) will prevent or minimize the predicted impact. In instances where such mitigating factors are not present, mitigation for potential shadow flicker impacts will be provided by development agreements with neighboring landowners. Money provided through these agreements could be used to purchase landscape screening (trees, shrubs), or window treatments such as curtains, blinds, or shutters.
- Irrespective of whether non-participating neighbors are visually impacted, the Applicant will offer neighbor payments to all such non-participating neighbors within 2,000 feet of a turbine.

3.9 Climate and Air Quality

This section discusses the existing climatic conditions and regional air quality.

3.9.1 Climatic Conditions

The Natural Resources Conservation Service (NRCS) of the U.S. Department of Agriculture (USDA) maintains and monitors National Water and Climate Centers (NWCCs) in numerous locations throughout the U.S., including four in Clinton County. The one NWCC substation in adjacent Franklin County is more distant from the Site than any of the Clinton County substations. The nearest NWCC substation in Clinton County to collect precipitation data is in Ellenburg Depot, which has collected precipitation data only from 1948 until the present. Since the Site is located in the Towns of Clinton and Ellenburg, the Ellenburg Depot data is considered representative of the Site. The 30-year average precipitation for the period of 1971 to 2000 at Ellenburg Depot is 32.85 inches/year. August, with an average precipitation of 3.79 inches, is historically the wettest month of the year, and February, with 1.62 inches, is historically the driest. The 30-year average snowfall recorded at Ellenburg Depot is 100.2 inches/year. December and January are historically the snowiest months of the year, with annual averages of 19.1 and 20.7 inches, respectively.

The other three NWCC substations in Clinton County collect temperature data. Due to their elevations and locations, no other single substation is truly representative of Ellenburg Depot, although the three substations together likely provide bounding conditions. Ellenburg Depot is located at an elevation of 860 feet above Mean Sea Level (MSL). Based on the data in the table below for the period of 1971 to 2000, the average daily maximum temperature is 53.1° to 55.5° Fahrenheit, and the average daily minimum temperature is 34.1° to 34.6° F. Historically, January is the coldest month, with an average daily temperature of 16.8° to 18.1° F and July is the warmest, with an average daily temperature of 68.6° to 70.1° F.

Table 3.9.1: Daily Temperature

NWCC	Elevation (ft MSL)	Avg. Daily Max Temp	Avg. Daily Min Temp	Coldest Month	Avg. Daily Temp.	Warmest Month	Avg. Daily Temp.
Chazy	170	54.8° F	34.1° F	January	17.0° F	July	69.4° F
Peru	510	55.5° F	34.6° F	January	18.1° F	July	70.1° F
Dannemora	1,340	53.1° F	34.3° F	January	16.8° F	July	68.6° F

3.9.2 Air Quality

Air quality data for New York State are published annually by the NYSDEC Division of Air Resources. The most recent summary of air quality data available for the state is the *2004 Annual New York State Air Quality Report - Ambient Air Monitoring System* (NYSDEC, 2005). Included in this report are ambient air quality data through 2004, as well as long-term monitoring trends in air quality that were collected and compiled from numerous state and private (e.g., industrial, utilities) monitoring stations across the state. The data presented indicate that the only exceedance of National Ambient Air Quality Standards (NAAQS) in NYSDEC Region 5 is at the summit of Whiteface Mountain, located in Essex County at a considerable distance from the Site. At that location, the ozone NAAQS (8-hour average) is exceeded by approximately 11%, but is trending downward during the period 2002-2004, after trending upward during the period 2000-2002.

The EPA Green Book, accessible at http://www.epa.gov/airprogm/oar/oaqps/greenbk/ancl.html, lists Currently Designated Nonattainment Areas for All Criteria Pollutants by county for the entire United States. As of its last update on September 29, 2005, all of Clinton County, including the Towns of Clinton and Ellenburg, are designated as within attainment for all major pollutants monitored [carbon monoxide (CO), nitrogen dioxide (NO_2), ozone, lead, particulate matter less than 10 microns in diameter (PM_{10}), PM less than 2.5 microns in diameter ($PM_{2.5}$), and sulfur dioxide (SO_2)], indicating that the NAAQS are not exceeded.

Air emissions in the area are related primarily to manufacturing, vehicular travel, and farm operations. Vehicles traveling area roads produce exhaust emissions, along with dust from unpaved road surfaces. Routine odors are associated with certain farming practices (e.g., spreading of manure). Although at times an annoyance, none of these have a significant adverse effect on local air quality.

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. Many studies and reports have noted the effects of acid rain deposition in the Northeast, in particular the Adirondack Mountains and surrounding areas [Jenkins, *et al*, 2005]. Several programs monitor and track acid rain deposition. As detailed in Jenkins, *et al*, 2005, the monitoring systems are coordinated by the National Acid Precipitation Assessment Program (NAPAP), a cooperative program among many U.S. government agencies and Departments. Much of the actual monitoring is conducted by the National Trends Network (NTN), a network of 145 member institutions. The Adirondack Long-Term Monitoring Program (ALTM), the NYS Atmospheric Deposition Monitoring Network, and EPA's Clean Air Status and Trends Network (CASTNET) are all involved.

3.9.3 Potential Impacts

3.9.3.1 Potential Short Term Impacts

Short-terms impact would be those associated with the constriction of the Project. During the site preparation and construction phases of the Project, temporary minor adverse impacts to air quality will result from the operation of construction equipment and vehicles. Impacts will occur as a result of emissions from engine exhaust and the generation of fugitive dust during earth-moving activities and travel on unpaved roads. The increased dust and emissions will not be sufficient to significantly impact local air quality. However, dust could cause annoyance and property damage at certain yards and residences located adjacent to unpaved Town roads or project access roads. These impacts are expected to be short-term and localized.

3.9.3.2 Potential Long Term

Long-term impacts are expected to be positive, since the Project will result in the reduction of emissions by fossil fuel-fired power plants in the region.

As noted in Section 3.9.2, the region is subject to emissions transported from fossil-fuel burning sources, principally in the Midwest. Resource Systems Group, Inc. (RSG) conducted a study for the Flat Rock Wind Power Project (now known as Maple Ridge Wind Power Project) in Lewis County, NY, to assess the effects of that project in reducing air emissions (RSG, 2003). The analysis projected significant reductions in contaminants resulting from that project's power generation. Since both projects are located in northern New York State, the emission factors (EFs) determined by RSG are considered representative for the Marble River project. The EFs are presented below, along with estimated emission reductions that will result from this project.

Table 3.9.3.2-1: Estimated Emissions Reductions Resulting from the Project

Compound	Emission Factor (lbs/MW-hr)	Total Annual Reductions (tons/year) [1]
Nitrogen oxides (NO_x)	1.363	375
Sulfur dioxide (SO_2)	1.765	485
Carbon dioxide (CO_2)	1,274	350,350
Particulate matter less than 10 microns in diameter (PM_{10})	0.041	11
Volatile organic compounds (VOCs)	0.035	10
Mercury	2 E-06	0.0005 (1.1 lbs/yr)

[1] Assumes 550,000 MW-hrs of electrical power generated by Marble River during an average year.

The project will have a significant beneficial impact on air quality by producing up to 218 MW of electricity without any emissions to the atmosphere. The annual production of wind power by the Project will reduce CO_2 emissions, which contribute to global warming, by an amount equivalent to removing about 58,000 cars from the road [calculated using US EPA Greenhouse Gas Calculator, 2001].

3.9.4 Proposed Mitigation

Several measures will be implemented to minimize the amount of dust generated by construction activities. The extent of exposed or disturbed areas on the site at any one time will be minimized, and those areas will be restored or stabilized as soon as practicable. The site environmental monitor will identify any dust problems and report them to the construction project manager and the contractor. Water will be used to wet down dusty roads (public roads, as well as project access roads) as needed during the duration of construction activities.

Because the Project will have a long-term beneficial impact on air quality, this major benefit of displacing emissions of air pollutants may be viewed as mitigation for other environmental impacts associated with the Project. Since transmission losses generally increase linearly with the distance electricity is transmitted, all else being equal, displaced power generation is more likely to be located closer to the site than further away, providing additional local air quality benefit.

The following mitigation measures for construction-related air emissions and dust are proposed and will be standard operating policy for the Project construction contractors:

- All vehicles used during construction will comply with applicable Federal and state air quality regulations;
- Operational measures such as limiting engine idling time and shutting down equipment when not in use will be implemented;

- Active dust suppression will be implemented on unpaved construction access roads, parking areas and staging areas, using water-based dust suppression materials in compliance with state and local regulations;
- Traffic speeds on un-paved access roads will be kept to 25 mph to minimize generation of dust;
- Car-pooling among construction workers will be encouraged to minimize construction-related traffic and associated emissions;
- Disturbed areas will be re-planted or graveled to reduce wind-blown dust;
- Erosion control measures will be implemented to limit deposition of silt to roadways.

3.10 Noise

Hessler Associates, Inc. was retained by the Applicant to evaluate potential noise effects from the operation of the proposed Marble River Wind Farm on sensitive receptors in the vicinity of the proposed project area. The project as presently configured will consist of approximately 109 Gamesa Eólica Model G90 wind turbine generators, each with a nominal output of 2 MW installed over a large area within the Towns of Ellenburg and Clinton, NY. The results of a 2003 field test revealed that the two turbine models sound power levels were found to be identical. A more recent test in 2005 showed the G87 to have a slightly higher sound power level (106 dBA). Since this later study is more detailed and indicated a higher sound level that is more conservative, the G87 has been used in the noise modeling to represent either the G87 or G90. The full report titled Environmental Sound Survey and Noise Impact Assessment, Marble River Wind Farm Project is contained in Appendix L.

3.10.1 Existing Conditions

3.10.1.1 Background Sound Level Survey

A background sound level survey was conducted to determine what minimum environmental sound levels are consistently present at the nearest potentially sensitive receptors. A number of statistical sound levels were measured in consecutive 1 hour intervals over the entire survey. Of these, the average (L_{eq}) and residual (L_{90}) levels are the most meaningful.

The average, or equivalent energy sound level (L_{eq}), is the average sound level over each measurement interval. While useful and informative, this measure needs to be viewed with some caution when the survey objective is to quantify the mean minimum background level - since it can be, and often is, influenced by noise events that are relatively loud in magnitude but short in duration, such as a car passing close by the monitoring position. Such an event can significantly elevate the average level and yield a result that may be unrepresentative of the quieter times during the sample.

In order to avoid this, the L_{90}, statistical sound level is commonly used to quantify background sound levels. The L_{90} is the sound level exceeded during 90% of the measurement interval and filters out sporadic, short-duration noise events thereby capturing the quiet periods between such events. It is this consistently present "background" level that forms a conservative basis for evaluating the audibility of a new source. If the source does not exceed the background sound level by more than approximately 3 to 5 dBA, the source will typically not be perceived as a noise nuisance and may not be audible at all.

An additional factor that is important in establishing the minimum background sound level is the natural sound generated by the wind. Wind turbines only operate and produce noise when the wind exceeds a minimum cut-in speed of about 4 m/s measured at a reference elevation of 10 meters. Turbine sound levels increase with wind speed up to about 8 m/s when the sound produced reaches a maximum and no longer increases with wind speed. Consequently, at moderate to high speeds when turbine noise is most significant, the level of natural masking noise is normally also relatively high due to tree or grass rustle thus reducing the perceptibility of the turbines.

3.10.1.2 Site Description and Sound Level Measurement

From a noise impact perspective the site consists of two distinct areas: the eastern half of the gross project area which is forested and contains few permanent residential dwellings while the western half which consists of small to moderate sized farms interspersed with individual residences on smaller tracts of land. The distribution and density of residential dwellings over the western half of the site is more or less uniform except for a small area of greater density around the locality of Churubusco.

As there are few potentiality sensitive receptors within several miles of any of the proposed turbine locations in the eastern half of the site, the field survey and analysis focused on the populated western half of the Project area. Appendix L presents the sound contour plots of the Project Area.

The topography of the site area and its surroundings is essentially flat, meaning that there are no significant ridges, ravines or mountains that would have a meaningful impact on sound propagation from any given turbine to any given receptor point.

The western part of the site is comprised mostly of open farm fields and pasture lands intermixed with wooded areas. Some homes have several trees immediately adjacent to them but are otherwise located in open areas. Most of the deciduous trees had a few leaves at the beginning of the survey and were largely bare by the end of the survey. The proposed wind turbine locations in the western half of the site are distributed in a fairly uniform manner and are interspersed among and between the residences.

Because of the homogeneous nature of the populated portion of the site, background sound level measurement locations were chosen to evenly cover and represent the entire area as shown in Appendix L. The more usual approach of identifying and measuring sound levels at the residences closest to the Project and most likely to be impacted was not practical at this site.

Each location is close to a residence considered typical for the area in terms of proximity to local roads and exposure to the prevailing sources of normal background noise, which are largely confined to wind induced sounds, farm machinery and very distant, indistinct traffic noise.

The survey was carried out over an approximate week period from October 13 to November 1, 2005. The principal instruments, deployed at the north (N), central (C), south central (SC) and south (S) positions were Norsonic Model 118, ANSI Type I precision integrating octave band analyzers, which were set to measure sound levels in full octave bands. Rion Model NL-06 and NL-32 ANSI Type 2 A-weighted sound level meters were used at the north central (NC) position.

Microphones were fitted with appropriate windscreens and measurements were taken 2 meters above local ground level. All equipment was field calibrated at the beginning of the survey and again at the end of the survey.

The weather conditions during the survey included many days of overcast skies, light to moderate rain and even a significant snow event. A good sampling of wind speeds over the full range of interest were observed from the turbine cut in speed up to the speed necessary to rotate the turbine blades at maximum rpm. The specific periods of precipitation and other meteorology are tabulated in the report provided in Appendix L.

The wind speed at the site was measured at a meteorology tower immediately adjacent to the Central monitoring location on Route 189. The hourly average wind speeds measured at an elevation of 82 meters above ground level (agl) and the calculated average wind speed[1] at the standard normalization height of 10 meters are shown In Appendix L.

3.10.1.3 Background Measurement Results

The hourly L_{90} sound levels for all five positions were plotted for the entire 20-day survey period. The plots are available in the full report in Appendix L. The plotted data reveals that the sound levels at all five locations, although many miles apart, are very similar and certainly follow the same overall trends, which are clearly dictated wind speed. One inconsistency between the various monitoring positions is the pattern of regularly repeating spikes observed at the South position around 9 am. and 7 p.m. every day. These periods of elevated sound levels are associated with morning and evening traffic activity on Star Road. Aside from these temporary peaks, the natural background sound levels at the South position essentially follow those of the other locations.

[1] per IEC Standard 61400

The general trend at all the monitoring stations is that sound levels closely parallel wind speed. Areas such as this are said to have a "macro-ambient", meaning that the sound level at any specific point can be inferred with good accuracy from levels measured elsewhere within the same macro-ambient environment. The wind speed range of interest with respect to wind turbine noise is from the cut-in speed of 4 m/s at 10 meters[2], when the turbines just begin to operate up to about 8 m/s at 10 meters when the noise levels off at a constant, maximum value after increasing from zero.

The measured wind speed data[3] presents a trend of increasing background sound levels with wind speed as shown below.

Table 3.10.1.2-1: Measured A-Weighted Background Sound Levels a Standardized Wind Speed

Wind Speed at Standardized Height of 10 Meters, m/s	4	5	6	7	8	9
Background Sound Level L_{90}, dBA	33	35	37	39	40	42

This analysis indicates the background ambient sound level for the cut in speed of the turbines (6 mph) is 33 dBA and 40 dBA when the turbines would reach maximum power (8 m/s) and when noise levels would reach their maximum value. Beyond this wind speed background noise would continue to increase while turbine noise would remain constant.

The average octave band frequency spectra associated with the turbine cut in wind speed of 4 m/s and maximum noise level wind speed of 8 m/s (both measured at 10 m) were developed and are presented in Appendix L.

These two spectra for relatively low and high wind conditions show that sound levels generally increase in all frequencies with increasing wind speed. The largest change, about 10dB, is in the lower frequencies (<500 Hz) whereas an increase more on the order of 5dB occurs in the higher frequencies.

Generally, the 8 m/s spectrum illustrated in Figure 2.8.1 of Appendix L is similar in shape to the sound level spectrum that would be produced by a Gamesa G87 wind turbine at a fairly short distance. Because of this similarity, natural wind induced sounds could provide effective masking of turbine noise. Therefore, when the turbine sound level is comparable to or less than the background level, it will be difficult to perceive that the turbines are operating. depending only on the relative overall magnitude of each.

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[2] Because surface roughness varies from place to place, measurements of wind turbine sound power levels and concurrent wind speeds carried out in accordance with IEC Standard 61400-Il (Ref I) are normalized and reported at a reference height of 10 m.

[3] See Figure 2.7.1 in Appendix L

3.10.2 Potential Operational Impacts

3.10.2.1 Turbine Noise Level

The sound power level produced by the Gamesa G87 wind turbine is known through carefully controlled field measurement tests carried out by independent acoustical engineers on behalf of the manufacturer. As described earlier, the G87 and G90 Gamesa wind turbines have nearly identical sound level profiles. Noise testing in 2005 indicated a slightly higher full speed sound power level (106 dBA re 1pW) for the G87 and therefore these levels were used in the analysis.

Sound *power* level is a based on the measured sound pressure level at a given point and the effective radiating surface, or wave front area at that point. Knowledge of the sound power level allows the sound *pressure* level of the source, the quantity perceived by the ear and measured with instruments, to be determined at any point.

The noise output of the Model G87, as well as other similar wind turbines, varies with wind speed. Turbine noise is zero below the cut-in wind speed, grows from a very low level to maximum noise output from about 5 to 8 m/s and then remains constant or even declines slightly at all higher wind speeds. The following table presents the turbine sound levels at different wind speeds downwind of the turbine.

Table 3.10.2.1-1: Gamesa G87 Sound Power Levels vs. Wind Speed

Wind Speed at Standardized Height of 10 Meters, m/s	5	6	7	8	9	10	11	12
Sound Power Level dB re: 1 pW	101.2	104.7	106.2	106.4	106.0	105.4	105.1	105.2

As seen in the table, the highest sound level 106.4 dBA, occurs at a wind speed of 8 m/s. This sound level and the associated octave band frequency sound levels in Table 3.10.2.1-2 were used in the analysis.

Table 3.10.2.1-2: Gamesa G87 Sound Power Levels vs. Wind Speed

Octave Band Center Frequency	31.5	63	125	250	500	1k	2k	4k	8k	dBA
Sound Power Level dB re: 1 pW	118.4	111.6	107.6	105.6	102.8	100.8	96.0	86.6	78.2	106.4

3.10.2.2 Assessment Criteria

There are several criteria against which to compare the predicted noise from the Project to determine if any adverse environmental impacts might result. The first is the local regulatory noise limit; the second is the noise assessment guidelines published by the New York State Department of Environmental Conservation (NYSDEC); and a third is the Composite Noise Rating (CNR) method.

Regulatory Noise Limits: The Town of Clinton local law limits noise from any wind energy conversion system to a maximum of 50 dBA at any "off-site", non-participating residence. The ordinance also places a limit on tonal noise that basically limits any tonal component as defined in the ordinance to 45[4] dBA at any off-site residences. There are no other overarching state or federal noise regulations that apply to the Project.

NYSDEC Guidelines: The NYSDEC has published a guidance document titled Policy *Assessing and Mitigating Noise Impacts* (2001), which provides a methodology for evaluating potential community impacts from any new noise source. The policy uses a two level approach to evaluating the cumulative noise increase. A First Level Noise Impact Evaluation is carried out to model noise from the future project in an extremely simple and conservative manner considering only the reduction in sound level with distance. This analysis identifies 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 (6-dBA), a Second Level Noise Impact Evaluation noise modeling study is carried out considering all normal sound propagation loss mechanisms (in addition to pure distance losses).

CNR: This method considers the frequency content of the proposed new noise source within the context of the existing environmental setting and predicts community reaction based on a database of case histories.

[4] In the event audible noise due to Wind Energy Facility operations contains a steady pure tone, such as a whine, screech, or hum, the standards for audible [50 dBA] shall be reduced by 5 dBA. A pure tone is defined to exist if the one-third (1/3) octave band sound pressure level in the band including the tone exceeds the arithmetic average of the sound pressure levels of the two contiguous one third octave bands by:

5dB for center frequencies of 500 Hz and above
5 dB for center frequencies between 160 and 400 Hz
15 dB for center frequencies less then or equal to 125 Hz

3.10.2.3 Noise Modeling

Using these sound power levels several worst-case, maximum noise level contour plots for the site were calculated using the "CadnalA", ver. 3.5 noise modeling program developed by DataKustik, GmbH (Munich). This software allows the Project and its surroundings, to be realistically modeled in three-dimensions. Each turbine is represented as a point noise source at a height of 78 m above the local ground surface (design hub height).

A conservative ground absorption coefficient of 0.5 has been assumed in the modeling (except for the First Level analysis which only considers distance) since all of the intervening ground between the turbines and potentially sensitive receptors 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, dirt or sand. Consequently, a higher ground absorption coefficient between 0.7 to 0.9 could be used but would be less conservative. Also, any 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 be blowing 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 the "standard day" default conditions (10 deg. C and 70% RH). An example is thermal conditions in the atmosphere where air close to the ground cools faster than the air aloft, causing sound waves that might otherwise travel upwards to diffract downwards allowing distant sounds to be heard when they normally wouldn't be.

3.10.2.4 Modeling Results

Plot 1 in Appendix L shows the Project sound level contours calculated in accordance with the First Level Noise Impact Evaluation outlined in the NYSDEC Guidance. The condition shown is for an omnidirectional 8 m/s wind, which is associated with the maximum turbine sound power level. As described above in the analysis of the background survey data a residual background sound level of 40 dBA can be expected during such a wind condition. Given this background level, the NYSDEC 6 dBA cumulative increase threshold for project noise would be 45 dBA. Therefore, the 45 dBA sound contour defines the area of concern that might be potentially impacted.

Because the site area is large it is not possible to discern individual houses in Plot 1 but there are numerous residences within the 45 dBA contour, particularly in the western part of the site along Route 189, Route 11, Star Road and other smaller roads. In accordance with the DEC Guidance this analysis is intended to act as a kind of screen to determine if further evaluation is required. Because there are houses inside the threshold a Second Level evaluation is required.

The Second Level noise model considers the actual circumstances of the site including any attenuation that might be afforded by such factors as terrain, vegetation or man made barriers. In this case, the only additional propagation loss factor that is warranted is the inclusion of ground absorption. The site terrain is sufficiently flat that it has no features that would appreciably influence sound propagation, so no terrain effects have been considered in the model. Additionally, wooded areas were neglected, even though they are fairly extensive.

The results of the Second Level model are shown in Plot 2 of Appendix L. This plot represents a more realistic, but conservative view of what can be expected with all turbines operating at their maximum noise point and shows that the areas above 45 dBA are much more localized around the turbines and are non-continuous. Plots 2A through 2C in Appendix L are enlargements showing all residences believed to be within the 45 dBA to 47 dBA contour lines. Plots 2A and 2C show 22 residences where sound levels could be 45 to 47 dBA. Of these, most are located on or just inside of the 45 dBA contour line where the turbine noise above normal background levels is unlikely to be particularly noticeable. Only four residences, 02P and 17 in Plot 2A and 12P and 22 in Plot B are located in areas where their theoretical exposure is above 46 dBA. Outside these homes, it may be possible to intermittently hear sounds from the nearest turbine when outside when the wind and atmospheric conditions favor noise propagation from that turbine towards the house. Continuous audibility seems unlikely given the conservative assumptions inherent in the model. Table 3.10.2.4-1 shows these locations.

Table 3.10.2.4-1: Residences Where Project Sound Levels May be Above 45 dBA

Identification Number	Address/Location	Project Participant Status
01P	52 Nichols Road, Clinton, NY	Yes
02P	AES-EHN NY Windpower, Route 189, Churubusco, NY	Owned by Project
03P	6649 Route 11, Clinton, NY	Yes
05P	228 Route 189, Churubusco, NY	Yes
06	231 Whalen Road, Churubusco, NY	No
07P	Patnode and Gagnier Road, Churubusco, NY	Yes
08P	Campbell Road, Churubusco, NY	Yes
09	7909 Starr Road, Churubusco, NY	No
11P	876 Route 198, Clinton, NY	Yes
12P	238 Liberty Pole Road, Clinton, NY	Yes
13P	37 Jones Road, Clinton, NY	Yes
14	51 Liberty Pole Road, Clinton, NY	No
15	6977 Route 11, Clinton, NY	No
16P	6985 Route 11, Clinton, NY	Yes
17	157 Rte 189, Clinton, NY	No
18	206 Rte 189, Clinton, NY	Yes
21	32 Liberty Pole Road, Clinton, NY	Yes
22	238 Liberty Pole Road, Clinton, NY	Yes
25	6922 Rte 11, Clinton, NY	No
26	293 Gagnier Road, Clinton, NY	Yes
27	327 Gagnier Road, Clinton, NY	Yes
28	444 Gagnier Road, Clinton, NY	No

In general, some residents in the area between the 45 and 48 dBA contours may hear the turbines at times but because of modeling conservatism and seasonal considerations, the probability of a significant adverse impact due to noise alone is low.

It is clear from the analysis that the local ordinance limit of 50 dBA will not be exceeded at any residence and therefore the Project will be compliant with the noise provision of the Local Laws.

The results of the evaluation of the turbine noise using the CNR method presented in Appendix L indicated that, in real terms the impact from the Project is likely to be mild when people are actually outside or have their windows open and go unnoticed in the wintertime when people are inside.

3.10.2.5 Potential Transformer Noise Impacts

The substation and collector stations are located at the end of Access Road number 7 in an area of brush cover, approximately 2,200 feet from Patnode Road.. The Point of Interconnection (POI) is proposed to be located within the NYPA 230 kV transmission line easement area. To the north of the POI Station will be two 34.5 kV collector stations, both laid out to accommodate seven collector circuits, including one spare bay.

There will be a control house and a common parking area between the two collector stations, which will be accessed from Star Road to the south via a new access road. The POI Station will have four 230 kV breakers, although it will be laid out to accommodate six breakers if required and a 34.5 kV/230kV step up transformer. The POI Station will have its own separate control building, set back inside the fence by at lease 10 feet. The most notable source of noise in the substation are the two step up transformers. Typical noise profile of the transformers is shown in Table 3.10.1 of Appendix L. The substation is located in a remote location (1 mile or more from houses) and therefore no adverse community noise effects are expected because of this distance. Although transformers can have significant tonal components, particularly in the 120 Hz band, tonal peaks will fade due to distance and become negligible before reaching any homes.

3.10.3 Potential Construction Impacts

Construction of the proposed wind energy project will include the following typical activities:

- Right of Way clearing
- Construction of Access Roads
- Foundation Construction
- Wind Turbine Structure Erection
- Underground Electric Collector Cable Installation
- Substation Installation
- Site Cleanup and Restoration

Construction noise is produced primarily by the diesel engines that power the construction equipment and by impact noise from rock drills, jackhammers, and compactors. Generally, engine noise will dominate the noise produced by diesel and gasoline engine-powered equipment, and functional mufflers will be maintained on all applicable machinery.

Appendix L presents some estimates of noise levels at other distances from typical construction equipment. As a general rule, not all equipment listed will be employed during each phase of construction, and the equipment is typically operated intermittently during a work shift.

Table 3.10.3-1: Typical Construction Equipment Sound Level

Equipment[5]	Typical Sound Level at 50 feet (dBA)
Dozer, 250 – 700 hp	88
Front End Loader, 300 – 750 hp	88
Grader, 13 – 16 foot blade	85
Excavator	86
Piling Auger	88
Concrete Pump, 150 cu yd/hr	84
Off Highway Hauler, 115 ton	90
Flatbed Truck	87
Mobile Crane, 75 ton	85

Noise from the construction-related phases including clearing, foundations, structure erection and collector cable installation, are expected to be temporary, and therefore the effect on potential receptors is not anticipated to be significant. The temporary noise will constitute an unavoidable impact at some but not all of the homes in the Project area. This impact would be similar to that experienced by road repair or paving that might typically occur on Town roads. The work is envisioned as being sequenced such that access roads and collector cables will be constructed first followed by foundations. It is anticipated that work will be undertaken at several locations across the Project area simultaneously. Consequently, individual receptors will be exposed to construction noise for relatively short periods of time. Following foundation curing, erection of the turbine support monopoles and installation of the turbines (nacelle and rotor) will occur, moving from one foundation to the next.

The main noise impact associated with the construction is that associated with typical construction projects including noise from large diesel powered equipment, other support vehicles such as pick up trucks and miscellaneous gasoline power construction tools (compressors, compactors, etc.)

3.10.4 Proposed Mitigation

3.10.4.1 Turbine Operation

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 and an increase less than this is not audible.

Noise measurements at the site demonstrated that the Project area is uniform in magnitude

[5] Source :ESERCA, Power Plant Construction Guide, BBN Report 3321, May 1977

and sound levels over the entire site area are dominated by wind induced noises and uniformly dependent on the speed of the wind. At an 8 m/s wind speed, measured at the standard reference height of 10m above ground level, the Gamesa G87 wind turbine produces the maximum amount of noise. At this wind speed the mean background residual (L_{90}) sound level was found to be 40 dBA under leaf-off, wintertime conditions, meaning that such a sound level is consistently present and available to mask potential turbine noise during the winter. Experience with surveys during other times of the year indicates that a significantly higher background level could be expected under windy conditions in the spring and summer due to leaf rustle. Analysis of potential noise impacts during low wind conditions when the background level is diminished indicates that turbine noise levels drop in parallel with the level of masking noise so that any incremental increase or impact would not be any different for a low wind situation than it is during an 8 m/s wind when the turbines generate maximum sound levels.

In general, some residents in the area between the 45 and 47 dBA contours may hear the turbines at times but because of modeling conservatism and seasonal considerations the probability of a significant adverse impact due to noise alone is low. Continuous audibility seems unlikely given the conservative assumptions inherent in the model. The Second Level modeling study also demonstrates that the local (Towns of Clinton and Ellenburg) law limits of 50 dBA at any residence will not be exceeded.

Mitigation of the turbine noise has been accomplished through the design of the turbine and through the incorporation of setback distances from receptors during the siting of the turbine. A procedure for addressing any complaints received from residents regarding turbine operation noise is outlined in the Complaint Resolution Plan (Appendix C).

3.10.4.2 Transformer Operation

The relatively remote location of the substations will provide sufficient distance between receptors and the noise source so that no adverse community noise effects are expected.

3.10.4.3 Construction

Construction-related noise will be a temporary short-term impact, and therefore the effect on potential receptors and community is not anticipated to be significant. In many locations construction noise will not be louder than typical normal noise associated with farm equipment or vehicular traffic. Mitigation measurers will include best management practices for noise abatement such as insuring all engines have mufflers in good condition, minimizing idling of equipment and limiting hours of construction. Landowners will also be notified of certain construction noise in advance such as notification of blasting activity should it be necessary. A procedure for addressing any complaints received from residents regarding construction noise is outlined in the Complaint Resolution Plan (Appendix C).

3.11 Socioeconomics

This section describes local socioeconomic conditions in Clinton County and the Towns of Clinton and Ellenburg, and presents the anticipated potential economic and fiscal impacts of development of the Project. Socioeconomic information is described in terms of population, economy and employment, community facilities and services, and taxes.

3.11.1 Population

Based on the 2004 Census, the population of Clinton County is 81,875 (U.S. Census Bureau, 2006). Between 1990 and 2000, the County's population decreased from 85,969 to 79,894, and between 2000 and 2004 increased to 81,875 (U.S. Census Bureau, 2006a). Towns within the Project area include Clinton Township and Ellenburg Township. Based on the Census 2000 information, Clinton has a population of 727, and Ellenburg of 1,812.

3.11.2 Economy and Employment

The vast majority of Clinton and Ellenburg employment is attributed to the agriculture industry, community services (i.e., public schools, town government, county government), or manufacturing employment. According to the U.S. Census Bureau, unemployment rates in 2000 were 5.6% for the Town of Clinton and 3.2% for the Town of Ellenburg, and 3.7% for Clinton County as a whole (U.S. Census Bureau, 2006b).

3.11.3 Municipal Budgets and Taxes

Tax revenues in the Project area accrue from both sales tax and real property taxes. A total sales tax of 8% is levied on purchases in Clinton County. New York State retains 4% and Clinton County 3% (NYS Department of Taxation and Finance, 2005).

3.11.4 Potential Impacts

The Project will have both direct and indirect positive economic effects, commencing during the construction phase and continuing throughout the viable economic life of the Project. In the short term, the benefits of project construction will include additional employment and income stemming from jobs in the various construction trades that will be required to build the Project. In the long term, the Project will provide an array of direct and indirect economic benefits. It will generate significant additional revenue for affected municipalities and school districts. The Project will also likely result in increased visitation to the area by interested individuals, additional tourism related to the proposed project could have a minor beneficial effect on local businesses. The socioeconomic impacts of the Project on population and housing, employment and income, and community facilities and services are described in the following sections.

3.11.4.1 Population and Housing

Construction of the Project is not expected to have any significant impact on area population. Although the Project construction will require up to 180- 250 temporary workers, this labor force will be made up largely of workers who reside in the area only for the period of construction and then return to their homes elsewhere. Full time employment for the completed project is estimated at 13 to 18 employees. Existing housing stock in the area can easily accommodate this number of workers and their families.

Concerns are often expressed regarding the potential impact of wind power projects on real estate value. The Renewable Energy Policy Project issued a report (Sterzinger Back, and Kostiuk, 2003) analyzing property sales data within 5 miles of 10 large-scale wind power projects before and after project development. The report compared changes in property value within 5-mile project viewsheds and in comparable nearby communities outside of the viewsheds. The analysis included a total of 25,000 property sales records. The report found no evidence that wind power project development had reduced property values within the 5-mile viewsheds. In fact, in nine of the 10 locations analyzed, property values in the post-development period increased faster in the wind power viewshed than in the comparable community. In addition, in nine of 10 locations, property values in the viewshed increased faster in the three years following project development, than in the three years preceding project development (Sterzinger et al., 2003). Based on these findings, the Marble River project is not expected to have any adverse effect on real estate values within and adjacent to the Project area.

In addition, the Applicant retained an independent property valuation firm (Cushman & Wakefield) to perform a property value analysis for the Towns of Clinton and Ellenburg. While the primary objective of the property value analysis was to provide the Towns with an independently assessed "before" picture of local property values, the study does conclude that, due to the unique characteristics driving property values within the Project boundary, the Marble River Wind Farm is likely to cause no negative impact on local property values.
The complete property valuation study can be found in Appendix N.

3.11.4.2 Employment and Income

Construction: The increase in regional economic output, a measure of local economic activity, can be calculated using the regional-specific economic multipliers from the Bureau of Economic Analysis (BEA) for the Projects region. It is estimated that the overall increase in regional (Clinton County) economic activity due to construction of the Project will be over $55 million, of which approximately $20 million can be attributed as secondary impact.

In addition to economic multipliers, development of the Project will have a multiplier effect on local employment. Assuming a conservative estimate of 190 local construction jobs created by the Project (with an additional 110 out of state construction jobs making up 300 total construction jobs during the construction period), regional employment is expected to increase during the construction period by between 85 and 240 non-construction jobs (using the BEA multiplier of 1.45 jobs created for every new construction job as well as the BEA final demand employment multiplier).

The BEA definition of "earnings" covers wage and salary disbursements, other labor income and proprietors' income. On the local level, the construction phase of the Project will have the total effect of increasing earnings in Clinton County non-construction jobs by approximately $4 million during the construction period.

Table 3.11.4.2-1: Economic Benefits Analysis - Construction

Description	Amount	Assumptions/Notes
Number of New York-based construction man-years (estimated)	190	Number of Phase 1 New York-based construction man-years from Maple Ridge Wind Farm pro-rated to size of Marble River Wind Farm: Approximately 300 total construction man-years of which 190 would be regionally based in Clinton County.
New York-based construction wages (estimated)	$5,700,000	Estimated average construction worker wage = $15/hr; assumed 2000 worker hours per worker during construction period; hence $15/hr x 2000 worker hours x 190 local workers (excluding benefits)
Out-of-state construction wages	$5,500,000	$25/hr (management) x 2000 worker-hours x 110 remaining construction jobs, excluding benefits
Amount spent on construction materials, New York-based (estimated)	$30,000,000	Estimated 70% of BOP contract spent on New York-based construction materials (gravel, rock, concrete, wood, etc.)
Total local-based, direct economic impact from construction (i.e. final change in demand for Clinton County)	$35,700,000	"Local materials" impact plus "local construction wages" impact equals the total direct impact to Clinton County during construction period

Operations: It is estimated that the annual economic impact of the Marble River Wind Farm, once fully operational, will be approximately $2.6 million per year, of which approximately $450,000 per year can be attributed as secondary impact.

Once the Project is operational it is expected to require a full-time staff of between 13-18 employees. Total aggregate annual wages of this local workforce are estimated to be approximately $700,000 per year (including an estimated 25% premium on wages for aggregate benefits).

During the operations phase, the level of regional earnings not connected with the Project is anticipated to increase by almost $875,000, on top of the expected $700,000 total estimated aggregate annual wages and benefits paid to Marble River Wind Farm employees.

The Marble River Wind Farm annual royalty payments to landowners are expected to be $1,300,000. (This does not include the prospect of additional neighbor payments or locally leased property).

Table 3.11.4.2-2: Economic Benefits Analysis - Operations

Description	Amount	Assumptions / Notes
Operation Wages and Benefits (estimated)	$700,000	Estimated full-time Operations and Maintenance staff of 13 to 18 people.
Amount spent on local maintenance/repairs annually (estimated)	$60,000	Estimated by comparisons with in-state and out-of-state operating wind farms.
Local spending on supplies and materials annually (estimated)	$45,000	Estimated by comparisons with in-state and out-of-state operating wind farms
Annual Landowner Royalty payments	$1,300,000	
Total annual, local-based, direct economic impact from Operations (i.e. final change in annual demand for Clinton County)	$2,105,000	

3.11.4.3 Municipal Revenues

The proposed project will significantly increase the revenues of each of the taxing jurisdictions in the Project area. Annual Payment in Lieu of Taxes (PILOT) payments of $1 million will be paid during the initial 15 years of project operation or as negotiated by the Clinton County IDA.

Northern Adirondack School Board: The Northern Adirondack school board will receive 54% of this PILOT agreement. The total fiscal benefit to the school board will be approximately $550,000 per year or a total of $14,750,000 over the life of the Project. It is important to note that, unlike most other businesses that create significant tax revenue, an operational wind farm does not carry with it the burden of increased need for Town services and schools.

Consistent with the Applicant's reputation as a leader in the wind energy industry, it is reasonable to assume that the presence of a major wind operating facility will provide numerous educational and early job opportunities for the children and teachers in the school.

Clinton County: The County will receive 14% of the negotiated PILOT payment. This will be an annual revenue of approximately $158,000 per year. The total payments to the County over the expected life of the Project will be approximately $4 million.

The PILOT payment would make the Applicant one of the largest taxpayers in the entire county.

Town Of Ellenburg: The Town of Ellenburg represents the smaller portion of the proposed Marble River Wind Farm. This fact is due mainly because of the existence of the "blue line" which demarcates the northern boundary of the Adirondack park and prohibits any future commercial construction. The potential municipal revenues from 20 wind turbines proposed within the Town of Ellenburg can be quantified as follows:

1. PILOT: The Town of Ellenburg can expect to receive approximately 32% of the PILOT payments as per the Clinton County IDA. This represents an annual payment of $63,000, or $1,500,,000 over the life of the Project
2. Host Community Agreement: The Town of Ellenburg may opt to sign a Host community agreement. Based on precedent within New York State, this agreement pays approximately $1,000 per installed MW. This equates to an additional payment of approximately $40,000 per year.
3. Road Use Agreement: Given the importance of the local roads to the operations of the Project, the Applicant will propose to enter into a Roads agreement with Ellenburg. The Roads agreement will seek to agree on responsibilities and considerations the Applicant owes the Town for use of the local roads. Benefits often include road improvement and major upgrades of roads, including culverts, bridges and seasonal roads.
4. Total Direct Municipal Revenue: The total revenue to the Town of Ellenburg is estimated to be approximately $103,000 per year or $2,575,000 over the life of the Project.

Town of Clinton: The Town of Clinton represents by far the bulk of the Marble River Project. Over half of the 89 turbines proposed within the Town of Clinton are located in the more sparsely populated northeast section. The potential municipal revenues from 89 wind turbines proposed within the Town of Clinton can be quantified as follows:

1. PILOT: The Town of Clinton can expect to receive approximately 32% of the PILOT payments as per the Clinton County IDA. This represents an annual payment of $280,000, or almost $7 million over the life of the Project
2. Host Community Agreement: The Town of Clinton may opt to sign a Host community agreement. Based on past precedent within New York State, this agreement pays approximately $1,000 per installed MW. This equates to an additional payment of approximately $178,000 per year
3. Road Use Agreement: Given the importance of the local roads to the operations of the Project, the Applicant will propose to enter into a Roads agreement with Clinton. The Roads agreement will seek to agree on responsibilities and considerations the Applicant

owes the Town for use of the local roads. Benefits often include road improvement and major upgrades of roads, including culverts, bridges and seasonal roads.

4. Total Direct Municipal Revenue: The total revenue to the Town of Clinton is estimated to be approximately $458,000 per year or $11,450,000 over the life of the Project.

3.11.5 Proposed Mitigation

The Project will provide a net positive socioeconomic benefit to the Towns of Clinton and Ellenburg in terms of PILOT payments, Host Community Agreements, and Road Use Agreements which will provide additional municipal revenue or improvements to Town infrastructure such as roads.

3.12 Telecommunications

To evaluate the potential for the Project to impact existing telecommunication signals, Brian Webster Consulting (BWC) was contracted to conduct a Microwave Path Analysis. a 100-mile television station search, and a Television broadcast off-air reception measurement analysis. In addition, Comsearch was contracted to conduct a cellular/PCS telephone analysis, a land mobile radio (LMR) analysis, and to notify the National Telecommunications and Information Administration regarding the proposed project (see reports in Appendix N).

3.12.1 Existing Conditions

3.12.1.1 Microwave Analysis

Microwave telecommunication systems are wireless point-to-point links that communicate between two sites (antennas) and require clear line-of-sight conditions between each antenna. BWC identified once microwave path that intersects the Project area (see graphics in Appendix N).

3.12.1.2 Television Analysis

Rotating turbine blades can cause a time-varying signal that completes with the "direct wave" appearing at the antenna of a ground receiver. The result can be television signal distortion capable of making reception difficult (Evans, 2005). The television (TV) station search conducted for the Marble River Project identified all of the off-air television stations within a 100-mile radius of the proposed Project site. Off-air television stations transmit broadcast signals from terrestrially located facilities that can be received directly by a television receiver or house-mounted antenna. The results of the study indicate that there are 40 off-air television stations within 100 miles of the Project area.

To determine the existing qualify of off-air television reception for the Project area (and surrounded communities). On-site measurements were conducted in January 2006. To provide broad coverage of the study area, a FCC database was analyzed to determine the television broadcasting in the region, and to identify areas/communities that may potentially be affected by the Project (i.e., interrupted off-air television reception). Six sites were selected (Ellenburg Depot, Forrest, Ellenburg, Clinton Mills, Churubusco, and Chateugay, referred to as sites 1 through 6 respectively) based upon the coverage areas of the TV stations, the Project location, and the rural nature of the Project area. In addition, BWC determined that a good representation of the current signal levels could be obtained through these six test site locations. The entire TV spectrum was scanned for signals at each location, but the analysis focused on the reception of Channels 3, 5, 22, 33, and 57. The result of the off-air reception analysis for each of the six test sites is detailed below in Table 3.12.1.2-1.

Table 3.12.1.1-1: Summary of Results From Off-Air Television Reception Analysis.

Site	Channel 3 WCAX	Channel 5 WPTZ	Channel 22 WVNY	Channel 33 WETK	Channel 57 WCFE	Other Channels
1	No usable signal	No usable signal	100 uv	35 uv w/noise	800 uv	None detected
2	40 uv w/noise	12 uv	90 uv	85 uv w/noise	400 uv	None detected
3	No usable signal	Weak audio No meter reading	55 uv	No usable signal	500 uv	None detected
4	95 uv	88 uv	Weak audio No meter reading	58 uv	350 uv	CH2 (130 uv) Ch12 (80 uv)
5	85 uv	92 uv	160 uv	No usable signal	90 uv	CH2 (120 uv) CH12 (40 uv)
6	No usable signal	No usable signal	No usable signal	No usable signal	100 UV	Ch 12 (350 uv)

Notes: Cable quality – Perfect. >1000 uv
Some noise but excellent picture, >700 uv - <1000 uv
Good quality, but noticeable sparkles. Good but not excellent. >400 uv - <700 uv
Fair quality, noticeable noise, sparkles, and distortion. >100 uv - <400 uv
Intermittent video. Not viewable, unacceptable. <100 uv

3.12.1.3 AM Radio Analysis

If a turbine intercepts a low frequency radio wave from an AM broadcast antenna, it can "re-radiate" the signal with an arbitrary phase delay. This secondary radiator then becomes a radio frequency source that interferes with the primary signal, causing fading and noise in receivers tuned to the frequency (Evans, 2005). The Federal Communications Commission (FCC) requires that studies be conducted to determine if a proposed development will affect existing AM radio broadcast stations. Specifically, a study is required when the proposed development is located within 1.0 km of a non-directional broadcast station and/or within 3.0 km of a directional broadcast station. As a component of the Microwave Path Analysis, BWC also examined this matter, and determined that none of the Project's wind turbines fall within these distances.

3.12.1.4 Cellular/PCS Telephone Analysis

The Comsearch analysis determined that there are two cellular telephone operators in Clinton County. RCC Atlantic (Rural Cellular Corp), which operates on Band A, and Verizon, which operates on Band B. In addition, there are nine PCS telephone operators in Clinton County, which are listed below in Table 3.12.1.4-1.

Table 3.12.1.4-1: PCS Telephone Operators in Clinton County, NY

Operator	Band of Operation
Cingular	A
T-Mobile	A
Sprint-PCS	B
Verizon	C
DEVTEL	C
New Dimensions Wireless	C
Cingular (Rural Cellular Corp)	D
RCC Minnesota	E
PCS Partners	F

3.12.1.5 Land Mobile Radio Analysis

The Comsearch analysis determined that there are 60 land mobile radio (LMR) systems registered in the vicinity of the proposed project. Table 1 of Appendix N identifies each LMR system and indicates the owner/operator and pertinent parameters. Only six LMR systems are not owned/operated by a government (state or county) entity.

3.12.1.6 National Telecommunications and Information Administration Notification

Comsearch sent a written notification of the proposed project to the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce on January 19, 2006. Upon receipt of notification, the NTIA provides plans for the proposed project to the federal agencies represented in the Interdependent Radio Advisory Committee (IRAC), which include the Department of Defense (DOD), Department of Education (DOE), Department of Justice (DOJ), and the Federal Aviation Administration (FAA). The NTIA then identifies any project-related concerns during a 30-day review period. The correspondence to the NTIA and their response is provided in Appendix G.

3.12.2 Potential Impacts

3.12.2.1 Construction

Temporary communication interference as a result of project construction may occur. Cranes used during construction activities (and the individual turbine components being raised by the cranes) can cause temporary obstruction of microwave links as well as some degradation to television and radio signals (L. Polisky, personal communication). However, because individual turbines have been sited to avoid interference with microwave paths that cross the Project, the potential for microwave interference by equipment assembling and erecting these turbines should be minimal. Any impact on television or radio reception caused by construction equipment would be temporary, as turbine assembly and erection is typically completed within 1-2 days.

3.12.2.2 Operation

3.12.2.2.1 Microwave Communication Systems

To assure an uninterrupted line of communications, a microwave link should be clear, not only along the axis between the center point of each antenna, but also within a mathematical distance around the center axis known as the Fresnel Zone. BWC assumed a worst-case Fresnel Zone (i.e., maximum width along the entire path) while conducting the microwave path analysis. It was determined that impacts to the microwave path will not occur if all proposed wind turbines are sited a minimum of 128 feet from the centerline of the microwave path. As currently proposed, all of the Project's turbines meet this siting guideline. Therefore, the proposed project will not result in impacts to the existing microwave path.

3.12.2.2.2 Television Communication Systems

The television analysis report provided detailed information for each of the 40 television stations that occur within 100 miles of the Project. This information included a depiction of the coverage contour for each station. Based upon this data, BWC determined that the Project falls within the "weak coverage area" for all of the 40 stations, and any person/household wishing to view these stations off-air would need a high-gain outdoor directional antenna pointed directly at the transmitter site of interest. However, because the five primary off-air television stations (Channels, 3, 5, 22, 33, and 57) originate from the same basic direction (southeast of the Project area), the on-site TV analysis indicates that the proposed project could create a signal shadow to the northwest of the turbine locations. Therefore, various impacts to television reception are possible as a result of the Project. These impacts would most likely include noise generation at low VHF channels (2 through 6) within 0.5 mile of turbines, reduced picture quality (ghosting, shimmering), and signal interruption (NWCC 2005).

3.12.2.2.3 AM Radio Analysis

All proposed wind turbines within the Project are located at least 1.0 km from a non-directional AM broadcast station and/or 3.0 km from a directional AM broadcast station. Therefore, it is unlikely that the Project will not interfere with existing AM radio transmissions.

3.12.2.2.4 Cellular, PCS and LMR Systems

Telephone mobile communications in the cellular and PCS frequency bands should be minimally affected by the presence of the wind turbines. This is because the blockage caused by wind turbines is not very destructive to the propagation of the signals in these frequency bands. In addition, these systems are designed so that if the signal from (or to) a mobile unit cannot reach one cell, it will be able to reach one or more other cells in the network. Therefore, local obstacles are not normally a problem for these systems, whether they are installed in urban areas near large structures and buildings, or in a rural area near a wind energy facility (Appendix N).

3.12.2.2.5 NTIA Notification

In a letter sent to Comsearch, the NTIA stated that they did not identify any project-related concerns related to signal blockage following their 30-day review. Therefore, impacts to the IRAC radio frequency transmissions are not anticipated.

3.12.3 Proposed Mitigation

3.12.3.1 Construction

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

3.12.3.2 Operation

3.12.3.2.1 Microwave Communication Systems

The project, as currently proposed, will not impact existing microwave communications. If future project layout revisions are necessary, the microwave path siting guideline (turbines located a minimum of 128 feet from the centerline of the microwave path) will be adhered to. Beyond this, additional mitigation is not necessary.

3.12.3.2.2 Television Communication Systems

If project operation results in any impacts to existing off-air television coverage, the developer/operator will address and resolve each individual problem as necessary (see proposed Complaint Resolution Procedure in Appendix C). Mitigation actions could include adjusting existing receiving antenna's, upgrading the antenna, or providing cable or satellite systems to the affected households. In addition, the FCC's mandate to transition all off-air television broadcasts from analog signals to digital signals by January 1, 2009 will eliminate any turbine-related interference problems since digital signals are not subject to interference from intervening structures (NWCC 2005).

In addition, post-construction measurements will be conducted at all of the six test site locations. This will allow for an assessment of future signal conditions, at the same test site locations, to determine if the built project has any affect on existing off-air television reception.

3.12.3.2.3 AM Radio Analysis

The project, as currently proposed, will not impact existing AM radio transmissions. If future project layout revisions are necessary, and these revisions result in an expanded project area, an additional AM radio transmission analysis will be conducted, and mitigation measures evaluated, as necessary.

3.12.3.2.4 Cellular, PCS, and LMR Systems

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

3.13 Safety and Security

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

3.13.1 Background Information

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

Public safety concerns associated with the operation of a wind power project are somewhat more unique, and are the focus of this section.

In many ways, wind energy facilities are safer than other forms of energy production since combustible fuel source and fuel storage are not required. In addition, use and/or generation of toxic or hazardous materials are minor when compared to other types of generating facilities. However, wind turbines are generally more accessible to the public, and risks to public health and safety can be associated with these facilities. Examples of such safety concerns include ice shedding, tower collapse, blade throw, stray voltage, fire and lighting strikes. Each of these concerns is discussed individually below.

3.13.1.1 Ice Shedding

Ice shedding, or ice throw, refers to the phenomenon that can occur when ice accumulates on rotor blades and subsequently breaks free and falls to the ground. Although a potential safety concern, it is important to note that while more than 55,000 wind turbines have been installed worldwide, there has been no reported injury caused by ice being thrown from a turbine (NYSERDA Power Naturally NY Website). However, ice shedding does occur, and remains a potential safety concern.

Icing in the Marble River Project area would generally result from freezing rain events forming a "glaze" ice (as opposed to "rime" icing that occurs at high elevations). Under such conditions, ice would build up on the rotor blades and/or sensors, slowing its rotational speed and potentially creating an imbalance in the weights of the blades. Such effects of ice accumulation can be sensed by the turbine's computer and would typically result in the turbine being shut down until the ice melts.

Field observations and studies of ice shedding indicate that most ice shedding occurs as air temperatures rise and the ice on the rotor blades begins to thaw. Therefore the tendency is for ice fragments to drop off the rotors and land near the base of the turbine (Morgan, 1998). Ice can potentially be "thrown" when ice begins to melt and stationary turbine blades begin to rotate again (although usually turbines do not restart until the ice has largely melted and fallen straight down near the base). Several observational studies and mathematical models examining this phenomenon have calculated how far ice can potentially be thrown from a moving rotor blade before hitting the ground (Morgan and Bossanyi, 1996). The distance traveled by a piece of ice depends on a number of factors, including: the position of the blade when the ice breaks off, the location of the ice on the blade when it breaks off, the rotational speed of the blade, the shape of the ice that is shed (e.g., spherical, flat, smooth), and the prevailing wind speed. Data gathered at existing wind farms have documented ice fragments on the ground from 50 to 328 feet from the base of the tower (<33 to 197 feet blade diameter). These fragments were in the range of 0.2 to 2.2 pounds in mass (Morgan, 1998). The risk of ice landing at a specific location is found to drop dramatically as the distance from the turbine increases.

3.13.1.2 Tower Collapse/Blade Throw

Another potential public safety concern is the possibility of a wind turbine tower collapsing or a rotor blade dropping or being thrown from the nacelle. These are extremely rare occurrences, but such incidents do occur (a tower collapse at the Weatherford Wind Power Project in Oklahoma occurred in May, 2005), and are potentially dangerous for project personnel, as well as the general public. The reasons for a turbine collapse or blade throw vary depending on conditions and tower type. Past occurrences of these incidents have generally been the result of design defects during manufacturing, poor maintenance, wind gusts that exceed the maximum design load of the turbine structure, or lightning strikes (AWEA, 2006). Most instances of blade throw and turbine collapse were reported during the early years of the wind industry. Technological improvements and mandatory safety standards during turbine design, manufacturing and installation have largely eliminated such occurrences.

3.13.1.3 Stray Voltage

Stray voltage is a phenomenon that has been studied and debated since at least the 1960's. It is an effect that is primarily a concern of farmers whose livestock can receive electrical shocks. Stray voltage can be defined as a "low level of neutral-to-earth electrical current that occurs between two points on a grounded electrical system" (Wisconsin Rural Energy Management Council, 2000). In a farm setting, stray voltage typically originates from low levels of Alternating Current (AC) voltage on the grounded conductors of a farm wiring system. These voltages are termed "stray voltage" when they are large enough to form a circuit when a person or an animal simultaneously touches two objects which are part of an electrical system.

The occurrence of stray voltage may result from a damaged or poorly connected wiring system, corrosion on either end of the wires, or weak/damaged insulation materials on the "hot" wire. Livestock may encounter stray voltage in their everyday activities when they contact two surfaces with voltage differences, resulting in a small electrical current flowing through the animal and creating a shock. In a barn, stray voltage may occur at watering systems, dairy stanchions, animal pens, or even the metal siding on the building. Dairy barns are particularly prone to the occurrences of stray voltage since they contain all the necessary components, including: concrete or dirt floors that are likely to be wet, metal confinement structures and water systems, metal rebar in the concrete floor, and metal walls with moisture condensed on the surfaces.

Wind power projects and other electrical facilities can create stray voltage to varying degrees, based on factors such as operating voltage, geometry, shielding, rock/soil electrical resistively, and proximity (D. Carr, personal communication). Stray voltage from such facilities usually only occurs if the system is poorly grounded and located in proximity to ungrounded or poorly grounded metal objects (fences, buildings, etc.).

The occurrence of stray voltage can be mitigated to obsolescence by incorporating proper grounding techniques within and around Project components.

3.13.1.4 Fire

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

Other Project components create the potential for a fire or medical emergency due to the storage and use of diesel fuels, lubricating oils and hydraulic fluids. Storage and use of these substances may occur at the substation, in electrical transmission structures, staging area(s), and the O&M building/facility. Due to the accessibility of these areas, response to an emergency should not pose difficulty to local fire and emergency personnel. However, the presence of potentially hazardous materials as well as high voltage electrical equipment at the substation could present potential safety risks to local responders.

3.13.1.5 Lightning Strikes

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

3.13.2 Potential Impacts

3.13.2.1 Construction

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

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

3.13.2.2 Operation

3.13.2.2.1 Ice Shedding

As stated previously, while turbine icing certainly will occur at times, any ice that accumulates on the rotor blades will likely cause an imbalance, or otherwise alert turbine sensors, and result in a shut-down. As the ice begins to thaw, it will typically drop straight to the ground. Any ice that remains attached to the blades as they being to rotate could be thrown some distance from the tower. However, such a throw will usually result in the ice breaking into small pieces, and falling within 300 feet of the tower base. The minimum setback distance as required in the wind ordinances of Ellenburg and Clinton of 500 feet from roads and property lines, and a minimum distance of 1,000 feet (Ellenburg) and 1,200 feet (Clinton) between the proposed turbines and adjacent residences, will adequately protect nearby residents and motorists from falling ice of any significance. In addition, unauthorized public access to the site will be controlled by installing a locked gate at the entrance of all access roads, and posting signs to alert the public and maintenance workers of the potential ice shedding risks. However, several snowmobile trails do traverse the Project area (Figure 26). In accordance with the Applicant's Snowmobile Safety Policy, the potential impact to local snowmobilers will be mitigated by instituting minimal distances for snowmobile paths as well as signage to indicate proper pathways (see Appendix O – Marble River Snowmobile Safety Policy).

Marble River Project's siting criteria, and the proposed control of public access to the turbine sites, it is not anticipated that the Project will result in any measurable risks to the health or safety of the general public due to ice shedding.

3.13.2.2.2 Tower Collapse/Blade Throw

Modern utility-scale turbines are certified according to international engineering standards. These include ratings for withstanding different levels of hurricane-strength winds and other criteria (AWEA, 2006). The engineering standards of the wind turbines proposed for this Project are of the highest level and meet all Federal, State, and local codes. The design specifications are based on well proven and established sets of construction standards set forth by the various standard industry practice groups such as:

- American Concrete Institute (ACI)
- Institute for Electrical and Electronic Engineers (IEEE)
- International Electrotechnical Committee (IEC)
- National Electric Code (NEC)
- National Fire Protection Agency (NFPA)
- Construction Standards Institute (CSI)

In the design phase, state and local laws require that licensed professional engineers review and approve the structural elements of the turbines. State-of-the-art braking systems, pitch controls, sensors, and speed controls on wind turbines have greatly reduced the risk of tower collapse and blade throw. The wind turbines proposed on the Marble River Project automatically shut down at wind speeds over 47 mph. They also cease operation if significant vibrations or rotor blade stress is sensed by the turbines' blade monitoring system. For all of these reasons, the risk of catastrophic tower collapse or blade failure is minimal.

3.13.2.2.3 Stray Voltage

While the concerns surrounding stray voltage are legitimate, it is important to note they are preventable with proper electrical installation and grounding practices. The Project's power collection system will be properly grounded, and will not be connected to the local electrical distribution lines that provide electrical service to farm buildings and homes. It will be physically and electrically isolated from all of the buildings in and adjacent to the Project area. Additionally, the wind farm's electrical collection lines will be located at least 36 inches below ground, which will prevent incidental contact and protect the system's insulation materials from sustaining any damage. Proper grounding, installation, and maintenance practices will assure that the Marble River Wind Farm does not cause or contribute to stray voltage in the area.

3.13.2.2.4 Fire

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

In the unlikely event that a wind turbine catches fire, standard industry practice is to allow the fire to burn itself out while maintenance and fire personnel maintain a safety area around the turbine and protect against the potential for spot ground fires that might start due to sparks or falling material. Power to the section of the Project with the turbine fire is also disconnected. An effective method for extinguishing a turbine fire from the ground does not exist, and the events generally do not last long enough to warrant attempts to extinguish the fire from the air (NYSERDA Power Naturally NY Website). However, since the public typically does not have access to the private land on which the turbines are located, risk to public safety during a fire event would be minimal.

Transformers at the substation are equipped with a fire suppression system. This system should quickly extinguish any fires that occur at the Project substation and shut down power to the facility.

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

In accordance with "best practice" wind facility operating procedures, the Applicant has prepared a draft Fire Prevention and Control Plan (Appendix L).

3.13.2.2.5 Lightning Strikes

Lightning protection systems were first added to rotor blades in the mid 1990s, and are now a standard component of modern turbines (Korsgaard and Mortensen, 2006). These systems rely on lightning receptors and diverter strips in the blades that provide a path for the lightning strike to follow to the grounded tower. The turbines' blade monitoring system provides documentation of all critical lightning events. If a problem is detected, the turbine will shut down automatically.

3.13.3 Proposed Mitigation

3.13.3.1 Construction

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

- Personal protective equipment such as hardhats, safety glasses, orange vest, and steel-toed boots);
- Job safety meetings and attendance requirements;
- Fall prevention;
- Construction equipment operation;
- Maintenance and protection of traffic;
- Hand and power tool use;
- Open hole and excavation area safety;
- Parking;
- General first aid;
- Petroleum and hazardous material storage, use, containment and spill prevention;
- Posting of health and safety requirements;
- Visitors to the job site;
- Local emergency resources and contact information; and
- Incident reporting requirements.

As mentioned in Section 3.4, a Materials and Equipment Delivery Route Assessment (Appendix H) has been developed and will be implemented to assure that construction vehicles avoid areas where public safety could be a concern (schools, clusters of homes, etc.). To minimize safety risks to the general public, all over-sized vehicles will be accompanied by an escort vehicle and/or flagman to assure safe passage of vehicles on public roads. The general public will not be allowed on the construction site, and after hours, vehicular access to such sites will be blocked by parked equipment or temporary fencing.

Temporary construction fencing or other visible barrier will be placed around excavations that remain open during off hours. In addition, material safety data sheets (MSDS) for potentially hazardous construction materials will be provided to local fire and emergency service personnel. The contractor will also coordinate with these entities to assure that they are aware of where various construction activities are occurring, and avoid potential conflicts between construction activity and the provision of emergency services (e.g., road blockages, etc.).

Should an injury occur on site, the following actions will be taken:

- The Site Construction Manager(s), O&M Manager, or designee, will be notified of the injury(s).
- A qualified first aid attendant will administer first aid until medical assistance arrives.
- The Site Construction Manager(s), O&M Manager, or designee, will notify emergency response (911) system.
- All key supervisors will be paged or called and advised of the injury.
- For off-site assistance, the Construction Manager(s), O&M Manager, or designee, will meet the emergency responders at a prearranged gate and direct them to the location of the emergency.
- Should an employee become injured and require emergency off-site medical transportation, they will be accompanied by a Project representative to give pertinent information needed.
- In the event of death, only a professional medical practitioner can confirm the death. The paramedics will be called first and then a physician on retainer. Notification of the Clinton County Police office and the local Emergency Medical Service is required plus OSHA per the requirements of the OSHA Health and Safety Act of 1970 which requires the notification within eight hours after the death of any employee from a work-related incident or the in-patient hospitalization of three or more employees as a result of a work-related incident.
- If a medical practitioner declares death, the Construction Manager(s) or O&M Manager, as the case may be, will inform the deceased's next of kin.

Inspections: Safety, environmental protection, and QA/QC inspections of the major facilities and equipment will also assure that the Project is constructed in a manner that minimizes risks to the public and project personnel. These inspections will typically include, but not be limited to, the following operations, checks and reviews:

Safety

- Review of safety procedures;
- Observation and attendance of safety training for supervisors and field staff (tail-gate
- meetings);
- Review of construction safety techniques and implementation; and

- Verification of safety incident reports and statistical data.

Wind Turbine Generators and Towers

- Inspection of turbines at manufacturer's facilities;
- Review and inspection of manufacturer's QA/QC procedures;
- Manufacturing drawing review and verification;
- Verification of welding procedure specifications (WPS) compliance;
- Material mill certificates tracking system and verification;
- Overall visual inspection (including assembly, fastening systems and welding);
- Inspection of flange interface flatness measurements, finishing and protection;
- Witness or review of turbine run-in load testing;
- Inspection of paint finishing and protection;
- Inspection of painting/marking/preparation for shipment;
- Verification of field wiring and tagging; and
- Pre-Commissioning field testing and verification.

Concrete / Structural

- Inspection of batch plant facilities, engineer's review of mix design and break test verification;
- Inspection of forms, structural steel and rebar prior to backfilling and prior to casting;
- Field engineer's witness of concrete pouring; and
- Inspection of concrete testing during pour (slump) and verification of break tests results.

Electrical Collection System

- Inspection of cables and trenches prior to burial and backfilling;
- Witness of proper backfilling procedures;
- Witness and/or review of polarity, cable marking and phase rotation tests;
- Witness and/or review of grounding system resistance measurements; and
- Inspection of all lock-out tag-out locations and energization sequences and plan.

Turbine Transformers and Main Substation Transformers

- Inspection of transformers at manufacturer's facilities;
- Witness and/or review of winding resistance, polarity and phase displacement tests;
- Witness and/or review of no load losses and excitation current at rated voltage and frequency;
- Witness and/or review of impedance voltage and load losses at rated current and rated frequency;
- Witness and/or review of high potential and induced potential tests;
- Witness and/or review of impulse tests, reduced full wave, chopped wave and full wave tests;
- Witness and/or review of regulation and efficiency calculations;
- Verification of compliance to engineering specifications;

- Inspection of painting/tagging/preparation for shipment; and
- Verification of field wiring and tagging.

Substation Breakers

- Witness and/or review of rated continuous current and short circuit tests;
- Witness and/or review of dielectric withstand tests;
- Witness and/or review of switching tests;
- Witness and/or review of insulator tests;
- Witness and/or review of mechanical life tests;
- Witness and/or review of terminal loading tests;
- Witness and/or review of partial discharge tests;
- Verification of compliance to engineering specifications;
- Inspection of painting/tagging/wiring/preparation for shipment; and
- Verification of field wiring and tagging.

Substation Relaying and Instrumentation

- Inspection of manufacturer's facilities;
- Verification of instrument and relay compliance to specifications;
- Verification of installation in accordance with drawings;
- Witness and/or review of instrument and relaying calibration; and
- Verification of field wiring and tagging.

Substation Structural Steel Work

- Inspection of manufacturer's facilities;
- Review and inspection of manufacturer's QA/QC procedures;
- Manufacturing drawing review and verification;
- Verification of welding procedure specifications (WPS) compliance;
- Material mill certificates tracking system and verification;
- Overall visual inspection (including assembly, fastening systems and welding);
- Inspection of flange interface flatness measurements, finishing and protection; and
- Inspection of paint finishing and protection.

3.13.3.2 Operation

3.13.3.2.1 Ice Shedding

As stated previously, compliance with required set-backs and measures to control public access (gates, warning signs, etc.) should minimize any public safety risk associated with ice shredding. The Applicant will also meet with local landowners and snowmobile clubs to explain the risks of ice shredding and proper safety precautions. Relocation of any designated snowmobile trails that occur within 500 feet of a proposed turbine will be undertaken by the Applicant in coordination with the local snowmobile clubs and affected landowners and as stated in the Marble River Wind Farm Snowmobile Safety Guidelines

(Appendix O). Additionally, ice detectors will be installed at the maintenance facility, on the 80-meter meteorological tower, and on selected wind turbines (as necessary) to alert maintenance personnel of icing conditions, and allow for turbine shut-down and/or notification of area residents.

3.13.3.2.2 Tower Collapse/Blade Throw

In regard to tower or blade failure, a fall zone set-back from roads and property lines equivalent to the maximum turbine height (i.e., base of tower to tip blade), plus a safety factor is generally considered adequate for public safety purposes. In those rare instances where towers or blades have failed, the failure typically results in components crumpling or falling straight down to the ground. It would be very unusual for the tower to break off at the base and fall over. However, that is what the fall zone set-backs from roads, utility lines, and property lines allow for. The minimum 500 foot setbacks included in the Town of Clinton's and Town of Ellenburg's respective wind ordinances, assure that even a "worst case" tower failure would not endanger adjacent properties, roadways or utilities. Members of the public do not typically have access to the private lands on which the turbines are located, and as stated above, gates, signage, and public education/outreach efforts will be used to discourage unauthorized access. These actions should further reduce any risk due to a turbine collapse or blade throw.

3.13.3.2.3 Stray Voltage

Stray voltage will be prevented through proper design and grounding of the Project's electrical system. Any reported stray voltage problems will be addressed through the Project's Complaint Resolution Procedure (see Appendix C).

3.13.3.2.4 Fire

An employee safety manual will be incorporated into the overall operating and maintenance policies and procedures for the Project. Included in that manual will be specific requirements for a fire prevention program. A draft Fire Prevention and Control Plan for the Marble River Wind Farm is included as Appendix O. In accordance with both the Town of Clinton and the Town of Ellenburg Wind Energy Facilities ordinances, a final version of this plan will be developed in consultation with the fire department(s) that have jurisdiction over the proposed wind power project site. It is anticipated that this plan will include the following components:

- Initial and refresher training of all operating personnel and procedures review in conjunction with local fire and safety officials.
- Regular inspection of transformer oil condition at each wind turbine step-up transformer.
- Regular inspection of transformer oil condition at each step-up transformer installed at the main substation.

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

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

3.13.3.3 Lightning Strikes

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

3.13.3.4 Extreme Weather Abnormalities

Extreme weather events might include blizzards, massive sleet or hail, ice storms, or extremely high winds. In the event of extreme wind gusts, the wind turbine generators automatically shut down and go into standby mode. If extreme weather events occur, the following actions will be taken:

- When there is a weather warning issued by the National Weather Bureau, O&M Manager, or designee, will consult with appropriate authorities at the local weather service offices and at the county to determine the anticipated severity and duration of the weather event;
- The O&M Manager will hold planning meetings prior to a foul weather incident to prepare and implement a foul weather action plan;
- Loose materials that can be blown around or damaged will be moved inside or tied down; All doors will be secured;
- If the Project is shut down, the O&M Manager, or designee, will notify the electric transmission line operator of the anticipated outage;
- Communication equipment will be checked; and

- The substation high voltage line transmission facilities will be double checked for secure terminations on poles, relays, transformers and supports.

3.13.3.5 Facility Blackout

A facility blackout could occur if the main utility grid power (NYPA system) de-energized or if a grid fault causes the substation's main circuit breaker to open. If the transmission system is shut down, the substation main circuit breaker connecting the power plant to the transmission system will be opened immediately, if not already opened. Such a power outage causes the turbines to automatically shutdown, trip open the turbine main breaker, and lock the rotors in place. Back up batteries at the substation main control house will be tripped on for emergency power to the substation relay controls and also for emergency lighting inside the control house. The O&M facility will also have emergency indoor lighting, which will come on line. The central SCADA system's Uninterruptible Power Supply comes on-line automatically to provide backup power to the system and allow for controlled shut-down of the computer system. In the event of a facility blackout, the following procedures will be followed:

- Station service switchgear will be checked and breakers not opened by under-voltage will be opened;
- Breaker control relays inside the substation control house will be inspected;
- The central SCADA system will be inspected;
- The O&M manager or designee will immediately contact the lead transmission system operator (NYPA) on duty to determine the status, expected delay and appropriate course of action;
- If the main transmission system is energized, the restart will commence only when cleared by the transmission system operator;
- Once the transmission system is re-energized, the turbines will be brought back on line manually or automatically depending on the appropriate course of action as permitted by the transmission system operator