DRAFT ENVIRONMENTAL IMPACT STATEMENT

FOR THE

CROWN CITY WIND ENERGY PROJECT

Towns of Cortlandville, Homer, Solon, and Truxton
Cortland County, New York

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COMMONLY USED TERMS, ACRONYMS, AND ABBREVIATIONS

ABPP	Avian and Bat Protection Plan
amsl	above mean sea level
ASOS	Automated Surface Observation Station (used for purposes of long-term correlation of onsite recorded meteorological data)
Alternative Design Analysis	An assessment of the use of differing setback distances on the Project layout of turbines
BBA	Breeding Bird Atlas (New York State)
BBS	Breeding Bird Survey
BGEPA	Bald and Golden Eagle Protection Act
BER	Bit Error Rate
CCICS	Cortland County Interoperable Communications System
CATP	Coverage Acceptance Test Plan (Motorola's system acceptance testing for Radio System)
Class Year	The term used in the NYISO tariff to describe the final phase of the transmission interconnection study and entering into commercial agreements pertaining construction of the connection works
Commission	Refers to Public Service Commission (New York State)
DAQ	Digital Audio Quality
dBA	decibels, A-rated
DECPG	USFWS January 2011 Draft Eagle Conservation Plan Guidance
Decommissioning Plan	A formalized plan developed c-operatively with the Towns to cover the Project Sponsor's obligations for decommissioning of the Project. Please refer to Section 2.8 for further explanation.
DEIS	Draft Environmental Impact Statement
ECP	Eagle Conservation Permit
edr	edr Companies
EIA	Energy Information Administration
EIS	Environmental Impact Statement
Environmental Monitor	A suitably qualified representative to be appointed by the Lead Agency and funded by the Project Sponsor to oversee Project preparation and construction and ensure compliance with all environmental regulations, SEQRA, and conditions implemented in the Final Environmental Impact Statement. See Section 1.0 for more detail.
EPA	Environmental Protection Agency
FAA	Federal Aviation Authority
FEIS	Final Environmental Impact Statement
GHz	Gigahertz (a measure of the frequency of a radio wave 1 GHz = 1,000 MHz)
GIS	Geographic Information System
GLGH	Germanischer Lloyd Garrad Hassan

IDA	Industrial Development Agency
IRM	Installed Reserve Margin
Km	Kilometer (1 kilometer = 0.62 miles / 3,280 feet)
kV	Kilovolt (1 kilovolt = 1,000 volts)
kW	Kilowatt (1 kilowatt = 1,000 watts)
kWh	Kilowatt hours (i.e., the amount of electricity generated)
Link Budget	the calculated threshold to which the system can absorb additional clutter while maintaining reliable service
LMP	Locational Marginal Price (refers to the 11 trading zones in the New York wholesale power market structure)
LVRT	Low Voltage Ride Through is the wind turbines ability to provide reactive power capability to the grid in order to continue to operate through voltage fluctuations on the grid. NYISO determines the requirements for LVRT and connecting generators have to comply
m	Meter (1 meter = 3.28 feet)
m/s	Meters per second (1m/s is equal to 2.23 mph)
MACRS	Modified Accelerated Cost Recovery System
Mandated Purchases	The Scoping Document (Section 2.3) required that the DEIS contain a statement about Mandated Purchases; this is covered in Section 2.3. At the current time it is not envisioned that any of the capital purchases required for the Project will be 'Mandated Purchases'
MHz	Megahertz (a measure of the frequency of a radio wave)
mph	Miles per hour
MW	Megawatts (1 Megawatt = 1,000 Kilowatts) – is a measure of generating capacity
MWh	Megawatt hours (i.e., the amount of electricity generated) over time
NAAQS	National Ambient Air Quality Standards
NCF	Net Capacity Factor (annualized measurement of the efficiency of a wind project)
NHP	Natural Heritage Program (New York State)
No Equipment Access Areas	Wetlands and streams, except where crossed by permitted access roads
Non-participating	Persons or land that are not participating in the Project , by way of hosting wind farm infrastructure, or not under option to lease with the Project Sponsor or in negotiation relating to entering an option to lease
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
NY	New York State
NYCA	New York Control Area
NYCRR	Official Compilation of Codes, Rules, and Regulations of the State of New York
NYISO	New York Independent System Operator
NYSA&M	New York State Department of Agriculture and Markets

NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
NYSOPRHP	New York State Office of Parks, Recreation & Historic Preservation
NPCC	Northeast Power Coordinating Council
NYSRC	New York State Reliability Council
OE/AAA	Obstruction Evaluation / Airport Airspace Analysis (FAA study)
OSHA	Occupational Safety and Health Administration
O&M	Operations and Maintenance
Participating	Persons or land that are considered to be part of the Project through lease option or under negotiation with the Project Sponsor, all Project infrastructure will be located on Participating parcels
PSC	Public Service Commission (New York State)
PILOT	Payment In Lieu Of Tax
PPA	Power Purchase Agreement'
PTC	Production Tax Credit (a federal tax credit of $22.5 per MWh for 10 years) currently expiring on December 31, 2012
Project	Crown City Wind Energy Project located on 7,500 acres of Participating land on which Project facilities will be installed
Project Sponsor	Air Energy TCI Inc, the originator and developer of the Project
Radio System	Cortland County Interoperable Communications System (CCICS)
RECs	Renewable Energy Credits (as purchased by NYSERDA pursuant to its annual solicitations)
Restricted Activities Area	A buffer zone of 100 feet where Project construction traverses streams, wetlands and other bodies of water
RFP	Request for Proposals
Road Use Agreement	A contract between the Project Sponsor and the Towns (Homer, Cortlandville, Truxton, and Solon), the agreement will obligate the Project Sponsor to pay for pre-construction condition surveys, put in place a financial security, or maintain an investment grade credit rating in lieu thereof, to cover any damages, and is anticipated to include a method for post-construction inspections to assure local roads were restored to condition equal to or better than documented by the pre-construction survey. All costs associated with creating the agreement, and administering it, will be paid by the Project Sponsor. Please refer to Section 3.8 for full details.
rpm	Wind turbine rotor rotations (or revolutions) per minute
RPS	Renewable Portfolio Standard
SCADA	Supervisory Control and Data Acquisition
Scoping Document	The Scoping Document approved by the Lead Agency on September 13, 2012
SEQRA	State Environmental Quality Review Act
Setback	The distance that a Project component is set apart from a resource such as a residence, river, or wetland
SHPO	State Historic Preservation Office (New York)

Skitter	Variations in wind energy output exceeding 5 percent change over a five-minute time period, explained in more detail in Section 2.2.
SMP	Spill Mitigation Plan
SPDES	State Pollutant Discharge Elimination System
SWPPP	Stormwater Pollution Prevention Plan
TCI	Air Energy TCI Inc.
TIA	Telecommunications Industry Association
Towns	Towns of Cortlandville, Homer, Solon and Truxton
TSB	Telecommunication Systems Bulletin
USACOE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish & Wildlife Service
USGS	U.S. Geological Survey
VIA	Visual Impact Assessment
WaSP	Wind Atlas Analysis and Application Program
WCFZ	Worse Case Fresnel Zone

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1.0 EXECUTIVE SUMMARY

This Draft Environmental Impact Statement (DEIS) is for a proposed action known as the Crown City Wind Energy Project ("the Project"). Provided below is a brief Project description, along with summaries of the regulatory process; the Project's purpose, need, and benefit; its potential environmental impacts; and proposed mitigation measures. Alternatives to the Project and its effect on use and conservation of energy are also summarized.

Summary of Project Description

Air Energy TCI Inc. (TCI or the Project Sponsor), is proposing to develop a wind-powered generating facility in the Towns of Cortlandville, Homer, Solon, and Truxton in Cortland County, New York (Figure 1). The Project includes 44 wind turbines, which will deliver up to 71 MW of electrical power to the New York state grid. In addition to the wind turbines, the Project involves construction of associated components including two permanent meteorological towers, a system of gravel access roads, buried 34.5 kilovolt (kV) electrical collector lines, an operation and maintenance (O&M) building, and a collection and transforming substation. To deliver power to the New York State power grid, the Project Sponsor proposes to construct a 115 kilovolt (kV) transmission line, and a Point of Interconnection facility located adjacent to an existing 115 kV transmission line south of East River Road in Homer, NY. The transmission route will be approximately 0.5 mile in length.

The proposed Project is located on approximately 7,500 acres of leased land, or land that is currently under negotiation to lease (the "Project"). Project construction is anticipated to occur in a single phase, starting in late 2015, and be completed by December 31 of that year. Once built, the wind turbines and associated components will operate in almost completely automated fashion as described in more detail Section 2.7. The Project will, however, employ approximately five to seven operations and maintenance personnel. The wind turbine currently proposed is the GE 1.6 - 100 wind turbine (or equivalent) which has a minimum cut-in wind speed of approximately 3 meter/second (m/s) (7 miles per hour [mph]) required to generate electricity. This turbine's maximum rotational speed is 16 revolutions per minute (rpm). Each wind turbine has a computer to control critical functions, monitor wind conditions, and report data. Please refer to Appendix A2 for a summary of the GE 1.6 -100 wind turbine.

Summary of Regulatory Process

This DEIS has been prepared by **edr** Companies (**edr**) of Syracuse, New York. The document is intended to provide a basis for informed public comment and decision-making, and to facilitate the Project's environmental review process in accordance with the requirements of New York State's Environmental Quality Review Act (SEQRA). The Cortland County Legislature is acting as the lead agency pursuant to SEQRA.

Various plans and support studies have also been prepared in support of the Project, which provide detailed expert analysis on discrete topical areas in furtherance of the SEQRA evaluation. These studies include the following:

- Wetland and Stream Inventory Report
- Desktop Geotechnical Review
- Preliminary Stormwater Pollution Prevention Plan (SWPPP)
- Phase 1A Cultural Resources Investigation
- Historic Architectural Resources Survey and Addendum Report
- Visual Impact Assessment
- Shadow Flicker Analysis
- Route Evaluation Study
- AM and FM Broadcast Analysis
- Cellular/PCS Telephone Analysis
- Off-Air Television Reception Analysis
- Licensed Microwave Search & Worst Case Fresnel Zone Study
- Land Mobile Radio Analysis
- Birds and Bat Risk Assessment
- Sound Level Assessment Report
- Socioeconomics Analysis

Summary of Purpose, Need, and Benefit

The Project responds to objectives identified in the 2009 State Energy Plan (New York State Energy Planning Board 2009, p. 1-2), and the Renewable Portfolio Standard (RPS) in New York (NYSERDA 2012, p. 1-32). In September 2004, the Public Service Commission (PSC) approved the RPS and identified a renewable energy policy, which calls for an increase in renewable energy used in the State to 25% by the year 2013 (PSC 2004, p. 3). In 2008, the PSC increased the RPS goal to 30% by 2015 (NYSERDA 2012, p. 3).

The New York State Energy Plan contains a series of mandatory policy objectives that the Project will assist in achieving, including increasing the use of energy systems that enable the State to significantly reduce greenhouse gas emissions, while stabilizing long-term energy costs and improving the State's energy independence through development of in-state energy supply resources (New York State Energy Planning Board 2009, p. 1-2). The State Energy Plan recognizes that wind energy projects will play a role in fulfilling this objective.

In June 2007, former Governor Spitzer and then Lieutenant Governor Paterson formed the NYS Renewable Energy Task Force to investigate the implementation of increased renewable energy sources in the State. The Task Force published a report in February of 2008 that is intended to serve as a policy "road map" to address the many challenges we face in reducing our dependence on fossil fuels, stimulating investment in clean energy alternatives, and moving toward a Clean Energy Economy in New York State. The authors of the report recognize the need for, and benefits of, a rapid transition toward the large-scale development of renewable energy sources such as the proposed Crown City Wind Energy Project (Renewable Energy Task Force 2008, p. 10-11).

Summary of Potential Impacts

In accordance with requirements of the SEQRA process, potential impacts arising from the proposed action are evaluated in this DEIS (see Section 3.0) with respect to an array of environmental and cultural resources. The identified and analyzed potential impacts are broadly summarized below.

Environmental Factor	Potential Impacts
Physiography, Geology, and Soils	Soil disturbance Soil erosion Soil compaction Loss of agricultural land Proximity of proposed wind turbines to the Cortland County landfill
Water Resources	Temporary disturbance Siltation/sedimentation Stream crossings Alteration of private water supplies
Biological Resources	Vegetation clearing/disturbance Incidental wildlife injury and mortality Loss or alteration of habitat
Climate and Air Quality	Construction vehicle emissions Dust during construction Reduced air pollutants and greenhouse gases
Aesthetic/Visual Resources	Visual change to the landscape Visual impact on sensitive sites/viewers Shadow-flicker impact on adjacent residents
Cultural Resources	Visual impacts on architectural resources Disturbance of archaeological resources
Sound	Construction noise

Environmental Factor	Potential Impacts
	Operational impacts on adjacent residents
Transportation	Road wear/damage Traffic congestion/delays Road system improvements/upgrades
Socioeconomic	Host communities to receive a payment in lieu of taxes (PILOT) Revenue to participating landowners Expenditures on goods and services Tourism Short-term and long-term employment
Public Safety	Construction concerns related to large equipment, falling objects, open excavations, electrocution Possible ice shedding concerns Project components catching fire Low frequency noise
Communication Facilities	Temporary interference to communication signals Degraded reception to off-air television signals
Community Facilities and Services	Demands on police and emergency services Relocated utility distribution lines and poles
Land Use and Zoning	Adverse and beneficial impacts on forested land Changes in community character and land use trends

Construction of the Project will result in disturbance of up to 322.5 acres of soil and 453 acres of vegetation, most of which is forest land or active agriculture. In addition, approximately 11 acres of wetland could be disturbed by Project construction. However, the majority of these impacts will be temporary and will require U.S. Army Corp of Engineers approval. A total of 55.5 acres will be converted to built facilities, including 26.9 acres of forest land and 1.5 acres of wetland. Project construction will also result in some level of temporary disturbance and congestion on area roadways.

Project operation is expected to result in some level of avian and bat collision mortality. The turbines will be visible from many locations within the surrounding area, particularly in agricultural areas with wide open fields, but will also be fully or partially screened from viewers in many locations (e.g., in forested areas, developed settings and in parts of the valleys surrounding the Project area). Overall, only minor changes in land use within the Project area are anticipated as a result of Project implementation. Pursuant to the independent Sound Level Assessment Report (refer Appendix P and Section 3.7) none of the 1,113 permanently inhabitable residential receptors modeled will experience operational noise produced by the Project in excess of the 65 dBA NYSDEC guideline, with the highest being 45.3 dB(A). It should be noted that in absolute terms, the New York State Department of Environmental Conservation (NYSDEC) guidelines characterize sounds in the range that is anticipated to be generated by Project operation as “quiet to very quiet.” The Project is expected to generate approximately $355,000 per year ($7.1 million over 20 years) in PILOT revenues to local taxing jurisdictions, while requiring very little in terms of municipal services.

Summary of Mitigation Measures

Various measures will be taken to avoid, minimize and/or mitigate potential environmental impacts. General mitigation measures will include adhering to requirements of various local, state, and federal ordinances and regulations. To assure compliance with various environmental protection commitments and permit conditions, the Project Sponsor will provide funding for an independent, third party Environmental Monitor to oversee Project construction and restoration activities and to ensure compliance with all applicable environmental conditions. The Environmental Monitor(s) are responsible for monitoring the environmental and agricultural conditions on the site, and reporting compliance with the environmental permits and regulations specific to the Project (including federal, state and local permits and approvals), as well as the Project Sponsor's internal environmental plans and programs. The Environmental Monitor(s) will ensure that Project construction is in compliance with 1) the environmental aspects of the drawings and specifications of the Project, 2) environmental protection commitments included in the SEQR record, 3) all requirements of the federal and state wetland permits, 4) the NYS Department of Agriculture and Markets (NYSA&M) Guidelines, and 5) the Project SPDES General Permit and associated Stormwater Pollution Prevention Plan (SWPPP). The Environmental Monitor(s) will also act as a liaison between the Project Sponsor, construction personnel, and agency representatives.

In addition, the Project Sponsor will implement a Community Outreach and Communication Plan. This plan sets forth an open communication link between the Town and the Project Sponsor, and also establishes a complaint resolution procedure, including a toll free number set up by the Project Sponsor for use by local residents.

The proposed Project will result in positive impacts on socioeconomics (e.g., increased revenues to County and local municipality tax bases, payments to local contractors and hospitality sector service providers) and lease revenues to participating landowners, air quality (through reduction of emissions from fossil-fuel-burning power plants), and the climate (reduction of greenhouse gases that contribute to global warming). By eliminating pollutants and greenhouse gases, the Project will also benefit ecological and water resources as well as human health. These benefits also serve to mitigate unavoidable adverse impacts associated with Project construction and operation. Please see Section 3.0 for additional detail.

Specific measures designed to mitigate or avoid adverse potential environmental impacts during Project construction or operation include:

- Siting the Project away from population centers and areas of substantial residential development.

- Siting turbines and access roads so as to avoid or minimize impacts to wetlands and streams.
- Using the routing of existing logging roads and farm lanes for turbine access whenever possible to minimize disturbance to forest and agricultural land.
- Utilizing 'best practice' construction techniques that minimize disturbance to vegetation, streams, and wetlands.
- Implementing agricultural protection measures to avoid, minimize, or mitigate impacts on agricultural land and farm operations.
- Limiting turbine lighting to the minimum allowed by the Federal Aviation Administration (FAA) to reduce nighttime visual impacts, and following lighting guidelines to reduce the potential for bird collisions.
- Entering into a PILOT agreement with the local taxing jurisdictions to provide a significant predictable level of funding for the town, county, and school districts for the operational life of the Project.
- Close coordination with local first responders and other relevant community support services.

Summary of Approvals and Permits Needed

Implementation of the Project will require certain permits and/or approvals from local, county, state, and federal agencies (see Table 6). The Towns of Cortlandville, Homer, Solon, and Truxton all require building permits and site plan review. Three of the four towns have zoning ordinances (the Town of Truxton is the exception) that require zoning permits. In addition, officials in all four Towns are currently considering drafting or approving regulations governing commercial wind energy facilities. Although such local ordinances are pending and the exact nature of the approval is not yet known, local discretionary approval is outside of the scope of SEQRA and will be required from each Town.

County approvals for the Project include the SERQA Findings Statement by the Cortland County Legislature (Lead Agency), highway work permits by the County Highway Department, and approvals associated with installation of septic system and/or water supply well for the O&M facility by the County Department of Health, Division of Environmental Health. In addition, in association with town-issued zoning permits, a recommendation pursuant to General Municipal Law 239-m will be necessary from the Cortland County Planning Board.

At the State level, the Department of Environmental Conservation is expected to issue the following permits: Article 24 Permit for disturbance to state jurisdictional wetlands, Article 15 Permit for disturbance of protected streams, State Pollution Discharge Elimination System (SPDES) General Permit for construction activities, Section 401 Water Quality Certification, and issuance of SEQRA findings. Approvals from the Department of Health will be required for installation of the septic system and/or water supply well at the Operations and Maintenance (O&M) facility. The

Department of Transportation will require a highway work permit and a Special Use Permit for the oversize/overweight trucks used to deliver the turbines. It is also currently anticipated that consultation with the Office of Parks, Recreation, and Historic Preservation will be necessary to comply with the requirements of Section 14.09 and/or 106 of the Historic Preservation Act.

Federal approvals required for this Project include a Nationwide Permit from the U.S. Army Corp of Engineers for temporary disturbance in federal jurisdictional wetlands/waters of the U.S., and a Lighting Plan and clearances for potential aviation hazard from the Federal Aviation Administration.

Summary of Alternatives

Alternatives to the proposed Project that were considered and evaluated include alternative Project area, alternative project design/layout, alternative project size, alternative technologies, alternative construction phasing, and no action. Analysis of these alternatives revealed that both the size of the Project and the configuration of the turbines as currently proposed are necessary to produce a commercially feasible project that minimizes adverse environmental impacts to the extent practicable. A smaller project would not fully capture the available wind resource in a manner to make the construction and interconnection of the Project to the existing New York grid economic. A larger facility might theoretically provide more economic return, but it would force location of towers into areas with marginal wind power resources and greater proximity to residents, steep slopes, and undisturbed forest land, as well as landowners that may not be willing to participate. This would result in a greater number of potential adverse environmental impacts than currently anticipated. A larger number of smaller turbines, while perhaps reducing visibility from some areas, would not change the overall visual impact of the Project and would increase impacts associated with the more extensive road, foundation, and interconnect systems required. Alternative technologies (e.g., different sources of generation) eliminate many of the environmental advantages associated with the proposed Project. In summary, the alternatives analysis concluded that the Project as proposed offers the optimum use of resources with the fewest potential adverse impacts.

Summary of Effects on Use and Conservation of Energy Resources

The proposed Project will have significant, long-term beneficial effects on the use and conservation of energy resources. Energy will be expended during the construction phases of the Project, as well as for the maintenance of the wind turbines and support facilities on-site. However, the operating Project will possess a maximum of 71 MW of electricity generation capacity without consuming water or producing toxic emissions on an ongoing basis. This greatly exceeds the energy required to construct and operate the Project, and the output is enough to power approximately 29,820 average NYS households, on an annual basis (based on average annual electric consumption of 7.3 Megawatt hours (MWh) for New York households [EIA, 2012a]).

The Project will add to and diversify the state's sources of power generation, accommodate future growth in power demand through the use of a renewable resource (wind), and over the long term will displace some of the state's older, less efficient, and less environmentally sustainable sources of power and/or the amount of energy imported into the state. Wind energy generation results in reductions in air emissions because of the protocol utilized to manage the electric power system. Generally, in the New York state wholesale energy market the most expensive energy consuming power sources (such as coal or natural gas) will be "backed down" first when there is a sufficient source of wind energy available. Within the wholesale energy markets governing the trading of energy, wind energy is a preferred power source on an economic basis because wind turbines consume no fuel. Also, since wind projects are able to access revenue from Production Tax Credits (PTCs) and Renewable Energy Credits (RECs) (refer to Section 2.3), wind Projects are able continue to operate at during periods of low wholesale market pricing. Therefore, wind energy is one of the last forms of generation to be backed down. At times of excess generation capacity (i.e., when demand is low) wind energy typically displaces the need for generation from individual fossil fuel-fired power plants or units, thereby reducing fuel consumption and the resulting air emissions that would have otherwise occurred (Jacobson & High 2008, p. 9-10). The operation of the New York Independent System (NYISO) electricity market is discussed in further length in Section 2.2.

In summary, this Project is proposed at a time of significant energy uncertainty, at both the state and national levels and is being developed to contribute to satisfying the state's mandated targets for diversifying its energy mix. At 71 MW, the Project will generate enough energy annually to serve approximately 29,820 New York homes.

2.0 DESCRIPTION OF PROPOSED ACTION

This Draft Environmental Impact Statement (DEIS) is for a proposed action known as the Crown City Wind Energy Project ("the Project"). The Project consists of the construction and operation of 44 wind turbine generators and associated facilities, with an installed, generating capacity of 71 megawatts (MW) connecting to the New York state power grid. As explained in Section 2.2, the Project is expected to operate at an annual net capacity factor (NCF) of approximately 35%. This means that over the course of a full calendar year the Project would produce 217,686 MWh (i.e., 71 MW x 24 hrs/day x 365 days x 35%).

The Cortland County Legislature is the Lead Agency pursuant to the New York State Environmental Quality Review Act (SEQRA) (6 NYCRR Part 617). Cortland County has required the preparation of this DEIS in order to evaluate the potential environmental, social and economic impacts of the Project, which is to be located within approximately 7,500 acres of lands within the Towns of Cortlandville, Homer, Solon, and Truxton, Cortland County, New York. The purpose of this DEIS is to evaluate the potential impacts of the Project, evaluate alternatives, and consider mitigation measures.

The proposed Project is described below in terms of its components, location, construction, operation and maintenance, and decommissioning. The Project's purpose, need, and benefit; cost and funding; and permits and approvals are also discussed below, along with a description of the regulatory process and opportunities for public and agency involvement in that process.

2.1 INTRODUCTION

Air Energy TCI Inc. (TCI or the Project Sponsor) a Canadian company, is proposing to develop a wind-powered generating facility in the Towns of Cortlandville, Homer, Solon, and Truxton, Cortland County, New York (Figure 2). The Project Sponsor is a subsidiary of TCI Renewables Limited, an international renewable energy development company established in England and headquartered in Oxford. The original TCI Company was created in 1996 in Australia and at that time the company designed and built cellular telecommunications networks in Australia and Europe. TCI Renewables was established in 2005 as a wind energy development company. Air Energy TCI Inc. was formed in 2006 (refer to Section 2.3 and Appendix V for further information pertaining to TCI's experience in developing wind energy projects). TCI currently has wind energy projects under development across the United States, Canada, Ireland, and the United Kingdom.

The Project includes 44 wind turbines, which will deliver up to 71 MW of electrical power to the New York state grid. As presently envisioned the Project will use the GE 1.6 - 100 wind turbine (or equivalent) currently having a rated capacity of 1.6 MW; please refer to Appendix A2 for further technical details for the GE1.6-100. Each wind turbine will include a three-bladed upwind rotor, with a diameter of 100 meters (328 feet), mounted on a 96-meter (315-foot) tubular steel tower. The Project will also involve construction of approximately 18.6 miles of gravel access roads, approximately 29.6 miles of buried 34.5 kV electrical collector lines, 0.5 mile of overhead 115 kV electrical transmission lines, a collection and transforming substation, Point of Interconnection facility and two permanent 100-meter (328 feet) tall meteorological towers. To service the facility, an operations and maintenance building (O&M facility) will house operations personnel, equipment and materials, and provide staff parking. Due to a previous request by the County Superintendent of Highways in 2009, 1.6 miles of electrical collector lines may be installed overhead on land at the County landfill. This is to be confirmed during the detailed design stage of the Project in consultation with the landfill management and County Superintendent of Highways. See Figure 3 for Proposed Project Layout. It is currently proposed that each town will host the following Project components:

- Town of Cortlandville: 8 wind turbines, approximately 2.4 miles of access roads, and approximately 2.7 miles of electrical collector lines.
- Town of Homer: 8 wind turbines, approximately 3.5 miles of access roads, approximately 6.8 miles of electrical collector lines, the electrical collection station, 0.5-mile overhead transmission line and interconnect station, and up to one permanent meteorological tower.
- Town of Solon: 17 wind turbines, approximately 8 miles of access roads, approximately 14.4 miles of electrical collector lines, and up to two permanent meteorological towers.
- Town of Truxton: 11 wind turbines, approximately 4.6 miles of access roads, approximately 5.7 miles of electrical collector lines, and up to one permanent meteorological tower.

To deliver power to the New York State power grid, the Project Sponsor proposes to construct a 115 kilovolt (kV) transmission line, and a Point of Interconnection facility located adjacent to an existing 115 kV transmission line south of East River Road. The transmission route, from the Project transforming substation, will be approximately 0.5 mile in length (see Section 2.5.3 for additional detail).

The layout, location, and number of turbines evaluated in the DEIS presents a Project that is intended to optimize the benefits of the local wind resource while either avoiding or minimizing adverse environmental impacts, and assuring that the Project is commercially viable. Because of ongoing agency consultation/input, environmental considerations, landowner negotiations, and potential unforeseen construction issues, all of the potential turbine locations are subject to minor adjustments or micrositing prior to finalization of the Final EIS (FEIS) and thereafter construction. However, this DEIS analysis provides a basis for future decision-making that will assure that any such micrositing will, consistent with SEQRA, avoid or minimize adverse impacts to the maximum extent practicable pursuant to thresholds and criteria established by the Lead Agency. Micrositing is the relocation of wind turbines by small distances within the turbine site area at the detailed design stage of development; typically the movement is less than 100 feet in any unconstrained direction (i.e. avoiding all other constraints on infrastructure location). The distance of the turbine shift is dependent on the resource being avoided, and would be implemented to reduce Project impacts or to avoid Project impacts. A non-exhaustive table of possible scenarios that could lead to turbine micrositing is shown below.

Table 1: Factors Affecting Micrositing

Event forcing Micrositing	When change will be discovered	Potential Micrositing distance	Impact
Geotechnical issue potentially affecting foundation construction	After detailed on-site geotech analysis (summer 2014)	100ft / distance required to avoid issue	Turbine move Geotechnical issue avoided, turbine move must be within unconstrained area
Discovery of significant archaeological artifacts or other discoveries during detailed surveying	During Phase 1B archaeology walkover study / other detailed field study	100ft / dependent on significance of artifact/resource	Turbine / access road / electrical collector system move. Impact to artifact/resource reduced to acceptable level or avoided
Unmapped / unknown historic or current gas line discovered	During detailed civil engineering design / on site during construction	100ft / maximum distance required to avoid impact	Impact to unmapped, previously unknown feature avoided
Changes in turbine location resulting from debt providers due diligence and their independent wind yield analysis	At or around financial close of debt arrangement (some 12 months prior to start of construction)	100 ft within unconstrained areas	To improve wind yield or solve turbulence as requested by debt financier

To protect microwave communication links, a minimum 264 foot buffer will be maintained between turbine towers and the extent of all WCFZ's. This setback is calculated as follows: 164 foot extent of wind turbine blade + 100 foot buffer to Worst Case Fresnel Zone (WCFZ) buffer. Therefore micrositing of wind turbine towers will not occur within 264 feet of any WCFZ to ensure that no part of an installed wind turbine will encroach on the WCFZ 100 foot buffer. The 100ft buffer between the tip of the wind turbine blade and the WCFZ is applied to enable a mapping tolerance and sufficient working space during construction. See Section 3.12 for additional information on WCFZs and microwave communications.

The Project is currently scheduled to be constructed in late 2015 / 2016, and market availability of wind turbines could dictate the use of an alternate turbine from the proposed GE 1.6 MW machine and success or otherwise in NYSERDA REC auctions may prolong the construction (refer to Section 2.3 for further details regarding NYSERDA's REC auctions). Any wind turbine ultimately selected will be of similar technology, size, appearance, operating characteristics, and approximate generating capacity. Furthermore, should a turbine model with characteristics different from those of the GE 1.6 MW machine be selected for use at the Project, any appropriate studies required to address the differences between turbine characteristics (such as sound assessment) shall be re-conducted to ensure that Project related impacts are mitigated.

2.2 PROJECT PURPOSE, NEED, AND BENEFIT

This section describes the background and purpose of the Project, how it would help meet economic and environmental needs, and how the proposed action is consistent with goals, objectives, orders, and directives issued by the executive and legislative branches of the U.S. and State Government.

The New York State (NY) wind energy market currently has 1,418 Megawatts (MW) of operating wind energy capacity and the state ranks twelfth in the nation for installed capacity. There exists a further 3,698 MW of projects in the New York Independent System Operator (NYISO) interconnection queue, and 216 MW under construction at the time of issuance of the DEIS. In 2011, wind energy produced 2.1% of New York State's power, equivalent to 340,000 homes (AWEA 2012, p. 1).

In 2000, the Madison Wind Farm in Madison County became the first utility scale project to be constructed in New York State. The wind farm consists of 7 Vestas V82 1.65 MW turbines, for a total installed capacity of 11.55 MW. To date, the largest operating project in NY is the Maple Ridge Wind Farm in Lewis County, which has 195 Vestas V82 1.65 MW turbines, for a total installed capacity of 321.5 MW. Maple Ridge was constructed in two phases with the second phase reaching commercial operation in January 2006. The biggest growth years for the wind industry in NY were 2008 and 2009, with 407 MW and 442 MW installed, respectively. The largest wind turbines currently installed in New York are located at the Marble River Project near Plattsburgh, which consists of 76 Vestas V112 3.0 MW turbines with a rotor diameter of 367 feet (the project was in construction at the time of issuance of the DEIS).

Wind energy is a key employer in New York State. According to the American Wind Energy Association (AWEA 2012, p. 2), a total of 1,001 direct jobs attributed to wind energy in NY in 2011. Arguably the most notable employer is General Electric (GE), which operates their Renewable Energy Global Headquarters in Schenectady. GE is the largest supplier of wind turbines in North America, and ranked third in the World. New York also hosts numerous wind energy development companies, manufacturing plants, operation and maintenance crews, specialist consultants (environmental, engineering, legal, wind yield experts, met tower installers), and one of the US's most experienced wind energy balance of plant construction contractors.

TCI Renewables commenced development of the Crown City Wind Farm in early 2007. TCI was contacted by a local landowner in response to an advertisement that TCI had placed in a statewide agricultural magazine seeking landowners interested in hosting wind turbines. TCI undertook a preliminary analysis of the Project area, which involved assessing a number of criteria including; access to electrical transmission, wind speed, alternative locations in the area, consultation with the County and Towns, environmental fatal flaw, etc. This initial fatal flaw analysis continued through 2007 in parallel with commencement of land acquisition. In November 2007, TCI submitted its transmission interconnection application to the NYISO. By early 2008, TCI had acquired sufficient land rights to have identified suitable locations to erect two wind measurement towers and at the same time commenced preliminary ecology work (bird and bat surveys). In parallel with the ecology field work, TCI continued consultation with the County and Towns.

In November 2008, TCI sought to formalize the SEQRA process by submitting an Environmental Assessment Form (EAF) to Cortland County. This resulted in the County passing a resolution on December 18, 2008, to act as the Lead Agency. Also in November 2008, TCI held its first open house in McGraw community center. Through 2009 and 2010 TCI began specific studies of the environmental, biological, wetland, archaeological, and visual resources in the area, and continued with land acquisition and wind data collection. By the end of 2011, TCI had substantially completed its wind yield analysis and had preliminary identified the GE 1.6-100 wind turbine as being an efficient option for the Project. At that time TCI sought to finalize a viable draft layout which involved additional land acquisition. TCI appointed environmental consultants **edr** Companies in April 2012 to assist in the drafting of the DEIS and completion of outstanding fieldwork. The draft scope was issued on July 3, 2012 containing a preliminary layout of 48 wind turbines. See Section 3.10.1 for additional information about the Project's SEQRA process.

The purpose of the proposed Project is to create an economically viable wind-powered electrical-generating facility that will provide a significant source of renewable energy to the New York power grid to:

- Satisfy regional energy needs in an efficient and environmentally sound manner;
- Supplement and offset fossil-fuel electricity generation in the region, with emission free wind generated energy ;
- Contribute to reduce the amount of electricity imported to New York State
- Realize the full potential of the wind resource in the Project area
- Promote the long-term economic viability of rural areas in New York; and

- Assist New York State in meeting its proposed Renewable Portfolio Standard for the consumption of renewable energy in the State (see below).

Site specific Project wind data was collected at three locations within the Project area (wind data collection is still ongoing). Three years of on-site wind data, (along with long term analysis and correlation of wind data collected from nearby sites such as airports etc.) has been analyzed by an industry recognized independent renewable energy consultancy, GL Garrad Hassan (GLGH) to validate the wind resource and provide an estimation of the energy that will be produced from the Project. The Crown City Wind Energy Project is expected to have an average annual net capacity factor (NCF) of approximately 35%, which is slightly higher than most operational commercial wind farms in New York State. There have been significant developments in wind turbine technology in the last 24 months and the turbine model proposed (GE 1.6-100) is designed to maximize wind energy yields at this site area. As indicated in the turbine information provided in Appendix A2, "GE's 1.6-100 wind turbine offers a 47% increase in swept area when compared to the 1.6-82.5 turbine, resulting in 19% increase in Annual Energy Production (AEP) at 7.5 m/s (17mph). This increase in blade swept area allows greater energy capture and improved project economics for wind developers. GE's 1.6-100 turbine has a 53% gross capacity factor, at 7.5 m/s (17mph); a class leading performance." Although the Project does not enjoy a 7.5 m/s (17 mph) wind resource, none-the-less the GE1.6-100 technology vastly improves the ability to improve the viability of wind energy sites with characteristics similar to the Project. As further indicated in Appendix A2, the GE 1.6-100 turbine provides the following:

- Value: Best in Class capacity factor, 53% at 7.5 m/s (17 mph)
- Reliability: GE fleet at 98%+ availability
- Experience: 16,500+ fleet, most 100 meter+ (328 feet+) rotors, 2.1 million operating hours
- Finance-ability: evolutionary design using "proven technology" from GE 1.5 and 2.5 MW platforms

Annual NCF is a means of measuring the productivity of a wind power project (or another power production facility), and this factor compares the actual, or predicted, production of a facility over the course of a year as compared to the potential production if the facility was running at full capacity for the full year. A 35% NCF means that on average, a facility will generate approximately 35% of its potential output over a given year. For a wind project, this does not mean that it will be generating power only 35% of the time (the turbines may actually be generating power 65% to 90% of the time, just not always at full capacity), but rather the Project will generate approximately 35% of its potential maximum output over the course of each year. In response to the Scoping Document of September 13, 2012, a wind power density map has been generated to demonstrate that the Project Sponsor's estimates of potential power production are reliable and that the Project is thus a viable proposition. The site specific Project wind data, collected at three locations within the Project area has been analyzed by the world's largest independent renewable energy consultancy, GL Garrad Hassan (GLGH). GLGH provided a wind yield estimate, and associated interpretative analysis including wind roses, and wind power density data that was used to create the microscale wind power density map included in Appendix A1.

Based on GLGH's independent wind yield analysis, total net electricity delivered to the existing New York power grid is expected to be approximately 217,686 MWh/year (i.e., 71 MW x 24 hours/day x 365 days x 35%), or enough electricity to meet the average annual consumption of between approximately 18,929 and 29,820 average NYS households (based on average annual electric consumption of 7.3 MWh for New York and 11.5 MWh for the U.S.; Energy Information Administration [EIA], 2012a). A table has been provided below to show the effects of different Net Capacity Factors (NCF) on the energy production. As can be seen below, if the Project was to achieve an NCF of 30% the energy produced could still power 25,560 average New York homes and if the Project were to achieve an NCF of 40% the energy produced could power approximately 33, 228 average New York homes.

Installed Megawatts (MW)	**Net Capacity Factor** (NCF)	**Annual Energy Production** (MWh)	**NY homes** (Average annual consumption 7.3 MWh*)	**US Homes** (Average annual consumption 11.5 MWh*)
71	30%	186,588	25,560	16,225
71	31%	192,808	26,412	16,766
71	32%	199,027	27,264	17,307
71	33%	205,247	28,116	17,848
71	34%	211,466	28,968	18,388
71	35%	217,686	29,820	18,929
71	36%	223,906	30,672	19,470
71	37%	230,125	31,524	20,011
71	38%	236,345	32,376	20,552
71	39%	242,564	33,228	21,093
71	40%	248,784	34,080	21,633

*Source: Energy Information Administration [EIA], 2012a

The Scoping Document adopted on September 13, 2012 (see Section 2.10.1 for additional detail about Scoping) requests a description of the New York Independent System Operator (NYISO) capacity and reserves. Detail on available reserves is described later in this section. Capacity data for the NYISO has been extracted from NYISO's "Power Trends 2012 - State of the Grid" (NYISO 2012b, p. iii) and is listed below:

<u>Power Resources</u>

Generation

Total Generation -- 2012 ....39,570 MW

Generation Added Since 2000 ....9,174 MW

Transmission

Total Circuit Miles of Transmission -- 2012 ....11,016 miles

Transmission Capability Added Since 2000 ....1,640 MW

Demand Response

Total Demand Response available in summer 2011 ....2,173 MW

<u>Reliability Requirements</u>

Reliability Requirement – summer 2012 ....38,622 MW

Total Resources Available – summer 2012 ....43,686 MW

<u>Renewable Resources</u>

Total Renewable Resource Capacity – 2012. ....6,064 MW

Total Existing Wind Generation *(Nameplate Capacity)* – 2012 ....1,414 MW

Proposed Wind Generation *(Nameplate Capacity)* ....3,986 MW

Percentage of Electric Energy from Renewables in 2011 ....23.75%

<u>Power Demands</u>

Total Usage in 2011 ....163,330 GWh

Total Usage in 2010 ....163,505 GWh

Forecast Peak Usage for 2012 ....33,295 MW

Actual Peak Usage for 2011 ....33,865 MW

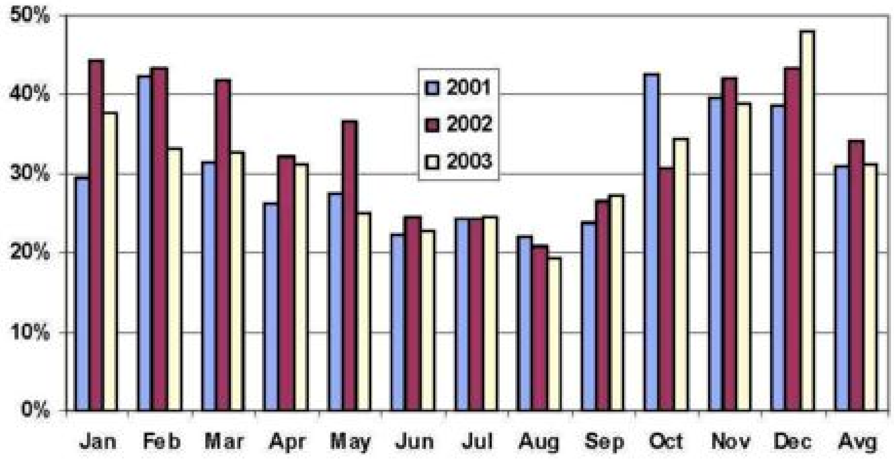
Record Peak Usage (August 2, 2006) ....33,939 MW

The Scoping Document of September 13, 2012 also requests that the DEIS examine NYISO's need for wind-generated electricity. NYISO issued a news release entitled "New York Grid Ready for More Wind Power" on September 30, 2010. This news release was issued to coincide with a report NYISO had recently completed, titled "Growing Wind: NYISO 2010 Wind Generation Study" (see Appendix U for a copy of the 2010 press release and associated study). The press release (NYISO 2010a, p. 1) states, "According to a study issued today by the New York Independent System Operator (NYISO), wind generation could be increased by over five times the amount currently operating in New York. The report, Growing Wind: NYISO 2010 Wind Generation Study looks at expanding wind power from the existing 1,275 megawatts (MW) to 8,000 MW by 2018. The new analysis was undertaken because a previous study, done in 2004, analyzed only 3,300 MW of wind generation. There are now more than

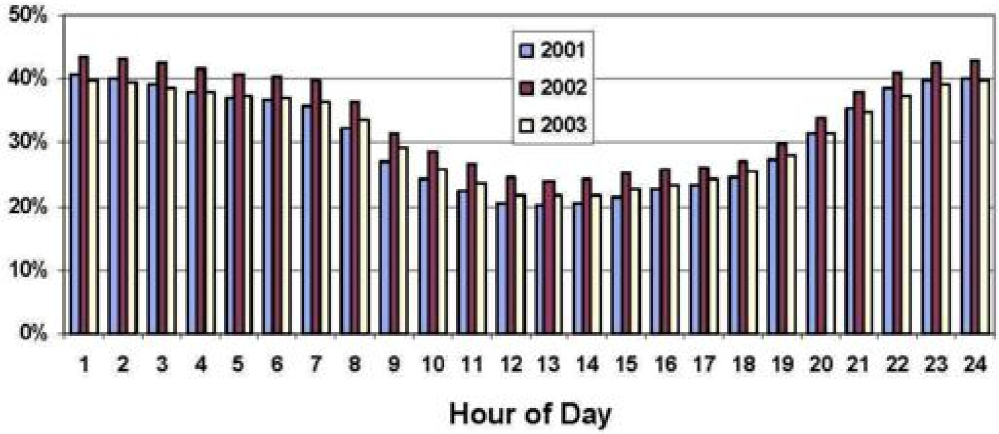
7,000 MW of proposed wind projects that have been submitted to the NYISO for potential interconnection to the New York power grid."

While acknowledging that integrating wind energy was not without its challenges in terms of variability and daily output cycles, the NYISO (2010a, p. 1) states, "The study found that any operational requirements associated with integrating sufficient wind generation could be addressed, paving the way for the fulfillment of New York State's goal of having 30 percent of the state's electricity supplied by renewable resources by 2015." In the press release associated with the report, Stephen Whitley, the President and CEO of NYISO stated, "Wind power is a vital component of New York State's renewable energy strategy. This study provides a much clearer picture of the benefits consumers can see as a result of continued wind development" (NYISO 2010a, p. 1).

The Scoping Document also request that a description is provided of the seasonal and daily availability of electricity from the Project. It is well known that wind energy has seasonal and diurnal (daily) variations. Typically during the winter and spring months wind speeds are higher within the Project area and by contrast during the summer and autumn months wind speeds are generally lower. It is also known that wind speeds are generally higher in the evening than during the day. Seasonal and daily wind patterns for New York State wind projects from NYSERDA's 2005 report "The Effects of Integrating Wind Power on Transmission System Planning, Reliability, and Operations" are displayed below. Since this report has been issued, NYISO has developed a detailed plan for integrating more 'available capacity' from wind energy onto the New York grid system and the findings of this report have been developed upon significantly in recent years.



Monthly Wind Capacity Factors (NYSERDA 2005, p. 148).



Hourly Wind Capacity Factors (NYSERDA 2005, p. 148).

The seasonal energy production of the Project is estimated in the summary below as a percentage of the predicted annual output.

Table 2: Estimate of Annual Energy Production

Annual Energy Production Estimate (%)											
Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
10.5	9.1	10.0	10.3	8.8	6.4	5.4	5.1	6.3	8.3	9.5	10.3

The Scoping Document also requests an explanation as to what happens when the wind isn't blowing or if the electricity is not needed. A minimum wind speed of 3 m/s (7 mph) is required for the GE1.6-100 to generate electricity. When the wind is blowing below this level or above the cut-out wind speed of 25 m/s (56 mph), electricity will not be generated by the Project. The Project will connect to the New York grid and as such will feed into a supply mix of various forms of generation including coal, gas, nuclear, oil, renewables, etc. Any modern electricity grid system will have a good mix of generation types, so that there is no over-reliance on any one technology or fuel type. If the NYISO determines that the electricity is not needed from this Project at a given time (e.g., due to regional transmission constraints), then in accordance with their active management of wind energy supply (described later in this section) this output may be curtailed. The risk of curtailment is carried by the Project Sponsor and is assessed and accounted for as part of the Project financial and technical due diligence. Note that under curtailment, the Project would not accrue PTC or earn revenue for the sale of REC's for the energy that is being curtailed. Hence, given that there is no effective way of storing wind energy, when it cannot be used then the Project would be curtailed. At the current time, the Project Sponsor does not expect that the Project would be curtailed as a result of excess wind generation in New York State. This will be studied further once the Project enters the NYISO Class Year.

The Scoping Document also requests a description of "how much wind electricity from the Project will be counted as 'reserve' and will never be used." The NYCA electricity market system and the use of priority dispatch, means that none of the electricity generated from the Project would be counted as 'reserve'. According to the NYISO (2012b, p. 20) "The difference in the amount of power potentially available (capacity) from any type of supply and the actual generation produced (energy) is a function of the supply offered to meet the demand bid in wholesale electricity markets. The NYISO market is designed to select the least-costly generation offered to meet demand. As a result, lower cost power offered by hydropower projects, windpower facilities, and nuclear plants were selected via the markets to supply generation in a proportion larger than their share of total capacity."

In general terms the New York State Reliability Council (NYSRC) has determined that an Installed Reserve Margin (IRM) of 16% in excess of the NYCA summer peak demand forecast for the Capability Year 2012-13 is required to meet the Northeast Power Coordinating Council (NPCC) and NYSRC resource adequacy criterion. The IRM is established annually by the NYSRC and is subject to state and federal regulatory approval (NYISO, 2012a).

The Project could produce the phenomenon of "skitter", the term is used to refer to variations in wind energy output exceeding 5 percent change over a five-minute time period (Skitter). How this is managed by grid operators is analyzed in a 2005 NYSERDA report, http://www.uwig.org/GROWING_WIND_-_Final_Report_of_the_NYISO_2010_Wind_Generation_Study.pdf, (Figure 5.1, page 7), which recognizes potential issues regarding managing the variability of wind energy. However, it is important to point out that the report concludes, "As expected, the geographic diversity of the wind sites causes the impact of wind generation on the five-minute variability to be quite small" and, "Overall, the impact on five-minute variability is relatively small, and not expected to have substantial impact on load following" (NYSERDA 2005, p. 88). The report's final recommendations on this issue are, "No immediate changes in operations due to the variability impacts of wind are required" (NYSERDA 2005, p. 101).

Skitter will be experienced, on rare occasions, in the event of 'high wind cut out event' whereby the wind speeds at the Project exceed the operational limits of the turbines for a certain period of time (namely 25 m/s or 56 mph), the normal operational procedure is that the wind energy plant would shut down temporarily (initially by feathering the blades and then by rotating out of the wind), in order to protect the equipment from storm damage. This is normal protocol for all wind farms and is not expected to cause any significant impacts other than the Skitter impacts that will require to be managed by the NYISO.

NYISO manage the occurrence of Skitter by utilization of an advanced forecasting developed significantly in recent years so that NYISO, and the Project operator, have a good understanding of wind output and potential 'high wind cut out events' and sharp increase in wind output as storm fronts traverse a region of New York that may be likely to occur in the proceeding 24 hours. In 2008 NYISO introduced a centralized forecasting system to forecast energy outputs at interconnected wind generating plants. These outputs are provided to NYISO by an independent wind monitoring company for real-time and day ahead markets. The real time data allows for management of potential high speed cut out or storm ramp events. NYISO is also looking at managing output ramping events by more frequent transmittal of data. For instance, new projects such as the Crown City Wind Project would be required to transmit data every 30 seconds and provide meteorological data captured within 5 kilometers (km) (3.1 miles) of each turbine (the Project includes two permanent onsite met towers, which will ensure the Project complies with this requirement). The NYISO is also using Security Constrained Dispatch (SCD) to manage ramping or 'Skitter' events.

It is also important to note that Skitter or 'high-speed cutout events' are, according to NYISO (2010b, p. 6), actually quite 'rare events'.

In addition, since the 2005 NYSERDA report was produced NYISO has worked to manage this issue: "To accommodate wind generation reliably, the NYISO has implemented innovative measures such as a wind dispatch system based on bids of individual generators and a wind forecasting mechanism that uses wind speed and wind direction data collected by interconnected wind resources in New York, and other meteorological data, to forecast the amount of energy expected to be produced by wind resources over various time frames. The NYISO has also implemented pioneering changes in market design to integrate new energy storage resources" (NYISO 2010a, p. 1). See Appendix U for additional information from NYISO.

It is also fair to say that NYISO is fully aware of and is capable of managing this issue as per the findings of their recent report "Growing Wind – Final Report of the NYISO 2010 Wind Generation Study" (see Appendix U). This report states, "The fluctuating nature and the uncertainty associated with predicting wind plant output levels manifests itself as an increase in overall system variability as measured by the net load (load minus wind). In response to these increased operational challenges the NYISO has implemented changes to its operational practices such as being the first ISO to incorporate variable generation resources into security constrained economic dispatch (SCED) and to implement a centralized forecasting process for wind resources. The study concluded that at higher levels of installed wind generation the system will experience higher magnitude ramping events and will require additional regulation resources to respond to increased variability during the five minute dispatch cycle" (NYISO 2010b, p. x).

The Scoping Document requires the DEIS to describe whether or not the Project Sponsor will be requesting the right to eminent domain. At the current time the Project Sponsor has no intent to use eminent domain.

In addition, the Scoping Document requests that the competition for electrical generation sales is described. NYISO provides the most up to date information relating to the electricity generating mix. NYISO produces frequent updated reports detailing the breakdown of the sources of electricity generation and therefore corresponding to the percentage of sales. As of May 2012 the breakdown of significant sources of generation was as follows:

- Coal: 6%
- Nuclear: 14%
- Gas and Oil: 37%
- Oil: 8%Gas: 16%
- Hydro: 11%
- Hydro Pumped Storage: 4%
- Wind: 3%
- Other Renewables: 1%

For additional detail please see "Power Trends 2012 State of the Grid" (NYISO, 2012b, p. 19).

The Project responds to objectives identified in the 2009 State Energy Plan (New York State Energy Planning Board, 2009, p. 1-2), and the Renewable Portfolio Standard (RPS) in New York (NYSERDA, 2012, p. 1-32). In September 2004, the Public Service Commission (PSC) approved the RPS and identified a renewable energy policy, which calls for an increase in renewable energy used in the State to 25% by the year 2013 (PSC 2004, p. 3). In 2008, the PSC increased the goal to 30% by 2015 (NYSERDA 2012, p. 3).

The New York State Energy Plan contains a series of mandatory policy objectives that the Project will assist in achieving (New York State Energy Planning Board 2009, p. 1-2). Among these objectives is to increase the use of energy systems that enable the State to significantly reduce greenhouse gas emissions while stabilizing long-term energy costs, the key objective being to increase the percentage of non-fuel consuming ('renewable') sources of generation, and improving the State's energy independence through development of in-state energy supply resources. The State Energy Plan recognizes that wind energy projects will play a role in fulfilling this objective and thus reduce the impact on future cost increases in fossil fuel (either by way of regulation or future market price increases).

Based on the State Energy Plan, other public benefits of the Project related to energy use include the following:

- Production and use of in-state energy resources can increase the reliability and security of energy systems, reduce long-term energy costs (for the reasons referred directly above), and contribute to meeting climate change and environmental objectives.

- To the extent that renewable resources and natural gas are able to displace the use of higher carbon and particulate emitting fossil fuels, relying more heavily on these in-state resources will also reduce public health and environmental risks posed by all sectors that produce and use energy.
- By focusing energy investments on in-state opportunities, New York can reduce the amount of dollars “exported” out of the State to pay for energy resources.
- By re-directing those dollars back into the State economy, New York will increase the amount of business and economic activity related to power generation within the state. Renewable energy contributes to the reduction of energy price volatility in the long-term and enables wind to displace other fossil based forms of generation – particularly when there is an excess of generation capacity.

In June 2007, former Governor Spitzer and then Lieutenant Governor Paterson formed the NYS Renewable Energy Task Force to investigate the implementation of increased renewable energy sources in the State. The Task Force published a report in February of 2008 that is intended to serve as a policy "road map" to address the many challenges faced in reducing the dependence on fossil fuels, stimulating investment in clean energy alternatives, and moving toward a Clean Energy Economy in New York State. The authors of the report state that the primary benefits of renewable energy development will be three-fold: 1) economic growth opportunities throughout the state, 2) enhanced energy security and reduced volatility in energy prices, and 3) reduced greenhouse gas emissions. The report states that New York State has the most wind energy development potential in the Northeast and the mid-Atlantic region. This potential could allow the State to move toward an innovative, clean energy economy, which would put New York State at the forefront of the transition towards a more environmentally sustainable energy future (Renewable Energy Task Force 2008, p. 18).

In its 2012 annual RPS Report NYSERDA stated, “New York, through regulations adopted by the Public Service Commission (PSC or Commission), first enacted its RPS in 2004 with the goal of increasing the amount of renewable electricity used by consumers to 25% by 2013. Following a comprehensive mid-course review, and in an Order issued in January 2010, the Commission expanded the RPS target from 25% to 30% and extended the terminal year of the program from 2013 to 2015” (NYSERDA 2012, p. 3).

As part of the 2004 Order, the PSC designated NYSERDA as the central procurement administrator for the RPS Program. Unlike most states with an RPS, New York uses the corresponding central procurement model whereby NYSERDA administers or is otherwise responsible for the majority of the RPS programs goals. Specifically NYSERDA is responsible for obtaining the Main Tier (large utility scale resources – such as the being proposed by the Project) and Customer Sited Tier (CST) (smaller behind the meter resources – such as rooftop solar, etc.). Through December 31, 2011, NYSERDA has conducted seven competitive solicitations in pursuit of the Main Tier renewable energy procurement target. From these solicitations, NYSERDA currently has contracts with 56 large-scale projects. These projects will add approximately 1,841 MW of new renewable capacity to the state's energy mix. Through December 31, 2011 NYSERDA's progress at achieving the Main Tier and Customer Sited Tier targets are 48% and 39% respectively (NYSERDA 2012, p. 3).

Progress in the program through December 31, 2011 has yielded, and is expected to yield, significant economic benefits to New York State and its associated locales. Economic benefits accrue from the planning, development, construction, and operation of renewable energy facilities. Using data from 2009 mid-course program evaluation conducted by independent program contractors, NYSERDA estimates that direct economic benefits associated with all projects selected in the first seven Main Tier solicitations will approach $2.4 billion over the next twenty years. When the effects induced on the broader economy are considered, the total economic benefits are estimated at more than $4.9 billion.

According to NYSERDA (2012, p. 4), implementation of the RPS has been highly cost effective. Program highlights include:

- Progress towards the NYSERDA Main Tier and Customer Sited Tier 2015 combined target of 10.4 million MWh is approximately 47% while funding committed to date toward this progress is 39% of the total approved RPS budget.
- Total new renewable capacity supported by the Main Tier and Customer Sited Tier could reach nearly 1,968 MW by the end of 2013, of which 1,898 MW will be located in New York.
- Under the Main Tier component of the program, 1,456 MW of new renewable capacity from 46 projects is in operation; an additional 384 MW, from 10 projects, are currently under development and/or construction.

Further, Federal policy has recognized the need for increased supply of energy to the U.S., and for new renewable energy resources. The Project fulfills a need for the production and transmission of renewable energy, which would serve the public interest. The Project is consistent with Executive Order 13212 (dated May 18, 2001), which states, "The increased production and transmission of energy in a safe and environmentally sound manner is essential to the well-being of the American people. In general, it is the policy of this Administration that executive departments and agencies shall take appropriate actions, to the extent consistent with applicable law, to expedite projects that will increase the production, transmission, or conservation of energy."

In addition to partly satisfying goals set by the Executive Branch of New York State and Federal Policy, other benefits of the proposed action include:

- Local socioeconomic benefits:
  - Increased revenues to local municipalities,
  - Employment during the development phase, TCI has where feasible utilized locally based companies to undertake environmental field work, legal counsel, engineering assessments etc.
  - Short-term employment of construction workers, and long-term employment of operating workers (Ouderkirk & Pedden 2004, p. 10-11, 15).
  - Direct lease payments to participating landowners, who are participating in the Project on a voluntary basis.
  - "Direct economic effects" in the form of immediate payments to consultants, contractors, and the labor pool required to develop, build, and operate the Project (Ouderkirk & Pedden 2004, p. 9).
  - "Induced effects" in the form of everyday purchases made by the firms and employees working at the Project area (i.e., groceries, gas and supplies, hotel accommodations, patronization of various local establishments, etc.) (Ouderkirk & Pedden 2004, p. 9).

- Environmental benefits:
  - Within the New York electricity market, wind-generated electricity typically displaces the use of fossil fuels in conventional power plants, producing a reduction in the emission of key air pollutants; sulfur dioxide and nitrogen oxides (acid rain precursors); mercury; and carbon dioxide (tied to global climate change). NYSERDA found that if wind energy supplied 10% (3,300 MW) of the state's peak electricity demand, 65% of the energy it displaced would come from natural gas, 15% from coal, and 10% from electricity imports. This equates to an annual displacement of 6,400 tons of nitrogen oxides and 12,000 tons of sulfur dioxide (NYSERDA 2005, p. 31-32).
  - Energy efficiencies and renewable generation together will reduce New York's greenhouse gas emission, helping to achieve the State's CO_2 reduction goals (New York State Energy Planning Board 2009, p. 59).
  - The well-being of some ecosystems in the northeastern U.S., including New York State, is at serious risk as a result of the negative environmental externalities associated with fossil fuel based power plant emissions. Research conducted by scientists from the Hubbard Brook Research Foundation concluded that "hotspots" throughout the Northeastern U.S. have levels of mercury deposition "10 to 20 times higher than pre-industrial conditions, and 4 to 5 times higher than current EPA estimates". This research highlights "the connection between airborne mercury

emissions from United States sources and the existence of highly contaminated biological hotspots…Emission reductions from high emitting-sources near biological hotspots in the United States will yield beneficial improvements in both mercury deposition and mercury levels in fish and wildlife" (Driscoll et al. 2007, p. 3).

- Statewide economic benefits:
  - New York is the fourth largest energy consuming state (EIA, 2012b), and spends approximately $65 billion annually for energy, of which 53% ($35 billion) pays for energy imports (New York State Energy Planning Board 2009, p. 5). The State Energy Plan goals promote diversity of the State's economy through the use of alternative in-state energy sources, including renewable based energy (New York State Energy Planning Board 2009, p. 39).
  - An analysis undertaken for NYSERDA, by KEMA Inc. in 2009, concluded that approximately $6 billion in direct economic benefits are expected to accrue to New York from the Main Tier solicitations alone in the event of the 30% RPS target being achieved (NYSERDA 2012, p. 20)

- Human health benefits:
  - Airborne mercury, released primarily by coal-fired power plants, has contaminated numerous rivers, lakes, and streams across the State. While eating fish from State water bodies is not prohibited, the NYSDEC has issued advisories pertaining to fish consumption. Eighty-seven (87) of the 136 bodies of water with health advisories in New York State are listed in part or wholly because of mercury contamination. Pregnant women, women who may become pregnant, or children under the age of 15 are advised not to consume any fish, at any time, from any of the water bodies listed by the NYSDEC (NYSDOH, 2012).
  - Sulfur dioxide and nitrogen oxide emissions react with volatile organic compounds in the atmosphere (i.e., gasoline vapors or solvents) and produce compounds that can result in severe lung damage, asthma, and emphysema (Wooley, 2000).
  - Researchers at the Harvard School of Public Health estimated that air pollution from conventional energy sources across the U.S. kills between 50,000 and 70,000 Americans every year (Levy et al., 2000).
  - Research undertaken by the American Cancer Society, Harvard School of Public Health, and the Environmental Protection Agency shows that residents in every single state across the Nation were at risk of premature death from air pollution (Cooper & Sovacool 2007, p. 103).

As mentioned previously, the Renewable Energy Task Force report (2008) is intended to serve as a policy road map to address the many challenges we face in reducing our dependence on fossil fuels, stimulating investment in clean energy alternatives and a move toward a Clean Energy Economy in New York State. The authors of the report recognize the need for, and benefits of, a rapid transition toward the large-scale development of renewable energy sources such as the proposed Crown City Wind Energy Project.

As referred above, Implementation of the RPS has been highly cost effective. Progress towards the NYSERDA Main Tier and Customer Sited Tier 2015 combined target of 10.4 million MWh is approximately 47% while funding committed toward this progress is 39% of the total approved RPS budget (NYSERDA 2012, p. 4).

2.3 PROJECT COST AND FUNDING

Based on experience with other projects (both operational and in the advanced stages of development or currently in construction via partnerships that TCI has entered into with strategic partners), the Project Sponsor estimates that developing, permitting, and constructing the Project will total approximately $150 million, which will be provided by TCI and its future strategic partners. At the current time it is not envisioned that any of the capital purchases required for the Project will be mandated purchasers (i.e., those required by way of a government order of law). TCI has experience developing other wind power projects, including four projects in Quebec and Ontario totaling 325 MW which are all under long-term power purchase agreements with provincial utilities and either under advanced development or in construction.

TCI's business model has been to progress projects to a reasonably advanced stage of development, and then to partner with larger financially robust entities ('strategic partners') who construct, own, and operate the projects, with TCI being retained to assist in progressing projects through to construction. Such a business model does involve the transfer or sale of the Project to the future strategic partner. The Scoping Document asked for a description of 'legal rights to resell the Project quickly'. TCI did not purchase the Project (rather it was the entrepreneur behind the Project's realization over five years ago) and a thus a 'resell' is theoretically therefore not possible. Irrespective, the other interpretation on the Scoping Document enquiry could have meant what are the legal pre-conditions related to the sale of the Project by TCI. Given that all land agreements are fully assignable without the consent of the landowner, then TCI is entitled to sell the Project fore-with at any time. As discussed above, TCI's business model is to partner with a strategic partner and to continue to develop the Project in conjunction with the partner through to construction.

To date TCI has executed strategic partnerships with NextEra Energy Canada (2 projects totaling 185 MW, one in construction and one scheduled for 2013 construction), EDF EN (a 100 MW project – construction not yet slated), TransAlta (2 projects totaling 116 MW, one in construction, the other slated for 2013), and a group of native American investors (a 24 MW project slated for 2015 construction). With the exception of the partnership created with native Americans (which was in response to a specific opportunity afforded by Hydro Quebec to promote the viability of First Nation communities across Quebec) these entities are large and financially robust (i.e., investment credit rated), and have mandates to own and operate renewables projects on a long-term basis. This business model enables TCI to focus on identifying and developing projects to an advanced stage and enables strategic partners to access advanced projects that are approaching construction and thus represent a reduced risk as compared to 'green fielding' their own project opportunities. Please refer below for a brief overview of TCI's existing strategic partners on projects in Canada:

NextEra Energy Canada

NextEra Energy Canada is a wholly owned subsidiary of NextEra Energy Resources, which is part of NextEra Energy, Inc. (NYSE: NEE) a leading clean energy company with revenues of more than $15.3 billion, more than 41,000 megawatts of generating capacity, and approximately 15,000 employees in 24 states and Canada as of year-end 2011. Headquartered in Juno Beach, Florida, NextEra Energy's principal subsidiaries are Florida Power & Light Company, which serves approximately 4.6 million customer accounts in Florida and is one of the largest rate-regulated electric utilities in the country, and NextEra Energy Resources, LLC, which together with its affiliated entities is the largest generator in the United States of renewable energy from the wind and sun. Through its subsidiaries, NextEra Energy generates clean, emissions-free electricity from eight commercial nuclear power units in Florida, New Hampshire, Iowa, and Wisconsin. In September 2012, NextEra Energy, Inc. (NYSE:NEE) has been named to the 2012 Dow Jones Sustainability Index (DJSI) of the leading companies in North America for corporate sustainability. The Dow Jones Sustainability North America Index tracks the performance of the top 20 percent of the 600 largest Canadian and United States companies in the Dow Jones Global Total Stock Market Index based on long-term economic, environmental, and social criteria.

EDF EN Canada

EDF EN Canada is a wholly owned subsidiary of EDF Energies Nouvelles, a company operating in Europe and North America. EDF Energies Nouvelles is a market leader in green electricity production, with a portfolio of 4,200 MW of gross installed capacity. With development focused on wind and solar photovoltaic energy, the Company recently entered 3 new promising markets: Israel, Morocco and South Africa, and is expanding its business in offshore wind energy. The Company is also present in other segments of the renewable energy market: marine energy, biogas, biomass, and small hydro, as well as in distributed energies. EDF EN manages renewable energy projects' development, financing, construction as well as operation and maintenance for its own accord and for third parties. EDF Energies Nouvelles is a subsidiary of the EDF Group. The EDF Group is the leading electricity producer in Europe and its renewable energy arm.

TransAlta

TransAlta is a power generation and wholesale marketing company focused on creating long-term shareholder value. TransAlta maintains a low-to-moderate risk profile by operating a highly contracted portfolio of assets in Canada, the United States, and Australia. TransAlta's focus is to efficiently operate our geothermal, wind, hydro, natural gas, and coal facilities in order to provide our customers with a reliable, low-cost source of power. For 100 years, TransAlta has been a responsible operator and a proud contributor to the communities where we work and live. TransAlta is recognized for its leadership on sustainability by the Dow Jones Sustainability North America Index, the FTSE4Good Index, and the Jantzi Social Index. TransAlta is Canada's largest investor-owned renewable energy provider.

At the current time, TCI has not concluded a strategic partner arrangement for the Crown City Wind Energy Project. Current expectations are that TCI would conclude a partnership around the time of the Project gaining a REC contract. At that time, TCI would engage with the County, Towns, and local community to introduce the strategic partner. On all prior strategic partnerships that TCI has entered, TCI continues to be responsible for ongoing development activities through to around the start of construction. The nature of the partnerships typically involve TCI retaining a minority stake in the constructed projects or TCI exiting the projects (being bought out) as the projects achieve commercial operation.

In addition to the Project and those discussed above, TCI is currently developing other late stage wind energy projects in the US, Canada, and United Kingdom. Air Energy TCI (the Canadian subsidiary of TCI Renewables Ltd) is based in Montreal, Quebec, Canada, and has projects being developed throughout North America. The company has enjoyed considerable success in the Canadian market, since inception in 2006, originating and gaining power purchase agreements (PPAs) for 325 MW to date with Hydro Quebec and the Ontario Power Authority. These projects have been sold to TransAlta (116 MW) and the Mohawk Nation (24MW) (in Quebec) and NextEra Canada 185 MW (in Ontario), whereby Air Energy TCI retains development obligations through to the start of construction; such responsibilities include obtaining and managing outstanding environmental approvals, etc. In addition, Air Energy TCI has sold a further 100 MW project in Canada for which PPAs are pending, in Ontario. Air Energy TCI is currently developing projects in the United States in: New York, California, Colorado, Michigan, Ohio, Wyoming and Minnesota. Air Energy TCI's parent company, TCI Renewables, also has a proven track record of success in its

English and Northern Ireland markets, where the company owns a pipeline of approximately 98 MW of fully permitted, shovel ready projects.

A more detailed summary of TCI Renewables and Air Energy TCI's project pipeline is shown in Appendix V. It should be noted that Air Energy TCI is currently responsible for all development activities of the Crown City Wind Energy Project. As can be seen from the information contained below regarding the Project Sponsor's experience and capability, the company has had considerable success gaining power sales contracts in Canada for 5 projects, totaling approximately 325MW, since inception of operations in North America in 2006, with approximately a further 240 MW of PPA awards pending. Air Energy TCI Inc. is a wholly owned Canadian subsidiary of TCI Renewables Ltd, a company registered in England.

The Crown City Wind Energy Project will be funded as a commercial, for-profit enterprise with all development and capital cost to be provided by its Sponsor and future strategic partners, who will elect to finance this expenditure through commercial debt and/or other balance sheet resources. As referred above, TCI intends to pair with a suitably qualified and financially robust strategic partner who will then construct, own, and operate the Project on a long-term basis, generally through a wholly owned subsidiary that will be a standalone special purpose entity (an ownership structure that is typical for the independent power producing or unregulated utility industry). The electrical output from the Project will likely be sold in the New York Independent System Operator (NYISO) wholesale power market or to other power buyers under bilateral power purchase agreements; and the renewable energy credits (RECs) will likely be sold separately to NYSERDA, under the RPS program, or to other buyers of clean power.

In New York State, large scale wind energy projects are typically financed based on three key sources of income received as a result of generating wind derived electricity, revenues are only earned in the event that the Project generates electricity and the electricity is accepted on the transmission system by NYISO. These three revenue components are explained below in more detail:

- **Renewable Energy Credit (REC) Contract (NY & Alternative REC Markets):**
  The key element of financing any wind energy project in New York typically starts with securing a fixed price REC contract. It is possible that a project located in New York could explore additional markets for green credits by entering a REC contract with a utility, or trading entity, for the sale of the RECs arising from the Project to a market outside of New York (such as one in the New England ISO, and sell RECs pursuant to a Massachusetts or Connecticut RPS, which have a substantial demand over the next few years). However, this is not considered likely by TCI at the current time. Hence, the most likely scenario is that the Project would secure, by way of participation in a competitive request for proposals (RFP), a ten year fixed price

contract with NYSERDA to sell RECs and all other future environmental attributes that may arise during the term of such contract (such as carbon credits, etc.). As explained above, NYSERDA acts as the central procurement agency for the state to procure the RECs associated with the New York RPS targets. NYSERDA undertakes an annual competitive solicitation for RECs. Implementation of the RPS has been highly cost effective to date. Progress towards the combined NYSERDA Main and Customer Sited Tiers 2015 target of 10.4 million MWh is approximately 47% while funding committed toward this progress is 39% of the total approved RPS budget. The latest NYSERDA REC Solicitation #8 was issued in December 2012. Application packages were due to be submitted on January 28, 2013. The Project Sponsor did not bid the Project into REC Solicitation #8.

- **Production Tax Credit (PTC)**

  The PTC is a federal tax credit that provides for qualifying renewable facilities to access a tax credit currently valued at $22 for every MWh (equivalent to 2.2 cents per kWh) of renewable energy produced over the first ten years of operation. The PTC was created under the Energy Policy Act of 1992 at the value of $15 per MWh, which has since been adjusted annually for inflation. The PTC is enacted through tax legislation and hence is not an ongoing permanent mechanism. The PTC was renewed in January 2013 for one year and is currently set to expire December 31, 2013 and at the current time there is no guarantee that it will be renewed, extended or replaced. The definition of projects qualifying for the PTC has changed from achievement of commencement of operation by the PTC expiry date to commencement of construction by the PTC expiry date. For the purposes of the explanation of financing wind energy projects in New York it has been assumed that the PTC will continue. In the event that it is not, then the financing structure would be dependent another form of federal incentive being applicable or for the other two sources of revenue to be sufficient on their own to enable a project to be viable. It is important to note that the PTC is a tax credit, and therefore to monetize the credit, TCI would seek to partner with a strategic partner who is able to monetize the credit by offsetting it against a tax liability. In order for the PTC to accrue, the Project needs to generate electricity and the transmission grid needs to be able to receive the electricity.

- **Energy Sales**

  Normally the final component to concluding a financeable wind energy project structure in New York is execution of a mechanism to trade the electricity produced by the wind energy project. There are two key options for trading the energy from a wind energy project in New York.

  - **Wholesale Market:** The NYISO, established in 1999, administers the wholesale power market for New York State. Wholesale power is accessible only from the high-voltage system, at quantities larger than one megawatt. While the NYISO is not involved in the retail market for electricity, the companies that provide retail electricity (utilities and energy service companies, for example) procure power through the NYISO's wholesale electricity markets, which operate on both a day ahead and real time energy pricing based on locational marginal pricing (LMP). The pricing of the LMP relates to the eleven zones into which New York has been divided. The Project is located in the Central zone. In order for most wind energy projects to be viable, a financial instrument (known as an energy hedge) is required, whereby typically an energy trading company commits to purchase the energy from the wind project over a five to seven year period for a known price mechanism, and thus takes the risk of trading the energy on the day ahead New York wholesale market.

- **Bilateral Power Purchase Agreement:** A project may enter a bilateral agreement with a suitably financially robust intensive energy user, or collection of energy users, to sell the electricity for a pre-agreed price over a 10 to 20 year contract. The type of arrangement, often referred to as a 'power purchase agreement' (PPA), would thus take the place of the energy hedge referred above.

Accelerated Depreciation

In addition to the above referred production related revenues (i.e., paid upon generation of electricity), the Internal Revenue Services (IRS) has provided renewable energy projects, including wind energy projects, with a tax regime that seeks to make the resource more competitive, by way of being able to accelerate the depreciation of capital investments (which would then be used to offset a tax liability), when compared to conventional fossil fuel generation (which incidentally also receives considerable subsidies). Given that the vast majority of the cost of generating wind energy is incurred in upfront capital cost, and that there is no ongoing fuel source (other than the wind), mechanisms such as the Modified Accelerated Cost Recovery System (MACRS) have a more beneficial impact on the cost of wind energy when compared to the impact the same accelerated depreciation provisions have on fossil fuel generators (i.e., given that the primary cost for fossil fuel plants is ongoing fuel costs and not upfront capital investment). MACRS is the tax vehicle that the IRS selected as the main regime applicable for wind projects. It is important to note that MACRS in its current form has been in existence since the Tax Reform Act of 1986. Moreover, MACRS applies to other technologies and equipment besides those found in the wind industry. In fact, MACRS is applicable to virtually all fixed capital investments related to equipment or machinery. It has been the backbone for trillions of dollars in new US capital investment since its creation.

MACRS provides for accelerated depreciation of the majority of a wind energy project's costs on a 5 year basis (with the balance typically depreciated over 15 years). This ensures that wind projects are attractive to third party investors.

MACRS unquestionably plays a critical role in a wind project receiving external long term financing. Given the lack of a federal renewable energy policy, the U.S. regulatory structure does not have many tools to help incentivize wind energy. MACRS allows for large institutional investors such as banks and insurance companies to invest large amounts of capital to support the construction and ongoing operations of countless wind projects. However, on its own, MACRS is not an adequate mechanism for justifying the investment required to finance and construct a wind energy project.

In summary, the Project Sponsor expects that the Project will be financed using the following mechanisms:

Mechanism	Production Related*	Project Expected to Utilize the Mechanism?
Production Tax Credit (PTC)	**YES**	**Yes** – tax credit first 10 years of operation at 2.2 cents per kwh
Renewable Energy Credit (REC) Contract	**YES**	**Yes** – 10 year contract for a fixed price related to participation in a competitive NYSERDA REC request for proposals (RFP)
Energy Sales	**YES**	**Yes** – it is expected that the Project will have an energy hedge or bilateral sales agreement governing the sale of electricity
Modified Accelerated Cost Recovery System (MACRS), an IRS approved form of accelerated depreciation	**NO**	**Yes** – it is anticipated that the Project will utilize the MACRS accelerated depreciation mechanism in relation to the capital invested in the Project. The MACRS is not dependent upon electricity being generated, but is an insufficient mechanism to finance a wind energy project without the three Production Related* mechanisms referred above.
NYSERDA Grants	**N/A**	No – Replaced by the RPS REC procurements and hence no longer relevant.

*The Project is required to generate and export electricity to the grid in order the access the mechanism.

To be able to successfully finance a wind energy project, investors require at least three sources of production revenues be locked in, meaning revenues received as a result of the production and delivery to the transmission system of electricity, described above (please refer to Section 2.2 for an explanation of the NYISO electricity market). Upon achieving this milestone a project owner (e.g., TCI's future strategic partner) is able to secure external debt finance from a financial lending institution. Such lenders typically look for project owners to invest between 25 – 30% of the entire capital cost of a project as equity ('cash down payment'), thus providing sufficient financial protection to the debt provider. TCI's strategic partners on projects currently in construction in Canada, projects that TCI originated, have provided 100% of the required equity from their own financial resources (the associated projects are the 125 MW Summerhaven project in Ontario where TCI partnered with NextEra Energy Canada, and the 66 MW New Richmond project in Quebec where TCI partnered with TransAlta).

In addition to the strategic partner's due diligence related to its equity investment, the debt provider will undertake detailed technical and financial due diligence to ensure that a project's financial forecast is suitably robust. The key aspects of the due diligence would focus on the capital cost of constructing a project (which would typically require firm priced contracts to be in place for construction, turbine supply, warranties, etc.); the wind yield analysis performed by an independent suitably certified company; operating costs of the project; long-term liabilities of the project (e.g., decommissioning obligations), expert review of the detailed design; geotechnical survey; lease and other pertinent project agreements; review of all permitting materials and any conditions related thereto; etc. Once the lender has concluded all due diligence, a project achieves what is referred to as 'financial close'. Normally financial close would take place prior to start of construction, but in the event that a project is initially constructed with 'balance sheet' funds or 'construction finance,' then financial close would take place after construction. In any event, the project sponsor's equity would be required to be maintained at the 25 -30% level, thus providing adequate financial protection to the lender(s). The duration of lending agreements varies based on the specifics of the sponsor and the project.

The financial return for the project owner is the profit generated from the investment of the equity, after having paid out all construction and ongoing operating costs (lease payments, operations & maintenance, PILOT payments, debt costs, etc.). The Payment in lieu of tax (or PILOT) payments are made from the operating project to the local Industrial Development Agency (IDA), who then in turn allocate the payments among the relevant tax jurisdictions (i.e., towns, school districts, county) according to the existing standard tax rates. As part of the incentives typically offered by an IDA, a sales tax exemption may be requested which would reduce the cost of the Project for the purchase of materials and supplies for the Project. The mechanism related to the ability to enter a PILOT agreement are resulting from New York's wind/solar power property tax exemption statute as stated in Real Property Tax Law ("RPTL") § 487, which provides for improvements constructed as part of a solar, wind, or farm waste energy system are exempt from "general" real property tax for a term of 15 years. The exemption does not apply to special assessments or special ad valorem levies. The amount of the exemption is the full value of the improvement which, in the case of wind turbines, is usually the cost to construct the turbines as tempered by their market value. The law requires that a form be filed with the appropriate assessing jurisdiction upon completion of the project. To that end, currently projects must be completed by 2015, when the law's sunset provision takes effect. Taxing jurisdictions that have not opted out of the RPTL 487 exemption (i.e., jurisdictions in which these projects are tax-exempt) may require the project owner to make payments in lieu of real property taxes or PILOT payment up to the amount of "normal taxes" that would be due if the project were wholly taxable. An IDA PILOT cannot deviate from the IDA's Uniform Tax Exemption Policy (UTEP). The PILOT is discussed in further detail in section 3.9.2.2.3.

Given the above described pre-conditions, investment of equity into operating wind energy projects is considered a reasonably reliable and safe form of long-term investment, and once a project is operating, investors typically include utilities, pension funds, and similar entities.

2.4 GENERAL PROJECT LOCATION

The proposed Project is located on approximately 7,500 acres of land (either under lease or in negotiation pertaining thereto) in the Towns of Cortlandville, Homer, Solon, and Truxton, in Cortland County, New York (see Figure 1). The proposed location for wind turbines, access roads, 34.5 kV electrical collector lines, the O&M facility, meteorological tower, substation, the 115 kV transmission line and the Point of Interconnection station is located on 81 separate land parcels (owned by 51 landowners – see Section 2.3 for a description of lease agreements) in northeastern Cortlandville, southeastern Homer, northern Solon, and southwestern Truxton, centrally located in Cortland County. The Project is located approximately 1.4 miles northwest of the Hamlet of Solon, 1 mile north-northeast of the Village of McGraw, and 4 miles east of the City of Cortland (as measured to the nearest proposed turbine site). Specifically, the Project is located east of Interstate 81, bordered to the west-northwest by State Route 13, south by State Route 41, to the northeast by Cheningo Creek and to the east by the Solon-Taylor town line (see Figure 2).

The Project layout set forth in this DEIS has taken into account numerous constraints, which are depicted on Figure 17, including location of the County's planned emergency communication towers.

The Project area has a rural and low-density character, with forestland and agriculture as the dominant land uses. The Project area is mostly forested, with agricultural fields located along the valley roads and on nearby gentle rolling hills. Residential land use is minimal in the Project area, with single-family homes located along public roadways adjacent to the Project, including Heath Road, McGraw North Road, and Maybury Road (please see Section 3.13 for additional information on land use, including state forestland and other state resources in the vicinity of the Project).

To deliver power to the New York State power grid, the Project Sponsor must construct a 115 kV overhead electrical line to transmit power from the generating facility to an interconnection facility located adjacent to an existing 115 kV transmission line south of East River Road. The Transmission Route runs 0.5 mile north from the Projects proposed collection and transforming substation to the interconnection point, as depicted on Figure 3 and in Appendix A2. To allow local residents and the pubic to identify parcels as well as the locations of proposed Project components, Figure 3 provides an index sheet and nine (9) subsequent sheets prepared at a scale sufficient to facilitate a clear understanding of the Project. In addition, Figure 3 has been prepared using orthoimagery base mapping to depict (and allow for identification of) existing structures, infrastructure, etc., in relation to the Project.

The Project Sponsor will enter into an agreement with Participating landowners (the 51 landowners who have or would need to finally provide consent to Project components occupying portions of their land) in the form of a standard lease agreement (for the host of the wind towers) or easement (for hosting of access roads, electrical collection lines and related facilities), that provide for compensation during the Project's development, construction, and operation. These leases and easements will secure all the land rights necessary to develop, construct, and operate and maintain the wind turbine generators along with all ancillary facilities. These agreements include the following provisions:

- A term of 25 years with a 20 year extension (at the option of the Sponsor);
- Lessee access rights as necessary to develop, build and operate the wind project facilities;
- Quarterly rental payments for the landowner hosting wind turbine towers, and annual payments for easements (typically payable per linear foot of access road or power line);
- Standard indemnification provisions that protect the landowner from any damages related to the construction or operation of the Project facilities, increased property tax valuations etc.;
- A clean-up requirement of the lessee that obligates it to remove from the leased premises all refuse and other debris resulting from the development, construction or operation of the wind project facilities, and to maintain the cleanliness of these premises;
- A decommissioning requirement that obligates the lessee to remove all above-ground Project facilities at the end of the Project's useful life, and to return the leased property to its original condition, except for any facilities that are more than 36 inches below ground. In accordance with the NYS Department of Agriculture and Markets guidelines, buildings, structures, wind turbines, access roads and/or driveways and foundations, that are located on prime agricultural land must be removed to a depth of 42 inches below finished grade;
- The option and lease agreements each provide TCI an ability to assign the agreements to a third party in the event of a sale of the Project. Given that TCI's strategy is to align with a future strategic partner prior to the start of construction, it is envisioned that the option agreement would be assigned to the future strategic partner prior to execution of the lease agreement;
- And other commercial terms that are typical for long-term leases or easements in New York.

  A mechanism that sets out the Project Sponsor's obligations to liaise with gas leasing companies that may have rights to the land in question. Such liaison would entail allowing communal use of access roads and rights-of-way for infrastructure to be installed. Liaison would also allow the two industries to cooperate so that they may coexist within the Project area.

As previously indicated in Section 2.1, the Project includes 44 wind turbines, which will deliver up to 71 MW of electrical power to the New York state grid. The Project Sponsor does not have any plans for future phases beyond that which is described and evaluated in this DEIS.

2.5 PROJECT LAYOUT AND COMPONENTS

The Project consists of 44 wind turbine generators and associated facilities, with an installed generating capacity of approximately 71 MW (see Section 2.1) and a predicted capacity factor of approximately 35%, which would produce approximately 217,686 MWh/year (see Section 2.2). The siting criteria used to develop the Project layout are described in Section 2.5.1, and the proposed layout is depicted in Figure 3. Project components are described in Sections 2.5.2 through 2.5.7, and illustrated in Appendices A2, B, M1, and M2.

2.5.1 Project Siting Criteria

The primary goal of wind turbine siting and design is to maximize the capture of wind energy to assure economic viability, while providing a design that minimizes environmental impacts and meets all turbine vendor site suitability requirements and local law considerations. As such, this is an iterative process with the final Project array design reflecting a balance of these factors. The proposed location and spacing of the wind turbines and support facilities is initially based upon site develop-ability, landowner participation, wind resource assessment, environmental resource factors, and review of the site's zoning constraints. Factors considered during preliminary and final placement of turbines and other Project components include the following:

Wind Resource Assessment. Through the use of on-site meteorological data collected at two 60 meter (197 foot) monitoring towers, topographic and surface roughness data, wind flow modeling, and wind plant design software, the wind turbines are selected and sited to optimize exposure to wind from all directions, with emphasis on exposure to the prevailing wind direction in the Project area. Please refer to Section 2.2 and Appendix A1, Wind Power Density Map, for further information.

Sufficient Turbine Spacing. Siting turbines too close to one another can result in decreased electricity production and excessive turbine wear, due to the creation of wind turbulence between and among the turbines. Each operating wind turbine creates downwind turbulence in its wake. As the flow proceeds downwind, there is a spreading of the wake and recovery to free-stream wind conditions. The Project turbines will have a final placement with enough space between them to minimize wake losses and maximize the capture of wind energy.

Distance from Non-participating Land Parcels. The turbine locations will maintain a minimum setback of 738 feet, (1.5 x the total height of the turbine), from the property line of all adjacent parcels owned by Non-participating neighbors.

Distance from Residences. The turbine locations will maintain a minimum setback of at least 1,642 feet between the tower and the nearest occupied permanent residence (excepted by way of easement). The transforming substation is located at least 1,600 feet from the closest residence. The proposed 115 kV transmission line is located over 200 feet from the closest residence. The new proposed point of interconnection substation is located 500 feet from the closest residence and will be sited as close as possible to the proposed interconnection line in accordance with recommendations from National Grid, as detailed in the System Reliability Impact Study for the Project, which describes the POI substation as being sited within 200 feet of the POI. The POI will represent an upgrade to the existing transmission facilities by installation of a three-breaker ring bus station connecting to the 115kV Cortland-Fenner line #3. A diagram of the loop-tap and three-breaker ring bus station is included in Appendix A2. The additional communications systems required are described in Section 2.5.3.

Distance from Other Structures and Buildings. The turbine locations will maintain a minimum setback of approximately 500 feet between the tower and all structures or buildings other than year round residences (excepted by way of easement).

Distance from Roads. The turbine locations will also maintain a minimum setback of at least 738 feet from non-seasonal public roads. The proposed transforming substation is located 1,500 feet from the closest public road. The proposed transmission line is located approximately 500 feet from the closest road and the point of connection substation is located over 500 feet from the closest road.

Wetlands and Waterbodies. The O&M facility, temporary turbine construction staging area, substation, meteorological tower, and turbine foundations will not be located within delineated federal jurisdictional or state regulated freshwater wetlands. Placement of the electrical collection/transmission lines and access road in wetlands/streams will be avoided to the extent possible.

Distance from existing electrical transmission facilities. The turbine locations will maintain a minimum setback of at least 1,000 feet from existing electrical transmission facilities and 200 feet from existing electrical distribution line facilities. The transforming substation will maintain a setback of at least 500 feet from existing electrical transmission line facilities. The point of interconnection substation will be sited adjacent to the proposed interconnection line in accordance with recommendations from National Grid, as detailed in the Project System Reliability Impact Study, which assumes that the POI substation will be sited within 200 feet of the transmission line right-of-way. Should a crossing of any utility lines be required, they will be completed in consultation with Dig Safely NY, and the owner/operator of each utility line

Distance from underground cross-country gas pipelines. The turbine locations will maintain a minimum setback of 700 feet from known *underground cross-country gas pipelines.* The transforming substation will be sited a minimum distance of 200 feet from all known buried gas infrastructure and the Point of Interconnection substation will maintain a setback distance of 200 feet from known buried gas infrastructure. A Dig Safely NY consultation was completed in May 2009 to identify existing infrastructure. The only known buried gas infrastructure within the Project area consists two gas pipelines operated by Dominion Transmission Inc. Further discussion of gas wells may be referred to in Section 3.13.2. Should a crossing of any utility lines be required, they will be completed in consultation with Dig Safely NY, and the owner/operator of each utility line. For example, the crossing of the Dominion Transmission's gas pipeline will be completed in accordance with their document, "Guidelines for Construction Activities on Rights-of-Way and in the Vicinity of Dominion Transmission, Inc. (DTI), Pipelines" (Dominion 2009).

Electrical and Communications Systems Interference. Turbines will be sited outside of known microwave pathways or Fresnel zones to minimize the effect that they may have on local communications. It is not anticipated that the installation of the Project will have any impact on cellular telephone reception. For further information, please refer to Section 3.12. The Project is not anticipated to have any impacts on electrical systems other than the 115 kV Cortland-Fenner #3 line to which it will connect. All electrical distribution lines will be mapped and considered during detailed design and prior to Project construction; please see section 2.5.3 for further detail.

Cultural Resources. Project construction will be conducted in such a way that does not cause any effect to prehistoric or historic archeological resources, as recommended by the Project's Cultural Resources Specialist.

As indicated in Section 2.4 above, the Project area has a rural and low-density character, and residential land use is not extensive. The Project has been sited to avoid interaction with sensitive natural resources (e.g., wetlands, streams). More detailed discussion on the Project's relationship to these features and other resources, such as schools, parklands, and historic properties is provided in Section 3.0. The individual components of the Project layout are described individually in the following sections. Please see Figure 3 for a depiction of the Project layout, which as currently proposed includes 44 wind turbines and will deliver up to 71 MW of electrical power to the New York state grid.

2.5.2 Wind Turbines

The wind turbines currently anticipated to be used for this Project are manufactured by GE, model GE 1.6-100. Illustrations and additional information regarding these turbines is included in the manufacturer's brochure in Appendix A2. The appearance of the turbines is also illustrated in photo simulations in Figure 10, Appendix B, and

Appendix M2. This wind turbine was selected because it is a state of the art on-shore wind turbine, and because its performance and efficiency are suited to the wind resource/wind conditions on site, refer to Section 2.2 for further discussion on the efficiency of the proposed wind turbine. As previously described, because the Project is not currently scheduled to be built until 2015, market factors such as availability and cost could dictate use of an alternate turbine. However, any turbine ultimately selected will be similar in design, dimension and operating characteristics to the GE 1.6-100 machine.

Each wind turbine consists of three major components: the tower, the nacelle, and the rotor. The height of the tower, or "hub height" (height from the base of the tower to the center of the rotor hub on top of tower) will be approximately 100 meters (328 feet). The nacelle sits atop the tower, and the rotor hub is mounted on a drive shaft that is connected to the gearbox and generator contained within the nacelle. The rotor has a 100-meter (328-foot) diameter, and the total turbine height (i.e., height at the highest blade tip position) will be approximately 492 feet. Descriptions of each of the turbine components are provided below.

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

Nacelle: The main mechanical components of the wind turbine are housed in the nacelle. These components include the drive train, gearbox, and generator. The nacelle is housed by a steel reinforced fiberglass shell that protects internal machinery from the environment and dampens noise emissions. The housing is designed to allow for adequate ventilation to cool internal machinery, and is approximately 29 feet long, 12 feet tall, and 12 feet wide. The nacelle is externally equipped with an anemometer and a wind vane that measure wind speed and direction (this information is used by the turbine controller to turn the machine on and off, and to yaw it into correct position). Attached to the top of some of the nacelles will be a single, medium intensity aviation warning light, per specifications of the Federal Aviation Administration (FAA). These will be synchronized flashing red lights (L-864 or similar) and operated only at night. The nacelle is mounted on a sliding ring that allows it to rotate or "yaw" into the wind to maximize energy capture.

Rotor: A rotor assembly is mounted on the drive shaft, and is operated upwind of the tower. Each rotor consists of three fiberglass composite blades approximately 49 meters (160 feet) in length (total rotor diameter of 100 meters [328 feet]). The rotor attaches to the drive shaft at the front of the nacelle. Electric servo motors within the rotor hub vary the pitch of each blade according to wind conditions, which enable the turbine to operate efficiently at varying wind speeds. The wind turbines begin generating energy at wind speeds as low as 3.0 meters per second (m/s) (7 mph) and automatically shut down, and yaw out of the wind, at wind speeds above 25 m/s (56 mph). The maximum rotor speed is approximately 16 revolutions per minute (rpm).

2.5.3 Electrical System

The proposed Project is anticipated to have an electrical system that consists of the following parts: 1) a system of buried 34.5 kV shielded and insulated cables that will collect power from each wind turbine ("electrical gathering I or collector lines"), 2) a collection substation to step up the power from 34.5 kV to 115 kV, 3) an overhead 115 kV electrical line, and 4) a Point of Interconnection substation located adjacent to an existing 115 kV transmission line. Each of these components is described below and the location of such facilities mapped in Figure 3:

Buried Electrical Collection System: A transformer located near the base of the tower or in the interior of the nacelle will raise the voltage of electricity produced by the turbine generator from typically 690 volts up to the 34.5 kV voltage level of the collection system. From the transformer, three power cables along with the fiber optic communication cables will collect the electricity produced by wind turbine generators to be connected through underground circuits. The electrical collection system will total approximately 29.6 miles in length. Approximately 14.8 miles will be located collinear with Project access roads within turbine strings, and the remaining 14.8 miles will cross open country between turbine strings, mostly through agricultural fields and forest lands. Although underground cabling is the preferred option for the electrical collector system, overhead cables may be used where requested by landowners or where underground installation is prohibited or infeasible due to constraints such as rivers, streams or creek crossings, bedrock etc. Overhead cabling may also be used where the electrical collector system route follows or crosses a public or private road. It is anticipated that bedrock will be encountered during the excavation of underground collector system trenching. Appreciative of the requirements for achieving the minimum depths noted elsewhere in the DEIS (particularly in agricultural land), the Project Sponsor is therefore expecting that it will deploy a rock-wheel trenching machine to excavate the cable trenches to the required depth. Figure 3 illustrates the layout of the electrical collection system, including stream and public road crossings. Please refer to Section 2.6.7 for further information. See also Appendix B, which provides photographs and a drawing illustrating typical buried electrical system details, including installation and restoration.

Collection Substation: This is the terminus of the 34.5 kV collection system, which will likely consist of three to four incoming circuits, and will be located at the beginning of the 115 kV line. The collection substation transformer will increase the voltage of the buried collection system from 34.5 kV to 115 kV. The collection transforming substation will include 34.5 and 115 kV busses, a transformer, circuit breakers, towers, a control building, and related structures, and will be enclosed by chain link fencing. The collection substation will occupy approximately two acres, and be adjacent to the Operations and Maintenance Facility described in Section 2.5.7 below. Please refer to Appendix A2 for a drawing depicting the general arrangement of the equipment anticipated to be located in the transforming substation. The transforming substation has been selected based on being located away from existing residences and such that it will be well screened from adjacent public roads. The ground conditions at the proposed location are assumed to be consistent with those occurring generally across the Project, and hence the Project Sponsor has not yet undertaken detailed geotechnical investigations to determine the extent of work required to achieve adequate grounding protection. Please see Section 2.6.9 below for additional information on limitations related to constructability (soil suitability, bedrock limitations, etc.).

Overhead Transmission Line: As mentioned previously, the 115 kV transmission line runs 0.5 mile north from the collection substation to an interconnection point adjacent to the existing Cortland to Labrador 115 kV line owned by National Grid located to the South of East River Road. Structures associated with this overhead line are not anticipated to exceed a height of 85 feet, which is consistent with the height of the structures associated with the existing National Grid 115 kV line.

Interconnection Substation: The point of interconnection station ("POI station") will be located immediately adjacent to the existing 115 kV transmission line. Access will be from the East River Road, to the north, via upgrades to an existing farm lane. The dimensions of the fence line will be approximately 210 by 210 feet in size (approximately 1 acre) and will encompass electrical switches and related equipment necessary to tie into an existing circuit that comprises the National Grid 115 kV line (see Appendix B for illustrations of typical substations). The majority of the POI station will be owned and operated by National Grid. However, it is anticipated that the POI station will also house the command center of the Project's supervisory control and data acquisition (SCADA) system, which allows an operator to control critical functions and the overall performance of each turbine. The Project Sponsor will operate this portion of the POI station. The Project SCADA system will be integrated with the electric interconnection SCADA to ensure that the Project critical controls, alarms, and functions are properly co-ordinated for safe, secure and reliable operation. New communication equipment in the form of relays for high voltage transmission line protection will be installed at both the National Grid Cortland and Fenner substations to ensure adequate communication between these substations. Please see Section 2.6.9 below for additional information on limitations related to constructability (soil suitability, bedrock limitations) and upgrades to the existing National Grid 115 kV line that may be necessary to accommodate the Project.

Please refer to the grading plan in Appendix A2 for a depiction of the transforming substation: its layout, location, and grading. The grading plan shows that the transforming substation is located on private, arable land. Corn is currently grown on the proposed site. This site was chosen due to the relatively low changes in gradient; a location set back from the crest of the slope, situated mid-slope on a reasonably flat part of the natural ridge and in close proximity to the connection point on the existing National Grid 115kV transmission line. Soils at this location are anticipated to be moist to wet in their natural state; significant drying or wetting that would cause damage to structures due to significant volume changes is not anticipated (AE, 2012). In spite of the low propensity for structure damage from soil volume changes, the site will require cut and fill to level the site and to ensure that the substation and operations and maintenance building along with any compacted fill is founded on underlying bedrock, which is expected to be uncovered at a depth of less than 3 feet from the existing ground level. The grading plan shows the areas that will be cut and those that will be filled, and depicts the fence line of the substation compound and extent of cut and fill embankments. Post construction it is anticipated that the remaining field area will be used for corn production which will afford some seasonal screening of the substation. In addition to this vegetative screening, the site grading will further reduce the visual impact of the transforming substation. If deemed necessary, an area on the exterior of the site will be planted with additional screening vegetation. The access road to the transforming substation will follow the existing farm lane from Shippey Road to the field boundary to provide access to the substation location. As the existing farm lane is currently used for heavy machinery, it is not anticipated that slope and alignment will present additional construction issues for the upgrade of this road.

2.5.4 Access Roads

The total length of access road required to service all proposed wind turbine locations and substation is approximately 18.6 miles, some of which will be upgrades to existing farm lanes/logging roads. Based on site specific investigations and layout development, access roads to turbines 5, 11, 12, 13, 27, 32, 34, and 41 use existing farm lanes/roads, accounting for approximately 2.4 miles of the 18.6 miles of total proposed access roads. Figure 3 illustrates the proposed location of Project access roads, which are mostly in forested areas and agricultural fields. Temporary access roads will be gravel surfaced and typically are 34 feet wide to accommodate construction vehicles/component delivery. The surface of all access roads constructed through agricultural fields shall be level with the adjacent field surface. Crane travel will not be necessary on all Project access roads, but because crane travel is not planned until selection of the crane operator/contractor, a worse case assumption of 40-foot width for all roads has been assumed in quantifying the impacts, refer to Table 3. Following construction, roads will be restored for use as permanent access roads. The permanent roads will be gravel-surfaced and typically are 16 feet in width (however, for impact calculation purposes a maximum finished width of 20 feet is assumed). Please note that improvements to public roads (such as modifications to intersection geometry) are addressed in Section 3.8. See also Appendix B, which provides photographs and drawings illustrating typical access road details, including construction and restoration.

2.5.5 Wind Measurement Tower

Two 100-meter (328-foot) tall wind measurement towers ("meteorological tower") will be installed to collect wind data and support performance testing of the Project. The towers will be guyed galvanized tubular or lattice steel structure, and will be equipped with wind velocity and directional measuring instruments at three different elevations and temperature and humidity monitors near ground level. One permanent met tower will be located on a hilltop in the northern portion of the Project area on leased private land, and the other permanent met tower will be located on a hilltop in the eastern portion of the Project area on leased private land. Please refer to the Project layout map in Figure 3. The permanent meteorological towers will not be located in the exact same location as the temporary meteorological tower because turbines will be constructed in these locations. Photos 23 and 24 in Appendix B depict typical meteorological towers.

2.5.6 Staging Area

Construction of the Project will require the development of a temporary construction staging area, which will accommodate construction trailers, storage containers, large project components, and parking for construction workers. The staging area is anticipated to be up to 8 acres in size**,** and will be located on participating land immediately adjacent to State Route 41 in the Hamlet of Solon (see Figure 3). The staging area is a temporary feature associated with construction of the Project, and no additional permanent fencing or permanent lighting of the staging area is proposed.

2.5.7 Operations and Maintenance Facility

An operations and maintenance facility (O&M) and associated storage yard will be constructed initially to house a temporary construction site office, parking, operations personnel, equipment, and materials and provide staff parking. The O&M facility will be located at the transforming substation location within the maximum area of disturbance and is depicted in Appendix A2. The permanent operations and maintenance staff offices will be located in the permanent O&M building, which will be of single story pitched roof construction with brick elevation, the building will also contain toilet and shower facilities and small kitchen, break room and drying facilities. Staff will be on duty during normal business hours (eight hours a day, five days per week) with weekend shifts and extended hours as required. The O&M facility will also be used to store equipment as necessary, and is anticipated to be up to 3.5 acres in size and located within the substation compound. Impact calculations assume 3.5 acres of temporary impact and 2.5

acres of permanent impact. Please see Appendix B for illustrations and dimensions of typical O&M facilities. Please refer to Appendix A2 for a drawing of the general arrangement of the transforming substation containing the O&M building.

2.6 PROJECT CONSTRUCTION

Project construction will be guided by construction plans (drawing, details, and specifications) prepared by a licensed Professional Engineer (PE), and reviewed and approved by the Lead Agency or their designated representative. All construction activities will follow industry standard best management practices and be in accordance with the New York Standards and Specifications for Erosion and Sediment Controls ("The Blue Book"). The Project will also be constructed in accordance with the conditions of all issued permits and approvals, including the State Pollution Discharge Elimination System (SPDES) General Permit and associated SWPPP, state and federal wetland/stream permits, NYS Department of Agriculture and Markets (NYSA&M) agricultural protection guidelines and in accordance with FAA clearances and determinations. Compliance with the practices required by these plans, permits and guidelines will be the responsibility of the site construction manager, and will be documented by the Environmental Monitor throughout Project construction. Project construction is anticipated to occur in a single phase. Pending the receipt of all required permits, construction is currently scheduled to start in the spring/summer of 2015 and be completed by December 31 of that year. Construction activities are anticipated to employ up to 60 workers (see Section 3.9 for additional detail), and to proceed in the following general order: a) civil engineering work (e.g., site establishment, public road improvements, access roads construction, turbine foundation construction); b) electrical engineering work (e.g., installation of buried collector and overhead interconnect and construction of the interconnection facility); c) wind turbine installation; d) Project testing and commissioning; and e) restoration. Representative photographs and details of wind power Project construction activities are included in Appendix B.

Hazards that have the potential to occur during construction are foreseeable and are initially mitigated by the effective pre-qualification and selection of qualified and experienced construction contractors, the specification and use of suitable materials and components, effective and regular auditing, etc. Typical hazards 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. The risks associated with these types of incidents are well understood by competent contractors, and with proper safety precautions, such construction-related injuries can be prevented. Furthermore, because the Project is contained within remote parcels of privately-owned land, these safety concerns should not present risk to the general. See Section 3.10.2.1 for additional discussion of safeguards to be taken to protect local citizens from construction-related hazards.

During all aspects of Project construction, the contractor and/or construction manager will minimize fugitive dust and airborne debris to the maximum extent practical by implementing appropriate control measures. These measures may include (but are not limited to) the application of mulch, water, stone, or an approved polymer additive on any public roads, access roads, exposed soils, or stockpiled soils when dry and windy conditions exist. Other mechanisms to initiate dust control procedures include a determination from the Environmental Monitor that control measures shall be implemented, or a complaint by a landowner or local resident. A watering vehicle shall be available for use for the duration of Project activities, including restoration.

In addition, during all aspects of construction, any stockpiled soil and/or spoil material will only be temporary (i.e., spread and graded to match original contours following construction activities). Proper methods for segregating stockpiled and spoil material will be implemented, and excavated soil will be reused to the maximum extent possible on the site that it was excavated from, as a means to limit opportunities for proliferation of non-native flora and other invasive species. Appropriate sediment and erosion control measures (see Section 3.1 for additional information) will be implemented, which will ensure that temporarily stockpiled soil and/or spoil material will not result in significant sedimentation or turbidity to local surface waters.

With respect to construction-related impacts to sensitive environmental resources (i.e., streams and wetlands), please refer to Figure 7, which depicts all field delineated streams/wetlands in proximity to the propose Project, along with the anticipated limits of disturbance associated with each component of the Project. The construction of access roads is anticipated to result in both permanent (loss of wetland/surface water acreage) and temporary impacts to streams/wetlands. The development and use of temporary workspaces will result in only temporary impacts to wetlands/streams. The installation of above ground or buried 34.5 kV electrical collection lines will temporarily disturb streams and wetlands during construction as a result of clearing (brushhogging, or similar clearing method requiring no removal of rooted woody plants), and soil disturbance from the electrical 34.5 kV collector. Based on an analysis of the proposed Project layout and the delineated stream/wetland boundaries, approximately 9.5 acres of temporary wetland/stream disturbance are anticipated to occur due to Project construction. No impacts to State regulated freshwater wetlands are proposed. Please refer to Section 3.2.2 and Table 14 for additional information on stream and wetland impacts. Stabilization and restoration of temporary impacts to soils, wetlands and streams, ecological communities/habitat, etc. is addressed in detail in the Section 3.0, specifically: soils (Section 3.1.3); wetlands and streams (Section 3.2.3); and ecological communities/habitat (Section 3.3.3).

Mitigation measures to protect and restore any agricultural soils within the Project area will be undertaken during and after construction, and will include full restoration of temporarily disturbed agricultural land according to the *New York Department of Agriculture and Markets Guidelines for Agricultural Mitigation for Windpower Projects* (see NYSA&M

Guidelines in Appendix G). Topsoil from work areas (tower sites, parking areas, "open-cut" electric cable trenches, along access roads) shall be stockpiled separate from other excavated material (rock and/or subsoil). All topsoil will be stockpiled immediately adjacent to the area where stripped/removed and shall be used for restoration on that particular site. Topsoil stockpile areas shall be clearly designated in the field and on the on-site "working set" of construction drawings. The Environmental Monitor will develop an appropriate schedule for inspections to assure that the goals of the NYSA&M Guidelines are being met.

With respect to invasive species that may be encountered during construction, Project construction activities will result in disturbance to soils, vegetative communities, and other natural resources. A potential threat to certain sensitive resources (e.g., wetland and stream corridors) is the risk of introduction or spread of invasive vegetative species, either through the movement of topsoil, fill, gravel, construction equipment, or during restoration activities. Invasive species are non-native species that can cause harm to the natural ecology of an area, often by out-competing native species. The Crown City Wind Energy Project will strive to use best practice procedures to minimize the spread of invasive species within sensitive resources affected by construction activities on-site. The New York State Department of Environmental Conservation (NYSDEC) published an Interim List of Invasive Plant Species in New York State (*www.dec.ny.gov/docs/lands_forests_pdf/isplantlist.pdf)* that includes many plant species that are widely-recognized as invasive or potentially-invasive. The Project Sponsor intends to work with the appropriate regulatory agencies (e.g., NYSDEC) to develop methods to prevent the introduction and spread of target invasive species to new locations resulting from project activities within the limit of project disturbance associated with sensitive resources (e.g., wetland and stream corridors). It should be noted that as with most locations in Central New York, the Project area already contains numerous species listed as invasive. Based on site-specific surveys, the following invasive species (listed on the NYSDEC Interim List) were identified during the vegetation survey conducted for the Project: reed canary grass, Japanese knotweed, Canada thistle, garlic mustard, multiflora rose, Morrow honeysuckle, and black locust.

Controlling the introduction and spread of the target species will be achieved through the implementation of an Invasive Species Control Plan (ISCP), which is proposed to consist of four appropriate measures: 1) construction materials inspection; 2) target species treatment and removal; 3) construction equipment sanitation; and 4) restoration.

1. Construction Materials Inspection: Construction material such as seed mixes, mulch, topsoil, sand, gravel, crushed stone, and rock brought on the Project Site from an outside source shall be free of invasive plant material. In addition, during all aspects of construction, any stockpiled soil and/or spoil material will only be temporary (i.e., spread and graded to match original contours following construction activities). Proper methods for segregating stockpiled and spoil material will be implemented, and excavated soil will be

reused to the maximum extent possible on the site that it was excavated from, as a means to limit opportunities for proliferation of non-native flora and other invasive species. Appropriate sediment and erosion control measures (see Section 3.1 for additional information) will be implemented, which will ensure that temporarily stockpiled soil and/or spoil material will not result in significant sedimentation or turbidity to local surface waters.

2. Target Species Treatment and Removal: If unavoidable areas containing target invasive species are encountered within regulated wetlands/streams, then appropriate treatment and removal methods would be conducted. Therefore, hand removal of all plant materials including root mass, rhizomes, and stolons would be performed within the Project's area of disturbance, followed by proper disposal. Disposal methods of the removed plant material will be based upon density and quantity of invasive species encountered, and may include herbicide treatment, placement in an interim designated secure container, transport in a sealed container and proper offsite plant material disposal in a designated secure disposal container. Soil removal would adversely affect adjacent regulated areas by introducing disturbance and thereby promoting further spread of target invasive species, therefore, soil removal is not considered a preferred method of control. Any herbicide spot treatment will be applied by a Commercial Certified Pesticide Application in accordance with NYSDEC approved herbicide and treatment measures.
3. Construction Equipment Sanitation: The introduction of invasive exotic plant species will be controlled by assuring that all construction equipment is clean upon arrival on site, and that equipment utilized in areas with an abundance of exotic species (e.g., Phragmites or purple loosestrife) will be cleaned prior to moving to another site.
4. Restoration: Regulated wetland and stream areas that are temporarily impacted during construction will be stabilized and restored in accordance with the project specific Stormwater Pollution Prevention Plan. Following construction activities, temporarily disturbed areas will be seeded with a native seed mix to reestablish vegetative cover in these areas.

Monitoring of the control of invasive species for the Crown City Wind Energy Project is proposed to have two phases: 1) monitoring the implementation of the ISCP during construction and 2) monitoring the success of the ISCP for a period of time to coincide with the monitoring of other project restoration activities.

1. Construction Monitoring: During construction, workers will be educated about the Best Management Practices described above in controlling the spread of invasive species, and the Environmental Monitor will confirm that all required practices are being implemented during construction activities.
2. Post-Construction Monitoring: The change in invasive species coverage on-site from pre-construction to post-construction will be conducted by visual inspection of sensitive and/or regulated areas within the limit of disturbance during the growing season for a five year period following restoration, unless it is agreed in

writing with NYSDEC that a shorter monitoring period is acceptable. A report detailing the success of the ISCP will be included in an annual monitoring report. In the event that the ISCP goals are not met, then a revised control plan containing additional control actions for an extended monitoring term will be developed to ensure control of invasive species.

As indicated above, the Project Sponsor intends to work with the appropriate regulatory agencies (e.g., NYSDEC) to develop the final ISCP, and it is anticipated that this will become a condition of any discretionary approvals issued by the NYSDEC such as an Article 15 and/or Article 24 permit. The details of the ISCP proposed above for the Crown City project are consistent with ISCP's proposed (and ultimately approved by the NYSDEC) for recent wind power projects constructed in New York, such as the Hardscrabble Wind Power Project in Herkimer County (i.e., Natural Resource Permit Condition #14 [Invasive Species Management Plan] in the *Article 24, Section 401, Article 15 Permit Authorizations* issued by the NYSDEC to Atlantic Wind LLC on May 19, 2010).

Construction waste will be disposed of in accordance with applicable regulations, utilizing local solid waste disposal and recycling services. See Section 3.11 for additional information on solid waste disposal.

2.6.1 Pre-construction Activities

Before construction commences, a site survey will be performed to stake out the exact location of the wind turbines, access roads, electrical lines, and substation areas, this process will also include validation of GIS layers containing lot lines and other locational significant aspects of the Project design. Once the surveys are complete, a detailed geotechnical investigation will be performed to identify subsurface conditions and allow development of final wind turbine foundation and electrical design, and other facility components as necessary. The geotechnical investigation involves a drill rig obtaining borings to identify the subsurface soil and rock types, strength and chemical properties (such as establishing sulfate content etc.), and will also document the presence and depth of any groundwater encountered. Testing is also done to measure the soil's electrical properties to ensure proper grounding system design. . Geotechnical borings will be conducted at all turbine locations. A preliminary desktop geotechnical investigation has been completed and is presented in more detail in Section 3.1 of this DEIS.

Using all of the data gathered for the Project (including geotechnical information, environmental conditions, site topography, etc.), the Project Sponsor will develop a set of site-specific construction specifications for the various components of the Project. The design specifications will comply with construction standards established by various industry practice groups, and the Project engineering team will ensure that all aspects of the specifications, as well as the actual on-site construction, comply with all applicable federal, state, and local codes and good industry practice and required certification. The Project Sponsor and/or contractor will coordinate directly with the local code enforcement officers in order to assure that all aspects of Project specifications/inspections are properly communicated and understood.

To assure compliance with various environmental protection commitments and permit conditions, the Project Sponsor will provide funding for an independent, third party Environmental Monitor to oversee Project construction and restoration activities and to ensure compliance with all applicable environmental conditions. It is anticipated that the Environmental Monitor will be selected by, and report to, the Cortland County Legislature (or its appointed representative). This individual (or individuals) would typically have a degree in environmental science, or similar experience in environmental compliance or management, and completed NYSDEC erosion and sediment control training. Prior to the start of construction at any given site, an Environmental Monitor and the contractor will conduct a walk-over of areas to be affected, or potentially affected, by proposed construction activities. This pre-construction walk-over will focus on the previously identified sensitive resources to avoid (e.g., wetlands, archeological, or agricultural resources), as well as the limits of clearing, location of wetland and stream crossings, location of drainage features (e.g., culverts, ditches), location of underground utilities and tile lines, and layout of sedimentation and erosion control measures. Upon identification of these features, they will be marked in the field (by staking, flagging, fencing, etc.), specific construction procedures will be determined, and any modifications to construction methods or locations will be proposed before construction activities begin. During Project construction, the Environmental Monitor(s) will conduct inspections of all areas requiring environmental compliance, with an emphasis on those activities that are occurring within jurisdictional/sensitive areas, including cultural resource areas, wetland and stream crossings, and active agricultural lands. The Monitor(s) will keep a log of daily construction activities, and will issue periodic/regular (typically weekly) reporting and compliance audits. See Section 4.3 of this DEIS for additional information about the Environmental Compliance and Monitoring Program.

2.6.2 Staging Area Construction

The construction staging area will be developed by stripping and stockpiling the topsoil and grading and compacting the subsoil. Geotextile fabric and approximately 8 inches of gravel will then be installed to create a level working yard. To the extent suppliers qualify, building materials such as gravel will be sourced locally from various suppliers with operations within Cortland County and the surrounding area. Potential building material suppliers in the area of the Project are identified in Appendix R2, and include, but are not limited to: Homer Sand and Gravel; Suite-Kote Corporation; Cortland Ready-Mix Inc.; Cortlandville Sand and Gravel; RMS Gravel; and H.L. Robinson Sand and Gravel. Haulage of the building materials will be in accordance with local, State, and Federal regulations. Electric and communication lines will be brought in from existing distribution poles to allow connection with construction trailers. At the end of construction, utilities, gravel, and geotextile fabric will be removed and the site restored to its preconstruction condition. Removed gravel may be reused elsewhere at the Project site, returned to the quarry, or properly disposed of. Disposal of all materials will be in accordance with all local, state, and federal regulations.

2.6.3 Site Preparation for Construction

Project construction will be initiated by clearing woody vegetation from all tower sites, access roads, and electrical interconnect routes. Trees cleared from the work area will be cut into logs and stockpiled on the edge of the work area or removed from the defined work area, while limbs and brush will be chipped and spread in upland areas (safely away from water resources) on-site so as not to interfere with existing land use practices. Landowners will have the right to any materials, including trees, taken from their property during site preparation, and any trees not claimed by the landowner will be sold to a local forestry operation or timber mill. For the purposes of this DEIS, it is assumed that a radius of 150-200 feet will be cleared around each tower, a 100-foot wide corridor will be cleared (or forested vegetation trimmed) along access roads, and a 25-foot-wide corridor will be cleared along underground electric collection lines that are not adjacent to access roads.

2.6.4 Public Road Improvements

Based upon field visits to the Project area and travel along public roads, it is not anticipated that any significant public road widening activities will be necessary. Preliminary delivery routes associated with the delivery of turbine components have been defined, as discussed in detail in Section 3.8. Although the travel route to be used for hauling gravel and concrete has yet to be finalized, they are not anticipated to result in impacts beyond those which are defined for component delivery. Due to the number of truckloads anticipated for delivery of sand, gravel and concrete, a delivery route will be determined in consultation with the gravel and concrete delivery suppliers and County and Town Highway departments that will be in accordance with a site traffic management plan to minimize traffic congestion and ensure public safety at all times. The routing of construction traffic along local roads will be determined prior to construction, in consultation with the County and Town Highway departments and local police, in accordance with appropriate site traffic management procedures. Final haul routes will be determined in consultation with the turbine supplier and its transportation provider, along with the Towns of Cortlandville, Homer, Solon, and Truxton, Cortland County, and the NYSDOT.

Turn-outs at the intersection of Project access roads and certain town roads will be temporarily established, to allow an uninterrupted flow of construction activity. Public roadway intersections along the construction and delivery routes may also require spot radii improvements to accommodate the turning radius of over-length delivery vehicles, and surface treatment/reinforcement of some public roads may be necessary to support construction/delivery vehicles and equipment, Figure 12 shows an overview map of the intersections that may require upgrades. Included in Appendix B are photographs of typical turning radii improvements and surface treatments to public roads. In addition, a preliminary Delivery Route Analysis has been conducted (see DEIS Appendix R1), which provides a detailed analysis of the anticipated delivery routes and associated improvements.

Figure 13 shows the Autotrack™ analysis of the delivery routes and identifies potential improvement areas (as indicated below) for each of the width constraints along the proposed delivery routes. The final limit of improvements may be a combination of widening on the inside and the outside of the curve. Specifically, six intersections have been identified as potentially requiring further upgrades:

- Sheet 6 of Figure 13 shows that the north-east and south-east corners of the intersection of Warren Road and Town Line Road will need to be upgraded to allow delivery of turbine blades. The upgrades will be made on public road rights-of-way (ROW) and on private and public (County) land that is proposed to be participating in the Project.
- Sheet 10 of Figure 13 shows that the southern verge of State Route 41 and the north-east corner of the Lapp Hill Rd / SR41 intersection will need upgrades within the public road ROW to widen the road.
- Sheet 11 of Figure 13 shows that the southern verge of State Route 41 and the north-west corner of the Syrian Hill Rd / SR41 intersection will need upgrades within the public road ROW to widen the road.
- Sheet 12 of Figure 13 shows that the southern verge of State Route 41 and the north-east corner of the North Tower Rd / SR41 intersection will need upgrades within the public road ROW to widen the road. This upgrade will require relocation of a National Grid electricity pole.
- Sheet 13 of Figure 13 shows that the south-eastern side of the intersection of Maybury Rd and Bell Rd will need an upgrade to widen the road on private land which is participating in the Project.

The extent of the roadway segment improvements will be verified with the turbine supplier/contractor prior to Project construction, and coordinated with State, County, and local highway departments (at no expense to these departments) prior to the arrival of oversize/overweight vehicle on-site. Construction activities that will likely be required at the locations of road width and turning radii improvements are further described in Section 3.8.Any cut and fill required for road improvements will comply with the measures set forth in the Preliminary SWPPP (see Appendix F), and ultimately the final SWPPP developed during the engineering phase of Project design.

2.6.5 Access Road Construction

Wherever feasible, existing roads and farm drives will be upgraded for use as Project access roads in order to minimize impacts to both active agricultural areas and wetland/stream areas. Where an existing road or farm drive is unavailable or unsuitable, new gravel surfaced access roads will be constructed. Sand, gravel and other aggregates to be used during construction may be sourced within the immediate vicinity of the Project area (see Appendix R2). There are four known sand and gravel suppliers in the Cortland/Homer area. These are Homer Sand & Gravel; Suit-Kote Corporation; Cortland Ready-Mix and Cortland Sand & Gravel. There are many concrete contractors in the Cortland area including Cortland Ready-mix and Suit-Kote Corporation. Cortland Ready-mix has the capability to produce 1,000 cubic yards per day which would be considered adequate to serve the needs of the Project foundation construction schedule.

The surface of all access roads constructed through agricultural fields shall be level with the adjacent field surface. Road construction will involve topsoil stripping and grubbing of stumps, as necessary. Stripped topsoil will be stockpiled (and segregated from subsoil) along the road corridor for use in site restoration. Any grubbed stumps will be removed, chipped, or buried. Following removal of topsoil, subsoil will be graded, compacted, and surfaced with 8 to 12 inches of gravel or crushed stone. A geotextile fabric or grid will be installed beneath the road surface, if necessary, to provide additional support.

Culverts and waterbars shall be installed to maintain natural drainage patterns. Appropriately sized culverts (minimum 12 inch) will be placed in any wetland/stream crossings in accordance with state and federal permit requirements. The location of each stream and wetland crossing is illustrated in Figure 7; see Section 3.2.2 and Table 14 for additional information on stream and wetland impacts.

In other locations, culverts may also be used to assure that the roads do not impede cross drainage and to provide stormwater control; please refer to Appendix F (SWPPP) for typical examples of these measures. During detailed design, the exact locations of such measures will be determined and depicted on the Project sediment and erosion control drawing set. If access road construction or improvements require the installation of culverts, the Project Sponsor will provide drainage design and calculations to the County or relevant Town for review. Any ditches or other water conveyance structures shall be assessed prior to any disturbance to determine if they are part of a stream or wetland and subject to U.S. Army Corps of Engineers jurisdiction (see Section 3.2 for additional detail regarding stream and wetland resources). Where access roads are adjacent to, or cross, wetlands, streams or drainage ditches/swales, appropriate sediment and erosion control measures will be installed and maintained according to the Project-specific NYSDEC-approved Stormwater Pollution Prevention Plan (SWPPP) for the Project which is discussed in more detail in Section 3.1 of this DEIS.

During construction, access road installation and use could result in disturbance of a maximum width of 100 feet, with turning radii of 200 feet. In agricultural areas, topsoil will be stripped and wind-rowed (and segregated from subsoil) along the access road to prevent construction vehicles from driving over undisturbed soil and adjacent fields. Once construction is complete, temporarily disturbed areas will be restored (including removal of excess road material, de-compaction, and rock removal in agricultural areas) and returned to the approximate pre-construction contours. The typical finished access road will be 16 feet in width (accounting for road construction in agricultural land), with occasional wider pull-offs to accommodate passing vehicles, and earthen shoulders on either side to accommodate crane traffic. With respect to the removal and proper disposal of temporary road materials, it is anticipated that all gravel will be used on-site to cap/reinforce the immediately adjacent permanent access roads (which is consistent with the restoration practices at two recent wind power projects, as observed by **edr** while serving in the role of Environmental Monitor). Geotextile fabric removed from the base of temporary road surfaces will be disposed of in dumpsters located at the construction staging area (see Section 3.11.2.1 for additional detail). For purposes of impact calculation, a 20-foot road width is assumed, which accounts for the finished travel surface and sideslope grading. Typical access road details and recent construction photos are included in Appendix B.

The installation of Project access roads will impact a total of 217.1 acres of ecological communities, with 43.4 acres permanently impacted (i.e., converted to built facilities) and 173.7 acres temporarily impacted (i.e., restored following construction). More specifically, impacts will occur to 67.6 acres of agricultural land (13.5 acres permanent and 54.1 acres temporary); 106.2 acres of forest land (85 acres temporary and 21.2 acres permanent); 16.9 acres of successional old field (3.4 acres permanent and 13.5 acres temporary); 9.5 acres of successional shrubland (1.9 acres permanent and 7.6 acres temporary); and 16.9 acres of disturbed/developed land (3.4 acres permanent and 13.5 acres temporary). See Section 3.3.1.1.1 for a description of these ecological communities. See also Figure 8, which depicts vegetative communities within the Project area and the layout of the Project access roads. Any construction of new access roads across existing buried utility infrastructure will be completed in consultation with Dig Safely NY, and the owner/operator of each utilities facility. For example, any crossing of the Dominion Transmission's gas pipeline would be completed in accordance with their document "Guidelines for Construction Activities on Rights-of-Way and in the Vicinity of Dominion Transmission, Inc. (DTI), Pipelines" document (Dominion 2009).

2.6.6 Foundation Construction

Once the roads are complete for a particular group of turbine sites, turbine foundation construction will commence on that completed access road section. Foundation construction occurs in several stages including excavation, pouring of concrete mud mat, rebar and bolt cage assembly, outer form setting, casting and finishing of the concrete, removal of the forms, backfilling and compacting, and site restoration. Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of excavated areas required to install foundations.

Initial activity at each tower site will involve clearing and leveling within a 150 to 200-foot radius around each tower location (maximum area of disturbance of up to 2.9 acres). Proper methods for segregating stockpiled and spoil material shall be implemented, and excavated soil will be reused to the maximum extent possible on the site that it was excavated from, as a means to limit opportunities for proliferation of non-native flora and other invasive species. Following topsoil removal, tracked excavators will be used to excavate the foundation. If bedrock is encountered it is anticipated to be rippable, it will be excavated. Based on the desktop geotechnical report prepared by ATL Engineering, PC, along with local knowledge garnered from landowners and County Officials, it is anticipated that the rock will be rippable; should this not prove to be the case, it will be excavated by pneumatic jacking. Blasting will not be used to remove bedrock. During consultation with Mr. Don Chambers, Cortland County Superintendent of Highways (D. Chambers, pers. comm), and through desktop analysis of the underlying shale bedrock (AE 2012, p. 9), it has been determined that the Project Sponsor that the shale bedrock will be removed by using a hydraulic impact hammer and other excavation equipment. If necessary, dewatering of foundation excavations will involve pumping the water to a discharge point, which will include measures/devices to slow water velocities and trap any suspended sediment. Dewatering activities will not result in the direct discharge of water into any streams or wetlands.

Immediately prior to final turbine foundation design, a subsurface investigation will be performed at each proposed turbine location to determine the site specific subsurface conditions and allowable soil/rock bearing capacities. These subsurface investigations will include soil borings, rock corings, seismic testing, and additional laboratory testing that will be performed to further evaluate the subsurface soil, bedrock, and groundwater conditions (see Section 3.1.2.1 for more information). However, based on the results of the desktop geotechnical review, the foundation is anticipated to be a spread steel reinforced concrete type foundation. This foundation will be approximately 10 feet deep, approximately 50 to 60 feet in diameter, reinforced with pre-cut and bent reinforcement steel fixed on site and approximately 500 cubic yards (cy) of structural grade concrete. It is not anticipated that a project-specific concrete batch plant will be required, as the concrete necessary to support construction of the Project can be viably sourced from local concrete suppliers within the vicinity of the Project Area. The Project Sponsor wishes to minimize construction impacts to the Project area by eliminating the need for an on-site concrete batch plant. If a concrete batch plant was to be located on site, it would still need to be delivered to each turbine foundation location, thus concrete delivery truck trips would not be eliminated. Pending the qualification of the supplier, potential building material suppliers in the area of the Project are identified in Appendix R2 and include, but are not limited to: Homer Sand and Gravel; Suite-Kote Corporation; Cortland Ready-Mix Inc.; Cortlandville Sand and Gravel; RMS Gravel; and H.L. Robinson Sand and Gravel. Haulage of the concrete will be in accordance with local, State, and Federal regulations. As required by the Scoping Document adopted September 13, 2012, please refer to section

3.8.2 for a description of the number of truck trips generated by Project construction. In addition, refer to the preliminary delivery routes for turbine components, discussed in detail in Section 3.8. It is anticipated that the concrete delivery routes will be similar to the delivery routes for turbine components, but cannot be confirmed until supply contracts are awarded.

Once the foundation concrete is sufficiently cured, the excavation area around and over it is backfilled with the excavated on-site material providing for suitable foundation drainage. The top of the foundation is typically an 18-foot diameter pedestal that extends 6 to 8 inches above grade. The base of each tower will be surrounded by a 6-foot wide gravel skirt, and an area approximately 115 feet by 66 feet will remain as a permanent gravel crane pad. The foundation will be constructed with adequate cableways and ducts to facilitate connection of the 34.5kV underground collectors system, communications cabling and appropriate grounding conductors.

2.6.7 Electrical Collector System Installation

Direct burial methods through use of a cable plow, rock saw, rock wheel and/or trencher will be used during the installation of underground electrical collector system whenever possible. Direct burial will involve the installation of bundled cable (electrical and fiber optic bundles) directly into a “rip” in the ground created by the plow, saw blade or rock wheel. The rip disturbs an area approximately 24 inches wide with bundled cable installed to a minimum depth of i) 36 inches in most areas, or ii) and 48 inches in active agriculture and pasture lands, or as a minimum, entirely below the top surface of bedrock and at least 24 inches below the surface in all situations. Sidecast material will be replaced with a small excavator or small bulldozer. All areas will be returned to pre-construction grades. Installation of buried electrical lines would typically require a width of up to 25 feet of vegetation clearing. However, in areas where buried electrical lines are collinear with proposed access roads or public roads, no additional soil disturbance, beyond that anticipated for road construction, is anticipated. Buried electrical lines along public roads will be buried in the right-of-way (ROW) adjoining land that is under lease to the Project. For purposes of a worst-case scenario, impact calculations assume a 25-foot temporary disturbance for electrical gathering lines, but no permanent disturbance, as the cleared area along the buried electrical line will be allowed to regenerate naturally.

Based on prior experience of projects originated by the Project Sponsor and already constructed, a rock-wheel trenching set-up similar to the one indicated in the inserted photograph would be deployed. A rock-wheel would create a clean cut excavation and depending on final equipment selection may only require a one pass process for excavation and cable laying (see Appendix B for typical photographs/specifications). Buried cables would be surrounded in suitable specified thermal sand to ensure adequate thermal conduction of heat into the bedrock.

Photo 1: Cable Trenching Equipment

In addition to public road crossings (illustrated on Figure 3), the electrical collection will also cross existing utility lines in 23 places. Specifically, these crossings consist of 12 National Grid overhead distribution lines, four Dominion buried gas pipelines, one National Grid high voltage transmission corridor, and six Verizon buried lines. These crossings will be made in consultation with Dig Safely NY and the owner/operator of each utility line. For example, the crossing of the Dominion Transmission's gas pipeline will be completed in accordance with their document, "Guidelines for Construction Activities on Rights-of-Way and in the Vicinity of Dominion Transmission, Inc. (DTI), Pipelines" (Dominion 2009). In total, the installation of the electrical collection system will result in 88 acres of temporary impact to ecological communities, consisting of 28.2 acres of agricultural land, 40.9 acres of forest land, 8.6 acres of successional old field, 5.4 acres of successional shrubland, and 4.8 acres of disturbed/developed land. See Section 3.3.1.1.1 for a description of these ecological communities. See also Figure 8, which depicts vegetative communities within the Project area and the layout of the electrical collection system.

Electric interconnect cables and transmission lines installed above ground can create long term interference with agricultural land use. As a result, interconnect cables shall be buried in agricultural fields wherever practicable. Interconnect cables and transmission lines installed above ground should be located outside field boundaries wherever possible. When above ground cables and transmission lines must cross farmland, the Project Sponsor will minimize agricultural impacts by using taller structures that provide longer spanning distances, and will locate poles on field edges to the greatest extent practicable. In cropland, hay fields, and improved pasture, underground collection cables will be buried at a minimum depth of forty-eight inches. In unimproved grazing areas and land permanently devoted to pasture, cables will be buried at a minimum depth of thirty-six inches. In areas where the depth of soil over bedrock ranges from zero to forty-eight inches, the electric cables shall be buried entirely below the top of the bedrock, or at the depth specified for the particular land use, whichever is less. At no time will the depth of cover be less than twenty-four inches below the soil surface; as described above, in the event of shallow bedrock, the electrical collector cable would be entirely located below the top surface of the bedrock and at a minimum of 24 inches below ground level.

The installation of above ground or buried electrical collection will temporarily disturb streams and wetlands during construction as a result of clearing (brushhogging, or similar clearing method requiring no removal of rooted woody plants), and soil disturbance from burial of the electrical 34.5 kV collector lines or from pole installation (if above ground electrical 34.5 kV collector lines are required). The location of each stream and wetland crossing is illustrated in Figure 7 and listed in Table 14; see Section 3.2.2 for additional information on stream and wetland impacts. Indirect impacts to wetlands and surface waters may result from sedimentation and erosion caused by construction activities (e.g., removal of vegetation and soil disturbance). This indirect impact may occur at wetlands adjacent to work areas where no direct wetland impacts are anticipated. Where crossings of surface waters and wetlands are required, the Project Sponsor will employ 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 (see Section 3.2.3 for additional detail).

2.6.8 Wind Turbine Assembly, Erection and Commissioning

Beyond the tower, nacelle, and rotor blades, other smaller wind turbine components include hubs, nose cones, cabling, control panels and internal facilities such as lighting, ladders, etc. All turbine components will be delivered to the Project area on flatbed transport trucks, and the main components will be off-loaded at the individual turbine sites. An illustration of the turbine workspaces is included in Appendix A2. Turbine erection is performed in multiple stages including setting of the bus cabinet and ground control panels on the foundation, erection of the tower, erection of the nacelle, assembly and erection of the rotor, connection and termination of the internal cables and grounding system, and inspection and testing of the electrical system prior to energization.

Turbine assembly and erection involves mainly the use of large track mounted cranes, smaller rough terrain cranes, boom trucks, and rough terrain fork-lifts for loading and off-loading materials. The tower sections, rotor components, and nacelle for each turbine will be delivered to each site by flatbed trucks and unloaded by crane. A large erection crane will set the tower segments on the foundation, place the nacelle on top of the tower, and following ground assembly, place the rotor onto the nacelle (see photos in Appendix B). The erection crane(s) will move from one tower to another along the designated Project access roads.

Turbine commissioning will occur once the wind turbines and substation are fully installed and the NYISO is ready to accept transport of power to the New York grid. The commissioning activities will consist of testing and inspection of electrical, mechanical, and communications systems. This activity can be summarized as follows:

- Equipment Required: Support trucks, which will be driven to the construction site.
- Materials brought on site: Gearbox oil, lubricating grease, two temporary portable generators. The only chemicals required for this phase are oils, gasoline, and grease used to operate construction equipment and portable generators, gearbox oil, and lubricants. Fuel-handling will be conducted in compliance with the required mitigation measures and the Project-specific NYSDEC approved SWPPP.
- Timing: This will preferentially be completed in late spring or summer to take advantage of typically drier weather. If necessary, this activity can be completed in the spring or fall or winter depending on weather conditions.
- Material generated: Some packing material waste will be generated. The recyclable material will be separated from the non-recyclable material on site. Both streams of waste will be removed by a licensed sub-contractor.

2.6.9 Point of Interconnection Substation and Transforming

From a siting perspective, based on review of the USDA soil types and topography of the area, slopes within the Point of Interconnection substation and Transforming substation areas are approximately 10-15%, which does not present concern at this time due to the relatively shallow nature and low-landslide incidence within the Project area (see Appendix E1). The specific depth to bedrock is not known at this time; however, based on the Surficial Geologic Map of NY, Finger Lakes Sheet, bedrock in the northern portion of the Project area, where both substations are proposed to be located, is anticipated to be within 1 to 3 meters (3 to 10 feet) of the surface and may sporadically crop out. A perched water condition should be anticipated at both the Point of Interconnection and Transforming substation locations. Typically, these structures do not contain basements so permanent drainage systems would not be required. If the foundations are constructed within the depth of the perched water table, temporary construction dewatering will be required and the foundations could be designed to resist hydrostatic forces, if required. The bedrock and groundwater depths with respect to the foundation systems, as well as any need for permanent drainage would be evaluated and addressed once soil borings are performed and more information regarding the structures is established. However, based on desktop review of information available at these locations, all likely bedrock/water table conditions can be addressed and mitigated through relatively common engineering and construction techniques (B. Barnes, pers. comm.).

The Point of Interconnection substation and Transforming substation construction will begin with clearing the site and stockpiling topsoil for later use in site restoration. Proper methods for segregating stockpiled and spoil material shall be implemented, and excavated soil will be reused to the maximum extent possible on the site that it was excavated from, as a means to limit opportunities for proliferation of non-native flora and other invasive species. The site will be graded, and a laydown area for construction trailers, equipment, materials, and parking will be prepared. Concrete foundations for major equipment and structural supports will be poured, followed by the installation of various conduits, cable trenches, and grounding grid conductors. Foundations will be constructed on the shale bedrock that is expected to be encountered at a depth of 3 feet. Above-ground construction will involve the installation of structural steel, bus conductors and insulators, switches, circuit breakers, transformers, control buildings, etc. The final steps involve laying down crushed stone across the station, erecting the chain link fence, connecting the high voltage links, and testing the control systems. Restoration of the area immediately adjacent to the interconnection substation will then be completed. Please refer to Appendix A2 for a depiction of the POI and transforming substation grading plans.

With respect to upgrades to the existing transmission facility, subsequent to an Interconnection Request filed with NYISO in 2008, a Feasibility Study and full System Reliability Impact Study (SRIS) were performed to assess the feasibility of connection of the Project to the National Grid transmission system based on the Project having a firm (i.e., 24/7) right to transmit up to 90 MW of generation capacity. All studies must comply with the requirements of the National Energy Reliability Council (NERC). The Project Sponsor's proposed point of interconnection (POI) is to the 115kV Cortland to Fenner Line #3 owned by National Grid, adjacent to East River Road. As part of the Project SRIS performed on behalf of the NYISO and funded by the Project Sponsor, National Grid provided a description of the facilities required for 1) interconnection of the Project including the scope and cost estimates of the interconnection substation at the POI, and 2) other remote System Upgrade Facilities (SUF) required to allow the Project to be capable of exporting energy across the New York grid. The remote upgrades are not substantial and are limited to switchgear amendments at both Cortland and Fenner substations. The upgrades include resetting of the circuit breakers and installation of a communications device related to the trip protocol to be complied with in the event of a contingency occurring (such as loss of a substantial part of either the Cortland or Fenner distribution circuit in the event of a storm occurrence). The conclusions of the SRIS stated further that other than these upgrades the Project would not degrade the New York bulk power transmission stability.

2.6.10 Operations and Maintenance Facility Construction

The approximately 3.5-acre area (assuming the worst-case footprint analysis) will be cleared and graded in preparation for construction. Best practice methods for segregating stockpiled and spoil material shall be implemented, and excavated soil will be reused to the maximum extent feasible on the site that it was excavated from, as a means to limit opportunities for proliferation of non-native flora and other invasive species. Following construction of the building and parking areas, which will be in accordance with best practice procedures, (which will occupy approximately 2.5 acres), approximately 1 acre will be restored, including regrading and seeding.

2.6.11 Project Construction Summary

As a summary, Project components and their construction will result in disturbance to soil and vegetation and result in land displacement or conversion. Conservative assumptions associated with the Project's limits of disturbance, used for the purposes of the SEQRA evaluation, are outlined in Table 3.

Table 3. Impact Assumptions

Project Components	Typical Area of Vegetation Clearing	Area of Total Soil Disturbance (temporary and permanent)	Area of Permanent Soil Disturbance
Wind Turbines and Workspaces	Up to 200' radius per turbine	Up to 200' radius per turbine	0.20 acres per turbine (pedestal plus crane pad)
Access Roads	100' wide per linear foot of road	40' wide per linear foot of road	20' wide per linear foot of road
Buried Electrical Gathering Lines	25' wide per linear foot of line	25' wide per linear foot of line	None
Transmission Line	100' wide per linear foot of line	100' wide per linear foot of line	None, other than pole bases
Meteorological Towers	1 acre per tower	1 acre per tower	0.10 acre per tower
O&M Building and associated site (4,000 – 6, 000 sf)	3.5 acres	3.5 acres	2.5 acres
Staging Area	8 acres (if required)	8 acres (if required)	None
Collection Station	2 acres	2 acres	2 acres
Substation	1 acres	1 acres	1 acres

Resource-specific disturbances are calculated based on the impact assumptions presented in Table 3, and are presented in detail in Section 3.0 of the DEIS. A summary of Project disturbance by component is presented below in Table 4 (please note that a maximum of four permanent meteorological towers are assumed from a worst-case impact perspective; however, it is anticipated that only two permanent meteorological towers will be erected).

Table 4. Project Disturbance.

Project Components	Number/Linear Distance of Component	Area of Maximum Disturbance (Temporary and Permanent)	Area of Permanent Disturbance
Wind Turbines and Workspaces	44	126.6 acres	8.8 acres
Access Roads	18.6 miles	217.1 acres	43.4 acres
Buried Electrical Gathering Lines	29.6 miles	88 acres	None
Transmission Line	0.5 mile	6.5 acres	None, other than pole bases
Meteorological Towers	4	4.0 acres	0.4 acre
Staging Area	1	8 acres	None
Collection Station	1	2.0 acres	2.0 acres
Substation	1	1.0 acre	1.0 acre
TOTAL		**453 acres**	**55.5 acres**

The following summarizes the anticipated conversion from existing land use (see Figure 15) (as defined by the New York State Office of Real Property Tax Services [NYSORPTS, 2012b]) to built features of the Project:

- Of the 8.8 acres of permanent footprint occupied by wind turbines, 4.4 acres are classified as agricultural, 1.4 acres are classified as residential, 0.4 acre is classified as vacant, 2.0 acres are classified as wild, forested, conservation lands and public parks, and 0.6 acre is classified as public services.

- Of the 43.4 acres of permanent footprint occupied by access roads, 20.5 acres are classified as agricultural, 6.1 acres are classified as residential, 2.2 acres are classified as vacant, 9.9 acres are classified as wild, forested, conservation lands and public parks, and 4.7 acres are classified as public services.
- Of the 0.4 acre of permanent footprint occupied by meteorological towers, 0.1 acre are classified as agricultural, 0.2 acre are classified as residential, and 0.1 acre are classified as public services.
- The 2.0 acres of permanent footprint occupied by the collection station are classified as agricultural.
- The 1.0 acre of permanent footprint occupied by the substation is classified as agricultural.

The Scoping Document adopted on September 13, 2012 requires the DEIS to describe, as part of the decommissioning plan, any hazardous or significant byproducts associated with wind turbines, such as neodymium magnets. Note that this requirement is addressed in Section 2.8, Decommissioning.

The Scoping Document adopted on September 13, 2012 also requires a description of the number of truck trips generated by Project construction. Please refer to section 3.8.2 for detail.

2.7 OPERATIONS AND MAINTENANCE

Operation and maintenance of the Project will follow industry standard best management practices, as described below. The Project will require full time (during normal working hours) technical and administrative staff to maintain and operate the facility. The primary workers will be approximately five wind technicians (i.e., technicians who carry out maintenance on the turbines), along with a site supervisor.

The wind turbines will be operating (i.e., in "Run" mode and generating electricity) when the wind speed is within the operating range (the operating wind speed range for the turbine the GE1.6 – 100 is 3 m/s – 25 m/s [approximately 7 – 56 mph]) and there are no component malfunctions or NYISO grid constraints. Each turbine has a comprehensive control system that monitors the subsystems within the turbine and the local wind conditions to determine whether the conditions are suitable for operation. If an event occurs which is considered to be outside the normal operating range of the turbine (such as low hydraulic pressures, unusual vibrations, or high generator temperatures), the wind turbine will immediately and automatically shut down and report the condition to the operations center. A communication line connects each turbine to the operations center, which closely monitors and, as required, controls the operation of each turbine. The wind turbine system will be integrated with the electric interconnection Supervisory Control and Data Acquisition (SCADA) to ensure that the Project critical controls, alarms, and functions are properly co-ordinated for safe, secure and reliable operation. In response to the Scoping Document adopted

September 13, 2012, credible evidence demonstrating that the Project Sponsor's estimates of potential power are reliable is addressed in Section 2.2 and Appendix A1.

The turbines are equipped with two fully independent braking systems that allow the rotor to be brought to a halt under all foreseeable conditions. The system consists of aerodynamic braking by the rotor blades ('pitching') and by a separate hydraulic-disc brake system. Each wind turbine has a computer to control critical functions, monitor wind conditions, and report data back to the SCADA system.

Operations and maintenance staff offices will be located in the O&M building, and staff will be on duty during normal business hours (eight hours a day, five days per week) with weekend shifts and extended hours as required. In the event of turbine or facility outages, the SCADA system (anticipated to be located in the interconnection substation) will send alarm messages to on-call technicians to notify them of the outage. The Project will always have an on-call local technician who can respond quickly in the event of any emergency. The wind turbines selected for the Project have been chosen in part for their high functional reliability. Each wind turbine manufacturer studies and reports on the frequency of operation problems and malfunctions that arise when the turbines are generating electricity. Data on the turbines' reliability is summarized by the manufacturer in the turbine's availability rating, which estimates the percentage of time that the turbine will function.

The Project Sponsor is responsible for the operation, inspection, and maintenance requirements of all Project components/improvements, both on-site and off-site. The Project Sponsor may subcontract this responsibility to GE and if so the turbines will be monitored from GE's global wind energy center of operations and maintenance located in Schenectady, NY. The center is manned 24 hours a day 365 days per year.

Scheduled Maintenance

Wind turbine routine preventative maintenance activities are scheduled at six month intervals with specific maintenance tasks scheduled for each interval. Maintenance is done by removing the turbine from service and having two to three wind technicians climb the tower to spend a full day carrying out maintenance activities.

Consumables such as various greases used to keep the mechanical components operating and oil filters for gearboxes and hydraulic systems are used for routine maintenance tasks. Following all maintenance work on the turbine, the area is cleaned up. All surplus lubricants and grease-soaked rags are removed and disposed of as required by applicable regulations. All maintenance activities will adhere to the same spill prevention industry best practices undertaken during the construction phase.

In response to the Scoping Document approved September 13, 2012, all costs including potential damage caused by hydraulic spills or other accidents resulting from Project maintenance activities will be adequately covered by the Project insurance. The Projects Sponsor will maintain certain insurances such as general commercial liability insurance, workers compensation, and other statutory coverages throughout the lifetime of the Project. The Project Sponsor shall maintain comprehensive general liability insurance in an amount of not less than Ten Million Dollars ($10,000,000.00) with a licensed insurance company authorized to carry on business in New York State throughout the lifetime of the Project.

Unscheduled Maintenance

Modern wind turbines are very reliable and the major components are designed to operate for up to 30 years. However, wind turbines are large and complex electromechanical devices with rotating equipment and many components. As a result, at times, turbines will require repair, most often for small components such as switches, fans, or sensors; typically, such repairs will take the turbine out of service for a short period of time until the component is replaced. These repairs can usually be carried out by a single technician visiting the turbine for several hours.

Events involving the replacement of a major component such as a gearbox or rotor are not typical. If they do occur, the use of large equipment, sometimes as large as that used to install the turbines, may be required.

It is possible that an access road, built for construction and returned to farmland when the construction phase is completed, would need to be rebuilt to carry out repairs to a damaged turbine. Typically only a small percentage of turbines would need to be accessed with large equipment during their operating life.

Electrical System Maintenance

The collector lines and substation will require periodic preventative maintenance activities. Routine maintenance will include condition assessment for above-ground infrastructure and protective relay maintenance of the substation in addition to monitoring of the secondary containment system for traces of oil. Finally, vegetation control will be required around the transmission line to prevent any damage to the line and ensure safe operation.

Waste Management

Waste generated during the operations phase will be removed from the operations and maintenance building by a licensed operator and disposed of at an approved facility. Any lubricants or oils resulting from turbine maintenance will be drummed on site and disposed of in accordance with applicable state regulations. All reasonable efforts will be made to minimize waste generated and to recycle materials including returning packaging material to suppliers for reuse/recycling. The spill prevention protocols followed during construction will continue to be observed throughout the Project's operations and maintenance activities.

Environmental Management

All repair activities will be in accordance with all applicable federal, state, and local permits and associated conditions/requirements. To the extent practicable, all repairs will be facilitated through use of existing Project-related infrastructure (e.g., permanent gravel access roads, crane pads, etc.). If existing infrastructure is not adequate to accommodate certain repairs, any additional infrastructure improvements will be conducted in accordance with the applicable regulations (e.g., widening of an access road within or adjacent to a wetland will be conducted in accordance with Section 401 and 404 of the Clean Water Act, and Article 24 of the Environmental Conservation Law, as applicable). Please see Section 2.7 for a discussion of environmental considerations during decommissioning activities.

The Scoping Document adopted on September 13, 2012 requires the DEIS to provide information on the anticipated annual rate of power generation. Total net electricity delivered to the existing New York power grid is expected to be approximately 217,686 MWh/year, or enough electricity to meet the average annual consumption of approximately 29,820 average NYS households.

The predicted energy yield has been calculated by the Project Sponsor's independent wind yield consultant GL GH, the leading specialist consultant in wind yield prediction, who has undertaken the following process to determine the wind yield analysis:

- Quality control of recorded on site wind data to remove erroneous data (related to anemometer freezing, etc.).
- Recorded data was then long-term correlated (to compare with long-term weather patterns in the area) and synthesized with 14.7 years of long-term weather data at Binghamton Automated Surface Observing Station (ASOS). Analysis of the comparison to the measured data set as compared to Binghamton ASOS confirmed that the onsite measured data set was representative of the long-term weather patterns in the area.
- The boundary layer power law shear exponents were derived at all met tower locations and the concurrent wind speed data recorded at the three elevations on each met mast were used to derive the long-term mean vertical power law shear exponent at each of the three met mast locations (i.e., the vertical increase in wind speed).

- The vertical power law shear exponent was then used to extrapolate the calculated and long-term correlated wind speed at each met tower location to predict the wind speed at the proposed wind turbine hub height of 96 meters (315 feet) at each met tower location.
- The variation in wind speed over the Project area was then predicted using the Wind Atlas Analysis and Application Program (WAsP) computational flow model initiated from the three onsite meteorological masts erected in the Project area. WAsP enables the analysis of wind measurement time series and generates a statistical report on the observed site specific wind climate.
- The predicted wind energy yield was then calculated based on inputting the performance characteristics (power curve and thrust curve) of the proposed wind turbine (GE1.6-100) adjusted for calculated onsite air density.
- WAsP was then used to calculate the predicted wake losses (i.e., the interference between adjacent wind turbines) and this was added to other predicted losses (electrical, turbine availability, etc.) to derive the predicted net wind energy output summarized in Section 2.2.
- An uncertainty analysis was then performed to enable an understanding of wind yield variability over the operational life of the Project. The uncertainties that were considered included accuracy of wind speed measurements, long-term correlation, vertical wind shear uncertainty, accuracy of wake modeling, and variability of the future annual wind speeds at the site.
- A power intensity map was produced using WaSP, providing a visual representation of wind speed across the area containing wind turbines, a copy of which is included in Appendix A1. The Project Sponsor has modeled 315 feet (96 meters) tall turbines and hence GL GH only produced a power intensity corresponding to its specific intentions for the Project.
- It should be noted that the global wind energy industry has adopted the International System of Units (SI), and hence even in the United States, the industry uses the metric system in all technical reports, turbine certifications, and performance measurements.

Refer to Section 2.2 for additional information on the anticipated annual rate of power generation and annual capacity factor. With respect to long-term ownership and operation of the Project, and information regarding lease/easement arrangements, please see Section 2.3. With respect to the anticipated useful life of the Project, please see Section 2.8.

With respect to the Project's potential effect on local electric rates, it is not anticipated that the Project will have a direct positive or negative effect on local electric rates given that the energy will be sold competitively in the wholesale market and the fact that the NYSERDA REC budget is already accounted for in the state budget, bearing in mind that as from December 2011 NYSERDA had achieved 48% of the RPS target for 37% of the approved budget (see Section 2.3 for additional detail). This wind project will provide an additional source of power generation and will therefore help meet future growing energy demand.

2.8 DECOMMISSIONING AND CLOSURE PLANS

At the start of construction, an acceptable form of financial security will be put in place to cover the net costs of decommissioning the Project, the mechanism of valuing the financial security is discussed further below. Typically in such arrangements (between project promoters and utilities and government organizations) an obligation from an investment grade credit rated entity is accepted in lieu of a letter of credit, being replaced by a letter of credit or parent company guarantee in the event that the credit rating is deemed inadequate to cover the costs of decommissioning. The value of the security is based on the cost of removing the Project and remediating the site less the projected salvage value of the towers and turbines (expected to be available from the dismantling of the Project)., The funds under the financial security will be available to the beneficiary (expected to be Towns involved in the Project) to pay for the decommissioning of the Project at the end of its useful life, in the event that the Project Sponsor breaches its obligations under the Decommissioning Plan (refer below). Specifically, the Project Sponsor shall, at reasonable intervals during the Project's operation, provide a bona fide estimate from an independent suitably qualified and experienced engineer for review and approval by the Towns of Cortlandville, Homer, Solon and Truxton, in order to establish the cost of decommissioning the wind energy facility as compared to the capacity provided by the financial security.

The anticipated life of the Project is estimated to be a minimum of 25 years. The following describes how the Project will be dismantled following the operations phase of the Project.

Prior to the commencement of construction, the Project Sponsor shall formulate a Decommissioning Plan cooperatively with each of the four involved Towns, or demonstrate that the private land leases provide adequate requirements for this plan. Unless otherwise agreed between each of the four involved Towns and the Project Sponsor, and unless it can be demonstrated that the land leases adequately address this issue, the Decommissioning Plan shall include:

- Provision describing the triggering events for decommissioning of wind power facilities.
- Provisions for the removal of all above-ground structures and debris, but not the removal of anything below a 42-inch depth (e.g., tower foundations, buildings).
- Provisions for the removal of all below-ground structures to 48 inches in active agricultural land.
- Provisions for the restoration of the soil and vegetation.

- A timetable approved by the Towns for site restoration.
- An estimate of decommissioning costs certified by an independent, Professional Engineer, to be repeated at reasonable intervals during the operational life of the Project.
- Form of financial security, (as explained above) secured by the Project Sponsor, naming the Towns of Cortlandville, Homer, Solon and Truxton as the beneficiaries in the event of a default by the Project Sponsor to comply with the terms of the Decommissioning Plan, for the purpose of adequately performing decommissioning, in an amount equal to the Professional Engineer's certified estimate of decommissioning cost, less the expected salvage cost of the wind farm components.
- Identification of procedures for the Towns to access Financial Security at reasonable intervals throughout the operational life of the Project.
- A provision that the terms of the Decommissioning Plan shall be binding upon the Project Sponsor or any of their successors, assigns, or heirs.
- A Provision that the Towns shall have access to the site, pursuant to reasonable notice, to inspect the results of complete decommissioning.
- Removal of machinery, equipment, tower, and all other materials related to the Project is to be completed within one year of ceasing commercial operation.
- All town, county or state roads, impacted by Project decommissioning, if any, will be restored to original condition upon completion of decommissioning.

The current trend in the wind energy industry has been to replace or "re-power" older wind energy Projects by upgrading older equipment with more efficient turbines. However, if not upgraded or if the turbines are non-operational for an extended period of time (such that there is no expectation of their returning to operation), they will be decommissioned, in accordance with the Decommissioning Plan. In the event of a breach of the Project Sponsors' obligations to decommission and remove the Project within twelve months of ceasing commercial operation, and in the absence of a mutual agreement for an extension of time, then the Towns shall be entitled to draw upon the financial security without the consent of the Project Sponsor.

As described in Section 2.7, the Project Sponsor will maintain adequate insurance sufficient to cover unforeseen events, such as the collapse of a wind turbine. The Project Sponsor shall be obligated to furnish the Towns with evidence of adequate insurance as reasonably requested by the Towns.

In the event of insolvency or bankruptcy of the Project Sponsor prior to decommissioning of the Project, then it would be anticipated that the financial institution that provided the financing for the Project would utilize its 'step-in' rights and take-over the operation of the Project until a new buyer could be found. In this event, the financial institution would be bound by the terms of the Decommissioning Plan. If the financial institution has not done so within a reasonable period of time (as specified within the Decommissioning Plan), then the Towns would be entitled to draw upon the financial security.

Decommissioning would consist of the following activities:

- Wind turbines, including the blades, nacelles, and towers will be disassembled, and transported off site for reclamation and sale.
- All of the transformers will also be transported off-site for reuse or reclamation.
- Foundations at depths less than 42 inches below grade in non-agricultural land and 48 inches below grade in active agricultural land will be removed.
- Except as described otherwise for active agricultural fields (in the above bullet point), all buildings, structures, wind turbines, access roads and/or driveways and foundations at depths greater than 42 inches below finished grade will be left in place. Areas where subsurface components are removed will be graded to match adjacent contours, stabilized with an appropriate seed mix, and allowed to re-vegetate naturally. At the discretion of the landowner, access road materials will be removed and transported to a disposal location. Written approval by the landowner will be obtained for any access roads to remain in place.

The Scoping Document adopted on September 13, 2012 requires the DEIS to describe, as part of the decommissioning plan, any hazardous or significant byproducts associated with wind turbines, such as neodymium magnets and radiation hazards, and will address how these would be handled and disposed of. There are very limited hazardous materials produced when dismantling and decommissioning a wind turbine. The Bureau of Land Management has produced a programmatic Environmental Impact Statement (EIS) for wind energy projects, which provides a comprehensive guide to the typical hazardous materials used to construct, operate and decommission wind energy projects, their uses, and approximate quantities (U.S. Department of the Interior 2005, p. 3-22 to 3-24). From this detailed list, only some of these materials are considered to be a potential risk during decommissioning. These are detailed below in Table 5.

Table 5. Potentially Hazardous Materials

Material	Use	Typical Quantity
Fuel Diesel/Gasoline	Vehicles used in dismantling and transportation of materials	Less than 1,500 gallons stored in above ground tanks during decommissioning

Material	Use	Typical Quantity
Lubricating oils/grease/hydraulic fluids/gear oils	• Lubricating oil is present in some turbine components • Used in vehicles for dismantling and transportation • Hydraulic fluid used in, rotor driveshaft and braking systems • Gear oil and grease used in transmission and yaw mechanisms	Limited quantities stored in portable containers (capacity of 55 gallons or less); maintained onsite during construction and decommissioning.
Glycol-based antifreeze	Used for cooling wind turbine components	Limited quantities (10 to 20 gallons of concentrate) stored on site during construction and decommissioning
Lead acid storage batteries	• Present in vehicles used for dismantling and transportation of materials • Back-up power for computers, lights, etc.	Limited quantities of electrolyte solution (<20 gallons) for maintenance of construction and transportation equipment during construction and decommissioning
Other Batteries (Nickel-Cadmium)	Present in some control equipment and signal-transmitting equipment.	Very small quantities on site
Paints and Coatings	Not required during decommissioning	Not required during decommissioning
Dielectric fluids	Present in electrical transformers, bushings, and other electric power management devices as an electrical insulator.	Some transformers may contain more than 500 gallons of dielectric fluid.
Explosives	Not required during decommissioning	Not required during decommissioning
Pesticides	Not required during decommissioning	Not required during decommissioning

The Scoping Document also mentions neodymium as a possible hazardous source. Neodymium, as with all earth metals, is considered to have a low-moderate level of toxicity. Neodymium is used for making powerful magnets and is actually found in many everyday products; ear-phones, microphones, and even modern hybrid and electric vehicles. Neodymium is found in wind turbines as part of the permanent magnets that are used to generate power. Whilst neodymium dust could be considered hazardous, neodymium is not present in wind turbines in dust form, and therefore is not considered a particularly hazardous material for this project. Careful handling of these powerful magnets during decommissioning will ensure that they do not pose any significant risk. Decommissioning staff would be required to wear personal protection equipment when handling this or any other potentially hazardous material.

According to a recent U.S. Geological Survey report, "Neodymium-iron-boron magnets have the potential to be recycled, remanufactured, and reused because the magnets can be selectively disengaged from the assemblies in which they are used" (Goonan 2011, p. 9). Therefore, it is expected that neodymium magnets would be recycled, where possible, at the time of decommissioning.

Research by the Project Sponsor has indicated that there are no known radiation hazards associated with wind turbines post decommissioning.

Great care is required when handling potentially hazardous materials during decommissioning. All potentially hazardous material will be disposed of or recycled using appropriately licensed waste removal or recycling companies, and disposed of at suitable and appropriately licensed facilities. All waste handling and removal will be conducted using Federal, State, and local policies and guidelines. Hazardous wastes are managed under the Federal Hazardous Waste Management Program. This is a constantly evolving piece of legislation which according to the NYSDEC (2012f), "is continually modified to incorporate technical changes for managing hazardous wastes." New York's hazardous waste regulations are also therefore constantly being modified to reflect the changes in this evolving program. Currently the hazardous waste management regulations are handled in 6 NYCRR Parts 370, 371, 372, 373, 374 and 376 (the Part 370 series). The Project Sponsor will abide by the Federal, State, and local regulations and guidance in effect at the time of decommissioning.

As mentioned, a Decommissioning Plan that details the process, estimated cost, salvage value, and site restoration will be provided to the Towns of Cortlandville, Homer, Solon and Truxton prior to Project operation. All decommissioning and restoration activities will be in accordance with all applicable federal, state, and local permits and requirements and will include the following:

Turbine removal: Cranes and/or other machinery will be used for the disassembly and removal of the turbines. Electronic components and controls, and internal cables will be removed. The rotor and nacelle will be lowered to the ground for disassembly. The tower sections will be lowered to the ground where they will be further disassembled for transporting. The rotor, nacelle, and tower sections will either be transported whole for reconditioning and reuse or dissembled into salvageable, recyclable, or disposable components.

Turbine foundation removal: Turbine foundations will be removed down to a level 48 inches below grade in agricultural settings (42 inches elsewhere), and the material will be transported to a pre-approved disposal location. The remaining excavation will be filled with clean sub-grade material, compacted to a density similar to surrounding sub-grade material, and finished with topsoil.

Underground collection cables: Except as described otherwise for active agricultural fields, all cables buried less than 36 inches will be removed. All cables buried deeper than 36 inches, will be kept in place if it is determined that their presence does not adversely impact land use and they do not pose a safety hazard.

Access roads and crane pads: At the discretion of the landowner, gravel will be removed from access roads and crane pads and transported to a pre-approved disposal location. Any drainage structures will be removed and backfilled with sub-grade material (if necessary), and the disturbed areas seeded to support re-vegetation. Written approval by the landowner will be obtained for any access roads to remain in place.

2.9 REQUIRED APPROVALS AND APPLICABLE REGULATORY PROGRAMS

Implementation of the Project will require certain permits and/or approvals from local, state, and federal agencies. The permits and approvals that are expected to be required are listed in Table 6. Further discussion of these permits and approvals is provided following the table.

Table 6. Permits and Approvals for the Crown City Wind Energy Project

Agency	Agency SEQRA Status	Description of Permit or Approval Required
Town of Cortlandville	Involved Agency	Building permit, Site plan review and Zoning Permit, Local law compliance
Town of Homer	Involved Agency	Building permit, Site plan review and Zoning Permit, Local law compliance
Town of Solon	Involved Agency	Building permit, Site plan review and Zoning Permit, Local law compliance
Town of Truxton	Involved Agency	Building permit, Site plan Review, anticipated Wind Turbine Siting Regulation compliance
Cortland County		
County Legislature	Lead Agency	Acceptance of EIS documents, approval to enter into a lease option agreement and issuance of findings (as Lead Agency under SEQRA).
Highway Department	Involved Agency	Highway work permits.
Department of Health, Division of Environmental Health	Involved Agency	Approvals associated with installation of septic system and/or water supply well for the O&M facility.
Cortland County Planning Board	Interested Agency	Recommendation pursuant to General Municipal Law 239-m.
New York State		
Department of Environmental Conservation	Involved Agency	Article 24 Permit for disturbance to state jurisdictional wetlands. Article 15 Permit for disturbance of protected streams. SPDES General Permit. Section 401 Water Quality Certification. Issuance of SEQRA findings.
Department of Transportation	Involved Agency	Special Use Permit for oversize/overweight vehicles. Highway work permit.
Office of Parks, Recreation, and Historical Preservation	Interested Agency	Consultation pursuant to § 14.09 of the NYS, Parks, Recreation and Historic Preservation Law (PRHPL) and § 106 of the National Historic Preservation Act.
Department of Public Service	Interested Agency	No discretionary approvals required under SEQRA.

Federal		
U.S. Army Corps of Engineers	N/A	Nationwide Permit for temporary and permanent disturbance in federal jurisdictional wetlands/waters of the U.S. NEPA compliance.
Federal Aviation Administration	N/A	Lighting Plan and clearances for potential aviation hazard.
U.S. Fish and Wildlife Service	N/A	Informal consultation pursuant to Section 7 of the Endangered Species Act, associated with the aforementioned Section 404 Permit.
Environmental Protection Agency	N/A	Activities associated with disturbance within/adjacent to a sole source aquifer.

As indicated above in Table 6, the Towns of Cortlandville, Homer, Solon, and Truxton are anticipated to be SEQRA Involved Agencies per the issuance of a local discretionary approval. At the current time, the Project Sponsor has not applied for or received any official determinations from the Towns as to the applicability of their zoning laws. Please note, there is a moratorium preventing the Town of Cortlandville from 1) granting approvals, 2) granting variances, 3) issuing any permits, 4) considering any applications, for any use that would result in the establishment, placement, construction, enlargement or erection of a commercial wind farm facility within the Town. The moratorium will expire on June 30th 2013. In addition, there is a moratorium preventing the Town of Truxton from accepting applications for, consideration of or granting Site Plan approval for Wind Tower Facilities. The moratorium will expire on March 18th 2013. Although officials in all four Towns are currently considering drafting or approving regulations governing commercial wind energy facilities, such local ordinances are pending and the exact nature of the approval is not yet known. Thus, setbacks from Non-participating residences and property lines do not exist at this time per local ordinance requirements. However, the Project Sponsor has designed the Project in accordance with minimum self-imposed setback distances of 738 feet between proposed turbines and non-seasonal public roads and Non-participating property lines, and 1,642 feet between the proposed turbines and permanent residences. The Scoping Document adopted September 13, 2012 requires the DEIS to describe whether the setback distances are consistent so that landowners don't lose the right to build on their property area in the future. These concerns are addressed in Section 7.0. Based on the assumption that local wind power ordinances requiring discretionary approval will be enacted, all four Towns have been assigned an Involved Agency status in Table 6.

Based on the Project layout set forth herein and the associated resource-specific analyses (e.g., wetlands), it is also assumed that the NYSDEC and the NYSDOT will be SEQRA Involved Agencies as a result of the anticipated issuance of discretionary approvals. Per SEQRA regulations, federal agencies (e.g., U.S. Army Corps of Engineers) cannot be involved in the SEQRA process, which is limited to local, county, and state agencies. However, certain federal approvals will be required for this Project, as listed above. Lastly, as a result of approvals required from the NYSDEC and U.S. Army Corps of Engineers (please refer to Section 3.2.2 and Table 14 for additional information on stream/wetland impacts), consultation with the Office of Parks, Recreation, and Historic Preservation will be necessary to comply with the requirements of Section 14.09 of the New York State Parks, Recreation, and Historic Preservation Law and Section 106 of the National Historic Preservation Act.

Also note that the Project Sponsor will work in close cooperation with National Grid engineers in the site selection of the interconnect facilities, and with the Dominion Gas pipeline operator.

2.10 PUBLIC AND AGENCY INVOLVEMENT

Since first initiating development work on this Project, the Project Sponsor has attended numerous meetings on numerous occasions with the Cortland County Legislature; individual Legislators; the legislature Agriculture, Planning and Environment Committee; Cortland County Planning Department; Cortland County BDC/IDA; and the Town Boards of Cortlandville, Homer, Truxton, and Solon. Air Energy TCI has presented preliminary Project plans to these groups on numerous occasions throughout the development process. In addition, the Project Sponsor has conducted meetings with a variety of landowners in the vicinity of the Project area. Discussions have also been ongoing with the local community to provide information about the Crown City Wind Energy Project. Air Energy TCI has conducted two open house sessions, as advertised in the Cortland Standard (on November 25, 2008 and October 6, 2011), and participated in an open information session held at Cortland County offices on February 2, 2012. These events were held to provide the public, and County and Town Officials with up to date information regarding the Project, and to provide an avenue for conveying Project and industry related information. Summary information regarding the Project was made available to attendees and feedback sheets were available for attendees to complete.

Further, TCI has also provided project newsletters to landowners and officials within the Project area. TCI has also had summary information regarding the Project on its website since 2008, which since July 2012 has included a Project layout and detailed information regarding the schedule to achieve Lead Agency approval of the DEIS. Additional meetings and open houses will continue throughout the SEQRA process in order to provide accurate information about the Project to the local community. A project newsletter was produced in July 2012 (see Appendix L2) and made available on TCI's website, issued to the four Towns, and disseminated in the Project area by way of a door to door information campaign, aimed at informing residents in the immediate Project vicinity about the status of the Project and explaining the DEIS schedule and process. This also provided the opportunity for residents to ask questions about the Project. Over 400 individual dwellings within the Project area were visited by TCI's employees during the week of commencing July 23, 2012.

2.10.1 SEQRA Process

On November 14, 2008 a full environmental Assessment Form (EAF) was submitted by TCI to Cortland County for the proposed wind power Project, including a Project layout consisting of 49 wind turbines. The submittal of this EAF, which has been confirmed, by the legal counsel to the Lead Agency and by the Project Sponsor's legal counsel as an application under SEQRA, requires discretionary approval, and therefore initiated the SEQRA process for the subject action. On December 19, 2008, the Cortland County Planning Department on behalf of the Legislature, forwarded a declaration of intent to become SEQRA Lead Agency, along with a copy of the EAF document, to potentially interested/involved SEQRA agencies. It was stated in the letter of intent to act as lead agency that, subject to the agreement of all Involved Agencies, the lead agency determination would become effective 30 days from the date of the declaration letter. No agency objected to the Cortland County Legislature assuming the role of Lead Agency. A copy of Cortland County Planning Department's letter of intent to act as Lead Agency is attached as Appendix D. An updated Project description and map of Project facilities was provided to the Lead Agency on June 18, 2012. The Cortland County Legislature, as Lead Agency, subsequently issued a Positive Declaration on June 28, 2012 requiring the preparation of this DEIS.

On July 3, 2012 the Cortland County Ag/Planning/Environment Committee accepted the Draft Scoping Document and adopted a motion that set forth a 30-day public comment period and established a scoping public meeting on July 23, 2012 at 6:00 PM in the Cortland County Auditorium. Following review of all written and oral comments on the Draft Scoping Document, the Ag/Planning/Environment Committee adopted the Scoping Document on September 13, 2012.

This document has been prepared in compliance with the requirements of SEQRA (6 NYCRR Part 617). The purpose of the DEIS is to assess the environmental impacts associated with construction of the Project. The SEQRA process for the Project includes the following actions:

- DEIS accepted by Lead Agency (Cortland County Legislature)
- 30 Day Public Scoping period on DEIS (July 3rd- August 3rd 2012)
- Public meeting for comment on the DEIS draft scope on July 23rd 2012
- File notice of completion of DEIS and notice of public hearing and comment period.
- Public hearing on DEIS. A minimum 30-day public comment period.
- Revise DEIS as necessary to address substantive comments received.
- Prepare a Final EIS (FEIS).
- FEIS accepted by Lead Agency (Cortland County Legislature).

- File notice of completion of FEIS.
- Minimum 10-day public consideration period.
- Lead Agency issues Findings Statement, completing the SEQRA process.
- Involved agencies issue Findings Statements.

This DEIS, along with a copy of the public notice, will be distributed for review and comment to the public and to the agencies and parties listed in Table 7. Additionally, a 2005 amendment to SEQRA, (Chapter 641 of the NYS Laws of 2005; “Ch. 641”) requires every Environmental Impact Statement to be posted on a publicly accessible internet website, as of February 26, 2006. A DEIS is to be posted as soon as it is accepted and remain posted until the FEIS is accepted. The FEIS should be posted when completed, and must remain posted until one (1) year after all final approvals have been issued for the Project that is the subject of the FEIS. In accordance with this amendment to SEQRA, the DEIS will be posted to the Project webpage located at TCI’s website www.tcirenewables.com.

2.10.2 Agency and Public Review

Opportunities for detailed agency and public review in relation to this specific action will continue to be provided throughout the SEQRA process, as well as in conjunction with the review of applications for the other permits and approvals needed for the Project. With respect to the SEQRA process, the DEIS for the Crown City Wind Energy Project will be available for public review and agency comment as outlined above. In addition to a public comment period (during which time written comments will be accepted), a duly noticed public hearing concerning the DEIS will be organized and held, in accordance with SEQRA requirements.

This DEIS, along with a copy of a public notice, will be distributed for review and comment to the public, and to the parties identified in Table 7.

Table 7. Involved/Interested Agencies and Public Viewing Locations

Town of Cortlandville	
Town of Cortlandville Planning Board Raymond G. Thorpe Municipal Building 3577 Terrace Road Cortland, NY 13045	Town of Cortlandville Highway Department 4765 Route 41 Cortland, NY 13045
Town of Cortlandville Town Board Raymond G. Thorpe Municipal Building 3577 Terrace Road Cortland, NY 13045	Cortland Free Library 32 Church Street Cortland, NY 13045

Town Clerk Raymond G. Thorpe Municipal Building 3577 Terrace Road Cortland, NY 13045	Lamont Memorial Free Library, 5 Main Street McGraw, NY 13101
Town of Homer	
Town of Homer Planning Board Town Hall 31 N Main Street Homer, NY 13077	Town of Homer Highway Department 5656 E. Homer Baltimore Road Homer, NY 13077
Town of Homer Town Board Town Hall 31 N Main Street Homer, NY 13077	Phillips Free Library 37 South Main Street Homer, NY 13077
Town Clerk Town Hall 31 N Main Street Homer, NY 13077	
Town of Solon	
Town of Solon Planning Board Town Hall 4012 North Tower Road East Freetown, NY 13040	Town of Solon Highway Department 4250 Wildman Road Cincinnatus, NY 13040
Town of Solon Town Board Town Hall 4012 North Tower Road East Freetown, NY 13040	Kellogg Free Library 5681 Telephone Road Cincinnatus, NY 13040
Town Clerk Town Hall 4012 North Tower Road East Freetown, NY 13040	
Town of Truxton	
Town of Truxton Planning Board Town Hall 6543 Route 91 Truxton, NY 13158	Town of Truxton Highway Department Town Hall 6543 State Route 91 Truxton, NY 13158
Town of Truxton Town Board Town Hall 6543 Route 91 Truxton, NY 13158	Town Clerk Town Hall 6543 Route 91 Truxton, NY 13158
Truxton Senior Center United Methodist Church, 3670 Route 13, Truxton, NY 13158	

Cortland County	
Cortland County Legislature County Office Building 60 Central Avenue Cortland, NY 13045-2746	Cortland County Department of Planning 37 Church Street Cortland, NY 13045
Cortland County Health Department Division of Environmental Health County Office Building 60 Central Avenue Cortland, NY 13045-2746	Cortland County Industrial Development Agency 37 Church Street Cortland, NY 13045
Cortland County Highway Department County Highway Garage 4267 Traction Drive Cortland, NY 13045	Cortland County SWCD Amanda Barber, District Manager 100 Grange Pl # 205 Cortland, NY 13045
New York State	
NYS Dept. of Environmental Conservation 635 Broadway Albany, New York 12233-1011	NYS Department of Public Service Three Empire State Plaza Albany, New York 12223-1350
Joseph Dlugolenski, Deputy Regional Permit Administrator NYSDEC Region 7 Sub-Office 1285 Fisher Ave Cortland, NY 13045-1090	NYS Department of Transportation 50 Wolf Road, 6th Floor Albany, New York 12232
NYS Department of Agriculture and Markets 10B Airline Drive Albany, NY 12235	NYS Energy Research and Development Authority 17 Columbia Circle Albany, NY 12203
NYS Department of Transportation Region 3 State Office Building 333 E. Washington Street Syracuse, NY 13202	NYS Historic Preservation Office Peebles Island Resource Center PO Box 189 Waterford, New York 12188
Federal Agencies	
Mr. Tim Sullivan U.S Department of the Interior Fish and Wildlife Service 3817 Luker Road Cortland, New York 13045	Diane Kozlowski U.S. Army Corps of Engineers 1776 Niagara Street, CELRB-R Buffalo, NY 14207

3.0 EXISTING CONDITIONS, POTENTIAL IMPACTS, AND MITIGATION MEASURES

The selection of possible sites for development of wind power facilities is constrained in that projects must be located in areas with adequate wind resource; which are proximate to electric transmission lines; and which are situated in locations which can accommodate setback, land use, and environmental considerations. Once a project site has been selected (macro-siting), there is some ability to alter turbine and other component locations on the properties that are participating in the project (micro-siting) within the confines of the lease agreements that the Applicant has obtained. The micro-siting of project components within a given project site is governed by site-specific factors, including land use constraints, noise constraints, wind resource constraints, wetland constraints, agricultural constraints, and landowner considerations.

The subsequent subsections of this EIS evaluate the potential impacts of the specific layout designed around the numerous constraints that have been taken into account by the Project Sponsor (see Figure 17). For example, the Project layout incorporates self-imposed minimum setback distances of 738 feet between proposed turbines and Non-participating property lines and non-seasonal public roads, and 1,642 feet between the proposed turbines and permanent residences. All property lines will be surveyed prior to construction to assure adherence to these setbacks. See Section 2.5.1 for additional information on Project siting criteria.

As required by the Scoping Document, the Project's impacts on existing and future uses and/or expansion of the landfill are addressed in this DEIS (see Section 3.14).

With respect to the Project Sponsor's summary of the Project's wind yield analysis, please see Section 2.2 and Appendix A1.

3.1 GEOLOGY, SOILS, AND TOPOGRAPHY

This sub-section is organized as follows:

- 3.1.1 Existing Conditions
- 3.1.2 Potential Impacts
- 3.1.3 Proposed Mitigation

3.1.1 Existing Conditions

Information regarding topography, geology, and soils was obtained from existing published sources, including the Cortland County Soil Survey (U.S. Department of Agriculture [USDA] 1917), U.S. Geological Survey (USGS 2004) topographic mapping, statewide bedrock geology mapping (NYS Museum/NYS Geological Survey 1999a), and New York State surficial geology mapping (NYS Museum/NYS Geological Survey 1999b). In addition, ATL Engineering, P.C. (AE) prepared a desktop geotechnical study to evaluate surficial and bedrock geology at the Project area, please refer to Figures 1 and 2 for an indication of the Project location. This geotechnical report is included as Appendix E1, and reviews existing information, summarizes geologic/geotechnical conditions, identifies potential geologic/geotechnical issues, summarizes soil conditions, addresses feasible foundation options, identifies potential roadway issues, and recommends a geotechnical investigation scope for final project design.

3.1.1.1 Topography

The Project area is located in the glaciated portion of the Allegheny Plateau physiographic province, which is characterized as a mature, eroded plateau with gently rolling uplands and valley topography (USDA 1917, p. 5). The Project area is located on a series of ridges between the East Branch of the Tioughnioga River to the north and Trout Brook to the south. Elevations range from approximately 1,120 feet above mean sea level (amsl) along the East Branch of the Tioughnioga River along the northwestern edge of the Project area to approximately 1,980 feet amsl near the intersection of Sportsman Club Road and North Tower Roads, with the elevation at proposed turbine locations ranging from 1,420 feet amsl at Turbine 1 to 1,970 feet amsl at Turbine 45. No turbines are proposed in the valley portions of the Project area.

3.1.1.2 Geology

Bedrock within the Project area is predominantly shale, with minor siltstone and fine grained sandstone. These sedimentary rocks are part of the West River Shale Formation of the Genesee Group, and are Upper Devonian in age (NYS Museum/NYS Geological Survey 1999a). The bedrock is horizontally bedded with varying degrees of weathering at the bedrock surface. Bedrock within the Project area ranges in depth from being exposed at the surface or relatively shallow along the hilltops, to several feet below glacial till overburden soils in the valleys and low-lying areas.

Surficial geological materials include till (variable texture [boulders to silt] 1 to 50 meters [3 to 164 feet] deep), which is relatively impermeable, and has the potential for land instability on steep slopes. The northern portion of the Project area is mapped as having bedrock within 1 to 3 meters (3 to 10 feet) of the surface, which may sporadically crop out, with a variable mantle of rock debris and glacial till. The northeast portion of the Project area is mapped as having exposed or shallow bedrock (within 1 meter [3.28 feet] of the surface). According to mapping and soil descriptions provided in the Cortland County Soil Survey, depth to bedrock is generally greater than six feet in valley areas and typically ranges from 10 to 40 inches on hills and along ridges within the Project area.

No prominent and/or unique geological features (i.e., large boulders, ledges, or rock outcroppings) have been identified within the Project area.

3.1.1.3 Soils

The Cortland County Soil Survey has mapped general soil associations and soil types within the Project area. The soil survey indicates that two soil associations and 47 soil series are present within the Project area (see Figure 4). Of these, Lordstown, Volusia, Mardin, and Chippewa are the dominant soil series. Table 8 lists the soil associations found within the Project area and their characteristics. Table 9 summarizes the characteristics of the dominant soil series found within the Project area.

Table 8. Soil Associations Within the Project area

Soil Association	Main Characteristics
Lordstown-Volusia-Mardin	• Dominantly gently sloping to sloping • Somewhat poorly to moderately well drained soils • Found in hilltop areas • Shallow or moderately deep soils over bedrock.
Volusia-Mardin-Lordstown	• Dominantly gently sloping to sloping • Somewhat poorly to moderately well drained soils • Found on uplands • Shallow or moderately deep soils over bedrock.

Table 9. Dominant Soil Series Within the Project area

Soil Series	Main Characteristics
Chippewa	• Poorly drained • Depth to fragipan is 8 to 20 inches. • Found in depressions • Farmland of statewide importance (0% to 8% slopes)
Lordstown	• Well drained • Found on benches, hills, and ridges. • Depth to bedrock is 10 to 40 inches. • Prime farmland (moderately deep 2% to 8% slopes) • Farmland of statewide importance (8% to 15% slopes; shallow 2% to 8% slopes)
Mardin	• Moderately well drained • Found on ridges, till plains, and hills • Depth to fragipan is 14 to 26 inches • Farmland of statewide importance (2% to 15% slopes)

Soil Series	Main Characteristics
Volusia	• Somewhat poorly drained • Found on ridges, till plains, and hills. • Depth to fragipan is 10 to 22 inches • Farmland of statewide importance (2% to 15% slopes)

Soils in the Project area are primarily channery silt loams, but also include some gravelly loams. Additional detailed information from the Cortland County Web Soil Survey is included in Appendix B of the Geotechnical Study (see DEIS Appendix E1).

Approximately 72 percent of the Project area contains soils classified as either prime farmland soils or farmland of statewide importance (see Figure 4a). While not all of this land is currently in agricultural production, based on field investigations, corn is the primary row crop, while other crops include soybeans and small grains. 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. For additional information about agricultural resources within the Project area, including designated Agricultural Districts, agricultural land use, and post-construction restoration of agricultural lands, see Section 3.13 of this DEIS.

With respect to potential soil-related constraints, soil drainage is predominantly well drained or somewhat poorly drained, with approximately 46 percent of the on-site soils well drained, 15 percent moderately well drained, 34 percent somewhat poorly drained, and 5 percent either poorly drained or very poorly drained. Approximately 39 percent of the soils within the Project area are listed as hydric by the NRCS (2012a), including Volusia channery silt loams, Chippewa channery silt loams, Alluvial land, Tuller channery silt loam, and Erie channery silt loams Project area Project area (see Figure 4a for a depiction of hydric soils).

In the major stream valleys in the vicinity of the Project (e.g., the East Branch of the Tioughnioga River, Cheningo Creek, and Trout Brook), the water table generally occurs at depths less than 25 feet below the land surface. However, in upland areas where most Project components are sited, the water table may be as deep as 100 feet below the land surface (EPA 2010). For additional information about groundwater and surface waters in the Project area, see Section 3.2 of this DEIS.

In further evaluation of potential soil-related constraints, according to the desktop geotechnical study, the pH of the soils in the area ranges between 3.6 and 8.4 indicating primarily acidic soil conditions within the Project area. The risk of corrosion to concrete, based on the sulfate and sodium content, texture, moisture content, and the acidity of the soils found throughout the Project area, ranges from "low" to "high". The risk of corrosion to uncoated steel based on soil moisture, particle-size distribution, acidity, and electrical conductivity of the soils found throughout the Project area also range from “low” to “high” (AE 2012, p. 3). Based on USDA soil survey data, shallow excavations in the Project area are rated as “somewhat limited” to “very limited” due to shallow groundwater, slopes, sloughing of excavation sidewalls, potential presence of dense soil layers, and shallow bedrock. Several wet spots were identified on the USDA map within the Project area, likely due to the poor drainage characteristics of the soils (AE 2012, p. 3). The soils mapped in the Project area are reported to have low shrink/swell potential. These soils are anticipated to be moist to wet in their natural state and significant drying or wetting is not anticipated that would result in damage to structures due to significant volume changes. In addition, there are steep slopes throughout the Project area and the glacial till soils have the potential to become unstable, particularly when saturated. However, based on a review of USGS hazard maps, the Project area has a low incidence of landslides (less than 1.5% of area included) (AE 2012, p. 6).

3.1.2 Potential Impacts

Potential impacts to geology, soils, and topography are anticipated to include excavation of bedrock, cut and fill on steep slopes, increased potential for erosion and sedimentation into surface waters (see also Section 3.2), and disturbance of agricultural soils.

3.1.2.1 Construction

Project components have been sited to avoid or minimize either temporary or permanent impacts to physiography, geology, and soils, including agricultural resources, to the extent practical. The Project is not anticipated to result in any significant impacts to geology, but depth to bedrock in the Project area is variable and it is possible that some turbine foundations will be set into bedrock. As indicated by AE (2012 p. 9), if bedrock is encountered it is anticipated to be rippable, and will thus be excavated using large excavators, rock rippers, or chipping hammers. If the bedrock is not rippable, it will likely be excavated by pneumatic jacking. Blasting will not be used to remove bedrock at this site. During consultation with Mr. Don Chambers, Cortland County Superintendent of Highways, (pers. comm., October 3, 2012) and through desktop analysis of the underlying shale bedrock (AE 2012, p. 9), it has been determined that the shale bedrock will be removed by using a hydraulic impact hammer and other aforementioned excavation equipment. Based on the information provided in the Desktop Study geotechnical report (Appendix E1), it is fully anticipated that all turbine foundations will be located on competent substrata and will be constructed without any undue adverse impact to geology. The depth to bedrock across the northern portion of the Project area is anticipated to be 1-3 meters (3-10 feet), which may sporadically crop out to the surface (AE 2012, p. 3). Only temporary, minor impacts to physiography and geology are expected as a result of construction activities. For example, as indicated above, if a shallow depth to bedrock (<24 inches) is encountered, as is expected at turbines

4,6,7, 17, 18, 20, 27, 30, 34, 36, 38, 40, 42, 43, 44, 45, some ripping or pneumatic jacking could be required. In addition, where turbine and access road sites are not located on completely level terrain, some grading and / or cut and fill (or addition of fill) will be required, estimated quantities and anticipated construction details are discussed further on page 103.

Appendix X provides detailed soil mapping that illustrates the proposed Project's limits of disturbance, along with soil series and topographical contour lines. Overall impacts to topography will be relatively minor. Please refer to the impacts table (Figure 4b) and mapping in Figure 4a which describes the extent of impact of all Project infrastructure on the following:

- Wetlands
- Protected Streams
- Unprotected Streams
- Seeps and Springs
- Floodplains
- Hydric Soils
- Prime Agricultural land
- Steep Slopes (>15%)
- Depth to Bedrock / Shallow Soils (<24 inches)
- Whether cut and fill of earth is required

The mapping in Figure 4a and impacts table in Figure 4b show that wetlands have been largely avoided during the design and layout of the Project. The workspaces for turbines 10 and 39 may encroach on wetland areas. In addition some wetland crossings by buried cable and access roads are unavoidable throughout the Project. Please see Figures 4a and 4b for further detail and section 3.2.2 for a description impacts to water resources.

No protected streams will be impacted by turbine work areas or access road disturbance areas. Cables will cross a protected stream between turbines 15 and 28. Please see Figures 4a and 4b for further detail and section 3.2.2 for a description of stream crossing practices, permits required and impacts to water resources.

No unprotected streams will be impacted by turbine work areas. Unprotected streams will be crossed by access roads from turbines 40 to 41, from Syrian Hill Rd to turbine 38 and from Lapp Hill Rd to turbine 28. The electrical collector system will cross unprotected streams at Town Line Rd, N. Tower Rd, northwest of turbine 13, west of Syrian Hill Rd to turbine 31 and from turbine 15 to Soshinsky Rd. Please see Figures 4a and 4b for further detail and section 3.2.2 for a description of stream crossing practices, permits required and impacts to water resources.

Seeps and springs have been avoided where possible. However at this stage of the design some impact to seeps and/or springs may occur in the following areas: Workspace of turbine 30, access road from Shippey Rd to turbine 5, access road from Parks Rd to turbine 10, access road from Syrian Hill road to turbine 38, access road from Town Line Rd to turbine 18, access road from turbine 12 to turbine 13, access road from turbine 16 to turbine 15, buried cable from Parks Rd to permanent met mast location 3, buried cable from Soshinsky Rd to Maybury Rd. Where seeps and springs are encountered temporary dewatering practices (such as usage of pumps) may be employed during construction and water management techniques will be employed during operation of the Project. Please see Figures 4a and 4b for further detail and section 3.2.2 for a description of stream crossing practices, permits required and impacts to water resources. See also Appendix F - Preliminary Stormwater Pollution Prevention Plan for a description of stormwater management practices.

No infrastructure has been sited on floodplains therefore no impact is expected.

There are an abundance of hydric soils throughout the Project area, therefore portions of most turbine access roads and the electrical collector system will cross hydric soils (see Figures 4a and 4b for further detail). Turbine workspaces that have been sited partially on hydric soils are turbines 2, 5, 10, 12, 14, 18, 19, 24, 25, 26, 27, 28, 31, 32, 33, 36, 37, 38, 39, 40. Where hydric soils are encountered and waterlogged, temporary dewatering practices (such as usage of pumps) may be employed during construction. Please see Figures 4a and 4b for further detail and section 3.1.2 for a description of impacts to hydric soils.

The workspaces for only 10 of the proposed 44 turbines (turbines 6, 9, 13, 15, 19, 21, 22, 26, 30 and 35) are situated on portions of Prime Agricultural land. Access tracks and the electrical collector system cross Prime Agricultural land in a number of places as can be seen in Figure 4A. Project impact to the Prime Agricultural land will therefore be low. Please see Figures 4a and 4b for further detail and section 3.1.2 for impacts to Geology, Soils and Topography.

It is assumed that the term "fractured shale" used in the Scoping Document of September 13 2012, is adequately described by the term "shale bedrock" used throughout this DEIS, as no reference could be found to the geologic term "fractured shale" in the context of naturally occurring underlying bedrock. Since blasting will not be employed during Project construction, no pre-blasting water sampling or comprehensive analysis of the shale bedrock will be required.

Immediately prior to final Project design and turbine foundation design, a subsurface investigation will be performed at each proposed turbine and ancillary structure location to determine the site specific subsurface conditions and allowable soil/rock bearing capacities. Subsurface investigation activities will consist of soil borings and rock coring at each of the proposed wind turbine and ancillary structure locations, along with test pits, seismic testing, and additional laboratory testing that will be performed to further evaluate the subsurface soil, bedrock, and groundwater conditions. The results of the site specific subsurface investigation will inform the final Project design and determine the need for additional analysis. For example, design of concrete and steel structures will be based on analysis of the soils including electrical resistivity, pH, chloride, and sulfate testing. Additional information on soils may be found in Section 3.1.1.3.

The primary impact to the physical features of the site will be temporary disturbance of soils during the development of the construction staging area, the O&M building, and the installation of access roads, foundations, underground collector systems, collection station, and interconnection substation. The location of each Project component is depicted on Figure 3, and on the detailed soils mapping included in Appendix X. Detailed geophysical features mapping is included in Figure 4a, a table of impacts describing the mapping may be referred to in Figure 4b. Based on the assumptions outlined in Section 2.6 (Project Construction), Table 3 (Impact Assumptions), soil disturbance from all anticipated construction activities will total approximately 322.5 acres. Earth moving and general soil disturbance will increase the potential for wind/water erosion and sedimentation into surface waters, particularly in areas with moderate to severe erosion hazards. Impacts to soils by soil series and drainage class are presented below in Table 10.

Table 10. Soil Impacts by Series and Drainage Class

Soil Series	Soil Series Name	Drainage Class[1]	Temporary Impacts (acres)	Permanent Impact (acres)	Total Impact (acres)
AaA	Alden and Birdsall silt loams, 0-3% slopes	VPD	0.1	0.0	0.1
Total Impacts to Very Poorly Drained Soils			**0.1**	**0.0**	**0.1**
Ab	Alluvial land	PD	0.2	0.0	0.2
CeA	Chippewa channery silt loam, 0-3% slopes	PD	2.7	0.5	3.2
CeB	Chippewa channery silt loam, 3-8%slopes	PD	2.4	0.7	3.1
Total Impacts to Poorly Drained Soils			**5.3**	**1.2**	**6.5**
TeB	Tuller channery silt loam, 2-8% slopes	SPD	3.3	0.5	3.8
VbB	Volusia channery silt loam, 2-8% slopes	SPD	52.0	11.6	63.6
VbC	Volusia channery silt loam, 8-15% slopes	SPD	14.2	3.2	17.4
VbD	Volusia channery silt loam, 15-25% slopes	SPD	2.2	0.2	2.4
VbD3	Volusia channery silt loam, 15-25% slopes, eroded	SPD	0.2	0.0	0.2
Total Impacts to Somewhat Poorly Drained Soils			**71.9**	**15.5**	**87.4**
MaB	Mardin channery silt loam, 2-8% slopes	MWD	18.5	3.6	22.1
MaC	Mardin channery silt loam, 8-15% slopes	MWD	16.3	1.2	17.5
MaD	Mardin channery silt loam, 15-25% slopes	MWD	5.6	1.7	7.3

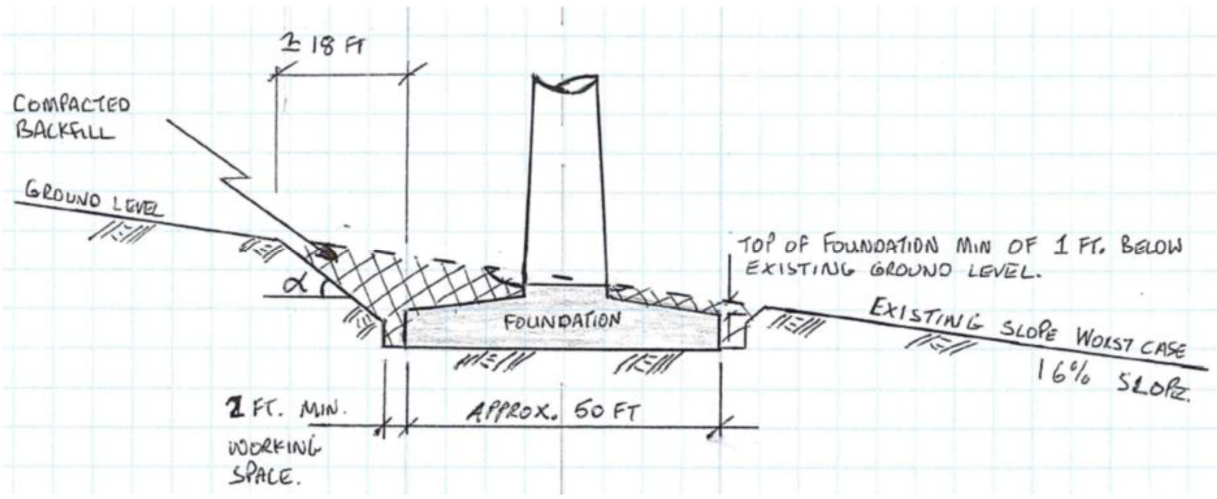
Total Impacts to Moderately Well Drained Soils			**40.4**	**6.5**	**46.9**
AcB	Arnot channery silt loam, 2-8% slopes	WD	16.5	3.8	20.3
BaB	Bath channery silt loam, 3-8% slopes	WD	1.8	0.5	2.3
BaC	Bath channery silt loam, 8-15% slopes	WD	1.7	0.2	1.9
BaD	Bath channery silt loam, 15-25% slopes	WD	3.6	0.6	4.2
BbD	Bath-Chenango gravelly loams, 15-25% slopes	WD	0.1	0.0	0.1
BcE	Bath and Mardin soils, 25-40% slopes	WD	0.7	0.0	0.7
LdB	Lordstown channery silt loam, moderately deep, 2-8% slopes	WD	25.8	6.4	32.2
LeB	Lordstown channery silt loam, shallow, 2-8% slopes	WD	20.4	3.6	24.0
LfC	Lordstown channery silt loam, 8-15% slopes	WD	39.4	8.7	48.1
LfD	Lordstown channery silt loam, 15-25% slopes	WD	27.3	5.8	33.1
LgE	Lordstown soils, 25-55% slopes	WD	12.0	2.7	14.7
Total Impacts to Well Drained Soils			**149.3**	**32.3**	**181.6**
Total Impacts to All Soils			**267.0**	**55.5**	**322.5**

[1] Drainage Class Codes: VPD = Very Poorly Drained, PD = Poorly Drained, SPD = Somewhat Poorly Drained, MWD = Moderately Well Drained, WD = Well Drained

The NRCS Web Soil Survey for Cortland County, included in Appendix B of the Geotechnical Study (see DEIS Appendix E1) lists constraints or limitations of specific soil series that must be considered during development of roads and small commercial buildings. For the soils series listed above in Table 10, these constraints include depth to saturated zone, unstable excavation walls, and flooding for poorly drained and very poorly drained soils; slope for soil series with steep slopes; shallow bedrock and/or fragipan; and frost action. It should be noted that these constraints are not unique to the Project area, and that such constraints are not uncommon. Furthermore, the NRCS cautions that this information is intended for land use planning, and for planning site investigations prior to design and construction; the information is not site specific and does not eliminate the need for onsite investigation of the soils or for analysis by personnel experienced in the design and construction of engineering works (NRCS 2012c). To determine the site specific subsurface conditions and allowable soil/rock bearing capacities, a subsurface investigation will be performed at each proposed turbine and ancillary structure location prior to final Project design. The planned subsurface investigation is described below in Section 3.1.3.1.

As described above, Project components have been sited to avoid or minimize either temporary or permanent impacts to topography and soils, including agricultural resources, to the extent practical. See the detailed soil mapping in Appendix X, which illustrates Project components, soil series, and contour lines., Portions of the turbine workspaces (a 328 foot x 328 foot area) for turbines 3, 5, 11, 17, 22, 23, 25, 37, 38, 40, 43 and 44 include areas of steep slopes (in excess of 15%). Construction at these sites will require some degree of cutting and filling to create a level surface for the turbine foundation and crane pad.

The extent of any cut and fill at turbine workspaces will depend upon detailed engineering design and will take into account the site specific geotechnical investigations that will occur later in the process than at DEIS. A high level estimate of the quantities of cut and fill has been undertaken based on the slopes existent at the proposed wind turbine locations (the slopes having been established via National Elevation Database (USGS) Digital Elevation Models). For constructability and windflow constraints it is not preferable to locate wind turbines on slopes that exceed approximately 15 – 16%. The information in Table 11 provides an indication of the slope steepness at each turbine located on slopes exceeding 10% and provides a high level estimate of the associated cut and fill volume. Please also refer Appendix B - Typical Construction Photos and Details - Sketch SK2 which provides an indication of the worst case slope (16%) anticipated excavation profile and extent of cut and fill. An extract of Sketch SK2 is shown below. Turbine foundations will be located such that there is a minimum depth of one foot between the downslope ground level and the top of the foundation which will avoid an artificial increase in ground level to cover the foundation. Sketch SK2 assumes that adequate bearing capacity is achieved at normal foundation depth. Depending on the conditions at each turbine site, localized rip rap may be installed around the base of the wind turbine to avoid wash out of the compacted backfill. This will be established at detail design stage and will be further assessed as part of the SWPPP plan and would also be agreed on site with the Environmental Monitor.



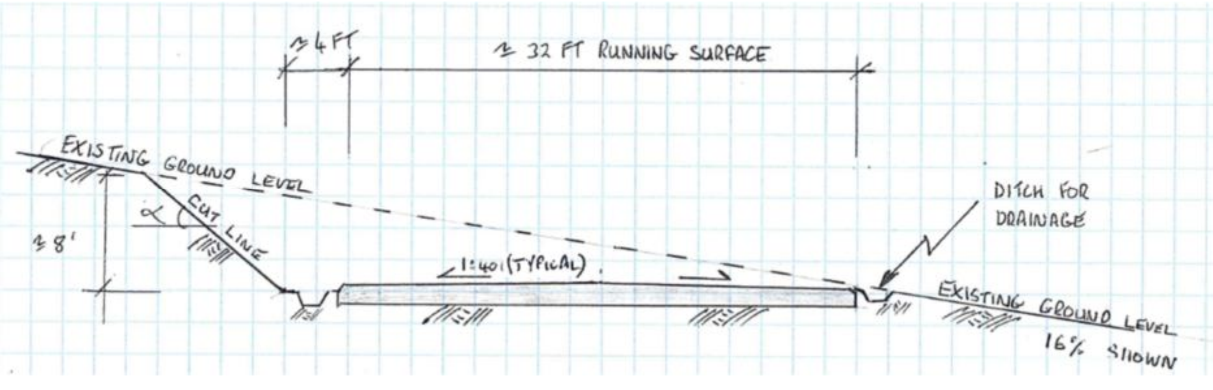
Extract from Sketch SK2 in Appendix B Typical Construction Photos and Details (16% slope indicated on sketch).

Table 11: Indication of slope steepness at each wind turbine location and estimation of the volume of cut and fill required to achieve the anticipated construction detail referred in Sketch SK2 (Appendix B) extract inserted above.

Wind Turbine #	Steep slope (>10%)	Depth of bedrock (Inches)*	Map Sheet (Refer Appendix X Soils Mapping)	Estimated Volume of Cut & Backfill (cubic yards)
Turbine 3	11%	36	5	200
Turbine 5	11%	>79	3	200
Turbine 11	11%	36	3	200
Turbine 13	11%	>79/36	11	200
Turbine 15	11%	>36	11	200
Turbine 17	12%	>36/24	13	235
Turbine 22	10%	36	2	165
Turbine 23	12%	36	5	235
Turbine 25	12%	>79/36	7	235
Turbine 32	12%	>79/36	2	235
Turbine 37	11%	>79/36	14	200
Turbine 38	12%	>79/36	10	235
Turbine 40	11%	36/16	9	200
Turbine 41	13%	>79/36	9	270
Turbine 43	16%	79/24	9	375
Turbine 44	12%	36/24	9	235
			Total	3,620

*Where more than one depth occurs it means there are two soil types with different depth to bedrock characterisitics according to USGS analysis

For 90% of all cut and fill required for the installation of access roads, the gradient contemplated will be less than a 15% slope. Therefore sketch SK1 below refers to a worst case scenario for ten percent of the Project access roads. The traverses will necessitate excavation of a cutting to form the required road running width. Figure 4B – Geophysical Impacts table describes the areas requiring grading, cutting and filling in detail. Please also refer to Appendix B Typical Construction Photos and Details - Sketch SK1, which provides an indication of the amount of cutting required to construct an access road running perpendicular to a 16% slope. An extract of Sketch SK1 is shown below.



Extract from Sketch SK1 in Appendix B - Typical Construction Photos and Details (16% slope indicated on sketch).

Co-located access roads and buried electrical collection lines may traverse steeper slopes (in excess of 15%) for limited portions of the new roads on the approach to turbines 1, 3, 4, 5, 8, 9, 15, 16, 17, 19, 21, 22, 23, 25, 27, 28, 30, 34, 37, 40, 41, 42 and 44. The Project Sponsor will seek to further mitigate the amount of access roads located on these steeper slopes during the detailed design stage, which will include a more detailed land survey to identify accurately the location of steep slopes and the changes in slope steepness thus enabling re-alignment of access roads to position access roads, wherever possible, away from steep slopes.

The volume of material that would be excavated in the case shown above for a perpendicular traverse of a 16% slope is 5 cubic yards per linear foot. Appropriate stormwater management techniques will be employed at all such slope traverses, examples of these techniques are described in detail in section 3.2 and in Appendix F - Preliminary Stormwater Pollution Prevention Plan. Stormwater management techniques are represented in Attachment A of Appendix F. Refer to Table 12 below that provides a high level summary of access tracks and slope steepness.

Table 12: Indication of location of access tracks for varying slope steepness

Location of road / Turbine number affected during slope traverse or climb	Slope Range (%)	Miles of road disturbance area containing slope
Portions of most access roads	0 to 5	4.3
Portions of most access roads	5 to 10	7.2
Portions of most access roads	10 to 15	3.9
Small portion of most access roads	15 to 20	2.0
T3, T4, T5, T8, T11, T16, T17, T19, T21, T22, T23, T41, T43, T44	20 to 25	0.7
T4, T5, T8, T11, T17, T19, T21, T22, T32, T43, T44	25 to 30	0.2 (1056 ft)
T 4, T8, T11, T19, T21, T22	30 to 35	0.1 (528 ft)

The installation of buried collection lines between turbine strings where they are not located alongside access roads, will traverse steep slopes approaching turbine 3, turbines 5, 8 and 11, turbine 10, turbine 14 leading from turbines 17, 16 and 15, between turbines 22 and 32, from Syrian Hill Rd to turbines 31 and 28, between turbines 32 and 35, between N. Tower Rd and Harris Hill Rd and between N. Tower Rd and turbine 40 (refer to Figure 4a). It is not anticipated that the installation of buried collector lines on these slopes will result in substantial earthworks as cable trenching equipment (as described in section 2.6.7 and shown in Photo 1) will be used, causing minimal disruption to the soil.

The overhead interconnection line running north from the collection substation to the POI substation also crosses steep slopes and again it is not envisaged that this will result in any substantial earthworks and stormwater management is not anticipated to be required at this location.

The slope climbs and traverses described above will be subject to change following detailed design and field verification during the detailed design of the Project. This detailed design may eliminate the need to traverse / climb the steepest slope classes described above. Please see Figure 4a for a map showing the locations of the slope areas described above.

The impacts associated with the analysis summarized in Tables 11 and 12 do not require any further specific mitigation, given that the mitigations already require compliance with SWPPP and engagement with the Environmental Monitor with respect to final stormwater control and management.

Construction activity also has the potential to impact soil in agricultural fields through rutting, mixing of topsoil and subsoil, and soil compaction. An illustration of the turbine workspaces is included in Appendix A2. Mitigation measures will be implemented throughout the construction process to minimize the potential for these soil impacts (see Section 3.1.3 below). Impacts to agricultural protection lands, hydric soils, and steep slopes are summarized below in Table 13.

Table 13. Impacts to Agricultural Protection Lands, Hydric Soils, and Steep Slopes

Soil Classification	Temporary Impacts (acres)	Permanent Impacts (acres)	Total Impacts (acres)
Prime Farmland	27.6	6.9	34.5
Farmland of Statewide Importance	187.6	37.8	225.4
Hydric Soils	77.5	16.9	94.4
Soils exceeding 25% slope	12.7	2.7	15.4
Shallow Soils (<24 inches)	43.6	10.8	54.4

As shown in Table 13 above, approximately 34.5 acres of land classified as prime farmland and 225.4 acres of land classified as farmland of statewide importance will be impacted by Project construction, of which 6.9 acres and 37.8 acres, respectively, will be permanently impacted. Approximately 94.4 acres of soils listed as hydric by the NRCS will be impacted by Project construction, of which 16.9 acres will be permanently impacted and the remainder will be restored post-construction. Dewatering techniques may be used where necessary during construction on areas where hydric soils may be impacted and soils are waterlogged. Turbine work areas will be graded to be level while foundation footprints will generally be excavated to bedrock. Stormwater management procedures will be employed where necessary. This will be determined during the detailed engineering design and validated during the construction phase of the Project. In addition, 15.4 acres of soils exceeding 25% slope will be impacted, of which 2.7 acres will be permanently impacted. Permanent impacts on steep slopes are associated with installation of access roads (1.8 acres), turbine pad (0.2 acre), and substation (0.6 acre). Please refer to sketch SK2 and the description above for access road impacts on slopes.

The area of disturbance calculation presented above assumes that significant soil disturbance will occur in all areas that are proposed for the installation of infrastructure. The actual disturbance will be highly variable based on the specific construction activity; the construction techniques employed, and soil/weather conditions at the time of construction. For instance, in many locations installation of the buried electrical collection lines will involve relatively minor soil disturbance, restricted to the path of the rock saw or cable plow (as opposed to the 25-foot widths assumed in calculating such impacts). Similarly, when soils are hard and dry, use of crane paths across open fields may result in no actual disturbance of the soil (beyond compaction) or only minor leveling. However, because such conditions cannot be guaranteed within the area of disturbance, for calculation purposes it is assumed that soils within the entire area of potential disturbance will be impacted during construction.

With respect to potential construction limitations and constraints at the Point of Interconnect station and the collection station, based on review of the USDA soil types and topography of the area, slopes at these two locations are approximately 10% and 15% respectively, which does not present concern at this time due to the relatively shallow nature and low-landslide incidence within the Project area. See Appendix A2 for grading plans for the collection and POI substation, and Appendix X for detailed soil mapping. The specific depth to bedrock is not known at this time; however, based on the Surficial Geologic Map of NY, Finger Lakes Sheet, bedrock in the northern portion of the Project area is anticipated to be within 1 to 3 meters (3 to 10 feet) of the surface and may sporadically crop out. A perched water condition should be anticipated at the Point of Interconnection substation. Typically, these structures do not contain basements so permanent drainage systems would not be required. If the foundation is constructed within the depth of the perched water table, temporary construction dewatering will be required and the foundations could be designed to resist hydrostatic forces, if required. The bedrock and groundwater depths with respect to the foundation systems, as well as any need for permanent drainage would be evaluated and addressed once soil borings are performed and more information regarding the structures is established. However, based on desktop review of information available at these locations, all likely bedrock/water table conditions can be addressed and mitigated through relatively common engineering and construction techniques (B. Barnes, pers. comm.). See Section 3.1.3 below for further information about mitigation.

3.1.2.2 Operation

Overall, the Project will result in permanent conversion of approximately 55.5 acres of land into built facilities (0.2-acre of crane pad and foundation at each tower site, maximum 20-foot-wide permanent access roads, a 2-acre collection station, a 1-acre switching substation, a 2.5-acre O&M building, and 0.1-acre at the met tower location). The Project will also result in some alterations to surface drainage patterns, although this should be minimal given current Stormwater Pollution Prevention Plan (SWPPP) requirements to minimize alteration of run-off within individual watersheds. Beyond occasional soil disturbance associated with Project maintenance and repair, impacts caused by the operation of this Project on physiology, geography, and soils are expected to be inconsequential.

As shown in above in Table 13, Project development will result in the permanent conversion of agricultural land. Approximately 6.9 acres of land classified as prime farmland and 37.8 acres of land classified as farmland of statewide importance will be permanently impacted by Project construction (i.e., converted to built facilities). However, it is anticipated that the farming will continue adjacent to Project infrastructure, and that only minor changes in existing land uses within the Project area will occur as a result of Project implementation. In terms of impacts to agricultural zoning districts, the Project components will occupy approximately 7.5 acres of AG District in the Town of Cortlandville, 13 acres of AG District in the Town of Homer, and 3 and 20 acres of AG-1 and AG-2 district land, respectively, in the Town of Solon. The Town of Truxton does not have established zoning districts. With regard to NYSA&M Agricultural Districts, the Project will occupy 28 acres of Cortland County Agricultural District 1. Other than occasional maintenance and repair activities, the Project should not interfere with on-going agriculture activities. For additional information about land use in the Project area and potential Project impacts to land use (including agricultural districts), please see Section 3.13.

Concerns have been raised regarding negative impacts to the landfill liner materials due to ground vibrations from the turbines in close proximity to the landfill. In response to these concerns, the Project Sponsor commissioned a study on the potential effects of installation of wind turbines on the integrity of the landfill liners (see Appendix E1). According to this study, vibrations imposed to the foundation soils during normal turbine operation are relatively low level vibrations (AE 2012, p. 7). This is because turbine foundations must be designed to meet a minimum foundation stiffness, specified by the turbine manufacturer and based on site specific dynamic soil properties. As discussed above, a subsurface investigation will be performed at each proposed turbine site prior to foundation design. Existing data on subsurface soil conditions at the landfill (as reported on landfill monitoring well logs) indicate that the subsurface soil and bedrock in the area of the landfill are not susceptible to liquefaction. Based on their experience with numerous other wind energy projects in the Northeast, AE (2012, p. 8) concluded that ground vibrations from the turbines will not likely be perceptible or problematic, and are not likely to negatively impact adjacent structures or the landfill liner systems.

In order to further investigate the perceived risk to landfill liners through vibration from operation of a wind turbine, the Project Sponsor had a vibration expert review the AE report; this review is included in Appendix E2. As indicated therein, wind turbines create ground vibration through interaction with their foundations. Although properly designed foundations minimize vibrations, all vibrations cannot be negated, so some ground motion is generated by turbine operation. Distance is a major factor in mitigating vibrations from a wind turbine, and was considered along with expected site specific ground conditions in evaluating potential for damage from wind turbine caused vibrations. Normal safe and tolerable vibrations of the wind turbine could result in small unbalanced forces, which would cause only small vibrations of the foundation and adjacent ground. Under some extreme conditions (wind velocity, duration, and direction), vibrations of a larger amplitude and many cycles may occur, but are not anticipated given the turbine operational limits would apply prior to such events occurring. The vibration review concluded that the placement of the wind turbines as proposed does not represent a hazard to the integrity of the landfill (Woods 2012, p.6). For additional information about vibrations, see Sections 3.10.2.2.9 and 3.14 of this DEIS.

Mr. Donald Chambers, the Cortland County Supervisor of Recycling/Solid Waste and Superintendent of Highways, provided a GIS shapefile to the Project Sponsor depicting the area that is considered to be undevelopable within the County landfill boundaries (area containing closed and operating landfill cells, land proposed for future use, etc.). All proposed wind turbines have been located outside of the "undevelopable area" as described and mapped by Mr. Chambers (2008). Although the proposed Project will not impact the existing landfill, future expansion of the landfill cells or other landfill operations not considered at the present time will have to consider the installed turbines and associated infrastructure in its plans.

It is anticipated that there will be a need for permanent drainage features at the transforming substation and operations and maintenance building location. Permanent drainage features will not be required at the Point of Interconnection substation site. For further detail of the operations and maintenance building facility, please refer to Section 2.5.7.

3.1.3 Proposed Mitigation

3.1.3.1 Proposed Mitigations During Construction

Impacts to topography and geology have been largely avoided by siting Project components so as to minimize disturbances to steep slopes, sensitive soils, and bedrock to the extent practical. Where cutting / filling etc. will be required to enable the installation of wind turbines and access roads on slopes, the impacts are within the mitigations proposed herein, particularly in respect of compliance with the SWPPP and regular interface and approval of such works by the Environmental Monitor. Reconnaissance-level investigations were conducted by **edr** personnel experienced with the permitting and construction of wind power projects, and these efforts resulted in relocation of certain Project components to avoid such resources.

As previously mentioned, a Desktop Study geotechnical investigation has been prepared to conduct a pre-construction evaluation of surficial and bedrock geology (see Appendix E1). As indicated in Section 7.2 of the

Desktop Study provided in Appendix E1, the underlying shale bedrock is anticipated to be rippable in shallow excavations using excavators, rock rippers, or chipping hammers. As further indicated in this report, the County Engineer's office has indicated bedrock encountered on construction related projects in the area has been rippable (AE 2012, p. 9). If the bedrock is not rippable, it will likely be excavated by pneumatic jacking. Blasting will not be used to remove bedrock during Project construction.

Prior to final Project design, a subsurface investigation will be performed at each proposed turbine and ancillary structure location to determine the site specific subsurface conditions and allowable soil/rock bearing capacities. Subsurface investigation activities consisting of soil borings and rock coring at each of the proposed turbine and ancillary structure locations, test pits, seismic testing, and additional laboratory testing will be performed to further evaluate the subsurface soil, bedrock, and groundwater conditions. In addition, pre-notification signs and warnings to affected landowners, use of best management practices, and compliance with applicable permit requirements will be instituted as mitigation measures.

At proposed construction sites identified as being located adjacent to steep slopes, a slope stability analysis will be performed for any structures (i.e., turbine foundations, substations, access roads and buildings) please refer to Sketches SK1 and SK2 in Appendix B -Typical Construction Photos and Details, for an indication of the type of construction detail envisaged and also to Figures 4A and 4B for an analysis of soil type, slope steepness etc.. At proposed construction sites with soils identified during the subsurface investigation as having the potential for significant volume changes, the final designs will require soils to be over-excavated and replaced beneath structures.

Siting turbines in relatively level locations, and using existing roads for turbine access, wherever possible have minimized potential impacts associated with soil disturbance. Impacts to topography and soils will be further minimized by the following means:

- Any access roads on steep slopes will be sited and designed in a manner that limits finished road grade to no more than 12%. Embankment design will analyze slope stability where necessary (refer to Sketch SK1 in Appendix B for an indication of the type of detail envisaged).
- Where turbines are located on steep slopes the excavation required to construct turbine foundations will be backfilled and compacted with the original topsoil depth reinstated on top of the compacted fill, thus avoiding settlement around the perimeter of turbine foundations (refer to Sketch SK2 in Appendix B for an indication of the type of detail envisaged for excavation to enable construction of foundations and for backfill around the turbine foundations on steep slopes). Where required, localized rip rap may be installed around the

turbine base to avoid scouring, all such work will be in compliance with the SWPPP and be undertaken with the approval of the Environmental Monitor.

- Topsoil disturbance and soil compaction will be minimized by limiting construction traffic to designated roads and access routes.
- Prior to commencing construction activities, erosion control devices such as hay bales, sand bags or silt fences will be installed between the work areas and downslope areas, to reduce the risk of soil erosion and siltation. Erosion control devices will be monitored continuously throughout construction and restoration for function and effectiveness, and will be maintained and/or replaced as necessary.
- All temporary stockpiled soils will be stabilized through seeding and/or mulching within seven days of disturbance.
- Soil stockpiles will be "windrowed" along access roads and around the perimeter of turbine work areas to avoid mixing of topsoil and subsoil, discourage off-road travel by construction vehicles, and be available for site restoration.
- Soil disturbance associated with the installation of buried collection lines will be minimized through the use of direct burial methods (e.g., cable plow), rather than open ditching, wherever possible.
- During construction activities, hay bales, silt fence, or other appropriate erosion control measures will be placed as needed around disturbed areas and stockpiled soils.
- Public road ditches and other locations where Project-related runoff is concentrated will be armored with rip-rap to dissipate the energy of flowing water and to hold soils in place.
- Where necessary, the electrical collection system may be carried on overhead poles in areas with severe soil or slope limitations or by written request of the landowner due to safety concerns such as on County landfill property.
- Following construction, all temporarily disturbed areas will be stabilized and restored in accordance with approved plans.

Impacts to soil resources will be minimized by adherence to best management practices that are designed to avoid or control erosion and sedimentation, stabilize disturbed areas, and prevent the potential for spills of fuels or lubricants. In addition, erosion and sedimentation impacts during construction will be minimized by the implementation of a Stormwater Pollution Prevention Plan (SWPPP) and associated erosion and sedimentation control plan developed as part of the State Pollution Discharge Elimination System (SPDES) General Permit for construction activities. Prior to construction, the Project Sponsor will be required to prepare a complete SWPPP, which will describe in specific terms the erosion and sediment control practices that will be implemented during construction activities and the stormwater management practices that will be used to reduce the pollutants in stormwater discharges after Project construction has been completed. Because the Project will disturb in excess of five acres, the SWPPP will include a construction sequencing plan that shows how the Project Sponsor will manage SWPPP implementation over the entire site for the duration of construction. The sequencing plan will be designed and implemented in such a way that limits the amount of soil exposed at one time, and will be approved by the NYSDEC prior to the commencement of construction activities. **edr** prepared a Preliminary SWPPP, which is attached hereto as Appendix F. The Preliminary SWPPP provides general information on stormwater management practices, including erosion and sediment control (vegetative and structural measures, temporary and permanent measures), construction phasing and disturbance limits, waste management and spill prevention, and site inspection and maintenance (**edr** 2012a, p. 1-2). To mitigate any potential impacts associated with erosion and sedimentation, the Project contractor will, at a minimum, implement the type of measures set forth in the Preliminary SWPPP provided in Appendix F. These measures include weekly SWPPP inspections during Project construction (a minimum of monthly if construction extends into the winter months) that will document compliance with the SWPPP, including installation and maintenance of all sediment and erosion control measures. SWPPP inspection and maintenance of temporary sediment and erosion control measures will continue until all disturbed soils on site have achieved 80% vegetative cover. The final SWPPP will analyze the Project area on a watershed-by-watershed basis, and apply specific stormwater management practices based on the temporary and permanent conditions that will exist within each watershed. Please refer to the Preliminary SWPPP in Appendix F, which provides typical details of temporary stormwater measures and permanent stormwater measures. During detailed design, the exact locations of such measures will be determined and depicted on the Project sediment and erosion control drawing set.

Mitigation measures to protect and restore any agricultural soils within the Project area will be undertaken during and after construction, and will include full restoration of temporarily disturbed agricultural land according to the *New York Department of Agriculture and Markets Guidelines for Agricultural Mitigation for Windpower Projects* (see NYSA&M Guidelines in Appendix G). Specifically, the following mitigation measures will be implemented with respect to agricultural soils:

1. Topsoil will not be stripped during saturated conditions when such actions would damage agricultural soils.
2. Existing farm roads will be used for temporary access to farmland to the extent practicable.
3. If temporary roads in new locations are necessary, topsoil in the work area will be stripped and stockpiled alongside the area of disturbance, (topsoil will be kept separate from subsoil), on the property from which it was removed.
4. All vehicular movements and construction activity will be restricted to areas where topsoil has been removed.
5. All temporarily disturbed agricultural soils will be restored following construction, which will generally involve the following sequence of activities:
    a. Removal of gravel or other temporary fill.

b. Decompaction of compacted subsoils to a depth of 18 inches using a deep ripper or heavy-duty chisel plow.
c. Disking and removal of stones (four inches and larger in size) from decompacted subsoil.
d. Spreading of stockpiled topsoil over the decompacted subsoil, and reestablishing pre-construction contours to the extent practicable.
e. Disking and removal of stones (four inches and larger in size) following the spreading of topsoil.
f. Seeding and mulching topsoil. Seed selection in agricultural fields will be based on guidance provided by the landowner and NYSA&M personnel.

Soil impacts occurring during the construction of the Project will also be minimized by providing the contractor and all subcontractors copies of the final construction documentation and erosion and sediment control plans, which will contain all applicable soil protection, erosion control, and soil restoration measures. During construction, the Environmental Monitor(s) will assure compliance with the construction plans/documentation and soil protection measures described above. As indicated above in Section 2.6.1, it is anticipated that the Environmental Monitor(s) will be selected by and report to the Cortland County Legislature (or its appointed representative). This individual (or individuals) would typically have a degree in environmental science (or similar), experience in environmental compliance or management, and completed NYSDEC erosion and sediment control training. The Environmental Monitor(s) will conduct inspections of all areas requiring environmental compliance, with an emphasis on those activities that are occurring within jurisdictional/sensitive areas. The Monitor(s) will keep a log of daily construction activities, and will issue periodic reporting and compliance audits. See Section 4.3 of this DEIS for additional information about the Environmental Compliance and Monitoring Program.

3.1.3.2 Proposed Mitigations During Operation

The above referred mitigations deployed during design and construction will consider the operational life of the Project and also assess the appropriateness of the associated design criteria over the operational life of the Project. For example, relevant long-term storm events will be considered as part of the engineering design of turbine foundations, stormwater protection, access roads, permanent drainage features at the substation, etc., in order to ensure the mitigations referred above remain valid for the operational life of the Project. Project components will be specified to have an adequate design life and only newly manufactured components shall be used to construct the Project. Part of the selection process for the GE1.6-100 was oriented toward selection of a turbine that has been designed so as to maximize the amount of 'up tower repair' as opposed to requiring a crane on a more regular basis. The SWPPP is described by NYSDEC as a living document, and remains an effective document for the life of the constructed project, guiding operation and maintenance of the post-construction stormwater management practices.

A regular inspection and monitoring regime shall be implemented to ensure that the performance of stormwater infrastructure, turbine foundations, access roads, etc. is maintained in accordance with the mitigations explained above. The Project Sponsor will liaise on a regular basis with the Cortland County Superintendent of Highways to ensure the adequate operation of stormwater infrastructure, assessment of any impacts requiring the operation of the wind turbines located on the County landfill, etc.

In addition, if complaints should arise, they will be addressed through the Community Outreach and Communication Plan (see Section 4.2 and Appendix L1).

Implementation of the mitigation measures above, along with post-construction monitoring that will also be implemented (in accordance with the *New York Department of Agriculture and Markets Guidelines for Agricultural Mitigation for Windpower Projects* provided in Appendix G), is anticipated to ensure that post-construction agricultural production remains consistent with the existing condition.

3.2 WATER RESOURCES

The Project area is located in the Mid-Atlantic drainage basin (USGS Hydrologic Unit 02050102) of the Chenango River Watershed, which ultimately drains to the Susquehanna River and eventually enters the Atlantic Ocean via Chesapeake Bay. On-site surface waters, wetlands, and groundwater resources are described below.

This sub-section is organized as follows:

- 3.2.1 Existing Conditions
- 3.2.2 Potential Impacts
- 3.2.3 Proposed Mitigation

3.2.1 Existing Conditions

3.2.1.1 Surface Waters

The rolling hills on which the Project is sited are bound by the East Branch of the Tioughnioga River to the west, Cheningo Creek to the east, and Trout Brook to the south (Figure 5). The East Branch of the Tioughnioga River is the dominant hydrologic feature in the vicinity of the Project area. In the central and southern portion of the Project area, Mosquito Creek, Maybury Brook, and other unnamed tributaries drain south into Trout Brook, which flows west into the East Branch of the Tioughnioga River. In the northeastern portion of the Project area, a few small unnamed creeks drain northeast into Cheningo Creek, which flows northwest into the East Branch of the Tioughnioga River. In the central and northern portion of the Project area, a different Trout Brook and other unnamed tributaries flow northwest, draining into the East Branch of the Tioughnioga River. The East Branch of the Tioughnioga River flows southwest, converging with the West Branch approximately 1 mile west of the Project area. From this confluence, the Tioughnioga River flows southeast, joining the Chenango River, and then draining into the Susquehanna River, which eventually enters the Atlantic Ocean via Chesapeake Bay.

There are several class C(t) NYSDEC protected streams within the Project area, including the northern Trout Brook and two unnamed tributaries, Maybury Brook and an unnamed tributary, Mosquito Creek, and two unnamed tributaries of the southern Trout Brook. Class C(t) streams are "protected streams," and are subject to the stream protection provisions of the Protection of Waters regulations, because the streams may support a trout population. All other streams within the Project area are classified by the NYSDEC as class C streams, indicating that they are suitable for non-contact activities and supporting fisheries. Class C waters are not subject to regulation under the stream protection category of the Environmental Conservation Law, Article 15 (Protection of Waters). All perennial and intermittent streams in the Project area are also protected by the Army Corps of Engineers (USACOE) under Section 404 of the Clean Water Act. There are no streams regulated by Section 10 of the Rivers and Harbors Act of 1899 (navigable waters) within the Project area. In addition, based on the definition set forth at 6 NYCRR 608.1(u) of the Environmental Conservation Law, and site-specific investigations, it is not anticipated that any waters identified within the Project area would meet the New York State definition of "navigable".

Streams in the Project area, both named and unnamed, are primarily low-gradient drainage features that meander through wetlands, agricultural fields, and pastures. Most of these streams are less than 10 feet wide with variable substrates, and vegetative cover characteristics. Some Project area streams have well-defined and abrupt banks, while the banks of others transition into adjacent wetland vegetation, and thus are essentially indiscernible. Small farm ponds/open water areas are also interspersed throughout the area. Generally, they are found in open field settings, adjacent to houses and barns, or within wetlands. Water depths, although not verified, are anticipated to be 4 feet or more. They may be used as a source of water for livestock as well as for fishing and aesthetic purposes.

3.2.1.2 Wetlands

All wetlands within the Project's proposed limits of disturbance have been identified and their approximate locations mapped based on review of aerial photography, review of state and federal wetland mapping, review of the location of mapped hydric soils, review of the locations of mapped springs and seeps, and on-site inventories based on federal wetland delineation methodologies. The results of these investigations are presented below.

3.2.1.2.1 Existing Information

Review of NYSDEC mapping indicates that there are a number of freshwater wetlands located within Cheningo Creek valley in the vicinity of the Project area that are regulated under Article 24 of the Environmental Conservation Law (Figure 5). Portions of two NYSDEC wetlands lie within the Project area, TR-4 and CY-3. State-regulated wetland TR-4 is designated as a Class II wetland by the NYSDEC. This wetland totals 28 acres in size, with 14.26 acres located within the boundaries of the Project area. Although only 1.08 acres of state-regulated wetland complex CY-3 occurs within the Project area, this wetland is noteworthy due to its large size (approximately 272 total acres). This Class II wetland includes portions of Cheningo Creek.

Review of National Wetland Inventory (NWI) mapping indicates that there are 52 federally mapped wetlands located within the Project area, totaling 46.95 acres. The federally mapped wetlands are identified in Figure 6. The NWI maps indicate that freshwater ponds and broad-leaved deciduous scrub-shrub wetlands are the dominant wetland types within the Project area, totaling approximately 12.55 and 12.75 acres, respectively. Needle-leaved evergreen forested wetlands are also common, totaling approximately 9.74 acres. Less common wetland types include broad-leaved deciduous forested wetlands (5.63 acres), freshwater emergent (2.89 acres), and riverine (3.39 acres).

A review of the National Hydric Soil List for New York State indicates that portions of the Project area contain hydric soils, as determined by the NRCS (2012a). Hydric soils covering approximately 39% of the Project area include Volusia channery silt loams, Chippewa channery silt loams, Alluvial land, Tuller channery silt loam, and Erie channery silt loams. In addition, Cortland County Soil Survey Mapping shows springs and seeps in several locations within the Project area. Such features are typically associated with wetlands, and were investigated during the field identification of wetlands, described below.

3.2.1.2.2 Field Review

edr personnel performed identification of wetlands and streams in areas proposed for wind power development during the 2012 growing season. Field surveys were conducted in those portions of the Project area where wetland impacts were likely to occur from construction and/or operation of the Project, including turbines, turbine workspaces, access roads, substation, O&M building, potential laydown areas, public road intersections (for potential widening/improvements), and buried electrical collection lines. A wetland study area was created for wetland delineation fieldwork that focused on specific areas that included the area within approximately 100 feet of each identified project component (Survey Area). The Survey Area also included various project component alternatives that were investigated as a part of the wetland fieldwork. The Survey Area was field reviewed and all potentially jurisdictional streams and wetlands within this area were identified. The term Survey Area refers only to the area of potential disturbance associated with the current Project layout. Although a formal delineation and jurisdictional determination have not yet been conducted, **edr** (2012b, p. 13) identified a total of 53 wetlands and streams within this Survey Area. The complete wetland inventory report can be found in Appendix H.

3.2.1.2.3 Wetland and Stream Descriptions

In general, jurisdictional wetlands identified within the Project area exist as one or a combination of the following types: 1) emergent wetland, 2) scrub-shrub wetland, 3) forested wetland, 4) farm ponds or 5) streams (ephemeral, intermittent and perennial). Wetland types were classified according to the Cowardin classification (Cowardin et al., 1979). Wetlands and streams identified within the Project area are depicted in Figure 7 of Appendix H, and descriptions of each of the communities are presented below.

Emergent wetland – A total of 15 wetlands within the Survey Area are emergent or are partially emergent. Emergent wetlands occur where surface water collects in shallow basins and/or adjacent to open water. These wetlands are characterized by more persistent and/or deeper inundation, often containing soils that remain inundated throughout the year. Although the Cowardin classification was used to classify wetlands, some of the emergent wetlands in this category could be best described, according to the EPA definition, as wet meadows (EPA 2012c). Wet meadow wetlands are usually found in poorly drained, low-lying depressional areas. Wet meadow wetlands may resemble grasslands and are typically drier than other marshes, except during periods of seasonal high water. They generally lack standing water for most of the year, though snow melt, stormwater runoff, and/or a high water table allows the soil to remain saturated for a significant portion of the growing season.

Emergent wetlands identified in the Survey Area are dominated by herbaceous plants such as cattail (*Typha latifolia)*, sedges (*Carex spp.*), rushes (*Juncus spp.*), green bulrush (*Scirpus atrovirens*), reed canary grass (*Phalaris arundinacea*), flat-topped goldenrod (*Euthamia graminifolia*), purplestem aster (*Symphotrichum puniceum*), joe-pye weed (*Eutrochium maculatum*), and boneset (*Eupatorium perfoliatum*). Evidence of wetland hydrology in the emergent wetlands identified within the Survey Area includes surface water, drainage patterns, saturated soils, microtopographic relief, and saturation visible on aerial imagery.

Scrub-shrub wetland – A total of 21 wetlands on site were found to be completely or partially scrub shrub. Scrub/shrub wetlands within the Survey Area are characterized by dense stands of shrub species less than 20 feet tall, including willows (*Salix spp.*), silky dogwood (*Cornus amomum*), gray dogwood (*Cornus racemosa*), common elderberry (*Sambucus nigra*), and nannyberry (*Viburnum lentago*). Herbaceous vegetation in these areas includes sensitive fern *(Onoclea sensibilis)*, marsh fern (*Thelypteris palustris*), creeping Jennie (*Lysimachia nummularia*), field horsetail (*Equisetum arvense*), American bugleweed

(*Lycopus americanus*), and various sedges. Evidence of wetland hydrology in the scrub-shrub wetlands identified within the Survey Area includes water-stained leaves, saturated soils, microtopographic relief, and saturation visible on aerial imagery.

Forested wetland **–** Forested wetland communities are dominated by trees that are 20 feet or taller, but also include an understory of shrub and herbaceous species. The 24 forested wetlands or partially forested wetlands in the Survey Area include a mix of hydrophytic trees such as green ash *(Fraxinus pennsylvanica)*, American elm (*Ulmus americana*), red maple *(Acer rubrum*), and black willow (*Salix nigra*). Herbaceous species in forested wetland include sedges, manna grasses (G*lyceria spp.*), spotted jewelweed *(Impatiens capensis)*, pale jewelweed (*Impatiens pallida*), creeping buttercup (*Ranunculus repens*), royal fern (*Osmunda regalis*), and stinging nettle (*Urtica dioica*). Evidence of wetland hydrology in the forested wetlands identified within the Survey Area includes water-stained leaves, water marks, moss trim lines drainage patterns, saturated soils, microtopographic relief, and saturation visible on aerial imagery.

Farm Ponds - A few small farm ponds and recreation ponds are found within the Survey Area, generally in open field settings or adjacent to houses and barns. Typically, these ponds are excavated or diked, with well-defined banks. Emergent wetland vegetation tends to be limited or lacking. Although not verified, water depths are expected to be consistent with excavated ponds that are used as a source of water for livestock as well as for fishing and aesthetic purposes. Such ponds are typically a minimum of 4 feet deep.

Streams **–** A total of 31 streams were identified in the Survey Area. Streams within the Project area are located amongst agricultural fields, forests, and old-field communities, and generally have a gentle gradient (0-3%). Most of the delineated streams are intermittent, with a rocky substrate, and did not have well defined and established riparian corridors typical of larger, perennial stream/river systems. The majority of streambeds were dry at the time of the field investigation, due to the lack of adequate precipitation. Water depths within the channels with stream flow averaged 2-5 inches.

The primary functions provided by these wetlands appear to include maintaining surface water flows, recharging groundwater supplies, storm water retention, flood protection and abatement, water quality improvement, wildlife habitat, and nutrient production and cycling. Many of the delineated wetlands are portions of much larger systems, which may provide significant functions and values. For example, several of the larger forested wetlands provide habitat for forest-nesting songbirds. In addition, areas that may potentially provide vernal pool habitat were observed; however, these observations did not occur in the spring (when vernal pools are typically most pronounced) and therefore the presence of vernal pools was not definitively documented.

3.2.1.3 Groundwater

The City of Cortland and surrounding communities obtain water from a highly productive glacial-aquifer system that borders the Project area. This aquifer underlies the western part of Cortland County, which includes the parts of the West Branch, East Branch, and Tioughnioga River valleys, along with the Trout Brook and Cheningo Creek valleys. Aquifers in the vicinity of the Project area are mapped in Appendix C of the desktop geotechnical study (DEIS Appendix E1). Note that the proposed Project will be located in the uplands, well above and outside of the aquifer footprints located in the valleys. This aquifer system has been designated as a "Primary Aquifer" by the New York State Department of Environmental Conservation and as a "Sole Source Aquifer" by the U.S. Environmental Protection Agency (EPA). In 1989, the U.S. Geological Survey (USGS), in cooperation with Cortland County Departments of Health and Planning, began a 3.5-year study to define the hydrogeology of this glacial aquifer. The results of the study were published by the USGS in 1998, and summarized in an associated Fact Sheet published by the USGS in 2004.

The upper layer of the glacial-aquifer system in the Cortland area consists of an unconfined sand and gravel aquifer 40 to 80 feet thick. The water table in unconfined aquifers fluctuates up and down, depending on the recharge and discharge rates. Water is received directly from the surface; there is no overlying "confining beds" of low permeability that physically restricts the movement of water in or out of the aquifer. In the Cortland glacial-aquifer system, the unconfined aquifer overlies a lacustrine confining layer 1 to 155 feet thick that, in turn, overlies a confined sand and gravel aquifer that ranges from 1 to 170 feet thick. The confining unit impedes vertical movement of ground water between the upper and lower aquifers in the middle of the valley, but the two aquifers are connected in many places along the valley walls where the confining layer is absent.

The unconfined aquifer receives recharge from three primary sources: 1) infiltration of precipitation that falls directly on the aquifer, 2) upland sources, such as runoff from unchanneled hillsides and seepage from bedrock slopes that border the aquifer, and 3) seepage from tributaries that flow onto the aquifer. The confined aquifer is recharged along the edges of the valley. The upper portion of the aquifer is close to the surface and highly permeable, which makes it highly susceptible to contamination. Protection of this aquifer system from contamination is critical to ensure a safe drinking-water supply for the area (USGS 2004, p. 1).

According to the EPA Safe Drinking Water Information System, surrounding municipalities that rely on groundwater for their drinking water supply include the City of Cortland, Town of Cortlandville, Village of Homer, Village of Marathon, Village of McGraw, Town of Preble, Town of Truxton, and Town of Virgil (EPA 2012a). Of these municipalities, the only health-based violation report to the EPA was in the City of Cortland for an exceedance of coliform in June 2006.

A search of available water well records from the NYSDEC within the Project area indicates recent wells drilled in the towns are drilled into bedrock that is encountered at depths ranging from a few feet below the surface to 175 feet. Well yields ranged from 1.5 gallons per minute (GPM) to 60 GPM. The NYSDEC Water Well Data is available in Appendix D of the AE Desktop Study (DEIS Appendix E1), and the well locations have been mapped on Figure 5 of this DEIS. Based on an EPA report on the Cortland Homer Preble Aquifer System, drinking wells located in the upland areas are typically drilled into bedrock and generally have relatively low yields. The report indicates the water table is as deep as 100 feet below the surface in the upland areas, well above the surrounding valley floors (EPA 2010).

A review of the NYSDEC water well database indicates that there are a limited number of wells in the Project area; however, this is a limited dataset as it does not contain data prior to 1999. Conversations with Cortland County Soil and Water Conservation District have revealed that every residence within and adjacent to the Project area is anticipated to have its own water well. Based on the assumption that water wells are anticipated to be within 50 feet of each house (P. Reidy, pers. comm.), a map was created to depict known water wells. Please refer to Figure 5A, sheets 1-4 for a map of anticipated water well locations in the area.

Monitoring well drilling logs provided by TCI (prepared by Barton and Loguidice, P.C. for Cortland County) for wells MW-17A/B and MW-18A/B near the center of the existing Cortland County Landfill facility generally encountered very stiff to hard, fine grained glacial till soils that extended to the surface of shale bedrock at depths of approximately 46 and 84 feet, respectively. Based on limited monitoring well data provided to AE, groundwater in the landfill area generally appears shallow and flows in a southerly direction. It is not known if the shallow groundwater measured in the wells is perched groundwater or the static groundwater table (AE 2012, p. 7).

Groundwater flow in the upland areas is toward and into the streams that cross the Project area. It is expected that groundwater flows from the higher elevations along the underlying till and bedrock to the lower stream valleys. Based on the topography across the Project area, groundwater flow directions and gradients may vary (Pers. Comm. B. Barnes, AE 2012, p. 2). Due to the topography of the Project area, it is assumed that in the north of the Project area, groundwater generally flows northwards to the principal aquifer underlying the East Branch Tioghnioga River valley. In the southern half of the Project area the groundwater flows southwards to the principal aquifer around McGraw village and Trout Brook. These principal aquifers then recharge the primary glacial-aquifer system at Cortland (USGS 2004, p. 4).

Post construction drainage pathways and stormwater control infrastructure to direct flow of runoff and stormwater will be based on a site grading plan that will be designed prior to construction, during the detailed design phase of the Project.

3.2.1.4 Floodplains

Review of Federal Emergency Management Agency (FEMA) mapping indicates that small portions of the floodplains associated with the East Branch of Tioughnioga River, Cheningo Creek, and Mosquito Creek extend into the Project area in several locations. FEMA flood hazard Zones A, AE, and X500 occur within the Project area. Zones A and AE are subject to a 1% chance of flooding annually, while flood Zone X500 FEMA is outside the areas that have a 0.2% annual chance of flooding (i.e., outside the 500 year floodplain).

The East Branch of the Tioughnioga River floodplain is designated as FEMA flood hazard Zone AE along the northwestern portion of the Project area (with small areas designated as X500), and Zone A along the northern portion of the Project area. Along the eastern boundary of the Project area, the Cheningo Creek floodplain is designated as FEMA flood hazard Zone A. The floodplain associated with Mosquito Creek, designated as FEMA flood hazard Zones A and AE, crosses into small portions of Project parcels in the western portion of the Project area.

There are no Project components located within FEMA-designated floodplains.

3.2.2 Potential Impacts

Potential impacts to surface waters and wetlands are anticipated to include minor alterations of soil profile and drainage patterns, possible siltation and sedimentation, and some temporary and permanent filling. Based upon the preliminary project layout, wetland inventory, and desktop evaluations conducted to date, an assessment of temporary and permanent impacts to wetlands and streams is presented below. The Project was designed to minimize the impact on streams wherever possible, but because of the need to connect turbines with electrical collector cable and have access roads between turbines, some stream crossings were unavoidable. Those crossings needing Article 15 stream disturbance permits have been identified in Table 14 below.

3.2.2.1 Construction

3.2.2.1.1 Surface Waters and Wetlands

To avoid or minimize the overall permanent impacts to streams and wetlands, preliminary and final Project design will be guided by the following criteria during the siting of wind turbines and related infrastructure:

- Large built components of the Project, including wind turbine generators, the staging area, O&M facility, and substation, are anticipated to avoid wetlands to the maximum extent practicable.
- Number and overall impacts due to access road crossings were minimized by routing around wetlands whenever possible and utilizing existing crossings and narrow crossing locations to the extent practicable.
- Buried 34.5 kV electric collector lines will avoid crossing forested wetlands whenever possible, crossed wetlands at narrow points, and will utilize installation techniques that minimize temporary wetland impacts.

Other Project area environmental or logistical constraints, such as Project participants/lease holders, landowner concerns, buried utilities, and other current land use, may make further avoidance of wetlands and streams unfeasible.

During construction, potential direct or indirect impacts to wetlands and surface waters may occur as a result of the installation of access roads and wind turbine foundations, the upgrade of local public roads, the installation of above ground or buried electrical interconnects, and the development and use of temporary workspaces around the turbine sites. Direct impacts include 1) an increase in water temperature and conversion of cover type due to clearing of vegetation, 2) siltation and sedimentation due to earthwork, such as excavating and grading activities, 3) disturbance of wetland vegetation and soils and stream substrate resulting from buried cable installation, and 4) the direct placement of fill in wetlands and surface waters to accommodate road crossings. The construction of access roads and possibly the upgrade of local public roads are anticipated to result in both permanent (loss of wetland/surface water acreage) and temporary impacts to wetlands. The development and use of temporary workspaces will result in only temporary impacts to wetlands/streams. The installation of above ground or buried electrical interconnects will temporarily disturb streams and wetlands during construction as a result of clearing (brushhogging, or similar clearing method requiring no removal of rooted woody plants), and soil disturbance from burial of the electrical 34.5 kV collector lines or from pole installation (if above ground electrical 34.5 kV collector lines are required).

Indirect impacts to wetlands and surface waters may result from sedimentation and erosion caused by construction activities (e.g., removal of vegetation and soil disturbance). This indirect impact may occur at wetlands adjacent to work areas where no direct wetland impacts are anticipated, including areas adjacent to proposed access road upgrade/construction, electrical collector and interconnection routes, turbine sites, staging area(s), wind measurement towers, or the substations. The construction of wind turbine foundations could give rise to concrete being spilled into wetlands or water courses.

Based on an analysis of the proposed Project layout and the delineated wetland boundaries, approximately 9.5 acres of temporary wetland/stream soil disturbance are anticipated to occur due to Project construction. These impacts will involve temporary placement of fill to accommodate proposed Project access road construction and turbine work spaces, as well as temporary soil disturbance associated with the installation of buried electrical collection lines. No impacts to State regulated freshwater wetlands are proposed.

To further minimize impacts to wetlands and streams, it is anticipated that trees within forested wetlands will be cleared manually and flush cut to ground level. Timber matting will be used, as needed, to access forested wetlands. Wherever feasible, buried electrical collector lines will be installed co-linear with access roads to minimize disturbance to wetlands.

Following Project construction, temporarily impacted wetland areas will be restored, and are anticipated to include the following:

- 200-foot radius turbine workspaces will be reduced to a permanent footprint of 0.2 acre (115-foot by 66-foot gravel crane pad, 18-foot diameter turbine pedestal, and a 6-foot wide gravel skirt around the tower base).
- Access roads will be reduced to maximum drivable width of 20 feet (except where unstable soil conditions or severe erosion hazard preclude restoration).
- The 100-foot crane paths will be allowed to regenerate naturally.
- Buried electrical collector lines routes will be allowed to regenerate naturally.

Permanent impacts to surface waters and wetlands (loss of surface water/wetland acreage) will result from the footprint of permanent access roads necessary to accommodate long-term maintenance and operation activities. Other long-term impacts to wetlands will occur as a result of clearing activities (e.g., brushhogging within the buried collection line ROW) in forested wetlands. This activity will not result in a loss of wetland acreage, but will result in the conversion of forested wetlands to communities dominated by shrub and herbaceous vegetation (scrub-shrub/wet meadow/emergent). Based upon the proposed layout, the permanent footprint of access roads (drivable width of 20 feet wide) is anticipated to result in approximately 1.5 acre of permanent impacts to wetlands/streams. No permanent impacts to NYSDEC freshwater wetlands or protected streams are proposed. A summary of all anticipated wetland and stream impacts, including wetland type and location is provided below in Table 14.

Table 14. Wetland and Stream Crossings

Wetland ID	Component(s)	# of Crossings (Wetland Communities Impacted)	Location	Figure 7 Sheet Number	Anticipated Permit
C	Access road to substation and turbines 4, 5, 8, 11.	2 (both are Intermittent Stream/PSS)	Between the northern end of Shippey and Town Line Rds.	1, 6, 7	Nationwide Permit, Section 401
BBG	Collection line between turbines 8 and 19.	1 (Perennial Stream/PFO)	Between the northern end of Shippey and Town Line Rds.	2	Nationwide Permit, Section 401
BBA	Collection line between turbines 22 and 32.	1 (Intermittent Stream/PSS)	South of the intersection of Maybury and Bell Rds.	3, 8	Article 15, Nationwide Permit, Section 401
BBK	Access road to turbine 33. Collection line between turbines 27, 33, 34, and 36.	3 (2 Intermittent Streams, 1 PFO)	North of Bell Rd.	3, 4	Nationwide Permit, Section 401
H	Collection line between turbines33 and 36. Turbine 36 workspace.	2 (1 Intermittent Stream, 1 PSS)	North of Bell Rd.	4	Nationwide Permit, Section 401
B	Access road from Parks Rd to turbines 1 and 2. Collection line between turbines 1 and 2.	1 (Intermittent Stream/PEM/PSS)	North of the intersection of Phelps and Parks Rds.	9	Nationwide Permit, Section 401
A	Collection line between turbines 2 and 3.	1 (PFO)	North of the intersection of Phelps and Parks Rds.	9	Nationwide Permit, Section 401
BBD	Collection line between turbines 3 and 10.	1 (Intermittent Stream/PFO)	Between North Road and Phelps Rd.	10	Nationwide Permit, Section 401
BBC	Collection line between turbines 3 and 10.	2 (PEM/PSS)	Along North Road south of Parks Rd.	10	Nationwide Permit, Section 401
JPN	Collection line between turbines 10 and 12. Turbine 10 workspace.	2 (1 PEM, 1 PFO)	Parks road east of North Rd.	11	Nationwide Permit, Section 401
JPL	Collection line/access road between turbines 18 and 20.	1 (Intermittent Stream)	Between Potter Road and Town Line Rd.	13, 20	Nationwide Permit, Section 401
BBL	Collection line between turbines 32 and 38.	1 (Intermittent Stream/PSS)	Intersection of 4-H and Knecht Rds.	14	Article 15, Nationwide Permit, Section 401
S1012	Collection line between 32 and 38.	1 (Ephemeral Stream/PEM)	Intersection of 4-H and Knecht Rds.	14	Article 15, Nationwide Permit, Section 401
JPA	Turbine 39 workspace and access road. Collection line between turbines 39 and 40.	1 (Intermittent Stream/PFO/PSS)	Between Tower and Knecht Rds.	15	Nationwide Permit, Section 401
JPB	Access road to turbines 41-45. Collection line between turbines 40 and 41.	2 (PEM)	Between Taylor Valley and Tower Rds.	16	Nationwide Permit, Section 401
BBE	Collection lines between turbines 13 and 5.	1 (Perennial Stream/PFO)	Between McGraw North and Town Line Rds.	18	Nationwide Permit, Section 401
JPJ	Access road for turbines 12 and 13. Collection line between turbines 9 and 13. Turbine 12 workspace.	1 (PFO)	North of Heath Rd.	18, 19	Nationwide Permit, Section 401
JPI	Access road for turbines 12 and 13. Collection line between turbines 9 and 13.	1 (Intermittent Stream/PSS/PEM)	North of Heath Rd.	18, 19	Nationwide Permit, Section 401

	Turbine 12 workspace.				
JPK	Collection line/access road between turbines 18 and 20.	2 (1 PSS/PEM, 1 Intermittent Stream)	Between Potter and Town Line Rds.	20	Nationwide Permit, Section 401
W53	Access road to turbine 38.	1 (Intermittent Stream/PSS/PEM)	East side of Syrian Hill Rd, south of Harris Rd.	21, 22	Nationwide Permit, Section 401
JPP	Access road to turbine 38.	1 (PSS)	East of Syrian Hill Rd, south of Harris Rd.	22	Nationwide Permit, Section 401
JPQ	Access road to turbine 38.	1 (Perennial Stream/PFO/PSS)	East of Syrian Hill Rd, south of Harris Rd.	22	Nationwide Permit, Section 401
BBM	Collection line between turbines 38 and 40.	2 (Both are Perennial/Intermittent Stream/PFO/PSS)	Between Harris and North Tower Rds.	23	Nationwide Permit, Section 401
S1015	Collection line between turbines 14 and 17.	1 (Perennial Stream)	Along Heath Road	24	Article 15, Nationwide Permit, Section 401
BBB	Collection line between turbines 31 and 37.	1 (Perennial Stream/PFO)	Between Syrian Hill and Lapp Hill Rds.	25, 28	Nationwide Permit, Section 401
JPD	Collection line between turbines 15 and 28.	1 (Perennial Stream/PFO)	Between Maybury and Soshinsky Rds.	26	Article 15, Nationwide Permit, Section 401
JPF	Collection line between turbines 15 and 28.	1 (Perennial Stream)	Between Maybury and Soshinskly Rds.	26	Article 15, Nationwide Permit, Section 401
JPE	Collection line between turbines 15 and 28.	1 (Intermittent Stream)	Between Maybury and Soshinsky Rds.	26	Nationwide Permit, Section 401
JPG	Collection line between turbines 15 and 28.	1 (Intermittent Stream)	Between Maybury and Soshinsky Rds.	26	Nationwide Permit, Section 401
JPH	Collection line between turbines 15 and 28.	1 (Intermittent Stream/PSS)	Between Maybury and Soshinsky Rds.	26	Nationwide Permit, Section 401
JPU	Access road for turbines 28 and 31. Collection line between turbines 15 and 28.	1 (Intermittent Stream)	Between Syrian Hill and Lapp Hill Rds.	27	Nationwide Permit, Section 401
JPT	Access road/collection line between turbines 28 and 31. Turbine 28 workspace.	1 (Intermittent Stream)	Between Syrian Hill and Lapp Hill Rds.	27, 28	Nationwide Permit, Section 401
JPO	Access road to turbine 37. Collection line between turbines 37 and 31.	1 (PFO)	Between Syrian Hill and Harris Rds.	29	Nationwide Permit, Section 401

As indicated above, only six crossings are anticipated to trigger jurisdiction under Article 15 of the Environmental Conservation Law, and all of these crossings are temporary and associated only with collection lines between turbines (i.e., no permanent impacts to Article 15 waters). All other crossings are anticipated to fall under the jurisdiction of the Clean Water Act (Nationwide Permit [Section 404] and Water Quality Certification [Section 401]). Final jurisdiction of all impacted streams and wetlands will have to be determined by the respective regulatory agencies (NYSDEC and U.S. Army Corps of Engineers).

3.2.2.1.2 Groundwater

The proposed turbine and ancillary structures will be located in the uplands, well above and outside of the aquifer footprints located in the valleys. Excavations for foundations, roadways, and underground collector lines are expected to be relatively shallow and are not anticipated to intercept groundwater within the surrounding aquifers. Since the upland areas are a source of aquifer recharge, the aquifers could be exposed to contamination due to runoff from the Project area if suitable storm water or runoff control measures are not employed. However, the Crown City Wind Energy Project will adhere to a SWPPP to prevent contamination and/or erosion due to surface runoff, thereby avoiding such impacts (AE 2012, p. 7).

As previously mentioned, the Project will add only small areas of impervious surface, which will be dispersed throughout the Project area, and will have a negligible effect on groundwater recharge. However, construction of the proposed Project could result in certain localized impacts to groundwater, and the use of that water by adjacent landowners. These impacts could include:

- Minor localized disruption of groundwater flows down-gradient of proposed turbine foundations;
- Minor modification to surface runoff or stream-flow, thereby affecting groundwater recharge characteristics;
- Minor degradation of groundwater chemical quality from installation of concrete foundations; and
- Impacts to groundwater recharge areas (wetlands).

Perched groundwater should be anticipated in shallow excavations due to the high percentage of fines (silt and clay), poor drainage properties of the soils, and the presence of shallow bedrock within the Project area. Additionally, ponding of surface and/or precipitation water may occur in open excavations and in low-lying areas. It is anticipated that perched groundwater and surface water that accumulates in shallow excavations of the upland areas can generally be controlled using conventional sump and pump methods.

Installation of turbine foundations has the greatest potential for impacts to groundwater. Based on the information reviewed during AE's Desktop Study, it is anticipated that the underlying shale bedrock will be rippable in shallow excavations using large excavators, rock rippers, or chipping hammers. If the bedrock is not rippable, it will likely be excavated by pneumatic jacking or. Blasting will not be used to remove bedrock at this site. A detailed on-site study of the surface and subsurface conditions will be conducted prior to final project design.

The construction process could also impact groundwater flow paths in areas where excavation occurs below the water table. In these instances, 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 an effect on the elevation of the water table. However, this water will be pumped to the surface and allowed to infiltrate back into the water table 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 chemistry (pH) during the curing process. This effect will not extend beyond the immediate area of the foundation and will not adversely affect groundwater quality. With respect to groundwater in the vicinity of the County Landfill, based on the USDA soil survey data, a perched groundwater condition should be anticipated during turbine foundation excavations near the landfill that may require temporary construction dewatering. Turbine foundations have typically been designed to resist hydrostatic forces, when required, rather than installing permanent drainage systems. Based on the desktop review conducted by AE and the distances of the turbines from the landfill, construction of the turbine foundations should not impact groundwater levels in the landfill area. The groundwater levels at the turbine locations and potential construction impacts to the landfill would be evaluated once soil borings are performed and addressed through relatively common engineering and construction techniques (B. Barnes, pers. comm.). Construction of the Project is not expected to have any adverse impacts on the lined or unlined landfill cells, and it is therefore anticipated that the quality of leachate and its collection and storage systems will not be affected by the installation or operation of wind turbines (Woods 2012, p. 6). Please refer to Section 3.14 for further detail.

In addition to impacts to groundwater due to turbine foundation installation, minor impacts could result from other Project activities. Construction of access roads will result in minor increases in storm water runoff that otherwise would have infiltrated into the ground at the road locations. Buried 34.5 kV collector lines may facilitate groundwater migration along trench backfill in areas of shallow groundwater. Construction of Project components that traverse wetlands may also have an impact on groundwater as many wetlands serve as groundwater recharge areas.

An additional potential impact to groundwater is the introduction of pollutants to groundwater from the discharge of petroleum or other chemicals used during construction, operations or maintenance. 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.

3.2.2.1.3 Floodplains

As previously indicated, floodplains only occur in small portions of the Project area, primarily on the periphery of the Project area. No project components are located within floodplains, and no construction activities are proposed within floodplains. Therefore, Project construction will not directly impact any floodplains.

Indirect impacts to floodplains could result from soil sedimentation caused by construction activities, such as soil disturbance and the removal of vegetation. However, given the distance that floodplains lie from the proposed activities, and with the implementation of mitigation measures that have proven effective at keeping soil sedimentation at very low level, no adverse impacts to floodways are anticipated. Erosion and sedimentation impacts during construction will be minimized by the implementation of an erosion and sedimentation control plan developed as part of the State Pollution Discharge Elimination System (SPDES) General Permit for the Project. These erosion and sediment control measures shall, at a minimum, include the measures set forth in the Preliminary SWPPP, provided in Appendix F. The FEIS will present additional mapping and site-specific information on stormwater flows, as available, based on engineering completed in support of SWPPP/SPDES General Permit. During detailed design, the exact locations of such measures will be determined and depicted on the Project sediment and erosion control drawing set.

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 wetlands, streams, or other surface waters within the Project area. Vehicular access to the turbines, substation, meteorological tower, and O&M facility will be completely established during Project construction, and routine operation and maintenance procedures are not anticipated to result in significant adverse impacts. Minor and isolated incidences of impact may occur, which could have a minimal impact to surface waters or wetlands in or adjacent to the Project area, including buried electrical collector line maintenance, access road washouts, culvert replacement/maintenance, or accidental fuel/chemical spills. Adequate procedures, training and mitigation measures (such as spill kits in all vehicles) will be implemented during the operational phase of the Project to mitigate this potential impact, as described in Section 3.2.3. All repair activities will be in accordance with all applicable federal, state, and local permits and associated conditions/requirements.

To the extent practicable, all major repairs will be facilitated through use of existing Project-related infrastructure (e.g., permanent gravel access roads, crane pads, etc.). If existing infrastructure is not adequate to accommodate certain repairs, any additional infrastructure improvements will be conducted in accordance with the applicable regulations (e.g., widening of an access road within or adjacent to a wetland will be conducted in accordance with Section 401 and 404 of the Clean Water Act, and Article 24 of the Environmental Conservation Law, as applicable). Please see Section 2.7 for a discussion of environmental considerations during decommissioning activities.

The proposed Project will not result in significant conversion of land to built/impervious surfaces. Tower bases, crane pads, access roads, and the substations in total will add approximately 55.5 acres of impervious surface to the 7,500-acre Project area (i.e., conversion of less than 1%). In addition, the final SWPPP will examine the Project area on a watershed-by-watershed basis, and incorporate stormwater management features that minimize alteration of run-off characteristics within each watershed. These proposed features will be designed by a licensed PE and reviewed and approved by the NYSDEC before being implemented. Consequently, no significant changes to the rate or volume of stormwater runoff are anticipated. The SPDES regulations dictate that the rate of stormwater runoff associated with the post-construction condition must not exceed the rate of stormwater runoff associated with the pre-construction condition. To assure this, hydrologic models (e.g., Hydraflow Hydrographs Extension for AutoCAD Civil 3D software) based upon measurable watershed characteristics will be utilized by professional engineers to calculate stormwater discharges. Stormwater runoff rates discharged from the site under existing conditions (pre-construction) will provide the basis for evaluation and comparison to proposed conditions (post-construction). Design points of interest will be established where stormwater runoff exits the site (e.g., where proposed Project access roads intersect with existing pubic roads/roadside ditches). These design points will provide fixed locations at which existing and proposed stormwater quantities can be compared. The areas draining to these design points will be delineated using land survey information and proposed grading plans, and a hydrologic analysis of each of the drainage areas will be conducted to model their discharges (typically for the 1, 2, 10, 25, 50 and 100-year storm events) and will be used as the basis for designing appropriate mitigation measures and meeting SPDES requirements. Based on experience with other wind power projects, long term control of stormwater quantity and quality is typically managed through the use of features other than on-site retention basins. Features such as grass filters and level spreaders are typically employed, as they more closely mimic natural drainage features and require less long-term maintenance. See Attachments A and B of Appendix F for standards and specifications of temporary and permanent stormwater control measures. These features are also easily accommodated within the Project's existing "footprint" of disturbance. The FEIS will present additional mapping and site-specific information on stormwater flows, as available, based on engineering completed in support of SWPPP/SPDES General Permit.

3.2.2.2.2 Groundwater

Most potential impacts to groundwater (e.g., alteration of flow patterns or potential contamination due to excavation and backfilling) will occur during construction only and are described above in Section 3.2.2.1.2. Over the long term, addition of small areas of impervious surface to the Project area in the form of permanent access roads, crane pads, the O&M facility, and the substations will have a minimal effect on groundwater recharge. Turbine foundations installed below the water table are not anticipated to have any measurable effect on groundwater levels, flow patterns, or gradients. The migration of groundwater along buried collector line trenches could have a minor effect on groundwater flow paths, and the ongoing potential for chemical spills during operation/maintenance could also affect groundwater.

Dr. Richard D. Woods, Professor Emeritus of Civil Engineering, Department of Civil and Environmental Engineering, University of Michigan at Ann Arbor, provided a description of vibration potential for the Project. His report (included in Appendix E2, Woods), (2012, p. 6) concluded that the placement of the wind turbines as proposed does not represent a hazard to the integrity of the landfill cells or landfill caps due to vibration. Therefore it is anticipated that there will be no impact on the quantity or quality of leachate or the manner in which such leachate is stored. Therefore it is not anticipated that the operation of the Project will have an impact on groundwater quality. For additional information about vibrations, see Sections 3.1.2.2 and 3.14 of this DEIS.

3.2.2.2.3 Floodplains

As previously indicated, no Project components occur within a floodplain or floodway, and no significant changes to the rate or volume of stormwater runoff are anticipated. Project operation will have no impacts on such resources.

3.2.3 Proposed Mitigation

As mentioned previously, wetland and stream impacts have been mitigated by siting major Project components away from wetlands and surface waters. However, some minor impacts associated with crossings of access roads and buried electrical cables are unavoidable. To mitigate for unavoidable permanent wetland and stream impacts as well as permanent conversion impacts (i.e., clearing of forested wetlands) associated with the Project, if required, the Project Sponsor will undertake a suitable on-site or off-site compensatory mitigation project, ranging from the creation of in-kind wetland to contribution to an agency approved mitigation bank. This suitable compensatory mitigation project will be developed in consultation with the NYSDEC and USACOE during the Joint Application for Permit process.

Based on previous experience permitting wind power projects, mitigation for indirect or temporary impacts to wetlands or streams is unlikely to be required by the permitting agencies, given the fact that these impacts will not result in any loss of stream channel or wetland acreage. However, temporary impacts to wetlands/streams will be minimized during construction as discussed below.

The direct impacts to wetlands/streams will be minimized by utilizing existing or narrow crossing locations whenever possible. Upgrading existing crossings that are under-maintained/undersized will have a long-term beneficial effect on water quality, as it will help to keep farm equipment and other vehicles out of surface waters. Special stream crossing techniques, such as the use of pumps to dewater the stream channel within the work area, and installing crossings "in the dry" will be used to minimize adverse impacts and downstream water quality. At both wetland and stream crossings, examples of these techniques can be seen in Appendix B. Equipment restrictions, herbicide use restrictions, and erosion and sedimentation control measures will be utilized to reduce adverse impacts to water quality, surface water hydrology, and aquatic organisms. In addition, clearing of vegetation along stream banks and in wetland areas will be kept to an absolute minimum to limit loss of shade, minimize soil exposure, and facilitate restoration.

Where crossings of surface waters and wetlands are required, the Project Sponsor will employ 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, and streams will be designated "No Equipment Access" on construction drawings, thus prohibiting the use of motorized equipment in the areas. Compliance with No Equipment Access Areas and Restricted Activities Areas (described below) will be enforced by the Environmental Monitor(s).
- *Restricted Activities Area:* A buffer zone of 100 feet, referred to as "Restricted Activities Area", will be established where Project construction traverses streams, wetlands 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, routing 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 maintain the natural water levels/flows on each side of the road.

- *Sediment and Siltation Control*: A soil erosion and sedimentation control plan will be developed and implemented as part of the 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 Project development. Exposed soil will be seeded and/or mulched to assure that erosion and siltation is kept to a minimum along the wetland boundaries. The range of control measures that could be applied are specified in the preliminary Project SWPPP included as Appendix F. The location of these features will be indicated on construction drawings and reviewed by the contractor and Environmental Monitor(s) prior to construction. The Environmental Monitor(s) will also inspect these features to assure that they function properly throughout the period of construction, and until completion of all restoration work (final grading and seeding).
- *Restoration of Temporary Disturbance*: All wetlands and streams temporarily disturbed by buried cable installation or access road crossings will be restored by removing any temporary fill and reestablishing pre-construction contours. Native stone or heavy rip rap will be used to stabilize all incised stream channels, and stockpiled native topsoil will be used to restore disturbed wetlands and stream banks. A native wetland seed mix will be applied to all exposed soils, along with temporary sediment and erosion control measures. These measures may include, but not be limited to, mulch, jute mesh, straw wattles, and selective placement of stone or bio-engineering materials. Temporary erosion and sedimentation controls will remain in place at these sites until they are fully revegetated. Post construction monitoring of these will be conducted (in concern with invasive species monitoring) to assure that they are stable, functional and adequately vegetated with native plant species.

The wetland impacts previously described will be re-evaluated during the state and federal wetland permitting process. This process will require a Joint Application for Permit filed with the NYSDEC and the USACOE, and will involve the following steps:

1. Submission of a final wetland delineation report to USACOE and NYSDEC, along with request for jurisdictional determination by these agencies.
2. Site visits by USACOE and NYSDEC representatives to both 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 could include a number of possible options, including in-kind replacement of all permanently impacted wetlands through wetland creation, wetland enhancement, wetland preservation, wetland mitigation fee, or mitigation bank contribution.

5. USACOE and NYSDEC processing/review of the permit application, including public notice and consultation with other state and federal agencies (SHPO, EPA, USFWS).
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.

The FEIS will contain a more-specific evaluation of wetland impacts and mitigation, based on the formal wetland delineation process and the permitting processes with USACOE and NYSDEC.

To assure compliance with proposed mitigation measures during construction, the Project Sponsor will provide the construction contractor copies of, and contractually oblige them to comply with, all NYSDEC (Article 24 and 15, Section 401 Water Quality Certification) and USACOE permits (Section 404), and site specific plans detailing construction methodologies, sediment and erosion control plans, and required natural resource protection measures. The Environmental Monitor will also be present during construction to ensure compliance with all plans and permit conditions, as further discussed in Section 4.2.

The contractor will adhere to any special conditions of permits issued by the NYSDEC and USACOE, which may include low impact stream crossing techniques, seasonal restrictions, and/or alternative stream crossing methods. Wetlands temporarily disturbed during construction will be restored to their original grade. This will allow wetland areas to regenerate naturally following construction.

Any increase in stormwater runoff will be negligible, as Project construction will result in limited addition of impervious surface. At the detailed design stage the Project Sponsor will validate this assessment using proprietary runoff forecasting computer software (V*flo*™ or similar) to determine whether additional mitigations are likely to manage any stormwater run-off impacts arising from the construction of the Project. The FEIS will present additional mapping and site-specific information on stormwater flows, as available, based on engineering completed in support of SWPPP/SPDES General Permit. During detailed design, the exact locations of such measures will be determined and depicted on the Project sediment and erosion control drawing set. 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, and the stormwater requirements set forth in the SPDES regulations (as previously described in Section 3.2.2.2.1 above).

Additionally, a Spill Mitigation Plan that outlines procedures to be implemented to prevent the release of hazardous substances into the environment will be implemented. This plan will not allow refueling of construction equipment 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 (i.e., a shovel, tank patch kit, and oil-absorbent materials). Potential pollutants will be stored in a secure location and used in a manner consistent with the manufacturer's instructions. Hazardous material storage areas will not be located near water courses or storm drain inlets and will be equipped with covers, roofs, and secondary containment to prevent stormwater from contacting stored materials. Chemicals that are not compatible will be stored in segregated areas so that spilled materials cannot combine and react. Material disposal will be in accordance with the respective Material Safety Data Sheet and OSHA regulations, and materials no longer required for construction will be removed from the site as soon as practicable (edr 2012a, p. 24-26). Any spills will be reported in accordance with state and/or federal regulations. Contractors will be responsible for ensuring responsible action on the part of construction personnel, subject to enforcement by the Environmental Monitor(s). Please see Appendix F for additional detail on spill prevention and response.

To avoid localized drainage problems, the Environmental Monitor(s) will review construction plans and work with the contractor to identify the proper location for ditches, water bars, culverts, and temporary sediment retention basins in the field prior to the initiation of construction. If drainage problems develop during or after construction, the Environmental Monitor(s) will evaluate the problem (in consultation with the Project Sponsor, contractor, landowner, County and/or agency representative) and recommend a solution. The contractor will take corrective actions after receiving the recommendation.

In the event that shallow groundwater is encountered during construction activities such as foundation excavation, dewatering will likely occur (see Appendix B for typical photographs and details associated with dewatering). If dewatering is required, a temporary pit (or sump pit) will be constructed in upland areas (i.e., not within or streams or wetlands) during excavation and dewatering activities to trap and filter water prior to pumping it to a stable discharge area. The pump will be placed within temporary secondary containment. Wastewater from Project activities and dewatering must be routed to a stable vegetated area or sediment trap outside the ordinary high water line to allow removal of fine sediment and other water pollutants. The stable outlet must be appropriate to filter sediment, able to withstand the velocity of the discharged water to prevent erosion, and sized and operated such that pumped water must flow through and be filtered by a sediment removal measure (e.g. sediment filter bag, silt fence barrier located in an upland vegetated area). Migration of shallow groundwater along the buried cable trenches will be controlled by avoiding or repairing any existing tile lines along the route, and by installing trench breakers as necessary. Trench breakers are typically installed for the dual purpose of preventing trench washouts during construction and abating water piping subsequent to trench backfilling. Drainage problems that develop along the cable route despite these measures will generally be addressed through the installation of new tile lines (in consultation with landowners). Blasting will not be used to remove bedrock at this site.

Concrete pours will be conducted in a controlled fashion so as to avoid the contamination of groundwater and surface water other than the temporary impacts identified in Section 3.2.2.1.2 arising from the curing of the concrete. Specifically; all concrete molds shall be inspected by a suitably trained and experienced person prior to pouring of concrete, to ensure the structural adequacy and sufficient sealing to prevent leakage of concrete or water contaminated with concrete; all concrete pumping activities shall be conducted in accordance with best management practices (including subsequent flushing) to ensure that excess concrete and contaminated water is captured and disposed of in accordance with the SWPPP/SPDES General Permit. A suitably constructed and lined temporary containment area shall be constructed to dispose of excess concrete and for washing out of concrete trucks. Thereafter, cured excess concrete shall be disposed of off-site in accordance with relevant regulations.

The exact location of all private water supply wells and other sources within the Project area will be determined and clearly marked to avoid potential damage during construction and operation of the Project. A dewatering plan will be developed as part of the SPDES General Permit as a conservative groundwater protection measure. This plan will include specifications on the required capacity of sediment basins as well as proposed locations of the sediment basins. As a further groundwater well mitigation measure, prior to construction, a well survey in the form of a questionnaire to all landowners and households within the Project area, will be completed by the Project Sponsor to locate all wells and other water sources. Before and after construction, the Project Sponsor will conduct structural, water quality, and water quantity inspections of wells and other water sources, such as springs and wells for livestock watering, if any occur within 500 feet of proposed wind turbines; however, not many such water sources are anticipated due to turbines' setbacks from residences. Any private wells or water sources used for drinking water are anticipated to be within 50 feet of residences (see Figure 5A). Any impacts identified through these inspections will be addressed on a case-by-case basis and appropriately mitigated through oversight of the Environmental Monitor(s). In addition, if complaints should arise, they will be addressed through the Community Outreach and Communication Plan (see Section 4.2 and Appendix L1).

Final Project design will be consistent with the NYSA&M Guidelines for Agricultural Mitigation for Wind Power Projects. Therefore, topsoil removal and de-compaction will be conducted in areas where soil restoration is necessary to protect active agricultural areas. These practices will also mitigate any potential impacts that soil compaction could have on infiltration of rain and snow melt, thus preserving the existing local water table levels. For non-agricultural lands, the construction footprint will be minimized by defining/delineating the work area in the field prior to construction, and adhering to work area limits during construction. This will limit the potential impacts of soil compression on normal infiltration rates.

3.3 BIOLOGICAL RESOURCES

This sub-section is organized as follows:

- 3.3.1 Existing Conditions
- 3.3.2 Potential Impacts
- 3.3.3 Proposed Mitigation

3.3.1 Existing Conditions

3.3.1.1 Vegetation

Plant species and communities found within the Project area were identified and characterized during field surveys conducted by **edr** during the summer of 2012. A total of 204 plant species were documented within the Project area during these surveys. A list of these species, including scientific names, is included in Appendix I. All of the plant species identified during the course of field surveys are relatively common to the region and the state.

3.3.1.1.1 Ecological Communities

Vegetative communities within the Project area were evaluated based on interpretation of aerial photography and field verification. All of the major plant communities found within the Project area are common to New York State. Forestland is the dominant community type on the Project area, while agricultural land, successional old field, successional shrubland, and developed/disturbed communities occur to a lesser extent. Brief descriptions are provided below for each of these ecological communities, which are mapped in Figure 8. Wetlands and surface waters (including associated habitats such as riparian corridors and vernal pools) are described separately (see Section 3.2).

<u>Mixed Deciduous/Coniferous Forestland</u>

Forestland constitutes the largest ecological community type within the Project area, with approximately 4,389 acres (58%). Forests within the Project area resemble the beech-maple mesic forest and the hemlock-northern hardwood forest communities described in the *Draft Ecological Communities of New York State* (Edinger et. al. 2002, p. 100-101). These forests occur throughout the Project area, on ridgetops, steep hillsides, and in valleys. Tree species vary based on the orientation of the slope, but dominant or co-dominant species in most locations include sugar maple, American beech, eastern hemlock, black cherry, and red maple. Other common tree species include basswood, white ash, white pine, northern red oak, and yellow birch. Mid-story sized trees include saplings of overstory trees, along with striped maple and eastern hophornbeam. The shrub layer ranges from sparse to very dense depending upon density of the canopy, with common species including red elderberry and alternate-leaved dogwood, along with saplings of the overstory trees. Common herbaceous species include mayapple, enchanter's nightshade, sarsaparilla, white snakeroot, Christmas fern, hay-scented fern, woodferns, and Canada mayflower. This community also includes numerous conifer plantations. According to Edinger et al. (2002, p. 107), a conifer plantation is "a stand of softwoods planted for the cultivation and harvest of timber products, or to provide wildlife habitat, soil erosion control, windbreaks, or landscaping". Conifer plantations may be a mix of softwoods, but within the Project area are typically monocultures of Norway spruce.

Agricultural Land

Agricultural land constitutes the second-largest community within the Project area, with approximately 1,767 acres (23%) of the land in row crops, field crops, or pastureland. Corn is the primary row crop, while other crops include soybeans and small grains. 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 primarily used for the grazing of dairy cows, and is typically characterized by mixed grasses and broad-leafed herbaceous species, including clovers, plantains, and dandelion.

Successional Shrubland

Successional shrubland occurs on approximately 533 acres (7%) of the Project area, and is frequently associated with old fields and young forestland on the periphery of agricultural areas. Shrubland areas are commonly found in poorly drained areas, on steep slopes, or other areas that limit agricultural production. Areas of young trees and shrubs are also intermixed with some forested areas. Herbaceous species similar to those found in successional old fields occur in this community. However, shrub species such as honeysuckle, arrowwood, buckthorn, multiflora rose, gray dogwood, hawthorn, and blackberry dominate this community. Shrub-dominated wetlands were described in Section 3.2, and are dominated by species such as willows, dogwoods, nannyberry, and common elderberry.

Disturbed/Developed

Disturbed/developed constitutes 439 acres (6%) of the Project area. Disturbed/developed land consists of a combination of several "cultural communities" as defined in the *Draft Ecological Communities of New York State* (Edinger et. al. 2002, p. 106-111). Disturbed/developed lands occur throughout the Project area, and are characterized by the presence of buildings, parking lots, paved and unpaved roads, lawns, gravel mines, and the County landfill. Vegetation in these areas is generally either lacking or highly managed (i.e., mowed lawns or plants seeded along roadsides for erosion control). Volunteer vegetation in these areas is generally sparse, and comprised of old-field, often non-native, herbaceous species such as pokeweed, bull thistle, ragweed, curly dock, common mullein, and various upland grasses.

Successional Old Field

Successional old field constitutes 385 acres (5%) of the Project area. As defined by the *Draft Ecological Communities of New York State* (Edinger et. al. 2002, p. 81), a successional old field is a meadow dominated by forbs and grasses that occurs on sites that have been cleared and plowed (for farming or development), and then abandoned. Species found in these areas include orchard grass, timothy, goldenrods, asters, clovers, common milkweed, Queen Anne's lace, Indian hemp, and burdock. Shrubs such as honeysuckle are also components of this community, but represent less than 50% of total vegetative cover.

3.3.1.1.2 Significant Natural Communities/Rare Plant Species

A written request for information regarding federally-listed threatened and endangered plant species was sent to the United States Fish and Wildlife Service (USFWS) on September 21, 2007 and May 30, 2008. Responses from the USFWS on November 15, 2007 and June 27, 2008 indicated that no federally-listed threatened or endangered plant species, nor any proposed for listing, have been documented on the Project area. In addition, no habitat in the Project impact area is currently designated or proposed critical habitat in accordance with provisions of the Endangered Species Act. Since that time, the USFWS has changed their consultation procedure, and no longer provides project-specific responses to requests for information regarding the potential presence of species protected under the Endangered Species Act. Instead, a website has been designed to assist applicants in determining the possible occurrence of federally-listed, proposed, and candidate species by county. The lists include all such species known to occur in a given county, as well as those likely to occur there. The USFWS recommends retrieving updated lists from the online database every 90 days to ensure that information is current. This online consultation procedure was conducted for Cortland County on July 18, 2012. No federally-listed, proposed, or candidate species of plants have been documented in Cortland County. See Appendix D for Agency Correspondence.

Several written requests for information regarding state-listed threatened and endangered plant species and unique or significant natural communities were sent to the NYS Natural Heritage Program (NHP). According to the most recent response received from the NHP on June 27, 2012 (see Appendix D for Agency Correspondence), an occurrence of Jacob's ladder (*Polemonium vanbruntiae*), a state-listed rare species, has been documented in the vicinity of the Project area. In addition, northern clustered sedge (*Carex arcta*), a state-listed endangered species, is listed as a historical record and has not been documented in the vicinity of the Project area since 1896. Each of these species, and their potential for occurring on the Project area, is described below:

Jacob's Ladder

Jacob's ladder occurs from Quebec south through Maine, Vermont, New York, Pennsylvania, West Virginia, and Maryland, with the majority of populations occurring within the Catskill Mountains, Tug Hill Plateau, and Allegany Plateau of New York State. Jacob's ladder is found in wet meadows, swamps, seepage areas, beaver meadows, edges of streams, and sometimes ditches. The plant can be found under closed forest canopy, but generally only flowers regularly when located in open areas. Many of the sites where the plant occurs are associated with a beaver impoundment, a high elevation, and often high gradient seepage slope, or a narrow, meandering stream (NYNHP 2011b).

The State of New York protects this species with a state status of rare, and its state heritage rank is S3, indicating that the species is vulnerable within the state. Species with the rank of S3 typically have 21 to 35 documented occurrences statewide, making them rare in the state. In regard to the occurrence of Jacob's ladder in New York, there are 31 known sites and over 20 historical populations. Many of these sites occur in isolated wetlands and/or within protected landscapes (NYNHP 2011b). Populations of Jacob's ladder have been confirmed in Chenango, Cortland, Delaware, Lewis, Montgomery, Otsego, Schoharie, Sullivan, and Ulster Counties. This plant is considered a "probable" component of the flora in Allegany, Herkimer, Onondaga, and Tioga Counties, but has been extirpated in Madison County. The NHP recommends surveying for Jacob's ladder between early June and early August when it is flowering, or early July and early September when it is fruiting (Young 2010, p. 84). The potential on-site occurrence of this specific species has not been evaluated through field surveys, but will be prior to Project construction. However, based on site-specific habitat evaluations/ecological surveys conducted by **edr** during 2012, no listed threatened and endangered plant species, or unique or significant natural communities that typically support such species, were observed on site.

Northern Clustered Sedge

Northern clustered sedge occurs from Quebec west to the southern Yukon and Alaska, and south to New York, Michigan, Minnesota, and California. Within New York, this sedge has a broad distribution that ranges from the southern Hudson valley, north to the Adirondacks, and west to Allegheny State Park. However, within this broad range, less than ten populations have been reported. Today, only one population is known, and it occurs in the Adirondack region. This sedge may be found in low wet coniferous woods and thickets, wet meadows, along the edges of islands, flats along rivers, streambanks, swales, around reservoirs and other bodies of water, and other wet depressions (NYNHP 2011a).

The State of New York protects this species with a state status of endangered, and its state heritage rank is S1, indicating that the species is critically imperiled within the state. Species with the rank of S1 typically have five or fewer documented occurrences statewide, making them highly vulnerable to extirpation. Populations of northern clustered sedge have been confirmed in Herkimer County. This plant is considered a "probable" component of the flora in Cattaraugus, Cortland, Essex, Franklin, Tompkins, and Westchester Counties, and possibly occurs in St. Lawrence County (Young 2010, p. 6).

The NHP recommends surveying for northern clustered sedge between mid-June and mid-September (Young 2010, p. 61). The potential on-site occurrence of this specific species was not evaluated through field surveys conducted to date, but will be prior to Project construction. The presence of this species on site is not considered likely, given that the population identified by the NHP in the vicinity of the Project area has not been re-located since 1896, and is considered "historical." In addition, based on site-specific habitat evaluations/ecological surveys conducted by **edr** during 2012, no listed threatened and endangered plant species, or unique or significant natural communities that typically support such species, were observed on site.

In summary, data review, agency consultation, and ecological surveys conducted by **edr** during 2012 confirmed that common ecological communities dominate the Project area. No listed threatened and endangered plant species, or unique or significant natural communities that typically support such species, were observed on site. Follow-up field surveys will be conducted prior to Project construction to determine if Jacob's ladder or northern clustered sedge occur on site.

3.3.1.2 Fish and Wildlife

Fish and wildlife resources within the Project area were identified through analysis of existing data sources (including USFWS species lists), on-site field surveys, correspondence received from the NHP, and on-site avian and bat studies prepared by Ecology and Environment, Inc. (E&E) and ABR, Inc. – Environmental Research & Services (ABR) (see Appendix J).

A total of 162 wildlife species (or sign of these species, such as identifiable tracks and/or scat) were observed within the Project area during on-site field surveys conducted during 2007, 2008, and 2012. However, based on existing data sources and observed habitat conditions, it is estimated that over 230 different species could potentially be found at some time within the Project area. These species of wildlife, including scientific names, are listed in Appendix I. More specific information regarding birds, mammals, reptiles and amphibians, listed threatened and endangered species, fish, and wildlife habitat within the Project area is presented below. Please also note there are no State-designated Wildlife Management Areas within 5 miles of the Project.

3.3.1.2.1 Birds

To determine the type and number of bird species present within the Project area, existing data sources were consulted and on-site field surveys were conducted. Sources of information included the following:

- USGS Breeding Bird Survey (BBS).
- NYS Breeding Bird Atlas (BBA).
- Audubon Christmas Bird Count (CBC)
- On-site breeding bird surveys conducted by E&E during 2008.
- On-site raptor migration surveys conducted by E&E during spring and fall 2008.
- On-site migratory bird surveys conducted by E&E during spring and fall 2008.
- On-site observations by **edr** ecologists during the summer 2012.

Protocols for the on-site avian studies conducted by E&E were developed in consultation with the NYSDEC and the United States Fish and Wildlife Service (USFWS). A draft Work Plan for Preconstruction Bird and Bat Studies was submitted to the NYSDEC and USFWS for review in March 2008, and included studies that were consistent with NYSDEC Draft Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects (see Appendix J for additional detail). In April 2008, TCI and E&E met with several NYSDEC and USFWS staff to review the draft work plan. Based on agency input received at this meeting, the draft plan was modified to extend fall migratory raptor surveys and conduct the migratory bird surveys and breeding bird surveys at proposed turbine locations rather than roadside locations to the extent possible. Additional spring migratory raptor surveys and a nocturnal radar study to evaluate passage rates and flight altitudes for migrating birds, which were also recommended by the agencies, were not conducted. The request for radar studies was based on the fact that the USFWS believes such data to be helpful in evaluating the use of airspace by flying animals, and because no other radar studies have been conducted in the area (Stilwell 2009, p. 2, see end of Appendix D). The additional radar migration data were requested by the NYSDEC to supplement spring 2008 data collection effort that was initiated after the start of the raptor migration season in 2008. Data from such studies were considered unlikely to enhance the applicant's ability to evaluate the potential impacts of the Project on birds. Abundant radar and spring raptor migration data is available from other wind power project sites, and has proven limited in its ability to predict post-construction risk. In addition, the Project is not located in, or proximate to, the features identified in Section 2(b) of the NYSDEC Draft Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects (e.g., the Atlantic coastline, the shoreline of one of the Great Lakes, large rives such as the Hudson or St. Lawrence). While the Project is located within 40 miles of a known bat hibernaculum (Jamesville hibernaculum is located in Onondaga County, approximately 25 miles northeast of the Project area), a 2006 NYSDEC radio telemetry study showed that female bats emerging from hibernation at the Jamesville hibernaculum generally fly north and northwest to maternal roost sites, and no tracked bats flew due south toward the Project area (see Section 3.3.1.2.6 for additional detail). Therefore, the pre-construction studies conducted for this Project were consistent with the standard studies set forth in the NYSDEC Draft Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects.

Based on existing data, on-site investigations, existing habitat conditions, and species range, it appears that approximately 175 avian species could use the Project area at some time throughout a given year (Appendix I). Details on the Project area's avian community are presented below:

<u>Breeding Birds Survey</u>

The Breeding Bird Survey (BBS), which is directed by the USGS, is a long-term avian monitoring program that tracks the status and distribution of North American avian populations. The Dryden BBS (#61041) is a roughly west-to-east route from the town of Dryden to the town of McGraw in Cortland County; this route is approximately one mile south of the Project area at its closest point. Numbers of species documented along this route have ranged from 50 to 76 during the years when surveys have been conducted. A total of 126 species have been recorded over the duration of the Dryden BBS. The most commonly observed species include rock dove, mourning dove, red-eyed vireo, wood thrush, American crow, barn swallow, American robin, European starling, Baltimore oriole, yellow warbler, common yellowthroat, chipping sparrow, song sparrow, savannah sparrow, red-winged blackbird, common grackle, American goldfinch, and house sparrow. Three species listed by the State of New York as threatened have been observed along the Dryden BBS route (northern harrier, upland sandpiper, and Henslow's sparrow). In addition, nine state-listed species of special concern have been observed on this route. These include American bittern, Osprey, Cooper's hawk, grasshopper sparrow, horned lark, red-shouldered hawk, sharp-shinned hawk, vesper sparrow, and cerulean warbler (Sauer et. al., 2008). All of these state-listed species have been detected in low numbers, and no federally-listed threatened or endangered species have been observed along this route (see Table B-2 in the Bird and Bat Risk Assessment in Appendix J).

The BBA is a comprehensive, statewide survey that indicates the distribution of breeding birds in New York State (McGowan & Corwin, 2008). Point counts are conducted by volunteers within 5-km by 5-km (3.1-mile by 3.1-mile) survey blocks across the state. The turbine locations proposed for the Crown City Project are located within six New York State BBA blocks (49071B, 4072B, 4072D, 4171A, 4072C, and 4172C). Data from the Atlas 2000 project (covering the years 2000-2005) indicate that a combined total of 117 species were identified in these six atlas blocks (see Appendix J, Bird and Bat Risk Assessment, Table B-1, for the species identified in each block). The species identified are generally consistent with regularly occurring nesting species for the region, and are very similar to that indicated by the BBS. The majority of the species identified in the BBA are typical of the mixed forest, successional and agricultural habitats that dominate the Project area and surrounding area. Four state-listed species were documented in these blocks during the Atlas 2000 project. These include one state-listed threatened species (northern harrier), along with three state-listed species of special concern (sharp-shinned hawk, Cooper's hawk, and vesper sparrow).

On-site breeding bird surveys were also conducted by E&E during June 2008 to provide site-specific information on nesting birds at the Project area. The point count survey methodology, modeled after the BBS, was used to count individuals of each species at a series of survey points. A total of 24 points were sampled to include a variety of habitat types, ranging from crop fields and grassland to successional shrubland and forest. Surveys were timed to coincide with the hours of peak bird singing activity, between sunrise and 10:00 am. Each point was surveyed for five minutes, during which all visual and audible observations of birds were documented (see Appendix J for additional detail). During the on-site breeding bird survey, a total of 996 birds, representing 70 different species were observed. Species richness (number of observed species at survey points) ranged from seven to 17 species per survey point, with an average of 10.9 breeding bird species during the June 9 and 10 survey period, and 13.5 species during the June 28 and 29, survey period. The species composition was generally consistent with what would be anticipated based on habitat and the results of the BBS and BBA. The most common species documented in the on-site breeding bird survey included red-eye vireo, American crow, American robin, ovenbird, song sparrow, blue jay, savannah sparrow, rose-breasted grosbeak, red-winged blackbird, American goldfinch, and cedar waxwing. No threatened or endangered species were identified during E&E's breeding bird surveys; only one state-listed species of special concern, vesper sparrow, was detected.

Migratory Songbirds

E&E conducted four baseline migratory bird surveys on the Project area during the spring migratory season in 2008 (May 10, 15, 20, and 28), and four during the fall migratory season in 2008 (September 3, 11, 19, and 26). Twenty sampling points were selected based on turbine locations (as proposed at that time), viewing distances, and a variety of habitats. Additional studies were not conducted at the currently proposed turbine locations, because the 2008 results were consistent with the results of other pre-construction studies at proposed wind projects in New York, as well as with relevant local data. Therefore, survey results are not likely to change based on the layout shifts (E&E 2012, p. 6-1). Birds were identified by sight or sound in 5-minute periods at each survey point. Because avian activity is greatest in the morning, the surveys were conducted during the morning hours from half an hour before sunrise to 10:00 a.m. Following the point surveys, field observers drove the Project area looking for possible threatened and endangered species habitat. If habitat was found, visual surveys and passive listening were conducted. Data from these surveys were used to document the occurrence and distribution of migratory song bird species in the Project area and help identify the presence/absence of listed species and areas of higher/lesser migratory bird activity.

A total of 1,360 birds of 87 species were recorded during spring migratory bird surveys (see Appendix J, Bird and Bat Risk Assessment, Tables E-1 through E-5). The total number of birds per point across all surveys ranged between zero and 35 birds, with an overall average of 17.0 birds per point. Species richness per point ranged between zero and 21 species, with an overall average of 11.7 species per point. The most common species found within the Project area during the spring migratory season included common yellowthroat, American crow, and song sparrow. The survey points with the highest number of birds and species richness were characterized by a mix of habitats. The survey points with the lowest number of birds and species richness typically lacked habitat diversity and/or had poor lines-of-sight (i.e., occurred at proposed turbine sites located in forested or dense shrubby areas).

A total of 1,579 birds of 62 species were recorded during fall migratory bird surveys (see Appendix J, Bird and Bat Risk Assessment, Tables F-1 through F-5). The most common species found within the Project area included blue jay, American crow, and red-winged blackbird. Overall, the species observed were generally as expected based on the habitat, location, and time of year. The total number of birds per point across fall migratory surveys ranged between two and 89 birds, with an overall average of 19.7 birds per point. Species richness per point ranged between one and 15, with an overall average of 6.6 species per point. As in the spring surveys, the survey points with the highest number of birds and species richness generally had a mix of habitats. The survey points with the lowest number of birds and species richness generally lacked habitat diversity and/or had poor lines-of-sight (i.e., occurred at proposed turbine sites located in forested or dense shrubby areas).

Most of the birds tallied during the spring and fall migratory surveys were likely local breeders rather than migrants, as most species identified were within their population breeding range. There was no evidence from the surveys or other time spent on the Project area during the spring and fall seasons that the area serves as a concentrated migratory corridor or stopover point for passerines or other bird species.

Migrating Raptors

The Project area is located on the western border of the Eastern Continental Hawk Flyway, which extends from the Canadian Maritimes south to eastern Florida. Within this large area, raptors tend to concentrate along linear ridges, which create updrafts or "thermals" that raptors use to fly long distances with minimal exertion (Berthold, 2001). Migratory raptor surveys were conducted by E&E from a single sampling location within the Project area approximately every other week over the spring migration season for a total of 10 surveys. Migratory raptor surveys were also conducted approximately every week during peak fall raptor migration season and approximately once every two weeks during non-peak fall migration periods for a total of 10 surveys. Field data on migrating raptors included species identified, number of individuals, flight direction, flight behavior, and estimated flight altitude (above or below 500 feet [approximately 150 meters] above ground level). Additionally, weather information, such as temperature, precipitation, cloud cover, visibility, wind speed, and wind direction, were also recorded in the field. The surveys were conducted from 9:00 a.m. to 4:00 p.m. on days of preferable raptor migration weather (little or no precipitation, warmer than average temperatures, and light or southerly winds) to the extent possible.

Over the course of the 10 raptor surveys conducted during the spring of 2008, a total of 435 raptors of 13 species were identified, 192 of which were considered to be migrants. The most common migrants included turkey vulture and red-tailed hawk. Listed species included osprey, bald eagle, northern harrier, sharp-shined hawk, Cooper's hawk, red-shouldered hawk, golden eagle, and merlin. However, all of these were observed in low numbers. The migratory passage rate was 2.8 raptors per observer hour. For comparison, at the Braddock Bay Hawk Watch in Hilton, New York over the same 10 survey days, 9,954 raptors were tallied over 64.24 hours for a passage rate of 154.9 raptors/hour (HawkCount 2008). At the Derby Hill Hawk Watch in Mexico, New York over the same 10 survey days, 7,403 raptors were tallied over 88 hours for a passage rate of 84.1 raptors/hour (HawkCount 2008). Flight directions of migrating raptors during the spring were predominantly to the northeast, which is expected for this season. Approximately 65% of the total observed raptors (migrants and residents) were observed flying below 500 feet. Resident raptors fly below 500 feet more often than migrant birds; migrating raptors were observed flying below 500 feet 51% of the time.

During the fall migratory raptor surveys, E&E observed a total of 759 raptors including 687 migrants and 72 local raptors of 11 species. Turkey vultures were the most prevalent raptor species seen. Many of the turkey vultures identified were local birds exhibiting back and forth foraging flights and were observed over the landfill. Broad-winged hawks were observed in greater numbers in the fall, and sightings of red-tailed hawks remained common. The migratory passage rate was 10.0 raptors per observer hour. By means of comparison, during the same fall survey period the Franklin Mountain Hawk Watch in Oneonta, New York (approximately 50 miles southeast of the Project area) documented 1,152 raptors over 65.25 hours for a passage rate of 17.7 raptors/hour (HawkCount 2008). Flight directions of migrating raptors during the fall were predominantly to the southern direction, which is expected for the fall season. Overall, approximately 48% of the observed raptors (migrants and residents) were observed flying below 500 feet. However, migrants were more often observed flying above 500 feet, while local birds were more often observed flying below 500 feet. Approximately 42% of the migratory raptors flew below 500 feet at some point during observation. No concentrated flight paths were identified.

The findings from the spring and fall migratory raptor surveys are consistent with knowledge of raptor migration in New York State away from the Great Lakes. While some local raptors were observed flying over the landfill adjacent to the survey location, results from the survey suggest that the landfill is not heavily utilized by local or migrating raptors during the spring migration. However, the landfill does appear to be used by local raptors (especially turkey vultures) during the fall season. The Project area receives relatively low use by migratory raptors, and there is no evidence of a pronounced spring or fall migratory raptor corridor in the vicinity of the Project area.

Waterbirds

Waterfowl and wading birds are not well represented amongst the breeding birds documented within or near the Project area. The Project area is not located adjacent to any large lakes, marshes, or mudflats that would be expected to attract high numbers of migrating waterbirds. While there are several small marshes, ponds, and streams in the vicinity of the Project area, the site is not unique in this respect. Satellite imagery suggests that these habitat features are well distributed throughout Cortland County. Therefore, waterbirds that use these habitats for nesting or during migration will be spread throughout the landscape, not concentrated in any one area.

Wintering Birds

Large concentrations of birds do not winter in the Project area and diversity is low because of the harsh climate and general lack of food sources. Most species present in other seasons (e.g., warblers, flycatchers, and thrushes) migrate south for the winter, leaving only year-round species that are not seasonally displaced (e.g., great horned owl, pileated woodpecker) and some species (e.g., American tree sparrow, rough-legged hawk) that travel south from more northern climates to winter in New York. Christmas Bird Count (CBC) data provide an overview of species that would be anticipated to occur in the area during the winter.

The primary objective of the National Audubon Society's CBC is to monitor the status and distribution of wintering bird populations across the Western Hemisphere. The CBC is an all-day census of early winter bird populations within 15-mile diameter survey areas. The closest CBC is the Cortland count, which is centered approximately 10 miles northwest of the McGraw, approximately one mile southwest of the southwestern edge of the Project area. Given that a 15-mile diameter area is surveyed, the western half of the Project area is included in this count.

A total of 136 species have been identified on this CBC from December 1938 through December 2010 (National Audubon Society 2012). The number of species counted each year ranged from a minimum of 21 species in 1962 to 79 species in 2007, for an average of 44 species annually over the life of the survey (see Table B-3 in the Bird and Bat Risk Assessment in Appendix J, for the data from the last 10 years of the Cortland CBC). State-listed endangered species that have been identified at least once during the Cortland CBC between 1938 and 2010 include golden eagle and short-eared owl. State-listed threatened species include northern harrier, bald eagle, and pied-billed grebe. Special concern species documented by the Cortland CBC include common loon, sharp-shinned hawk, Cooper's hawk, northern goshawk, red-shouldered hawk, and horned lark. No federally listed species have been identified by the CBC.

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 entirely through on-site field surveys and evaluation of available habitat. This effort suggests that up to over 40 species of mammals could occur in this area, including bats. Field surveys conducted by **edr** and E&E documented the presence of 18 species within the Project area (or signs of their occurrence such as tracks or scat). These species include raccoon, gray squirrel, eastern chipmunk, whitetail deer, opossum, beaver, woodchuck, and various bats. Species not observed, but likely to occur in the area include weasels, striped skunk, mink, muskrat, porcupine, foxes, and a variety of small mammals (mice and shrews). All of the observed species are common and widely distributed throughout New York State.

Bats

Nine species of bat occur in New York State. These include big brown bat, silver-haired bat, eastern red bat, hoary bat, eastern small-footed bat, little brown bat, Indiana bat, northern long-eared bat, and tri-colored bat. Habitats utilized by these bats include wetlands, agricultural and reverting fields, forests, and developed areas with a variety of micro-habitats used for foraging, roosting, and maternity roosting. Specialized habitats required for bats include winter hibernacula, where resident bat species congregate during hibernation periods (November through March). Identified hibernacula include limestone caves, old mines, and old well shafts, where a moderated constant temperature and humidity all resident (cave-dwelling bats) to survive over the winter. Resident bats migrate relatively short distances to these hibernacula, while migratory bat species travel farther south to warmer climates. Summer roosts are where bats rest during the day, and include buildings, exfoliating tree bark, tree cavities, rock piles, and caves depending on species-specific preferences.

Generally bats are solitary outside of mating and hibernation periods, although some colonial roosting does occur. The most common species of bats found in New York prior to the onset of white-nose syndrome were little brown bat, tri-colored bat, big brown bat, and eastern red bat. These species utilize a wide variety of habitat types including human-altered landscapes, and therefore are assumed to utilize the Project area. Population levels for the remaining bat species are not as well-known, therefore, their potential occurrence and abundance in the area are much more difficult to predict. Indiana bat is a state and federally-listed endangered species, and eastern small-footed bat is listed as a species of special concern by New York State.

To characterize and document bat activity within the Project area, E&E and ABR conducted background research and acoustic monitoring surveys. Protocols for the on-site bat studies were developed in consultation with the NYSDEC and the United States Fish and Wildlife Service (USFWS). A draft Work Plan for Preconstruction Bird and Bat Studies was submitted to the NYSDEC and USFWS for review in March 2008, and included studies that were consistent with NYSDEC Draft Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects (see Appendix J for additional detail). In April 2008, TCI and E&E met with several NYSDEC and USFWS staff to review the draft work plan. Based on agency input received at this meeting, the draft plan was modified to include additional active acoustic monitoring. A nocturnal radar study to evaluate passage rates and flight altitudes for migrating birds and bats, which was also recommended by the agencies, was not conducted. Data from this study was considered unlikely to enhance the applicant's ability to evaluate the potential impacts of the Project on bats.

Active acoustic monitoring surveys were designed to gather information on the resident bats that occur within the Project area, while the passive acoustic surveys at the Project area were designed to document levels of bat activity for migratory tree-roosting bats and other bats on the Project area, and to examine temporal and altitudinal variations in bat activity. The passive acoustic surveys were conducted during the spring migratory, summer, and fall migratory periods (May 2 - October 15, 2008) using Anabat SD1 broadband acoustic detectors, which record bat vocalizations. The active monitoring surveys were conducted using a hand-held AnaBat SD1 detector equipped with a personal digital assistant running AnaPocket© software on six nights in June and July 2008.

During the passive acoustic survey of on-site bat activity, three acoustic detectors were deployed at different heights (60 meters [197 feet], 22 meters [72 feet], and 1.5 meters [4.9 feet] above ground level) on a met tower on the Project area. These detectors provided a total of 426 successful detector-nights. Of the 426 successful detector nights, 148 nights were from the 1.5 meter (5 foot) detector, 138 nights were from 22 meter (72 foot) detector, and 140 nights were from the 60 meter (197 foot) detector. The met tower where the detectors were deployed was located in a hay field near the center of the Project area, (approximately 400 meters [0.25 mile] east of the intersection Warren Road and Potter Road) and was adjacent to forested stands and two large farm ponds. Acoustic data were collected during ABR's surveys from one hour before sunset to one hour after sunrise, with sampling period ranging from 11 to 13 hours per night. Individual vocalizations ("bat passes") were recorded and assigned to one of seven phonic groups (i.e., a species or group of species whose echolocation calls possess similar characteristics). Bat activity was defined as mean passes/detector night. The results of this study, including mean detection rate, species composition, and the relationship between bat activity and a number of variables, are summarized below. Additional detail is provided in Appendix J.

A total of 3,682 bat passes were recorded during the total sampling period. The mean detection rate of all bats for all detectors was 8.9 call sequences per detector-night (10.5 for late spring and 8.4 for the fall). The highest detection rate was recorded at the lowest detector (14.5 at 1.5 meters [4.9 feet]) with the lowest detection rate at the highest detector (5.1 at 60 meters [197 feet]). The middle detector had a detection rate slightly higher than the highest detector (6.8 at 22 meters [72 feet]), but was slightly less than half of the lowest detector's detection rate. The peak activity occurred between July 14 and July 21 with seven of the eight highest detector nights for the entire study occurring in this timeframe. In general, the data show activity was relatively steady through May and early June with a slight decrease in activity before the spike in activity in mid-July. Activity then declined through August with a slight spike in activity observed in early September.

A large portion (72.2%) of the call sequences were identified to species or species group. The remaining unidentified calls (27.8%) were divided into high and low frequency groups. The tree bat group, consisting of big brown bat, silver-haired bat, eastern red bat, hoary bat, and unidentified low frequency calls, comprised 57.4% of all calls. The big brown/silver-haired group was the most recorded group in the fall survey (29% of fall calls). The myotis group was the most recorded group in the springtime survey (49% of spring calls) as well as the overall most recorded group (31.9% of total calls). The only other species to make up a significant portion of the call sequences was the hoary bat (10.3% of the total calls). The eastern red bat and tri-colored bat were recorded but did not make up a significant portion of the call sequences (2.2% and 0.1% respectively).

Since acoustical monitoring cannot distinguish to the species level for the genus *Myotis*, there is the potential that the protected Indiana and eastern small-footed bats could be present within the Project area. However, this is considered to be a low potential because of the rarity of the species in New York State (E&E 2012, p. 5-19). See Section 3.3.1.2.6 for additional discussion of Indiana bat and eastern small-footed bat.

These survey results are within the range documented by acoustic studies conducted at other wind power project sites in the eastern U.S. and New York State. However, bat activity at the Crown City site was found to be at the high end of this range (see Appendix 1 in ABR's report in DEIS Appendix J). ABR indicated that this may reflect site-specific differences in habitat at the detector sites, as well a variation in sampling protocol, survey timing/duration, and data analysis (Hein et al. 2012, p. 15). Site selection is a key component for comparing data between sites. Most studies are conducted at met towers, which are often placed in wide open fields that are not near wooded areas where there is often more local bat activity. Therefore, sites located near wooded areas and/or wetlands may have higher detection rates compared to other sites because of the diversity in surrounding habitat. The survey location for the Crown City acoustical monitoring falls into the latter category, because it was located near a forested edge and there were wetlands/ponds in close proximity to the MET tower (E&E 2012, p. 4-13).

During the active acoustic survey, 12 survey points were sampled on each of six nights between June 3 and July 28, 2008. Sample points were selected to represent a variety of landscape features within the Project area where bats would be expected to forage (such as field edges, hedgerows, roadsides, riparian corridors, and other wetland areas). Surveys consisted of an approximately 10 minute stationary survey, similar to a breeding bird point count. If significant activity was detected, surveys were extended longer. One point was not sampled on the first night, so the study yielded 71 active survey counts. There were 1,008 call files recorded during the entire survey period, of which 865 (85.8%) were identifiable to a species group. Unidentified calls made up 14.1% (142 calls files) of the total recorded call sequences due to short call sequences, poor call signature formation, or static interference. Overall, the Myotis group was the most frequently identified group with 688 of the 865 identifiable files (79.5%) classified to that group. The second most common species group was the big brown/silver-hair/hoary bat group which was identified for 125 of the 865 identifiable files (14.5%). Lastly, the eastern red/tricolored bat species group was the least frequently identified, with only 52 call files (6.0%) belonging to this group. In general, the results of this study were consistent with the passive acoustic study conducted by ABR, in that the Myotis group was the most frequently identified species group followed by the big brown/silver-haired/hoary and eastern red/tricolored bat species groups, respectively (E&E 2012, p. 4-13).

In the time since the passive and acoustic monitoring were conducted at the Project area in May 2008, white nose syndrome (WNS) has spread across the state and country from where it was first documented in a cave near Albany, New York in the winter of 2006. WNS is named for the presence of a white fungal growth around the affected bats' muzzle, ears, and wing membranes (Blehert et al. 2009, p. 1). It is a significant source of mortality among cave-dwelling bats, and is now believed to be present in all hibernacula in New York State (NYSDEC 2010a). In April 2012, NYSDEC reported observed statewide declines since the onset of WNS of 98% for northern long-eared bat, 95% for tri-colored bats, 90% for little brown bats, 71% for Indiana bats, and 13% for small footed myotis (NYSDEC 2012a).

3.3.1.2.3 Reptiles and Amphibians

Reptile and amphibian presence within the Project area was determined through field surveys and review of The Amphibians and Reptiles of New York State (Gibbs et al. 2007). This reptile and amphibian resource book is based on the New York State Amphibian and Reptile Atlas. The Atlas Project was a 10-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 2007). Based on this data, along with documented species ranges and existing habitat conditions, it is estimated that approximately 30 reptile and amphibian species could occur in the area (NYSDEC 2007; Gibbs et. al. 2007). Of these, 10 species were documented on-site during surveys in 2012, including eastern garter snake, eastern painted turtle, red-spotted newt, northern two-lined salamander, eastern red-backed salamander, American toad, wood frog, bull frog, green frog, and northern leopard frog. Species not observed, but likely to occur on the Project area based on existing habitat conditions include snapping turtle, spotted salamander, slimy salamander, gray treefrog, spring peeper, northern water snake, and red-bellied snake (Appendix I). All of these species are common and widely distributed throughout New York State. The New York State Amphibian and Reptile Atlas also includes records of two state-listed species of concern within the Project area quadrangles, spotted salamander and wood turtle (NYSDEC 2007).

3.3.1.2.4 Fish

Although no fisheries data has been obtained or field surveys conducted, ponds and streams within and adjacent to the Project area likely support both native and stocked fish populations. Several state-classified trout streams occur in the vicinity of the Project area, including the East Branch of the Tioughnioga River, Trout Brook, Maybury Brook, and various unnamed tributaries. These streams likely support a coldwater fish community including trout, creek chub, and slimy sculpin. Ponds/beaver impoundments in the vicinity of the Project area likely support a warm water fish community (e.g., bass, sunfish, and shiners).

3.3.1.2.5 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.

Forestland

Results of the on-site breeding bird survey indicate that forest habitat within the Project area provides habitat for wildlife species that require forest interior conditions, such as wood thrush, veery, red-eyed vireo, black-and-white warbler, hairy woodpecker, and pileated woodpecker. However, many of the forests on site have been subject to past and on-going logging activity. This activity has resulted in the clearing of overstory trees, and the development of forest roads and clearings in many forested areas on site. Consequently, these areas have already experienced some degree of forest fragmentation and may not provide the high quality forest interior conditions preferred by the afore-mentioned bird species. Mammals that utilize forested habitat include gray squirrel, red squirrel, eastern chipmunk, beaver, black bear, and whitetail deer.

Successional Old Field and Wet Meadows

These grass/forb dominated areas occur primarily on reverting agricultural fields and in wetlands, as well as along roadsides and electrical right-of-ways. Due to their relatively small size, most of these areas do not provide preferred nesting and foraging habitat for grassland bird species such as bobolink, horned lark, eastern meadowlark, savannah sparrow, and song sparrow. However, these species have been documented as breeding in the area, and the vegetation in these fields provides forage in the form of seeds and foliage, which is utilized by a wide variety of birds, as well as small mammals (mice, shrews, etc.), whitetail deer, and eastern cottontail. Birds of prey, such as northern harrier, and mammalian predators, such as red fox and eastern coyote, also use such habitats 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, which provide food sources for birds and mammals such as raccoon, striped skunk, and opossum.

3.3.1.2.6 Threatened and Endangered Wildlife Species

As mentioned previously, written requests for listed species documentation were sent to the NHP and USFWS. In addition, the results of on-site surveys and existing data sources, including the NYS Amphibian and Reptile Atlas, the BBS, the BBA, and the CBC, were consulted to assess the potential presence of state- and/or federally-listed threatened and endangered species.

According to letters from the NYSDEC (see Appendix D), the NHP database indicates occurrences of northern harrier and pied-billed grebe in the area. Both of these species are listed as threatened in New York State. In addition, the NHP correspondence indicates eastern small-footed bat (state-listed as special concern) and Indiana bat (state and federally-listed as endangered) have been documented within 40 miles of the Project area. Habitat requirements, distribution, threats, and likelihood of occurrence are assessed below for each state-listed species documented by the NHP to occur in the area.

Northern Harrier

The northern harrier is a slender medium-sized hawk with long wings, legs and tail. They are often seen flying low over fields while hunting rodents. The northern harrier is widely distributed throughout the United States and Canada. In New York State, northern harriers are confirmed breeders in the western Great Lakes Plain, open habitats of the Adirondacks, western Finger Lakes, Long Island, and the Hudson, Saint Lawrence, and Lake Champlain valleys. The winter range is similar depending on prey abundance and snow cover. The State of New York protects this species with a status of threatened. The state heritage rank for this species is S3B, S3N indicating 21-100 breeding occurrences or limited breeding acreage, and 21-100 non-breeding occurrences (NYNHP 2011c).

Northern harriers use a wide range of open grasslands, shrubland, and salt and freshwater marshes (Andrle & Carroll, 1988, McGowan & Corwin, 2008, p. 190). Nests are placed on the ground, usually in dense cover. Suitable habitat exists throughout Cortland County and this species has been documented on the Project area.

One of the most significant threats to northern harrier populations in New York is the loss of suitable grassland habitat. As pastureland is abandoned, they are lost to development or the land reverts to shrubland and forests. Grasslands are becoming more scattered and isolated thereby reducing connectivity (Post 2005). This is true for parts of the Project area, where some local landowners have reported to the Project Sponsor that pasture farming has become uneconomic. Another significant threat to northern harriers is the loss of wetland habitat by draining, dredging, and filling marshes (Evers 1992). Breeding Bird Survey data show a possible decline of 3.8% per year between 1980 and 2006 (Sauer et al. 2008).

Pied-billed Grebe

The pied-billed grebe is a small, stocky, brown waterbird with small, narrow wings. The range of the pied-billed grebe extends throughout Canada and the United States. Pied-billed grebes breed throughout New York State with concentrations on the Lake Ontario Plain and St. Lawrence Valley. It is sparsely distributed in the Adirondacks, Catskills, Allegheny uplands, and on Long Island. Overall, the species is considered a rare to uncommon, local breeding species with many of the records clustered in areas of large wetland complexes. The Project area lacks the preferred breeding habitat of the pied-billed grebe (i.e., freshwater ponds, marshes, lakes), and therefore no activities pertinent to the life cycle of this species would regularly bring it to the Project area except as a migrant or a transient. The State of New York protects this species with a status of threatened. The state heritage rank for this species is S3B, S1N indicating 21-100 breeding occurrences or limited breeding acreage and less than 5 non-breeding occurrences (NYNHP 2011d).

Pied-billed grebes inhabit quiet marshes, marshy shorelines of ponds, shallow lakes, or marshy bays and slow moving streams with sedgy banks or adjacent marshes; rarely in brackish marshes with limited tidal fluctuation. Although plant species in breeding marshes may vary, a 50/50 combination of emergent vegetation interspersed with open water ("hemi-marsh") is desirable (Andrle & Carroll, 1988).

Currently, the greatest threat to this species is the ongoing alteration and loss of wetlands through draining, dredging, filling, pollution, invasive species and siltation from agricultural practices and roads. These threats lead to the degradation, isolation, and fragmentation of wetlands and have left many marshes that were too small, or were not part of larger marsh complexes, unsuitable for grebes and other marsh birds (NYSDEC 2006, Appendix A, p. 97). Although Breeding Bird Survey data for 12 survey routes in New York between 1966-1989 showed a non-significant 0.6% decrease in abundance (Gibbs & Melvin 1992) another analysis shows a 2.0% annual decrease from 1980-2002 (NYSDEC 2006, Appendix A, p. 97). An increase in the number of Breeding Bird Atlas blocks where the species was either a probable or confirmed breeder from the first Atlas to the second (86 to 184) Atlas could reflect population increases, range expansion, or increased surveys efforts for marshbird species.

Indiana Bat

The Indiana bat is a small bat, approximately 2 inches in length and weighing approximately 0.2 to 0.3 ounces (Harvey et al. 1999; NYSDEC 2006). The range of the Indiana bat includes much of the eastern United States. Hibernacula are known to occur in the following counties of New York State: Albany (1), Essex (2), Jefferson (1), Onondaga (1), Ulster (4), and Warren (1). Maternity colonies have been identified through radio-telemetry studies and mist-net captures in Dutchess, Essex, Jefferson, Onondaga, and Ulster counties. Bachelor colonies have also been identified through radio-telemetry studies and mist-net captures in Albany, Dutchess, Jefferson, Orange, and Ulster counties. The Indiana bat has both a state and federal protection status of endangered. The state heritage rank for this species is S1 indicating typically 5 or fewer occurrences, very few remaining individuals, or biological factors that make the species especially vulnerable in New York State (NYNHP 2011e).

Indiana bats hibernate in caves and mines during the winter. Indiana bats radio-tracked from hibernacula in Jefferson, Essex, and Ulster Counties were found to move between approximately 12 and 40 miles to roost location on their foraging grounds. The roosts consisted of living, dying, and dead trees in both rural and suburban landscapes (NYNHP 2011e).

The Project area supports suitable roosting and foraging habitat for this species. There is potential for Indiana bat presence within the Project area, but it is considered low because of the rarity of the species within the state, and because of the location of the site in relation to documented hibernaculum. The Jamesville hibernaculum is located in Onondaga County, approximately 25 miles northeast of the Project area. However, a 2006 NYSDEC radio telemetry study showed that female bats emerging from hibernation at the Jamesville hibernaculum generally fly north and northwest to maternal roost sites. Of the 38 bats that were tracked in the study, 37 bats moved to summer roost sites in Onondaga, Oswego, and Cayuga Counties. One bat flew southwest to a roost site in Onondaga County; no tracked bats flew due south toward the Project area, and none flew to maternal roost sites in Cortland County (NYSDEC, unpublished data). This data suggests that Indiana bats from the Jamesville hibernaculum are unlikely to use the Project area trees for maternal roost colonies.

Since acoustical monitoring cannot distinguish to the species level for the genus *Myotis*, there is the potential that Indiana bat could be present within the Project area. However, this is considered to be a low potential because of the rarity of the species in New York State. Furthermore, NYSDEC does not consider this species likely to be present in Cortland County (E&E 2012, p. 4-19). In addition, further consultation with USFWS will be undertaken before commencement of construction activities.

Before the onset of white nose syndrome in the winter of 2006, ten Indiana bat hibernacula within New York State appeared to be stable. The maximum total count had increased from approximately 13,000 to 41,000 Indiana bats. Despite the increase in numbers, the population was still considered vulnerable, due to the concentration of overwintering bats at a few limited sites, many of which occur in areas subject to increasing development (NYNHP 2011e). Since that time, WNS has decimated populations of cave-dwelling bats within New York State. By April 2012, the NYSDEC reported Indiana bat populations had declined 71% statewide (NYSDEC 2012a) from peak population numbers observed prior to the introduction of WNS.

<u>Eastern Small-Footed Bat</u>

The eastern small-footed bat is a very small bat (2-3 inches in total length) with tiny feet. The range of the eastern small-footed bat extends from Ontario and Quebec to the northeastern United States and south to Georgia and Oklahoma. In New York State the species is most often recorded at hibernacula with most of the large sites being located in the Adirondacks. Hibernacula are also located in eastern and central New York caves (Albany County, Schoharie County, Montgomery County, and Onondaga County), and southern and western New York mines (Orange County, Ulster County, Putnam County, and Livingston County). Small-footed bats have been captured at summer foraging locations in central New York (Onondaga County) and southern New York (Ulster County, Orange County, and Putnam County). However, the summer range is undoubtedly larger than what is currently recorded. The State of New York protects this species with a status of species of special concern. The state heritage rank for the species is S2 indicating typically 6-20 occurrences, few remaining individuals, or factors exist that make the species very vulnerable within New York State (NYNHP 2011f).

This species winters in caves and mines with the largest overwintering populations currently known from mines in the northern part of the state. Several individuals, including a few lactating females, have been mist-netted in deciduous forests during the summer months in southeastern and central New York, but the species is likely to be more widespread in the state during the summer months. Several studies in the northeast and southeast have indicated that small-footed bats roost and form maternity colonies in fractures in rock ledges and talus. The Project area supports suitable roosting and foraging habitat for this species. There is potential for eastern small-footed bat presence within the Project area, but it is considered low due to the distance from the nearest known hibernaculum and because of the rarity of the species within the state (E&E, 2012).

Some mines used by this species may suffer from collapse or closure and a few cave occurrences are probably threatened or reduced in quality due to the commercialization or frequent winter visitation by spelunkers. The main threat is disturbance during the winter hibernation period and, although this currently does not appear to be a major threat at the best sites (mines), it could be a problem at some of the cave sites. The small number of total individuals statewide and the small number of high-quality occurrences are the primary ranking considerations. Although the species has been recorded from 40 hibernacula, many of the hibernacula contain few individuals. There are just nine overwintering locations with approximately 50 or more individuals (NYNHP 2011f).

Since acoustical monitoring cannot distinguish to the species level for the genus *Myotis*, there is the potential that eastern small-footed bat could be present within the Project area. However, this is considered to be a low potential because of the rarity of the species in New York State (E&E 2012, p.5-19).

Before the onset of WNS, the small-footed bat population within New York State appeared to be stable. The total maximum count, using high counts from each of the 40 known hibernacula between 1982 and 2006, was 3,396 (NYNHP 2011f). Although the impact of the disease appears to be far less severe than for most other hibernating bats, the NYSDEC (2012a) reported that small-footed bat populations had declined 13% statewide by April 2012.

The NYSDEC response letter also notes the presence of a great blue heron rookery within 10 miles of the Project area, and yellow lampmussel, an uncommon but unlisted mussel species documented at 10 locations in the Tioughnioga River.

The July 18, 2012 online consultation with the USFWS indicates that no federally-listed threatened or endangered wildlife species, nor any proposed for listing, have been documented within the Project area (see Appendix D for Agency Correspondence). However, it should be noted that, due to the effect of White Nose Syndrome, the USFWS is currently reviewing the status of two bat species that could occur in the Project area. Both the northern long-eared bat and the eastern small-footed bat could be recommended for listing as threatened or endangered species in the future (E&E, 2012).

Other sources of information about listed species include publicly available databases such as the BBS, the BBA, the CBC, and the New York State Amphibian and Reptile Atlas. BBS survey data indicate that three state-listed threatened species (northern harrier, upland sandpiper, Henslow's sparrow) and nine state-listed special concern species (American bittern, Cooper's hawk, grasshopper sparrow, horned lark, red-shouldered hawk, sharp-shinned hawk, osprey, vesper sparrow, and cerulean warbler) have been recorded in the general area of the Project area (Sauer et al. 2008). According to BBA data, one state-listed threatened species (northern harrier) and three state-listed special concern species (sharp-shinned hawk, Cooper's hawk, and vesper sparrow) have been documented in the vicinity of the Project area (NYSDEC 2012g). According to CBC data, two state-listed endangered species (golden eagle and short-eared owl), three state-listed threatened species (pied-billed grebe, bald eagle, and northern harrier) and six state-listed special concern species (common loon, sharp-shinned hawk, Cooper's hawk, northern goshawk, red-shouldered hawk, and horned lark) have been observed in the vicinity of the Project area (National Audubon Society 2012).

The presence of state- and federally-listed threatened and endangered species was also assessed during site-specific avian and bat studies conducted by E&E. During spring and fall raptor migration surveys, one state-listed endangered species (golden eagle), two state-listed threatened species (northern harrier and bald eagle), and four state-listed special concern species (Cooper's hawk, sharp-shinned hawk, red-shouldered hawk, and osprey) were observed. During migratory songbird surveys, two state-listed special concern species (horned lark and vesper sparrow) were observed. During on-site breeding bird surveys, one state-listed special concern species was detected (vesper sparrow).

In order to investigate reports of resident bald eagles within the Project area the Project Sponsor contacted Tim Sullivan at USFWS, Luker Road, Cortland. On November 20, 2012 the USFWS sent an email to TCI, which states,

"After reviewing our files, we have found two bald eagle nests in the Cortland area. Both are to the south of the project area and located along large streams. They are both within 10 miles of the project area with one nest being approximately 6.9 miles from the nearest turbine in the Crown City Wind project area while the other bald eagle nest is approximately 9.8 miles from the nearest wind turbine" (T.Sullivan email to G. McDonald, Nov. 20, 2012).

The Project Sponsor further investigated the presence of the Bald Eagle nests by contacting the USFWS eagle expert in the area, Ms. Sandra Doran (referred to TCI by Mr. Sullivan) who repeated that the presence of two bald eagle nests had been reported (pers. Comm. S. Doran telephone conversation with G. McDonald, November 27, 2012). The Project Sponsor then contacted the Region 7 NYSDEC office responsible for collection of data on bald eagles. NYSDEC confirmed the locations of two bald eagle nests within Cortland County. Detailed research by Ms. B. Parton verified that two eagle nests exist in the County, away from the Project area, located 7.09 miles and 9.87 miles to the south of the most proximate proposed Crown City Project turbines. Ms. Parton also informed the Project Sponsor that the eagles did not appear on the (NY) Natural Heritage Program data, previously provided to the Project Sponsor in July 2012, as the NYNHP system had not been updated due to a contract lapse (pers, comm. B. Parton telephone conversation with G.McDonald, November 30, 2012).

A dedicated pre-construction eagle monitoring plan will be developed and performed in 2013/2014 to further supplement the existing bird and bat risk assessment studies, to substantiate the discovery of the two bald eagle nests in Cortland County and to evaluate and understand the eagles' use of the Project area, if any. The eagle study will comprise three different phases:

<u>Bald Eagle Point Count Surveys</u>

In order to determine the usage patterns of Bald Eagles within the Project area, the Project Sponsor will conduct Bald Eagle Point Count Surveys throughout the Crown City Project area during the wintering, nesting, foraging, and migration seasons. The methodology used to conduct the Bald Eagle Point Count Surveys is based on Appendix C of USFWS's January 2011 Draft Eagle Conservation Plan Guidance (DECPG). While revisions to DECPG protocol are currently underway, it is unlikely that the revision will result in less rigorous survey requirements. The Project Sponsor believes that adhering to the January 2011 Guidance methodology will provide valuable information that can be used to establish Bald Eagle usage patterns in the Project area and a Bald Eagle risk analysis.

Bald Eagle Nest Monitoring

In addition to conducting point count surveys within the Project area, the Project Sponsor also proposes to conduct Bald Eagle nest monitoring at the two nest locations. During the wintering period (December 2013 – February 2014), each nest will be monitored from a roadside location, for two-hours, once per month. During the incubation and rearing stage (April 1 to June 15, 2015), the nest locations will be monitored for at least 4 hours, once per week in an attempt to visually track the direction of flight to and from the nest of the adult birds, until consistent activity patterns are established. If consistent activity patterns are observed after the wintering and incubation/rearing stage, the Project Sponsor will describe the observed patterns to USFWS and NYSDEC to seek agency concurrence to reduce or eliminate remaining raptor nest monitoring activities.

Bald Eagle Survey Reporting

A draft Bald Eagle risk assessment will be prepared, based on a review of available literature and site-specific information collected as part of the Bald Eagle Point Count and Nest Monitoring Surveys. This report will be submitted to USFWS and NYSDEC to facilitate consultation regarding the potential for the Project to impact Bald Eagles. The data will be used by USFWS to calculate the predicted mortality of Bald Eagles as a consequence of the Project. At that stage, USFWS will decide whether or not to issue recommendations regarding application of an Eagle Conservation Permit (ECP) and/or Avian and Bat Protection Plan (ABPP) and potentially continuing eagle point count surveys. Alternatively, USFWS and NYSDEC may determine that the Project does not represent a sufficient hazard to Bald Eagles and may not require any further work or analysis.

A summary of state-listed wildlife species documented to occur in the vicinity of the Project area is presented below in Table 15. Please note that only those species with an "OS" prefix in the source column were actually observed on-site.

Table 15. State-listed Wildlife Species Documented in the Vicinity of the Project area.

Common Name	Scientific Name	NYS Legal Status	Source[1]
Birds			
Golden Eagle Short-eared Owl	*Aquila chrysaetos* *Asio flammeus*	Endangered Endangered	OS-RMS, CBC CBC
Henslow's Sparrow	*Ammodramus henslowii*	Threatened	BBS
Upland Sandpiper	*Bartramia longicauda*	Threatened	BBS
Northern Harrier	*Circus cyaneus*	Threatened	AC-NHP, OS-RMS, BBA, BBS, CBC
Bald Eagle	*Haliaeetus leucocephalus*	Threatened	OS-RMS, CBC
Pied-billed Grebe	*Podilymbus podiceps*	Threatened	AC-NHP, CBC
Cooper's Hawk	*Accipiter cooperii*	Special Concern	OS-RMS, BBS, BBA, CBC
Northern Goshawk	*Accipiter gentilis*	Special Concern	CBC
Sharp-shinned Hawk	*Accipiter striatus*	Special Concern	OS-RMS, BBS, BBA, CBC
Grasshopper Sparrow	*Ammodramus savannarum*	Special Concern	BBS
American Bittern	*Botaurus lentiginosus*	Special Concern	BBS
Red-shouldered Hawk	*Buteo lineatus*	Special Concern	OS-RMS, BBS, CBC
Cerulean Warbler	*Dendroica cerulean*	Special Concern	BBS
Horned Lark	*Eremophila alpestris*	Special Concern	OS-MBS, BBS, CBC
Common Loon	*Gavia immer*	Special Concern	CBC
Osprey	*Pandion haliaetus*	Special Concern	OS-RMS, BBS

Common Name	Scientific Name	NYS Legal Status	Source[1]
Vesper Sparrow	*Pooecetes gramineus*	Special Concern	OS-BBS, OS-MBS, BBA
Mammals			
Indiana Bat[2]	*Myotis sodalis*	Endangered	AC-NHP
Eastern Small-footed Bat	*Myotis leibii*	Special Concern	AC-NHP

[1] Source: AC-NHP = Agency Correspondence, Natural Heritage Program, AC-FWS = Agency Correspondence, US Fish & Wildlife Service (including consultation website), BBA = Breeding Bird Atlas, BBS = USGS Breeding Bird Survey, CBC = Christmas Bird Count, OS-BBS = On-site Breeding Bird Survey, OS-MBS = On-site Migratory Bird Survey, OS-RMS = On-site Raptor Migration Surveys.
[2] Also federally-listed as endangered.

3.3.2 Potential Impacts

3.3.2.1 Construction

Anticipated construction-related impacts to vegetation, wildlife, and listed threatened and endangered species are outlined in the following section, based on the current Project layout and studies conducted to date. While the bird and bat surveys were conducted in 2008, the results of the migratory raptor, migratory bird, breeding bird, and acoustical studies are consistent with the results of other pre-construction studies at proposed wind projects in New York, as well as with relevant local data and existing knowledge. Therefore, survey results are not likely to change based on the subsequent layout shifts (E&E 2012, p. 6-1).

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 exposure/disturbance of soil. 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, and buried electrical interconnect and transmission line. Based on the area of impact assumptions described in Section 2.6 (Project Construction), these activities will result in disturbance to approximately 453 acres within the Project area. As indicated in Table 16, the majority of the calculated impacts will be temporary, and native vegetation will be allowed to regenerate following restoration of areas disturbed during construction. Construction-related impacts to wetlands were previously discussed in Section 3.2.

Table 16. Impacts to Vegetation

Location	Total Disturbance (acres)	Temporary Disturbance (acres)	Permanent Loss (acres)
Wind Turbines and Workspaces	126.6	117.8	8.8
Access Roads	217.1	173.7	43.4
Buried Electrical Gathering Lines	88.0	88.0	-
Transmission Line	6.5	6.5	-
MET Towers	4.0	3.6	0.4
Staging Area	8.0	8.0	-
Collection Station	2.0	-	2.0
Point of Interconnect Station	1.0	-	1.0
TOTAL	**453.0**	**397.5**	**55.5**

3.3.2.1.2 Fish and Wildlife

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 activities. Each of these potential impacts is described below.

Incidental Injury or Mortality

Incidental injury and mortality should be limited primarily to sedentary/slow-moving species such as small mammals, reptiles and amphibians that are unable to move out of the area being disturbed by construction. If construction occurs during the nesting season, wildlife subject to mortality could also include the eggs and/or 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 by construction. Vehicle-related mortality may increase temporarily due to the increased traffic during construction; however, as traffic decreases upon the completion of construction, so will wildlife-vehicle collisions.

Tall construction cranes used to erect the turbine components, including the tower, nacelle, and rotors, could potentially serve as obstacles to a small number of migrant birds. If collisions are to occur, they would most likely occur during nighttime because the cranes would be visible and easily avoided during daylight hours. Therefore, collision risk is expected to be greater among migratory songbirds (primarily nocturnal migrants) and waterbirds (occasional nocturnal migrants) than among raptors (primarily diurnal migrants). Erected turbines would not be operational during the construction period but would pose a similar minor collision risk.

Silt and Sedimentation

Earth-moving activities (including foundation excavation and back-fill, widening of existing roads and construction of new access roads) may result in sediment and siltation impacts to aquatic habitat. These impacts could occur 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.

Habitat Disturbance/Loss

As mentioned previously, Project components have been sited so as to minimize impact to undisturbed habitat. Many of the proposed turbines would be located in or adjacent to agricultural land, which in general provides habitat for only a limited number of wildlife species. In addition, these areas are already subject to periodic disturbance in the form of mowing, plowing, harvesting, etc. However, approximately 397.5 acres of wildlife habitat will be temporarily disturbed during construction, while permanent loss through conversion of natural habitat to built facilities will total 55.5 acres. Ground-disturbing construction activities could also reduce the availability of stopover habitat for migratory birds within the landscape directly through the loss of habitat and indirectly by inducing avoidance of stopover habitat in response to visual and/or noise disturbance (Strickland et al. 2011, p. 98-99). Changes in vegetation could also influence the behavior of bats by changing microclimatic conditions and the quality of habitat for foraging or roosting bats (NRC 2007, p. 78). Bats may also become attracted to openings made in forested areas from tree clearing activities for turbines and access roads as they may find foraging opportunities in the openings. It is anticipated that any bats that are present in the Project area would return to areas that were temporarily disturbed following the completion of construction activity. Significant adverse impacts on bat populations are not expected during construction of the Project, especially if tree clearing activity can be limited to the winter months.

On a landscape scale, there is abundant availability of habitats similar to those of the Project within the nearby landscape. It is anticipated that 135.6 acres of agricultural land will be directly impacted by Project construction. Natural communities will also experience construction-related disturbance, including approximately 233 acres of forest, 22.8 acres of shrubland, and 35.3 acres of old field that will be directly impacted by Project construction.

Construction impacts to bat species are expected to be even less than those experienced by birds. Bat habitat may be impacted by ground disturbance and tree removal. However, these activities are also associated with farming and logging, which are common in the area. At this stage of development, it cannot be verified when tree clearing activities will be conducted. Tree clearing during the winter months would present the lowest potential risk to bats by avoiding potential removal of roosting trees.

Displacement

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, the species most likely to be disturbed/displaced by Project construction include grassland bird species such as bobolink, eastern meadowlark, red-winged blackbird, and savannah sparrow. Within New York State, peak breeding time for birds common to agricultural and grassland habitat occurs in late spring and early summer. If construction begins before the initiation of breeding activities, then most breeding birds would likely avoid nesting in active construction areas. If construction begins during the breeding season, then breeding birds that are accustomed to similar disturbances, such as farming and logging, are expected remain in the area while others will likely relocate to adjacent suitable habitat, if available. These impacts are not expected to be significant because a sizable amount of suitable habitat will remain undisturbed within and adjacent to the Project area. Outside of localized construction disturbance and some temporary displacement in the immediate vicinity of turbines, access roads, etc., no significant displacement impacts on breeding birds are anticipated during construction.

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

3.3.2.1.3 Threatened and Endangered Species

As discussed in Section 3.3.1.2.6, listed wildlife species documented in the vicinity of the Project area utilize a variety of habitats, including wetlands/water bodies, forests, and grasslands. Project components have been sited to avoid wetlands and streams to the extent practicable. In addition, the agricultural lands being affected are generally not high quality grassland habitat, and forest land being impacted often does not display the characteristics of forest interior habitat. Consequently, the habitat being impacted by Project construction is unlikely to receive significant use by listed threatened and endangered species. However, to the extent that these species occur in the area, Project construction could result in limited disturbance/displacement of these species due to human activity and noise, and/or direct mortality impacts to eggs or young.

No construction-related impacts to listed plants or significant natural communities are anticipated. Pre-construction surveys for Jacob's ladder and northern clustered sedge will be conducted, and Project components relocated as necessary to avoid these species if they are found.

3.3.2.2 Operation

3.3.2.2.1 Vegetation

As indicated in Table 16, Project construction will result in permanent conversion of 55.5 acres of vegetated land to unvegetated/built facilities (access roads, turbines, O&M building, collection station, and POI station) within the Project area. This total will include approximately 18.6 acres of agricultural land, 4.3 acres of successional old-field, 2.1 acres of successional shrubland, 3.6 acres of disturbed/developed land, and 26.9 acres of forest. It should be noted that for vegetation, permanent impacts include both conversion of natural communities to built facilities, and conversion of one vegetative community to another (e.g., forest to successional shrubland or old field) for the life of the Project. This conversion will occur within a 200-foot radius of all tower sites and along the shoulders of access roads located in forested areas. A total of 206.1 acres of forest land will be converted to successional communities for the duration of Project operation. Other than minor disturbance associated with routine maintenance and occasional repair activities, no additional disturbance to plants and vegetative communities are anticipated as a result of Project operation.

3.3.2.2.2 Fish and Wildlife

With respect to impacts to wildlife in general, a recent NYSERDA report compares the risk to wildlife from six different electricity generation types: coal, oil, natural gas, hydro, nuclear, and wind (Newman et al. 2009). For each generation method, a relative level of risk (lowest, lower, moderate, higher, and highest) was assigned for each of six different phases (resource extraction, fuel transportation, facility construction, generation, transmission and delivery, and decommissioning). While each of these generation methods pose risks to wildlife individuals and/or populations, the degree and extent of the risks depend on the energy generation source. The report concluded that non-renewable electricity generation sources, such as coal and oil, typically pose higher risks to wildlife than renewable sources, such as hydro and wind: *"Coal as an electricity generation source is by far the largest contributor to risks to wildlife found in the NY/NE region"* (Newman et al. 2009, p. 3-1). Overall, the greatest risks to wildlife occur during the resource extraction and generation phases of power production. Since wind powered electricity production does not entail a resource extraction phase, threats from fuel extraction and transportation do not apply. For the other four phases, relative risk levels for wind ranged from "lowest" to "moderate." In contrast, each of the other five electricity generation types had at least one phase with a risk level of "higher" or "highest" (Newman et al. 2009, p. 3-1). With respect to avian impacts, a recent peer-reviewed article presented a contextual assessment of avian mortality caused by various sources of electricity generation. Although results are considered preliminary, initial estimates suggest that wind farms and nuclear power stations are responsible each for between 0.3 and 0.4 avian fatalities per gigawatt-hour (GWh) of electricity, while fossil-fueled power stations are responsible for approximately 5.2 avian fatalities per GWh (Sovacool 2009, p. 1).

However, wind power projects are not without impacts to wildlife, and operational impacts of the Crown City Project are expected to include loss of habitat, possible forest fragmentation, wildlife displacement due to the presence of the wind turbines, and avian and bat mortality as a result of collisions with operating turbines. Each of these potential impacts is described briefly below:

Habitat Loss

A total of 55.5 acres of wildlife habitat will be permanently lost from the Project area (i.e., converted to built facilities). This habitat loss represents less than 1% of the 7,500-acre Project area. As mentioned in the previous section, approximately 34% of this loss (approximately 18.6 acres) will occur in agricultural lands, which have limited wildlife habitat value. In addition, approximately 233 acres of forest are expected to be lost or converted to a successional community (old field, shrubland, or saplings) for the life of the Project. Given the relatively small area of lost or converted natural communities, the cumulative habitat loss/conversion resulting from Project development is not considered significant.

Forest Fragmentation

The proposed Project will result in conversion of 26.9 acres of forested habitat to built facilities or successional communities alongside built facilities. Project components are generally located along the edges of open areas and active agricultural fields to minimize impacts to forestland habitats. To the extent practicable, the proposed Project utilizes existing farm lanes and logging roads to minimize forest clearing and fragmentation of forest habitat. However, in some locations impacts to contiguous forestland will occur. In most instances where forested habitat will be impacted, the forested parcels are large and primarily used for commercial timber management. Therefore, fragmentation of forest habitat is not anticipated to be significant. However, the on-site breeding bird survey did document nesting by several forest-interior bird species (e.g., ovenbird and wood thrush), which suggests that forest clearing could impact such species (either through direct habitat loss or increased likelihood of nest parasitism by brown-headed cowbirds). Other avian species that are considered early successional specialists (i.e., indigo bunting, mourning warbler, eastern towhee) may benefit from forest fragmentation and the creation of additional edge habitat.

Disturbance/Displacement

Habitat alteration and disturbance resulting from the operation of turbines and other wind farm infrastructure can make a site unsuitable or less suitable for nesting, foraging, resting, or other wildlife use. As mentioned above, the footprint of turbine pads, roads, and other Project infrastructure represents a very small percentage of the site following construction (less than 1%). Therefore, overall land use is relatively unchanged by wind power development. However, the true amount of wildlife habitat altered by a wind power project can extend beyond the functional project footprint, due to the presence of tall structures and increased human activity.

Breeding Birds

While wildlife may become habituated to the presence of wind turbines within a few years, the rate (and degree) of habituation is currently unknown because few long-term studies have been conducted. Evidence indicates that some grassland species do not respond favorably to the presence of tall structures in their habitat. Studies conducted at wind power projects in southwest Minnesota and in Wyoming revealed that grassland nesting birds are found in reduced numbers as the proximity to wind turbines increases (Johnson et. al. 2000, p. 44; Leddy et. al. 1999, p. 103). Post-construction surveys at the Noble Wethersfield Windpark in Wyoming County, New York (Kerlinger & Guarnaccia 2010) concluded that one species of bird, the bobolink, showed an effect of turbine displacement following construction, with significantly fewer bobolinks within 246 feet (75 meters) of turbines situated in hayfields. However, another species of bird, the savannah sparrow, did not show a significant difference in abundance with distance from turbines.

Most breeding grassland bird species are anticipated to habituate to the turbines over the long-term, though some permanent displacement may result. However, displacement is likely to be limited to the immediate area of each turbine, and is also likely to be influenced by other factors, such as size of field and agricultural practices. Any potential impacts to grassland-nesting species are anticipated to be much less than the impacts from existing hay mowing and pesticide use in the same area. Many of the proposed turbines are sited in active agriculture fields that are already subject to periodic disturbance and have limited habitat value. Therefore, there is a low risk of substantial displacement of breeding grassland birds.

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 & Guarnaccia 2007, p. 43). A post-construction study of 11 turbines located on a ridgeline in Searsburg, Vermont showed that some forest-nesting birds (such as blackpoll warbler, yellow-rumped warbler, white-throated sparrow, and dark-eyed junco) appeared to habituate to the turbines within a year of construction. The study did not document how close to the turbines these species nested, but it clearly demonstrated that forest-nesting birds foraged and sang within forest habitat about 100 feet (30 meters) from the turbine bases. Other species found in pre-construction surveys, such as Swainson's thrush, were absent in the initial post-construction surveys and appear to have been displaced by the turbines (Kerlinger 2002, p. 22). However, a subsequent visit to the Searsburg site six years later revealed that Swainson's thrushes were singing (and likely nesting) within the forest adjacent to turbines (Kerlinger & Guarnaccia 2007, p. 33). Minimal displacement in wooded areas was also documented following construction of the Noble Bliss Wind Farm in Wyoming County, New York (Kerlinger & Guarnaccia 2009, p. 47). This study found that bird diversity rebounded following construction of the wind project, but abundance did not. These results suggest that different species may habituate to the presence of wind turbines at different rates.

Waterbirds

The potential impacts of the Project on migrating or foraging waterfowl should not be significant, even though migrating geese can be expected to forage in nearby farm fields, sometimes in substantial numbers. This conclusion is based on the results of 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 areas, 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 that site revealed that 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 the study, no turbine-related waterfowl or shorebird mortality was documented (Koford et. al. 2005, p. 5). 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 waterfowl.

Raptors

Raptors may experience some displacement due to the loss and fragmentation of habitat from the construction of the facility (Garvin et al. 2011). Based on studies from the Midwest, local breeding raptors may decrease in density within the Project area after construction, but will most likely acclimate to the turbines with time.

Game Species

While habituation to the presence of the turbines may not be immediate, game 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 is not expected to be an issue; **edr** and TCI have independently witnessed substantial numbers of deer and turkey foraging in open fields directly adjacent to and beneath operating wind turbines at several New York wind power sites.

<u>Bird Collision Risk</u>

Avian fatalities at wind plants can result from collisions with turbine rotors, guy wires of on-site met towers, and perhaps wind turbine towers. In 2003, an estimated 20,000 - 37,000 birds were killed at about 17,500 wind turbines in the United States (Erickson et. al. 2005, p. 1036). Fatalities ranged from zero to about 9 birds per turbine per year, yielding an average of 2.11 birds per turbine per year. Recent studies in the Western and Midwestern United States have confirmed the fatality levels at the lower end of the range, while studies from the Eastern United States reveal fatality levels slightly higher than the national average. For example, 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 & Kerlinger 2004, p. 5), and approximately 7 birds per turbine per year were reported killed at a small project in eastern Tennessee (Nicholson et al. 2005, p. 17). Nationwide, night migrating songbirds incur the majority of collision fatalities, with other avian species experiencing many fewer collisions.

Although collision risk is likely to be low, data on resident and migrating birds and bats at the Project area were collected to determine if site-specific characteristics might suggest an elevated level of risk relative to other sites. The overall level of activity and species composition documented during those surveys is within the range documented by similar surveys that have been conducted at other proposed wind power projects in New York State. Consequently, the Project area is not believed to be a particularly important avian corridor or an area of concentrated migration activity. Details of this evaluation are presented in the Bird and Bat Risk Assessment included in Appendix J. A summary of the findings of this assessment is presented below.

Migratory Songbirds

Based on post-construction fatality studies at operating wind projects, it is likely that nocturnal migrant passerines (songbirds) will make up the majority of bird kills due to collision with the turbines. However, there are no geographical or topographical features on or adjacent to the Project area that are likely to attract or concentrate nocturnal migrant passerines, and the Project area is not immediately proximate to any large water bodies where nocturnal migrants tend to concentrate at stopover areas. Outside of such concentration areas, passerine migration is typically diffuse over a broad front. Therefore, the Project is anticipated to have a fatality rate that will be within the range of fatality rates observed elsewhere in New York; (see Table 17 for a summary of the calculated bird fatality rates at New York wind energy facilities). There are no indicators of potential elevated risk to passerines, and thus no biologically significant adverse impacts are anticipated for any passerine species.

Waterbirds

Due to the lack of open water habitats in the area, the Project area does not support a large number of water birds. In addition, post-construction studies at existing wind energy facilities have shown that waterfowl are less susceptible to collision than other species groups (Erickson et al. 2002, p. 33; Langston & Pullan 2003, p. 21; NWCC 2010, p. 6). Risk of collision to waterfowl and other waterbirds during migration is also likely to be minimal because these birds typically migrate at high altitudes (Kerlinger & Moore, 1989, p. 130; Bellrose 1976, p. 40), and because this group of birds has not demonstrated a propensity to collide with tall structures such as other wind energy projects, communication towers, tall buildings etc.

The landfill located at the western edge of the Project area has the potential to congregate a large number of gulls, and could result in a greater use of the area by gulls than would be typically expected in the general landscape of Cortland County. The gulls would likely be using the landfill as a foraging and loafing area, and could use the airspace above the Project area as they travel to and from the landfill. Though there is the potential for collision by the gulls because these species often occupy the rotor swept area during flight, their daytime flight behavior should increase the gull's ability to avoid the turbines through visual detection of the turbines. This conclusion is supported by the fact that there have not been large numbers of collisions by gulls documented at wind farms. Thus, there are no indicators of potential elevated risk to waterbirds at the Project area (E&E 2012, p. 5-14).

Raptors

Raptor mortality from collision with turbines has been low at most operating wind power projects outside of California and some sites in Europe, which generally speaking are now considered to have been poorly sited. Based on comparative studies of avian mortality rates at wind farms in New York State and raptor passage rate through wind farm sites, the overall raptor fatality rate at the Project is expected to be low. Post-construction ground searches conducted at several operating wind power projects in Wyoming County, New York have consistently documented low raptor mortality. At the 100.5 MW Noble Bliss Windpark (67 GE 1.5 MW turbines, [389 feet to blade tip]), surveys documented seven raptor carcasses: three red-tailed hawks (one during standardized surveys and two incidental reports) and a sharp-shinned hawk during the 2008 survey (Jain et al. 2009e, p. 17), and three red-tailed hawks (one during standardized surveys and two incidental reports) during the 2009 survey (Jain et al. 2010c, p. 17). Post-construction ground searches conducted at the 126 MW Noble Wethersfield Windpark (84 GE 1.5 MW turbines, [393 feet to blade tip]) in 2010 found two raptor carcasses; one red-tailed hawk and one sharp-shinned hawk (Jain et al. 2011a, p. 16). At the 112.5 MW High Sheldon Wind Farm (75 GE 1.5 MW turbines, [397 feet to blade tip]), mortality of only three raptors (a sharp-shinned hawk and two turkey vultures) was documented during two years of post-construction studies (Tidhar et al. 2011b). These recent results are similar to those of other studies conducted in New York, and reflect the fact that raptor migration is typically diffuse in the region.

Even where concentrated hawk migration does occur around wind energy sites, evidence to date shows that risk to migrating raptors is not great and not likely to be biologically significant. At the 66 MW Mountaineer Wind Energy Facility on Backbone Mountain (44 NEG Micon 1.5 MW turbines [363 feet to blade tip]), (a long, linear ridge) in West Virginia, a study by Kerns and Kerlinger (2004, p. 18) found that only one raptor, a red-tailed hawk, was killed during a year of study. Reports from Tarifa, Spain, where raptor migration is highly concentrated, strongly suggest that migrating raptors rarely collide with turbines (DeLucas et. al. 2004, p. 404). Several studies have documented raptor collision avoidance behaviors at wind facilities (Whitfield & Madders 2006, p. 15; Chamberlain et. al. 2006, p. 200).

Although the mechanism of turbine avoidance is unknown, most raptors are diurnal and have good eyesight, suggesting they may be able to detect turbines visually as well as acoustically.

There are no geographical or topographic features (e.g., mountain ridgelines, river valleys, or coastlines) in the vicinity of the Project area that would attract or concentrate migrant raptors in large numbers. Surveys of the Project area did not identify any concentrated flight paths in either spring or fall. The results of the 2008 spring migratory raptor study recorded a migratory passage rate of 2.8 migratory raptors/ observer hour. The results of the 2008 migratory raptor fall study recorded a passage rate of 10.0 migratory raptors/hour. These passage rates are low relative to what is seen at hawk watches and other raptor concentration areas. Consequently, the impacts to migrating raptors from the development and operation of the Project are anticipated to be low. There is a potential for slightly higher impacts to vultures and other raptors at turbines located near the county landfill. Additional food sources available at the landfill may increase raptor activity in this area. There is also an increased risk of collision from any turbine located near an active nest. However, based on the general lack of elevated risk factors and the results of fatality monitoring at other New York wind projects, no biologically significant adverse impacts on raptors are anticipated from operation of the Project.

In summary, studies conducted at other sites outside of California have shown avian fatalities to be relatively infrequent events at wind farms. 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 the affected species. The observed level of mortality is also minor when compared to other potential sources of avian mortality (Erickson et. al. 2001, p.19).

Bird Fatality Approximations

There currently is no predictive model available that has been demonstrated to accurately predict avian collision mortality as a result of wind power project operation. Therefore, risk assessments must be based on pre-construction indices and indicators of risk (e.g., site-specific survey data), along with empirical data from operating projects. Bird fatality rates have varied between 0.66 and 9.59 birds/turbine/study period and between 0.44 and 5.81 birds/MW/study period at New York sites where recent, rigorous post-construction mortality monitoring has been conducted (see Table 17). Avian fatality rates at the Project are anticipated to be similar to those recorded elsewhere within New York State. This prediction is based on the results of on-site bird studies and literature review, which did not identify any indicators of elevated risk at the Project area. There are no species or habitats on site that would suggest elevated risk to breeding birds, and there are no features in the area that would attract or concentrate large numbers of migrating birds.

It is anticipated that the bird fatality rates for the Crown City Project will be within the wide range of bird fatality rates documented in the studies summarized in Table 17. A lower bound estimate of 33 avian fatalities per year is based on the results of the 2008 survey results from the Noble Bliss Wind Project (Jain et al. 2009e, p. 43). An upper bound estimate of 418 avian fatalities per year is based on the results of 2006 surveys conducted at the Maple Ridge Wind Project (Jain et al. 2007, p. 49-50). An average fatality rate of 108 birds per year at the Crown City Project was calculated based on the weekly bird/MW/study period rates documented in other studies. These estimations represent the full range of estimated mortality, which may be biased high or low depending on survey methods. Such comparisons can be misleading due to differences in the attention paid to avoidance measures during project design, the differences in habitat and avian abundance at the different projects, and other factors that would influence bird impacts. The number of bird fatalities at a given project can really only be determined through post-construction mortality study. However, using actual mortality rates documented at operating wind projects in comparable settings is the best available (and widely accepted) means of predicting collision mortality, and the range and average of predicted collision mortality presented above represents a reasonable estimate of the Project's potential impacts.

Although these numbers may appear large, they are a tiny fraction of the population that migrates through the area, and are not considered biologically significant impacts as the numbers are not sufficient to impact the parent population. As indicated above, this predicted level of fatalities is quite minor when compared to other sources of mortality. Other sources of avian mortality that each greatly exceed that caused by wind turbines include collision with buildings/windows, predation by housecats, use of agricultural pesticides, collision with communication towers, collision with power lines, and collision with vehicles (Erickson et.al. 2001, p.19; Klem 1991, p. 99; Coleman & Temple 1993, p. 381; Pimentel et al. 1992, p. 756-757).

Table 17. Bird Fatality Rates from Post-Construction Studies at New York State Wind Energy Facilities

Wind Project and Location	Monitoring Start/End Date	Year	Reported Mortality Rate (Adjusted for Searcher Efficiency, Scavenger Removal)		Reference
			Bird Fatalities/ Turbine	Bird Fatalities/ MW/Period	
Maple Ridge, Lewis County, New York – Mixed (agriculture and forest)					
Daily surveys	6/17 – 11/15	2006	9.59	5.81	Jain et al., 2007
3-day surveys	6/29 – 11/15	2006	4.47	2.71	Jain et al., 2007
Weekly surveys	7/11 – 11/13	2006	3.13	1.90	Jain et al., 2007
Weekly surveys	4/30 – 11/14	2007	3.87	2.34	Jain et al., 2009a
Weekly surveys	4/15 – 11/9	2008	3.42	2.07	Jain et al., 2009b
Noble Bliss, Wyoming County, New York – Mixed (agriculture and forest)					
Daily surveys	4/21 – 11/14	2008	4.30	2.86	Jain et al., 2009e
3-day surveys	5/9 – 11/14	2008	0.66	0.44	Jain et al., 2009e

Weekly surveys	5/9 – 11/14	2008	0.74	0.50	Jain et al., 2009e
Daily surveys	4/15 – 11/15	2009	4.45	2.97	Jain et al., 2010c
Weekly surveys	4/15 – 11/15	2009	2.87	1.91	Jain et al., 2010c
Noble Clinton, Clinton County, New York – Mixed (agriculture and forest)					
Daily surveys	4/26 – 10/13	2008	1.43	0.96	Jain et al., 2009c
3-day surveys	4/26 – 10/13	2008	3.26	2.17	Jain et al., 2009c
Weekly surveys	5/8 – 10/13	2008	2.48	1.65	Jain et al., 2009c
Daily surveys	4/15 – 11/15	2009	1.50	1.00	Jain et al., 2010b
Weekly surveys	4/15 – 11/15	2009	1.76	1.17	Jain et al., 2010b
Noble Ellenburg, Clinton County, New York – Mixed (agriculture and forest)					
Daily surveys	4/29 – 10/13	2008	2.09	1.40	Jain et al., 2009d
3-day surveys	4/28 – 10/13	2008	1.37	0.91	Jain et al., 2009d
Weekly surveys	4/28 – 10/13	2008	1.18	0.78	Jain et al., 2009d
Daily surveys	4/15 – 11/15	2009	5.69	3.79	Jain et al., 2010a
Weekly surveys	4/15 – 11/15	2009	2.29	1.53	Jain et al., 2010a
Cohocton and Dutch Hill, Steuben County, New York – Mixed (agriculture and forest)					
Daily surveys	4/15 – 11/15	2009	4.7	1.88	Stantec, 2010
Weekly surveys	4/15 – 11/15	2009	2.9	1.18	Stantec, 2010
Daily surveys	7/15 – 9/17	2010	2.06	1.37	Stantec, 2011
Weekly surveys	7/15 – 9/17	2010	1.16	0.77	Stantec, 2011
Munnsville, Madison and Oneida Counties, New York – Mixed (agriculture and forest)					
Dog searches (recurrence unknown)	4/15 – 11/15	2008	1.71	1.14	Stantec, 2008
Weekly surveys	4/15 – 11/15	2008	2.22	1.48	Stantec, 2008
Noble Wethersfield, Wyoming County, New York – Mixed (agriculture and forest)					
Weekly surveys	4/26 – 10/15	2010	2.55	1.70	Jain et al., 2011a
Noble Altona, Clinton County, New York – Mixed (agriculture and forest)					
Daily surveys	4/26 – 10/15	2010	2.76	1.84	Jain et al., 2011b
Weekly surveys	4/26 – 10/15	2010	1.55	1.04	Jain et al., 2011b
Noble Chateaugay, Franklin County, New York – Mixed (agriculture and forest)					
Weekly surveys	4/26 – 10/15	2010	2.48	1.65	Jain et al., 2011c
High Sheldon, Wyoming County, New York – Mixed (agriculture and forest)					
Daily and weekly surveys	4/15 – 11/15	2010	2.64	1.76	Tidhar et al., 2011a
Daily and weekly surveys	5/15 – 11/15	2011	2.36	1.57	Tidhar et al., 2011b

Bat Collision Risk

Fatality monitoring studies at operating wind power projects in the Northeast suggest that collision mortality for bats can be substantially greater than that seen for birds. Migratory tree-roosting bat species (hoary bat, eastern red bat, and silver-haired bat) appear to be especially susceptible to colliding with the operating wind turbines. Results of fatality studies at wind energy facilities in the eastern United States as well as several western sites (U.S. and Canada) seem to indicate that these species are more susceptible to collisions with wind turbines then resident bat species (NWCC 2010, p. 4; Kunz et al. 2007, p. 316; Arnett et al. 2008, p. 70). For example, during the post-construction surveys at the Maple Ridge Wind Farm in Lewis County, New York, 151 of 203 total dead bats found during the 2007 surveys and 106 of 140 total dead bats found during 2008 surveys were the three tree-roosting bat species mentioned above (Jain et al. 2009a, p. 25; 2009b, p. 29). Similarly, during the post-construction surveys at the Noble Bliss Windpark, 43 of the 74 total dead bats found during 2008 surveys, and 27 of the 36 total dead bats found during the 2009 surveys were hoary, eastern red, or silver-haired bats (Jain et al. 2009e, p. 21; 2010c, p. 21).

As the population sizes/trends and migratory patterns of most bats in New York State are unknown, it is uncertain what level of impact wind projects have, especially in light of the even greater mortality risk presented by WNS (NYSDEC 2010a).

Bat Fatality Approximations

Available data from operating wind projects suggest that the risk of collision mortality will generally be higher for bats than that for birds. Bat fatalities were highest at wind projects sited along forested ridgelines in the Appalachians, with a range of 20.8 to 69.6 fatalities per turbine per year (Arnett et. al. 2008, p. 63). This differs from the much lower mortality rates documented at mid-west and western sites located in open and mixed landscapes, ranging from 0.07 to 2.32 fatalities per turbine per year (Erickson et al. 2002, p. 86). Mortality rates at the Maple Ridge facility in the Tug Hill region of northern New York State are lower than those reported from studies at Appalachian ridges, but greater than those reported in Midwestern studies. Estimates ranged from 15.2 to 24.5 bats per turbine per year during the first year of post-construction monitoring (Jain et. al. 2007, p. 3), and from 15.4 to 18.4 bats per turbine per year during the second year of post-construction monitoring (Jain et. al. 2009a, p. 3).

Bat fatality rates have varied between 0.7 and 24.45 bats/turbine/study period and between 0.46 and 16.3 bats/MW/study period at New York sites where recent, rigorous post-construction mortality monitoring has been conducted (see Table 18). Bat fatality rates at the Project are anticipated to be similar to those documented elsewhere in New York State. This prediction is based on the results of the habitat surveys, acoustical monitoring studies, and literature review which did not identify any elevated indicators of risk to bats at the Crown City Site (e.g., there is no evidence of large roost, hibernacula or elevated bat activity in the area).

It is anticipated that the bat fatality rates for the Project will be within the wide range of bat fatality rates documented in the New York studies summarized in Table 18. E&E (2012, p. 5-22) calculated a lower bound estimate of 33 bat fatalities per year, based on the results of the 2008 survey results from the Munnsville Wind Project in Madison and Oneida Counties, New York (Stantec, 2008), and an upper bound of 1,174 bat fatalities per year, based on the results of 2010 surveys conducted at the Noble Wethersfield Wind Project (Jain et al. 2011a, p. 30). An average fatality rate of 288 bats per year at the Crown City Project was also calculated (E&E 2012, p. 5-24) based on the weekly bat/MW/study period rates provided in Table 18. These estimates may be somewhat high given the reduction of resident bat populations since the introduction of WNS in winter 2006.

As with estimates of avian collision morality, such comparisons can be misleading. The NWCC warns that caution must be used when comparing fatality rates across studies due to the use of different estimators and varying search intensities, study lengths, timing, size of search areas, and biases from unaccounted crippling losses (Strickland et al. 2011, p. 7). Research regarding impacts to bats from wind developments has been more limited until recent years; therefore, there are fewer studies with bat fatality data than bird fatality data. For many bat species, an understanding of their natural history, especially migration and foraging movements, remains incomplete (Miller 2008, p. 14-15). The effect of bat fatalities due to wind turbines on populations as a whole is not well understood and current research is addressing this issue. The Bats and Wind Energy Cooperative (BWEC), an alliance of state and federal agencies, the wind industry, academic institutions, and non-governmental organizations, is currently researching the interactions of bats and wind turbines with the intent to develop solutions for wind farm siting and mitigation that will minimize or prevent bat mortality from wind turbines. To date, there has been no confirmed correlation between habitat availability and specific atmospheric or seasonal conditions that result in increased mortality. However, most collision mortality of migratory tree bats occurs during the fall migration season (August to September), and preliminary data seem to indicate increased mortality rates during periods of lower wind speed.

Table 18. Bat Fatality Rates from Post-Construction Studies in New York State Wind Energy Facilities

Wind Project and Location	Monitoring Start/End Date	Year	Reported Mortality Rate (Adjusted for Searcher Efficiency, Scavenger Removal)		Reference
			Bat Fatalities/ Turbine	Bat Fatalities/ MW/Period	
Maple Ridge, Lewis County, New York – Mixed (agriculture and forest)					
Daily surveys	6/17 – 11/15	2006	24.53	14.87	Jain et al., 2007
3-day surveys	6/29 – 11/15	2006	22.34	13.54	Jain et al., 2007
Weekly surveys	7/11 – 11/13	2006	15.2	9.21	Jain et al., 2007
Weekly surveys	4/30 – 11/14	2007	15.24	9.42	Jain et al., 2009a
Weekly surveys	4/15 – 11/9	2008	8.18	4.96	Jain et al., 2009b
Noble Bliss, Wyoming County, New York – Mixed (agriculture and forest)					
Daily surveys	4/21 – 11/14	2008	7.58	5.05	Jain et al., 2009e
3-day surveys	5/9 – 11/14	2008	14.66	9.78	Jain et al., 2009e
Weekly surveys	5/9 – 11/14	2008	13.01	8.67	Jain et al., 2009e
Daily surveys	4/15 – 11/15	2009	8.24	5.5	Jain et al., 2010c
Weekly surveys	4/15 – 11/15	2009	4.46	2.97	Jain et al., 2010c
Noble Clinton, Clinton County, New York – Mixed (agriculture and forest)					
Daily surveys	4/26 – 10/13	2008	5.45	3.63	Jain et al., 2009c
3-day surveys	4/26 – 10/13	2008	4.81	3.21	Jain et al., 2009c
Weekly surveys	5/8 – 10/13	2008	3.76	2.5	Jain et al., 2009c
Daily surveys	4/15 – 11/15	2009	9.72	6.48	Jain et al., 2010b
Weekly surveys	4/15 – 11/15	2009	5.16	3.44	Jain et al., 2010b
Noble Ellenburg, Clinton County, New York – Mixed (agriculture and forest)					
Daily surveys	4/29 – 10/13	2008	8.17	5.45	Jain et al., 2009d
3-day surveys	4/28 – 10/13	2008	6.94	4.63	Jain et al., 2009d
Weekly surveys	4/28 – 10/13	2008	4.19	2.79	Jain et al., 2009d

Wind Project and Location	Monitoring Start/End Date	Year	Reported Mortality Rate (Adjusted for Searcher Efficiency, Scavenger Removal)		Reference
			Bat Fatalities/ Turbine	Bat Fatalities/ MW/Period	
Daily surveys	4/15 – 11/15	2009	8.01	5.34	Jain et al., 2010a
Weekly surveys	4/15 – 11/15	2009	3.7	2.47	Jain et al., 2010a
Cohocton and Dutch Hill, Steuben County, New York – Mixed (agriculture and forest)					
Daily surveys	4/15 – 11/15	2009	40	16	Stantec, 2010
Weekly surveys	4/15 – 11/15	2009	13.8	5.53	Stantec, 2010
Munnsville, Madison and Oneida Counties, New York – Mixed (agriculture and forest)					
Dog searches (recurrence unknown)	4/15 – 11/15	2008	2.9	1.93	Stantec, 2008
Weekly surveys	4/15 – 11/15	2008	0.7	0.46	Stantec, 2008
Noble Wethersfield, Wyoming County, New York – Mixed (agriculture and forest)					
Weekly surveys	4/26 – 10/15	2010	24.45	16.3	Jain et al., 2011a
Noble Altona, Clinton County, New York – Mixed (agriculture and forest)					
Daily surveys	4/26 – 10/15	2010	6.51	4.34	Jain et al., 2011b
Weekly surveys	4/26 – 10/15	2010	3.87	2.58	Jain et al., 2011b
Noble Chateaugay, Franklin County, New York – Mixed (agriculture and forest)					
Weekly surveys	4/26 – 10/15	2010	3.66	2.44	Jain et al., 2011c
High Sheldon, Wyoming County, New York – Mixed (agriculture and forest)					
Daily and weekly surveys	4/15 – 11/15	2010	3.50	2.33	Tidhar et al., 2011a
Daily and weekly surveys	5/15 – 11/15	2011	2.67	1.78	Tidhar et al., 2011b

3.3.2.2.3 Threatened and Endangered Species

Because limited use of the Project area by endangered, threatened, and special concern species is anticipated, no significant adverse impact on these species is expected during Project operation. The potential impacts on listed threatened and endangered species documented in the area are discussed in detail below.

Two migrant golden eagles were observed on the Project area by E&E staff during the spring raptor surveys. There is no suitable habitat for golden eagles breeding in the area and there are no active nests in New York State (NYSDEC 2012b). In addition, there are no activities pertinent to the life cycle of the golden eagle that would regularly bring it to the Project area, except as a migrant or an occasional transient. With such low utilization of the area, the potential risk of golden eagles colliding with the turbines is considered remote. Similarly, as there is no suitable breeding habitat in the area, the potential for disturbance, displacement, or habitat impacts that would affect this species are also unlikely. Therefore, potential adverse impacts to golden eagle are not anticipated.

Bald eagles were observed by E&E staff in the Project area during spring and fall raptor surveys in 2008. All of the observed bald eagles were classified as migratory individuals passing through the area. Upon detailed consultation with USFWS and NYSDEC, the Project Sponsor has learned that two bald eagle nests were identified within Cortland County in 2012, off the Project site, some 7.09 miles and 9.87 miles south of the most proximate proposed wind turbines. Habitat within the Project area is not considered to be suitable for breeding bald eagles, and foraging opportunities for this species are also limited due to the absence of any large bodies of water in the area (although there is potential that they could forage at the landfill, with a greater likelihood of this occurring in winter). There are no activities pertinent to the life cycle of the bald eagle that would regularly bring it to the area, except as a migrant or a transient, and the number of bald eagles documented during on-site raptor migration surveys was low. These assumptions will be further substantiated by the results of the pre-construction eagle monitoring plan described in section 3.3.1.2.6 above. In addition, mortality studies at operating wind power projects have documented that bald eagles are not particularly susceptible to collision mortality. Consequently, the potential for direct mortality or injury to bald eagles from colliding with wind turbines is low. Similarly, the potential for disturbance, displacement, or habitat impacts that would affect this species are also low. Therefore, potential adverse impacts to bald eagle are considered unlikely.

A total of eight northern harriers were observed on the Project area during spring and fall raptor surveys, with both locals and migrants observed. The NHP and BBA also indicate that it is a confirmed or suspected breeder in the area. Although foraging and courtship behavior by this species suggests the possibility at elevated collision risk, very low northern harrier mortality has been documented from wind turbines, even at sites that have relatively high use by this species (Erickson et al. 2002, p. 31). The risk of northern harrier collision, disturbance, displacement or habitat loss as a result of operation of the Project is considered low-to-moderate based on the species' frequency of occurrence in the area.

The pied-billed grebe was not recorded during any of the E&E field surveys, and was absent from the Dryden BBS (Sauer et al. 2008). However, this species was documented in the area by the NHP and recorded by the Cortland CBC. The species is an uncommon breeder in Cortland County and the Project area lacks its preferred breeding habitat (i.e., freshwater ponds, marshes, lakes). Therefore no activities pertinent to the life cycle of this species would regularly bring it to the Project area except as a migrant or a transient. As such, the potential risk of pied-billed grebes colliding with wind turbines is low. Similarly, the potential for disturbance, displacement, or habitat impacts that would affect this species are also low. Therefore, potential adverse impacts to Pied-billed Grebe are considered unlikely.

The federally and state-listed endangered Indiana bat and the state-listed species of special concern eastern small-footed bat are the only two protected bat species that were identified as having the potential to occur in Cortland County. Because acoustical monitoring cannot distinguish to the species level for the genus *Myotis,* there is the potential that these species could be present in the area. The Project area provides suitable roosting and foraging habitat for these species, and is within the range of the nearest hibernaculum, approximately 25 miles away. However, as indicated above, radio-tracked Indiana bats emerging from the Jamesville hibernaculum generally fly north and northwest, away from the Project area. Overall, the risk to these species is considered low, based on the results of fatality surveys at other wind projects and because of the inherent rarity of these species in New York State. In addition, WNS has likely largely decimated populations of cave-dwelling bats in the region. With decreases to already small populations, there is even less likelihood of these species being at the Project area, and thus exposed to collision risk.

Additional listed species documented in the area are listed in Table 15. All of these species were detected in very low numbers, and many were not actually observed on site. Therefore the potential risks of collision, disturbance, and displacement of listed species at the Crown City Project are considered remote.

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 impact ecological resources (fish, wildlife, natural communities). However, as indicated in Table 19, environmental impacts that result from more traditional power generating facilities such as fossil fuel, hydroelectric, and nuclear are much more significant than the impacts caused by wind power projects.

Table 19. 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	None	Yes	None
Mining/Extraction	None	Yes	Yes	Yes	Yes
Waste	None	Yes	Yes	Yes	None
Water Use	None	Yes	Yes	Yes	Yes
Habitat Impacts	Yes	Yes	Yes	Yes	Yes

(AWEA, 2008a).

These impacts include a larger project footprint, which results in direct habitat loss; the use of surface waters for generation and/or thermal regulation, which results in thermal discharge, fish entrainment, and impingement; the extraction and transportation of raw materials, which results in habitat disturbance and air pollution; waste disposal, which increases the effective footprint of a project and presents pollution/contamination concerns; air pollution, which results in acid precipitation and the subsequent effects on ecological resources; and/or continued contribution to global warming, which is perhaps the greatest potential impact to ecological (and human/cultural) resources worldwide.

3.3.3.1 Vegetation

Mitigation of impacts to vegetation will be accomplished primarily through careful site planning. Large areas of forest and wetland 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 forest roads wherever possible, 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 prior to Project construction to protect adjacent undisturbed vegetation and other ecological resources (see Section 3.2 Water Resources for further details).

Mitigation measures to avoid or minimize impacts to vegetation will also include pre-construction surveys for Jacob’s ladder and northern clustered sedge, 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, 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. Please also refer to the Invasive Species Control Plan included as Appendix Y, and summarized in Section 2.6.

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), adherence to designated construction limits, and avoidance of 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 SWPPP 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 Mitigation Plan will be developed and implemented to minimize the potential for unintended releases of petroleum and other hazardous chemicals during Project construction and operation.

Mitigation for impacts related to permanent habitat loss and forest fragmentation will be accomplished through careful site design (i.e., 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.

With respect to impacts to wildlife in general, as previously stated, the relative risk levels for wind powered electricity ranged from “lowest” to “moderate” in comparison to other electricity generation types (coal, oil, natural gas, hydro, nuclear). In contrast, each of the other five electricity generation types had at least one phase with a risk level of “higher” or “highest” (Newman et al. 2009, p.3-1). With respect to avian impacts, a recent peer-reviewed article presented initial estimates that suggest wind farms and nuclear power stations are responsible each for between 0.3 and 0.4 avian fatalities per gigawatt-hour (GWh) of electricity, while fossil-fueled power stations are responsible for approximately 5.2 avian fatalities per GWh (Sovacool 2009, p. 1). Therefore, because wind powered electricity offsets electricity generated by fossil-fueled power plants, implementation of the Project can be considered mitigation for the impacts caused by coal, oil, etc.

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 those in 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, electrical collection lines between the turbines will typically be buried. 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 blinking lights with the longest permissible off cycle).

Post-Construction Avian and Bat Monitoring

Based on the extensive expert study and analysis provided in the DEIS, the proposed Project is not anticipated to have an undue adverse impact on birds or bats, and therefore no mitigation is required. However, the NYSDEC is requesting post-construction monitoring studies at all wind power projects in New York State, and the Project Sponsor will commit to participate in this voluntary program in order to further the State's understanding of bird/bat interactions with wind turbines. According to the NYSDEC's Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects (included as Appendix W), standard post-construction studies include mortality surveys, bird habituation and avoidance studies, and bat acoustical monitoring. Typical details of each of these study components are described below. For additional detail, please see Appendix W.

Mortality Surveys

Ground searches for bird and bat carcasses will be conducted under operating turbines for a minimum of two years. In compliance with the NYSDEC guidelines for Bird and Bat studies (see Appendix W) at least 15 turbines will be selected and included in the ground searches. The area to be searched beneath each turbine will be no less than 1.5 times the rotor diameter (i.e., 100 meters [328 feet] rotor diameter x 1.5 = 150 meters [492 feet]). The type and amount of ground cover under each turbine will be recorded every day that searches occur, as will weather conditions. All required collection/possession permits will be obtained at the state and federal level prior to the commencement of searches. For each carcass found, digital photographs will be taken and location and identification data collected. Should a state or federally listed species be found dead or injured either during a regular survey period or incidentally at any of the turbines in the Project, the NYSDEC and USFWS will be notified within 48 hours. To accurately estimate mortality rates, searcher efficiency tests and scavenger removal tests will be conducted, using carcasses of various sized species that breed and migrate in the Project area (NYSDEC, 2009b).

Bird Habituation

Information from the post-construction bird habituation survey is intended to be comparable to pre-construction surveys, and will examine whether the Project is having any effect on bird use of the site during breeding and migration periods, and whether habituation or avoidance is occurring. The pre-construction breeding bird surveys and migratory bird surveys will be repeated during the first and second years after the Project becomes operational. A third year of study may be conducted on the third, fourth, or fifth year of Project operation, as determined through consultation with NYSDEC. Post-construction survey transects, points, and methods will be as close as possible to those used during pre-construction surveys. At pre-construction sample locations that become actual turbine sites, surveys will, to the greatest extent possible, take place during a period when turbine noise does not interfere with the observer's ability to hear, see, and record birds. Any land use or habitat changes that may have occurred since pre-construction or the previous post-construction survey was conducted will be noted, as this could potentially alter the bird species composition and density (NYSDEC, 2009b).

Bat Acoustical Monitoring

Standard bat acoustical monitoring will be conducted concurrently with mortality ground searches for as many years as mortality surveys are done. Detectors should be situated to sample as much of the rotor swept area as possible, or at least 150 feet above ground surface. At least two detectors sampling in a horizontal plane should be installed at each sampling location, one as high on the met tower as possible and the other at two to three meters (6.5 – 9.8 feet) above the ground. Recording at all detectors will occur daily between April 15 and October 15, from one half hour prior to sunset until one half hour after sunrise. Summer surveys will also include active acoustical sampling to determine which species are present on the site. This would entail one or more field investigators with a detector walking across the study area in a variety of habitats that are likely to contain bats, and recording what is present. Active sampling should be conducted on at least nine warm (i.e., temperatures above 55 degrees Fahrenheit), dry, calm evenings between June 1 and July 10, starting at dusk and ending no earlier than 2:00 a.m. Analysis of calls will include the criteria used for species identification (NYSDEC, 2009b).

The final specifications of the Project's post-construction monitoring study will be developed in consultation with state and federal agencies, including details such as study duration, search frequency, search areas, number and location of turbines to be searched, concurrent data collection and analysis, carcass collection for further study, and mitigation strategies that may be implemented if post-construction monitoring reveals operational impacts in excess of that which is anticipated or otherwise considered significant. A work plan for the post-construction studies will be submitted to the NYSDEC for review prior to Project implementation. Appropriate mitigation strategies such as exploring potential deterrents with respect to bats including 1) habitat modification at or near turbine sites to promote habitat for species of concern or 2) bat habitat management / enhancement elsewhere (e.g., working with landowners to implement specific mowing schedules to promote grassland habitat), would be investigated and deployed as deemed appropriate. These appropriate mitigation techniques would be developed in consultation with NYSDEC.

3.3.3.3 Threatened and Endangered Species

As indicated above in Section 3.3.1.2.6, no state- or federally-listed threatened or endangered plant species have been identified within the Project area, and no impacts to listed plants or significant natural communities are anticipated. Therefore, no mitigation is required.

With respect to threatened and endangered wildlife species, listed wildlife species documented in the vicinity of the Project area utilize a variety of habitats, including wetlands/water bodies, forests, and grasslands. As indicated above in Section 3.3.2.1.3, the habitat being impacted by the Project is unlikely to receive significant use by listed threatened and endangered species. Therefore, no mitigation specific to threatened and endangered species is required. The Bald and Golden Eagle Protection Act (BGEPA) will be adhered to. In consultation with DEC and USFWS, a pre-construction eagle monitoring plan will be created and implemented prior to construction of the Project. Potential mitigation of the effect of the Project on bald eagles is pro-active participation in applying for an Eagle Conservation Permit (ECP) and/or creation of an Avian and Bat Protection Plan (ABPP) along with potentially continuing eagle point count surveys, should this be required by the USFWS and NYSDEC. In New York State NYSDEC may issue a permit that authorizes the incidental take of a species listed as endangered or threatened. An incidental take permit shall include an endangered or threatened species mitigation plan that NYSDEC has determined will result in a net conservation benefit to the listed species and which has been approved by NYSDEC. The Project Sponsor would apply for an Incidental Take Permit if the pre-construction eagle monitoring plan predicts that bald eagles will be killed by wind turbines during the operation of the Project. Given the distance to the nearest bald eagle nests (7.09 miles and 9.87 miles) it is not considered likely that incidental take permit will be required but this will be validated as described above.

Note that should a state or federally-listed species be found dead or injured either during post-construction monitoring studies (described above in Section 3.3.3.2; see also Appendix W), the NYSDEC and USFWS will be notified within 48 hours.

The U.S. Fish and Wildlife Service in its press release, "Review Finds Endangered Species Protection May Be Warranted for Two Bat Species," (USFWS 2011) states that both the northern long-eared bat and the eastern small-footed bat may warrant federal protection as threatened or endangered species. Although there are no NYSDEC acoustic sampling transects in Cortland County, the transects from surrounding Counties, (the nearest transects are in Onondaga, Madison, Chenango, and Tompkins counties, which are located approximately 8 miles northwest, 13 miles northeast, 17 miles southeast, and 19 miles southwest of the Project area, respectively) were studied. The eastern small footed bat has not been detected, while the Northern bat had very few detections (in comparison to detections of other bat species), at any of the sampling routes in the vicinity of the Project area (E&E 2012, p.3-25). The Project Sponsor will continue to liaise with USFWS to identify risks to these particular species in the Project area. Please refer above for a description of the proposed Post Construction avian and Bat Monitoring plan.

3.4 CLIMATE AND AIR QUALITY

This sub-section is organized as follows:

- 3.4.1 Existing Conditions

- 3.4.2 Potential Impacts
- 3.4.3 Proposed Mitigation

3.4.1 Existing Conditions

Existing climatic conditions and regional air quality are discussed below.

3.4.1.1 Climatic Conditions

The Natural Resources Conservation Service (NRCS) maintains and monitors National Water and Climate Centers (NWCC) in numerous locations throughout the United States, including one in Cortland, New York. This NWCC station has collected temperature and precipitation data from 1971 through 2000. Based upon the compiled 30-year averages, the average daily maximum temperature in Cortland is 56.0 degrees Fahrenheit (°F), and the average daily minimum is 37.2°F. Historically, January is the coldest month with an average daily temperature of 22.4°F, and July is the warmest with an average daily temperature of 69.7°F. Temperature extremes range from a high of 100°F to a low of -18°F (NRCS, 2012b).

The NRCS-NWCC worked in partnership with Oregon State University to produce continuous digital temperature and precipitation maps of the U.S., using the point data collected from NWCC substations. The data sets are created using the PRISM (Parameter-elevation Regressions on Independent Slopes Model) climate mapping system. PRISM data sets are recognized as the highest quality spatial climate data sets currently available and the maps produced from the PRISM system have undergone an extensive peer-review process. Based on the data collected between 1895 and 2011, the average daily maximum temperature for the Project area is 54.4°F, and the average daily minimum is 36.6°F (Oregon State University, 2012).

The 30-year annual average precipitation recorded in Cortland is 39.25 inches. June, with an average monthly precipitation of 4.08 inches, is historically the wettest month of the year, and February, with an average monthly precipitation of 2.53 inches, is the driest. The 30-year average annual snowfall recorded in Cortland is 90.5 inches. December and January are historically the snowiest months of the year with monthly averages of 21.5 inches and 22.6 inches, respectively (NRCS 2102b).

Based on the PRISM system data, the average annual precipitation for the Project area between 1895 and 2011 is 40.67 inches (Oregon State University 2012).

3.4.1.2 Air Quality

The NYSDEC Division of Air Resources publishes air quality data for New York State annually. The most recent summary of air quality data available for the state is the *New York State Air Quality Report for 2011* (NYSDEC 2012c). Included in this report are the most recent ambient air quality data, as well as long-term air quality trends derived from data that have been collected and compiled from numerous state and private (e.g., industrial, utility) monitoring stations across the state. These trends are assessed and reported by NYSDEC regions; the Project area is located in NYSDEC Region 7, which encompasses Broome, Cayuga, Chenango, Cortland, Madison, Onondaga, Oswego, Tioga, and Tompkins Counties. There are four monitoring stations in Region 7: Fulton in Oswego County monitors ozone, Syracuse in Onondaga County measures carbon monoxide, East Syracuse in Onondaga County measures sulfur dioxide, ozone, and inhalable particulates, and Camp Georgetown in Madison County measures sulfur dioxide and ozone.

The Clean Air Act requires the Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for pollutants considered harmful to public health and the environment. In 2011, all Region 7 sampling points were within the acceptable levels established by the NAAQS for all tested parameters, which include sulfur dioxide, inhalable particulates, carbon monoxide, and ozone (NYSDEC 2012c).

The largest source of air emissions in the vicinity of the proposed Project is the Pall Corporation Process Group, Pall Trinity Micro Division in Cortlandville. In 2010, the Pall Corporation Process Group was ranked 65th among all facilities in New York State for total on- and off-site releases of all chemicals (EPA 2011).

No local air monitoring data is available to further characterize air quality in the immediate vicinity of the proposed Project.

3.4.2 Potential Impacts

3.4.2.1 Construction

During the site preparation and construction phases of the Project, minor, temporary adverse impacts to air quality could result from the operation of construction equipment and vehicles. Such impacts could occur as a result of emissions from engine exhaust and from the generation of fugitive dust during earth moving activities and travel on unpaved roads. The increased dust and emissions will not be of a magnitude or duration that would significantly impact local air quality. Any impacts from fugitive dust emissions from travel on unpaved roads are anticipated to be short-term and localized and will be avoided or corrected quickly, as discussed below.

3.4.2.2 Operation

The operation of this Project is anticipated to have a positive impact on air quality by annually producing 217,686 MWh of electricity with zero emissions (assuming 44 turbines, each with a nameplate capacity of 1.6 MW turbines, operating at 35% annually), except very small emissions from vehicles servicing the facilities. Power delivered to the grid from this Project can off-set the generation of energy at existing conventional power plants, as referred in Section 2.3. Based on emissions rates for the U.S. average fuel mix (EPA 2012b), this 217,686 MWh wind farm is estimated to annually displace:

- 243,808 pounds (121.9 tons) of NO_x
- 670,473 pounds (335.2 tons) of SO_2
- 264,706,176 pounds (132,353.1 tons) of CO_2

The operation of this Project is not anticipated to have any measurable effect on climate. Some recent studies have suggested that there may be minor impacts to microclimates within 0.5 mile of wind turbines. Modeling conducted by Baidya Roy et al. (2004, p. 5) suggests that large-scale wind turbine installations (i.e., 10,000 turbines) may have a warming effect on the local climate. During the environmental review process for a wind farm in Chautauqua, NY, a study group analyzed the impacts of wind turbines on vineyard microclimates (DeGaetano et al. 2004). This study group determined that a wind turbine could influence the ground level air temperature by no more than one degree Celsius (ºC) and concluded that significant positive or negative impacts to area vineyards as a result of this potential change in microclimate were unlikely. Preliminary findings from a study conducted in Iowa, found that wind turbines produce measurable effects on the microclimate near crops due to the turbines pushing air downwards, which increases air flow below the turbines (The Ames Laboratory 2010). However, on a larger scale, the Project represents a legitimate effort to mitigate the well-established causes of global climate change by generating up to 71 MW of electricity without the production of “greenhouse” gases.

3.4.3 Proposed Mitigation

3.4.3.1 Proposed Mitigation During Construction

Except for minor, short-term impacts from construction vehicles, the Project will have no adverse impacts on air quality. Dust control procedures will be implemented to minimize the amount of dust generated by construction activities, in a manner consistent with the Standards and Specifications for Dust Control (see Appendix K) as outlined in the *New York State Standards and Specifications for Erosion and Sediment Controls* (NYSDEC 2005). In accordance with these procedures, the extent of exposed/disturbed areas on the site at any one time will be minimized and restored/stabilized as soon as possible. The Environmental Monitor will identify dust problems and report them to the construction manager and the contractor. Water will be used to wet down dusty roads (public roads as well as Project access roads) as needed throughout the duration of construction activities. In more severe cases, temporary paving (e.g. oil and stone) could be used to stabilize dusty road surfaces in certain locations. In addition, the Project Sponsor will implement a Community Outreach and Communication Plan to establish an efficient process by which to report and resolve any construction or operational impacts (see Section 4.2 and Appendix L1 of this DEIS for additional information).

3.4.3.2 Proposed Mitigation During Operation

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. The United States currently obtains approximately 68 percent of its electricity from fossil fuels, with 42 percent coming from coal, the fossil fuel with the highest carbon dioxide content per unit of electricity produced (EIA 2012a). Total annual carbon dioxide emissions in the United States is approximately 5.6 billion metric tons; these emissions are projected to rise to 5.8 billion metric tons annually by 2035 (EIA 2012c, p.2). Every 10,000 MW of wind installed can reduce carbon dioxide emissions by approximately 29 million tons annually if it replaces coal-fired generating capacity (EPA 2007), or 18 million tons if it replaces generation from the United States average fuel mix (USDOE 2008a). Table 20 compares the average air pollutant emission rate of the proposed Crown City Wind Energy Project to equivalently-sized natural gas, coal, and oil generating facilities.

Table 20. Comparison of Air Pollutant Emissions Between Electricity Sources

Energy Source	Carbon Dioxide		Sulfur Dioxide		Nitrogen Oxides	
	Average emission rate (lbs/MWh)	Annual emissions for 217,686 MWh facility (tons/MWh)	Average emission rate (lbs/MWh)	Annual emissions for 217,686 MWh facility (tons/MWh)	Average emission rate (lbs/MWh)	Annual emissions for 217,686 MWh facility (tons/MWh)
Natural Gas	1,135	123,536.8	0.1	10.9	1.7	185.0
Coal	2,249	244,787.9	13	1,415.0	6	653.1
Oil	1,672	181,985.5	12	1,306.1	4	435.4
Wind	0	0	0	0	0	0

Source: EPA (2007). *Air Emissions.* Available at: http://www.epa.gov/cleanenergy/energy-and-you/affect/air-emissions.html

According to the National Renewable Energy Laboratory (NREL), the contiguous United States has the potential for 10,459 GW of onshore wind power and an additional 4,150 GW of offshore wind power, for a total of 14,609 GW (USDOE 2012). This potential additional wind power represents an amount more than nine times greater than current total U.S. electricity consumption (including Alaska and Hawaii) (EIA 2012a). Switching from fossil fuel energy generation to wind power generations contributes to cleaner and healthier air, since wind power generation has zero emissions and is not a direct source of regulated pollutants such as nitrogen oxides, sulfur dioxide, and mercury. If the United States obtained 20% of its electricity from wind energy by 2030, the country could avoid putting 825 MMT of CO_2 annually into the atmosphere, or a cumulative total of 7.6 billion metric tons by 2030 (USDOE 2008a, p. 107).

Thus, by contributing to this effort, the Project will have an incremental and long-term beneficial impact on climate and air quality. This benefit should be viewed as mitigation for other environmental impacts associated with the Project.

During decommissioning of the Project, as with the construction activities, impacts on climate and air quality are anticipated to be minor. To mitigate against these minor impacts during decommissioning of the Project, dust control procedures will be implemented to minimize the amount of dust generated by construction activities, in a manner consistent with the Standards and Specifications for Dust Control (see Appendix K) as outlined in the *New York State Standards and Specifications for Erosion and Sediment Controls* (NYSDEC, 2005). In accordance with these procedures, the extent of exposed/disturbed areas on the site at any one time will be minimized and restored/stabilized as soon as possible. Water will be used to wet down dusty roads (public roads as well as Project access roads) as needed throughout the duration of construction activities. In more severe cases, temporary paving (e.g. oil and stone) could be used to stabilize dusty road surfaces in certain locations. In addition, the Project Community Outreach and Communication Plan will enable the public to report and resolve any impacts during decommissioning (see Section 4.2 and Appendix L1 of this DEIS for additional information).

3.5 VISUAL AND AESTHETIC RESOURCES

This sub-section is organized as follows:

- 3.5.1 Existing Conditions
- 3.5.2 Potential Impacts
- 3.5.3 Proposed Mitigation

3.5.1 Existing Conditions

Based on established state agency guidance (e.g., NYSDEC 2000, p. 5; NYSOPRHP 2006, p. 1), the visual study area for the Project was defined as the area within a five-mile radius of each of the proposed turbines. The study area covers approximately 180 square miles and includes all or portions of the City of Cortland, Villages of Homer and McGraw, and the Towns of Cortlandville, Cuyler, Freetown, Homer, Preble, Solon, Taylor, Truxton, and Virgil in Cortland County (see Appendix M1, Figure 4). Existing visual and aesthetic resources within the visual study area were identified as part of a Visual Impact Assessment (VIA) conducted by **edr** (2012c), attached hereto as Appendix M1. The VIA was prepared in accordance with the NYSDEC Program Policy DEP-00-2 *Assessing and Mitigating Visual Impacts* (NYSDEC 2000), and included a review of existing data and field reconnaissance to identify landscape similarity zones, viewer groups, and sensitive visual resources within the area. These existing visual/aesthetic components of the study area are described below.

3.5.1.1 Landscape Similarity Zones

The turbines and transforming substation for the proposed Project are generally located on higher elevation hills and ridges that are a mix of active agricultural land, fallow/successional fields, and woodlots, at least 738 feet from adjacent non-seasonal roads and 1642 feet from houses. The proposed overhead transmission line descends a steep wooded hillside on the northern edge of the Project site, and connects with the proposed point of interconnection substation in an area characterized by a mix of active agricultural fields, existing overhead transmission lines, and low density residential development. Land use within the five-mile-radius visual study area for the most part consists of undeveloped land (agricultural, successional, wetland, and forest), farms, and low-density rural and suburban style residences. Agricultural land is concentrated on the more level ridge tops and valley bottoms, while forest land tends to occur on steeper slopes and wet areas. Rural residential development is concentrated along the frontage of the State, County, and local road system. Higher density residential and commercial development within five miles of the Project is concentrated in the City of Cortland and its immediate suburbs, along with the Villages of McGraw and Homer, and several small settlements, including the hamlets of Solon, Truxton, East Homer, Blodgett Mills, Little York, and Pratt Corners. Within the study area, eight distinct landscape similarity zones (LSZ) were defined (see Appendix M1, Figure 5). The general visual character of these zones is described below:

3.5.1.1.1 Zone 1: Rural Uplands

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

3.5.1.1.2 Zone 2: Rural Valleys

This LSZ is located in the areas of more level terrain in the Tioughnioga River Valley, the Cheningo Creek Valley (Taylor Valley) as well as the lower, broader portions of hollows/stream valleys that descend from the adjacent hills. Larger sized farms and broader flatter fields occur within this zone, along with the more heavily used state and county highways. The Rural Valley zone includes pastureland for livestock, hay and other feed crops, river/stream channels with numerous turns and oxbows, and floodplain wetlands. Agricultural land and associated farms and residential structures in this zone are almost invariably backed by forested hills. Views in this zone generally include a relatively level and open foreground, and an upward orientation. Under these viewer circumstances, structures and forest vegetation will generally not provide significant screening. However, hedgerows and small patches of vegetation frequently break up the agricultural fields, and may block or screen some longer-range views from within this zone. Typical views in this LSZ can be experienced along State Route 13 and County Route 600.

3.5.1.1.3 Zone 3: Forest Land

Forest land is another significant LSZ within the visual study area. It is characterized by the dominance of forest vegetation (mixed deciduous and coniferous tree species), and occurs in narrow valleys and on hillsides throughout the study area, and in larger blocks in the northeastern portion of the study area. Views in the Forest Land zone are typically limited due to the screening provided by overstory trees. Views are generally restricted to areas where small clearings and road cuts provide breaks in the tree canopy. Where long distance views are available within this zone, they are typically of short duration, limited distance, and/or framed by trees. Land use in this zone includes forestry, low-density residential development, and recreational use (hunting, snowmobiling, etc.). The largest area areas of contiguous forest occur in the northern and eastern portions of the study area and include Donahue Woods, Dog Hollow, Cuyler Hill, Peage Hill, Taylor Valley, and Baker School House State Forests.

3.5.1.1.4 Zone 4: City/Urban Core

This LSZ is confined to the central portions of the City of Cortland. Within the majority of this zone, buildings (typically 2-4 stories tall) and other man-made features dominate the landscape. Buildings within the urban core include commercial offices, retail stores, churches and municipal structures. Residential neighborhoods surround the central portion of the city. These areas feature traditional mid-19th to early 20th century mixed-used buildings, as well as some contemporary infill structures. Buildings are arranged in an organized pattern that generally focus views along the streets and block long distance outward views. In many areas, street and yard trees also help to enclose and screen views within this zone. Any long-distance, outward views that are available will generally be in the outskirts of this zone, and at least partially screened by existing structures, mature street trees, and/or the rolling hills surrounding the city. Longer distance views toward the surrounding hills are available from some major roads (e.g., State Routes 13 and 41), as well as from the outskirts of the city and the upper floors of multi-storied downtown buildings.

3.5.1.1.5 Zone 5: Village/Hamlet

This LSZ includes the Villages of Homer and McGraw, along with various hamlets. This zone is characterized by low to moderate-density residential (and limited commercial retail) development, generally in a valley setting. Vegetation and landform contribute to visual character in the village and hamlet areas, but within the majority of this zone, buildings (typically 1-2 stories tall) and other man-made features dominate the landscape. Villages are characterized by a main street business district surrounded by residential development on cross streets. Hamlets within the study area are relatively small pockets of development within a primarily rural/agricultural landscape. Structures are variable in their size and arrangement, but tend to be of an older/traditional architectural style. Activities within this zone are primarily associated with residential use, small commercial businesses, and local travel. Views within this zone are typically focused on the roadways and adjacent structures, although outward views across yards and adjacent fields are also available. Open views are most likely from open road corridors and the edges of the Village/Hamlet zone, where housing and vegetation density decrease and therefore screening is reduced.

3.5.1.1.6 Zone 6: Commercial

This LSZ generally consists of strip commercial development along a highway, and includes retail businesses, restaurants, convenience stores, automobile dealers, shopping centers and malls. Topography is typically level and vegetation restricted to remnant blocks of trees and landscaping around buildings. Views are focused along the axis of the highway, and the foreground is dominated by buildings, automobiles and pavement (roads and parking lots). The surrounding landscape varies from suburban residential, to farmland, to forested hills. With the study area, this LSZ occurs primarily on the outskirts of the City of Cortland and Village of Homer along State Routes 13, 41 and 281.

3.5.1.1.7 Zone 7: Transportation

The Transportation LSZ includes divided, multilane roads with limited access, specifically Interstate Route 81. Views along this road corridor are dominated by automobiles, pavement, guard rails, and signs. Viewer attention is generally focused on the roadway and associated traffic. Travel is at high speed, and outward peripheral views are fleeting. The surrounding scenery is variable, but within the study area is dominated by agricultural land and low density residential and commercial development in the valleys with forested hills/ridges in the background.

3.5.1.1.8 Zone 8: College Campus

This zone is a relatively minor, but distinctive, component of the study area. It includes the campus of Cortland State University (SUNY Cortland) in the City of Cortland. This zone is characterized by a landscaped campus with mowed lawns, ornamental shrub plantings, and scattered large trees. The campus also includes an organized assemblage of institutional buildings, typically in the range of 3-4 stories in height, with associated sidewalks, curbed roads and parking lots. Views are typically focused inward, toward the campus, and during the school year are dominated by the movement/activity of students. Outward views from the campus are blocked in many areas by on-site buildings and trees. However, partially screened, longer distance views are available from some open areas on campus, such as athletic fields and mowed lawns/quadrangles.

3.5.1.2 Viewer/User Groups

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

3.5.1.2.1 Local Residents

Local residents include those who live and work within the visual study area, including students at SUNY Cortland. They generally view the landscape from their yards, homes, local roads, schools, and places of employment. Residents are concentrated in and around the City of Cortland, and the Villages of McGraw and Homer, but occur in relatively low density throughout the visual study area. Except when involved in local travel, residents are likely to be stationary, and have frequent or prolonged views of the landscape. Local residents may view the landscape from ground level or elevated viewpoints (typically upper floors/stories of homes). Residents' sensitivity to visual quality is variable. However, it is assumed that residents may be very sensitive to changes in views from their homes and yards.

3.5.1.2.2 Through-Travelers/Commuters

Commuters and travelers passing through the area view the landscape from motor vehicles on their way to work or other destinations. Commuters and through-travelers are typically moving, have a relatively narrow field of view, and are destination oriented. Drivers on major roads in the area (e.g., U.S. Interstate Route 81, Route 11, New York State Routes 13, 41, and 281) will generally be focused on the road and traffic conditions, but do have the opportunity to observe roadside scenery. Passengers in moving vehicles will have greater opportunities for prolonged off-road views than will drivers, and accordingly, may have greater perception of changes in the visual environment.

3.5.1.2.3 Tourists/Recreational Users

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

3.5.1.3 Visually Sensitive Resources

The area within five miles of the Project includes 48 sites (primarily historic sites) that the NYSDEC Program Policy DEP-00-2 *Assessing and Mitigating Visual Impacts* (NYSDEC 2000) considers aesthetic resources of statewide significance. These include 22 properties that are listed on the National Register of Historic Places (NRHP). These include eight properties in the City of Cortland, five properties in the Village of Homer, one property in the Village of McGraw, three properties in the Town of Cortlandville, two properties in the Town of Taylor and one property in each of the Towns of Truxton, Preble and Solon. In addition, the visual study area includes 23 properties that have formally been determined by the New York State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP) to be NRHP-Eligible, primarily located in the City of Cortland, Village of McGraw and Hamlet of Truxton. Scenic Route 90 immediately west of the Village of Homer is a designated scenic byway under the New York State Scenic Byways program (NYSDOT 2010). The North Country National Scenic Trail passes through the eastern and southern portions of the visual study area, primarily traversing and connecting the state forests that occur there. The portion of the North Country National Scenic Trail that runs through the visual study area is also part of the Finger Lakes Trail System (FLTC 2012). There are no state parks, urban cultural parks or heritage areas, state forest preserves, national wildlife refuges or state wildlife management areas, national natural landmarks, national or state designated wild, scenic, and recreational rivers, scenic areas, state nature or historic preserves, or Bond Act properties within the visual study area.

In addition to the scenic resources of statewide significance listed above, the visual study area also includes areas that are regionally or locally significant, sensitive to visual impacts, and/or receive significant public/recreational use. These include local parks and recreation facilities, public open space, population centers, and heavily used transportation corridors. Areas of intensive land use and higher population density include the City of Cortland, the Village of Homer, and the Village of McGraw. Hamlets within the visual study area include Blodgett Mills, Pratt Corners, Little York, Truxton, East Homer and Solon. The visual study area also includes several highways that could be considered visually sensitive due to the number of drivers that travel these roads on a daily basis, including Interstate 81, U.S. Route 11, and New York State Routes 13, 41, 90, 91, 215, and 281. Identified recreational areas within the visual study area include nine local parks, several lakes and rivers including the Tioughnioga River, snowmobile trails maintained by six different organizations, eight state forests covering nearly 12,000 acres, NYSDEC's Casterline Pond Waterway Access, Heiberg Memorial Forest, and the Cortland Country Club Golf Course. The SUNY Cortland campus in the City of Cortland also provides recreational opportunities to students and other local residents.

The locations of visually sensitive resources within the study area are shown on DEIS Figure 9, and in Appendix A in the VIA (see Appendix M1).

3.5.2 Potential Impacts

3.5.2.1 Construction

Visual impacts during construction will include the addition of construction material and working construction vehicles and equipment to the local roads. In addition, construction activity/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, may be visible from some public vantage points. Dust generated by the movement of these vehicles 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. In addition, the most significant earth moving, tree clearing, and general construction activity will occur at turbine sites, which are typically well removed and/or screened from public vantage points. However, clearing trees along the transmission line ROW on the wooded slope between the proposed transforming substation and the point of interconnection facility will be visible from Route 13. Construction activity along this ROW (e.g., setting poles, string conductor, etc.) and at the proposed POI substation will also be visible from Route 13 and some nearby residences. Once construction activity ceases and site restoration activities are complete, construction-related visual impacts will no longer occur.

3.5.2.2 Operation

Impacts to visual resources resulting from Project operation were evaluated primarily through the VIA prepared by edr Companies (see Appendix M1) and the Additional Photomontages prepared by the Project Sponsor (see Appendix M2). Potential project visibility was evaluated using viewshed mapping, line of sight analysis (see Figure 9a), and field verification (ballooning). Visual impact was evaluated by preparing computer-assisted visual simulations of the Project from representatives/sensitive viewpoints from throughout the five-mile-radius study area. The Project's potential visual impact was evaluated by a panel of registered landscape architects with experience in visual impact assessment.

3.5.2.2.1 Viewshed Analysis

Viewshed maps were generated for the five-mile-radius visual study area to determine the extent of potential Project visibility based on existing topography and vegetation, and the location and height of the proposed wind turbines. Topographic viewshed maps for the Project were prepared using 10-meter [33 feet] resolution USGS digital elevation model (DEM) data (7.5-minute series) for the visual study area, the location and height of all proposed turbines, an assumed viewer height of 1.7 meters (5.6 feet), and ESRI ArcGIS® software with the Spatial Analyst extension. Two five-mile radius topographic viewsheds were mapped, one to illustrate "worst case" daytime visibility (based on a maximum blade tip height of 492 feet, or 150 meters, above existing grade) and the other to illustrate potential visibility of turbine lights (based on a nacelle height of 335 feet, or 102 meters, above existing grade). Because the screening provided by vegetation and structures is not considered in this analysis, the topographic viewshed represents a true "worst case" assessment of potential Project visibility.

A vegetation viewshed was also prepared to illustrate the potential screening provided by forest vegetation. The vegetation viewshed was prepared in the same manner as the topographic viewshed, except that a base vegetation layer was created using the 2006 USGS National Land Cover Dataset (NLCD) to identify the mapped location of forest land (including the Deciduous Forest, Evergreen Forest, and Mixed Forest NLCD classifications) within the visual study area. Based on standard visual assessment practice, the mapped locations of the forest land were assigned an assumed height of 40 feet and added to the DEM. The viewshed analysis was then re-run, as described above. Once the initial vegetation viewshed analysis was completed, a Spatial Analyst conditional statement was used to assign zero visibility to all areas of mapped forest, resulting in the final vegetation viewshed. Because it accounts for the screening provided by mapped forest stands, the vegetation viewshed is a much more accurate representation of potential Project visibility. However, it is important to note that because screening provided by buildings and street/yard trees, as well as characteristics of the proposed turbines that influence visibility (color, narrow profile, distance from viewer, etc.), are not taken consideration in the viewshed analyses, being within the viewshed does not necessarily equate to actual Project visibility.

Potential turbine visibility, as indicated by the viewshed analyses, is illustrated in VIA Figure 7 (see Appendix M1) and summarized in Table 21, below. As indicated by the topographic blade tip analysis, some portion of the proposed Project could potentially be visible in approximately 72.4% of the five-mile study area. This "worst case" assessment of potential visibility indicates the area where any portion of any turbine could potentially be seen, without considering the screening effect of existing vegetation and structures. Areas where there is no possibility of seeing the Project include narrow or distant valleys and hillsides oriented away from the Project site. These are concentrated in the outer portions of the study area, such as along the Main Branch and West Branch Tioughnioga River to the west/southwest, most of the Village of Homer, and sizeable areas in the far eastern portion of the study area. Based solely on the results of topographic viewshed analysis, potentially visible areas are found throughout the five-mile study area, but are most concentrated in the central and northern portions of the study area. Of the 48 identified aesthetic resources of statewide significance within the five-mile study area, 40 are indicated as having potential views of some portion of the Project (based on maximum blade tip height and screening provided by topography alone). Aesthetic resources of statewide significance within the study area that will be screened from view of the Project by topography alone include eight of the identified NRHP-Listed sites.

Table 21. Summary of Viewshed Results for Five-Mile Study Area

Number of Turbines Visible	Five-Mile-Radius Study Area[1] Viewshed Results							
	Blade Tip Topography Only		Blade Tip Topography and Vegetation		FAA/Nacelle Topography Only		FAA/Nacelle Topography and Vegetation	
	Square Miles	% of Study Area	Square Miles	% of Study Area	Square Miles	% of Study Area	Square Miles	% of Study Area
0	49.7	27.6	137.2	76.2	58.4	32.4	141.9	78.8
1-9	36.9	20.5	17.0	9.4	43.4	24.1	18.7	10.4
10-18	30.2	16.7	12.0	6.7	32.0	17.8	11.0	6.1
19-27	22.7	12.6	6.8	3.8	19.0	10.5	4.3	2.4
28-36	16.6	9.2	3.5	1.9	13.5	7.5	2.3	1.3
37-44	24.0	13.3	3.7	2.0	13.9	7.7	1.8	1.0
Total Visible	**130.4**	**72.4**	**42.9**	**23.8**	**121.8**	**67.6**	**38.2**	**21.2**

[1]The study area includes approximately 180.1 square miles, or 115,270 acres

Areas of potential nighttime visibility, as indicated by the FAA topographic viewshed analysis (VIA Figure 7, Sheet 2; see Appendix M1) include approximately 67.6% of the five-mile radius study area. This analysis indicates that the potential visibility of FAA warning lights at a height of 335 feet (102 meters) will generally be concentrated in the same areas where daytime blade-tip height visibility was indicated. As stated above, this topographic analysis presents a "worst case" assessment of potential nighttime visibility that does not take into account the screening effect of existing vegetation and structures, and is based on the conservative assumption that all turbines could be equipped with FAA warning lights (a more realistic assumption is that approximately half of the turbines will be lighted).

Factoring vegetation into the viewshed analysis significantly reduces potential Project visibility (VIA Figure 7, Sheets 3 and 4; see Appendix M1). Within the five-mile study area, vegetation, in combination with topography, will serve to block daytime views of the Project from approximately 76.2% of the 180-square mile area (i.e., 23.8% of the study area [42.9 square miles] is indicated as having potential Project visibility). Areas of potential nighttime visibility, as indicated by FAA vegetation viewshed analysis, are indicated in approximately 21.2% (38.2 square miles) of the five-mile radius study area. Visibility will generally be most available in open agricultural areas and along the valleys of the East Branch of the Tioughnioga River and Cheningo Creek. Visibility is also indicated in a large portion of the City of Cortland; however, buildings and street trees, not accounted for in this analysis, will likely screen many of those views.

Areas of actual visibility are anticipated to be more limited than indicated by the vegetation viewshed analysis, due to the slender profile of the turbines (especially the blade, which make up the top 157 feet of the turbine), the effects of distance, and screening from hedgerows, street trees and structures, which are not considered in the analysis.

3.5.2.2.2 Field Review

Visibility of the proposed Project was evaluated in the field on July 3, 2012. Three large (15-foot by 6-foot), blimp-shaped helium-filled balloons were raised to a height of 492 feet above ground level (based on a maximum blade tip height at the 12 o'clock position) at the approximate locations of proposed Turbines 4, 14, and 42. The purpose of this exercise was to verify visibility of the Project, and provide locational and scale references in photographs for subsequent use in the development of visual simulations. Clear skies in the morning gave way to overcast skies in the afternoon. However, visibility remained good, and calm winds resulted in relatively stationary balloon heights, throughout the day. The conditions provided adequate visibility and a representative variety of sky conditions.

While the balloons were in the air, field crews drove public roads and visited public vantage points within (and beyond) the five-mile radius study area to document points from which the Project would be visible. Photos were taken from 273 representative viewpoints within the study area. Viewpoint locations were determined using hand-held global positioning system (GPS) units and high resolution aerial photographs (digital ortho quarter quadrangles). The time and location of each photo were documented on all electronic equipment (cameras, GPS units, etc.) and noted on field maps and data sheets. Viewpoints photographed during field review generally represented the most open, unobstructed available views toward the Project.

Field review confirmed that actual Project visibility (as indicated by visibility of the three helium-filled balloons) is likely to be even more limited than suggested by viewshed mapping. This is due to the fact that screening provided by buildings is significant within more developed areas (e.g., the City of Cortland, villages and hamlets), and trees within the study area provide more extensive and effective screening than assumed in these analyses (e.g., vegetation is more extensive than indicated on the USGS NLCD, and often taller than 40 feet in height). The result is that certain sites/areas where "potential" visibility was indicated by viewshed mapping were actually well screened from views of the proposed Project. For instance, although viewshed analysis indicates potential visibility of the Project from throughout most portions of the City of Cortland, the helium-filled balloons were not observed from this area during the field review. Views of the Project from Cortland will be partially or completely screened by buildings and/or street and yard vegetation.

Field review also confirmed a lack of visibility (due the screening effects of adjacent buildings and/or vegetation) from areas that were heavily forested, from the village and hamlet centers (including the Village of McGraw), and from most portions of Interstate 81 within the study area. Sites of statewide significance where field review confirmed lack of visibility (due the screening effects of adjacent buildings and/or vegetation) included the Route 90 Scenic Byway, the Truxton Depot, the Old Homer Historic District, the Water, Wall, and Pine Street Lenticular Truss Bridges, the Tompkins Street/Main Street Historic District and other NRHP-listed sites in Cortland, and forested portions of the Finger Lakes Trail. Existing buildings and vegetation will also screen most of the Project from the Main Street Historic District in the Village of McGraw, although occasional, partial views of one or a few turbines (or turbine blades) will be available in gaps between buildings and trees.

The area with greatest Project visibility occurs on open hilltops and slopes within the Project site and from adjacent open river valleys, including portions of NYS Routes 13 and 41. More distant views were available from the elevated open fields to the north, east, and south of the Project area. Areas to the west, especially the population centers of the City of Cortland and the Village of Homer, tend to be more well screened by topography, forest vegetation, and/or existing structures. Open views will also be available from the outskirts of the Village of McGraw and hamlets of Truxton, East Homer, and Solon, and non-forested portions of the Finger Lakes Trail. However, throughout the study area, agricultural buildings, residences, hedgerows and trees not indicated on the USGS maps blocked/interrupted views toward the proposed turbines in many areas.

Field review also indicated that certain ancillary above-ground facilities associated with the Project, including the proposed transmission line, Point of Interconnection facility, and O&M facility, could be visible from Route 13 and/or other roads to the north of the Project site. The proposed ROW for the Project interconnection line traverses a steep forested hillside, and the resulting cleared corridor will be clearly visible in this area, especially during the winter months when snow is on the ground. The proposed twin wooden pole structures' natural color will blend with the adjacent forest vegetation along the transmission line ROW. Their anticipated pole height of 61 feet will be approximately 20 feet taller than the surrounding trees. In addition, all of these ancillary facilities would be over 500 feet from the nearest public road, and/or would occur in an area that already includes multiple existing transmission lines.

3.5.2.2.3 Visual Simulations

From the photo documentation conducted during field verification, **edr** and the Project Sponsor selected a total of 14 viewpoints for development of visual simulations. The simulations are included as Figure 10 and in Appendix C of the VIA (see DEIS Appendix M1). In addition, the Project Sponsor prepared supplemental still and animated simulations (photomontages) from an additional 15 viewpoints (see DEIS Appendix M2 and www.tcirenewables.com). These viewpoints were selected based upon the following criteria:

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

Current consultation with representatives from the local towns has been undertaken through letters sent to each Town Board member on October 3, 2012; emails to Town Supervisors on September 14, 2012 and Town Board members on October 4, 2012; and telephone calls to Town Board members on October 4 and 9, 2012. In response to this consultation, the Project Sponsor has included further additional montages to satisfy requests from two Truxton board members for a simulation from Truxton Depot and photomontages that are closer to wind turbine sites, particularly at a distance of 738 feet which is the setback from a property line observed by the Project Sponsor. See Appendix M2. Photomontage AV10 from Bell Road shows a turbine at 361 feet (0.09 miles). Photomontage AV15, also from Bell Road shows a turbine at 738 feet, the minimum setback distance that will be maintained from non-participating properties' lot lines. A photomontage of the view from McGraw Field, adjacent to the Truxton Depot, is also available in Appendix M2 (AV14). It should be noted that the Truxton Depot is included in the addendum historic resources survey report (see Table 2, Appendix O) as being a site of statewide significance, but its location does not provide significant views of the Project area. The following is stated in the report, "Visual setting is not a primary factor contributing to the historical significance of the site. The site is significant because it is a good example of a ca. 1870s railroad depot/train station" (**edr** 2012e, p. 18). The Scoping Document requires that the DEIS describe plans to provide visual simulations subsequently to all landowners requesting them. During the public comment period, occurring subsequent to the determination of adequacy of the DEIS by the Lead Agency, land owners lodging a written request with the Project Sponsor will be provided with a visual simulation of the Project. The Project sponsor currently intends to meet individually with each to present the visual simulation. Alternatively the Project Sponsor may provide a visual simulation electronically.

The location of each viewpoint selected for simulation in the VIA is shown in DEIS Figure 10 and VIA Figure 8 (see Appendix M1). Locational details and the criteria for selection of each viewpoint are summarized in Table 22:

Table 22. Viewpoints Selected for Simulation

Viewpoint Number	Visually Sensitive Resource	LSZ Represented[1]	Viewer Group Represented	Viewing Distance[2]	View Orientation[3]
8	-	1	Travelers	1.0	NE
37	-	1	Residents	1.0	W
39	-	1	Travelers	0.4	W
70	Hamlet of East Homer	5	Travelers, Residents	0.9	S
73	Route 13	2	Travelers, Residents	1.6	S
134	Outside of Village of McGraw	1, 5	Travelers, Residents	1.7	NE
142	Village of McGraw/Main Street Historic District	5	Travelers, Residents	1.2	NE
145	NYS Route 41, Outskirts of Village of McGraw	2, 5	Residents	0.9	E
150	Interstate Route 81	1, 7	Travelers	2.8	E
181	NYS Route 13/I-81 Interchange	6	Travelers, Residents	3.5	NE
182	Yaman Park	1	Residents, Tourists	3.2	E
224	-	1	Travelers, Residents	4.3	N
228	Finger Lakes Trail	2	Travelers, Tourists	2.0	W
244	-	1	Travelers, Residents	2.2	SW

[1]1 = Rural Uplands, 2 = Rural Valleys, 5 = Village/Hamlet, 6 = Commercial, 7 = Transportation
[2] Distance from viewpoint to nearest visible turbine (in miles)
[3] N = North, S = South, E = East, W = West

The locations of additional viewpoints where more still and animated photomontages were prepared by the Project Sponsor are included in Appendix M2. Animated simulations may be viewed on TCI's website at http://www.tcirenewables.com/default.aspx?lang=en&page=projects-new-york.

The visual simulations provided in Appendix M1 and M2 show simulations from a total of 27 viewpoints, including 5 simulations for Homer, 7 simulations for Cortlandville, 5 simulations for Truxton, 9 simulations for Solon, and one simulation that shows turbines equally in both Cortlandville and Solon. To show anticipated visual changes associated with the proposed Project, high-resolution computer-enhanced image processing was used to create realistic photographic simulations (and photomontages) of the completed turbines from each of the 27 selected viewpoints. The photographic simulations were prepared by TCI using Adobe PhotoShop, PTGui image-stitching software, and WindFarm rendering software.

The baseline views were produced by splicing together the 50 mm photos from each viewpoint with specialist software. The digital photographs were put directly into the computer program and each frame was combined to form a panoramic (55 to 92 degree) view with a corrected horizon. Photographs were processed and corrected for color, brightness and/or contrast to ensure that the image quality was optimized.

TCI generated a computer model of the Project with ReSoft WindFarm software. The arrangement and size of the turbines (blade diameter and hub height) were modeled in accordance with the chosen turbine type. Curvature of the earth and lighting conditions and strength were calculated using standard settings within the WindFarm software. Perspective viewpoints were created in the WindFarm model using GPS coordinates obtained when taking the photographs from each viewpoint. The direction and viewing angle of the perspective was matched with each panoramic view using locators set up within WindFarm. The wireframe computer images of the proposed turbines were placed onto the photographs and scaled/positioned so that any reference features in the image (balloons, buildings, roads, etc.) matched those in the photographs. The computer model was then rendered as a solid model perspective and saved as an image file, thus creating the simulation. Where required the photographs and turbine image were adjusted so as to achieve enough contrast to enable the turbines to be seen.

Each simulation was presented as 11 x 17 inch color print showing the existing view, the proposed view and wire frame view, plus viewpoint location, distances to the turbines, and other specific information (see VIA Appendix C, in DEIS Appendix M1 and Additional Photomontages in DEIS Appendix M2). In addition, the Project Sponsor prepared six animated photomontages that illustrate the appearance of the proposed Project with the turbine blades rotating at a representational speed. These animated photomontages are available at the Project webpage, located at TCI's website www.tcirenewables.com.

3.5.2.2.4 Potential Visual Impact Evaluation

As part of the Project VIA, visual impact was formally evaluated at 12 selected viewpoints. Additional viewpoints were not formally evaluated because they were considered comparable to other simulations or because no turbines were visible in the simulation. The formal evaluation involved a panel of registered landscape architects quantifying the effect of the proposed Project in terms of its contrast with existing components of the landscape (landform, vegetation, land use, water, sky, and viewer activity) in each view using visual contrast ratings on a scale of 0 (insignificant) to 4 (strong). The average score of the landscape components evaluated by each panel member was calculated for each viewpoint. The cumulative average of all scores for each viewpoint provides the composite score for that viewpoint. Results of the evaluation are summarized in Table 23.

Panel evaluation of the simulations indicates that the Project's overall impact on scenic quality within the study area is likely to be moderate. However, visibility and visual impact of the wind turbines will be highly variable, based on landscape setting, extent of natural screening, presence of other man-made features and/or visual clutter in the view, baseline scenic quality, viewer sensitivity, and distance of the viewer from the Project. Based on the contrast rating scores and rating panel comments, greater levels of contrast can be anticipated where foreground views of turbines (i.e., under 1.0 mile) are available from residences or areas of relatively higher overall scenic quality. Conversely, contrast is reduced when turbines are partially screened, viewed at greater distances, seen in the context of a working agricultural landscape, or viewed in a setting with existing visual clutter. Based on experience with currently operating wind power projects elsewhere, public reaction to the Project is likely to be generally positive, but highly variable based on proximity to the turbines, the affected landscape, and personal attitude of the viewer regarding wind power.

Table 23. Summary of Results of Contrast Rating Panel Review of Simulations

Viewpoint #	Distance (Nearest Turbine in View)	Landscape Similarity Zone (LSZ)	Composite Score		Average
			LA1	LA2	
8	1.0 mile	Rural Uplands	2.5	2.0	2.3
37	1.0 mile	Rural Uplands	2.7	3.6	3.2
39	0.4 mile	Rural Uplands	2.5	2.4	2.5
70	0.9 mile	Village/Hamlet	2.1	0.7	1.4
73	1.6 miles	Rural Valleys	2.3	1.6	2.0
134	1.7 miles	Rural Uplands, Village/Hamlet	2.6	1.6	2.1
142	1.2 miles	Village/Hamlet	0	0	0
150	2.8 miles	Rural Uplands, Transportation	1.1	0.2	0.7
181	3.5 miles	Commercial	0	0	0
224	4.3 miles	Rural Uplands	1.4	0.3	0.9
228	2.0 miles	Rural Valleys	2.4	1.6	2.0
244	2.2 miles	Rural Uplands	2.1	0.8	1.5
Average			**1.8**	**1.2**	**1.5**

[1]Contrast Rating Scale: 0 (insignificant contrast), 1 (minimal contrast), 2 (moderate contrast), 3 (appreciable contrast), 4 (strong contrast).
LA1 = D. Brackett, LA2 = S. Breitzka

Although not formally evaluated by the rating panel, the additional photomontages produced by the Project Sponsor were also reviewed as part of this DEIS. This review indicated that the visual impact presented by the photomontages is consistent with the rating panels evaluation, as presented in the Project VIA. As stated above, these photomontages indicate that visual impact will generally be greatest where foreground views of turbines (i.e., under 1.0 mile) are available from residences or areas of relatively higher overall scenic quality. Conversely, contrast is reduced when turbines are partially screened, viewed at greater distances, seen in the context of a working agricultural landscape, or viewed in a setting with existing visual clutter.

Electrical infrastructure and FAA warning lights associated with the proposed Project also will result in some level of visual impact. Above-ground electrical infrastructure includes a collection substation, transmission line, POI substation, and possibly some sections of the collection system. These components of the Project will present contrast with the largely undeveloped/agricultural character of the Project area and add visual clutter to the landscape. However, this effect will be limited due to the distance of these facilities from public vantage points, their relatively modest height, and abundant screening provided by native vegetation. Although views of the transmission line, its cleared ROW, and the POI substation will likely be available from Route 13, East River Road, and Townline Road, their contrast with the landscape will be minimized due to the occurrence of several existing transmission lines in the area. The transforming substation site was chosen due to the relatively low changes in gradient; the location is set back from the crest of the slope and from residences, situated mid-slope on a reasonably flat part of the natural ridge and in close proximity to the connection point on the existing National Grid 115kV transmission line. The substation location is in a field that is largely hidden by trees which should afford screening of the facility from highways. In addition to this vegetative screening, the site grading (cut and fill) will further reduce the visual impact of the transforming substation. Possible additional visual mitigation measures for proposed electrical infrastructure is discussed in Section 3.5.3.

The contrast of the proposed aviation warning lights with the night sky could be appreciable in dark, rural settings, and their presence will suggest a more commercial/industrial land use. Viewer attention will be drawn by the flashing of the lights, and any positive reaction that wind turbines engender (due to their graceful form, association with clean energy, etc.) is lost at night. While generally not an issue from roads and public resources visited almost exclusively during the day (parks, trails, historic sites, etc.), turbine lighting could be perceived negatively by area residents who may be able to view these lights from their homes and yards. However, this impact will be limited in areas of more concentrated human settlement, where existing light sources will limit the visibility and contrast of the aviation warning lights.

3.5.2.2.5 Assessment of Shadow Flicker

In addition to the VIA, a separate assessment of the phenomenon known as “shadow flicker” was conducted by **edr** and TCI (see Appendix N). Shadow flicker is the alternating change in light intensity or shadows created by the moving turbine blades when back-lit by the sun. These flickering shadows may be perceived by some as annoying when cast on nearby residences; however, due to the turbines' low blade pass frequency, shadow flicker is not anticipated to have any adverse health effects (e.g., trigger epileptic seizures) (Priestly 2011, p. 8). Shadow flicker is most pronounced in northern latitudes during winter months because of the lower angle of the sun in the winter sky. However, it is possible to encounter shadow flicker anywhere for brief periods before sunset and after sunrise (U.S. Department of the Interior 2005, 5-93 to 5-94). Shadow flicker does not occur when fog or clouds obscure the sun, or when turbines are not operating.

No consistent national, state, county, or local standards exist for allowable frequency or duration of shadow flicker from wind turbines at the proposed Project site. In general, quantified limits on shadow flicker are uncommon in the United States because studies have not shown it to be a significant issue (USDOE 2008b, 2012; NRC 2007, p.110). However, standards developed by some states and countries provide guidance in this regard. A model wind ordinance prepared by the North Carolina Wind Working Group in 2008 suggests a limit of 30 hours per year (generally less than 1% of annual daylight hours) at any occupied building on a Non-participating landowner's property (NCWWG 2008, p.6). The Ohio Power Siting Board also uses 30 annual hours of shadow flicker as a threshold of acceptability in reviewing commercial wind power projects (OPSB 2008, p. 89; 2009a, p. 22; 2009b, p. 16 and 18; 2009c, p. 17 and 31; 2009d, p. 16). In addition, several guidelines from Europe and Australia have also suggested 30 hours of shadow flicker per year as the threshold of significant impact, or the point at which shadow flicker is commonly perceived as an annoyance (NRC 2007, p. 111; DECC 2011, p. 10; DPCD 2012, p. 31). Accordingly, a threshold of 30 shadow flicker hours per year was used in the analysis of the proposed Crown City Wind Energy Project to identify any potentially significant impacts on area residences.

The shadow flicker modeling analysis for the proposed Project was conducted by TCI using WindFarm software, which is a widely accepted modeling software package developed specifically for the design and evaluation of wind power projects. Input variables and assumptions used for shadow flicker modeling calculations for the proposed Project include:

- Latitude and longitude coordinates of 44 proposed wind turbine sites.
- Latitude and longitude coordinates for 172 residential structures located within 1,000 meters (3,281 feet) of a proposed turbine.
- USGS 1:24,000 topographic mapping and USGS digital elevation model (DEM).
- The rotor diameter (100 meters [328 feet]) and hub height (100 meters [328 feet]) for a generic 3-blade turbine.
- The average annual percent of available sunshine for northern New York State, obtained from NOAA (http://www.ncdc.noaa.gov). That figure is approximately 46% but for this analysis a figure of 50% has been assumed as a worst-case scenario.

- No allowance was made for wind being below or above generation speeds. Blades are assumed to be moving and perpendicular to the sun during all daylight hours.
- The possible screening effect of trees and buildings adjacent to the receptors was not taken into consideration in the analysis. In addition, the number and/or orientation of windows in residential structures were not taken into consideration in the analysis.

Shadow flicker maps in Attachment A of Exhibit N depict the expected shadow flicker in the vicinity of the proposed Project. The projected shadow flicker at each of the 172 structures identified within 3,281 feet (1,000 meters) of a proposed turbine site is summarized below:

- 60 structures (35 %) may be affected 0 to 10 hours/year,
- 100 structures (58%) may be affected 10 to 30 hours/year, and
- 12 structures (7%) may be affected 30 or more hours/year. Additional information about the anticipated shadow flicker at these receptors is provided below in Table 24.

Table 24. Receptors with Greater than 30 Hours of Shadow Flicker

Receptor ID	Property ID Number	Address	Easting	Northing	Days per year	Max adjusted[1] min/day	Total adjusted[1] hours
5[2]	59.00-03-03.000	5180 Town Line Rd McGraw, NY	412177	4723251	197	31.2	51.6
7[2]	69.00-01-09.000	4932/4934 Warren Rd McGraw, NY	413321	4721977	147	21.9	36.6
19[2]	69.00-04-20.200	4861 Maybury Rd McGraw, NY	414482	4721470	156	21.6	36.75
182	59.00-03-05.000	5158 Town Line Rd McGraw, NY	412171	4723171	164	19.2	39.9
183	58.00-05-05.000	5117 Town Line Rd McGraw, NY	412107	4723083	141	18.3	30.5
369	79.00-04-13.110	4371 Syrian Hill Rd McGraw, NY	415343	4718677	164	29.7	44.35
379	69.00-04-10.000	3521 4-H Camp Rd McGraw, NY	414575	4721329	151	18.9	33.95
380	69.00-04-09.000	4844 Maybury Rd McGraw, NY	414541	4721389	125	19.8	29.7
399	69.00-04-02.000	4901 Maybury Rd McGraw, NY	414505	4721900	133	19.2	31.35
808	58.00-05-02.000	5215 Town Line Rd McGraw, NY	412109	4723401	145	18.3	31.55
823	58.00-05-03.000	5165 Town Line Rd McGraw, NY	412101	4723241	166	18.6	39.9
824	58.00-05-04.000	5141 Town Line Rd McGraw, NY	412100	4723167	143	21.6	37.9

[1] Maximum minutes/day, adjusted for sun index of 50%.
[2] Project participants.

Note that the office at the landfill was taken into consideration and modeled as a shadow flicker receptor. It is not anticipated that the landfill office will receive more than 30 hours shadow flicker per year.

As indicated above, shadow flicker maps in Attachment A of Exhibit N depict the expected shadow flicker at all areas in the vicinity of the proposed Project, including public roads. However, it is important to note that the shadow flicker analysis assumes a stationary object, which remains fixed 24 hours/day, 365 days/year. In contrast, road users or snowmobilers are mobile, typically in a motorized vehicle traveling at a relatively high speed. Therefore, any Project-related shadow flicker experienced by such users would be a fraction of that experienced by a stationary object. Furthermore, most vehicle and snowmobile operators are already accustomed to shadow flicker while driving, since shadows cast from nearby objects (e.g., trees, roadside/overhead signage, etc.) will "flicker" across the windows of a moving vehicle. As referred above, some public hiking trails will be within the viewshed of the Project; however, given that the Project area does not contain an extensive publicly accessible trail network no potentially impacted vantage points were identified as being particularly susceptible to excessive shadow flicker.

Although shadow flicker at 12 receptors exceeds the normal 30-hour per year threshold, these calculations do not take into account the actual location and orientation of windows, or the screening effects associated with existing site-specific conditions and obstacles such as vegetation and/or buildings. Further, this analysis assumes the turbine rotor is continuously in motion and perpendicular to the sun. Given these conservative assumptions, the predicted shadow-flicker frequency represents an extremely conservative scenario, and almost certainly overstates the actual frequency of shadow flicker that would be experienced at any given receptor location. In addition, many of the modeled shadow flicker hours are expected to be of low intensity, as they would occur during the early morning or late afternoon hours when the sun is low in the sky. As the sun sinks below the horizon, more of its light is scattered by the atmosphere, which has the effect of dampening its brightness and therefore reducing its ability to cast dark shadows.

The extremities of the shadow flicker zones (shown as shaded purple areas on pages 15-19 of Attachment A of Appendix N) portray the full extent of the effects that may be experienced during the summer and winter solstices. The most south-westerly point of the shadow flicker zone depicts the full extent of any shadow flicker effect that may be experienced at the sunrise during the summer solstice and the most south-easterly point shows the full extent of shadow flicker impact during the sunset during the summer solstice. The most north-westerly extremity of the shadow flicker zone shows the full extent of potential shadow flicker effects at sunrise during the winter solstice, while the most north-easterly point of each shadow flicker zone shows the full extent of potential shadow flicker at sunset during the winter solstice. It is important to note that shadow flicker assessment of the summer and winter solstices is not a sufficient test to evaluate the impact that may be experienced at any given residence. Therefore the shadow flicker assessment, as presented above (e.g., in Table 24), has been completed over a full calendar year. However in order to satisfy the requirements of the Scoping Document, the limits of effect during the summer and winter solstices are depicted on pages 15-19 of Attachment A of Appendix N.

Further study may be completed to fully assess the specific characteristics of the receptors predicted to receive more than 30 hours per year of shadow flicker, with particular focus on any windows facing the anticipated affected zone. For example, it may be that the wall presumed to be affected by shadow flicker contains no windows, or is not exposed to the sun due to shading by a barn, trees, garage or other outbuildings. To more accurately calculate the amount of shadow flicker likely to occur at these receptors, field review and additional data collection could be conducted to identify obstacles that could fully or partially block shadows at receptor sites. These data would then be incorporated into the shadow flicker model and the analysis of predicted shadow flicker impacts re-run. This further detailed analysis of receptor characteristics would be more accurate, and would likely reduce the number of predicted hours that residential receptors would affected by shadow flicker (**edr** 2012d, p. 5).

Of the 12 receptors predicted to exceed the 30-hour threshold, three are Project participants. Therefore, only nine Non-participating residential receptors are predicted to exceed the 30-hour per year threshold. Mitigation measures to reduce the impact of shadow flicker on sensitive receptors are discussed below in Section 3.5.3 of this DEIS.

3.5.3 Proposed Mitigation

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

Site planning has already been utilized to locate turbines away from visually sensitive resources/receptors and minimize site disturbance, including tree clearing and grading. Prior to finalization of the Project design, opportunities for additional micro-siting or realignment of facilities that could reduce potential visual impacts will be explored (e.g., alignments of the transmission line that reduce visibility of the cleared ROW).

During construction, visual impacts associated with working construction equipment will be minimized through adherence to a construction routing and sequencing plan that minimizes impacts on local roads and residences. A dust control plan and a sediment and erosion control plan will be developed and implemented as described in

Sections 3.4.3 and 2.7 respectively, to minimize off-site visual impacts associated with construction activities. As described in the impacts discussion, any unavoidable construction-related visual impacts will be short term.

Following completion of construction, site restoration activities will occur. As described in Section 2.0, restoration will include removal of excess road material from Project access roads (i.e., going from 40 feet to 20 feet in width), restoration of agricultural fields (including soil decompaction, rock removal, and topsoil spreading), and revegetating/restoring disturbed sites through seeding and mulching. These actions will assure that, as much as possible, the site is returned to its preconstruction condition and that long-term visual impacts are minimized.

Potential visual impacts of electrical infrastructure associated with the Project include placing the majority of the collection lines underground, (unless deemed unsafe or slope restrictions dictate that overhead collection must be used). To mitigate the potential visibility and visual impact of the transmission line, the Project Sponsor evaluated the feasibility of an alternate route that avoids clearing a straight corridor of trees on the wooded slope facing Route 13. The visual impact of the POI facility will be reduced by siting it in an area with existing electrical infrastructure. The evaluation of alternate locations for the POI substation is described in Section 5.3.2.4. Visibility of the proposed transforming substation will be minimized by placing it back from the crest of the hill. Site grading (cut and fill) will further reduce the visual impact of the transforming substation. This substation location is in a field that is largely hidden by trees which should afford screening of the facility from homes and highways. If deemed necessary, an area on the exterior of the sites for both substations will be planted with additional screening vegetation.

Mitigation options for the operating Project are limited, given the nature of the Project and its siting criteria (very tall structures typically located in open fields at the highest locally available elevations). It is also worth noting that for many individuals, views of wind power projects are not necessarily considered an adverse impact that requires mitigation (Warren, et al. 2005, p. 858). However, in accordance with NYSDEC Program Policy (NYSDEC 2000, p. 6), various mitigation measures were considered. These included the following:

Professional Design. All turbines will have uniform design, speed, color, height and rotor diameter. Turbines will be mounted on conical steel towers that include no exterior ladders or catwalks. The placement of any advertising devices (including commercial advertising, conspicuous lettering, or logos identifying the Project owner or turbine manufacturer) on the turbines will be prohibited. As mentioned above, options for routing the transmission line that avoid a straight cleared ROW that is visible from Route 13 will be explored as part of the final design of this component of the Project.

Screening. Due do the height of individual turbines and the geographic extent of the proposed Project, screening of individual turbines with earthen berms, fences, or planted vegetation will generally not be effective in reducing Project visibility or visual impact. However, selective off-site planting could be effective in screening views from some sensitive sites in the area (the potential screening effect of vegetation is illustrated in the simulation prepared for Viewpoint 142 in Appendix C of the VIA). A visual mitigation planting fund could be established to screen views of the Project from sensitive sites within the study area, if so desired by the affected landowner. As mentioned previously, additional plantings to provide screening will be considered in the vicinity of the POI and transforming substations to the extent necessary.

Relocation. Because of the limited number of suitable locations for turbines within the Project site, and the variety of viewpoints from which the Project can be seen, turbine relocation will generally not significantly alter visual impact. Moving individual turbines to less windy sites would not necessarily reduce impacts but could affect the productivity and viability of the Project. Where visible from sensitive resources within the study area, generally at least 10 turbines will be visible, and relocation of individual machines would have little effect on overall visual impact. Additionally, throughout the study area, views of the Project are highly variable and include different turbines at different vantage points. Therefore, turbine relocation would generally not be effective in mitigating visual impacts. Additionally, the Project layout has been designed to accommodate set-backs from roads and residences. Options for relocation of individual Project components are constrained by compliance with these various setbacks.

Camouflage. The white/off white color of wind turbines (as mandated by the FAA) generally minimizes contrast with the sky under most conditions. This is demonstrated by simulations prepared under a variety of sky conditions. Consequently it is recommended that this color be utilized on the Crown City Wind Project. The size and movement of the turbines prevents more extensive camouflage from being a viable mitigation alternative (i.e., they cannot be made to look like anything else). Nielsen (1996) notes that efforts to camouflage or hide wind farms generally fail, while Stanton (1996) feels that such efforts are inappropriate. She believes that wind turbine siting "is about honestly portraying a form in direct relation to its function and our culture; by compromising this relationship, a negative image of attempted camouflage can occur." Other components of the Project will be designed to minimize contrast with the existing visual character in the Project area. For instance, new road construction will be minimized by utilizing existing farm lanes wherever possible, electrical collection lines will be buried in most locations, and above-ground electrical lines will use wooden poles that are consistent in color with surrounding forest vegetation and will be similar in height to existing electrical infrastructure, (61 to 97 feet in height).. The proposed transforming substation will be located in an area well removed from public vantage points.

Low Profile. A significant reduction in turbine height is not possible without significantly decreasing power generation. Less generating capacity (resulting from smaller turbines) could threaten the Project's economic feasibility. To avoid generation losses, use of smaller turbines would require that additional turbines be constructed. Several studies have concluded that people tend to prefer fewer larger turbines to a greater number of smaller ones (Thayer & Freeman 1987; van de Wardt & Staats 1988; Fáilte Ireland 2012, p. 6). There will be minimal visual impact from the electrical collection system because of its underground installation. Above-ground transmission line and substation structures are expected to be approximately 20 feet higher than the adjacent tree cover and are not anticipated to exceed the height of existing transmission lines. The transforming substation has been located in an area of low value cropland that will be set back from the crest of the hill on which it is located and will be largely screened by existing forest vegetation, which will diminish visibility from Route 13, East River Road, and Shippey Road.

Downsizing. Reducing the number of turbines could reduce visual impact from certain viewpoints, but from most locations within the study area where more than one turbine is visible, the visual impact of the Project would change only marginally. Additionally, the elimination of turbines could significantly reduce the socioeconomic benefits of the Project and reduce the Project's ability to assist the State in meeting its energy policy objectives and goals and impact the viability of the Project.

Alternate Technologies. Alternate technologies for power generation, such as gas-fired generation, would have different, and perhaps more significant, visual impacts than wind power. Viable alternative wind power technologies (e.g., vertical axis turbines), that could reduce visual impacts, do not currently exist in a form that could be used on a commercial/utility-scale project.

Nonspecular Materials. Non-specular conductors will be used on the proposed transmission line and any electrical collection lines that are not buried. Non-reflective paints and finishes will be used on the wind turbines to minimize reflected glare.

Lighting. Turbine lighting will be kept to the minimum allowable by the FAA and is anticipated to include approximately half of the proposed turbines. Medium intensity red blinking lights will be used at night, rather than white strobes or steady burning red lights. At the time of drafting the DEIS several wind turbine manufacturers were consulted regarding the availability of radar-activated FAA warning lights (i.e., lights that become operational only when aircraft is approaching). The conclusion was that several have been working on such a solution but at the current time the technology has not yet been approved by the FAA. The Project

Sponsor will continue to consult with turbine manufacturers regarding progress of FAA approval of this technology and will continue to evaluate utilization of the technology at the Project.

The lowest permissible "off-cycle" will be utilized, and fixtures with a narrow beam path will be considered as a means of minimizing the visibility/intensity of FAA warning lights at ground-level vantage points. Lighting at the substations will be kept to a minimum, and turned on only as needed. The main security lighting at the substation will be activated by passive infrared sensors, and will be fitted with appropriate shades to direct light in a downward direction. Task lighting will be designed related to specific operational and emergency activities, and will only be activated when required. In addition, because of the distance between the substation and adjacent residences/public roads, significant adverse impacts associated with off-site trespass and glare are not anticipated. Full cut-off fixtures will be utilized to the extent practicable (consistent with safety and security requirements), and although there are no known turbine lighting alternatives currently approved by the FAA, use any such alternatives that may be approved by the FAA in the future will be explored.

Maintenance. The turbines and turbine sites will be maintained to ensure that they are clean, attractive, and operating efficiently. Research and anecdotal reports indicate that viewers find wind turbines more appealing when the rotors are turning (Pasqualetti et al. 2002; p. 35; Stanton 1996). In addition, the Project developer will establish a decommissioning fund (see Section 2.8) to ensure that if the Project goes out of service and is not repowered/redeveloped, all visible above-ground components will be removed. Any cleared electrical ROW will be managed to maintain a diverse assemblage of low-growing native plant species (primarily shrubs and herbaceous species).

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

<u>Shadow Flicker Mitigation</u>

As described above, the current shadow flicker analysis is considered to present a worst case scenario. Depending upon the outcome of additional more specific study, to be conducted by the Project Sponsor prior to FEIS, shadow flicker effects may need to be mitigated at up to 12 receptors that receive shadow flicker between 125 to 197 days per year, depending on location. As indicated above in Table 24, before implementation of mitigation measures, the maximum shadow flicker that could occur is 29 minutes and 42 seconds per day at Non-participating residences, and 31 minutes and 12 seconds per day at participating residences.

Prior to finalization of the FEIS, the Project Sponsor will evaluate what opportunities exist for mitigating those residents exposed to more than 30 hours per annum. Possible mitigations could include: screen plantings, installation of blinds or curtains at the impacted windows, or scheduled curtailment of turbines at sensitive times of day during the summer months to reduce the exposure to below 30 hours.

3.6 HISTORIC, CULTURAL, AND ARCHAEOLOGICAL RESOURCES

This sub-section is organized as follows:

- 3.6.1 Existing Conditions
- 3.6.2 Potential Impacts
- 3.6.3 Proposed Mitigation

3.6.1 Existing Conditions

Cultural resources studies conducted for the Project included a Phase 1A cultural resources survey, historic-architectural resources survey, and a supplemental (addendum) historic-architectural resources survey (see DEIS Appendix O). The Phase 1A Cultural Resources Survey for the proposed Project was prepared by PanAmerican Consultants, Inc. (PCI) in 2008-2009 (PCI 2012a). The purpose of the Phase 1A survey was to determine whether previously identified cultural resources are located in the areas that may be affected by the proposed Project, and to evaluate the potential for previously unidentified cultural resources to be located in the area of potential effect (APE). These resources include archeological sites (prehistoric and historic) and standing structures or other aboveground features.

The Phase 1A Cultural Resources survey for the Project consisted of a background/literature search, a site file check, and a field inspection of the Project area. Archeological and historic site files at the New York State Office of Parks, Recreation, and Historic Preservation (NYSOPRHP) were reviewed as an initial step to determine the presence of known archeological sites within a one-mile radius of the APE. These files include data recorded at both the NYSOPRHP and the New York State Museum (NYSM). Additional research concerning cultural resources in the study area was conducted at the Cortland County Historical Society, the Cortland Free Library, the McGraw Historical Society and on-line resources (see Appendix O for additional detail). In addition, **edr** has contacted the Interim Chair of the History Department at SUNY Cortland to 1) determine whether there are any faculty in this department who have expertise in local history or historic sites, and 2) inquire if they are aware of any historic properties that should be included in the analysis. Any relevant information received through this correspondence will be incorporated and evaluated as necessary in the EIS record.

The prehistory and history of the region are reviewed in order to understand the historic background of the area and provide a context for any cultural resources that may exist within the APE. To initiate consultation with the State Historic Preservation Office (SHPO) concerning the Project, the Phase 1A Cultural Resources Survey for the Project (PCI 2012a) was provided to NYSOPRHP (which serves as the SHPO in New York) on August 18, 2012 for their review and comment. The NYSOPRHP responded in a letter dated September 14, 2012, and indicated that the SHPO concurs with the conclusions and recommendations of the Phase IA report (see Appendix D for a copy of these letters).

A historic-architectural resources survey was conducted by PCI (PCI 2012b) for the Project in 2008-2009 based on an earlier (superseded) Project layout. The report included an inventory of sites listed on, and previously determined eligible for listing on, the NRHP within the five-mile study area for the 2008 Project layout. These included two NRHP-listed historic districts, nine NRHP-listed individual buildings, and 14 NRHP-eligible individual buildings. The report also included detailed historic context statements for municipalities and descriptions of typical architectural styles located within the five-mile study area. In addition, **edr** Companies (**edr**) conducted a supplemental historic-architectural resources survey for the Project. This addendum report (**edr**, 2012e) was intended to supplement and update the previous historic-architectural resources survey conducted by PCI. In preparation for this supplemental historic/architectural resources survey, **edr** prepared a topographic viewshed map based on the layout and dimensions of the currently proposed turbines. The methodology for preparation of viewshed analyses is described in the *Visual Impact Assessment* report (see Appendix M1) for the Project (where relevant, the process for conducting the addendum report was conducted in concert with the VIA). The study area for historic resources evaluated in the DEIS refers to the combined areas of potential Project visibility (or visual APE) based on topographic viewshed analysis) for both the 2008 and 2012 Project layouts. The areas included in the study area therefore present a conservative analysis of (and likely overstate) potential Project visibility.

The purpose of these surveys was to identify and describe historic resources (primarily buildings, or architectural resources, greater than 50 years in age) located within the five-mile radius visual APE for the Project.

3.6.1.1 Previously Recorded Cultural Resources

3.6.1.1.1 Archeological Resources

The review of archeological site files at the NYSOPRHP and the NYSM included in the Phase 1A Cultural Resources Survey (PCI 2012a, p.2-20) identified ten sites within one mile of the Project area (Table 25).

Table 25. Archeological Sites within One Mile of the Crown City Wind Farm Project Site

NYSOPRHP Site #	Additional Site Name	Distance from APE miles	Time Period	Site Type
	NYSM 9297, ACP CORT No#	exact location unknown*	Unknown	Traces of occupation
2311.000020	SUBi 1931, Solon Tavern	~0.2-mile	Early to mid-19th C.	Historic
2311.000019	SUBi 1930, Brook Store	~0.2-mile	mid to late-19th C.	Historic
2311.000014	SUBi 1925, Lawn Site	~0.2-mile	Mid-19th to Mid-20th C.	Historic
2311.000015	SUBi 1926, Solon Store	~0.2-mile	Early-to-late-19th C.	Historic
2311.000016	SUBi 1927, Stone Site	~0.2-mile	Mid-19th C.	Historic
2311.000021	SUBi 1933, Warden Site	~0.3-mile	Mid-19th to 20th C.	Historic
2311.000017	SUBi 1929, Solon Post Office	~0.3-mile	Mid-19th C.	Historic
2311.000018	SUBi 1928, Mrs. Stone Site	~0.3-mile	Mid-19th to 20th C.	Historic
2311.000022	SUBi 1932, House Site	~0.3-mile	Mid-19th to 20th C.	Historic

Only one prehistoric site (NYSM 9297) is located within one mile of the Project site. This site was first identified by Arthur C. Parker (1922) who described it as “traces of occupation.” Although a portion of the site appears to overlap the northern extent of the Project site, the site’s exact location is unknown. Parker, and other antiquarian archeologists, deliberately identified broad boundaries to preserve sites from looters and vandals and rarely specified their precise locations. In this instance, NYSM 9297 extends for several miles along the East Branch of the Tioughnioga River, encompassing the floodplain of the river. The designated site boundary denotes an area of increased archeological sensitivity due to the proximity of water and other physiographic features. Early archeological surveys such as Beauchamp (1900), Houghton (1909), and Parker (1922) do not report the presence of any other prehistoric sites in the vicinity of the Project area. Later archeological work by Ritchie (1980) and Ritchie and Funk (1973) also do not report archeological sites within the Project area.

The remaining nine sites are all historic-period archeological sites located within the hamlet of Solon, between 800 and 1,500 feet northwest of the Project site. These sites were identified during a cultural resource reconnaissance survey for a bridge replacement conducted by SUNY Binghamton in 1998. They include a tavern site, two stores, a post office, and five domestic residential sites (see Table 25).

No properties listed on the State or National Register of Historic Places (NRHP) are located within the archeological APE. The files at the NYSOPRHP include two previous cultural resource investigation reports in the immediate vicinity of the Project area:

- A Phase I investigation was conducted for the McCall EQIP project (Birchwood Archaeological Services 2007), involving the proposed installation of drainage pipeline and high tensile fencing. The survey area for the McCall EQIP project included an approximately 1,950 square-foot area located within the Crown City Wind Project Site. No cultural resources were identified during that investigation.

- A cultural resource reconnaissance was conducted for a bridge replacement (BIN 1024880) along NYS Route 41 (SUNY Binghamton 1998). Nine historic-period archeological sites were found during the investigation. These are listed in Table 25 and include a tavern site, two stores, a post office, and five domestic residential sites. Three of these sites were considered potentially eligible for the NRHP: the Solon Tavern site (2311.000020), the Stone site (2311.000016), and the Warden site (2311.000021). SUNY Binghamton recommended further investigations for the Stone and Warden sites, but not for the Solon Tavern site which, like the other six sites, was disturbed (PCI 2012a, p. 2-21).

3.6.1.1.2 *Historic and Architectural Resources*

The first historic-architectural resources survey conducted for the Project (PCI 2012b; see DEIS Appendix O) in 2008-2009 included an inventory of sites listed on, and previously determined eligible for listing on, the NRHP within the five-mile study area for the 2008 Project layout. These included two NRHP-listed historic districts, nine NRHP-listed individual buildings, and 14 NRHP-eligible individual buildings. The report also included detailed historic context statements for municipalities and descriptions of typical architectural styles located within the five-mile study area. The results of historic-architectural resources survey fieldwork of those areas with potential visibility of the Project (based on topographic viewshed mapping) within five miles of the 2008 layout resulted in the identification of 136 additional recommended NRHP-eligible individual buildings, approximately 63 of which are clustered in three recommended historic districts (all located within the City of Cortland). Descriptions of the 136 additional recommended NRHP-eligible properties were presented in an annotated historic property inventory.

The supplemental historic resources survey (**edr** 2012e) resulted in the identification of 108 additional individual properties, which, in the opinion of the Project's architectural historian, meet one or more criteria of those set out in the National Park Service regulations for NRHP eligibility (36 CFR 60.4). Of these additional individual properties, all but nine are located in the City of Cortland. Photographs and descriptions of the 108 properties identified during the addendum survey are included in the annotated property list included as Appendix A of the addendum report (see DEIS Appendix O).

In total, the combined 2008 and supplemental historic/architectural resources surveys resulted in the identification of 299 properties that are recommended as being eligible for listing on the NRHP, as well as 11 sites or districts already listed on the NRHP, and 23 properties that NYSOPRHP has previously determined are eligible for listing on the NRHP. The locations of these 333 properties and/or districts are shown on Figure 4 of the addendum report in DEIS Appendix O. All of these properties are described in the Annotated Property Lists included in either the 2008 *Architectural Survey* (PCI 2012b, p. 8-1) or Addendum Architectural Resources Survey (**edr** 2012e, Appendix A). As summarized in Table 26, the majority of historic resources identified within the study area were located in the City of Cortland (234 historic resources) and Village of McGraw (34 historic resources). The remaining historic resources were distributed throughout the rural portions of the study area.

Table 26. Summary of Historic Resources Located within the Study Area

Municipality	NRHP Status			
	NRHP Listed	NRHP Eligible	Recommended NRHP Eligible	Total
Cortland (city)	6	10	218	234
Cortlandville (town)	1		13	14
Cuyler (town)			1	1
Freetown (town)			1	1
Homer (town)			15	15
McGraw (village)	2	8	24	34
Solon (town)	1		6	7
Taylor (town)			3	3
Truxton (town)	1	5	18	24
Total	**11**	**23**	**299**	**333**

3.6.1.2 Prehistoric Context and Sensitivity

The three major cultural traditions manifested in New York State during the prehistoric era are the Paleo-Indian, the Eastern Archaic, and Woodland traditions. The development of prehistoric culture can be summarized as a gradual increase in social complexity, marked by several important cultural or technological innovations. During the late Prehistoric and Protohistoric (or Contact) periods (ca. 1500-1650 AD), tribal clusters of Iroquoian-speaking peoples were distributed throughout New York State and lower Ontario. Comprising several thousand people in at least one, and often several, villages in proximity to one another, each tribal cluster was separated from the others by extensive hunting and fishing areas (Trigger 1978; Engelbrecht 2003). Native American groups in Central New York were profoundly affected by the introduction of the fur trade, long before the arrival of a permanent European-American population in the area. This period marks the beginning of the end of traditional Native American cultural patterns as a result of ever-increasing political, military, religious and economic interactions with Europeans.

Before the arrival of Europeans, Central New York was primarily occupied by Iroquoian nations that belonged to the Haudenosaunee or Iroquois Confederacy. Each of the five original Haudenosaunee nations—Mohawk, Oneida, Onondaga, Cayuga, and Seneca—is represented by a sequence of sites spanning the late Prehistoric and Protohistoric periods. Over the course of the sixteenth century, the Tug Hill Plateau area became a depopulated buffer zone between the Haudenosaunee in the Mohawk valley and the Huron and their allies on the north bank of the St. Lawrence River. As a result, the lands in the vicinity of the Project area became part of Haudenosaunee hunting territory during the early historic period (Trigger 1978). The Project area is located near the boundary between the hunting territories of Oneida and Onondaga, and, later, Tuscarora nations (Campisi 1978; Blau et al. 1978; Landry 1978; Smith 1885).

Regarding the potential for prehistoric Native American archeological sites to be present, the upland environment of the Project area is generally sensitive for small seasonal camps and processing stations. It has been suggested that knolls in the uplands may have a relatively higher likelihood for archeological sites to be present than other settings in upland areas (Funk 1993). Sensitivity for larger settlements (e.g., base camps, villages) and burials is generally low because the larger settlements are more likely found in the valleys. The New York SHPO provides an on-line GIS database that defines areas of archeological sensitivity as those areas located within one-mile of previously identified archeological sites. This on-line mapping (see Appendix D) indicates that previously identified archeological sites in the vicinity of the Project are clustered within river valleys along the Tioghnioga River and East Branch of the Tioughnioga River, located west of and along the northern perimeter of the Project Site (respectively). According to SHPO's on-line mapping, the Project Site is not located within an archeological sensitive area.

3.6.1.3 Historic Context and Sensitivity

The Project area is located in what was the territory of the Onondaga Nation of the Iroquois Confederacy at the time of European contact and colonization in the eighteenth century. Native American use of the area was primarily limited to hunting and remaining traces of occupation are generally limited to campgrounds in the Tioughnioga River valley (Brownell 2005). During the Revolutionary War, the Onondaga were initially neutral, but ultimately fought with the British against the American colonists. Following the war, many relocated to the Six Nations Reserve in Canada, and in 1788, the Onondaga ceded all their New York lands to the state except for a reservation in Onondaga County (Schein 1993). In 1782, a 1.5 million-acre tract containing the Project area was set aside by the state for soldiers of the Revolutionary War (Goodwin 1859; Schein 1993; Schein 2005). Although the land was set aside for veterans, many of them either neglected to claim their land or sold their land to speculators and the area was settled primarily by migrants from Connecticut, Massachusetts, Pennsylvania, and eastern New York (Schein 1993; Brownell 2005).

For almost all of the seventeenth and eighteenth centuries European activities in central New York involved limited military, religious, and commercial endeavors, few, if any of these activities were in the vicinity of what is now Cortland County. The earliest settlers of Cortland County did not establish long-term residences until 1791. The Tioughnioga River was the main corridor for settlement of the county and was named a public highway in 1814. The first cabin was built in 1791 along this river in what is now the Town of Homer by Joseph and Rhoda Beebe, and Amos Todd, Joseph's brother-in-law. Other settlers followed, including John Miller who settled in Lot 56, north of what would become known as the City of Cortland. Named for Pierre Van Cortlandt, the first lieutenant-governor of the state (1777-1795), the county seat was established at the Village of Cortland in 1810 (Child 1869; Smith 1885; Milne 1899). The area population began to grow, with residents found in every town of the county by 1804, and turnpikes under construction by 1810.

In 1829, the Town of Cortlandville was created from the southern half of the Town of Homer. The hamlet of Cortland grew into a village (formally incorporated in 1853) with mills, asheries, distilleries, and tanneries increasing in numbers (Smith 1885). Although the east and west branches of the Tioughnioga River were important in the transport of goods south to Baltimore, Maryland, the area was fairly isolated and import/export of goods was expensive. The opening of the Erie Canal in 1829 accelerated the growth of communities along its route, and retarded that growth in areas well inland of it. Such was the case with Cortland County, whose development was hindered by the canal. The advent of the railroad through the area, however, was a boon to the economy. The first railroad through the county was completed in 1854 and the introduction of this type of transportation gave rise to the dairy industry in Cortland County. Other industries grew as well with the manufacturing of carriages, wagons, sleighs, cheeseboxes, wire, farm implements, leather, corsets, furniture, and fishing line (Schein 2005). The Town of Homer was formerly more important than Cortlandville, but as a result of the railroad Cortlandville grew. During the 1870s, two additional railroads were established through the town, the Ithaca & Cortland, and the Utica, Chenango & Cortland. All of these contributed to the growth and prosperity of the Village of Cortland and the township as a whole (Smith 1885). Cortland was incorporated as a city in 1900, the 41st city in New York State. By 1920, the population of the City of Cortland was 13,294. It supported more than 65 factories, including the wire and wire cloth industries, which had been established in the 1870s, and the carriage and wagon (later auto parts) industries, among others (Sullivan 2004).

By contrast, the Town of Cortlandville surrounding the city remained rural supporting thriving dairy and market gardening industries. The combined population of the Town of Cortlandville was 3,237 in 1920. In more recent times, the rural areas have seen increased settlement as suburban developments have grown (City of Cortland 2008). The county of Cortland had a population of 49,336 in 2010, with 19,204 in the City of Cortland. In 2010, the town of Cortlandville had a population of 8,509, Homer had 6,405, Truxton had 1,133, and Solon had 1,079 (US Census Bureau 2010).

The Project area and its surroundings are and have been historically used for agriculture. The proposed turbine locations are typically set in agricultural fields (e.g., pasture, crop) well behind locations of existing and map-documented farmsteads. In some areas, proposed access roads and interconnect lines intersect existing public roads, which raises the likelihood that they may intersect or pass close to historic-period archaeological sites associated with former farmsteads and/or residences. A 2008 review of historic maps as part of a Phase 1A by PCI resulted in finding 29 map documented structures (MDSs) within 100 meters (328 feet) of the APE at that time (see Figures 2.2-2.6 in PCI 2012a, p.2-15 to 2-19, included in DEIS Appendix O). The locations of MDS within the Project Site are considered potentially sensitive for historic archeological resources that may be associated with these farmsteads/homesteads. Sensitivity for historic middens associated with these farmstead sites is moderate.

3.6.2 Potential Impacts

3.6.2.1 Construction

3.6.2.1.1 Archeological Resources

Proposed construction of the Project will include ground disturbing activities that have the potential to impact archaeological resources. The APE for archeological resources includes all areas within the limits of disturbance for proposed construction activities. In general, there is relatively little likelihood that most portions of the Project site contain archeological sites. However, there are limited areas within the Project area where there is a moderate to high potential for prehistoric or historic archeological sites to be present. Archeologically sensitive areas are identified based on the following criteria: undisturbed areas that are environmentally sensitive with relatively level well-drained soils or in the vicinity of potable water such as springs, streams or creeks (these characteristics typify known site locations in the region); proximity to known (i.e., previously reported) prehistoric or historic site locations within or adjacent to the Project area; and proximity to historic structures identified within or immediately adjacent to the Project area (PCI 2012a, p.3-1).

3.6.2.1.2 Historic and Architectural Resources

As the construction of the access roads and wind turbines will not require demolition or other adverse impacts to historic and architectural resources, there will be no direct impact on architectural resources.

3.6.2.2 Operation

3.6.2.2.1 Archeological Resources

Once the proposed Crown City Wind Farm has been constructed, no significant earth-disturbing activities associated with operation and maintenance of the Project will occur. Therefore, Project operation will not have an adverse effect on archeological resources.

3.6.2.2.2 *Historic and Architectural Resources*

The Project's potential effect on a given historic property would be a change (resulting from the introduction of wind turbines) in the property's visual setting, if turbines are visible when the historic property is viewed from a publicly accessible vantage point. The Federal Regulations entitled "Protection of Historic Resources" (36 CFR 800) include in Section 800.5(2) a discussion of potential adverse effects on historic resources. The following types of effects apply to wind energy projects include:

> "Adverse effects on historic properties include, but are not limited to: [items i-iii do not apply]; (iv) Change of the character of the property's use or of physical features within the property's setting that contribute to its historic significance; (v) Introduction of visual, atmospheric or audible elements that diminish the integrity of the property's significant historic features; [items vi-vii do not apply]" (CFR 2004b).

As it pertains to historic properties, *setting* is defined as "the physical environment of a historic property" and is one of seven aspects of a property's *integrity*, which refers to the "ability of a property to convey its significance" (NPS 1990, p. 44-45). The other aspects of integrity include location, design, materials, workmanship, feeling, and association.

The potential effect resulting from the introduction of wind turbines into the visual setting for any historic or architecturally significant property is dependent on a number of factors including the number of visible turbines, distance, visual dominance, orientation of views, viewer context and activity, and the types and density of modern features in the existing view (such as buildings/residences, overhead electrical transmission lines, cellular towers, billboards, highways, and silos). It is also worth noting that visual setting may or may not be an important factor contributing to a given property's historical significance. Scenic views and/or association with the landscape are not specifically identified as contributing to the significance of any of the historic resources in the study area.

The potential visibility and visual impact of the proposed Project is evaluated in the Visual Impact Assessment (VIA) for the Project (**edr** 2012c; see DEIS Appendix M1). The VIA includes an evaluation of the potential visibility of the Project based on viewshed analysis (including the screening effects of vegetation and Federal Aviation Administration (FAA) warning light visibility), field confirmation of visibility utilizing helium-filled balloons raised to the maximum blade-tip height of the proposed turbines, preparation of representative visual simulations, and evaluation of visual simulations by a panel of Registered Landscape Architects.

Visibility of a project does not necessarily indicate that an adverse effect will occur. The NYSDEC guidance concerning visual impacts on aesthetic resources of statewide significance (which include NRHP-listed and NRHP-eligible structures) defines significant aesthetic impacts as those "that may cause a diminishment of the public enjoyment and appreciation of an inventoried resources, or one that impairs the character or quality of such a place… Mere visibility, even startling visibility of a project proposal, should not be a threshold for decision making. Instead a project, by virtue of its visibility, must clearly interfere with or reduce the public's enjoyment and/or appreciation of the appearance of an inventoried resource" (NYSDEC 2000, p. 9).

Most of the historic resources identified within the study area were recommended NRHP-eligible under Criterion C (i.e., they "embody the distinctive characteristics of a type, period, or method of construction" [CFR 2004a]). These properties are typically determined NRHP-eligible because they are representative examples of vernacular nineteenth-century architectural styles that retain their overall integrity of design and materials, or are associated with broad themes such as the agricultural development of the region. These properties would retain the characteristics that caused them to be recommended eligible after the introduction of wind turbines into their visual settings. For these types of resources, the potential change in the setting resulting from the Project will not necessarily result in diminished public enjoyment and appreciation of a given historic property, or impair its character or quality (per NYSDEC 2000,p. 5).

A detailed summary of potential Project visibility from all of the identified historic resources within the study area is provided in Table 2 of the Addendum Report, included in DEIS Appendix O. Of the 333 historic resources within the study area, 241 resources are located more than 3.5 miles from the Project (i.e., resources where the Project would be a feature in the background), 89 resources are located between 0.5 and 3.5 miles from the Project (i.e., where the Project would be a feature in the mid-ground), and three resources are located less than 0.5-mile from the Project (i.e., where the Project would be a feature in the foreground). The numbers of historic properties with potential Project visibility (based solely on topography) located in each municipality that fall within these various distances zones are summarized in Table 27.

Table 27. Summary of Potential Project Visibility from Historic Resources Considering Topography Only

Municipality	Potential Visibility by Distance Zone				Total
	Foreground	Mid-ground		Background	
	Visible	Visible	Not Visible1	Visible	
Cortland (city)	1	4		229	234
Cortlandville (town)		11	2	1	14
Cuyler (town)				1	1
Freetown (town)				1	1
Homer (town)	1	9		5	15
McGraw (village)		34			34
Solon (town)		6		1	7
Taylor (town)		2		1	3
Truxton (town)	1	21		2	24
Total	**3**	**87**	**2**	**241**	**333**

The two historic resources located within the study area that do not have potential visibility of the Project (based solely on topography) were identified during the previous (2008-2009) architectural survey (PCI, 2012b) and are located in areas where turbines in the former (superseded) layout would have been visible, but where no turbines in the current layout are visible.

Because it accounts for the screening provided by mapped forest stands, the vegetation viewshed is a much more accurate representation of potential Project visibility. The numbers of historic properties with potential visibility of the Project (considering screening provided by topography and mapped forest vegetation) are summarized in Table 28. It is important to note that this assessment of potential visibility does not take into account screening that would be provided by buildings, street trees, yard vegetation, or other factors that may reduce actual Project visibility.

Table 28. Summary of Potential Project Visibility from Historic Resources Considering Topography and Vegetation

Municipality	Potential Visibility by Distance Zone							Total
	Foreground		Mid-ground			Background		
	Visible	Not Visible	Visible	Partially Visible	Not Visible	Visible	Not Visible	
Cortland (city)	1				4	221	8	234
Cortlandville (town)			9		4	1		14
Cuyler (town)						1		1
Freetown (town)						1		1
Homer (town)	1		8		1	4	1	15
McGraw (village)			23	1	10			34
Solon (town)			4		2		1	7
Taylor (town)			1		1	1		3
Truxton (town)		1	19		2	1	1	24
Total	**2**	**1**	**64**	**1**	**24**	**230**	**11**	**333**

Considering the screening effects of forest vegetation (as opposed to only considering topography) results in 34 fewer historic resources with potential views of the Project (based on the results of viewshed analysis). However, it is important to note that because screening provided by buildings and street/yard trees, as well as characteristics of the proposed turbines that influence visibility (color, narrow profile, distance from viewer, etc.), are not taken consideration in the viewshed analyses, being within the viewshed does not necessarily equate to actual Project visibility. The visual simulations included as DEIS Figure 10 demonstrate the screening effect of buildings and vegetation from a variety of distances and settings within the study area. In addition, field review of potential Project visibility conducted as part of the VIA for the Project verified that visual screening provided by existing buildings, yard trees, and other objects limit views of the Project from many areas where viewshed mapping suggests the Project is potentially visible, especially within urban, village, and hamlet settings (**edr** 2012c, p. 15). This was particularly true for the City of Cortland, where field review confirmed that buildings and trees screened views toward the Project site. Therefore, the data presented in Tables 25 and 26 (and shown on Figure 4 of the Addendum Report, included in DEIS Appendix O) significantly overstates the potential visibility of the Project from historic resources within the study area.

As described in the VIA for the Project (**edr** 2012c, p. 14-16), the Project will result in generally greater visual contrast from vantage points located close to the turbines, where the turbines appear larger, and that provide relatively open views that feature multiple turbines. Therefore, the potential visual effect of the Project on the visual setting associated with historic resources will generally be greater for resources where the Project is featured in the foreground and/or near mid-ground (i.e., within approximately 1.5 miles) of the view. According to the viewshed model, forest vegetation will screen views of the Project from 17 of the 61 resources located within 1.5 miles of the Project. Turbines will potentially be in the foreground of views from historic resources 251 (2422 County Road 114, in Cortland) and 120 (River Crossing Road, in Homer), but will be screened by vegetation from historic resource 136 (3622 Cheningo Road, in Truxton). See DEIS Figure 18 for photographs of the two historic resources that will have foreground views of the Project. Also note that photographs of all identified historic resources can be found in Appendix O, in the historic-architectural resources survey (see page 8-110 and 8-111 for photographs of historic resource 120) and the addendum historic-architectural resources survey (see sheet 29 of Appendix A for photographs of historic resource 251). The visual simulations from Viewpoints 37 and 39 (see DEIS Figure 10) provide representative views of the scale and visual effect of wind turbines located in the foreground of the view.

In addition, another 58 properties are located between 0.5 mile and 1.5 miles from the Project. These include 34 historic resources located in the Village of McGraw (including the NRHP-Listed Main Street Historic District), and 28 historic resources dispersed throughout the rural areas in the vicinity of the Project. The field review conducted as part of the VIA indicated that visibility of the Project from McGraw will be highly variable. The Project will be a prominent feature in the views available from elevated, open vantage points located along the NYS Route 41 east of McGraw, and from higher elevation areas south of the village. However, from within the village, including from within the historic district, only occasional, partially screened views of the Project are expected. As shown in the visual simulation from Viewpoint 142 (see DEIS Figure 10), portions of single (or relatively few) turbines (or turbine blades) will be visible in the gaps between existing buildings and yard vegetation. From other vantage points in the village, the Project will be completely screened by existing buildings or trees. Regardless of the proximity of the proposed turbines, because views of the Project will be screened from most areas within the village, the Project is not expected to have a significant effect on the visual setting or character of historic resources located within the Village of McGraw. Similarly, the simulation from Viewpoint 70 (see DEIS Figure 10) demonstrates the screening effect of existing buildings from hamlet settings, in this case from the hamlet of East Homer. The simulations from Viewpoints 8 and 145 (see DEIS Figure 10) provide representative views of the visual effect of wind turbines located in the near mid-ground of the view from rural areas.

More distant mid-ground views (i.e., between 1.5 and 3.5 miles) of the Project will be potentially available from 31 historic resources, all of which are located in the rural areas surrounding the Project. Views of the Project will be screened by forest vegetation from eight of these historic resources. As shown in the simulations from Viewpoints 73, 134, 150, 228, and 244 (see DEIS Figure 10), at these distances the proposed turbines (although readily apparent) will not necessarily be prominent features in the view. The potential effect of the Project on the visual setting associated with these resources will generally be less than for resources located closer to the Project. As described in the VIA for the Project (**edr** 2012c), the effect on the view from vantage points where the Project will be featured in the distant mid-ground is dependent on many factors including the openness of the view, the number of visible turbines, the extent to which the Project is screened or partially screened by buildings, trees, or other objects, and the amount of existing visual clutter and/or modern intrusions in the view.

Most (241) of the 333 historic resources within the study area are located greater than 3.5 miles from the Project. The proposed turbines would be features in the background of the view from these resources. As described in the VIA and shown in the simulations from Viewpoint 224 (see DEIS Figure 10), the proposed turbines will not be prominent features in the view from these areas and will not significantly affect the visual setting associated with historic resources located more than 3.5 miles from the turbines. The simulations also show that the turbines' narrow profile and white color can significantly reduce their visibility and visual impact, especially at background distances.

Of these 241 resources with potential background views of the Project, 229 are located in the City of Cortland (the remaining 12 historic resources are dispersed throughout the rural areas around the periphery of the study area). The field review conducted as part of the VIA indicated that existing buildings, street trees, yard vegetation, utility poles, and other objects obstruct distant views out of the city and screen views of the Project site, particularly within the urban core, where most of the historic resources are located. Potential views of the Project from within the city were limited to the edges of the urban areas, where gaps between buildings allow for more distant views toward the Project site. As shown in the simulation from Viewpoint 181 (see DEIS Figure 10), from these areas distant, partially screened views of single (or relatively few) turbines (or turbine blades) will be available. However, these areas also feature more recent commercial and transportation development that diminishes the integrity of the setting of nearby historic resources. The Project is not expected to be visible from most portions of the City of Cortland. From areas where partial views of the Project are available, the Project will be a minor component in the background of the view and is not expected to have a significant effect on the visual setting associated with historic resources in the City.

3.6.3 Proposed Mitigation

As described in Section 3.2.3, it is anticipated that the Project will require a Joint Application for Permit filed with NYSDEC and USACOE because of potential impacts to surface waters protected under the NYS Environmental Conservation Law, Article 15 (Protection of Waters) and Section 404 of the Clean Water Act. As part of the Joint Application for Permit review, NYSDEC and the USACOE would be required to consult with the New York SHPO under Section 14.09 of the New York State Parks, Recreation, and Historic Preservation Law and Section 106 of the National Historic Preservation Act regarding the potential effect of the Project on archeological and/or historic resources listed on or eligible for listing on the NRHP. As described in Section 3.6.1, the Phase 1A Cultural Resources Survey for the Project site (PCI 2012a; see DEIS Appendix O) was provided to the NSYOPRHP on August 18, 2012 for their review and comment (see Appendix D) to initiate SHPO consultation for this Project. It is anticipated that any mitigation measures related to impacts on cultural resources that may be required for the Project will be determined by the Lead Agency in consultation with the SHPO.

3.6.3.1 Archeological Resources

To avoid any impacts to archeological resources, a Phase 1B archeological survey will be conducted prior to construction of the Project. The Phase 1B archeological survey will be conducted in accordance with the *New York State Historic Preservation Office Guidelines for Wind Farm Development Cultural Resources Survey Work* (the *SHPO Wind Guidelines*) issued by the NYSOPRHP in 2006. The *SHPO Wind Guidelines* (NYSOPRHP 2006, p.1-3) request that archeological surveys for wind projects be conducted in accordance with a specialized methodology, which includes:

1. Conducting a landscape classification analysis for the Project area following the criteria presented in the *Archeological Investigations in the Upper Susquehanna Valley, New York State* (Funk 1993);
2. Preparing an archeological sampling protocol that provides for intensive sampling of environmental zones identified in the landscape classification analysis;
3. Providing the archeological sampling protocol (in the form of a work plan) to NYSOPRHP staff for comment prior to conducting fieldwork; and,
4. Conducting a Phase 1b archeological field survey in accordance with the approved work plan, and submitting a Phase 1b archeological survey report to NYSOPRHP for review.

The Phase 1B archeological survey will take into account any further consultation with the NYSOPRHP (e.g., comments received on the Phase 1A report and the recommendations contained therein), and will include a pedestrian surface survey in previously cultivated areas, the excavation of shovel tests, and examination of the locations of map-documented structures. Any archeological sites identified within the Project site will be avoided during Project construction. All archeological sites identified within the APE for the Project will be avoided through relatively minor modifications to the Project layout. The mapped locations of identified archeological sites will be included on Project construction maps surrounded by a 100-foot (minimum) buffer, identified as "Environmentally Sensitive Areas" or similar, and marked in the field by construction fencing with signs that restrict access. These measures should be adequate to insure that impacts to archeological resources are avoided. In the event that unanticipated archeological resources are encountered during construction, the environmental monitoring plan will include provisions to stop all work in the vicinity of the archeological finds until those resources can be evaluated and documented by a Registered Professional Archeologist.

3.6.3.2 Historic and Architectural Resources

Mitigation options are limited, given the nature of the Project and its siting criteria (very tall structures typically located in open fields at the highest locally available elevations). To address any community concerns regarding potential visual effects on any historic structures or sites within the study area, the Applicant/owner/developer will work with the SHPO and the Lead Agency to identify a worthwhile cultural resources project (or projects) within the study area. Local stakeholders, such as historic societies or local historians, will be consulted as appropriate as part of this process. The previously prepared *Architectural Resources Survey* (PCI 2012b, p.7-4) describes recommendations for typical cultural resources mitigation projects that have been proposed for other wind energy projects in New York State, which could include activities such as additional historic resources surveys, NRHP nominations, monetary contributions to historic property restoration causes, development of heritage tourism promotional materials, development of educational materials and lesson plans, and development of public history materials, such as roadside markers.

3.7 SOUND

This sub-section is organized as follows:

- 3.7.1 Existing Conditions
- 3.7.2 Potential Impacts
- 3.7.3 Proposed Mitigation

To obtain background sound levels and evaluate potential sound impacts from the Project, Epsilon Associates, Inc. (Epsilon) prepared a *Sound Level Assessment Report* (Epsilon Associates, Inc. 2012). This document is included in Appendix P. The two primary phases of the study included an ambient sound level survey to characterize the existing acoustical environment and a computer modeling analysis of future Project operation sound levels.

3.7.1 Existing Conditions

Certain activities inherently produce sound levels or sound characteristics that have the potential to create noise (i.e., unwanted sound). Some properties of sound typically measured include:

1. Frequency: Frequency is the rate at which a source produces sound waves (i.e., complete cycles of high and low pressure regions). In other words, frequency is the number of times per second that a vibrating body completes one cycle of motion. The unit for frequency is the hertz (Hz = 1 cycle per second). Low pitched or bass sounds have low frequencies, while high-pitched or treble sounds have high frequencies. The sensitivity of the human ear to sound depends on the frequency or pitch of the sound. The human ear, in general, and different individuals in particular, hear some frequencies better than others.

2. Sound Pressure: Sound pressure level (SPL) is the amount of air pressure fluctuation that a sound source creates. We "hear" or perceive sound pressure as loudness. Sound pressure is usually expressed in units called pascals (Pa). The common sounds we hear have sound pressure over a very wide range (0.00002 Pa - 20 Pa). It is difficult to work with such a broad range of sound pressures. To overcome this difficulty, a unit of decibel (dB) is used which compresses the scale of numbers into a manageable range. SPL can be statistically summarized as the residual, or L90, sound level. The L90 is the sound level exceeded during 90% of a measurement interval. It excludes sporadic, short-duration sound events, thereby characterizing the more quiet lulls between such events. It is this consistently present "background" level that forms a conservative basis for evaluating the audibility of a new sound source.

3. Sound Power: The sound power is the sound energy transferred per second from the sound source to the air. A sound source has a given, constant sound power that does not change if the source is placed in a different environment. Sound power is expressed in units called watts (W). An average whisper generates a sound power of 0.0000001 watts, a truck horn 0.1 W, and a turbo jet engine 100,000 W. Like sound pressure, sound power (in W) is usually expressed as sound power levels in dB. Sound measurement readings can be adjusted to correspond to human hearing with an "A-weighting filter" which de-emphasizes frequencies or pitches that are outside the normal range of human hearing. Decibels measured using this filter are A-weighted and are called dB(A).

4. Time Distribution: Sound can be continuous, variable, intermittent, or impulsive depending on how it changes over time. Continuous sound remains constant and stable over a given time period.

The Project area is rural and sparsely populated except along the more major roadways, such as County Route (CR) 157 (Maybury Road), CR 116A (McGraw North Road), and CR 114 (East River Road), which mostly follow the course of low-lying valleys. Although most of the residences are located in valleys, there are also a fair number of homes in higher locations relatively close to proposed turbine locations. No other high-occupancy or sensitive receptors such as schools, hospitals, or institutions are located within the Project area, or within 0.5 mile of a proposed wind turbine. To evaluate background sound levels, Epsilon selected five measurement positions, which were selected to be representative of the acoustic environments experienced at nearby residences. Because wind speed and associated ambient sound levels vary with elevation, it is important to measure existing background sound levels that are representative of those experienced at the nearest homes. By including both higher elevation (locations 2 & 5) and lower elevation (locations 1 &4) sites situated along both the outside perimeter and within the project interior, the number and settings of measurement locations sufficiently characterizes the various receptor micro-environments throughout the Project area. The locations of the sound monitoring positions are described in Table 29 (and are mapped in Figures 5-2 through 5-6 of Appendix P).

Table 29. Sound Monitoring Positions

Position	Location	Description
1	MacLean Farm at 4260 North Road	Approximately 2,970 feet to the closest proposed wind turbine (7). Placed within a field on the MacLean property, located approximately 400 feet west of North Road
2	Joseph Schueren Property at 5064 Town Line Road	Approximately 2,700 feet to the closest proposed wind turbine (21). Located on the Schueren property, approximately 300 feet east of Town Line Road between the Towns of Homer and Truxton.
3	Ross Horse Farm at 5288 Maybury Road	Approximately 2,220 feet to the closest proposed wind turbine (27). Located within a paddock at the farm, located 200 feet east of Maybury Road in Truxton.

Position	Location	Description
4	Matheiu Property at 4793 Maybury Road	Approximately 1,800 feet to the closest proposed wind turbine (24). Placed in the front yard of the Mathieu property, approximately 200 feet west of Maybury Road within the Town of Solon.
5	Tobias Farm at 3811 Maybury Road	Approximately 1,530 feet to the closest proposed wind turbine (38). Located in a field behind the barn, closer to the proposed wind turbine than the house.

CEL Instruments Model 593.C1 Precision Sound Level Analyzer, equipped with a CEL-257 Type 1 Preamplifier, a CEL-250 half-inch microphone and a four-inch foam windscreen were used to collect broadband and one-third octave band ambient sound pressure level data. These instruments meet the “Type 1 – Precision” requirements set forth in the American National Standards Institute (ANSI) S1.4 for acoustical measuring devices. Each instrument was tripod-mounted at a height of five feet above ground. A 60-meter (197 foot) high meteorological tower located near the geographical center of the proposed wind farm also measured and logged wind speeds during the sound level measurement period.

The background sound level survey was conducted in October 2008, when most of the leaves had fallen off of the trees, reflective of late-autumn and/or winter conditions. When deciduous trees are bare of leaves, ambient sound level is generally lower, because rustling leaves are absent, resulting in relatively low sound levels compared to other seasons. Therefore, by capturing the lowest level of natural masking noise that could hide or obscure potential noise from wind turbines, measurements taken during mostly leaf-off conditions represent a conservative scenario for modeling future noise impacts.

Noise measurements indicated that the existing background noise sources include: wind noise, aircraft, birds, vehicular noise (some locations), insects (on warm days), and mechanical sources (some locations). In the summertime, when outdoor activities are more common and windows might be open, higher background levels due to leaf rustle can be expected to significantly increase the amount of background sound level masking. Sound levels rise and fall with increasing and decreasing wind speeds, respectively. In general, the turbines will be operational when the wind is blowing at speeds between 3 and 25 m/s (approximately 7 – 56 mph). The turbine manufacturer’s published sound power levels for the GE 1.6-100 turbine were provided for wind speeds between 5 and 10 m/s (11 and 22 mph) at a 10 meter (33 feet) reference height. The sound data for the turbines indicates that wind speeds at 8 m/s (18 mph) and above will produce maximum sound levels (105 dBA sound power level). While maximum absolute turbine sound emissions occur at 8 m/s (18 mph), the worst-case condition comparing the highest sound power with the lowest ambient level occurs at wind speeds of 7 m/s (16 mph) (i.e., this represents the wind speed conditions where the background sound level is lowest relative to the turbine sound level). This was determined, therefore, to be the “worst-case” wind condition for the Project in terms of an increase over background.

3.7.2 Potential Impacts

Virtually everything that has moving parts will make some sound, including wind turbines. The distinction between sound and noise is subjective, as well as what constitutes 'noisy'. Table 30 lists examples of common sound levels using typical dBA levels.

Table 30. Common Sources of Sound and Associated Typical Sound Levels (dBA)

Source/Activity	Indicative sound level (dBA)
Threshold of hearing	0
Rural night-time background	20-40
Quiet bedroom	35
Wind farm at 350 meters (1,148 feet)	35-45
Car at 40 mph	55
Busy general office	60
Truck at 30 mph at 100 meters (328 feet)	65
Pneumatic drill at 7 meters (23 feet)	95
Jet aircraft at 250 meters (820 feet)	105
Threshold of pain	140

Source: The Scottish Office, Environment Department, Planning Advice Note, PAN 45, Annex A: Wind Power, A.27. Renewable Energy Technologies, August 1994. Cited in "Noise from Wind Turbines," British Wind Energy Association, available at: http://www.bwea.com/ref/noise.html (Accessed July 12, 2012).

The potential sound-related impacts resulting from the construction and operation of wind turbines are described below.

3.7.2.1 Construction

Construction of wind power projects requires the operation of heavy equipment and construction vehicles for various activities including construction of access roads, excavation and pouring of foundations, the installation of buried electrical collector lines, and the erection of turbine components. Assessing and quantifying construction-related impacts is typically difficult for most wind power projects because construction activities will be constantly moving from place to place around the site, leading to highly variable impacts at any given location. A significant portion of the construction will occur in remote areas, and significant construction-related sound impacts are not anticipated. In general, the maximum potential impact at any single residence might be analogous to a few days to a week of repair or repaving work occurring on a nearby public road. More commonly, sounds from Project construction are likely to be faintly perceived as the far off sound of diesel-powered earthmoving equipment characterized by such things as irregular engine revolutions, back up alarms, gravel dumping, and the clanking of metal tracks.

Construction-related noise will not occur on a permanent basis, or outside of normal daytime working hours (when all Project construction is planned), but as a temporary, daytime occurrence during construction. Construction noise of this magnitude may go unnoticed by many in the area. In any event, Project construction noise will be a temporary impact.

3.7.2.2 Operation

According to Rogers et al. (Rogers et al. 2006, p.10), the sources of sounds emitted from operating wind turbines can be divided into two categories: 1) mechanical sounds, from the interaction of turbine components, and 2) aerodynamic sounds, produced by the flow of air over the blades. Mechanical sounds originate from the relative motion of mechanical components and the dynamic response among them. Since the emitted sound is associated with the rotation of mechanical and electrical equipment, it tends to be tonal (of a common frequency), although it may have a broadband component. Aerodynamic broadband sound is typically the largest component of wind turbine acoustic emissions, and is generally characterized as a “swishing” or “whooshing” sound. It originates from the flow of air around the blades, and generally increases with rotor speed.

In order to quantitatively look at potential impacts in absolute terms, a modeling study of worst-case Project sound levels was carried out to determine what specific sound levels could be expected at the nearest receptors. Using the design sound power level spectrum for the GE 1.6-100 turbine, worst-case Project sound levels were calculated using the Cadna/A®, noise modeling program developed by DataKustik, GmbH (Munich). This software enables the Project area and its surroundings, including terrain features, to be realistically modeled in three-dimensions using topographical maps of the area. The program calculates distant sound levels in strict accordance with ISO 9613-2 *Acoustics – Attenuation of Sound during Propagation Outdoors*, which considers the geometrical spreading of sound waves from a source and all other natural attenuation mechanisms that might come into play such as barriers, sound wave interaction with the ground surface, air absorption, etc. In this instance, ground absorption, geometric spreading (distance loss), air absorption under ISO “standard day” conditions (10 deg. C, 70% RH) were considered in the model. ISO 9613-2 is the primary worldwide standard for such calculations.

The sound power level of the GE 1.6-100 was developed from field testing in accordance with IEC 61400-11. Various other conservative assumptions have been applied to help ensure that actual Project noise levels do not exceed the predicted levels – including during times when atmospheric conditions may favor noise propagation relative to average conditions. As a consequence, the studies, which are based on these conservative assumptions, are likely to overestimate Project sound levels. Sound levels that are somewhat lower than those predicted in the modeling plots are actually expected to occur much of the time. The model represents a theoretical worst-case condition at any given receptor point that would require a convergence of the following conditions to occur:

- **Wind Direction** – The model assumes a hypothetical situation where wind is blowing from all directions at the same time.
- **Critical Wind Speed** - A 7 m/s (16 mph) wind represents the point where the least amount of masking noise is likely to be present relative to the turbine sound level.
- **Late-Autumn and/or Wintertime Background Levels** – The background survey was conducted under late-autumn and/or wintertime conditions when ambient levels are typically lower than peak spring/summertime conditions.
- **Conservative L90 Background Level** – The critical design wind condition of 7 m/s (16 mph) is based on the L90 background sound level that represents the near-minimum sound level. By definition, a higher background sound level will actually exist most of the time (90% of the time).
- **Low Ground Porosity** – Wooded areas and fields are normally more acoustically absorptive than assumed in the model.
- **Observer Outside** – The plotted sound levels occur outside; sound levels inside of any dwelling will be 10 to 20 dBA lower.

The field survey determined that the background sound level varies with wind speed; turbine sound level also varies with wind speed. Therefore, the two values must be compared under the same wind conditions. For example, it would be incorrect and meaningless to compare the maximum turbine sound level, which requires high winds for it to occur, to the background sound level on a calm, quiet night. In terms of potential noise impacts, the worst-case combination of background and turbine sound levels would occur at the wind speed where the background level is lowest relative to the turbine sound level (in other words, where the differential between the background level and turbine sound power level is greatest). This worst-case situation occurs at a wind speed of 7 m/s (16 mph), when the turbine first reaches the point of maximum sound emissions. At higher wind speeds the background level continues to increase while the turbine sound level remains constant. In addition, the maximum turbine sound emissions corresponding to a wind speed of 8 m/s (18 mph) was also modeled.

Table 31 shows the background (L_{90}) sound levels for the worst-case (7 m/s [16 mph]) and Table 32 shows the maximum sound power (8 m/s [18 mph] and above) wind speeds, as well as predicted sound levels due to wind turbine and substation operation and Project sound level added to the background sound level, as modeled using the Cadna/A program at the five locations. These receptors are all on property parcels owned by Non-participating landowners, whose ambient levels are represented by the five background measurement locations, and which are located in the areas of highest absolute sound levels from the Project nearest to the five background measurement locations that represent them. Figure 11 illustrates the maximum predicted sound emissions that will be generated by the turbines. See also Figures 7-2A, 7-2B, 7-2C, and 7-2D in Appendix P, which present more detailed sound contour maps, and also depict parcel boundaries, allowing for the assessment of sound levels at specific residences, property boundaries, or other locations of interest.

Table 31. Comparison of Sound Levels Resulting from Project Operation and Background Sound Levels for Worst Case Wind Condition (7 m/s [16 mph])

Position	Location	Wind Farm Only (dBA)	Lowest L_{90} Background (dBA)	Total: Wind Farm and Lowest L_{90} (dBA)	Increase over Background (dBA)*
1	MacLean Farm	36.8	38.7	40.9	2
2	Schueren Property	42.6	34.4	43.2	9
3	Ross Farm	41.7	37.8	43.2	5
4	Matheiu Property	42.1	35.3	42.9	8
5	Tobias Farm	38.9	33.6	40.0	6

*Rounded to the nearest whole number decibel.

Table 32. Comparison of Sound Levels Resulting from Project Operation and Background Sound Levels for Maximum Sound Power Wind Condition (8 m/s [18 mph)

Position	Location	Wind Farm Only (dBA)	Lowest L_{90} Background (dBA)	Total: Wind Farm and Lowest L_{90} (dBA)	Increase over Background (dBA)*
1	MacLean Farm	37.7	40.4	42.3	2
2	Schueren Property	43.5	37.1	44.4	7
3	Ross Farm	42.5	41.0	44.8	4
4	Matheiu Property	43.0	39.6	44.6	5
5	Tobias Farm	39.8	37.2	41.7	5

*Rounded to the nearest whole number decibel.

The Project Sponsor is not aware of any documented impacts to livestock as a result of the sound from operating wind turbines.

Compliance with NYSDEC Guidelines

The predicted worst-case sound levels from the Project were compared to the NYSDEC Noise Policy based on absolute and relative sound levels. The Policy states that the addition of any noise source should not raise the ambient noise level above a maximum of 65 dBA within a non-industrial area. The predicted sound levels for the Project will be well below 65 dBA at all 1,115 permanently habitable residential locations for the worst-case scenario (7 m/s [16 mph]), as well as the maximum sound power (8 m/s [18 mph]).

In addition, this guidance document states that sound level increases from 0-3 dBA should have no appreciable effect on receptors, increases from 3-6 dBA may have potential for adverse noise impact only in cases where the most sensitive of receptors are present, and increases of 6-9 dBA may require a closer analysis of impact potential depending on existing sound levels and the character of surrounding land use and receptors. In terms of human reaction, the guidance document also states that increases in sound pressure level under 5 dB are categorized as "unnoticed to tolerable", increases from 5-10 dB as "intrusive", increases from 10-15 dB as "very noticeable", increases from 15-20 dB as "objectionable", and increases over 20 dB as "very objectionable to intolerable."

Tables 29 and 30, above, depict the expected sound level increases over the background sound levels at the five modeling locations for the worst-case scenario (7 m/s [16 mph]) and maximum sound power (8 m/s [18 mph]), respectively. [Please note: sound pressure levels are on a logarithmic scale, and therefore cannot be arithmetically added or subtracted to determine the total sound pressure of all noise sources in an area. Sound pressure levels in decibels must first be converted back to standard pressure values, then added or subtracted, and then converted back to the logarithmic scale. For example, a background level of 35 dBA added to a Project-only sound level of 40 dBA results in a total cumulative level of 41 dBA, or a 6 dBA increase (Resource Systems Group, Inc. 2006, p. 6).] Sound level increases at all locations fall within the first two categories of human reaction ("unnoticed to tolerable" or "intrusive").

It is important to note that in the particular case of wind turbine noise, the NYSDEC threshold of a 6 dBA cumulative increase does not represent the point of inaudibility. Operational noise from wind turbines is often unsteady and variable with time, largely because the wind does not always blow in a completely smooth manner. When unsettled air or gusty winds interact with the rotor, or the airflow is not perpendicular to the rotor plane, an increase in turbulence (and noise) can result. In addition, turbines often produce a periodic swishing sound. These characteristics make operational noise more perceptible than it would be if it were bland and continuous in nature. Consequently, turbines can commonly be discerned at fairly large distances even though the actual sound level may be relatively low and/or comparable to the magnitude of the background level.

However, a cumulative increase in the total sound level of about 5 or 6 dBA at a given point is required before the new sound begins to be clearly perceptible or noticeable to most people. Cumulative increases of between 3 and 5 dBA for a source of this kind are generally regarded as negligible or hardly audible. Lower sound levels from the new source are "buried" in the existing background sound level and become progressively less perceptible. Section V B(7)c of the NYSDEC program policy is excerpted below:

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

In other words, cumulative increases in the total ambient sound level of 6 dBA or less are unlikely to constitute an adverse community impact. For increases beyond 6 dBA, the guidelines suggest further evaluation. The guidelines go on to say "in non-industrial settings the SPL should probably not exceed ambient noise by more than 6 dBA at the receptor," but also notes "there may be occasions where an increase in SPLs of greater than 6 dBA might be acceptable. The addition of any noise source, in a non-industrial setting, should not raise the ambient noise level above a maximum of 65 dBA" (NYSDEC 2001, p. 14).

The NYS DEC Noise Program Policy "Assessing and Mitigating Noise Impacts" discusses when to conduct a "First Level" and "Second Level" Noise Impact Evaluation. The "Second Level" evaluation is a more refined evaluation that includes topography, ground absorption, atmospheric absorption, and any other natural attenuation. Given the layout of a wind farm, with many sources of sound (wind turbines) spread out over a large area, and where topography may change significantly between sources of sound and receptors (residences), the "Second Level" analysis is more appropriate. Therefore, the sound level assessment for the Project resolved not to complete the "First Level" evaluation and went straight to a "Second Level" more detailed analysis. The software package Cadna/A was used to model all facets of a "Second Level" analysis for this project. A "Third Level – Mitigation Measures" analysis was deemed not to be necessary by the independent acoustic experts as no locations are predicted to have an increase of 10 dB(A) or more which would merit "consideration of avoidance and mitigation measures in most cases." (Pers. Comm. R. O'Neal, Epsillon Associates 2012)

<u>Compliance with Other Guidelines</u>

A useful guideline for putting sound levels in perspective is the "Guideline for Community Noise" (World Health Organization [WHO], 1999). According to the WHO guidelines, daytime and evening outdoor living area sound levels at a residence should not exceed an equivalent level (Leq) of 55 dBA to prevent serious annoyance and an Leq of 50 dBA to prevent moderate annoyance from a steady, continuous noise. At night, sound levels at the outside facades of the living spaces should not exceed an Leq of 45 dBA, so that people may sleep with bedroom windows open. This translates to an indoor guideline value for bedrooms of 30 dBA Leq for a continuous noise (WHO 1999, p. xii-ix). Epsilon (2012, p. 8-2) compared against the absolute worst-case sound levels produced by the Project to the quietest WHO guideline sound levels. All sound levels at each of the 1,115 modeled receptors are below the 45 dBA Leq nighttime WHO guideline value under these worst-case conditions, except one. This single receptor will experience sound levels that exceed the guideline by only a few tenths of a decibel, and represents a Project participant.

Another useful guideline for comparing sound levels is the “Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety” (EPA 1974). This document identifies a maximum sound level of 55 dBA (day-night average sound level (Ldn)). This is the sound level below which no effects on public health and welfare will occur outdoors in residential areas. This maximum level, which includes a 10 dBA “penalty” for sound levels at night (10 p.m. to 7 a.m.), will permit normal speech communication and prevent annoyance, and also protects against sleep interference inside a home with the windows open. Epsilon (2012) compared the absolute worst-case sound levels produced by the Project to the EPA’s 55 dBA Ldn recommendation. Results show that all predicted sound levels at all receptor locations within the Project are well below the EPA’s Ldn limit.

The NYSDEC Noise Policy document also notes that establishing a maximum sound level at a residence can be an appropriate approach to addressing potential adverse noise impacts. The day-night sound level (Ldn) cited in the Policy is a 24-hour metric, based on 24, 1-hour average sound levels (Leq). In this evaluation, the nine (9) nighttime hours between 10 PM and 7 AM also have a 10 decibel penalty (dBA) added to the average sound level values as they are typically sleep hours, where a lower sound level is typically expected at a residential location. As discussed, the EPA’s Protective Noise Levels guidance found that noise levels of 55 dBA L_{dn} was a sound threshold sufficient to protect public health and welfare and, in most cases, did not create an annoyance.

The highest short-term sound levels from the Project (modeled at all 1,115 receptors) were assumed to be constant for an entire 24-hour period. Ten decibels dBA were added to the nine nighttime hours and a 24-hour “day-night sound level” (Ldn) was calculated. Results show that predicted sound levels at all locations are well below the EPA’s L_{dn} limit. Additionally, out of all 1115 modeled residences, the highest L_{dn} (52 dBA) occurs at a residence that is 1,820 feet (555 meters) from the nearest turbine. Since sound levels decrease with increasing distance from the source, (wind turbines), day-night sound levels will be lower than 52 dBA at all other receptors in the study area. Therefore, all residences will meet the “day-night sound level” (L_{dn}) guideline of 55 dBA.

In addition, section 8.1 of the Sound Level Impact Analysis (Epsilon 2012) discusses worst-case sound level increases from the Project over background sound level, whether daytime or nighttime. Since background sound levels could not feasibly be monitored at each of the 1,115 modeling locations, a representative background level was used to evaluate Project impacts at these locations. In determining the increase over background sound levels at each receptor, an average of the ambient levels at each of the five monitoring locations (L_{90avg} = 36 dBA) was added to the predicted Project-only sound levels at the 7m/s (16 mph) wind speed condition. These combined future sound levels were then compared to the existing average ambient sound level of 36 dBA. The predicted sound level increase at all locations is below 10 dBA, so do not require consideration of avoidance or mitigation measures as per the NYSDEC guidelines. Sound level increases at all locations fall within the first two categories of human reaction ("unnoticed to tolerable" or "intrusive") referenced in the NYSDEC Noise Policy guidelines referred above.

Low Frequency Noise Concerns

Although concerns are often raised with respect to low frequency or infrasonic noise emissions from wind turbines, no adverse impact of any kind related to low frequency noise is expected from this Project. It is true that early wind turbines (designed with the blades downwind of the support tower) were prone to producing a periodic thumping noise each time a blade passed the tower, and the widespread belief that wind turbines generate excessive or even harmful amounts of low frequency noise likely originated with this phenomena. While modern wind turbines have been re-configured, with blades arranged upwind of the tower, and therefore no longer produce the same magnitude of thumping noises, the myth of excessive low-frequency noise may have perpetuated due to confusion of low frequency sound with the amplitude modulation typical of wind turbines (i.e., the periodic swishing sound with a frequency of about 1 Hz). However, numerous studies show that the low frequency content in the sound spectrum of a typical modern wind turbine – like those proposed for this Project – is no higher than that of the natural background sound level in rural areas (Sondergaard & Hoffmeyer 2007; Hessler et al. 2008, p. 300-301).

In addition, in response to concerns that sounds emitted from wind turbines cause adverse health consequences, AWEA and CanWEA established a scientific advisory panel to conduct a review of current literature pertaining to the perceived health effects of wind turbines (Appendix Q). The multidisciplinary panel is comprised of medical doctors, audiologists, and acoustical professionals from the United States, Canada, Denmark, and the United Kingdom. The objective of the panel was to provide an authoritative reference document for legislators, regulators, and anyone who wants to make sense of the conflicting information pertaining to wind turbine sound. The panel evaluated peer-reviewed literature on sound and health effects, as well as sound produced by wind turbines. The panel concluded that there is no evidence that the audible or sub-audible sounds produced by operating wind turbines have any direct adverse physiological effects and the ground-borne vibrations from wind turbines are too weak to be detected by, or to affect, humans. In addition, based on the levels and frequencies of the sounds produced by operating wind turbines and the panel's experience with sound exposures in occupational settings, the sounds produced from operating wind turbines are not unique and therefore do not likely cause direct adverse health consequences (Colby et al. 2009, p. ES-1).

The Chief Medical Officer of Health (CMOH) of Ontario also reviewed existing scientific evidence on the potential health impact of noise generated by wind turbines. The report concluded, "…the scientific evidence available to date does not demonstrate a direct causal link between wind turbine noise and adverse health effects. The sound level from wind turbines at common residential setbacks is not sufficient to cause hearing impairment or other direct health effects, although some people may find it annoying" (CMOH of Ontario 2010, p. 3).

In addition, the Massachusetts Department of Environmental Protection (MassDEP) and Massachusetts Department of Public Health (MDPH) assembled a team of independent experts to identify any documented or potential health impacts or risks that may be associated with exposure to wind turbines and discuss public health effects relating to wind turbines, based on scientific findings. To do this the independent expert panel conducted a literature review, including peer-reviewed scientific studies, other reports, and popular media, as well as reviewed public comments received by the MassDEP and/or MDPH. According to the report, there is insufficient evidence that the noise from wind turbines is directly causing health problems or disease (Ellenbogen et al. 2012, p. ES-5).

Please note, the Scoping Document adopted on September 13, 2012 requires the DEIS to address potential low frequency noise impacts on livestock (dairy cows, horses and others) and wildlife. The Project Sponsor is unaware of any reported impacts to livestock or wildlife as a result of operational wind power projects. In fact, **edr** and TCI have independently witnessed substantial numbers of livestock and wildlife (e.g., deer and turkey) foraging in open fields directly adjacent to and beneath operating wind turbines at several New York wind power sites (see Section 3.3 for additional detail). Therefore, impacts to livestock or wildlife are not anticipated.

3.7.3 Proposed Mitigation

Although impacts related to construction noise will be temporary, and are not anticipated to be significant, measures to be employed to mitigate temporary construction noise shall include:

- Implementing best management practices for sound abatement during construction, including use of appropriate mufflers and limiting hours of construction.
- Notifying landowners of certain construction sound impacts in advance.
- Implementing a complaint resolution procedure to assure that any complaints regarding construction or operational sound are adequately investigated and resolved (see Section 4.1 and Appendix L1 for additional information).

As indicated in the *Sound Level Assessment Report* (Epsilon 2012, p. 9-1) provided in Appendix P and summarized above, an increase above background sound levels of approximately 8 to 9 dBA is predicted at modeled locations 2 and 4 for the worst-case 7 m/s [16 mph] wind condition. However, these modeled sound levels are based on a worst case scenario, with conservative assumptions required by ISO 9613-2 propagation standards, including low ground-level wind, high hub height winds, and the residence being downwind of multiple wind turbines under different wind directions at the same time. In addition, none of the 1,115 permanently inhabitable residential receptors modeled will experience operational noise produced by the Project in excess of the 65 dBA NYSDEC guideline, with the highest being 45.3 dBA L90. Furthermore, no Non-participating receptors (and only one Project participant) will experience sound levels in excess of the 45 dBA Leq nighttime WHO guideline, and none of the 1,115 residences will experience sound levels above of the EPA's 55 dBA Ldn recommendation.

In addition to the NYSDEC noise policy guidance, the predicted area sound levels have been evaluated in accordance with WHO (1999) and EPA (1974) guidelines, and have also been evaluated for impacts of low frequency noise. These additional analyses require Project sound levels to meet a set of more stringent tests than the NYSDEC guidelines provide for alone. By completing these additional assessments, the Project Sponsor has completed a more complex analysis than is specified by the NYSDEC program policy, in accordance with the requirements of the Scoping Document, adopted September 13, 2012. These additional analyses consistently demonstrate that adverse operational noise impacts from this Project are not anticipated, and therefore, mitigation is not proposed at this time. However, the Community Outreach and Communications Plan (see Appendix L1) will provide area residents with a forum to log and resolve complaints if necessary.

3.8 TRAFFIC AND TRANSPORTATION

This sub-section is organized as follows:

- 3.8.1 Existing Conditions
- 3.8.2 Potential Impacts
- 3.8.3 Proposed Mitigation
- 3.8.4 Discussion of Traffic Impacts at Landfill Site

Wind power generating projects have the potential to create transportation impacts as a result of short-term construction activities (temporary impacts) and as a result of long-term operation and maintenance of the Project (permanent impacts). To evaluate the potential temporary and permanent impacts resulting from the proposed Project, Air Energy TCI, Inc. (TCI) conducted a Preliminary Delivery Route Analysis. The purpose of this evaluation is to serve as an initial assessment of the road impacts and modifications required to construct the Project. The TCI Preliminary Delivery Route Analysis is included as Appendix R1.

3.8.1 Existing Conditions

The Project area is served by a network of State, County, and local roadways. Existing roads in the vicinity of the Project area range from two-lane highways with paved shoulders to seasonally maintained, dirt/gravel roads. TCI conducted a desktop assessment to identify the best delivery routes to each wind turbine location and to locate junctions and areas of the route that would require more detailed study. The desktop analysis was followed-up by a field-based study. Each delivery route was driven, roads were measured, and road conditions were surveyed by TCI engineers and site surveyors to identify any areas of concern, as well as bridges, culverts, and areas of poor road conditions. Then, an analysis was conducted by TCI's Technical Department using AutoTrack Computer Aided Design (CAD) to identify additional areas of concern. AutoTrack was used to predict the path of the vehicles and assess the suitability of the delivery route for delivery of oversize components used in wind farm construction (see the Preliminary Delivery Route Analysis in Appendix R1 of this DEIS).

3.8.2 Potential Impacts

3.8.2.1 Construction

Some temporary impacts to transportation in-route (mobilizing to the Project area), as well as in and around the Project area will result from the movement of vehicles involved in Project construction. These vehicles and their role in the Project are described below. Additionally, some public roads will need to be widened on a temporary basis to facilitate large vehicles accessing the Project area. Such temporary road widening would typically involve widening the shoulder at junctions to facilitate the required turning circles (the specific locations identified by TCI are listed below in Table 34 and are shown in Figure 13 sheet 6, 7, 10, 11, 12 and 13). The exact construction vehicles have not yet been determined; however, it is known that transportation of turbine components and associated construction material involves numerous conventional and specialized transportation vehicles, including:

Wind Turbine Equipment

- Blade Sections – Wind turbines consist of three blades that are transported on trailers with one blade per vehicle. Blades typically control the length of the design vehicle, and the radius of the curves along the travel route to the site. Specialized transport vehicles are designed with articulating (manual or self-steering) rear axles to allow maneuverability through curves.
- Tower Sections – Towers consist of five sections and are transported with one section per truck. Towers generally can control the height and width of the design vehicle dimensions.
- Nacelle – The turbine and related elements are typically the heaviest component transported.

- Hub and Nose Cone – Typically transported with one or more of the same element on a vehicle, for a total of three truck trips per tower. These elements are not critical elements related to design vehicle dimensions.
- Escort Vehicles

Construction Equipment and Materials

- Construction of Site Roads – Conventional trucks carrying stone, gravel, and miscellaneous construction equipment.
- Crane – For assembly of the wind towers, cranes are transported in sections over numerous trips to the site. Assembled cranes may be crawled between tower sites.
- Concrete trucks for tower foundations.
- Variety of conventional semi-trailers for delivery of substation and O&M facility components and materials.
- Construction staff and other incidental truck trips.

Table 33 represents an estimate of the total number of loaded truck trips entering the site during the construction of the turbines.

Table 33. Preliminary Trip Generation Estimate (Loaded Trucks Entering)

Component/Truck Type	Assumption	Trips
Blades (round trip)	One blade per truck, 3 per tower	132
Towers (round trip)	One section per truck, 5 sections per tower	220
Nacelle (round trip)	One nacelle per truck, one per tower	44
Hub and other components (round trip)	3 truck trips per tower	132
Road Construction Gravel/Stone (in), Dirt (out)	Gravel delivery – 10 cubic yards per truck plus other construction equipment	17,013
Underground cable installation Sand (in), Dirt (out)	10 cubic yards per truck	1,062
Cranes (round trip)	Several trips per access point, crane may have to be disassembled between these.	70
Cement/concrete (round trip)	250 to 450 cubic yards per foundation, 8 cubic yards per truck.	2,078
Substation (round trip)	Delivery of components	128
Total Vehicle Trips		20,879

The total vehicle trips as estimated in Table 33 will be occurring throughout the 6 to 9 month construction phase of the project, primarily within the first 5 months of this period.

Based upon an assessment of the existing conditions, TCI identified two main delivery routes from Interstate 81 to each of the proposed wind tower access roads (see Figure 12 and Appendix R1). It is assumed that the wind components will typically be delivered directly to the tower sites and that the laydown area will be used primarily to store spools of cable, set up the construction trailers, and park vehicles and dozers. It should be noted that while construction may begin in the spring, turbine component deliver is not anticipated to occur until early-mid summer, after access roads and turbine foundations have been prepared. Therefore, potential winter weather will not affect and/or delay oversized vehicles. However, if bad weather (e.g., thunder storms) occurs while oversized vehicles are in route, such vehicles will likely be required to delay travel in accordance with NYSDOT permit conditions (e.g., pull into a rest stop).

The proposed routes are described below (see Appendix R1 for additional detail and depictions).

Delivery Route A from I-81 Southbound – Turbines 1 - 25:

To Wind Turbine Sites 1-25: Use Exit 10 for Route 11 toward Polkville/McGraw from Interstate 81 southbound. Take Route 11 northbound for 0.2 mile. Turn left onto State Route 41 at Route 11/Route 41. Continue to follow Route 41 for approximately 1.3 miles. Turn right at County Route 114 (East River Road). Continue on East River Road for 2.5 miles. Turn right onto Parks Road (Town of Homer).

To Wind Turbine Sites 1, 2, and 3: Continue on Parks Road for approximately 1.5 miles. Then enter the newly constructed access roads on the left hand side of Parks Road.

To Wind Turbine Sites 4, 5, 8, and 11: Follow Parks Road for 2.6 miles. Make a left turn onto Shippey Road. Follow Shippey Road for 0.75 mile. Enter newly constructed access road on right to Turbines 4, 7, 8, and 11.

To Wind Turbine Site 10: Follow Parks road for 3.3 miles. Make a right turn to enter newly constructed access track to Turbine 10.

To Wind Turbine Sites 6, 7, 9, 12, 13 and 14: Follow Parks Road for 3.6 miles. Make a right turn onto Town Line Road southbound towards the County Landfill. Follow Town Line Road / Landfill Driveway for approximately 0.75 mile. Turn right onto the newly constructed access road to Turbine 13. Follow newly constructed access road to Turbine 12. Continue on the newly constructed access road to cross Heath Road. Enter newly constructed access roads to Turbines 6, 7 and 9.

To Wind Turbine Sites 15, 16, 17, 18 and 20: Follow Parks Road for 3.6 miles. Make a right turn onto Town Line Road southbound towards the County Landfill. Follow Town Line Road / Landfill Driveway for approximately 0.75 mile. Turn left onto the newly constructed access road to Turbine 18. Continue on the newly constructed access road to Turbine 20. Continue on the newly constructed access road to cross Heath Road. Enter newly constructed access roads to Turbines 15 and 16 and 17.

To Wind Turbine Sites 19, 21, 22, 23, 24 and 25: Continue on Parks Road for 3.6 miles. Take a left turn onto Town Line Road. Follow Town Line Road northbound for approximately 0.4 mile. Turn right onto the newly constructed access road for turbines 19, 21, 22, 23, 24 and 25.

Delivery Route B from I-81 Northbound – Turbines 26 - 45:

To Wind Turbine Sites 26, 27, 30, 33 and 34: Take State Route 41 eastbound for 3.5 miles. Turn left onto Maybury Road. Follow Maybury Road for 4.2 miles. Right turn onto Bell Road. Continue 0.3 mile on Bell Road to newly constructed access road on left side of road.

To Wind Turbine Site 32: Once the turbine components leave I-81, this turbine site will be accessed from State Route 41. To allow access to this turbine site access roads must be approached from the north on Maybury Road, therefore component delivery vehicles will perform a 180 degree turn using the access road for turbine 34 on Bell road. From the I-81 off ramp, take State Route 41 eastbound for 3.5 miles. Turn left onto Maybury Road. Follow Maybury Road for 4.2 miles. Make a right turn onto Bell Road. Continue on Bell Road to turning area (T34 access road, 0.6 mile). Follow Bell Road back down towards Maybury Road. Turn left onto Maybury Road southbound. Follow Maybury Road for approximately 0.3 mile to the newly constructed access roads on the east side of Maybury Road for delivery to turbine 32.

To Wind Turbine Site 35: From I-81 off ramp, take State Route 41 eastbound for 3.5 miles. Turn left onto Maybury Road. Follow Maybury Road for 4.2 miles. Right turn onto Bell Road. Continue 0.6 mile on Bell Road to newly constructed access road on right side of road.

To Wind Turbine Site 36: From I-81 off ramp, take State Route 41 eastbound for 3.5 miles. Turn left onto Maybury Road. Follow Maybury Road for 4.2 miles. Right turn onto Bell Road. Continue 0.7 mile on Bell Road to newly constructed access road on left side of road.

To Wind Turbine Sites 28 and 31: From I-81 off ramp, take State Route 41 eastbound for 4.1 miles. Make a left turn onto Lapp Hill Road. Continue for 0.7 miles. Make a right turn onto the newly constructed access road to Turbines 28 and 31.

To Wind Turbine Site 37: From I-81 off ramp, take State Route 41 eastbound for 5.0 miles. Make a left turn onto Syrian Hill Road. Continue for 1.0 mile. Make a right turn onto the newly constructed access road to Turbine 37.

To Wind Turbine Site 38: From I-81 off ramp, take State Route 41 eastbound for 5.0 miles. Make a left turn onto Syrian Hill Road. Continue for 2.0 miles. Make a right turn onto the newly constructed access road to Turbine 38.

To Wind Turbine Site 39: From I-81 off ramp, take State Route 41 eastbound for 5.7 miles. Turn right onto North Tower Road. Continue on North Tower Road. Bear right after 1 mile to continue on North Tower Road. Follow North Tower Road for 2.1 miles. Turn left onto the newly constructed access road to access Turbine 39.

To Wind Turbine Sites 40, 41, 42, 43, 44 and 45: From I-81 off ramp, take State Route 41 eastbound for 5.7 miles. Turn right onto North Tower Road. Continue on North Tower Road. Bear right after 1 mile to continue on North Tower Road. Follow North Tower Road for 1.7 miles. Turn right onto the upgraded access road to access Turbines 40, 41, 42, 43, 44 and 45.

Constraints and Conceptual Improvements for the Proposed Delivery Routes

Each of the routes described above and shown in the Preliminary Delivery Route Analysis (Appendix R1 of this DEIS) has a number of potentially constraining features, including potential culvert crossings, bridge crossings and their associated load ratings, different load bearing capacities, slope gradient and particularly intersection turning radii. Turning radii are evaluated below; all other constraining features, although described below, will be fully evaluated prior to road use, in accordance with the Towns and County road use agreements, (for example bridges to be used must undergo a level 1 load rating assessment prior to use).

TCI used AutoTrack software to track a delivery vehicle path, which is overlaid onto orthoimagery. The resulting analysis produces an image of the vehicle movement and identifies any road upgrades that will be required to allow safe passage of the delivery vehicle (including those that may occur on private property). Appendix II - Figures 1 through 13 of the Preliminary Delivery Route Analysis (Appendix R1 of this DEIS) shows potential improvement areas for each of the constraints along the proposed delivery routes (see also DEIS Figure 13). The final limit of improvements may be a combination of widening on the inside and the outside of the curve.

The extent of the roadway segment improvements will be verified with the turbine supplier/contractor prior to Project construction, and coordinated with State, County, and local highway departments (at no expense to these departments) prior to the arrival of oversize/overweight vehicle on-site. The following construction activities will likely be required at the locations of road width and turning radii improvements:

- Clearing and grubbing of existing vegetation.
- Grading of the terrain to accommodate the improvement.
- Extension of existing drainage pipes and/or culverts.
- Re-establishment of ditch line (if necessary).
- Construction of a suitable roadway surface to carry the construction traffic (based on the existing geotechnical conditions).
- Temporary traffic management to ensure safe flow of normal traffic and to mitigate traffic delays arising from construction of the temporary road widening.

Any cut and fill required for road improvements would comply with the measures set forth in the Preliminary SWPPP (see Appendix F), and ultimately the final SWPPP developed during the engineering phase of Project design.

Table 34 below provides a summary of the location and estimated plan areas of each identified temporary road improvement. At the current time only one re-location of electrical distribution line poles has been identified at the corner of State Route 41 and North Tower Road (refer Figure 11 in Appendix 2 of the Preliminary Delivery Route Analysis). It is proposed that this pole will be moved 20 feet to the west. This upgrade will be completed with full interaction and consultation with National Grid, and in full compliance with their standards. Road widening will be constructed to ensure a continuation of existing cambers, and shall be to a specification agreed in the Road Use Agreement.

Table 34. Temporary Road Improvements

Location	Square Footage of Temporary Widening	Square Footage of Oversail Clearance (over and above road widening works)	Nature of Land	Figure 13, Sheet No.
Intersection of State Route 41 and North Tower Road	1,389 sq. ft. on Northwest corner	N/A	Public Road ROW	Sheet 12
Intersection of State Route 41 and Syrian Hill	689 sq. ft. on Northwest corner and 1,485 sq. ft. on Southern verge of SR41	N/A	Public Road ROW	Sheet 11

Location	Square Footage of Temporary Widening	Square Footage of Oversail Clearance (over and above road widening works)	Nature of Land	Figure 13, Sheet No.
Intersection of Town Line Road and Warren Road	12,012 sq. ft. on Southeast corner	N/A	Public Road ROW and County Land	Sheet 7
Intersection of Town Line Road and Warren Road (southbound)	12,701 sq. ft on Northeast corner	N/A	Public Road ROW and Private Land (Participating)	Sheet 6
Intersection of State Route 41 and Lapp Hill Road	1,076 sq. ft. on Northeast corner + 2,368 sq. ft. on Southern verge of SR41	N/A	Public Road ROW	Sheet 10
Intersection of Maybury Road and Bell Road	5,371 sq ft on Eastern side of intersection	N/A	Public Road ROW and Private Land (participating)	Sheet 13

Following enquiry with the Cortland County Superintendent of Highways along with previous consultation with relevant Town Supervisors in 2010, three potential limitations related to bridges or culverts have been identified on proposed delivery Route B in Appendix R1:

- On Maybury Road between the intersections with Widger Road and Lapp Hill Road, one potentially weak bridge has been identified. The structure is a wooden deck and asphalt topped bridge that rests on steel stringers. The wooden deck surface was replaced within the last two years and is in good condition. The steel stringers date from the 1940's or 1950's and would likely need to strengthened, temporarily propped or replaced entirely in advance of road use for the Project construction.
- A box culvert was identified on Maybury Road between its intersections with Bell Road and 4H Camp Road. This culvert is not anticipated to cause any issues due to its specification and condition, to be validated upon further detailed inspection prior to road use for Project construction.
- A 5-foot pipe culvert has been identified on Maybury Road, south of 4H Camp Road. This culvert may need to be upgraded, temporarily propped or replaced prior to use by Project construction traffic.

Please refer to Appendix R1 for photographs and further detail of these potential issues. The assumptions above will be validated prior to the start of construction in the County and Town Road Use Agreements and associated pre-construction road condition survey. It should be noted that one other weak culvert has been identified in the Project area, under Lapp Hill Road near its intersection with Maybury Road, but this intersection is not included in any of the delivery routes. Prior to construction, adequate signage will be erected to ensure that delivery vehicles do not use this route, or other similar constraints that have not been authorized in the Road Use Agreement.

The types of damage that could occur will be discussed in more detail in the road condition survey and will of course depend on the specification, age, and condition of the roads, but could include:

A. Rutting of running surfaces related to heavy axles travelling the same route over a prolonged period;
B. Longitudinal shoulder slippage resulting in longitudinal cracking of the running surface and road foundation, leading to water ingress;
C. Scrubbing of the running surface by heavy vehicles executing sharp turns whilst moving at slow speeds;
D. Polishing of the running surface, resulting in a reduced skid resistance;
E. Failure of the road foundation and formation as a result of overloading; and/or
F. Damage related to trafficking heavy loads during periods of freezing or thaw.

Generally, State and County roads, although more travelled, are in better condition, and of superior specification, than the Towns' roads. It is anticipated, based on field observations, that the following roads could be more susceptible to damage due to the volume of construction traffic that will be generated during Project construction:

- East River Road – Cortland County. Approximately 1.9 miles between its intersection with W Road and the intersection with Parks Road could be adversely impacted by construction traffic. The type of damage that could occur would be as summarized in bullet points A, B & E above
- Parks Road – Town of Homer / Cortland County. The type of damage that could occur is summarized in bullet point A above
- Bell Road – Town of Truxton. Apart from the first ¼ mile, this road is seasonal and therefore unsurfaced. 0.8 miles of this seasonal road from its intersection with Maybury Road to the new access road entrance to turbine 36 , the type of damage that could occur is summarized in bullet point A to F above
- Lapp Hill Road – Town of Solon. The 0.4 miles of this road will be exposed to construction traffic and the type of damage that could occur is summarized in bullet point C above
- Syrian Hill Road – Town of Solon - The first mile of this road will be exposed to construction traffic and the type of damage that could occur is summarized in bullet points C & D above

3.8.2.2 Operation

Once the Project is commissioned and construction activities are officially concluded, traffic will likely be concentrated around the O&M building resulting from Project employees traveling to and from the O&M building. Some of these personnel will need to visit each turbine location and return to this facility. Each turbine typically requires routine maintenance visits once every three months, but certain turbines or other Project improvements could require periods of more frequent service visits. Such service visits typically involve one to two pick-up trucks. However, because all turbines and associated access road are located on (and accessed from) leased land, public road use due to routine maintenance activities will be relatively limited. The Project owner is responsible for the maintenance of all private access roads leading to the turbine sites.

Project personnel (or National Grid personnel) may also need to service the Project substation. Routine servicing would likely be carried out on a similar quarterly basis and it is anticipated this would involve a similar number of maintenance vehicles.

3.8.3 Proposed Mitigation

Special hauling permits are required for loads that exceed legal dimensions or weights. Thus transport of the blades, nacelles, tower sections and cranes will require a variety of special hauling permits. Table 35 summarizes these maximum legal dimensions for State Highways. Actual loads will depend on the specific turbine supplier, crane equipment chosen, and degree of disassembly of the crane.

Table 35. Vehicle Dimensions and Weights

Vehicle Characteristics	**State Highway Limit[1]**	**Approximate Dimension**			
		Blade	Nacelle	Tower Sections	Crane
Width of vehicle; inclusive of load	8.0’	12.0’	12.0’	16.0’	Unknown
Height of vehicle (from underside of tire to top of vehicle); inclusive of load	13.5”	12.4’	15.0’	16.0’	Unknown
Length of vehicles; inclusive of load and bumpers	65.0’	<160’	< 160’	< 160'	< 160'
Weight of component; excluding vehicle 80,000 pounds	80,000 lbs		182,000 lbs	136,800 lbs	> 500,000 lbs

Source: adapted from NYSDOT PERM 30 Information Concerning Special Hauling Permits
[1]Qualifying or Access Highways allow 8.5 foot width and unlimited length.

The types of permits depend on the characteristics of the vehicle and its cargo, number of trips, distance traveled, and duration. When any vehicle exceeds 200,000 pounds, exceeds 16 feet in width or height, or exceeds 160 feet in length, special super load permits (PERMIT Type 1S) are required from NYSDOT for each vehicle trip. Nacelles can weigh approximately 182,000 pounds, and when combined with the transport vehicle, the total weight can exceed 200,000 pounds. The following list summarizes the driveway permits and special hauling permits that may be required:

Roadway Improvement/Driveway Permits

- NYSDOT – A Highway Work Permit (PERM 33) for any physical improvement within the NYSDOT right-of-way, such as state highway intersection or road improvements.
- Cortland County – Based upon conversation with the County Superintendent of Highways, the Project Sponsor will comply with the County Road Use Agreement.
- Town of Homer, Cortlandville, Truxton, and Solon – Based on conversations with the Highway Superintendents in 2009, the Project Sponsors must comply with the Road Use Agreements with each Town.

Overload Permits

- NYSDOT – It is expected that the Project will require the Type 13 Jobsite permit to cover most of the special delivery trips (not including super loads). In addition, NYSDOT will require several Type 1 permits for individual convoys including special hauling, route approval, trailer attachment, vehicle configuration, and cranes (PERM 85, PERM 12, PERM 80, PERM 39-1, PERM 39-2k, PERM 39-3g, PERM 99, AND PERM 39-4).

Prior to construction, the Applicant and/or contractor will obtain all necessary permits from the Towns and County highway departments and the NYSDOT, for activities including new access roads, improving existing roadways, crossing highways with buried electrical interconnects, and operating oversized vehicles on the highways. The final transportation routing documentation will be provided prior to construction, and will specify the local, County, and State roads to be used as delivery routes (both within and outside of the Project area) by construction/transportation vehicles. All public road upgrades that may be required to accommodate construction vehicles will be identified, including shoring up bridge abutments, adding steel plates or gravel to road surfaces, widening roadways, reconfiguring intersection geometry to accommodate the turning radius of large construction vehicles, and identifying the bridges, pipes, and culverts that will not accommodate the construction related traffic. These improvements will be made at the Applicants' expense prior to the arrival of oversized/overweight vehicles.

A construction routing plan will be developed to assure that to the extent practical, construction vehicles avoid areas where public safety could be a concern (schools, clusters of homes, etc.). To minimize safety risks to the general public, over-sized vehicles will be accompanied by an escort vehicle and/or flagman to assure safe passage of vehicles on public roads. In addition, construction operations will be conducted so that the traveling public is subjected to a minimum delay and hazard. Deliveries will be made during off peak hours for road use (typically 9:30 a.m. to 3:00 p.m. and 6:00 p.m. to 6:00 a.m.) at the discretion of the New York State Department of Transportation, County and Town Highway Departments, along with New York State Police. The contractor shall provide reflective warning signs, barricades, lighting and flags as necessary to protect traffic. All traffic protection shall be provided at the Applicant's expense including any safety requirements as ordered by the County and relevant Town Superintendent of Highways. It is anticipated that there will be some disruption of local traffic throughout the construction of the Project. This disruption will include temporary closure of some roads to all traffic other than construction traffic, emergency vehicles and residents of the closed road. Road closures will be limited to the minimum time period that is necessary and shall also provide for diversions. It is not anticipated that roads will be closed for the entire duration of Project construction. During road closures, traffic will be managed in accordance with the Town and County Road Use Agreements and will be conducted so that the travelling public is subjected to an acceptable level of delay and hazard and associated residual risk of harm. All public roads will be maintained to a useable standard by normal road vehicles throughout the Project construction period.

In accordance with the anticipated County and Towns' Road Use Agreements, directly prior to construction, a survey of the agreed delivery route will be carried out by appropriately qualified engineers (and NYSDOT, County Highway, and Town Highway Departments as available) to assess and document current existing road conditions. Any extraordinary damage or over-run caused by vehicles during the construction period is to be repaired to agreeable standards under a Road Use Agreement with the relevant authority (State, County, or Town). The Applicant will repair damage done to roads affected by construction within the approved delivery route, at no expense to the Town, County, or State, thereby restoring the affected roads to a condition equal to or better than documented by the pre-construction survey. Roads will also be maintained in good working order during construction. The Project Sponsor will establish a road use reparation fund or purchase a reparation bond as financial assurance that the roads damaged by the activities of the Project's construction will be repaired to the standards required by the Road Use Agreement.

Delivery routes may change during the design and construction preparation process; however, the municipalities will be notified of the changes throughout the continued development of the Project. Additionally, design plans will be completed for all public road improvements, and will be made available for the affected local Towns (and to the owner/operator of the respective road) to review prior to construction activities. Once the delivery routes are finalized, the Applicant will enter into a road-use agreement with the Towns of Homer, Cortlandville, Truxton, and Solon, which is anticipated to include a method for post-construction inspections to assure local roads were restored to condition equal to or better than documented by the pre-construction survey.

Following the examination of the proposed delivery routes and previous consultation with Cortland County Highway Department, the following mitigation measures are proposed for a suitable traffic management system, which will be put in place prior to any construction taking place:

- In accordance with the County and Towns' Road Use Agreements, directly prior to construction, a survey of the agreed delivery route will be carried out by appropriately qualified engineers and NYSDOT, County Highway, and Town Highway Departments to assess current existing road conditions. Any extraordinary damage or over-run caused by vehicles during the construction period is to be repaired to agreeable standards under a Road Use Agreement with the relevant authority (State, County, or Town).
- Any traffic management measures agreed with the relevant highway departments will be written into sub-contracts with turbine suppliers and civil engineering sub-contractors to ensure compliance.
- New York State Police and Cortland County Sheriff will be notified of the movement of long and abnormal vehicles and applications for the use of police or state licensed escorts will be made if deemed necessary.
- A lead warning vehicle will be used; this is particularly relevant on bends or junctions where long vehicles would need to swing into the path of oncoming vehicles. Traffic management (temporary traffic signal lights) will be put into place on these delivery routes especially on the Town roads closer to the proposed development site. Escort vehicles would drive ahead and stop oncoming traffic. In addition personnel with radio transceivers will be positioned at junctions requiring traffic management.
- For return (empty) trips, extendible low loaders (when used) for wind turbine deliveries would be closed so that they would leave the site at normal length (approximately 52 feet).

3.8.4 Discussion of Traffic Impacts at Landfill Site

Whilst all of the discussion above also relates to the impacts of traffic in and around the landfill site (including waste haulage vehicles and local residents using the facility); given that the Project would seek to utilize the current landfill access route for construction and on-going operation, additional analysis has been undertaken to assess any associated impacts that could arise.

Existing Conditions:

A desktop analysis and several site visits were carried out as part of the Preliminary Delivery Route Analysis (See Appendix R1). The landfill haulage route and site access road were visited and evaluated during this assessment and there has been on-going consultation with Don Chambers (County Highway Superintendent) throughout the DEIS preparation process. The conclusion was that the landfill access route is suitable for wind turbine component delivery and construction activities and that associated disruption is not anticipated to be significant.

Photo 2: Landfill Access Road (viewed from Warren Road)

The Cortland County Landfill (Landfill) is located at 4708 Town Line Road, McGraw, New York 13101. The site is at the junction of the Towns of Cortlandville, Homer and Solon and is partially situated in each Town. The Landfill is owned by Cortland County, Cortland County Office Building, 60 Central Avenue, Cortland, New York 13045. The Landfill is administrated by Donald Chambers, the Superintendent of the Cortland County Highway Department, located at 4267 Traction Drive, Cortland, New York 13045, under the direction of the Solid Waste Committee of the Cortland County Legislature.

The Landfill, currently receives approximately 20,000 tons of waste per year. In 2009 the Landfill accepted 19,097 tons of mixed municipal solid waste; 2,115 tons of construction and demolition debris; and 2,575 tons of sewage treatment plant sludge. (EnSol, Inc., 2009 pp.6) A review of the average traffic figures (supplied by Cortland County) shows that on average, approximately 100 vehicles visit the landfill site per day or roughly 12.5 vehicles per hour for an average 8 hour day.

The Landfill is open for deliveries from 7:45 am until 4:15 pm, the scale house is open from 8:00 am until 3:30 pm between Monday and Friday. The Landfill is also open on the second Saturday of each month between 9:00 am and 1:00 pm. The Landfill is secured by a locked front gate outside of the above referred operational hours.

The designated turbine haulage access from NYS Route 13 to the County Landfill is approximately 3.6 miles in length along the following route, which is presented in DEIS Figure 12:

- State Route 13 / hamlet of East Homer;
- South on East Homer Crossing Road;
- West on East River Road (County Road 114);
- South on Shippey Road (County Road 116A);
- East on Parks Road (County Road 116B);
- South on Town Line Road to the Landfill entrance

Potential Impacts (Construction)

The current landfill access route has been identified and mapped in DEIS Figure 12. There are portions of the proposed wind turbine delivery route that will overlap with the current landfill access route (small sections of Shippey Road and Town Line Road) and therefore some impacts can be expected.

The greatest potential for impacts to existing landfill traffic is during the construction period, during which (as identified in Table 33 above), there will be numerous vehicle movements, for example, excavation, concrete delivery and turbine component delivery, etc. Such vehicle movements have the potential to cause some delays or temporary obstacles for vehicles trying to access the landfill. Using standard construction traffic management procedures, general wind farm construction traffic (excavators, concrete trucks, etc.) should not pose any significant impacts to local traffic, however, wind turbine component and crane deliveries may cause temporary delays and temporary road closures or diversions. Fortunately these component and crane deliveries are smaller in number (at approximately 600 round-trip visits) and can be scheduled to arrive at times selected to minimize impacts on traffic using the landfill.

Mitigation Options

There are a number of mitigation options available to minimize potential impacts to traffic at the landfill site. It is worth noting that the majority of vehicles used during construction of the Project (see Table 33 above) are suitable for normal road use i.e. tipper trucks, pick-up trucks and concrete delivery trucks and therefore given the width and condition of roads in the area, should not pose a significant issue in terms of passing other standard landfill traffic. Suitable traffic control measures could be put in place to manage any pinch points that may be identified as part of a detailed traffic management plan, but this is not expected to pose any significant impacts on landfill traffic.

As mentioned, turbine component delivery and cranes are likely to cause the most disruption during construction. When turbine components are being delivered to turbines 4, 5 8 & 11 (off Shippey Road), a temporary alternative landfill access route (to divert traffic intended for the landfill site) is proposed by TCI (see DEIS Figure 12) which if used, would effectively eliminate impacts during this phase of construction. This route would require approval and co-ordination with the Town of Homer Highway Department.

For the remaining turbines (10, 18, 20, 17, 16, 15, 13, 12, 14, 9, 6, 7) alternative routing for turbine component delivery is not an option, given the shared portion of access road on Town Line Road from the junction of Parks Rd to the landfill entrance. Detailed inspection of the existing landfill road layout shows that there are suitable passing options, which would help reduce impacts on traffic and delays by allowing larger vehicles to pass unhindered. Please see below for an example of a passing option at the landfill scale house. This option would require traffic management such as flagmen or temporary traffic lights.

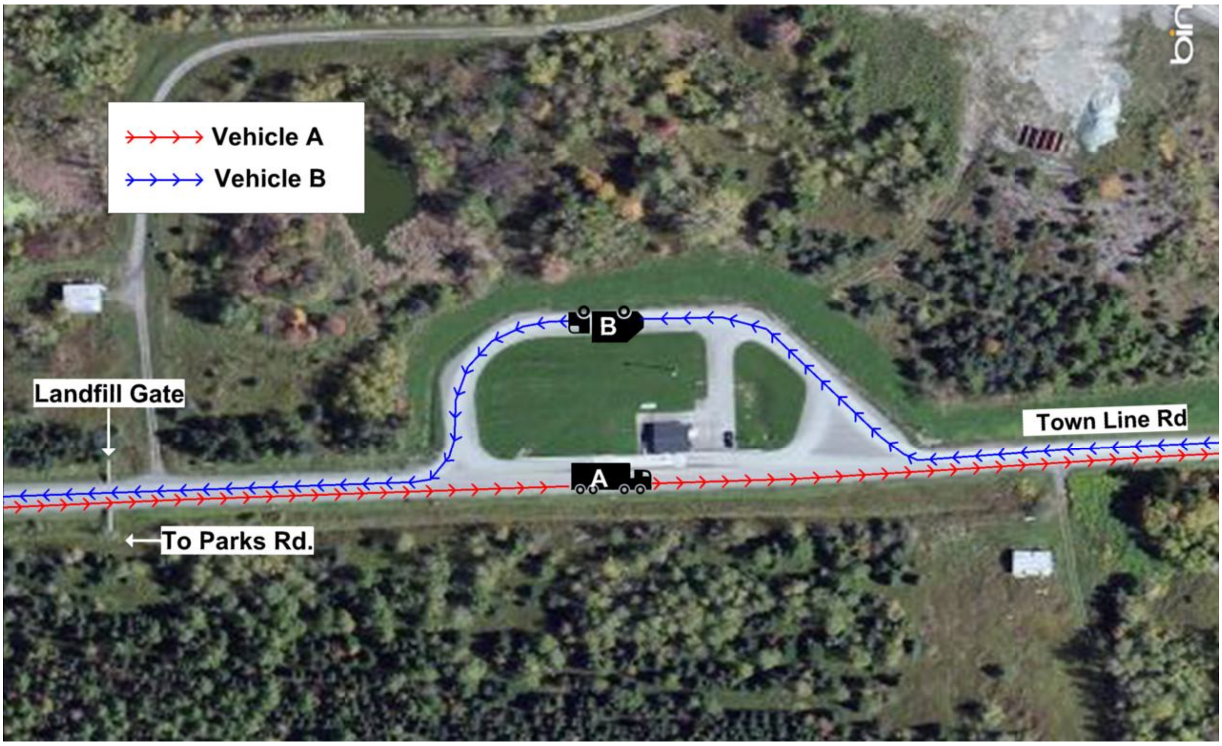


Photo 3: Landfill - Larger Vehicle Passing Option

It is also possible to mitigate impacts to landfill traffic by timing the delivery of components for weekends and other times that the landfill is not operating, therefore eliminating this impact entirely. Alternatively turbine component deliveries can be timed to coincide with periods of low traffic levels at the landfill. Alternatively waste haulers could be advised of the days and times of turbine component delivery and asked to time their visits outside of this schedule. Similar postings may be made in newspapers and signage could be used to advise local residents of the timing of expected construction traffic. The total duration of turbine component and crane movements into and out of the landfill is not expected to exceed 24 days, (the delivery schedule is yet to be determined).

While there will be approximately 20,879 vehicle trips associated with the construction of the project, only an estimated 600 of these trips will be using oversized, non-standard vehicles. Of these, approximately 286 trips will be made using the designated landfill access route. Approximately 150 component deliveries will use the landfill driveway and its access from Parks Road to Town Line Road. All other traffic will be composed of standard road vehicles such as concrete delivery vehicles and tipper trucks for stone / gravel / sand delivery and removal of excess excavated material. One option for traffic reduction is that the standard sized road vehicles may use other alternative delivery / exit routes to access the turbines located at the landfill or accessed through the landfill, if it is determined that traffic impacts are too high. For example, concrete and gravel may be delivered to turbines 6, 7, 9, 12, 13, and 14 via McGraw North Road and Heath Road. Turbines 15, 16, 17 and 20 may be accessed via State route 41 and Soshinsky Road during times of heavy traffic volume, thus reducing the impact on landfill traffic. These alternative delivery routes will be discussed with the appropriate Town Highway departments and will be included in a Road Use Agreement between the Project Sponsor and the appropriate Town.

Careful co-ordination with the operators of Cortland County landfill and their regular users will ensure that disruption to traffic is mitigated to the greatest extent. Therefore construction traffic is not expected to be a substantial interruption to the landfill activities. It is also worth noting that the construction window for a modern wind farm of this scale is typically 6-9 months and turbine component delivery is usually completed in a few days for each turbine, therefore any impacts are temporary in nature and of a relatively short duration.

Prior to construction, a detailed transportation and disruption management plan will be created in consultation with Town and County Highway Departments and the Solid Waste Committee of Cortland County legislature.

Potential Impacts (Operation)

There are not expected to be any significant impacts to landfill traffic during operation of the wind farm given that remote monitoring and SCADA systems allow for minimal human interface. There will be on-going access required to allow scheduled and un-scheduled maintenance of turbines, but this is typically undertaken in a pick-up truck or small van similar or smaller than the vehicles typically visiting the landfill at present.

In rare circumstances a crane or other large delivery vehicle may be required during the operational lifetime of the project to replace larger turbine or substation components, but again impacts can be managed by coordinating deliveries with landfill operators/users and these would be temporary in nature. GE has invested considerably in maximizing the amount of 'up tower maintenance' that can be undertaken on turbines without the use of a crane and this is one of the key reasons for the selection of the proposed GE wind turbine.

Prior to decommissioning of the Project a transport plan will be created in consultation with each relevant Town, County and State Highway Department to minimize and mitigate impacts on traffic throughout the Project area and to minimize the impacts to landfill traffic. The transportation plan will use the same mitigation techniques as described above to reduce traffic impacts, (alternative routes, traffic management, timed component delivery, etc.). It is anticipated that this requirement will form part of the road use agreement that will be put in place prior to the use of Town and County roads. This could be a condition of the FEIS approval.

3.9 SOCIOECONOMICS

This sub-section is organized as follows:

- 3.9.1 Existing Conditions
- 3.9.2 Potential Impacts
- 3.9.3 Proposed Mitigation

To assess the potential socioeconomic effects the Crown City Wind Energy Project will have on local municipalities, **edr** (2012f) prepared a Socioeconomic Report. This section presents specific information regarding the labor force, including population and housing; the economy, in particular employment rates and opportunities; and municipal budgets and taxes, including the local school budgets and taxes. The potential impacts of the Crown City Wind Energy Project on these existing socioeconomic conditions, during both construction and operation, are then evaluated. The Socioeconomic Report prepared by **edr** is included as Appendix S. With respect to potential incentives authorized by the County IDA, please see Section 2.3.

3.9.1 Existing Conditions

Cortland County straddles the boundary between Central New York and the Southern Tier, and shares many economic and demographic characteristics of both regions. A portrait of the existing socioeconomic conditions throughout the area serves as a baseline comparison for the potential impact of the proposed Project on local population, the housing market, employment, and municipal services.

3.9.1.1 Population and Housing

As shown in Table 36, Cortland County has experienced a mix of population growth, decline, and stagnation over the past 30 years, as have the Towns of Cortlandville, Homer, Solon, and Truxton. Tables 35 and 36 illustrate age distribution and educational attainment levels throughout the area, which are relatively consistent with those in the surrounding areas.

Table 36. Population, 1980-2010

	2010 Population	Change 2000-2010	2000 Population	Change 1990-2000	1990 Population	Change 1980-1990	1980 Population
Cortland County	49,336	1.52%	48,599	-1.82%	49,498	1.39%	48,820
Town of Cortlandville	8,509	7.45%	7,919	-2.82%	8,149	-1.81%	8,299
Town of Homer	6,405	0.66%	6,363	-2.80%	6,546	-0.80%	6,599
Town of Solon	1,079	-2.62%	1,108	9.38%	1,013	17.11%	865
Town of Truxton	1,133	-7.51%	1,225	14.06%	1,074	8.70%	988

Source: U.S. Census Bureau, 2012

Table 37. Age Groups, 2010

	<15 Years	% of Total Pop.	15-44 Years	% of Total Pop.	45-64 Years	% of Total Pop.	65+ Years	% of Total Pop.
Cortland County	8,479	17%	21,404	43%	12,995	26%	6,458	13%
Town of Cortlandville	1,517	18%	3,110	37%	2,447	29%	1,435	17%
Town of Homer	1,260	20%	2,246	35%	1,970	31%	929	15%
Town of Solon	185	17%	388	36%	373	35%	133	12%
Town of Truxton	204	18%	428	38%	369	33%	132	12%

Source: U.S. Census Bureau, 2012

Table 38. Educational Attainment, 2010

	% High School Degree or Other	2000-2010 Change	% Bachelor's Degree or Higher	2000-2010 Change
Cortland County	89.1%	6.30%	24.3%	5.5%
Town of Cortlandville	92.2%	7.90%	28.9%	9.1%
Town of Homer	91.4%	1.60%	28.7%	2.3%
Town of Solon	85.9%	9.60%	13.7%	4.5%
Town of Truxton	90.4%	9.20%	21.4%	7.2%

Source: U.S. Census Bureau, 2012

Housing availability throughout these four towns is stable, and homeownership rates are high (see Table 39, below). Housing values are relatively stable, and all are well below the statewide median value. Poverty rates within each town are lower than that of the County as a whole, which (at 14.1%) is similar to the statewide rate of 14.2% (see Table 40, below).

Table 39. Housing, 2010

	Housing Occupancy Rate	Home Ownership Rate	Median Housing Value
Cortland County	90.7%	64.9%	$95,100
Town of Cortlandville	94.6%	71.4%	$112,000
Town of Homer	93.8%	76.2%	$110,200
Town of Solon	91.0%	86.9%	$81,000
Town of Truxton	89.4%	79.7%	$94,500

Source: U.S. Census Bureau, 2012

Table 40. Household Income and Population Below Poverty, 2010

	Median Household Income	% of Population Below Poverty
Cortland County	45,338	14.1%
Town of Cortlandville	51,382	13.4%
Town of Homer	55,136	7.2%
Town of Solon	43,875	13.6%
Town of Truxton	51,528	4.9%

Source: U.S. Census Bureau, 2012

The proposed Project components are located within the boundaries of six school districts. These districts include (NYSED, 2012):

- Cortland City (Central) School District: six schools with a total enrollment of 2,715 students in 2010-2011,
- Cincinnatus Central School District: three schools with a total enrollment of 601 students in 2010-2011,
- Dryden Central School District: five school districts with a total enrollment of 1,765 students in 2010-2011,
- Groton Central School District: three schools with a total enrollment of 952 students in 2010-2011,
- Homer Central School District: five schools with a total enrollment of 2,154 students in 2010-2011,
- McGraw Central School District: two schools with a total enrollment of 565 students in 2010-2011, and
- Tully Central School District: two schools with a total enrollment of 1,042 students in 2010-2011.

3.9.1.2 Economy and Employment

As shown in Table 41, according to the New York State Department of Labor (NYSDOL) the five dominant employment sectors in Cortland County (in decreasing order of total employment) are 1) Government, 2) Health Care and Social Assistance, 3) Manufacturing, 4) Retail Trade and 5) Accommodation and Food Services. Once a significant contributor to the local employment base, on-farm employment now represents a much smaller share of countywide employment, although it remains a substantial economic generator throughout the region by several other measures. Although unemployment across all industries within the county is currently higher than the longer-term average, recent (slow) growth has begun to bring the unemployment rate down.

Table 41. Total Employment in Cortland County

	Total full-time and part-time employment by NAICS industry Cortland County, New York (number of jobs)			
Employment sector	**2008**	**2009**	**2010**	**2011**
Government	3,707	3,676	3,565	3,414
Health Care and Social Assistance	2,675	2,744	2,691	2,602
Manufacturing	2,408	2,095	2,225	2,517
Retail Trade	2,135	2,072	2,107	2,210
Accommodation and Food Services	1,725	1,724	1,930	2,087
Professional and Technical Services	784	765	754	818
Administrative and Waste Services	972	891	731	729
Other Services	778	762	715	738
Construction	462	496	497	467
Arts, Entertainment, and Recreation	371	345	418	477
Finance and Insurance	343	339	353	355
Wholesale Trade	411	382	347	357
Transportation and Warehousing	174	175	164	153
Agriculture, Forestry, Fishing, Hunting	134	156	158	176
Real Estate and Rental and Leasing	157	126	122	129
Information	135	117	102	99
Management of Companies and Enterprises	98	99	101	94
Mining	n/a	21	22	19
Unclassified	20	11	18	26

Source: NYSDOL, 2012.

3.9.1.3 Municipal Budgets and Taxes

Table 42 illustrates the municipal budgets for Cortland County and the Towns of Cortlandville, Homer, Solon, and Truxton. Local municipal budgets vary substantially between one another, and in some cases from one year to the next. Cortland County cut expenditures by 6% from 2009 to 2010, and the Town of Cortlandville increased expenditures by 3%. Other changes were more dramatic, including the Towns of Solon and Truxton decreasing expenditures 18% and 31%, respectively, and the Town of Homer's increase of 22%.

Table 42. Municipal Budgets

Cortland County		
	2010	**2009**
Total Revenues & other sources	$116,745,851	$116,353,867
Total Expenditures & other sources	$112,972,965	$120,145,697
Total Indebtedness	$374,240	$340,280
Town of Cortlandville		
Total Revenues & other sources	$7,203,238	$7,025,552
Total expenditures & other sources	$7,578,072	$7,360,136
Total Indebtedness	$899,900	$904,900
Town of Homer		
Total Revenues & other sources	$1,703,629	$1,586,948
Total Expenditures & other sources	$1,720,773	$1,416,223
Total Indebtedness	$0	$0
Town of Solon		
Total Revenues & other sources	$616,691	$610,541
Total Expenditures & other sources	$490,795	$598,578
Total Indebtedness	$0	$0
Town of Truxton		
Total Revenues & other sources	$741,914	$990,702
Total Expenditures & other sources	$579,435	$844,807
Total Indebtedness	$13,591	$13,666

Source: New York State Office of the State Comptroller, 2012

Property taxes are the single largest revenue source for local municipalities in the area. Annual municipal expenditures are recovered through each municipality's tax levy, which is borne by taxable properties according to their respective assessed value. Many factors influence the assessed value of land, including the type of land use on that property. Real property taxes are determined by the each property's assessed value, multiplied by the tax rate established by each municipality. . The tax rates are paid based on $1,000 of assessed property value (minus exemptions where applicable). As indicated in the Socioeconomic Report provided in Appendix S, land use type and classification contributes to the assessed value of property, which directly influences the real property tax rates for each municipality. Thus, local land uses have a direct correlation to the tax base that influences the fiscal health of a community. Although all five jurisdictions (four towns and one county) have a diversity of land uses, all of which factor into their respective tax base, the majority of the property tax revenue is based on residential properties. This places a significant tax burden on private residential landowners. The percent of land use distribution for the Towns as well as the total assessed property value per classification for these communities is presented in Table 7 of Appendix S.

Table 43 summarizes the most recent data available for municipal and county property tax levies and rates. Additionally, Table 44 presents the County, Town, Fire, and Total tax rates in the Towns of Cortlandville, Homer, Solon, and Truxton, as well as the Equalization rates for the roll years 2010, 2011, and 2012. Finally, Table 45 presents the School tax rates during 2012 in the Towns of Cortlandville, Homer, Solon, and Truxton applicable to the following School Districts: Cortland Enlarged (Central), Cincinnatus Central, Dryden Central, Groton Central, Homer Central, McGraw Central, and Tully Central. To provide further information on taxable assessed property value applicable to school districts in the Project area Towns (Cortlandville, Homer, Solon, and Truxton), the School District Summary from the 2012 Final Assessment Roll from each of the aforementioned Towns is presented in Table 46.

Table 43. Property Tax Levy and Municipal Tax Rate (2011, 2010)

	Levy year 2011 (roll year 2010)				Levy year 2010 (roll year 2009)			
	Property Tax Levy*	Municipal Tax Rate	County Tax Rate	Eq. Rate	Property Tax Levy*	Municipal Tax Rate	County Tax Rate	Eq. Rate
Town of Cortlandville	$1,671,885	3.68	14.03	100	$1,660,233	3.68	16.14	88
Town of Homer	$416,160	1.58	17.50	80	$416,205	1.58	17.79	88
Town of Solon	$333,617	9.22	12.07	82	$326,103	9.06	11.86	82
Town of Truxton	$412,295	6.98	16.57	82	$412,795	7.02	15.53	90
Cortland County	$29,293,712	-	-	-	$27,463,716	-	-	-

Source: NYSORPTS, 2012a.
*Property tax levy reflects the amount of revenue required by the municipality through the property tax base, and is equal to total municipal spending minus aid and other revenues. Tax base is equal to the sum of taxable parcel values. Municipal tax rate is determined by dividing the levy by the tax base, such that each taxable parcel produces that amount of property tax per $1,000 assessed value. For a $100,000 property in the Town of Cortlandville, property tax liability = (3.68 / 1000) * 100,000, or $368. Equalization (Eq.) rate is the state's measurement of a municipality's level of assessment (LOA). An equalization rate of 100 means that the municipality is assessing property at 100 percent of market value. An equalization rate lower than 100 means that the municipality's total market value is greater than its assessed value.

Table 44. County, Town, Fire, and Total Tax Rates and Equalization Rates (2010, 2011, 2012)

2012 Town and County Tax Rates					
Town Name	County Rate	Town Rate	Fire Rate	Total Rate	Equalization Rates
Cortlandville	14.54	3.05	1.36	18.95	100
Homer	15.25	1.28	0.42	16.95	100
Solon	10.25	7.34	0.83	18.42	97
Truxton	17.09	6.72	1.3	25.11	79
2011 Town and County Tax Rates					
Town Name	County Rate	Town Rate	Fire Rate	Total Rate	Equalization Rates
Cortlandville	14.03	3.1	1.38	18.51	100
Homer	17.5	1.58	0.51	19.59	100

Solon	12.07	9.51	1.09	22.67	100
Truxton	16.57	6.77	1.28	24.62	79
2010 Town and County Tax Rates					
Town Name	County Rate	Town Rate	Fire Rate	Total Rate	Equalization Rates
Cortlandville	16.14	3.68	1.62	21.44	100
Homer	17.79	1.58	0.52	19.89	83
Solon	11.86	9.22	1.07	22.15	81
Truxton	15.53	6.98	1.3	23.81	79

Source: Cortland County Real Property Tax Services

Table 45. School Tax Rates in the Towns in the area of the Project per School District (2012)

2012 School Tax Rates				
School District	Municipality	School Rate	Library Rate	Total Tax Rate
Cortland Enlarged (Central) School	Cortlandville	16.983815	0.378447	17.362262
Cincinnatus Central School	Solon	17.306227	-	17.306227
	Truxton	21.249418	-	21.249418
Dryden Central School	Cortlandville	22.2808	-	22.2808
Groton Central School	Homer	21.1419	0.6094	21.7513
Homer Central School	Cortlandville	19.225395	0.119813	19.345208
	Homer	19.225218	0.119812	19.34503
	Solon	19.819722	0.123516	19.943238
	Truxton	24.335609	0.151659	24.487268
McGraw Central School	Cortlandville	17.704784	0.154675	17.859459
	Homer	17.704784	0.154675	17.859459
	Solon	18.252355	0.159458	18.411813
	Truxton	22.411119	0.195791	22.60691
Tully Central School	Truxton	24.568453	0.385116	24.953569

Source: Cortland County Real Property Tax Services

Table 46. School District Summaries from the 2012 Final Assessment Rolls

Cortlandville 2012 Final Assessment Roll Town Totals: School District Summary								
District Name	Code	Total Parcels	Assessed Land ($)	Assessed Total ($)	Exempt Amount ($)	Total Taxable ($)	Star Amount ($)	Star Taxable ($)
Cortland City	110200	1,286	58,704,300	254,290,136	34,296,126	219,994,010	30,265,025	189,728,985
McGraw Central	112204	1,191	27,833,200	126,038,600	20,539,323	105,499,277	24,249,740	81,249,537
Homer Central	113001	1,369	60,127,400	272,857,703	54,924,377	217,933,326	26,302,685	191,630,641
Dryden Central	502401	239	7,808,400	28,170,056	3,086,985	25,083,071	6,437,525	18,645,546
Total		**4,085**	**154,473,300**	**681,356,495**	**112,846,811**	**568,509,684**	**87,254,975**	**481,254,709**

Homer 2012 Final Assessment Roll Town Totals: School District Summary								
District Name	Code	Total Parcels	Assessed Land ($)	Assessed Total ($)	Exempt Amount ($)	Total Taxable ($)	Star Amount ($)	Star Taxable ($)
McGraw Central	112204	41	1,598,600	3,802,604	385,038	3,417,566	666,600	2,750,966
Homer Cental	113001	2,929	75,467,701	378,158,156	47,419,318	330,738,838	67,123,994	263,614,844
Groton Central	502801	5	225,000	328,600	108,792	219,808	30,000	189,808
Total		**2,975**	**77,291,301**	**382,289,360**	**47,913,148**	**334,376,212**	**67,820,594**	**266,555,618**
Solon 2012 Final Assessment Roll Town Totals: School District Summary								
District Name	Code	Total Parcels	Assessed Land ($)	Assessed Total ($)	Exempt Amount ($)	Total Taxable ($)	Star Amount ($)	Star Taxable ($)
Cincinnatus Central	112001	93	3,073,200	6,215,221	161,065	6,054,156	1,142,525	4,911,631
McGraw Central	112204	609	20,168,800	45,431,788	2,885,980	42,545,808	10,744,480	31,801,328
Homer Cental	113001	4	273,700	294,210		294,210		294,210
Total		**706**	**23,515,700**	**51,941,219**	**3,047,045**	**48,894,174**	**11,887,005**	**37,007,169**
Truxton 2012 Final Assessment Roll Town Totals: School District Summary								
District Name	Code	Total Parcels	Assessed Land ($)	Assessed Total ($)	Exempt Amount ($)	Total Taxable ($)	Star Amount ($)	Star Taxable ($)
Cincinnatus Central	112001	3	284,800	296,460		296,460		296,460
McGraw Central	112204	12	514,800	832,171	67,543	764,628	216,780	547,848
Homer Cental	113001	735	20,334,395	62,505,515	6,273,586	56,231,929	8,830,861	47,401,068
Tully Central	315402	39	2,014,165	2,765,832	738,087	2,027,745	240,480	1,787,265
Total		**789**	**23,148,160**	**66,399,978**	**7,079,216**	**59,320,762**	**9,288,121**	**50,032,641**

Source: Cortland County Real Property Tax Services

3.9.1.4 Property Values

Local residents often inquire about the potential for property values to depreciate as a result of a proposed wind power project. This issue has come up during the siting and review of other wind power projects in New York and throughout the United States. In order to address this concern, Renewable Energy Policy Project (REPP) conducted a quantitative study in 2003 titled, *Effect of Wind Development on Local Property Values*. REPP assembled a database of real estate transactions adjacent to every wind power project in the United States (10 MW or greater) that became operational between 1998 and 2001 (a total of 10 projects, including the Madison and Fenner projects in Madison County, New York). For this study, data was gathered within 5 miles of the wind projects, as this was determined by REPP to be the potential area of visual impact (viewshed). For each of the 10 projects, similar data was also gathered for a comparable community that was located outside of the project viewshed (comparable communities were based on interviews with local assessors as well as analysis of U.S. Census Bureau demographic data). The goal of the data collection was to obtain real estate transaction records for a time period covering roughly six years (three years pre-construction and three years post-construction), and for data based on actual sales values, and not necessarily assessed values. The data was then analyzed in three different ways: Case 1 examined the price changes in the viewshed and the comparable community for the entire period of the study; Case 2 examined how property values changed in the viewshed before and after the project became operational; and Case 3 examined how property values changed in the viewshed and the comparable community after the project became operational.

The results of these analyses showed no negative affect on property value from existing wind facilities. Of the 10 projects examined in the Case 1 analysis, property value actually increased faster within the wind power project viewshed in eight of the 10 projects. The Case 2 analysis revealed that the property values also increased faster after the wind facilities became operational in nine of the 10 projects examined. In the Case 3 analysis, property values increased faster in the wind power project viewshed than in the comparable community in nine of the 10 projects (Sterzinger et al. 2003, p. 2).

It should be noted that the REPP study has been criticized because it assumes that all properties within the study area have a view of the respective wind facility, does not account for property distance to the wind facility, uses an unconventional statistical analysis, and includes transactions that are perceived to be inappropriate (e.g., estate sales, sales between family members, sales due to divorce, etc.). In addition, at least two property value studies (Haughton et al. 2004, p. 8; Heintzelman & Tuttle 2011, p. 21) have predicted a negative effect from the proposed development of a wind power project. To present a clearer understanding of the actual effects of existing wind facilities on property values, a Master of Science thesis was prepared by Ben Hoen (2006, p. 37). The purpose of this study was to analyze whether the transaction value of homes within 5 miles of the existing Fenner Wind Farm (total turbine blade tip height 328 feet), 24 miles northeast of the Project area, was significantly affected by views of the wind facility. "View" is defined using a continuous variable from 0 (no view) to 60 (a full view of all 20 turbines). The study additionally investigates how effects may vary with distance (spatially), time (temporally), and house value. Lastly, the effect and degree of the PILOT payment to Fenner Township is investigated. The study utilized the hedonic pricing model, which, given enough data, is sensitive enough to allow sales to be grouped temporally (e.g., by year), spatially (e.g., by distance), and economically (by the value of the home).

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

Computer modeling analysis of the 280 home sales within 5 miles of the Fenner Wind Farm did not reveal a statistically significant relationship between the sale price of homes and either proximity to, or visibility of, the wind facility. Additionally, the analysis did not demonstrate a relationship even when concentrating on homes within one mile of the wind facility that sold immediately following the announcement and construction of the Project. This study therefore concluded that in Fenner, a view of the wind facility does not produce either a universal or localized effect, adverse or otherwise. To the degree that other communities, like the current Project area resemble the Fenner rural farming community, similar conclusions are anticipated (Hoen 2006, p. 37).

A more recent study sponsored by the United States Government focused specifically on impacts of wind facility projects on residential property values. The report *The Impact of Wind Power Projects on Residential Property Values in the United States: A Multi-Site Hedonic Analysis,* released in December 2009 explains the study and the conclusions drawn from the study (Hoen et al., 2009). A more broad approach to assessing potential impacts on property values of residences near wind facility projects was undertaken for this study and consequently it is the "most comprehensive and data-rich analysis to date in the U.S. or abroad on the impacts of wind projects on nearby property values" (Hoen et al. 2009, p. xi). This study's analysis is based on information from 10 communities surrounding 24 existing wind power facilities spread across nine states. The study included the Fenner Wind Farm and Waymart Wind Farm (total turbine blade tip height 328 feet) in Wayne County, PA, two facilities that are comparable to the Crown City Wind Energy Project. While the Fenner Wind Farm is half the size of the Crown City Project, the study area is similar. The Waymart Wind Farm is similar in size and study area to the Crown City Project. Homes included in the study were located from 800 feet to over five miles from the nearest wind energy facility. This study used a methodology based on the hedonic pricing model to identify the marginal impacts of different housing and community characteristics on residential property values. Analysis of possible impacts on property values was undertaken by dividing the impacts into three non-mutually exclusive categories, area stigma, scenic vista stigma, and nuisance stigma. An explanation of each identified stigma, as used in this study is: Area stigma may occur regardless of whether the wind facility is within view of the home. The mere fact that a wind facility is generally nearby may adversely affect a home's value. Scenic vista stigma is based on the concern that a home may be devalued because a wind facility is within view and/or interrupts an existing scenic vista. A nuisance stigma can occur because of the potential for extenuating factors from a nearby wind facility, such as noise or shadow flicker (regardless of whether they actually occur). Exploration of the effects of all three stigmas resulted in finding no persuasive evidence that neither the view of the wind facilities nor the distance of the home to the facilities is found to have any significant effect on home sales prices. The study recognizes the possibility that the value of an individual home (or small numbers of homes) has been or could be negatively impacted by a nearby wind facility (Hoen et al. 2009, p. xvii). However, even if such occurrences do exist "they are either too small or too infrequent to result in any widespread, statistically observable impact" (Hoen et al. 2009, p. xvii). While the overall height to blade tip of the wind turbines proposed for the Crown City Wind Energy Project is approximately 50% taller than those installed at Fenner and Waymart, with an overall height of up to 492 feet versus 328 feet, the sites remain comparable as the Hoen et al. (2009) study is based on effects on property values for properties with and without views of wind turbines. Therefore the study can be compared to the Project area, as it was not based on definitive turbine heights and viewsheds. Rather, it was based on the presence of wind turbines. Furthermore the landscape of the Project areas and the density of wind turbines across the projects evaluated in each of the studies cited within this DEIS are similar to that which is proposed by the Project Sponsor, thereby providing a good basis for comparison.

As previously mentioned, Hoen et al. (Hoen et al. 2009, p. 2) categorized three types of wind turbine stigmas that could affect property values. In a site-specific study conducted in Ford and McLean County, Illinois, Hinman (Hinman 2010, p. 10) formalized a fourth stigma, wind farm anticipation stigma. This stigma decreases property values due to the uncertainty surrounding where turbines will be placed and what effect the wind facility will have on area residents when the development is initially proposed. The study examined 3,851 residential property transactions from 2001 through 2009 (Hinman 2010, p. 37). The study found that when the 240-turbine wind facility was initially announced, property values near the prospective wind facility decreased compared to elsewhere in the county. However, after the wind facility entered the operational stage, property values near the wind facility increased faster than those located elsewhere in the county. The turbines considered in this study are 398 feet from base to blade tip.

A property value study in the vicinity of Mendota Hills Wind Farm (62 wind turbines, turbine height to blade tip 297 feet), GSG 1 Wind Farm (40 wind turbines, approximately 399 feet to blade tip), and Lee-Dekalb Wind Center (145 wind turbines, turbine height to blade tip 388 feet) within Lee County, Illinois also examined the wind farm anticipation stigma (Carter 2011). The study examined 1,298 real estate transactions from 1998 to 2010. The study suggests that following announcement of the wind project, property values near the proposed wind facility initially decline. However the analysis indicates that residential properties located near wind turbines in Lee County have not in fact been negatively affected by the installation of a wind energy facility. Assuming the wind facility is appropriately sited using modern, industry standard setbacks, and that it minimizes impacts to nearby residences, property values eventually rebound once the uncertainty surrounding how homeowners are affected by the development disappears. The study acknowledges one shortcoming of property value studies, which is that the results presented are not able to state anything about whether being in close proximity to a wind facility affects the ease of selling a home. It could be that homes near wind turbines are not for sale or selling and consequently would not be included in the studies evaluating real estate transaction data (Carter, 2011). However, the Hoen et al. (Hoen et al 2009, p. 63) study estimated a sales volume model and concluded that sales volumes did not decrease with wind energy development.

Heintzelman and Tuttle (2011) examined 11,331 property transactions (including agricultural property) over nine years in Northern New York to explore the effects of new wind facilities on property values. These properties are within Lewis, Franklin, and Clinton Counties. However, only 461 transactions occur within 3 miles of a wind turbine. The study examined 194 turbines (height to blade tip 395 feet) in Lewis County, which occur on top of a large plateau, as well as 85 turbines in Franklin County and 186 turbines in Clinton County (turbine height to blade tip 390 feet), which occur within a broad river valley with small hills. Similar to the Hoen (2006), Hoen et al. (2009), Hinman (2010), and Carter (2011), the study found that in Lewis County turbines appear to have had little effect, or in some instances a positive effect. In contrast, property values in Clinton and Franklin Counties were negatively impacted by nearby wind energy facilities, with the magnitude of this effect dependent on the distance between homes and the nearest turbine. For Franklin and Clinton Counties, properties within 0.5 mile experienced an 8.8% to 15.8% decline. At a range of 3 miles the decline is between 2% and 8%. The study states that in Lewis County, landowners appear to be receiving sufficient compensation to prevent a decline in property values. In addition, the Clinton and Franklin County projects became operational in 2008 and 2009, at the very end of the 9 year study period, while the Lewis County project became operational in 2006, resulting in a much larger set of property sales and thus, more robust analysis (Heintzelman & Tuttle, 2011). While these wind facilities occur in Northern New York, the surrounding landscapes provide more open short and long distance views of the Projects, which differ from the Crown City Wind Project. In addition, there are several large Projects near each other that may result in cumulative effects, making the number of turbines potentially visible far greater than the Crown City Wind Project.

Public opinion and perception seem to indicate that the presence of wind turbines diminish property values. However, numerous property value studies based on statistical analysis of real estate transactions have found that wind facilities have no significant impact on property values (Sterzinger et al. 2003; Hoen 2006, p. 34; Hoen et al. 2009, p. 75; Hinman 2010, p. 85; Carter 2011, p. 25).

3.9.2 Potential Impacts

Potential economic impact associated with the proposed facility has been analyzed as part of the Project Socioeconomic Report. The Socioeconomic Report examines the jobs, earnings, and associated economic output that could be generated throughout the local and statewide economy by the construction and operation of a 71 MW facility with 44 turbines sized at 1,600 kW. The analysis incorporates the National Renewable Energy Laboratory's Job and Economic Development Impact (JEDI) model to calculate these impacts, and assumes a 9-month construction schedule starting in late 2015 / early 2016. All potential jobs, earnings, and economic output discussed within this section refer to the analysis described in the Socioeconomic Report.

3.9.2.1 Construction

3.9.2.1.1 Population and Housing

As described in the Socioeconomic Report, the construction of the proposed facility could increase local employment demand. During facility construction (expected to last approximately nine months), the Project could employ an estimated 60 workers on-site. At this stage, it is unknown what portion of these workers will come from the existing labor force within the county. Those that come from the existing local labor force will not represent an increase in local population, and are thus not expected to generate any increased demand in housing. Those that come from outside of the local labor force may precipitate a marginal, short-term increase in housing demand; some may move into the area on a permanent basis. It is anticipated that the local housing market can accommodate this increased demand.

3.9.2.1.2 Economy and Employment

The Socioeconomic Report also describes increased employment demand that could occur throughout the industrial supply chain. In addition to the 60 on-site construction jobs, the off-site industries within New York State that supply goods and services for the construction of the facility could experience increased employment demand of more than 160 workers. Furthermore, the increased household income associated with both on- and off-site employment could induce demand for more than 45 jobs, as construction and supply chain workers spend their earnings on everyday household goods and services. In sum, it is estimated that the on-site, supply chain, and induced jobs could generate $19.5 million in earnings over the course of facility construction.

In addition to jobs and earnings, the construction of the proposed Project could result in an increase in economic output for the businesses employing these workers. Output is measured by the value of industry production in the state or local economy. For the manufacturing sector, output is calculated by total sales plus or minus changes in inventory. For the retail sector, output is equal to gross profit margin. For the service sector, it is equal to sales volume. It is estimated that Project construction could result in an economic output of approximately $44.4 million, between on-site construction, supply chain impacts, and increased household spending.

3.9.2.1.3 Municipal Budgets and Taxes

The construction of the proposed Project may have a marginal positive impact on municipal budgets through sales taxes generated by construction workers' local personal spending as a result of additional economic activity generated by the Projects construction. The construction process is not anticipated to result in any municipal revenues from increased property taxes (see Section 3.9.2.2, below). The number of on-site workers associated with Project construction is not expected to require additional municipal services (e.g. snowplowing, solid waste pick-up, emergency services).

Although the construction of the Project may impact the condition of local roads, the cost of repair is not expected to be borne by local municipalities. Such repairs are subject to a Road Use Agreement negotiated between the Project sponsor and each municipality; it is expected that the Project Sponsor will be responsible for any such financial obligation.

3.9.2.1.4 Property Values

Little data exists with regard to the specific impacts of wind energy facility construction on nearby property values. As described above, a study conducted in Ford and McLean County, Illinois identified a "wind farm anticipation stigma." This stigma decreases property values when the development is initially proposed, due to uncertainty about where turbines will be placed and what effect the wind facility will have on area residents. The study found that when the 240-turbine wind facility was initially announced, property values near the prospective wind facility decreased compared to elsewhere in the county. However, after the wind facility entered the operational stage, property values near the wind facility increased faster than those located elsewhere in the county (Hinman 2010, p. 83). If a similar anticipation stigma were to occur in the vicinity of the proposed Crown City Project, such impacts would be expected to be similarly short-lived.

3.9.2.2 Operation

3.9.2.2.1 Population and Housing

The operation and maintenance of the proposed facility could increase local employment demand by an estimated five workers on-site. It is anticipated that these workers will either come from within the local labor force or move into the local labor force on a permanent (or semi-permanent) basis. It is also anticipated that the local housing market can accommodate whatever increased demand may result from these long-term positions.

3.9.2.2.2 Economy and Employment

The operation and maintenance of the proposed facility is estimated to generate five full full-time jobs with estimated annual earnings of approximately $300,000. Given the proposed 25 year lifetime of the Project and assuming an estimated 2.5% annual salary increase for the full time Project employees, the total payroll for operation and maintenance jobs over the Project lifetime will be approximately $10,250,000. These five jobs will be comprised of a Project Manager, Wind Technicians, and administrative personnel. Projected wage rates are consistent with statewide averages, and are estimated to range from $16 to $25 per hour for administrative and technical personnel, to around $40 per hour for facility management. These five full time local jobs generated by the wind energy facility comprise the project's direct long-term employment impact (**edr** 2012f, p. 24). Furthermore, due to the on-site nature of these jobs, the operation and maintenance employees of the Project will likely live in or near Cortland County, and thus a reasonable component of their salaries could likely be spent locally.

In addition to the on-site workforce described above, the operation and maintenance of the proposed facility will also generate employment through the industrial supply chain and the spending of landowner lease revenues and workers' earnings. Specifically, supply chain transactions and lease payments to landowners signed to the Project will benefit the local economy. Lease payments will total approximately $10,260,000 assuming an average annual benefit of $300,000 and a consumer price index of 2.5% over the proposed 25 year life of the Project. It is estimated that supply chain and lease revenues could support four jobs as a result of project operations and maintenance. The combined household spending of these employees, along with that of the on-site operations and maintenance workforce, could support an additional three jobs. In sum, it is estimated that the direct, indirect, and induced employment generated by facility operation and maintenance could be associated with $900,000 in total annual earnings. In addition, Project operation and maintenance could result in an economic output of approximately $2.4 million, between on-site labor, supply chain impacts, and increased household spending (**edr** 2012f, p. 22). All of this activity would result in a net inflow of millions of dollars into the local economy, from which Cortland County is poised to benefit.

According to the Australian Wind Energy Association (AusWEA), initial concerns that wind turbines would negatively impact tourism in that country have proven unfounded (AusWEA 2003, Fact Sheet 4, p. 1). Similarly, a survey of visitors to Vermont's Northeast Kingdom found that 95% would not be deterred from further visits by the existence of a proposed wind farm (Institute for Integrated Rural Tourism 2003). A 2002 study conducted in the Argyll Region of Scotland, involving interviews with over 300 tourists, found that 91% said the presence of wind farms in the area would not influence their decision about whether to return to the area (MORI Scotland 2002, p.4). Almost half (48%) of the tourists interviewed were visiting the area because of the 'beautiful scenery and views'. Of those who had actually seen wind farms, 43% indicated that their effect was "generally or completely positive", 43% were ambivalent, and 8% felt that the wind farms had a negative effect. (MORI Scotland 2002, p.3) Similar positive effects have been reported from various wind farm locations in Australia. Some tourism industry providers have begun marketing wind farms as a tourist attraction, even in rural portions of New York State (Puitt 2011; AusWEA 2003, Fact Sheet 4, p. 1).

It is anticipated that the Project will have a positive impact on dairy farming in the Project area, as landowners will benefit from lease payments, which could be reinvested into their dairy businesses.

3.9.2.2.3 Municipal Budgets and Taxes

The operation and maintenance of the proposed facility is anticipated to have a positive impact on municipal budgets through the provision of payments in lieu of taxes (PILOT). It is anticipated that a PILOT agreement would be entered into between the Project Sponsor and the Cortland County Industrial Development Agency (IDA), which would follow the Uniform Tax Exemption Policy (UTEP), with the acquiescence of the relevant local taxing jurisdictions. Although the structure of such payments has not yet been formalized by the Project sponsor and local taxing jurisdictions, it is estimated that the IDA UTEP PILOT will be approximately $5,000 per MW over the course of 20 years. Furthermore, certain terms of the PILOT such as the remuneration and time period are negotiable, though the general structure of an IDA PILOT cannot deviate from the IDA's UTEP. This annual revenue stream will be distributed among the relevant taxing jurisdictions according to their share as determined by the local combined tax rates and pursuant to the terms of the PILOT Agreement. Table 47 illustrates the potential distribution of PILOT revenues if this distribution were to follow recent local averages[1]. Once the PILOT agreement expires, the property (in this case, the installed infrastructure) is fully taxable. Local counties, cities, towns, villages and school districts (with some exceptions for large metropolitan areas) may choose to disallow PILOT agreements for solar, wind, or farm waste energy systems constructed after January 1, 1991 and before January 1, 2015.

[1] Table 47 summarizes the projected annual PILOT payments based on the average distribution of property taxes. Within the Study Area in 2010, municipal property taxes constituted an average of 13% of each property's total tax obligation. County taxes constituted an average of 36%, and school taxes claimed the remaining 51%. Distribution of property taxes based on average distribution as determined published 2010 tax rates (NYSORPTS, 2012a). Payment amounts based on 71 MW facility, with a base payment of $5,000 per MW installed.

Table 47. Potential Distribution of PILOT Payments

Annual PILOT payment	Average annual distribution			20-yr total PILOT payment	Average total distribution		
	Municipalities	County	School Districts		Municipalities	County	School Districts
$355,000	$46,150	$127,800	$181,050	$7,100,000	$923,000	$2,556,000	$3,621,000

It should be noted that in the event a sales tax exemption is established for the Project under New York Tax Laws §1115(a)(12) and 1105-B, a portion of the purchased materials, supplies and services required for the transportation, construction, and operation of the Project would be sales tax exempt. The Project construction items not tax exempt by Tax Laws §1115(a)(12) and 1105-B would likely be tax exempt under the IDA's UTEP. If this were the case, 100% of the Project construction would be sales tax exempt. However, the increased economic activity in the area as described throughout this section 3.9.2 will result in a long term economic benefit to the communities involved. Beyond the aforementioned positive impacts stemming from the Project PILOT (as well as the eventual full taxation of Project infrastructure, after the expiration of the 20 year PILOT), the operation of the proposed facility is not expected to have any direct impact on the municipal tax bases in the area. This expectation is based on multiple studies across the country (including examples from upstate New York) that have found no persuasive evidence of any significant relationship between the presence of wind energy facilities and the sale prices of adjacent or nearby properties (Sterzinger et. al. 2003, p. 4; Hoen 2006, p. 34; Hoen et. al. 2009, p. 75; Wiser et al. 2009, p. 6). For additional information on property values studies, see Appendix S.

3.9.2.2.4 Property Values

Although the presence of wind turbines will increase the value of the properties on which they are located and generate income for the participating landowners, due to the allowed tax exemption pursuant to New York State Real Property Tax Law, Article 4, §487, the landowners of these properties will not be assessed a higher value to reflect these improvements. In addition, studies of wind power impact on property values have indicated that these projects typically do not have an adverse effect on assessed property values of neighboring homes (Sterzinger et. al. 2003; Hoen 2006, p. 34; Hoen et al. 2009, p. 75; Hinman 2010, p. 85; Carter 2011, p. 25), and in some cases even appear to have a beneficial effect (i.e., property values near the wind facility increased faster than those located elsewhere in the county [Hinman, 2010; Heintzelman & Tuttle, 2011]). Therefore, the Project should have no effect on future real property tax obligations for each participating landowner or property values within (or in the vicinity of) the Project area.

3.9.2.2.5 Dairy Farms

Given that the only known operational dairy farm identified within the Project area is participating in the Project the only quantifiable impact identified to dairy farms is that the financial viability of the dairy farm would be improved by the realization of the Project. Hazards to livestock arising from stray voltage is often raised; this topic is discussed at more length in Section 3.10.2.2.3, which demonstrates that as long as proper design, construction, commissioning, testing and operational procedures are implemented that there is no impact from stray voltage caused from wind energy projects. Two dairy farms operate on the southern periphery of the Project area on State Route 41. As livestock on these farms is housed more than 3,000 feet from the most proximate proposed wind turbine, and that no impact is anticipated to dairy farms from the installation of the Project, it is not anticipated that there will be any adverse effects on these Non-participating dairy farms.

3.9.2.2.6 Hunting, Fishing and Bird Watching

With respect to potential socioeconomic impacts as a result of impacts to wildlife (e.g., hunting, fishing, bird watching), such impacts are not anticipated because adverse impacts to wildlife are not anticipated. See Section 3.3.2 for additional detail.

3.9.3 Proposed Mitigation

3.9.3.1 Construction

3.9.3.1.1 Population and Housing

Project construction is not expected to have any adverse impacts on population or housing availability in the Towns of Cortlandville, Homer, Solon, Truxton, or the surrounding communities, nor is it expected to depress local property values. Mitigation measures to address population and housing impacts are not necessary.

3.9.3.1.2 Economy and Employment

The construction of the Project is expected to have a positive impact on the local economy and employment, in that additional jobs will be created and additional local expenditures made (lease payments to participating landowners, as well as local purchase of goods and services). Mitigation measures to address economy and employment are not necessary.

3.9.3.1.3 Municipal Budgets and Taxes

Construction of the proposed Project will not create a significant demand for additional municipal facilities or services. Because it will not directly increase local municipal expenses, it will have no adverse impact on municipal budgets. Beyond the Road Use Agreement, no additional mitigation measures are necessary. The PILOT to be negotiated as part of the Project is expected to generate approximately $7.1 million over the 20 year agreement lifetime. This represents a payment to the County and Towns taxing jurisdictions of approximately $355,000 per year.

3.9.3.1.4 Property Values

The construction of the Project is not expected to have a significant impact on the local property values. Therefore, mitigation measures to address property values are not necessary.

3.9.3.2 Operation

3.9.3.2.1 Population and Housing

The operation and maintenance of the Project is not anticipated to adversely affect population or housing availability in the Towns of Cortlandville, Homer, Solon, Truxton, or the surrounding communities, nor is it expected to depress local property values. See the Socioeconomic Report in Appendix S for a detailed assessment of potential impacts to property values, including a review of studies conducted at operating wind energy facilities in New York State. Therefore, mitigation measures to address population and housing impacts are not necessary.

3.9.3.2.2 Economy and Employment

The operation and maintenance of the Project is expected to have a positive impact on the local economy and employment, in that additional jobs will be created and additional local expenditures made (lease payments to participating landowners, as well as local purchase of goods and services). Mitigation measures to address economy and employment are not necessary.

3.9.3.2.3 Municipal Budgets and Taxes

Neither operation nor maintenance of the proposed Project will create a significant demand for additional municipal facilities or services. Because it will not directly increase local municipal expenses, it will have no adverse impact on municipal budgets. Beyond the Road Use Agreement and PILOT agreement, no additional mitigation measures are necessary. The PILOT to be negotiated as part of the Project is expected to generate approximately $7.1 million over the 20 year agreement lifetime. This represents a payment to the County and Towns taxing jurisdictions of approximately $355,000 per year. Please refer to Section 3.11.2.2 for further detail.

3.9.3.2.4 Property Values

As previously discussed, the operating Project is not expected to have a depressing effect on local property values. Property owners within the viewshed of proposed wind power projects often inquire about the possibility that these projects could at some point be abandoned, and that the abandoned facilities may affect local property values. To address this issue, the Project developer will establish a decommissioning fund or purchase a decommissioning bond in an amount sufficient to secure the cost of removing turbine site improvements as required under its leases with participating landowners. This fund will assure that the proposed wind power facility will be dismantled and removed in accordance with a Project Decommissioning Plan in the event that it reaches the end of its operational life span or its operation is otherwise abandoned. For more detail on the Project Decommissioning Plan, see Section 2.8.

3.9.3.2.5 Dairy Farms

As discussed above no required mitigations for dairy farms arise as a consequence of the Project.

3.9.3.2.6 Hunting, Fishing and Bird Watching

As described in Section 3.3 Biological Resources, the Project is not anticipated to have a significant effect on avian and terrestrial wildlife populations in the area. Therefore it is anticipated that the Project will not have a negative impact on the socioeconomic benefits of hunting, fishing and bird watching within the Project area. In fact, **edr** and TCI have independently witnessed substantial numbers of wildlife (e.g., deer and turkey) foraging in open fields directly adjacent to and beneath operating wind turbines at several New York wind power sites (see Section 3.3 for additional detail). Adverse impacts to wildlife are not anticipated.

3.10 PUBLIC SAFETY

This section addresses potential public safety concerns related to the proposed Project. 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. With respect to potential impacts to the County's planned emergency communications system, please see Section 3.12.2. To the extent applicable to the information and analysis presented in this section below, internet sources (e.g., url suffix of ".edu") have been taken into account.

In addition, the Scoping Document adopted September 13, 2012 requests an evaluation of risks for occasional users of nearby lands for "snowmobiling, snowshoeing, cross country skiing, hunting or other outdoor recreational activities". All of the information about potential public safety concerns described below in Section 3.10 would also apply directly to persons engaging in outdoor recreational activities, as would the hazards, associated risks, and mitigation measures would also apply. Therefore, winter sports and recreations are addressed in Section 3.10.4, after the presentation of background information, potential impacts, and mitigation measures.

This sub-section is organized as follows:

- 3.10.1 Existing Conditions
- 3.10.2 Potential Impacts
- 3.10.3 Proposed Mitigation
- 3.10.4 Winter Sports and Recreation

3.10.1 Background Information

The effective management of health and safety is a top priority for TCI. Further, the global wind industry has made considerable efforts to ensure a continuous improvement of the safety performance of the industry.

All wind turbines are deigned to rigorous international safety standards administered by the International Electrotechnical Commission (IEC). The IEC is a non-profit, non-government international standards organization that prepares and publishes International Standards for all electrical, electronic and related technologies – collectively known as "electrotechnology". IEC standards cover a vast range of technologies from power generation, transmission and distribution to home appliances and office equipment, semiconductors, fiber optics, batteries, solar energy, nanotechnology, and marine. In order for a new wind turbine to be certified to IEC standards, the design has to be warranted by an international certifying organization such as (e.g., Germanischer Lloyd or Tuv Sud).

Safety concerns associated with the construction of a wind power project are categorized primarily by hazards that may occur during

i) planning and development,
ii) construction, and
iii) operations and maintenance.

With respect to public safety each of these categories is expanded upon below.

3.10.1.1 Planning & Development

During the planning and development phase of the Project various personnel have visited the Project area to assess the site from many technical, environmental, commercial, and financial perspectives. Appropriate procedures regarding effective management of hazards identified for such visits have been implemented (such as lone working procedures, contact with noxious plants, interface with livestock, safe movement of vehicles, etc.). These procedures are designed to protect employees of the Project Sponsor, landowners, and members of the public. Please also be aware that the Project Sponsor has consulted with the owners/operators of the high-pressure gas transmission pipelines in the vicinity of the Project area (see Section 3.11 for additional detail).

3.10.1.2 Construction

Hazards that are created during construction are typically more foreseeable and are initially mitigated by the effective pre-qualification and selection of suitably qualified and experienced construction contractors, the specification and use of suitable materials and components, effective and regular auditing, etc. Typical hazards 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. The risks associated with these types of incidents are well understood by competent contractors, and do not require extensive background information within the context of the DEIS. With proper safety precautions, such construction-related injuries can be prevented. Furthermore, because the Project is contained within remote parcels of privately-owned land, these safety concerns do not present risk to the general public if proper site protection and security is implemented.

3.10.1.3 Operation

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 significant use and storage of combustible fuels are not required and there are no emissions associated with wind energy production. In addition, use and/or generation of toxic or hazardous materials are minor when compared to other types of generating facilities. However, 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, lighting strikes, electrocution, and electro-magnetic fields. In addition, there has been much debate over the alleged negative health effects caused by low frequency sound produced by operating wind turbines. It should be noted that shadow flicker is not considered a health-related issue, as blade pass frequencies for modern commercial-scale wind turbines are so low they are considered harmless. According to the British Epilepsy Association, approximately five percent of individuals with epilepsy have sensitivity to light, and most people with photosensitive epilepsy are sensitive to flickering around 16-25 Hz (Hertz or Hz = 1 flash per second), although some people may be sensitive to rates as low as 3 Hz and as high as 60 Hz. Modern wind turbines are usually built to operate at a frequency of 1 Hz or less.

There is no evidence that wind turbines operating at this frequency can trigger seizures (see Appendix N for additional information). Please refer to Section 3.5 for an analysis of the anticipated shadow flicker associated with the Project.

3.10.1.3.1 Ice Shedding

Ice shedding and ice throw refer to the phenomena that can occur when ice accumulates on rotor blades and subsequently breaks free and falls to the ground. A number of conditions need to occur simultaneously for ice throw to actually pose a risk; a) icing conditions exist, b) the ice dislodges from the blades, c) the ice fragment is of a significant size and travels a significant distance, d) the ices remains intact, e) the fragment travels a particular direction and lands in a particular location, f) there happens to be someone in this location at the same time the ice lands in this area. Although a potential safety concern, there has been no reported injury caused by ice being "thrown" from an operating wind turbine (Klepinger 2007, p. 6), further to this the Project Sponsor's research has not identified any incident causing harm occurring after 2007. However, ice shedding and ice throw do occur, and could represent a potential safety concern. This hazard is taken extremely seriously by the Project Sponsor and wider wind energy industry.

Under certain weather conditions, ice may build up on the rotor blades and/or sensors, slowing the rotational speed, and potentially creating an imbalance in the weights of the individual blades. Such effects of ice accumulation can be sensed by the turbine's computer controls and would typically result in the turbine being shut down until the ice melts. Field observations and studies of ice shedding indicate that most ice shedding occurs as air temperatures rise and the ice on the rotor blades begins to thaw. Therefore, the tendency is for ice fragments to drop off the rotors and land near the base of the turbine (Morgan et al. 1998, p. 117). Ice can potentially be "thrown" when ice begins to melt and stationary turbine blades begin to rotate again. However, prior to the re-start of a turbine after an icing event, a set procedure has to be followed, as explained in Section 3.10.3.2.1.

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 at a distance of 50 to 328 feet from the base of the tower. These fragments were in the range of 0.2 to 2.2 pounds in mass (Morgan et al. 1998, p. 116). Ice throw observations are also available from a wind turbine (Tacke TW600 turbine: 164 feet hub height, 141 feet rotor diameter) near Kincardine, Ontario, where the operator conducted 1,000 inspections between December 1995 and March 2001. Only 13 of the 1,000 inspections noted ice fragments, which were documented on the ground at a distance up to 328 feet (100 meters) from the base of the turbine, with most found within 164 feet (50 meters) (Garrad Hassan America, Inc. 2007, p. 8).

An ice throw study conducted at a wind power facility in the Swiss Alps in Switzerland reported 121 ice fragments over the course of two winters (i.e., the winters of 2005-2006 and 2006-2007; Cattin *et al*. 2008, p. 3). The maximum length of observed ice fragments in this study was 100 cm (39 inches) and the maximum weight was 1800 grams (4 pounds), with a maximum distance of 92 meters (302 feet) from the wind turbine. Almost 40 percent of the ice fragments were within the distance of the rotor blade (i.e., within 20 meters [66 feet] of the turbine), approximately 54 percent were found between 20 meters (66 feet) and 80 meters (263 feet), and approximately six percent were found between 80 meters (263 feet) and 92 meters (302 feet) of the turbine. Almost 50 percent of the ice fragments weighed 50 grams (1.76 ounces) or less, with less than five percent weighing more than 500 grams (1.1 pounds). This study found that most ice throw occurred underneath the blades of the turbine and the distance ice was thrown was less than empirical models predicted. In addition, there was no relationship between the weight of the ice fragment and throwing distance, but the throwing distance was dependent of wind speed when the ice fell from the blade (Cattin et al. 2008, p. 4).

Further in the above referred Garrard Hassan report ((Garrad Hassan America, Inc. 2007, p. 4). it is noted that distances of 220 meters (721 ft) can typically be regarded as a safe distance, beyond which there is negligible risk of injury from ice shedding. Ultimately, the Project Sponsor envisages having to comply with local zoning requirements, as referred in Section 3.13 (Land Use & Zoning) these are not yet finalized, and hence anticipates having to liaise further during this process with the Towns. A copy of TCI's preliminary ice shedding risk assessment may be referred to in Appendix Q. As indicated in the risk assessment an independent analysis will be undertaken prior to construction of the project to verify the risk analysis.

3.10.1.3.2 Tower Collapse/Blade Throw

Another potential public safety concern is the possibility of a wind turbine tower collapsing or a rotor blade dropping or being thrown from the nacelle. While extremely rare, such incidents do occur. For example, a tower collapsed at the Klondike III Wind Farm in Oregon in August 2007, resulting in the death of one worker and injury to another. In addition, a wind turbine collapse occurred at the Altona Windpark in Clinton County, New York in March 2009. According to Noble Environmental Power (the project owner) and General Electric (the turbine manufacturer), the collapse was caused by a "wiring anomaly" which prevented the turbine from shutting down as designed during a power outage (The Times Union 2009). According to Noble Environmental Power, the turbine collapse caused a small fire and scattered debris up to 345 feet from the base of the turbine (The Press Republican 2009). No one was injured as a result of the incident and local setbacks proved sufficient to protect area homes and public roads.

Such incidents can clearly be dangerous for project personnel, and potentially for the general public, as well. The reasons for a turbine collapse or blade throw vary depending on conditions and tower type. The main causes of blade and tower failure are a control system failure leading to an over speed situation, a lightning strike, or a manufacturing defect in the blade (Garrad Hassan America, Inc. 2010, p. 5) Most instances of blade throw and turbine collapse were reported during the early years of the operation of a wind project. The global wind industry takes such occurrences extremely seriously and following any occurrence of any major component malfunction ensures than an appropriate investigation and analysis is undertaken and that subsequent to this mitigations are adopted to avoid repeat occurrences.

3.10.1.3.3 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, although occurrences of stray voltage have also occurred in residential urban areas. Stray voltage can be defined as a "low level of neutral-to-earth electrical current that occurs between two points on a grounded electrical system" (Schmidt 2000, p. 1), arising from the electrical resistance to earth being below those required by design and construction codes. The term stray voltage can be further defined as a "continuous voltage sources of less than 10 volts between two objects that are likely to be contacted simultaneously by livestock or domestic pets". Stray voltage is not something unique to wind project development, and in fact, most stray voltage problems have been traced to either National Electric Code wiring violations or poorly grounded electric services serving the farms or city owned lighting poles in question (J. Barrett, pers. comm.). Wind power projects and other electrical facilities can only create stray voltage in the unusual circumstance where they are not properly specified, designed, constructed, tested and commissioned. Stray voltage would arise from inadequate grounding.

According to the Canadian Wind Energy Association (CANWEA 2012, p.3), "There has been much confusion on the topic of stray voltage, and wind turbines have at times been inappropriately linked as direct sources of stray voltage. Stray voltage is a potential symptom in any system of electrical distribution, regardless of source and is especially prevalent on working farms. Wind turbines are often located in agricultural areas, connecting to the provincial electricity grid with farm operators leasing the land on which the turbines sit. Through improved regulation and electrical code enforcement, incidences of stray voltage will be increasingly detected and eliminated."

When designed, built, and operated to appropriate electrical safety standards, wind power projects and other electrical facilities do not create any stray voltage issues. Should issues or complaints regarding stray voltage arise, these would typically be investigated by the local utility operator who will investigate the problem and isolate the source of the problem. In the unlikely event of any stray voltage issues, the Project Sponsor will co-operate and liaise with local utilities where necessary to help identify the source of the problem.

3.10.1.3.4 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 who have not been adequately trained and equipped.

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 substations, in electrical transmission structures, staging area(s), and the O&M building/facility. The presence of high voltage electrical equipment also presents potential safety risks to local responders. See Section 3.11 for detailed information regarding emergency response services.

3.10.1.3.5 Lightning Strikes

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

3.10.1.3.6 Electrocution

Due to the generation and transmission of electricity, a wind power project poses the hazard of electrocution. Because power generation and transmission does not generally occur until after the wind project has been constructed, this concern is primarily associated with an operating wind power project. The electricity generated by each turbine will initially be transmitted through buried 34.5 kV electric lines to a collection and transforming substation, and then delivered to an interconnection substation through an overhead transmission line not to exceed

115 kV. Buried lines will be placed at least 3 feet below grade; therefore, any earthwork conducted at or below these depths (and in the immediate proximity of the buried lines) will introduce the risk of electrocution by accidental contact.

3.10.1.3.7 Electro-magnetic Fields

Electric and magnetic fields are sometimes jointly referred to as electro-magnetic fields, or EMF. EMF is found wherever there is electricity, whether it is wiring, appliances, computers or power lines. Electric power transmission and collector lines create EMF because they carry electric currents at relatively high voltages. EMFs decrease in size as the distance from the source increases. For an electric transmission/collector line, EMF levels are highest next to the lines (typically near the center of the transmission line right-of-way) and decrease as the distance from the transmission/collector corridor increases. Electric fields are attenuated by objects such as trees and the walls of structures, and are completely shielded by materials such as metal and the earth.

With the exception of the 115 kV interconnection line connecting the Project substation to existing National Grid facilities and in situations where installation of underground cabling would cause greater impact to the environment, all 34.5 kV collector lines for this Project will be buried, thus minimizing the potential for EMF radiation. The proposed 115 kV line is 0.5 mile in length and is located entirely on private leased lands. Public access to this line would be limited given the selected routing, and it would connect to an existing 115 kV National Grid owned line that runs along East River Road. It should be noted that the voltages for both the transmission and collector lines are typical of existing grid infrastructure across the Project area.

Humans are exposed to a wide variety of natural and man-made EMFs, both in the outdoor environment and in homes, schools, and businesses. The EMFs produced by electric transmission lines are well within the range of EMF exposures from such other sources. This is a view supported by the Federal-Provincial-Territorial Radiation Protection Committee of Canada (2008): "Public concerns appear to arise from periodic media reports and from dubious Internet websites which contain inaccurate, unsubstantiated, controversial or contradictory statements regarding EMF-health issues. Concerns may result in public opposition to the proposed construction of new high-voltage power lines or upgrades of existing ones. Opposition to such proposals is often influenced by factors other than health issues (e.g., aesthetics). In addition, some individuals and organizations are promoting precaution by advising the public to limit their time spent near power lines or to avoid being near lines. Like household electrical appliances, power lines emit power-frequency EMFs. The intensity of the EMFs from such lines depends on wiring and tower configurations, as well as the line voltage, the current being carried and distance from the lines. EMFs from power lines and electrical appliances diminish rapidly with increasing distance. For magnetic fields, the contribution from power lines to the levels in most homes and other buildings is very small to negligible when compared to the fields in close proximity to operating electrical appliances and building wiring."

Numerous public health review groups, including the National Institute of Environmental Health Sciences, the National Institutes of Health, and the U.S. Department of Energy, have examined the public's exposure to EMFs produced by power lines. The consistent overall conclusion of these groups is that available data do not support a cause and effect relationship between exposure to environmental levels of EMF and elevated risk of disease. In a fact sheet released in April 2004, Health Canada concluded that, "Research has shown that EMFs from electrical devices and power lines can induce weak electric currents to flow through the human body. However, these currents are much smaller than those produced naturally by your brain, nerves and heart, and are not associated with any known health risks."

3.10.1.3.8 Low Frequency Sound

Low frequency sound is audible sound in the frequency range that overlaps the higher infrasound frequencies and lower audible frequencies, while somewhat arbitrarily defined, low frequency sound is generally considered to be between 10 Hz and 200 Hz (Colby et al. 2009, p. 1-2). There has been much debate over the alleged negative health effects caused by low frequency sound produced by operating wind turbines. As stated in Colby et al. (Colby et al 2009, p. 3-17), the National Research Council reports that low frequency sound is a concern for older wind turbines but not the modern type. While not a medical diagnosis, Dr. Nina Pierpont began calling the reported negative health effects "Wind Turbine Syndrome", with symptoms that include headaches, nausea, sleep disturbance, tinnitus, ear pressure, vertigo, visual blurring, tachycardia, irritability, trouble with concentration and memory, panic attacks, internal pulsation, and quivering (Leventhall 2009, p. 6). Leventhall (Leventhall 2009, p. 25) reviewed the book "Wind Turbine Syndrome", authored and published by Dr. Nina Pierpont, as well as Dr. Pierpont's website Wind Turbine Syndrome (www.windtrubinesyndrome.com) and in the review demonstrated flaws in the research and hypotheses presented by Pierpont (Appendix Q). In addition, Roberts and Roberts (2009) and Colby et al. (2009) also evaluated the hypotheses and research presented by Pierpont in their reviews of literature published on the health effects of low frequency sound produced by wind turbines.

Roberts and Roberts (2009) used PubMed, a search engine maintained by the United States National Library of Medicine, to perform a search of the peer-reviewed scientific literature that has addressed the known or unknown health effects associated with infrasound and low frequency sound (Appendix Q). Roberts and Roberts (2009, p. 29) identified 156 articles relating to infrasound and low frequency sound, the 21 most relevant and scientifically appropriate articles were selected for the review, based on a relevancy selection criteria. As stated in Roberts and Roberts (2009, p. 38), the peer-reviewed published articles have not reported any specific health conditions to be classified as a disease caused by exposure to sound levels and frequencies generated by the operation of wind turbines. While some people respond negatively to the noise levels generated by the operating wind turbines, there is no peer-reviewed, scientific data to support the claim that wind turbines are causing negative health conditions. Simply being annoyed about the wind turbines may be an underlying factor attributed to the majority of the health complaints (Roberts & Roberts 2009, p. 40).

In response to concerns that sounds emitted from wind turbines cause adverse health consequences, AWEA and CanWEA established a scientific advisory panel to conduct a review of current literature pertaining to the perceived health effects of wind turbines (Appendix Q). The multidisciplinary panel is comprised of medical doctors, audiologists, and acoustical professionals from the United States, Canada, Denmark, and the United Kingdom. The objective of the panel was to provide an authoritative reference document for legislators, regulators, and anyone who wants to make sense of the conflicting information pertaining to wind turbine sound. Similar to Roberts and Roberts (2009), the panel evaluated peer-reviewed literature on sound and health effects, as well as sound produced by wind turbines. The panel concluded that there is no evidence that the audible or sub-audible sounds produced by operating wind turbines have any direct adverse physiological effects and the ground-borne vibrations from wind turbines are too weak to be detected by, or to affect, humans. In addition, based on the levels and frequencies of the sounds produced by operating wind turbines and the panel's experience with sound exposures in occupational settings, the sounds produced from operating wind turbines are not unique and therefore do not likely cause direct adverse health consequences (Colby et al. 2009, p. ES-1).

In addition, the Chief Medical Officer of Health (CMOH) of Ontario reviewed existing scientific evidence on the potential health impact of noise generated by wind turbines. The report concluded, "…the scientific evidence available to date does not demonstrate a direct causal link between wind turbine noise and adverse health effects. The sound level from wind turbines at common residential setbacks is not sufficient to cause hearing impairment or other direct health effects, although some people may find it annoying" (CMOH of Ontario 2010, p. 3).

The Massachusetts Department of Environmental Protection (MassDEP) and Massachusetts Department of Public Health (MDPH) also assembled a team of independent experts to identify any documented or potential health impacts or risks that may be associated with exposure to wind turbines and discuss public health effects relating to wind turbines, based on scientific findings. To do this the independent expert panel conducted a literature review, including peer-reviewed scientific studies, other reports, and popular media, as well as reviewed public comments received by the MassDEP and/or MDPH. According to the report, there is insufficient evidence that the noise from wind turbines is directly causing health problems or disease. In addition, there is no evidence for a set of health effects, resulting from exposure to wind turbines that could be characterized as a "Wind Turbine Syndrome" (Ellenbogen et al. 2012, p. ES-7).

Based on the reports from Leventhall (2009, p. 11), Roberts and Roberts (2009, p. 10), Colby et al. (2009, p. 3-8), CMOH of Ontario (2010, p. 6), and MassDEP and MDPH (Ellenbogen et al. 2012, p. 12) (provided in Appendix Q), there is no evidence to support the claim that the low frequency sound produced by operating wind turbines causes negative health effects. In addition, the Australian National Health and Medical Research Council (NHMRC) conducted a literature review concerning the potential impacts on human health associated with wind turbines, including low frequency sound. In a Public Statement issued in July 2010, the NHMRC states: "There is currently no published scientific evidence to positively link wind turbines with adverse health effects" (Australian NHMRC, 2010a, p. 1).

A January 2013 report from the Australian Environment Protection Authority in conjunction with Resonate Acoustics studied the level of infrasound within typical environments in South Australia, with a particular focus on comparing wind farm environments to urban and rural environments away from wind farms, (Evans, Cooper & Lenchine 2013). On site measurements were taken over a period of one week at seven locations in urban areas and four locations in rural areas, including two residences located approximately 1.5 kilometers (0.9 miles) away from wind turbines. The results showed that infrasound levels measured at houses adjacent to wind farms (1.5 km / 0.9 miles) were no higher than those at houses located a considerable distance from wind farms (30km /18.6 miles) and that infrasound levels in the rural environment appeared to be controlled by localized wind conditions. During low wind periods, low infrasound levels were measured at locations both near to and away from wind turbines. At higher wind speeds, increased infrasound levels were common at both wind farm and non-wind farm sites. Organized shutdowns of the wind farms adjacent to measurement locations indicated that there did not appear to be any noticeable contribution to the infrasound level measured at either measurement location from the wind farm. This suggests that wind turbines are not a significant source of infrasound. Of particular note, the results at one of the houses near a wind farm are the lowest infrasound levels measured at any of the 11 locations included in the study. Evans et al conclude that the level of infrasound at houses near the wind turbines assessed is no greater than that experienced in other urban and rural environments, and that the contribution of wind turbines to the measured infrasound levels is insignificant in comparison with the background level of infrasound in the environment and is significantly below the human perception threshold (Evans, Cooper & Lenchine, 2013).

With the rapid increase of development of wind energy projects in recent years and the associated publicity on wind project opposition, this position is currently under review and a revised statement is expected in May 2013. The widespread belief that wind turbines generate excessive or even harmful amounts of low frequency noise is evidently based on misinformation or a confusion of the amplitude modulation typical of wind turbines (i.e., the periodic swishing sound with a frequency of about 1 Hz) with low frequency sound. In addition, early wind turbines with the blades downwind of the support tower were prone to producing a periodic thumping noise each time a blade passed the tower wake, but this effect no longer exists with the upwind blade arrangement used today.

3.10.2 Potential Impacts

3.10.2.1 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 hazards 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, the risk of construction-related injury will be minimized through safety conscious design, pre-qualification and appointment of competent and experienced contractors, regular safety training, use of appropriate safety equipment, use of certified equipment plant, implementation of suitable safety procedures and regular site auditing, effective testing, and commissioning.

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, snowmobile, hunting, or other outdoor recreation activities). 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 adhere to industry safety standards and will occur primarily on private land well removed from adjacent roads and residences, exposure of the general public to construction-related risks/hazard is expected to be very limited as long as appropriate controls are put in place regarding restricting access to the active construction sites and appropriate signage, guard rails and fencing.

It is proposed that three turbines will be installed on the County landfill site, part of which is open for public access. The proposed turbine sites are located within restricted areas of the County landfill where public access is not permitted. Landfill staff will be informed of the construction activities and construction areas being used each morning and will not be permitted to enter the construction areas without accompaniment by the Project safety officer and being equipped with appropriate Personal Protective Equipment.

There is very limited potential for construction activities to disrupt the landfill cells, their liners and covers. This potential is discussed further in Sections 3.1.2.1, 3.10.2.2.9, and 3.14.

3.10.2.2 Operation

In July 2010, the NHMRC issued *Wind Turbines and Health; A Rapid Review of the Evidence*, which concludes with: "*This review of the available evidence, including journal articles, surveys, literature reviews and government reports, supports the statement that: There are no direct pathological effects from wind farms and that any potential impact on humans can be minimized by following existing planning guidelines*" (Australian NHMRC 2010b, p. 8). Measures that ensure risks to public safety have been minimized to the maximum extent practicable are described below. Please also note that the Scoping Document requires a response to comments regarding the potential for the Project to impact public health negatively due to the variation in individual's capacity to process auditory and visual stimuli. The Project Sponsor is aware that such variability exists amongst individuals; however, there is no evidence that wind power projects cause adverse health impacts, regardless of an individual's capacity to process auditory and visual stimuli.

3.10.2.2.1 Ice Shedding

As stated previously, while turbine icing certainly will occur at times, any ice that accumulates on the rotor blades will likely cause an imbalance, or otherwise alert sensors, and result in turbine 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 begin to rotate could be thrown some distance from the tower. However, such a throw will usually result in the ice breaking into small pieces, and falling within 300 feet of the tower base. The Project layout was designed in accordance with minimum setback distances of 738 feet between proposed turbines and non-seasonal public roads and Non-participating property lines, and 1,642 feet between the proposed turbines and permanent residences. These setbacks exceed the area around turbines where studies have documented the potential for ice shedding/ice throw may occur, which should adequately protect nearby residents, motorists and recreational users of nearby lands (such as snowmobilers, snowshoers, cross country ski-ing, hunting or other outdoor winter recreational activities) from falling ice of any significant size. Please refer to the Project Sponsors risk assessment in Appendix Q.

In addition, unauthorized public access to the site will be limited by posting signs to alert the public and maintenance workers of potential ice shedding risks. Based upon the results of studies/field observations at other wind power projects, the Project's siting criteria, and the proposed control of public access to the turbine sites, it is not anticipated that the Project will result in any measurable risks to the health or safety of the general public (including those participating in outdoor recreation activities such as snowmobiling, snowshoeing, cross country skiing, etc.) due to ice shedding.

The turbines proposed for the County landfill site have been located away from public areas.

3.10.2.2.2 Tower Collapse/Blade Throw

Modern utility-scale turbines are certified according to international engineering standards. These include ratings for withstanding different levels of hurricane-strength winds and other criteria (AWEA 2008b). The engineering standards of the wind turbines proposed for this Project are of the highest level and meet all federal, state, and local codes. In the design phase, state and local laws require that licensed professional engineers review and approve the structural elements of the turbines. State of the art braking systems, pitch controls, sensors, 24/7 monitoring and speed controls on wind turbines have greatly reduced the risk of tower collapse and blade throw. The wind turbines proposed for the Project will be equipped with two fully independent braking systems that allow the rotor to be brought to a halt under all foreseeable conditions. In addition to the ability for the blades to be feathered to spill the wind and the nacelles to be rotated out of the wind, the turbines will automatically shut down at wind speeds over the manufacturer's threshold (56 mph (25 m/s) for the GE 1.6 – 100 model). They will also cease operation if significant vibrations or rotor blade stress is sensed by the turbines' blade monitoring systems. A re-start protocol has to be complied with after any such wind turbine shutdown. Because of these reasons, the risk of catastrophic tower collapse or blade failure is minimal.

Prior to final Project design, a subsurface investigation will be performed at each proposed turbine location to determine the site specific subsurface conditions and allowable soil/rock bearing capacities. See Section 3.1.3 for additional information on the subsurface investigations to be performed before final foundation design. However, according to the desktop geotechnical study, the anticipated subsurface conditions appear suitable to safely support the turbines and ancillary structures on conventional shallow foundation systems (AE 2012, p. 8). See Section 7.2 of Appendix E1 for geotechnical analyses and recommendations specific to foundations. See also Appendix A2, which includes GE Energy's "Load Specification for the Foundation of the Wind Turbine Generator System: GE's 1.6-100." This document includes engineering data and drawings that demonstrate that the turbines foundations are sufficient to provide safe structures that are not subject to failure or tipover. Based upon the Project's siting criteria, and the proposed control of public access to the turbine sites, it is not anticipated that the Project will result in any measurable risks to the health or safety of the general public (including those participating in outdoor recreation activities such as snowmobiling, snowshoeing, cross country skiing, hiking, bird watching etc.) due to tower collapse or blade throw.

3.10.2.2.3 Stray Voltage

While the concerns surrounding stray voltage are legitimate, it is important to note that stray voltage is preventable with proper design, specifications, electrical installation, grounding practices, testing and commissioning. The

Project's power collection system (34.5 kV and 115 kV) will be properly grounded, and will be electrically isolated (in accordance with required electricity regulations) from the local electrical distribution lines that provide electrical service to on-site structures or off-site buildings and homes. It will be physically and electrically isolated from all of the buildings in and adjacent to the Project area. Additionally, the wind farm's buried electrical collection lines will be located a minimum of three feet below ground, and will use shielded cables with multiple ground points. This design eliminates the potential for stray voltage (J. Barrett, pers. comm.).

3.10.2.2.4 Fire

All turbines and electrical equipment will be inspected and tested by the Project Sponsor and the connecting utility (for grid and system safety) prior to being commissioned and brought on line. This, along with implementation of built-in safety systems, minimizes the chance of fire occurring in the turbines or electrical stations. However, fire at these facilities could result from a lightning strike, short circuit or mechanical failure/malfunction. Any of these occurrences at a turbine would be sensed by the System Control and Data Acquisition system and reported to the Project control center. Under these conditions, the turbines would automatically shut down and Project maintenance personnel would respond as appropriate. The Project Sponsor recognizes that the installation of fire suppressant equipment will improve the ability of the operations and maintenance and emergency services to control a fire and intends to include for these in the wind turbine nacelles.

Based on correspondence with local fire departments regarding the equipment available to each department, it is assumed that there is no equipment that can reach to a height of 325 feet. In the event that a wind turbine catches fire, it is typically allowed to burn itself out while maintenance and fire personnel maintain a safety area around the turbine to protect against the potential for spot ground fires that might start due to sparks or falling material. Power from the circuit of the Project with the turbine fire is also disconnected; however, the other circuit(s) remains connected and operational. An effective method for extinguishing a turbine fire from the ground does not exist, and the events generally do not last long enough to warrant attempts to extinguish the fire from the air (Global Energy Concepts 2005). However, since the public does not have access to the private land on which the turbines are located, risk to public safety during a fire event is essentially very low. In addition, as indicated in Section 3.11.1, it is anticipated that the local fire departments will maintain a safe perimeter around the area, which would include extinguishing any ground fire (and therefore not allowing combustible components that may be scattered to result in the spread of ground fire).

In the event that a wind turbine catches fire, there is a possibility for this fire to result in toxic smoke. Prior to Project construction the Project Sponsor will meet with the local EMS and fire personnel to discuss the need for a specific evacuation plan in the event of turbine nacelle fires and release of toxic smoke, and to discuss evacuation plans that may already be in place throughout the Project area. If it is determined that an evacuation plan must be created, the Project Sponsor will work closely with the local Fire departments to design a suitable plan. In the event that a nacelle fire results in the release of toxic smoke, the Project Sponsor will work with the local fire department/emergency services provider to determine potential threats to the community (based on wind direction, speed, downwind receptors, etc.) and the need for implementation of the evacuation plan.

The proposed turbine sites located within the grounds of the County landfill are restricted areas, where public access is not permitted. Landfill staff will be informed of the construction activities and construction areas being used each morning and will not be permitted to enter the construction areas without accompaniment by the project safety officer and the proper Personal Protective Equipment. Therefore there should be no increased risk to public safety by having turbines installed on the County landfill property. In addition, the turbine nacelles and transformers at the substation will be equipped with fire suppression systems. These systems should inhibit and extinguish any fires that occur within the nacelle or at the Project substation.

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

3.10.2.2.5 Lightning Strikes

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

3.10.2.2.6 Electrocution

As previously mentioned, most collector lines will be buried, and therefore, the general public will not be exposed to risk from electrocution. Underground collector cabling will be buried at a depth that will not interfere with normal agricultural practices. In addition, all underground cabling within private lands will be mapped and all land owners will be provided with detail of the cable locations. The Project Sponsor will also create a toll-free telephone number for landowners to request detailed information regarding the location of any underground or overhead cabling on their properties. This number would also be available to the wider community and relevant Local and County authorities. For areas where the underground cable leaves private lands, the locations will be indicated by standard cable markers where appropriate. This will minimize the potential for electrocution.

The 115 kV transmission line will be located overhead on standard poles, up to 85 feet in height, on private leased lands (with limited or no public access), thus minimizing the potential for electrocution. This line will also be marked with appropriate signage warning of high voltage. Appropriate, standard, high voltage warning signage and fencing will also be used for the interconnection substation and the collection substation to minimize risks to the public.

3.10.2.2.7 Electro-magnetic Fields

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

New York is one of few states that have established standards for electric and magnetic fields produced by electric power lines. All Project components will comply with applicable standards. Table 48 summarizes EMF guidelines that have been adopted by various states.

Table 48. State EMF Standards and Guidelines for Transmission Lines

State/Line Voltage		Electric Field		Magnetic Field	
		On ROW	Edge ROW	On ROW	Edge ROW
Florida[a]	69-230 kV 500 kV	8.0 kV/m 10.0 kV/m	2.0 kV/m[b]	-	150 mG 200 mG/250 mG[c]
Massachusetts		-	-	-	85 mG
Minnesota		8.0 kV/m	-	-	-
Montana		7.0 kV/m[d]	1.0 kV/m[e]	-	-
New Jersey		-	3.0 kV/m	-	-

State/Line Voltage	Electric Field		Magnetic Field	
	On ROW	Edge ROW	On ROW	Edge ROW
New York[f]	11.8 kV/m 11.0 kV/m[g] 7.0 kV/m[d]	1.6 kV	-	200 mG
Oregon	9.0 kv/m	-	-	-

(NIEHS, 2002)
ROW = right of way; mG = milliGauss; kV/m = kilovolts per meter
Notes: [a] Magnetic fields for winter-normal, maximum line load capacity
[b] Includes the property boundary of a substation
[c] 250 mG standard applies only to certain 500 kV double-circuit lines built on existing ROWs
[d] Maximum for highway crossings
[e] May be waived by the landowner
[f] Magnetic fields for winter-normal, maximum line load capacity
[g] Maximum for private road crossings

Electric Fields

Electric fields around power lines are produced by electrical charges, measured as voltage, on the energized conductor. Electric field strength is directly proportional to the line's voltage; that is, increased voltage produces a stronger electric field. The electric field is inversely proportional to the distance a sensor is from the conductors. The strength of the electric field is measured in units of kilovolts per meter (kV/m). The voltage, and therefore the electric field, around a power line remains practically steady and is not affected by the common daily and seasonal fluctuations in production of electricity by the Project.

Magnetic Fields

Magnetic fields around power lines are produced by the electrical load or the amount of current flow, measured in terms of amperage, through the conductors. The magnetic field strength is directly proportional to the amperage; that is, increased amperage produces a stronger magnetic field. The magnetic field is inversely proportional to the sensor's distance from the conductors. Magnetic fields are expressed in units of milligauss (mG). However, unlike voltage, the amperage and therefore the magnetic field around a power line, fluctuate hourly and daily as the amount of current flow varies. The strength of the magnetic field depends on the current in the conductor, the geometry of the construction, the degree of cancellation from other conductors, and the distance from the conductors or cables.

Overhead Transmission Lines

For an overhead 115kV electric transmission line, the electric field will be designed in accordance with the New York State EMF Standards and Guidelines for Transmission Lines referenced in Table 48 above. It is anticipated that the location of the 115kV transmission line on private land and within the Right-of-Way leased by the Project Sponsor will provide separation of these components from the general public that is sufficient to limit EMF exposure.

Underground Lines

For an underground 34.5 kV circuit, the electric field is totally contained within the insulation of the cable, although the magnetic field is not. Because the electric field is contained within the buried cables, no electric field is measurable at the surface of the ground. Magnetic fields are assessed on the basis of 3 parallel conductors, bundled together, and placed 3 feet below grade. The conservative peak line loading value assumed for assessment of each underground circuit is approximately 50% higher than expected peak loading levels. The net magnetic field of buried cables is measurable 1 meter (3.28 feet) above the surface of the ground over the cables.

The strength of EMF's produced by Project components will not be significant at any receptor location. The height of the turbine generator (over 300 feet) above the ground; the location of electrical collection cables underground; and the location of substation transformers and other electrical equipment inside a fenced yard and suitably setback from any residents, should adequately separate these components from any human receptors. Employees working at the Project will be adequately trained and medically checked to mitigate against any pre-existing conditions (such as heart pacemakers etc.) that could impacted by close proximity to electrical equipment.

3.10.2.2.8 Low Frequency Sound

To determine potential sound impacts from the Project, a Noise Impact Assessment was conducted and results were presented in Section 3.7. Modern turbines of the type proposed for this Project do not generate low frequency or infrasonic noise to any significant extent and no impact of any kind is expected from low frequency sound associated with this Project (Appendix P).

According to turbine manufacturers, turbine vibration is minimal on properly functioning wind turbines. If it occurs, the SCADA system detects the abnormality and the turbine is automatically shut down. The cause of vibration is then investigated and the appropriate corrective maintenance actions are performed prior to the wind turbine returning to service. The possibility of theoretical vibration-related health effects (none have been documented at operating wind power facilities) is negated as a result of this automated detection and shut down process. In addition, as previously mentioned, there is no peer-reviewed research that has found that wind turbines have any direct adverse physiological effects and the ground-borne vibrations from wind turbines are too weak to be detected by, or to affect, humans.

3.10.2.2.9 Vibration

As discussed in the previous section, according to turbine manufacturers, turbine vibration is minimal on properly functioning wind turbines. However, the Project Sponsor commissioned a study on the potential effects of installation of wind turbines on County landfill land with regard to vibration impacts on integrity of the landfill liners (see Appendix

E1), and the vibration related elements of this report have been further peer reviewed by an expert in the field of ground induced vibration (see Appendix E2). As indicated in this analysis, ground vibrations from turbine foundations are not likely to negatively impact the landfill liner systems (AE 2012, p. 8; Woods 2012, p. 6).

Four proposed turbines (numbers 12, 13, 18, and 20) will be located on or near the existing Cortland County Landfill. The nearest proposed turbine is approximately 700 feet from the landfill. Based on a telephone interview with Cortland County Superintendent of Highways and Supervisor of Recycling/Solid Waste, Donald Chambers, the landfill encompasses approximately 540 acres and contains three waste areas (cells), referred to as the Towslee Landfill, the Pine Tree Landfill and the West Side Landfill. The Towslee Landfill is currently closed and is unlined with a synthetic cap. Turbine number 18 is the most proximate to the Towslee Landfill cell at a distance of approximately 700 feet. The Pine Tree Landfill is currently closed and is lined with a single composite liner and leachate collection system. Turbine number 20 is the most proximate to the Pine Tree landfill cell at a distance of approximately 1250 feet. The West Side Landfill is currently operational and has a dual composite liner system. Approximately 6.9 acres at the south end of the cell is currently capped. Turbine number 13 is the most proximate to the West Side Landfill cell at a distance of approximately 950 feet. According to Mr. Chambers, the north side of the Towslee landfill near turbine 18 was stripped of overburden soil during landfill operations exposing the underlying shale bedrock. Based on aerial photos of the landfill, the area to the west of the West Side Landfill also appears to have been stripped of overburden soil (AE 2012, p.7). This area is currently used as a borrow area to extract material for landfill cover. Landfill workers would therefore have year-round access to this area to excavate material from the borrow area. It is anticipated that they will generally be inside vehicles when carrying out these excavations and wearing hard hats when outside of the machinery. The public are not expected to access this excavation area. (pers. Comm. D. Chambers, telephone conversation with G. McDonald, January, 1, 2013).
Vibrations imposed to the soils around turbine foundations during normal operation are relatively low level vibrations, and the foundations must be designed to meet minimum foundation stiffness, specified by the turbine manufacturer and based on site specific dynamic soil properties. Site specific dynamic soil parameters will be evaluated during the subsurface investigation phase (see Section 3.1.2) and incorporated into the final foundation design. Subsurface soil conditions reported on landfill monitoring well logs indicate that the subsurface soil and bedrock in the area of the landfill are not susceptible to liquefaction. Based on their experience with numerous other wind energy projects in the Northeast, AE (2012, p. 8) concluded that ground vibrations from the turbines will not likely be perceptible or problematic, and are not likely to negatively impact adjacent structures or the landfill liner systems.

The Project Sponsor had the AE report peer reviewed by an expert in the field of ground induced vibration, Dr. Richard D. Woods, Professor Emeritus of Civil Engineering, Department of Civil and Environmental Engineering, University of Michigan at Ann Arbor. This review is included in Appendix E2. As indicated therein, wind turbines create ground vibration through interaction with their foundations. Although properly designed foundations minimize vibrations, all vibrations cannot be negated, and turbine operation does generate some ground motion. Distance is a major factor in mitigating vibrations from a wind turbine, and was considered along with site specific ground conditions in evaluating potential for damage from wind turbine caused vibrations. Woods (2012, p. 6) concluded that the placement of the wind turbines as proposed does not represent a hazard to the integrity of the landfill. As discussed above, the implementation of the Project will not have an impact on the landfill cells or landfill caps due to vibration. Therefore it is anticipated that the effectiveness of the cap and liners of the landfill will not be reduced, and there will be no impact on the quantity or quality of leachate or the manner in which such leachate is stored. For additional information about vibrations, see Sections 3.1.2.2 and 3.14 of this DEIS. The distances between potential turbines and existing infrastructure installed at the County landfill site is described below in Table 49.

Table 49. Distances Between Turbines and Existing Landfill Infrastructure

Turbine ID	Landfill Road (feet)	Scale House (feet)	Working Cell (feet)
12	1,344	3,962	1,115
13	825	2,469	975
18	1,082	1,259	3,444

As shown in Table 49 above, none of the working landfill cells, scale house, or landfill roads are close to the proposed turbine sites. The closest turbine to a landfill cell is turbine 13, which will be installed 975 feet from the western edge of the West Side Phase II landfill cell. This distance is 237 feet in excess of the 738-foot setback that has been applied to Non-participating property lines, and is anticipated to be a safe distance from the working landfill cell. Turbines have been located away from landfill roads in conjunction with the setbacks that have been used for public roads throughout the Project. Public access within the landfill is limited to the scale house, waste drop off areas 1800 feet south of the landfill scale house and the open West Side landfill cell 2,200 feet south of the scale house. These waste drop-off areas are a minimum of 1,400 feet from the most proximate proposed turbine. To prevent public access to restricted areas, if not already in place, appropriate signage will be installed on landfill roads and turbine access roads to warn of the danger of electrocution, falling ice from wind turbines during the winter months etc. Turbine 18 is closest to the scale house at 1,259 feet to the northeast. This is a workplace, and is staffed Monday to Friday between the hours of 8 am to 3.30 pm, and on the second Saturday of each month between the hours of 9 am and 1 pm. The Scale house is staffed by two people, a secretary and a scale operator. As the scale house is not a place of residence, and therefore staff is only present for a maximum of 7.5 hours per day, this building was not considered as a receptor, and thus the 1,642 feet residence setback was not applied. However, a substantial setback of 1,259 feet was still attained, which will protect the safety of the public and workers at this location to an acceptable level. The minimum residence setback (1642 feet) is principally in place to mitigate against an increased level of sound over existing background sound level at residences, due to the presence of wind turbines (see section 3.7 for a full description of sound impacts). As the scale house is staffed only during the operating hours of the County landfill, and the sound level at the landfill during these hours is high due to the use of machinery, vehicle deliveries etc., it is not anticipated that the sound level at the scale house will be significantly increased due to the operation of the Project. The landfill is also a commercial / industrial operation for which the application of a residential sound level is inappropriate. Therefore it is not deemed necessary to use the residential setback for the scale house. Landfill staff will be trained to be cognizant of the risks associated with working in proximity to operating wind turbines during all weather conditions. Risks such as high voltage electricity, buried cables and ice shedding will form some of the training and education provided. The Project Sponsor anticipates that the County will undertake their own analysis as part of the due process of evaluating the opportunity to enter a lease with the Project Sponsor (should the landfill receive three turbines then the estimated payments over 25 years will amount to $653, 400). Therefore, if the County cannot get comfortable with hosting wind turbines on the landfill then none will be installed.

The Scoping Document adopted September 13, 2012 requested information about existing wind turbine installations on or near landfills. There are a number of examples of wind turbines being proposed on or near landfill sites. For example, Saskatoon Light and Power has proposed a 2 MW wind turbine be built on the City of Saskatoon landfill site as part of the City's Energy and Greenhouse Gas Management Plan to achieve a diverse and environmentally sustainable energy system using local renewable energy supplies. After examining a number of locations, including the local University campus, the landfill site was selected as the most suitable and a detailed environmental impact analysis was completed. The geotechnical investigation concluded that there was no overall barrier to construction, and that vibration was not considered to represent a significant risk to the integrity of the landfill liner (K. Hudson, pers. comm.; University of Saskatchewan, 2011, p. 21; City of Saskatoon 2012).

Similarly, Waste Recycling Group (WRG), one of the UK's largest waste resource management company and part of FCC Environment, is seeking to develop wind turbines on many of its landfill sites across the UK. The company wants to use the available lands to produce renewable energy and help the UK meet its clean energy commitments. Currently, WRG plans to install wind turbines at five of their landfill sites: Carnaby Bridlington Landfill (two 3 MW wind turbines); Catwick Grange Landfill Site (two 1.8 MW wind turbines); March Landfill Site (two 3 MW wind turbines); Gallymoor Landfill Site (two 1.8 MW wind turbines); and Lillyhall Landfill Site (four 2.3 MW wind turbines). Discretionary approvals have already been obtained for both the Carnaby and Gallymoor projects (WRG 2012).

With regard to operating turbines at landfills, the Project Sponsor is aware of three such examples: Turkey Point, Bowling Green, and Hull Wind 2. Each of these operational facilities is briefly described below.

<u>The Wind Project at Turkey Point (Constega, Pennsylvania)</u>

In the fall of 2010, Lancaster County Solid Waste Management Authority installed a 3.2 megawatt wind project at its Frey Farm Landfill in conjunction with PPL Renewable Energy. The turbines are located on a non-operational portion of the landfill site along the Susquehanna River. The closest turbine is located approximately 200 feet from a landfill cell (compared to the Crown City Wind Energy Project, where the nearest proposed turbine is approximately 700 feet from a landfill cell). As with all municipal solid waste facilities, Frey Farm landfill is subject to rigorous regulatory oversight from the Pennsylvania Department of Environmental Protection, which monitors the leachate collection wells and groundwater wells to determine the performance of the landfill liners and drainage systems. No adverse impacts have been reported as a result of the construction or operation of the two turbine wind project at Frey Farm Landfill. The wind project provides energy for the landfill and is considered a success by the landfill operators (B. Norris, pers. comm.). The Wind Project at Turkey Point is recognized nationally for its unique application of landfill re-use, as well as epitomizing innovation and excellence in the solid waste management industry (LCSWMA 2011a).

Photo 4: <u>The Wind Project at Turkey Point</u> (LCSWMA 2011b).

<u>The Bowling Green Wind Farm Project (Bowling Green, Ohio)</u>

The Bowling Green Wind Farm Project began as a joint venture between the City of Bowling Green Public Utilities, American Municipal Power Ohio, and Green Mountain Energy Corporation. The property is owned by Wood County and is adjacent to the Wood County Landfill. The wind project rents the land for the turbines from the county. The first two turbines were dedicated on November 7, 2003. During the first year, the turbine performed well above expectation, producing more electricity than predicted, and eight other municipalities joined the project: Cuyahoga Falls, Edgerton, Monroeville, Napoleon, Oberlin, Pioneer, Montpelier, and Wadsworth. Two additional turbines were dedicated a year later on November 19, 2004. The Wood County Solid Waste Management District offers tours of the wind farm Monday through Friday (WCSWMD 2012).

<u>Hull Wind 2 (Hull, Massachusetts)</u>

Constructed and operated by the Town of Hull Municipal Light Plant, the Hull Wind 2 turbine went online in May 2006. The 1.8 MW Vestas V80 turbine is located at a 13-acre landfill site along the shore of the Weir River. Landfill operations began in the 1930s in a 10-acre unlined cell (Phase 1). In 1985, a 3-acre, clay-lined expansion was constructed (Phase 2), at which time disposal operations ceased in the unlined area and Phase I was capped. The turbine is located at the high point of the site, atop the Phase 1 HDPE geomembrane cap, and is supported by 60 foot pilings driven through the waste to underlying bedrock. Landfill restoration was limited to the Phase 1 capping system; no restoration of the Phase 2 liner was required. Disposal operations continue within Phase 2, and the ability to produce energy from a local, reliable source has contributed significantly to stabilizing the Town's electric rates (Wright & Fournier 2009, p.74).

Photo 5: Hull Wind 2 (Wright & Fournier, 2009).

3.10.2.2.10 Auditory and Visual Simulations

The Project Sponsor is aware that the capacity for individuals within the Project area to process auditory and visual stimuli is greatly varied. The visual and acoustic studies performed in support of this DEIS are designed to represent the population as a whole and to take into account the variability of the general population's auditory and visual capacity. However the Project Sponsor is also aware that there will be a great variation in how sound and visual aspects of the Project will be processed and perceived by different members of the community. For example, some members of the community will enjoy the visual aspect of the Project and be calmed by the turning of the turbine blades, some people may become very interested in the Project and wish to learn more about wind generated power, whereas as some individuals may be annoyed by the same aspects of the Project. It is unknown at this stage how members of the community will perceive and react to the visual and acoustic stimuli introduced to the area from the Project. Despite its research efforts, the Project Sponsor is unaware of any studies that can definitively state how individuals may be affected by the Project, if they are affected at all. With specific reference to the public comments received on the topic of Autism and Aspergers Syndrome the same conclusion can be made as it is unknown how a certain stimulus will be processed by an individual in advance of its introduction. Evidence on the subject suggests that, based on their characteristic impairment to think and behave flexibly and in consideration of the extreme sensory reactivity of some people with Aspergers Syndrome or Autism, they may find the introduction of a wind energy project to the landscape extremely distressing or extremely appealing, or may have no reaction at all (Breen 2012).

3.10.2.2.11 New Emergency Communications System

The results of the Comsearch microwave report (Appendix T), which studied the Cortland County Interoperable Communications System (CCICS or Radio System), indicated that there will be no interference to this system. In addition, this conclusion was discussed with Motorola Solutions Inc. Motorola Solutions Inc. stated that a microwave link cannot be affected by infrastructure sited beyond a distance equivalent to the height of the tower as the tower height is calculated to ensure that the zone of potential impact would not be impacted by the ground surface. Therefore, wind turbines sited outside a buffer zone related to the tower height, applied to the link centerline should not cause any impact to the microwave path as they would be outside the zone of potential effect (pers. Comm. Chris Gabriel 2012). Therefore the proposed wind turbines should not cause an interference issue (see Section 3.12. for additional detail). Prior to the FEIS being drafted, the Project Sponsor has offered to pay for a third party independent review of the studies performed by Comsearch, to be conducted by a company mutually acceptable to the parties and with proven expertise, in order for the County to verify the information presented in these reports. If the third party independent review of these reports disagrees with the conclusions reached by Comsearch (i.e., finding that there will be an impact on CCICS from the proposed installation of wind turbines), the Project Sponsor will redesign the Project to mitigate the anticipated interference to the satisfaction of both parties and their respective expert consultants, including consideration of removing or relocating the turbines giving rise to the interference or reasonably anticipated risk thereof. This may be added as a condition of approving the Final EIS. Consequently, the Project could not lawfully commence construction.

Furthermore, first responder, industrial/business land mobile sites, area wide public safety, and commercial E-911 communications (including portables and mobile handsets) were studied and evaluated by Comsearch. These services are typically unaffected by the presence of wind turbines as they are designed to work in a non-line-of-sight environment. Harmful effects to these services within the Project area are therefore not anticipated to be affected by installation of the Project. For additional information about communication systems in the Project area, see also Section 3.12 and Appendix T.

3.10.3 Proposed Mitigation

3.10.3.1 Construction

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

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

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

3.10.3.2 Operation

3.10.3.2.1 Ice Shedding

As stated above in Section 3.10.2.2.1, compliance with required set-backs from sensitive receptors (dwellings, roads, unsigned lot lines etc.) and measures to control public access (gates, warning signs, etc.) should minimize any public safety risk associated with ice shedding. The Project Sponsor will also meet with local landowners and snowmobile clubs to explain the risks of ice shedding and proper safety precautions. Additionally, icing of the sensors on the wind turbines, designed to detect an icing event, will result in automatic turbine shut-down, requiring a re-start protocol to be complied with before recommencing operation. County employees will receive instruction regarding the assessment of risk pertaining to the operation of the wind turbines. The Project Sponsor will continue to evolve its risk assessment procedures to ensure assessments remain valid over time and anticipates further consulting with the Towns as the zoning by-laws pertinent to the Project are developed. A copy of TCI's ice shedding risk assessment can be referred to in Appendix Q

3.10.3.2.2 Tower Collapse/Blade Throw

The setbacks should assure that a tower failure would not endanger adjacent properties, roadways, or utilities. In addition, members of the public do not have access to the private land on which the turbines are located, and as previously stated, distance to the nearest public road/residences essentially eliminates risk to the public due to tower collapse/blade throw. Areas of the County landfill currently proposed for hosting of turbines are sufficiently away from public areas (738 feet), buildings where employees are located (1250 feet) and operating cells (738 feet). County employees will receive instruction regarding the assessment of risk pertaining to the operation of the wind turbines. Therefore, mitigation, other than that incorporated into the design and referred above, is not proposed.

3.10.3.2.3 Stray Voltage

Stray voltage will be prevented through proper design and grounding of the Project's electrical system, supplemented by appropriate testing and commissioning. Although not anticipated, any reported stray voltage problems will be addressed through the Project's Complaint Resolution Procedure, described in Appendix L1, Community Outreach Plan. Beyond this, additional mitigation is not proposed.

3.10.3.2.4 Fire

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

- Initial and refresher training of all operating personnel (including procedures review) in conjunction with local fire and safety officials.
- Regular inspection of transformer oil condition at each step-up transformer installed at the main substation.
- Regular inspection of all substation components.
- Regular inspection of fire extinguishers at all facility locations where they are installed.
- All Project vehicles will be equipped with firefighting equipment (fire extinguishers and shovels) as well as communications equipment for contacting the appropriate emergency response teams.
- The Material Safety Data Sheet (MSDS) for all hazardous materials on the Project site 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.
- All wind turbine nacelles will be fitted with suitable fire suppressant equipment.
- 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. The Project Sponsor will provide and maintain appropriate equipment and provide the required level of training to the local fire department.

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.

3.10.3.2.5 Lightning Strikes

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

3.10.3.2.6 Electrocution

Apart from the 115kV overhead transmission interconnection line, the Project Sponsor has committed to burying all electric lines a minimum of 3 feet. The 115 kV interconnection line will be designed in accordance with National Grid safety specifications and will be located on private land within a right-of way leased by the Project Sponsor. The Project Sponsor will also coordinate with Dig safely NY prior to the commencement of any construction activities. All electrical cabinets will be locked and signed accordingly, and only suitably authorized personnel shall be authorized to work on electrical equipment. All wind turbines shall have secure lockable doors (fitted with alarms to a central 24/7 monitoring room) and be signed to alert of the hazard of electrocution. Undergrowth in the vicinity of the 115 kV overhead line will be regularly trimmed to minimize the risk of a short circuit. All grounding systems will be inspected and tested in accordance with state regulations. The substation compound shall be fenced with a minimum of an 8-foot high chain-link fence and access to the transformer and associated switchgear shall be via a locked, signed and remotely alarmed gate. The Project Sponsor will ensure that an appropriate level of security of the substation compound outside of normal working hours, such as video surveillance, passive infrared lighting, and alarms fitted to all buildings and the transformer and switchgear compound.

Beyond these activities, no additional measures to mitigate the potential for electrocution are proposed.

3.10.3.2.7 Electro-magnetic Fields

Because no significant impacts from EMF are expected, no mitigation is necessary. As previously indicated, all proposed electrical collection lines are expected to operate well below the state established standard for magnetic fields. The Project Sponsor will voluntarily adhere to the magnetic field strength interim standards established in the New York State PSC's Interim Policy Statement on Magnetic Fields, issued September 11, 1990. The Interim Policy establishes a magnetic field strength interim standard of 200 mG, measured at one meter (3.28 feet) above grade, at the edge of the right-of-way, at the point of lowest conductor sag.

3.10.3.2.8 Low Frequency Sound

As mentioned previously, the automated vibration detection and shut down process provided by the SCADA system in addition to adherence to all appropriate design standards will effectively avoid and/or minimize any noise-related health risks during Project operation. Additional operational noise mitigation measures include siting turbines at least 1,642 feet from all residential structures (see Figure 3) and keeping turbines in good running order throughout the operational life of the Project. However, if complaints should arise, they will be addressed through the Community Outreach and Communication Plan (see Section 4.2 and Appendix L1).

3.10.4 Winter Sports and Recreation

The Scoping Document adopted September 13, 2012 requests an evaluation of risks for occasional users of nearby lands for “snowmobiling, snowshoeing, cross country skiing, hunting or other outdoor recreational activities”. Please refer to the Project Sponsors risk assessment in Appendix Q.

All of the information described above in Section 3.10 would also apply directly to persons engaging in outdoor recreational activities, and therefore the hazards, associated risks, and mitigation measures would also apply. It is also important to note that given the Non-participating Property Line Setback (738 feet), occasional users of neighbouring lands are not considered to be significantly impacted.

The Project Sponsor co-ordinated with County planning authorities and GIS personnel, as well as State and local recreational agencies, to identify any snowmobile, skiing, hiking or snowshoe trails or known recreational or hunting areas located within the Project area. These have been identified on the Recreational Trail Map in Appendix C. This map shows that there are a series of recreational trails running through the Project area, but the only recognized public trail is the Finger Lakes Trail (depicted in purple). Analysis has shown that the nearest turbine is over 1,200 feet from the closest point of the trail. Therefore, there are not expected to be any significant adverse impacts to the safety of trail users.

Snowmobiling

The map also shows that there are a number of snow mobile trails running through the site area, and while these are located on private lands. Research and discussion with snowmobiling agencies has shown that wind turbine projects actually create additional snowmobile routes because of the access tracks and offer new and interesting trails for snowmobilers.

For instance, the Fédération des Clubs de Motoneige Du Québec (Quebec Snowmobile Federation) recommends Trail Number 597 for snowmobilers, specifically because of the proximity to wind turbines (Quebec Maritime 2012). Similarly, First Wind organized a snowmobile tour of their Sheffield Wind Project in conjunction with Vermont Association of Snow Travellers, which was a very popular event (Clean Technica 2012a; M. Tetreault, pers. comm.). A 590 mile snowmobile route opened in Maine on February 16th which connects 11 wind projects. Carolan Ouellette, Director of the Maine Office of Tourism stated that snowmobile tourists are curious about wind farms, and because of their proximity to snowmobile trails, (they) use them as destinations (Portland Press Herald, 2013).

Photo 6: Snowmobiling Near Stetson Wind Turbines (Earth Techling 2011).

In addition to these benefits, the Project will introduce potential for additional hazards, particularly during construction (which will be limited, given the preferred warm season anticipated construction window) and operation. These hazards are not particularly unique to the Project, but will require appropriate levels of caution, co-ordination, and mitigation. The hazard during construction is pertinent given that there has been a recorded fatality whereby a snowmobiler collided with a fence on a wind project construction site in Manitoba, Canada (Rollason 2011).

The Project Sponsor liaised with James MacFarland (Senior Natural Resources Planner, NYSOPRHP Snowmobile Unit) and Dan Dineen (Director of Planning for Cortland County) regarding the location and types of trails in the Project area. There are a number of snowmobiling trails within the Project area (see the Recreational Trail Map in Appendix C). As can be seen from the map, some portions of the snowmobile trails overlap roads that would be used for the proposed Project and some turbines are in close proximity to the existing trails, and therefore more detailed analysis is required.

Assuming some construction activity does occur when snow levels are sufficient for snowmobiling, then snowmobilers will face risks from obstacles associated with construction activities; new fences, plant and machinery, excavated areas, new equipment, vehicular movements, stored materials, etc. The majority of this construction activity will take place on private lands, and these areas would be appropriately fenced and marked with appropriate warning signage. In addition, the Project Sponsor will liaise with local snowmobiling clubs, so that members are made aware of the construction window and the potential hazards that could be present within the Project area. The Project Sponsor will also supply local snowmobiling clubs with a contact number for members to find out more about the Project and the related construction activities. Given that the Project is being developed primarily on private lands, participating landowners will be informed about the Project's construction timeline, and may or may not restrict certain activities on their lands until construction has been completed, thus minimizing the potential risks.

The Project Sponsor will also issue an advisory to local snowmobiling clubs on using extra caution when entering the Project area and avoiding immediate construction areas. A detailed map will be provided to local snowmobiling clubs identifying potential hazards arising from Project equipment (substation, junction boxes, electricity poles, wind turbines, etc.) to be distributed to members. It would also recommend the use of helmets when snowmobiling in or near the Project area, and use of headlights on all snowmobiles. The Project Sponsor will also post the Project layout on its website for ease of access. In addition, the Project Sponsor will further liaise with NYSOPRHP Snowmobile Unit and local clubs to ensure that the Project infrastructure information is recorded on their trail database and mapping.

It is generally accepted that the main risks from ice from wind turbines occurs within the blade fall zone or 50m (164 feet) for the GE 1.6 100. Two hundred feet has therefore been identified as a suitable distance for setbacks from snowmobile trails to mitigate risks and is also the distance proposed in the Allegany Wind Farm Project DEIS (EDR, 2010, p. 198). Discussion with the Developer of the Allegany Wind Project has shown that this 200 foot setback was adopted for the design of the Allegany Wind Farm Project. (Pers. Comm. K.Sheen, 2012). The Project Sponsor has therefore identified any portions of known snow mobile trails within 200 feet of a proposed turbine. There are three instances where the trail comes within 200 feet of a proposed wind turbine and these areas have been identified on maps provided in Appendix C. All of these locations are on private lands, where trail users require the permission of Participating Landowners. The Project Sponsor has already identified alternative routing options and will liaise with local snowmobile clubs, landowners, and agencies to identify and develop new routes in these specific instances, to enable a 200 foot setback to be maintained. The maps in Appendix C illustrate existing trails, property lines, and public roads, along with proposed turbine locations and suggested alternate routes.

It's important to note that the likelihood (risk) of any significant impact is low. But maintaining appropriate setbacks should mitigate these risks further. The New York State Snow Mobile Association has said that there have been no recorded incidents or accidents in the state of New York relating to wind farms and snowmobiling, despite many trails running in close proximity to Maple Ridge Wind Farm and other similar projects. They advised working closely with local clubs to limit the potential for impacts (J. Rolf, pers. comm.).

The Project Sponsor is committed to working closely with local snowmobiling groups in this manner to establish 200 foot setbacks and safe trail use. Signage will be established where all snowmobile trails enter the Project area highlighting the identified hazards and what control measures are recommended.

Snowshoeing, Cross Country Skiing, Hunting, and other Outdoor Recreational Activities

There are no designated snowshoeing or cross country skiing trails identified within the Project area. Given the setback of 738 feet to Non-participating Land Parcels, occasional users of neighbouring lands for such activities are considered to be protected from significant adverse impacts. Entrances to wind farm access tracks will be posted with warning signs so that anyone entering the Project area would be made aware of the potential hazards and associated risks.

It is known that there are a number of hunting stands located on private lands within the Project area, but these are either owned and/or operated by Participating Landowners, who will be made aware of the potential risks or by individuals who have the permission of Participating Landowners to hunt on their lands and access would be managed to ensure safety of hunters and workers during the construction and operations phase of the Project.

It's important to note that there are already a number of existing wind projects in New York that have already examined this issue and have snowmobile and skiing trails, etc. in close proximity to wind turbines. Discussion with Lewis County officials has shown that there have been no significant adverse impacts on these typical recreational activities, and they go as far as to say, "Along with the economic benefits, the Wind Towers still allow for the area to maintain all premier outdoor recreation activities such as skiing, snowmobiling, hunting, fishing, ATV and horseback riding, while at the same time, keeping the strong agricultural land base and heritage" (Lewis County Chamber 2012).

The Project Sponsor has therefore managed the hazard by implementation of suitable risk management practices including: automated turbine safety systems; maintaining the appropriate setbacks; utilizing appropriate signage and engaging with local officials and groups will ensure that there are no significant adverse impacts on public safety for occasional snowmobiling, snowshoeing, cross country skiing, hunting, or other outdoor recreational activities on nearby lands.

3.11 COMMUNITY FACILITIES AND SERVICES

The level of community facilities and services provided to the Project area was determined through e-mail and telephone communications with state and county personnel, including the New York State Police Department and Cortland County Sheriff's Department. In addition, online research was conducted for fire departments and schools. These facilities include public utilities, police and fire protection services, emergency medical services (EMS), education facilities, and recreational facilities.

This sub-section is organized as follows:

- 3.11.1 Existing Conditions
- 3.11.2 Potential Impacts
- 3.11.3 Proposed Mitigation

3.11.1 Existing Conditions

<u>Public Utilities and Infrastructure</u>

Public utilities and infrastructure in the Project area include various overhead and underground facilities. Above ground components include electric distribution and telephone lines along most of the public roads within the Project area. Cable television and data lines and communications towers also occur in and around the Project area. Underground utilities include telephone, cable television and data, and natural gas pipelines. In addition, two high-pressure gas transmission pipelines are located in the vicinity of the Project area. Specifically, dating back to the spring of 2009 the Project Sponsor has been consulting with Dominion Transmission to identify the location of high-pressure gas transmission lines that are proximate to the Project (see Figure 14).

<u>Police Protection</u>

The Cortland County 911 Dispatch Center in Cortland dispatches all police, emergency and fire calls within Cortland County, which includes the City of Cortland, 15 Towns, and 3 Villages (Cortland County 2011). Police service is provided by the Cortland County Sheriff and/or the New York State Police, which are automatically dispatched by the Cortland County 911 Dispatch Center. Both departments provide 24-hour coverage, seven days per week for the rural parts of Cortland County, dispatching the closest car when there is an emergency call (L. Price, pers. comm.). The Cortland County Sheriff's department primary station is located at 54 Greenbush Street in the City of Cortland. The Cortland County Sherriff's department employs 31 Officers, which includes a Sheriff, Undersheriff, Captain, Lieutenants, Sergeants, and County Police Officers (Deputy Sheriffs) (L. Price, pers. comm.).

New York State Police (Troop C) provides concurrent police service in the Project area and operates out of the local headquarters station located in Sidney, as well as from their satellite station located in the Village of Homer, which is the station closest to the Project. The Homer station has approximately 14 troopers, two investigators, and two supervisors (J. Dorward, pers. comm.).

Fire Protection and Emergency Response

The four closest fire departments that provide service to the Project area are the Village of McGraw Fire Department, Cortlandville Fire Department, Homer Fire Department, and Truxton Fire Department. All stations are staffed by volunteers and provide fire protection, rescue, and emergency medical services. Fire and emergency response services are provided 24 hours per day, seven days per week. The Cortland County 911 dispatch center in Cortland dispatches all police, emergency and fire calls within Cortland County (Cortland County 2011).

The McGraw Fire Department is located at 7 West Center Street in the Village of McGraw. The department has approximately 40 volunteers, including ten emergency medical technicians (EMTs), and one paramedic. Department vehicles consist of two pumper engines, each that carry 1,000 gallons of water, one engine pumps 1,250 gallons per minute, and one engine pumps 1,500 gallons per minute, as well as a 2,000 gallon tanker, a mini pumper, and one emergency rescue vehicle. Within the Project Site, the McGraw Fire Department responds to calls within the Town of Solon and mutually responds to calls with the Cortlandville Fire Department within the Town of Cortlandville. Due to the nature of the fire department being volunteer, the response time and number of volunteers available varies, depending on time of day. Typical response time is five minutes, but can be longer during the day and major calls see around 20 volunteers. The department is equipped to handle basic emergencies, such as ground fires. However, in the event there is an electrical fire within the wind turbine it will be the responsibility of the Project Sponsor, and the McGraw Fire Department will provide security for the area.

The Cortlandville Fire Department has two stations located in the City of Cortland. Station 2, located at 3757 Route 11 in Cortland is closer to the Project area. There are 37 members (G. Henry, pers. comm.), which includes eight fire police and 19 EMTs (Cortlandville Fire Department 2011). In addition, the department has an ice rescue team, water rescue team, and fast intervention team (Cortlandville Fire Department 2011). The station responds to approximately 900 calls per year for service (J. Gebel, pers. comm.). Station 2 vehicles consist of one pumper/rescue with a 1,500 gallon per minute engine and 1,000 gallons of water with foam, one tanker with 2,000 gallons of water, one brush truck 4x4 with 300 gallons of water, and one fire police SUV. The station currently has a 1,250 gallon per minute pump and 2,000 gallons of water on order, which will replace the current tanker at the station when it is delivered. (J. Gebel, pers. comm.). Within the Project Site, the Cortlandville Fire Department responds to calls within the Town of Cortlandville, mutually with the McGraw Fire Department. In the event of a larger fire, the Cortlandville Fire

Department may need to assist other departments in neighboring towns, in accordance with the NYS and Cortland County Mutual Aid plan. Typical response time is ten minutes. The department is equipped to handle basic emergencies, such as ground medical events or ground fires. However, in the event there is an electrical fire within the wind turbine it will be the responsibility of the Project Sponsor, and the Cortlandville Fire Department will provide security for the area (J. Gebel, pers. comm.).

The Homer Fire Department is located at 45 South Main Street in the Village of Homer. The Homer Fire Department district covers 125 square miles, including all of the Town of Homer and the north central portion of the Town of Cortlandville. There are 85 volunteers, which includes nine fire police, five EMS first responders, nine EMTs, and three paramedics. The department responds to approximately 775 calls per year for fire and emergency medical services. Department vehicles consist of one engine that pumps 1,000 gallons per minute, two engines that pump 1,500 gallons per minute, one skid brush unit, two 1,600 gallon tankers, one ladder that pumps 1,000 gallons per minute, and two rescue vehicles (Homer Fire Department 2012; Cortland County Fire and Emergency Management 2012).

The Truxton Fire Department is located in the Hamlet of Truxton. The department is staffed by approximately 30 volunteers, which includes four fire police and four EMTs. In addition, the department has a water rescue team and fast intervention team. The department has one engine that pumps 1,000 gallons per minute, and one engine that pumps 1,500 gallons per minute, as well as two emergency response vehicles. (Cortland County Fire and Emergency Management 2012; Truxton Fire Department 2012).

The proposed PILOT scheme described in Section 3.9.2.2.3 has the potential to provide additional economic benefits to the departments described above. The division of funds from this PILOT scheme will ultimately be decided by the Town Boards. Please refer to Section 3.9.2.2.3 for more detail on the proposed PILOT payments.

<u>Health Care Facilities</u>

Cortland Regional Medical Center, the closest hospital to the Project area, is located at 134 Homer Avenue in the City of Cortland, approximately 4.3 miles west of the Project area. Cortland Regional Medical Center is an acute care facility, with 166 beds. Approximately 85 physicians provide the community with emergency, intensive care, cardiology, imaging, respiratory, pharmacy, medical/surgical and many other services. The medical center also provides emergency care services, which includes a walk-in care facility, Prompt Care. In addition, the medical center has a residential care facility, the Cortland Regional Nursing and Rehabilitation Center, where 82 residents receive long-term care or short-term rehabilitation (Cortland County Regional Medical Center 2012).

Educational Facilities

The Homer Central School District provides public education services to approximately 2,150 youth in the area, with one elementary school serving K through 6, one elementary school serving K through 2, one intermediate school serving 3 through 6, one junior high school, and one high school. Hartnett Elementary School is located at Academy Street in the Town of Truxton, and serves 125 students in grades K through 6. Homer Elementary School is located at 9 Central Park Place in the Village of Homer, and serves 400 students in grades K through 2. Homer Intermediate School is located at 58 Clinton Street in the Village of Homer, and serves 550 students in grades 3 through 6. Homer Junior High School is located at 58 Clinton Street in the Village of Homer, and serves 380 students in grades 7 and 8. Homer Senior High School is located at 80 South West Road in the Village of Homer, and serves 700 students in grades 9 through 12 (Homer Central School District 2012; NYSED 2012).

The McGraw Central School District provides public education services to approximately 565 youth in the area, with one elementary school and one high school. McGraw Elementary School is located at 50 West Academy Street in the Village of McGraw, and serves 290 students in grades K through 6. McGraw High School is located at 10 West Academy Street in the Village of McGraw, and serves 280 students in grades 7 through 12 (McGraw Central School District 2012; NYSED 2012).

SUNY Cortland is located approximately 4.7 miles southwest of the Project area. It serves approximately 6,300 undergraduate students and approximately 1,050 graduate students each year (SUNY Cortland 2012). The university campus is located within the City of Cortland and Town of Cortlandville.

Solid Waste Disposal

The Town and County do not provide a residential waste collection service for the Project area. However, residents can hire private waste removal companies. The Cortland County Solid Waste facility is located at Town Line Road in the Town of Solon. In addition, a transfer station is located on VanDonsel Road in the Town of Virgil. The landfill accepts municipal solid waste from County residents and businesses (Cortland County 2012b).

Parks and Recreation

There are several state forests within the vicinity of the Project area. Donahue Woods State Forest is located in the northeastern portion of the Project area. The state forest encompasses 1,093 acres in the Towns of Solon and Truxton. Recreational activities include hunting, bird watching, nature viewing, snowmobiling, and hiking. While mostly undeveloped, there is a two mile recreational access road through the middle of the forest, as well as a designated snowmobile trail within the forest (NYSDEC 2012d).

Taylor Valley State Forest occurs adjacent to the Project area. The state forest encompasses 4,638 acres in the Towns of Cuyler, Solon, Taylor, and Truxton. Recreational activities include hunting, hiking, snowmobiling, bird watching, nature viewing, picnicking, and camping. There are snowmobile trails, as well as a portion of the Finger Lakes Hiking Trail System (NYSDEC 2012d).

Baker School House State Forest is located 1.3 miles south of the Project area in the Towns of Freetown and Solon. The state forest encompasses 1,276 acres with recreational activities including hiking, hunting, trapping, bird watching, nature observation, and informal camping. There is a portion of the Finger Lakes Trail System that runs through the state forest. There is also a public forest access road through the northern section of the forest (NYSDEC 2012d).

Dog Hollow State Forest is located 1.9 miles northeast of the Project area in the Towns of Cuyler and Truxton. The state forest encompasses 723 acres with opportunity for hiking, hunting, trapping, fishing, bird watching, and snowmobiling. There is a forest access road through the eastern half of the forest and 0.8 miles of snowmobile trails that cross through the forest (NYSDEC 2012d).

Cuyler Hill State Forest is located 2.9 miles east of the Project area in the Towns of Cuyler and Taylor. The 5,507 acres of state forest provide opportunities for hunting, hiking, snowmobiling, fishing, camping, bird watching, and nature viewing. An 8.5 mile portion of the Finger Lakes Hiking Trail is within the state forest. In addition, 12.5 miles of snowmobile trails traverse the state forest (NYSDEC 2012d).

Hoxie Gorge State Forest is located 4.1 miles south of the Project area in the Towns of Freetown and Virgil. The 2,064 acre state forest provides opportunity for hunting, hiking, bird watching, and nature viewing. There are snowmobile trails, as well as a portion of the Finger Lakes Hiking Trail within the state forest. A 2.6 mile forest access road provides additional recreational access (NYSDEC 2012d).

Maxon Creek State Forest is located 4.3 miles northeast of the Project area in the Town of Cuyler. The 908 acre state forest provides opportunity for hiking and nature viewing. Approximately 1.8 miles of the Finger Lakes Hiking Trails crosses the state forest land (NSYDEC 2012d).

Tuller Hill State Forest is located 5.0 miles southwest of the Project area in the Town of Virgil. The 2,440 acre state forest provides opportunity for hiking, cross-country skiing, mountain biking, horseback riding, snowmobiling, geocaching, and snowshoeing. The state forest has 8 miles of cross-country ski trails, 5 miles of Finger Lakes Trails, and 12 miles of designated horseback riding trails. In addition, there are three forest access roads (NYSDEC 2012d).

Heiburg Memorial Forest is located 3.3 miles north of the Project area in the Town of Truxton. The forest is owned by the State University of New York College of Environmental Science & Forestry and is used as an outdoor classroom and experimental station. The forest is open to the public for hiking (CNY Hiking 2012).

Local parks located near the Project area include several municipal parks. Yaman Park is located on Kennedy Parkway in the City of Cortland (approximately 3.7 miles to the west of the Project area) and contains a basketball court and skateboard park. Suggett Park is located at the corner of Homer Avenue and Madison Street in the City of Cortland (approximately 4.4 miles from the Project area) and contains two basketball courts and swimming pool. Randall Park is located on Randall Street in the City of Cortland (approximately 4.7 miles from the Project area) and contains four tennis courts. Beaudry Park is located on Scammell Street in the City of Cortland (approximately 5.0 miles from the Project area) and contains two basketball courts. Court House Park is located on the corners of Church Street and Greenbush Street in the City of Cortland (approximately 4.2 miles from the Project area) (City of Cortland 2009). In addition, McGraw Park is located approximately 1.0 mile from the Project area in the Village of McGraw and contains a basketball court, picnic facilities, a swimming pool and a playground. Also, George Vernum Park is located on Main Street in the Village of Homer (approximately 3.2 miles from the Project area) and contains a basketball court, tennis court, and box lacrosse games. Durkee Memorial Park is located 3.2 miles from the Project area on Route 11 in the Village of Homer and contains a pavilion, picnic facilities, fishing spots, and a playground (Village of Homer 2012). Dwyer Memorial Park is located 4.8 miles northwest of the Project area in the Town of Preble. The park is a 55-acre park, located at the north end of Little York Lake and offers picnicking, a softball field, horseshoe pits, boating facilities, children's play area, and nature trails (Cortland County 2012a).

The East Branch of the Tioughnioga River runs to the northwest of the Project area. There is a 1.5 mile stretch of NYSDEC-designated public fishing rights approximately 3.0 miles to the north of the Project area (NYSDEC 2012e, p.1).

<u>Facilities of Local Interest</u>

Camp Owahta

Camp Owahta is a 128-acre 4H facility that is owned and operated by the Cornell Cooperative Extension Association of Cortland County. Camp Owahta is open year-round to schools, churches, youth groups, and families in central New York. During the summer, day and resident camps are offered. The facility includes five miles of woodland nature trails, large pond, expansive recreation field, certified low ropes challenge course, recreation/dining lodge, a large open pavilion, activity building, basketball, hockey, and sand volleyball courts, an infirmary, and bathhouses (Camp Owahta 2012).

Solon Sportsman's Club

Solon Sportsman's Club owns 9.4 acres on Sportsman Club Road. The club has 102 members and the parcel includes trap shooting and a pistol range, as well as a clubhouse. On the grounds, the club hosts shooting contests, which are mostly attended by locals, but will draw contestants from across the state. There are no designated trails, but there is some snowmobile use on the property during winter. The public can rent the clubhouse for weddings and private parties, which has a board of health restaurant license with liability and regular insurance. The clubhouse is also used for trapper and hunter education classes (R, Anderson. pers. comm.).

3.11.2 Potential Impacts

3.11.2.1 Construction

The Project will not result in significant increase in the demand for utilities such as telephone, natural gas, electric, water, sanitary sewer, etc. Due to their temporary nature, construction workers will not generate a significant demand on local recreational facilities, school district services/facilities, or other community services/facilities.

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

The Project Sponsor has consulted with the high-pressure gas transmission pipeline operator to avoid potential adverse impacts. Specifically, the Project Sponsor has been provided with documentation that outlines the guidelines for construction activities on (and in the vicinity of) Dominion Transmission rights-of-way. This documentation includes notification requirements, drawing requirements (e.g., submittal of plan and profile drawings for review and approval by Dominion Transmission), and requirements associated with crossing pipelines with heavy equipment and excavation, cuts or fill in the vicinity of Dominion pipelines. The Project Sponsor will continue to work with Dominion Transmission as the Project moves to detailed design phase to assure all impacts are minimized/avoided.

The police, fire, and emergency response departments have adequate personnel and equipment to respond to basic emergency needs during the construction and operation of the Project. However, during construction, some public roadways may be temporarily blocked due to oversized delivery vehicles. Impacts of this nature will be addressed through a road use agreement to be executed with the County and Towns. In addition, damage may occur to the roadways anticipated to be used by oversized/heavy equipment, which has the potential to reduce the response time of emergency personnel. If any roadways are deemed impassable during the construction period, Emergency Services will be notified of any impassable routes. The construction site 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.

Project construction will generate some solid waste, primarily plastic, wood, cardboard and metal packing/packaging materials, construction scrap, and general refuse. This material will be collected from turbine sites and other Project work areas, and disposed of in dumpsters located at the construction staging area(s). A private contractor will empty the dumpsters on an as-needed basis, and dispose of the refuse at a licensed solid waste disposal facility. Waste material will be minimized where possible, and material that is deemed to be recyclable will be recycled by the Project Sponsor or private contractor responsible for waste disposal.

During construction, the Project will not adversely impact the local school districts, beyond the possible delay of school bus pick-ups and drop-offs at homes within the Project area due to temporary construction traffic/activity. In addition, Project construction will not impact facilities of local interest (i.e., Camp Owahta and Solon Sportsmans Club) as no physical disturbance will occur to lands owned by these facilities.

3.11.2.2 Operation

The Project will not result in any significant adverse long-term impacts to local utilities and energy resources. Long-term energy use will increase slightly as a result of facility maintenance and the operation of the O&M facility. 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. In addition, the Crown City Wind Power Project will generate up to 71 MW of electric power using a renewable resource (wind), which will be delivered into the existing 115 kV Cortland to Fenner transmission line and, depending on flow direction, will serve customers fed from either Cortland or Fenner substations. At the time of undertaking the NYISO grid study the power flow analysis suggested that approximately 60% of the output of the Project fed Cortland substation, in which case this would then go on to feed electrical consumers in Cortland and surrounding area. The power flow analysis is however, analogous to a snapshot vehicle count on a highway as to what proportion of cars are travelling in a particular direction. In this respect the power flow can be altered by a number of factors on the transmission grid, for example the dispatch or not of other generators, demand levels on the grid, etc.

No significant problems that would require response by local police, fire, and emergency service personnel are anticipated to result from Project operation. The Project's siting criteria specifies that wind turbines are located at least 738 feet from property lines and non-seasonal public roads, and no permanent residential structures occur within 1,642 feet of a wind turbine. This is well outside of any area that could be affected in the unlikely event of a tower fall or catastrophic blade failure. To the extent Project personnel require emergency assistance, it is anticipated that local providers have experience in responding to fire and accidents in rural locations.

The local fire departments do not have the specialized equipment necessary to respond to a fire should one occur in the nacelle of a Project turbine. Generally, any emergency/fire situations at a wind turbine site or substation will be the responsibility of the Project owner/operator and/or the substation owner/operator. Construction and maintenance personnel will be trained and will have the equipment to deal with emergency situations that may occur at the Project area (e.g., tower rescue, working in confined spaces, high voltage, etc.).

The Project is not anticipated to result in a significant increase in the demand on educational facilities. The operating Project is anticipated to require approximately five to seven full-time employees and the existing educational facilities should have sufficient capacity to accommodate the addition of these families to the area (if it is necessary to hire these employees from outside the area).

As noted in Section 3.9.2.2.3, the Project Sponsor is proposing to provide an annual Payment in Lieu of Tax (PILOT) to the County of $5,000 per MW. It is proposed that the PILOT will be paid to Cortland County and will be distributed to the Towns and the School Districts as per the number of MW located in each taxing jurisdiction for a 20 year period. Within the Project area in 2010 the average municipal (town) taxes constituted an average of 13% of each property's total tax obligation, County taxes constituted an average of 36%, and school taxes claimed the remaining 51%. Assuming the aforementioned breakdown of taxes and based on the proposed layout of the 71 MW Project and $5,000 annual payment, Table 50 has been prepared to present the anticipated estimated PILOT revenue per taxing jurisdiction. This is considered a positive impact, and no mitigation beyond the eventual establishment of the PILOT agreement is necessary.

Table 50. Estimated PILOT Revenue Per Taxing Jurisdiction

Taxing Jurisdiction	Annual PILOT Share ($)	20 Year PILOT Share ($)
Total Payment	355,000	7,100,000
Cortland County	**127,800**	**2,556,000**
School District Total	**181,050**	**3,621,000**
McGraw Central School District	123,443	2,468,864
Homer Central School District	57,607	1,152,136
Town Total	**46,150**	**923,000**
Solon	17,831	356,614
Truxton	11,538	230,750
Cortlandville	8,391	167,818
Homer	8,391	167,818

3.11.3 Proposed Mitigation

The impacts to the local economy, population, and community services resulting from the proposed Project are not of the type or magnitude that will require mitigation. In fact, development of the proposed Project will have minimal impact on population, and place little demand on community services, while at the same time providing significant income and tax revenue to the town, county, and school districts. The income anticipated from the proposed Project will more than offset any incurred costs, and can assist with the financing of community services that benefit all residents of the towns and county.

To mitigate any potential concerns regarding Project construction, the Project Sponsor will meet with the local emergency service personnel (fire, police, and EMS) to review and discuss the planned construction process. During this meeting, unique construction equipment, the overall construction process, and schedule/phasing will be addressed. Prior to construction, the Project Sponsor will implement a coordinated emergency response plan, which will be developed in consultation with local emergency service personnel. The distance and response time of some of the emergency response personnel will be taken into account when initially developing the coordinated emergency response plan, along with identifying where various construction activities will be concentrated, the provision of maps and other related materials requested by emergency responders, and the development of alternate response routes in the event that the primary route is blocked by construction activities. At a minimum, the following measures will be implemented to assure adequate levels of protection related to local fire, police, and other emergency services.

- Coordinating with local police/EMS personnel during Project component delivery.
- Initial and refresher training of all operating personnel (including procedures review) in conjunction with local fire and safety officials.

- Regular inspection of transformer oil condition at each step-up transformer installed at the main substation.
- Regular inspection of all substation components.
- Regular inspection of fire extinguishers and fire suppression systems at all facility locations where they are installed.
- All Project vehicles will be equipped with firefighting 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).
- Site maps showing turbine locations and access routes will be provided to local emergency service personnel.
- 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.

The Project Sponsor shall coordinate with the local fire departments and emergency service agencies with regard to training, practice drills, and documentation of appropriate actions in case of emergency circumstances at the Project. Such documentation shall include the locations of all emergency shutdown controls, location of any potentially hazardous materials, and site maps showing turbine locations and access routes. In addition, the Project Sponsor will work with local emergency service providers to assure that the Project area can be adequately accessed during the winter months.

As described in Section 3.10, in the event that a wind turbine catches fire, it is typically allowed to burn itself out while maintenance and fire personnel maintain a safety area around the turbine to protect against the potential for spot ground fires that might start due to sparks or falling material. Power to the circuit 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 (Global Energy Concepts 2005). In order to further safeguard against fire in the nacelle of the turbines, the nacelle of each machine will be fitted with a fire suppression system that will be automatically deployed should fire occur.

As also indicated in Section 3.10, to minimize safety risks to school children (including children at school bus stops on local roads), prior to initiating construction activities, the Project Sponsor and/or contractor shall coordinate with appropriate school district personnel (i.e., director of transportation) to determine if the proposed delivery or construction routes pose any safety risks. If necessary, mitigation measures will be determined through consultation with school district personnel, and will address school bus and construction activity schedules, appropriate safety measures such as regularly scheduled communication between the Project Sponsor and/or contractor and school district personnel, avoidance scheduling, and alerts.

Generally, any emergency/fire situations at a wind turbine site or substation that are beyond the capabilities of the local service providers will be the responsibility of the Project owner/operator. Construction and maintenance personnel (and properly trained and equipped regional responders) will be trained and will have the equipment to deal with emergency situations that may occur at the Project area (e.g., tower rescue, working in confined spaces, high voltage, etc.).

3.12 COMMUNICATION AND UTILITY TRANSMISSION/DISTRIBUTION FACILITIES

This sub-section is organized as follows:

- 3.12.1 Existing Conditions
- 3.12.2 Potential Impacts
- 3.12.3 Proposed Mitigation

Communications

To evaluate the potential for the Project to impact existing telecommunication signals, Comsearch was contracted to conduct a Licensed Microwave Search, an Off-Air Television Reception Analysis, an AM/FM Radio Broadcast Analysis, a Mobile Phone Services Analysis, a Land Mobile Radio (LMR) and Emergency Services Search and a Paging System Assessment in the vicinity of the proposed Project area (see reports in Appendix T). In addition, TCI provided written notification of the proposed Project to the National Telecommunications and Information Administration (NTIA). To evaluate the potential for the Project to impact airspace and nearby airports, an Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) is also being conducted for the Project. In response to concerns raised by Cortland County in respect of the Project impacting the Cortland County Interoperable Communications System (CCICS or Radio System), a meeting was held on January 9, 2013 between the County, Federal Engineering (County's Communications Consultants), Motorola (County's turnkey contractors for the new Radio System) and TCI. Comsearch (TCI's consultants) dialed in to the meeting by conference call. The meeting was also attended by several members of the public. The intent of the meeting was to inform the drafting of the DEIS in terms of how potential impacts and mitigations could be improved upon from earlier versions of the DEIS. The content that follows represents the essence of the discussions related to the Radio System and how the Project may impact the performance of the Radio System.

Utility Distribution and Transmission

With respect to potential impacts to the existing transmission facility, subsequent to an Interconnection Request filed with NYISO in 2008, a Feasibility Study and full System Reliability Impact Study (SRIS) were performed to assess the feasibility of connection of the Project to the National Grid transmission system based on the Project having a firm (i.e., 24/7) right to transmit up to 90 MW of generation capacity (please see Section 2.6.9 for additional detail), the conclusions of the study confirm that subject to the connection facility complying with the NYISO interconnection procedures and associated market rules that the Project will not have any residual impacts on the transmission system. .

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. The microwave electromagnetic spectrum ranges approximately from 1GHz to 100 GHz, with most applications within the 1 to 40 GHz range. Comsearch (2012c, p. 2) identified nine microwave paths that intersect the Project area (see Figure 2 in the Licensed Microwave Report in Appendix T). Of these, three microwave links relate to the Radio System to be owned and operated by the County (at the time of drafting the DEIS the County anticipated final commissioning of the Radio System to occur during the summer of 2013).

The Fresnel Zone is the area around the visual line-of-sight between two microwave dishes (which are typically mounted on a communications tower or building rooftop) and are used for backhaul networking of simulcast repeater sites back to a core network controller. The wide area wireless coverage is not provided by the microwave links, rather the wide area network coverage (between the radio sites and handheld or vehicle mounted radios) is provided by omni-directional or sectored radio antennas mounted on the telecommunications towers and provides for 360 degree coverage around each tower, with the towers being located to provide contiguous coverage. As a radio user moves through the coverage area their radio communication is handed off to the tower from which they have the best signal. However to ensure operation of the network, the wide area radio coverage is dependent on the unimpeded microwave backhaul connecting all simulcast sites (radio towers) back to the core network controller “prime site” located at the new radio tower on Monroe Rd and the “master site” located in the County Building (refer to Section 3.12.1.5 for further explanation). The Fresnel Zone is the area around the visual line-of-site between microwave antennas (often referred to as microwave dishes), as depicted in the diagram below. The WCFZ is theoretical extrapolation of the widest point of the Fresnel Zone back to either end of the microwave beam path. Given that the Fresnel Zone is circular in cross section then the WCFZ is the same when viewed on elevation (side view) as from above (plan view).

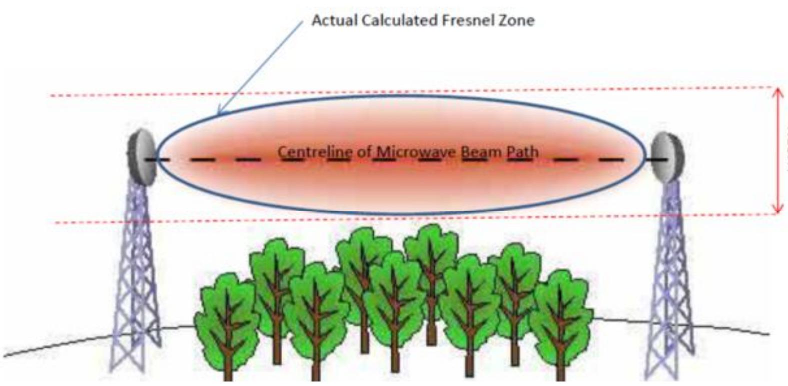


Image source: www.engweb.com

Diagrammatic representation of the Fresnel Zone and Worst Case Fresnel Zone (WCFZ), please note that given that the Fresnel Zone is circular in cross section then the above diagram is also valid when looking from above (plan view).

Image source: www.andrews.com

Photo 7: Tower Mounted Microwave Dish (used for backhaul typically 6 – 8 feet in diameter)

3.12.1.2 Off-Air Television Analysis

The television reception analysis identified all off-air television stations within a 150-kilometer (93.2-mile) radius of the proposed Project, as measured from the approximate center of the Project area. Off-air television stations transmit broadcast signals from terrestrially located facilities that can be received directly by a television receiver or house-mounted antenna (Comsearch, 2012e, p. 1). The results of the study indicate that there are one hundred sixty (160) off-air television stations within 150 kilometers (93 miles) of the Project area (see Off-Air TV Analysis in Appendix T).

The stations most likely to provide off-air coverage to the Project area are those within a distance of 75 kilometers (47 miles) or less. Comsearch (2012e, p. 3) identified sixty (60) stations within 75 kilometers (47 miles) of the Project area, of which thirty-six (36) are operational TV stations. Twenty-four (24) of the operational stations within 75 kilometers (47 miles) are translators or low power operations with limited range and limited programming, while the remaining stations are full-power TV stations. According to Comsearch (2012e, p. 7), most residents in the area likely view television programming through the use of cable or a satellite dish, as recent surveys of TV reception in the U.S. found that only 10% of households now rely solely on off-air television. TV cable service, where available and direct broadcast satellite service are more likely the dominant modes of service delivery (Consumers Electronics Association, 2011).

3.12.1.3 AM and FM Broadcast Analysis

The radio reception analysis identified all AM and FM broadcast stations within a 30-kilometer (19 mile) radius of the proposed Project, as measured from the approximate center of the Project area. Comsearch (2012a, p. 1-3) identified three (3) AM stations and nineteen (19) FM stations within this search area (see AM and FM Radio Report in Appendix T). One of the AM stations (WYBY) is licensed to operate at two different transmit levels, with high-power transmissions broadcast during day-time operations and lower power transmissions broadcast at night, while the other one (WHCU) transmits at one level at all hours. These AM station antennas are located between 8.5 and 28.8 kilometers (5 and 18 miles) away from the Project. Of the 19 identified FM stations, only eleven (11) are listed as operational, six (6) of which are low power or translator stations that operate with limited range. These licensed and operational FM station antennas are located between 6.8 and 28.8 kilometers (4.2 and 18 miles) away from the Project.

3.12.1.4 Mobile Phone Services Analysis

Advanced Wireless Service (AWS), Cellular, and Personal Communication System (PCS) services are available within the Project area. Comsearch (2012d, p. 5) determined that there are five AWS telephone operators, two Cellular telephone operators, and five PCS telephone operators in Cortland County (see Mobile Phone Carrier Report in Appendix T). The band of operation for each mobile telephone operator is presented below in Table 51.

Table 51. Mobile Telephone Operators in Cortland County, NY

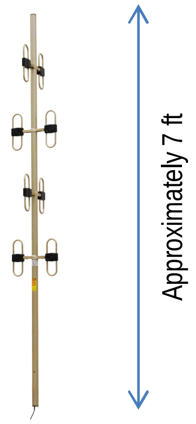
Operator	Type of System	Band of Operation
Verizon	AWS	F
MetroPCS	AWS	D
AT&T	AWS	A, C
SpectrumCo	AWS	B
T-Mobile	AWS	E
AT&T	Cellular	A
Verizon	Cellular	B
T-Mobile	PCS	A
Sprint Nextel	PCS	B
AT&T	PCS	A, C1, D, E
Verizon	PCS	F
Cricket/Leap	PCS	C2

3.12.1.5 Land Mobile Radio (LMR) and Emergency Services Radio Coverage

Comsearch (2012b) identified the registered site-based frequencies for first responder entities, such as police, fire, emergency medical services, emergency management, hospitals, public works, transportation and other state, county, and municipal agencies. In addition, Comsearch identified all regional licenses for industrial and business LMR systems, and commercial E911 operators within the proposed Project area. LMR systems are wireless communications used by terrestrial users in vehicles or on foot. Such systems are often used by emergency first responder organizations, public works organizations, and companies with large vehicle fleets or numerous field staff. LMR coverage is the result of the placement of repeaters that may be located at towers, on rooftop buildings or other fixed base locations. Comsearch (2012b, p. 3-6) determined that there are twenty-three (23) site-based licenses, thirty (30) regional licenses, and seven (7) mobile phone carriers with E911 service registered within the Area of Interest depicted in Figure 1 of the Land Mobile and Emergency Services Report (Appendix T). The majority of these LMR systems are licensed to governmental bodies including the State of New York, Cortland County, and local municipalities. In addition to the research conducted by Comsearch, Cortland County provided detailed information concerning the proposed microwave link paths of Cortland County's new interoperable (911) system which included the location of the eight simulcast repeater sites that combined with the microwave backhaul network will, from mid-2013, provide wide area coverage across 95% of Cortland County and currently being designed and constructed by Motorola under a turnkey contract to support Mobile Data Services and Digital Voice Communications used by the County. These proposed facilities have been taken into account throughout this analysis and their locations relative to the Project are included in WCFZ maps 1- 4 in Appendix T. The LMR report has taken into account the State-wide interoperable VHF, UHF and 800MHz frequencies that have to date been operating from the Virgil tower. Due to a State grant to Cortland County, new equipment to receive and transmit these frequencies will now be installed on all new Radio System towers with the exception of the County Office Building, Regional Training Center and 911 Center locations.

The new Radio System will port (with the exception of the analog paging system) the County's existing analog first responder emergency communications system to a new digital radio system and is being deployed by the County at a cost of approximately $15,000,000.

The Radio System will operate on a wide area wireless coverage basis, provided by an antenna (or aerial) network mounted on the eight telecommunications towers and will typically provide for 360 degree radio coverage (the County's Radio System is planned to operate at a frequency of 454 – 460 megahertz (MHZ)). Users are able to communicate, via either portable handheld or mobile vehicle mounted radios with the radio equipment housed in a shelter at the base of the telecommunications tower located at each simulcast site. All such communications are then backhauled via the microwave links (as described in Section 3.12.1.1 above) to the central radio network controller "prime site" located at the Monroe radio tower and to the "master site" located in the County Office Building. Hence, the function of wide beam width antennas is to provide 360 degree coverage from each communications tower whereas the function of microwave backhauls is to channel all communications via a concentrated microwave beam back to the radio network controller. As referred above however, for system operation both the wide area coverage and microwave backhaul must continue in operation. Given that the system is designed to provide 95% geographic coverage to the County and that Motorola are contractually obligated to this performance level, the system design contemplates the respective difference in power levels from the simulcast sites (Talk out) as compared to the lower power level portable and mobile radios (Talk in). This performance level will be verified upon final commissioning by Motorola through Digital Audio Quality (DAQ) voice testing of the Radio System to verify the system performance against their contracted system acceptance criteria. This method of testing is designed to replicate the end user experience in that it is a manual verification process based on a physical field test of the actual audio quality being transmitted and received by system users at various randomly selected test locations within the system coverage area (the County). The DAQ test is a pass or fail subjective test where if the audio quality experienced is adequate (achieving a score of 3.4 out of 5) the system has passed. If the audio quality experienced does not achieve a score of 3.4 out of 5, the system has failed the test.



Wide area omni-directional antennas mounted to the eight simulcast sites (radio towers) providing wide area radio coverage

3.12.1.6 Paging System

Cortland County owns and operates an existing UHF (453.7375 MHz) paging system for alerting emergency responders to an alarm. This paging system has been in operation for approximately 4 years and will not be upgraded as part of the County's new multipath simulcast system. There are seven antennas throughout the County which are used for the paging system. One paging antenna site will be moved from a leased American Tower site to a new County Radio System tower site at Knickerbocker Road in the Town of Cincinnatus. The six remaining paging antenna sites are not shared with the County's new simulcast Radio System. The paging system operates on a 453.7375 MHz (UHF) frequency. The main control site for the paging system is located on Tower Road, (off Taranto Road) in the Town of Virgil. The paging network consists mainly of Motorola components and is a one-way system transmitting at 125 watts of power. It contains one frequency channel, 453.7375 MHz, and has an internal fault detection mode which senses whether all the base stations have adequately transmitted the signal. Additionally, the County has a lower frequency band VHF system (operating at 46.08 MHz) in place, however Cortland County IT department has informed the Project Sponsor that this VHF system will not be used for emergency services paging in future and may be decommissioned. The paging system is further discussed in the Paging System Assessment in Appendix T. A map showing the location of the paging system antenna sites throughout the County relative to the Project may also be referred to in Appendix T.

3.12.1.7 NTIA Notification

TCI sent a written notification of the proposed Project to the National Telecommunications and Information Administration (NTIA) of the U.S. Department of Commerce. Upon receipt of notification, the NTIA provides plans for the proposed Project to the federal agencies represented in the Interdepartment 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 45-day review period. During this review period the agencies did not identify any concerns regarding blockage of their radio frequency transmissions (see correspondence from the NTIA in Appendix T).

3.12.1.8 FAA Aeronautical Studies

As indicated in the NTIA response, the IRAC only identifies concerns related to interference with federal radio frequencies, including FAA radio frequencies. Therefore, further correspondence with the FAA is required to determine potential flight obstructions from the built Project. The objective of Title 14 of the Code of Federal Regulations (CFR) Part 77 is to promote air safety and the efficient use of the navigable airspace. To meet this objective, the FAA conducts obstruction evaluation/airport airspace analysis (OE/AAA) aeronautical studies based on parameters of the proposed Project, such as wind turbine locations, maximum height above ground level (agl), and wind turbine lighting and color. To date 43 of the 44 proposed wind turbines have received Determination of No Hazard status and the remaining OE/AAA aeronautical studies are currently underway for the proposed Project. Turbine 23 has received a notice of presumed hazard to air navigation. The Project sponsor is working with the FAA to find a solution to this issue. If interference to airspace or nearby airports is identified during these studies, the Project Sponsor will work with the FAA in order to adequately resolve any identified potential interference. Further detail is available in Sections 3.12.2.2.8 and 3.12.3.2.8.

3.12.1.9 Electrical Distribution Systems

The Project area contains a system of overhead low voltage distribution circuits providing electricity to local residents, farms and other electrical consumers. The existing system is overhead supported on single wooden poles that generally occupy one side of most public roads in the Project area.

3.12.1.10 Unlicensed Airfields

The Project Sponsor has identified one active airfield within the Project area, known as Walter's Field located off Maybury Road, which potentially could be impacted by the Project.

3.12.2 Potential Impacts

3.12.2.1 Construction

There is very limited potential for temporary communication interference as a result of Project construction. Cranes used during construction activities (and the individual turbine components being raised by the cranes) can cause temporary obstruction of microwave links, as well as some degradation to television and radio signals (L. Polisky, pers. comm.). However, because individual turbines, including the maximum extent of their blades, have been sited to avoid interference with the WCFZ's of microwave paths that cross the Project area, plus a further tolerance / working space allowance of a 100 foot WCFZ buffer, the potential for microwave interference by equipment assembly and turbine erection is effectively eliminated. During Project installation, cranes will be sited and booms only operated outside of the Worst Case Fresnel Zone to avoid any signal interruption. Any impact on television or radio reception caused by construction equipment would be temporary, as turbine assembly and erection at each turbine site is typically completed within 1 to 3 days. The construction of the Project will, by its nature, introduce large metallic structures into the landscape and this will introduce more radio clutter into the environment. Clutter can be defined as physical objects above the terrain such as trees, buildings, electric transmission line towers, grain silos, water towers and wind turbines. The location of the microwave paths and their Fresnel Zones will be supplied to the construction crews so that they can be avoided during the construction phase. While it is not certain, and believed to be unlikely, the increase in clutter levels could lead to unacceptable degradation in service levels of the Radio System and/or mobile phone network coverage. It is important to note that increased clutter in the landscape will not cause obstacles or interference to the microwave links. Clutter is a phenomenon that has the potential to impact the quality of the wide area radio signal between the radio set (handheld or vehicle mounted "portable") and the radio base station or simulcast site. In contrast, microwave interference is a function of a solid object (in this case a rotating wind turbine blade or crane boom) physically entering the beam path between two microwave dishes and physically interrupting the "point to point" signal.

While the introduction of 44 steel structures within a fairly localized area (6 miles x 4 miles) is not typical of a rural clutter landscape, in practice, these multisite, simulcast systems can operate effectively in a cluttered environment such as this. This is evidenced by the many unaffected operational simulcast systems in areas that host wind farms, such as in Madison County, NY. The proposed turbine towers have a maximum diameter of 15 feet while the spacing maintained between turbine towers is approximately 1600 feet, meaning that there is a lot of free space for signals to propagate around the wind turbine towers. In addition, radio signals are affected by reflection, refraction and diffraction, meaning that the area that is shaded from a radio signal by a wind turbine tower will still receive the radio signal as it will bounce off elements in the environment or diffract around obstacles in the environment. Therefore, the erection of wind turbine tubular steel towers alone (328 feet tall, 15 foot base diameter) prior to the installation of the nacelle and rotor blades is not anticipated to have any impact on the Radio System. This is the professional opinion of Comsearch who have stated that Land Mobile Radio systems are typically designed to take into account signal level fluctuation (fading effects) caused by the surrounding environment and the mobility of the users. This opinion is predicated on the understanding that coverage planning whilst based on specific scientific principle is not of itself an exact science. Fade margins are introduced into the Link Budget (the calculated threshold to which the system can absorb additional clutter while maintaining reliable service) to account for various types of fading effects (reflective multipath, vegetation, shadowing from structures in the landscape such as multiple high voltage transmission line towers, existing radio towers, wind turbines, airports and associated air traffic, busy highways etc.). Properly designed systems can operate in a "cluttered" environment if adequate margins are established. Typically, fading effects are most impacted at the fringe of the coverage area of the base station(s), and reduced closer to the base stations due to the stronger signal received (unless of course the area is very mountainous (alpine in nature) or if it is an "urban canyon" environment). While it is the firm opinion of Comsearch that, given the design criteria applied to multi-site simulcast systems, operational wind turbines will have little to no impact on the Land Mobile Radio system, it can be said that even less impact from reflections and scattering of radio signals (i.e. fading effects) is anticipated when the turbines are stationary or whilst the turbine towers only are erected. Generally, the lesser variability in the orientation and movement of the turbine blades would result in reduced reflections or scattering. Additionally, when the turbine tower structures only, are present (during construction), Comsearch is of the professional opinion that the impact is even further reduced due to the fact that these structures are stationary, slender objects that do not justifiably present much of a barrier to the propagation of 450-460MHz radio signals, and thus are even less of a barrier to radio propagation as compared other features that typically exist in a rural environment (such as high voltage transmission line towers, telecommunications towers, grain silos, operating wind turbines, water towers etc. (Pers. Comm J. Marzin to G.McDonald, 2013). As further described in Section 3.12.2.2.5 Motorola has indicated that the design of the multi-site, simulcast radio system for Madison County made no specific allowance for the presence of the two existing wind projects in the County, other than siting the microwave links away from wind turbines, (Pers. Comm. C. Gabriel to G. McDonald, 2013). Given the discussion above, the emphasis of the mitigation of potential impacts to the Radio System has been orientated to those impacts arising from operation of the Project (refer Section 3.12.2.2.5 below).

3.12.2.2 Operation

The following subsections evaluate the potential for the Project to impact existing telecommunication signals.

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 microwave dish, but also within a formulaically calculated distance around the center axis of the radio beam, known as the Fresnel Zone. Using coordinates provided to the Project Sponsor by Cortland County, and microwave frequencies obtained from the FCC, a Worse Case Fresnel Zone (WCFZ) was calculated for the microwave paths identified within the Project area. Comsearch also considered proposed microwave paths that will be constructed in the near future as part of the Cortland County Radio Project. Final confirmation of proposed microwave dishes' coordinates related to the Cortland County Interoperable Communications System was obtained in September 2012 from Motorola and frequencies were confirmed with the FCC in October 2012. Based upon the calculated WCFZ, it was determined that the Project, as currently proposed will not have a detrimental impact on microwave communications systems (see Licensed Microwave Report and WCFZ maps 1-4 in Appendix T for a description of the proximity of the proposed wind turbines to the microwave links). TCI has applied an additional buffer of 100 feet (for tolerance and working space) from the outer edge of the WCFZ to the tip of the wind turbine blades into which no part of a wind turbine (including blades) will encroach. Ice that may be shed from a wind turbine blade should not disrupt the operation of the microwave as any falling ice pieces would be small in size and therefore would not block the entire beam path. Any piece of ice would also be in transit, and would act much like a bird flying through the beam path. Ice shedding risk assessment is discussed further in Section 3.10.

The potential for wind turbines to create interference of the microwave links was discussed by the County, Federal Engineering, Motorola Solutions Inc. (Motorola), TCI and Comsearch at the January 9, 2013 meeting. In addition, Motorola had previously stated that the Gutchess communications tower is 240 feet above ground level and the proposed East Side New tower is 195 feet above ground level. It was further stated that a microwave link cannot be affected by infrastructure sited beyond a distance equivalent to the WCFZ. By design the height of the microwave (240 feet) is calculated to ensure that the zone of potential impact would not be impacted by the ground. Therefore, wind turbines sited outside of a 240-foot buffer zone, applied to the link centerline should not cause any impact to the microwave path as they would be outside the zone of potential effect (pers. comm Chris Gabriel, 2012).

3.12.2.2.2 Television Systems

As described in Section 3.12.1.2, Comsearch (2012e) assessed the coverage of off-air television stations within a 75-kilometer (47-mile) radius of the Project area and the potential for degraded television reception as a result of the Project. The stations most likely to produce off-air coverage to the Project area are those within a distance of 75 kilometers (47 miles) or less. The off-air television available to the local communities is provided by a mix of translator stations that re-broadcast signals from distant markets such as Syracuse, Buffalo, Ithaca, and Binghamton.

The twelve full-power digital stations within 75 kilometers (47 miles) of the Project may have their reception disrupted in and around the turbines, or in locations on the opposite side of the Project area relative to the station antennas.

Although the potential for wind turbines to disturb some of the available channels at some reception points in the area is a possibility, Comsearch indicates that the TV stations are geographically distributed around the Project area, so that no community should have all of its available off-air channels affected by the presence of the turbines. In addition, recent surveys of TV reception in the U.S. found that only ten percent of households now rely solely on off-air television, while cable service and satellite are more likely the dominant modes of television service delivery. Specific impacts to TV reception would most likely include noise generation at low VHF channels within 0.5 mile of turbines, reduced picture quality (e.g., ghosting or shimmering), and signal interruption for analog modulation and pixilation, picture freeze, garbled audio and total loss of audio and picture for digital modulation (NWCC 2006, p. 50).

3.12.2.2.3 AM and FM Broadcast

According to Comsearch (2012a, p. 5), potential interference with AM broadcast coverage would only occur if turbines were located within 3.2 kilometers (2 miles) of AM broadcast stations with directive antennas, or within 0.8 kilometers (0.5 mile) of broadcast stations with non-directive antennas. Therefore, since all AM broadcast stations are located between 8.5 and 28.8 kilometers (5 and 18 miles) from the Project, no degradation of AM broadcast signals is anticipated.

According to Comsearch (2012a, p. 5), potential interference with FM broadcast coverage would only occur if turbines were located within 4.0 kilometers (2.5 miles) of FM broadcast stations. Therefore, since all operational FM broadcast stations are located between 6.8 and 28.8 kilometers (4.2 and 18 miles) from the Project, no degradation of FM broadcast signals is anticipated.

3.12.2.2.4 Mobile Phone Services

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

3.12.2.2.5 Land Mobile and Emergency Services Radio Coverage

Considering the frequencies at which these systems operate (450 – 475 MHz in the case of the County Radio System), (used for mobile data as well as digital audio communications), and the fact that these systems are designed to be used on the move, in an environment comprised of multiple stationary and moving obstacles such as traffic, vegetation and building screening, (clutter), degradation of coverage or signal strength should not be experienced when the turbines are installed. The Project Sponsor's enquiries with other Counties, who operate similar emergency radio systems in areas containing wind energy projects appear to verify this opinion, refer to Table 52 for a summary of such enquiries. Although wind turbines were not specifically modeled during the design of the Radio System, evolutions in the clutter landscape are anticipated when designing such radio systems please refer to explanations for 'Link Budget' and 'fade margins' contained in Section 3.12.2.1.. Furthermore, in anticipation of existing clutter in the landscape (such as high voltage transmission line towers, existing cell phone and radio towers, highways etc.) and the development of the clutter landscape, (due to addition of new buildings, telecoms towers, vegetation variable traffic flow on highways or wind turbines) the Radio System has been designed to allow for new simulcast sites to be added to the system should the need arise. This need could come from a degradation of service due to the addition of clutter into the landscape. As described in section 3.12.2.1., while the introduction of 44 steel structures within a fairly localized area (6 miles x 4 miles) is not typical of a rural clutter landscape, in practice, these multisite, simulcast systems can operate effectively in a cluttered environment such as this. This is evidenced by the many unaffected operational simulcast systems in areas that host wind farms, such as in Madison County, NY. The proposed turbine towers have a maximum diameter of 15 feet while the spacing maintained between turbine towers is approximately 1600 feet, meaning that there is a lot of free space for signals to propagate around the wind turbine towers. In addition, radio signals are affected by reflection, refraction and diffraction, meaning that the area that is shaded from a radio signal by a wind turbine tower will still receive the radio signal as it will bounce off elements in the environment or diffract around obstacles in the environment. Therefore, it is important to note that the addition of non-operational wind turbine tower structures alone is not expected to have any impact on the Radio System. This is the professional opinion of Comsearch who have stated that system coverage planning and system design for multisite, simulcast radio systems, contemplates an environment containing landscape clutter. Fade margins are introduced into the Link Budget to account for various types of fading effects (reflective multipath, shadowing, vegetation, etc.). Properly designed systems can operate in an evolving "cluttered" environment if adequate margins are established. These fade margins are also present to account for similar structures to be built in the future. While it is the firm opinion of Comsearch that, given the design criteria applied to multi-site simulcast systems, operating wind turbines will have little to no impact on the Land Mobile Radio system, it can be said that even less impact from reflections and scattering of radio signals (i.e. fading effects) is anticipated when the turbines are stationary. Generally, the lesser variability in the orientation and movement of the turbine blades would result in reduced reflections / scattering. Additionally, when just the turbine tower structures are present (as in during construction), Comsearch is of the professional opinion that the impact is even further reduced simply due to the fact that these structures are stationary, slender objects that do not justifiably present much of a barrier to the propagation of 450-460MHz radio signals, and thus are even less of a barrier to radio propagation as compared other features that typically exist in a rural environment (such as high voltage transmission line towers, telecommunications towers, grain silos, operating wind turbines, water towers etc. (Pers. Comm J. Marzin to G.McDonald, 2013). Given the opinions outlined above, the emphasis of any potential impact to the Radio System and any mitigation strategies have been focused on operation of the Project and not based on non-operational wind turbines. In addition, all of the permanent fixed licensed land mobile stations in the Crown City Wind Energy Project area are located more than 77.5 meters (254 feet) from the turbines. Thus the turbines meet the setback distance criteria for FCC interference emissions in the land mobile bands.

No impacts are anticipated to LMR and emergency services coverage, including Cortland County's new interoperable (911) system. Cortland County's new Radio System is designed to operate in a non-line-of-sight environment, and the frequency of the signals (c. 454 – 460MHz) also contributes to the system's ability for radio signals to propagate in and around physical objects such as moving vehicles, foliage, buildings and wind turbines. Therefore the system's Link Budget takes into account the effects of terrain, foliage, structures and other objects present in the environment and operates at sufficient margins to take into account evolving clutter levels. For example, the technology being utilized by the new Radio System could be designed to operate in an urban environment with multiple high rise buildings present, busy highways, large airports, shipping and trains present and moving within the environment. Therefore, the Radio System should have no problem operating in a rural environment with operating wind turbines present. Motorola has indicated that when they designed the multi-site, simulcast radio system for Madison County they made no specific allowance for the presence of the two existing wind projects (other than siting the microwave links away from wind turbines) and no detrimental coverage or service issues have arisen (Pers. Comm. C. Gabriel to G. McDonald, 2013). However, as referred in Section 3.12.2.1 above, the construction and operation of the Project will possibly increase the clutter levels. While the above professional opinions (that there will be no significant degradation to the County's radio system due to the introduction of wind turbines to the landscape) have taken this increased clutter landscape into account, (which appears to be supported by the Project Sponsor's enquiries with other Counties summarized in Table 52), there does still exist a remote possibility that the construction and/or operation of the Project could increase clutter levels to the point where a degradation in coverage reduces the quality of (Talk in / Talk out) service below the County's desired coverage threshold.

In order to empirically underpin and confirm the professional opinions of Comsearch, that the coverage levels will not be impacted by the construction of the Project, the Project Sponsor has undertaken a survey of other Counties, that operate similar microwave and radio systems and that have experienced the construction of a wind energy project, (and hence have wind turbine clutter in the environment) to understand if problems were experienced. Table 52 below provides an overview of all Counties that were contacted. In most cases, with the exception of Madison County, NY and a system upgrade in Lewis County, NY and Blair County, PA, the radio equipment had been installed prior to the installation of the wind projects. In the case of Blair County, the system has been recently upgraded (December 2012) from analog to digital portable units. The service level experienced now exceeds the previous quality of service. Two additional microwave / radio towers were added to the system as part of this upgrade which expanded the service coverage. There has been no degradation of service due to wind turbines being present in the County.

Table 52: Communications Systems Consultation with other Counties

County	Contact	System manufact-urer	Type of System / Frequency	No. of turbines in County	Voice & Data	Issues with communications
Franklin County, NY	**Ricky Provost** Dir. of Emergency Services	Unknown	Microwave 6GHz & 11GHz	Chateauguay Wind 71 turbines	Yes	No issues have been identified
Madison County, NY	**Paul Hartnett** Dir. of Communications	Motorola	Microwave & Radio VHF 150MHz 5GHz, 11GHz, 23GHz	3 Wind Projects 50 turbines	Unk	No issues have been identified
Clinton County, NY	**Kelly Donohue** Asst. Dir. of Communications	Motorola	Microwave & Radio 150MHz 800MHz	4 Wind Projects 258 turbines	Yes	No issues have been identified
Lewis County, NY	**Jim Martin** Fire/Emergency Mgmt. Officer	Unknown	Microwave & Radio 155MHz Fire: 46.112MHz	Maple Ridge Wind 195 turbines	Voice only	No issues have been identified
Wyoming County, NY	**Anthony Santoro** Dir. Fire & Emergency Mgmt.	Motorola / Harris	Microwave VHF, UHF Low band	4 Wind Projects 237 turbines	Unk	No issues have been identified
Steuben County, NY	**Tim Marshall** Dir. of Emergency Services	Motorola	Microwave & Radio 6GHz	2 Wind Projects 77 turbines	Unk	No issues have been identified
Herkimer County, NY	**Robert Vadawalker** Office of Emergency Services	Ericsson / JPG Comm.	Microwave & Radio VHF, Microwave 950 MHz & 5.9 GHz	Hardscrabble Wind 37 turbines	Unk	No issues have been identified
Tioga County, PA	**David Cohick** Dir.of Communications	Motorola	Microwave & Radio VHF 150MHz Microwave	Armenia Mtn. Wind 69 turbines	Yes	No issues have been identified
Blair County, PA	**Stephen Michelone Jr** Emergency Management	Motorola	Microwave & Radio UHF , 1.9GHz	3 Wind Projects 94 turbines	Unk	No issues have been identified
Cambria County, PA	**Steve Ettien** IT Director	Ceragon	Microwave & Radio 6GHz, 11GHz, 18GHz, Paging	3 Wind Projects 79 turbines	Yes	No issues have been identified
Schuylkill County, PA	**Scott Krater** 911 Director	Motorola (base stations)	Microwave & T1 High band 150-170MHz VHF - 46MHz	Locust Ridge I & II 64 turbines	Voice only	No issues have been identified
Somerset County, PA	**Richard Lohr** Exec. Director E-911 Services	Motorola	Microwave & Radio Low band, High band and 800MHz	2 Wind Projects 58 turbines	Voice only	No issues have been identified
Fayette County, PA	**Guy Napolillo** Communications	Motorola / Alcatel	Microwave & Radio 8GHz Trunked Simulcast system	2 Wind Projects 33 turbines	Yes	No issues have been identified

3.12.2.2.6 Paging System

Based on the number of base stations in the County's paging system (7) that provide wide geographical coverage of the County (see Paging System map in Appendix T), along with the UHF frequency utilized for the network, no impact on the paging receivers should occur after the installation of the wind turbines. This conclusion is based on the fact that at this Ultra High Frequency, (453.7375 MHz), little to no attenuation degradation of the paging signal is expected from the wind turbines. With multiple paging system base stations available to transmit the signal, the probability of an obstructed path from transmitter to receiver is low, even amongst the proposed turbines, since the area is surrounded by multiple transmitter locations. In situations where there is a turbine between the transmitter and paging receiver, the signal would still be sufficiently strong enough for reliable service.

3.12.2.2.7 NTIA Notification

In a letter sent to TCI, the NTIA stated that none of the agencies identified any concern regarding blockage of their radio frequency transmission (see Appendix T).

3.12.2.2.8 FAA Aeronautical Studies

The OE/AAA aeronautical studies were submitted for the proposed Project using the FAA's online Obstruction Evaluation / Airport Airspace Analysis (OE/AAA) consultation procedure. A screen shot of the information supplied for each turbine on the FAA's OE/AAA online consultation form has been included in Appendix D. The FAA studied a total of 51 potential wind turbine sites within the Project area and has made a Determination of No Hazard to air navigation for 50 of these 51 submitted locations. 43 of the 44 turbines proposed as part of this DEIS have received Determinations of No Hazard status notifications. Turbine 23 has been issued with a Notice of Presumed Hazard determination. See Appendix D – Agency Correspondence for a copy of these letters. TCI is working with the FAA to adequately resolve the identified presumed hazard associated with Turbine 23 and will continue to liaise with the FAA until Turbine 23 is granted a Determination of No Hazard to air navigation.

At the time of initial consultation with the FAA all turbine locations had not been finalized. Since that time, the Project layout was finalized for this DEIS, meaning that the initial 51 turbines, previously submitted to the FAA has been reduced to 44 turbines. A new consultation for four relocated wind turbines was initiated with the FAA through the OE/AAA consultation procedure, (Turbines 35, 38, 40, and 43). These turbines have now received Determination of No Hazard letters. If the FAA determines that any hazard associated with Turbine 23 cannot be eliminated or mitigated, then this turbine will either be relocated and restudied as part of the ongoing project development (which at the County's discretion may trigger the requirement for a supplemental DEIS), or the turbine could be removed from the Project.

3.12.2.2.9 Electrical Distribution and Transmission Systems

The Project's proposed underground 34.5 kV electrical collector system routing will not impact the existing overhead electrical distribution circuits contained within the Project area. During construction, if access tracks to the Project facilities have to cross under the existing electrical distribution then there is a risk that plant and machinery could cause damage to the existing distribution circuits. Given that there is no transmission infrastructure in the Project area other than the transmission corridor that the Project connects to then there are very limited impacts the Project could have on existing transmission systems. The impacts that the Project will have on the bulk transmission system are explained in more detail in Section 2.6.9.

3.12.2.2.10 Unlicensed Airfields

There is one known unregulated airfield within the Project area on Maybury Rd. This airfield is an unattended 1150 x 80-foot turf airstrip; permission must be requested from the owner prior to landing at this site. The airfield owner has been contacted and consulted with regard to the siting of the most proximate turbines to this facility, in order to minimize the impact that the Project may cause on his aviation operations. The owner has identified his routes of departure and approach and has had input into the Project design with regard to turbine siting. Consultation is still ongoing with the airfield owner and an understanding acceptable to all parties has been reached. The Project Sponsor and the owner anticipate that the airfield will still be available for use during Project operation.

3.12.3 Proposed Mitigation

3.12.3.1 Construction

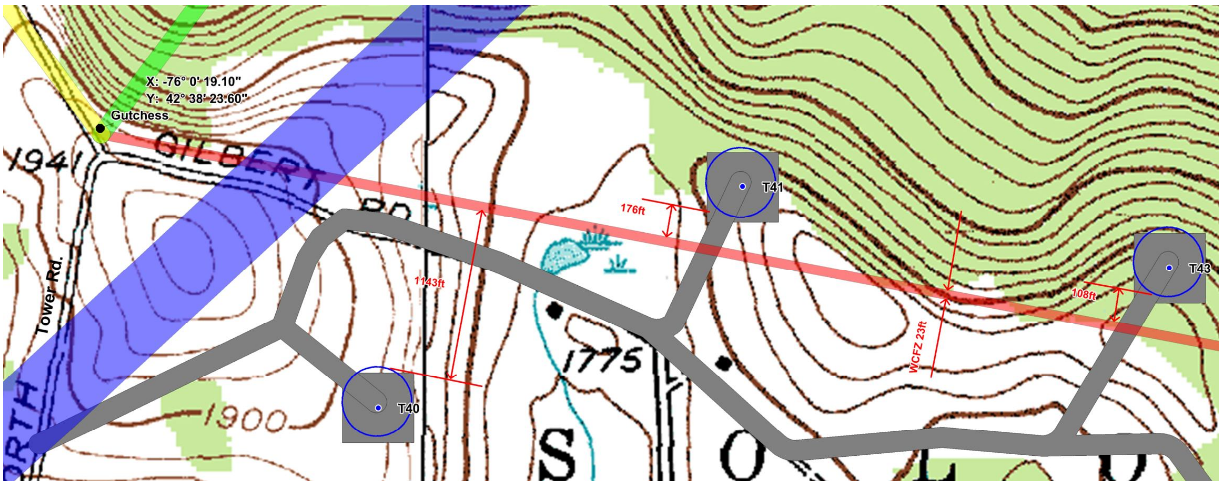
There is a low risk that disruptions to existing communication systems could occur as a result of Project construction. In the rare event that the impacts to telecommunications did occur it would likely be as a result of the following:

- Increased clutter being introduced by the erection of the wind turbines and this clutter leading to a degradation in wide area radio coverage (Talk in or Talk out) and signal intensity in the Project area below the County's required coverage threshold or by increasing the bit error rates (BER) on radio communications thus rendering the communications inaudible
- The process of construction causing a physical obstruction to an existing microwave beam path

Mitigations for each potential impact are discussed in more detail below:

3.12.3.1.1 Microwave Communications Systems

Turbines, including the furthest extent of their blades, have been placed a minimum of 100 feet from the edge of the microwave Worst Case Fresnel Zones (WCFZ). Hence, the process of turbine erection should not interfere with the microwave paths; however, any such impact will be assessed on a turbine specific basis as part of the construction and turbine erection planning process.



Representation of how the proposed wind turbine locations have been located in order to avoid the wind turbine blades from entering the WCFZ. A minimum dimension of 100 feet (actual achieved minimum buffer on proposed layout is 108 feet) has been assumed for tolerance and to allow for turbine erection and craneage. Detailed drawings of achieved setbacks of the most proximate proposed wind turbines from existing WCFZ (for the Radio System) are included in Appendix T – WCFZ Maps 1-4. The table of Link Separation Distances in Appendix T shows the distances of all wind turbines to the closest WCFZ.

Turbine erection will be properly planned and executed as efficiently as possible (under favorable conditions, one turbine can be erected in one day). Therefore, further mitigation is not anticipated other than that assessed as part of the operational impact of the Project on communications systems. A minimum 264 foot buffer (100 foot WCFZ buffer + 164 foot extent of blade) will be maintained between wind turbine towers and all WCFZ's. Therefore micrositing of wind turbine towers will not occur within 264 feet of the outer edge of any WCFZ to ensure that no part of a wind turbine will encroach on the WCFZ 100 foot buffer, applied to enable a mapping tolerance and sufficient working space during construction.

3.12.3.2 Operation

3.12.3.2.1 Microwave Communication Systems

As indicated above, none of the turbines were found to have a potential conflict with the incumbent microwave WCFZ's. Therefore, no mitigation, other than that described in the construction mitigations section is warranted or proposed. Validation of this statement by Cortland County's independent consultant may be made a condition of FEIS approval.

3.12.3.2.2 Television Systems

The Comsearch (2012e) report indicates that impacts to existing off-air television coverage are possible. If Project operation results in any impacts to existing off-air television reception, the Project Sponsor will address and resolve each individual problem as necessary. Included in Appendix L1 is a Complaint Resolution Plan, which sets forth the general parameters to be used to resolve any complaints that may arise during project construction or operation. Mitigation actions, should they be needed for verified issues of signal degradation for households that currently only receive over the air television, can take many forms and shall be resolved on an individual basis. Mitigation actions could include adjusting existing receiving antennas, upgrading an antenna, or providing cable or satellite systems to the affected households.

In addition, high-power television broadcast stations ceased analog operations in June 2009 and began broadcasting exclusively in digital format. Low-power TV broadcasters and translators were exempt from the FCC's digital requirement, and may still broadcast analog signals. Since translator stations rebroadcast high-power stations to a limited local audience, their programming is typically in digital format as well. Analog television broadcast signals are subject to variations in signal level by the motion of wind turbine blades, which may result in distortions in the contrast, brightness, and clarity of the video. In addition, changing reflections produced by the motion of wind turbine blades may cause ghosting. Digital television signals are also subject to level variations and reflections, but as long as the signal remains above the operational threshold of the receiver, the video produced is unaffected. Wind turbines can cause signal attenuation in both analog and digital signals. However, because they require a much lower signal level to produce excellent video, digital signals can withstand the attenuation effect to a greater extent. For analog television, as the signal is degraded by external effects, video quality is reduced in a sliding scale of performance. For digital television, as the signal is degraded, the video quality remains excellent until the signal level falls below the operational threshold of the receiver. Since the conversion to digital broadcast, there has been an improvement in television reception in the vicinity of wind energy facilities (Polisky, 2011).

3.12.3.2.3 AM and FM Broadcast

Due to its geographic location relative to existing AM and FM broadcast stations, and the nature of propagation of these radio signals, the Project will not impact AM/FM coverage. Any future Project modifications (if any) would occur within or immediately adjacent to the current Project area. Therefore, mitigation is not necessary.

3.12.3.2.4 Mobile Phone Services

The nature of the propagation of radio signals at the frequency used by cellular networks the downlink (from the cell towers) and the uplink (from the handheld device) transmissions will not be impacted by the Project. Unlike microwave beams, cellular uplink and downlink communications take place over a dispersed area and are thus unaffected by obstacles, or the motion of the handheld user (i.e., mobile phones work perfectly well when travelling in a motor vehicle as long as the user stays within range of one or more communications towers).

If an AWS, Cellular, or PCS company were to claim that their coverage had been compromised by the presence of the proposed Project, coverage could be restored by installing an additional cell or an additional sector antenna on an existing cell for the affected area. Utility, meteorology, and/or the turbine towers within the Project area could serve as the structure platforms for the additional AWS, Cellular, or PCS base station or sector antennas. Although no impact is anticipated, if there is a report of interference with an AWS, Cellular, or PCS system in the area, the Complaint Resolution Plan Methods set forth in Appendix L1 may be invoked.

3.12.3.2.5 Land Mobile Radio (LMR) and Emergency Services Coverage

Comsearch has completed an analysis of the registered frequencies used by emergency first responders, businesses and E911 operators in the Project area. No impacts are anticipated to LMR and emergency services coverage, including Cortland County's new interoperable (911) system (Radio System).

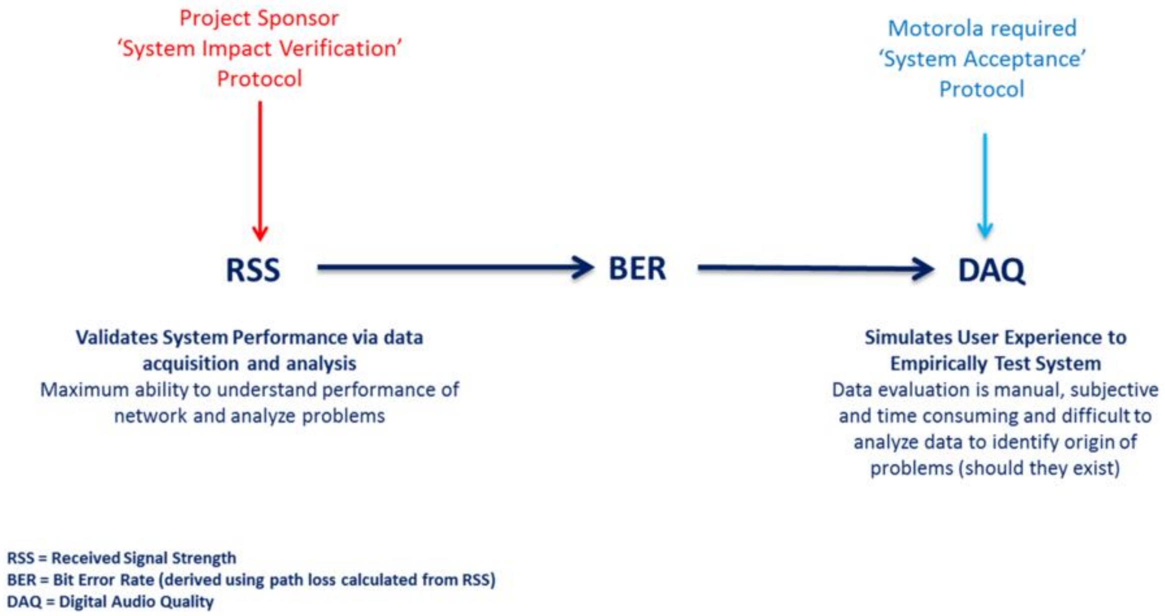
County's Radio System

At the time of writing the DEIS the Radio System was under construction pursuant to a turnkey contract between Cortland County and Motorola covering radio and microwave engineering, network development, construction, supply of radio sets, network commissioning and associated training. The Radio System consists principally of seven new lattice telecommunications towers (ranging in height from 180 to 300 feet above ground level) together with the upgrade of one existing radio site (250 foot tall Virgil tower). The Radio System will provide wide area radio coverage using Motorola's ASTRO 25 UHF digital simulcast radio technology and will be backhauled using a network of microwave links (refer section 3.12.3.2.1 for potential impacts to these microwave links). As referred above, for the network to operate both elements (i.e. the microwave backhaul and the wide area radio coverage) need to remain operable.

As referred in Section 3.12.3.1.5 it is not anticipated that the Radio System will be impacted by the construction or operation of the Project. However, it is acknowledged that the Radio System represents a considerable investment for the County and therefore as part of the proposed mitigations there is sufficient justification to deploy a formalized procedure to establish the performance of the Radio System network in the Project area prior to construction and then compare this to performance of the Radio System network in the same area once the Project has been constructed, in order to determine that the County's required coverage (Talk in and Talk out) and signal intensity is maintained and that Bit Error Rate (BER) is within an acceptable limit. Although the turbines will increase the clutter level in the landscape, it is not anticipated that non-operational turbines will create noticeable interference to the

Radio System and thus the first line of proposed mitigation being to cease operation of the wind turbines would be considered highly likely to immediately resolve any impacts, until such time as the permanent mitigations can be implemented. The procedure for determining the baseline performance of the Radio System prior to turbine installation (i.e. extent of coverage and specific signal strength and Bit Error Rate) will be to perform a drive study of the roads in the Project area. The drive study will be performed immediately prior to construction of the Project, by a specialist company, acceptable to both TCI and Cortland County, utilizing a vehicle fitted out with specialist equipment to enable it to monitor and record location, signal strength, derive digital Bit Error Rate (BER) etc. Coverage testing for the system shall adhere to the Telecommunications Industry Association (TIA) Telecommunications Systems Bulletin (TSB) #88-C. RF coverage is defined as the digital Bit Error Rate that provides a minimum Digital Audio Quality (DAQ) 3.4 audio signal for both outbound (talk-out) and inbound (talk-back) communications.

A diagram contrasting the methodologies to be used by Motorola (for the purposes of its contractual 'system acceptance') and by TCI to determine whether any impacts to the Radio System have occurred from the Project is summarized in the diagram below. As can be seen from the diagram, TCI's understanding of Motorola 'systems acceptance' is orientated towards simulating the experience of a radio user and is thus more empirical in its origins. In addition to completing a similar coverage acceptance test in the same test locations used by Motorola for verification of the system performance level, the enhanced data acquisition to be undertaken by the Project sponsor will determine by quantitative analysis the performance of the Radio System prior to the Project being constructed and after it has been completed. This is envisaged to provide the most robust methodology for determining if the Project has impacted the Radio System and because it will be implemented before and after Project construction it minimizes any problem in defining the source of impact to the Radio System arising from the construction or operation of the Project.



Drive measurements will be performed utilizing a specially instrumented vehicle. The vehicle will contain a UHF antenna that covers the UHF Band (i.e. the operating frequency of the Radio System and the paging system). The antenna will be mounted on top of the van along with a GPS antenna. The received signal data gathering antenna will be interconnected through low-loss coaxial cable connected to an RF Eye Spectrum Analyzer Receiver, which can simultaneously receive all the Cortland County trunk radio signals in the area and determine their signal strength. All trunk channels will be monitored by the RF Eye Receiver during the measurements. The GPS receiver will be used to note the location of each sampled measurement. Measurements will be made using a sample rate of 10 milliseconds, which means that at the highest speed driven, 55 miles/hour, samples will be taken at 0.8 foot intervals. The Firebird BER test set will derive the BER every 5 seconds; a test signal may need to be sent in order to test BER. The Firebird BER test set analyzes the number of (full or distorted) bits received and calculates the number of bits lost as a percentage of bits sent. The signal strengths and BER sampled by the RF Eye Receiver, GPS Receiver and Firebird BER test set will be fed into a lap top computer. The data will then be recorded for each mobile transmitted trunk channel. The location for the sampled data point will be also fed to the computer so that all samples taken have a location reference. The signal strength and location data will be recorded in an Excel format. After the measurements are complete the data will be turned over to the GIS staff for plotting on overlay maps of the Project area and surrounding areas. A diagram for the vehicle conducting the drive study measurements is shown in the figure below.

In order to measure any effect of wind turbine installation on the talk-back capability of Radio System users' portable and mobile radios, during the drive tests the "path loss" (which includes all external characteristics that affect the path, such as multipath signals from multiple simulcast sites), will be measured. The path loss is measured using the signal received from the Radio System base station radio transmitter and transmitting antenna. This is the down-link (talk-out) signal that will be used to characterize the path loss between the simulcast site and the signal level measured at the test vehicle (the signal level that would be present at the remote unit (users' portable / mobile radio)). Because the path loss parameter is the same whether the signal is going to or from the remote units, the path loss measured in the down-link measurement can be used for the calculation of the signal level received at the base station antenna from the handheld or vehicle mounted radio. To model the signal level at the at the base station site from the remote unit, or the up-link (talk-back) signal, the down-link transmitter and base station antenna power will be substituted with the transmit power and antenna gain of the remote unit. Using these parameters the signal level to be received at the base station antenna from the remote unit can be determined and thus validated as to whether an acceptable uplink (talk-back) communication will be possible. Since the path loss will be defined in the measurements, (and the signal coverage, BER and DAQ is a function of the path loss plus the other parameters that are defined by the Radio System), the talk-back characteristics in the base stations can be calculated from the results of the talk-out (down-link) measurements.

Analysis of the paging system is described in Section 3.12.3.2.6.

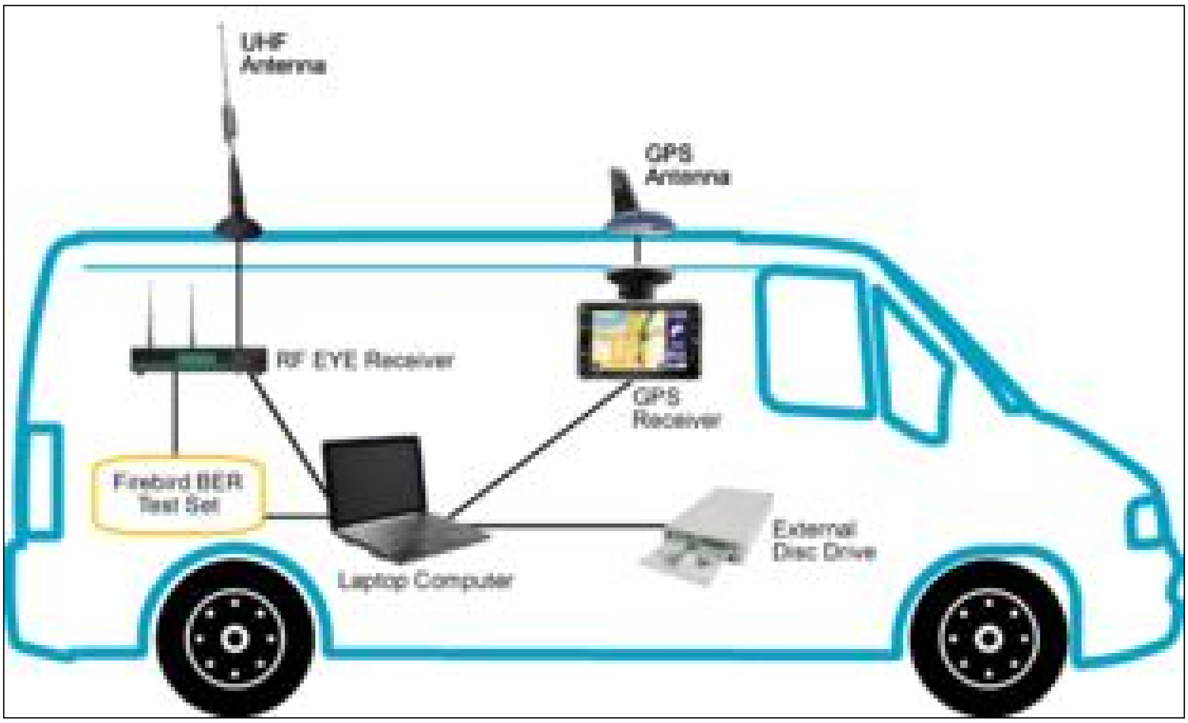


Diagram of vehicle used to perform RF analysis drive tests

The flowchart on page 342 summarizes the process for undertaking the drive study prior to construction and re-validation upon commissioning of the Project.

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All drive studies will be undertaken in full leaf conditions on all public roads within the Project area and to the extent considered relevant by the County, would be repeated to take account for representative wind directions, blade pitches and wind speeds (in order to simulate varying turbine orientations). The Project owner and the County (and their advisors) would then review the conclusions of the third party drive study and determine if the performance of the Radio System has been impacted by the construction of the Project. All drive study costs and the County's review thereof would be funded by the Project owner. In the event that impacts are identified by Radio System users prior to this occurring then the mitigations process would be implemented immediately, as indicated in the process described in the flowchart on page 342.

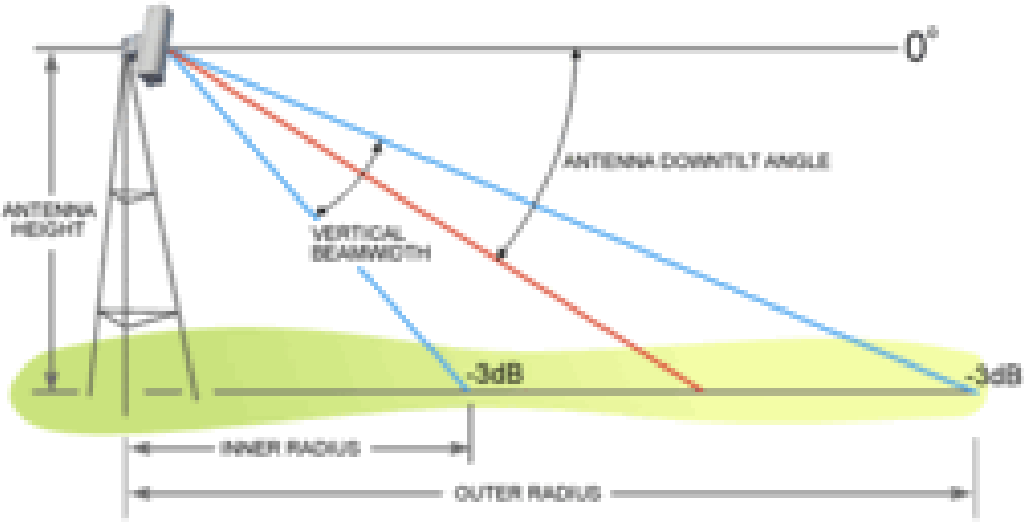
In the event that an impact to the Radio System is identified (either by post construction drive study or prior to that by Radio System users) and that radio coverage, DAQ, BER, and/or signal intensity is below the County's requirements then the Project owner would be responsible, with time being of the essence, for mitigating the identified impacts. Currently the identified mitigations (to be undertaken at the Project owner's cost) include, one or more, of the following:

- Cease operation or further construction of wind turbine(s) until such time as a further mitigation is deployed (it is not anticipated that a non-operational turbine will cause interference to the Radio System)
- Deploy a temporary simulcast site in order to provide temporary infill coverage and validate such infill to the satisfaction of the County and re-optimization / re-phasing of sites by Motorola if deemed necessary
- Construct an additional permanent simulcast site to provide infill coverage to the impacted area and re-optimization / re-phasing of sites by Motorola (Project owner to be responsible for entire Radio System (30 year design life) lifecycle costs (to be refunded by the County in the event of subsequently receiving state or federal grants), land easements and/or assignment of easement rights for access to towers by Cortland County, power supply, permitting process and associated costs). If determined to be feasible, the Project owner could locate the permanent infill simulcast site at / on one of the proposed permanent met towers deployed as part of the Project and provide the County with a perpetual lease for the duration that the Project continues in operation. Any such infill radio tower may be at a lower elevation than the existing radio towers, given that the specific intention would be to solve localized coverage or signal intensity. Hence, directional antennas, mechanically down-tilted could be used to concentrate the radio signal in the specific area requiring mitigation. Refer to the discussion below regarding minimization of coverage overlap with adjacent radio towers and associated Bit Error Rate issues that could arise. Any such infill repeater sites will be constructed to the same specifications as the Radio System towers. The typical tower requirements, provided by Federal Engineering (Cortland County's consultant) are available in Appendix T
- If deemed necessary and beneficial to the Radio System, tower mounted amplifiers, to enhance the wide area coverage and increase radio power levels, could be added to specific radio towers. This would be

followed by re-optimization/re-phasing of the Radio System by Motorola. The tower mounted amplifiers would be located on the towers between the radio equipment and the antennas and would amplify the signal strength with the intent of improving coverage area and/or signal strength. The installation of tower mounted amplifiers at specific radio towers could be implemented in conjunction with re-alignment and/or down tilting of the associated antennas and would also likely lead to the need to re-optimize/re-phase the other radio towers and/or to re-orientate antennas on the other towers. The intent of the optimization would be to minimize the areas of coverage overlap from adjacent radio towers thus mitigating against an increase in Bit Error Rates (defined as the number of bits of a data stream over a communication channel that have been altered due to noise, interference, distortion or bit synchronization errors, with the Bit Error Rate being the number of bit errors divided by the total number of transferred bits during a studied time interval).

- Given that the intent of any mitigation is to remedy any degradation to Radio System service and therefore minimize the areas of coverage overlap between adjacent radio towers, the Project Sponsor could install additional directional radio equipment and associated sector type antennas at an existing radio tower (possibly at lower elevations) in order to provide more concentrated coverage to infill the specific area that has been impacted by the Project. These antennas may be installed at a lower height than the existing system antennas and can be designed to operate at lower power, with a downward facing tilt so that the coverage area is restricted to only the impacted area. Therefore this signal would not cause interference to other simulcast signals by increasing the overlap areas, which may lead to an unacceptable Bit Error Rate. This equipment and these methods also reduce the risk of other RF interference. Re-optimization/re-phasing of sites including time synchronization of signals by Motorola will be performed if required.
- Such other mitigations that may evolve resulting from ongoing dialogue between the Project Sponsor, the County and their Radio System consultants and contractors and public review and comment or in drafting of the FEIS or subsequently.

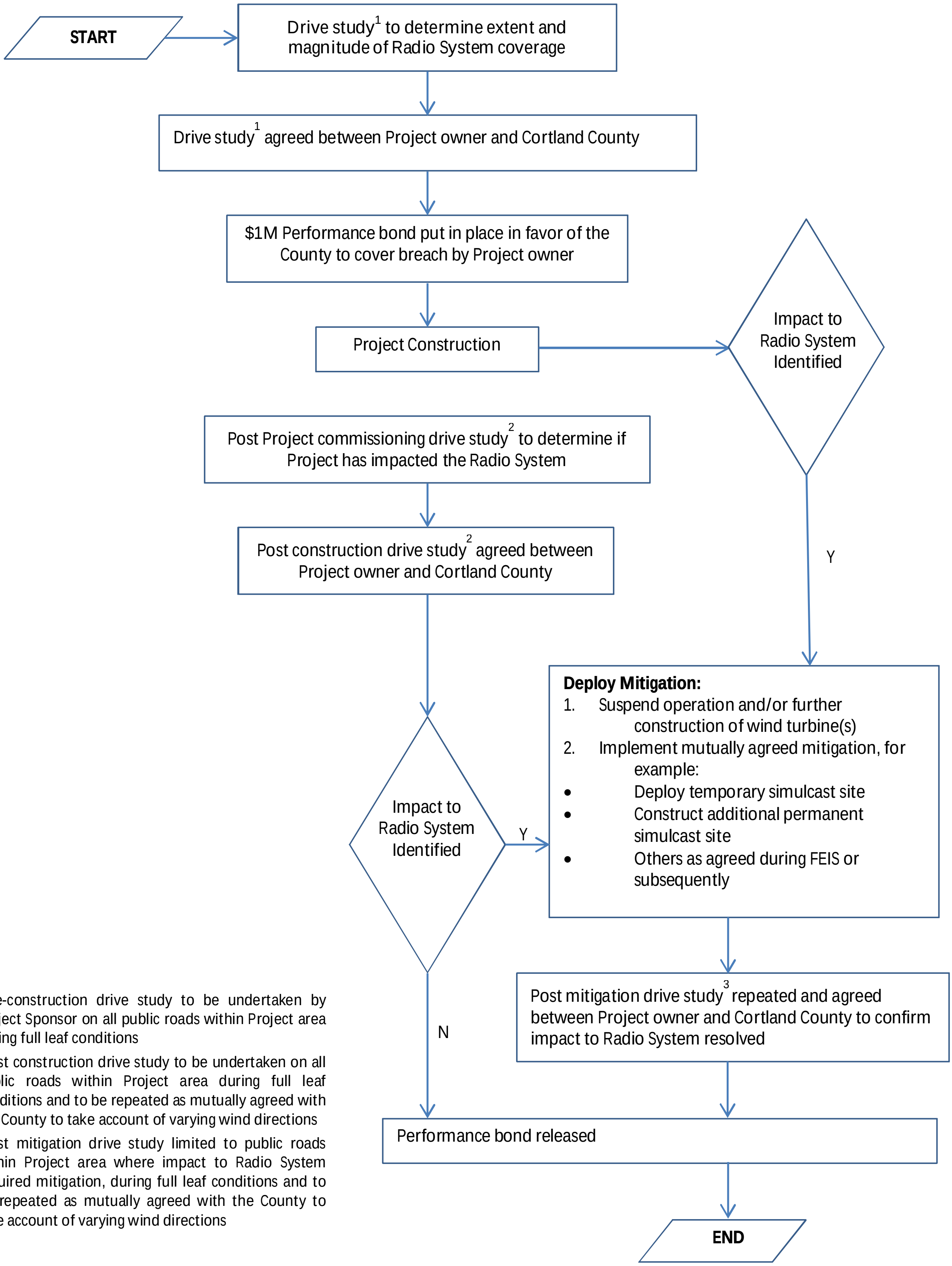
In order that the County is adequately protected for a breach of the Project owner's obligations, a $1M performance bond shall be put in place by the Project owner which could be called by the County in the event of a breach of the process described on the following page. The exact value and terms of the bond are to be agreed by TCI and the County during the public comment period following release of the DEIS. TCI shall bind any future purchasers of the Project to this and any other conditions arising from the FEIS findings.



Source: wirelanantennas.com

Diagrammatic representation of mechanical down tilting of an antenna to achieve localized infill coverage, as discussed above. This technique could be deployed to solve local coverage shadowing and/or signal strength issues arising from construction of the Project. This method could be deployed at new towers constructed to mitigate impacts to the Radio System or through installation of directional antennas at lower heights on the existing towers that form part of the Radio System. In all cases it is expected that the overall Radio System would have to be re-optimized / re-phased.

DRAFT PROCESS FOR VALIDATING IMPACT OF WIND PROJECT ON COUNTY RADIO SYSTEM



[1] Pre-construction drive study to be undertaken by Project Sponsor on all public roads within Project area during full leaf conditions

[2] Post construction drive study to be undertaken on all public roads within Project area during full leaf conditions and to be repeated as mutually agreed with the County to take account of varying wind directions

[3] Post mitigation drive study limited to public roads within Project area where impact to Radio System required mitigation, during full leaf conditions and to be repeated as mutually agreed with the County to take account of varying wind directions

Draft Environmental Impact Statement, February 2013

If there is a reported change in LMR coverage in the area, the Project owner will be responsible for remedying any such impact at no (short or long term) cost to the County. This could be accomplished by adding or positioning simulcast sites, directional antennas, repeaters or signal amplification at locations within the Project area. New infrastructure could be installed on utility, meteorological, or turbine towers within the Project area as needed. Any new towers that are proposed to be used for mitigation of impacts to the Radio System shall be designed to the same specification as the Radio System towers. These typical tower requirements, provided by Federal Engineering (Cortland County's consultant) are available in Appendix T. TCI's guarantee to rectify any issues, should they occur as a result of the Project, may be made a condition of FEIS approval.

3.12.3.2.6 Paging System

No reduction in service is predicted for the Cortland County paging network after installation of the Crown City Wind Energy Project. As a conservative measure, pre-installation measurements for the paging system could be performed during the drive study, at the same time that a baseline measurement is made for the Radio System, as described in detail in Section 3.12.3.2.5 above. The UHF antenna used will be calibrated and be able to cover the entire UHF band including both pager and Radio System frequencies. The methodology for measuring the paging system signal strength is the same as the methodology described in Section 3.12.3.2.5. The RF Eye receiver is able to measure multiple signals (both digital and analog) simultaneously. After installation of the wind turbines, the measurement may be repeated to ensure that the paging system is operating reliably. The Paging System Assessment is available in Appendix T. Although very unlikely, should there be a reduction in paging network service due to the introduction of the Project the paging signal could be strengthened by increasing the transmit power of the analog UHF paging signal affected paging system base stations or in a worst case scenario adding an additional low power base station in the area with coverage loss while keeping the original base stations at their original power level.

3.12.3.2.7 NTIA Notification

As indicated above, according to the NTIA Notification letter, (see appendix T) there are no anticipated impacts from the proposed Project on federal radio frequencies. Therefore, no mitigation is required.

3.12.3.2.8 FAA Aeronautical Studies

The FAA obstruction evaluation aeronautical studies for the proposed Project have been conducted. The FAA has made a Determination of No Hazard for 43 of the 44 turbines. Turbine 23 has been issued with a Notice of Presumed Hazard determination. See Appendix D – Agency Correspondence, for a copy of these letters. TCI is working with the FAA to adequately resolve the identified presumed hazard and will continue to liaise with the FAA until Turbine 23 is granted a determination of no hazard to air navigation.

Turbine 23 as currently proposed would penetrate vertically into the Greater Binghamton Airport Minimum Vectoring Altitude (MVA) area. TCI has applied to the FAA for a map and description of the MVA in order to avoid it through micrositing of the turbine. TCI may also apply to the FAA and local air traffic control, to increase the ceiling height of this MVA so that Turbine 23, in its current location, would no longer penetrate it. Given that there are other turbines in close proximity to Turbine 23, that do not penetrate the ceiling height of this MVA, and which are of the same or greater height above mean sea level, there appears to be a reasonable possibility that this request will be granted by the FAA.

At the time of initial consultation with the FAA all turbine locations had not been finalized. Since that time, the Project layout was finalized for this DEIS meaning that four turbine sites, previously submitted to the FAA have changed location. A new consultation for these four wind turbines (Turbines 35, 38, 40 and 43), was initiated with the FAA through the OE/AAA consultation procedure. These turbines have now received Determination of No Hazard letters. The FAA clearance will be obtained prior to completion, and may be a condition of the FEIS findings. If the FAA determines that the hazard associated with Turbine 23 cannot be eliminated or mitigated, then Turbine 23 will be eliminated from the Project. If any turbines are to be microsited or have their location changed, a re-study of the new turbine locations will be completed by the FAA prior to construction. Depending on the other impacts the County may at that time request a supplemental DEIS. Thus, the Project will not result in impacts to airspace and nearby airports, and further mitigation, other than achieving a Determination of No Hazard to air navigation for all turbines, is unnecessary.

3.12.3.2.9 Electrical Distribution and Transmission System

Suitable controls will be implemented during construction where access to the Project is required to go under existing overhead distribution circuits. These controls will involve compliance with appropriate procedures governing the operation of construction plant in the vicinity of overhead distribution equipment. In order to ensure no underground circuits are in the Project area, the Project Sponsor will also coordinate with Dig safely NY prior to the commencement of any construction activities. With respect to the Project's connection to the bulk transmission system, this work will be done in conjunction with NYISO to ensure adequate controls and measures are put in place to avoid adversely impacting the electrical transmission system.

3.12.3.2.10 Unlicensed Airfields

As indicated above, according to consultation with the operator of the relevant airfield, there are no anticipated impacts from the proposed Project. Therefore, no mitigation is required.

3.13 LAND USE AND ZONING

This sub-section is organized as follows:

- 3.13.1 Existing Conditions
- 3.13.2 Potential Impacts
- 3.13.3 Proposed Mitigation

Land use and zoning in the Project area was determined through review of local town zoning ordinances and zoning district maps, tax parcel maps, aerial photographs, and field review conducted in the summer of 2012. Land use and zoning are discussed in terms of regional land use patterns, on-site classifications, and future land use.

3.13.1 Existing Conditions

3.13.1.1 Regional Land Use Patterns

The proposed Project is located in the Towns of Cortlandville, Homer, Solon, and Truxton, in central Cortland County. Cortland County is located in south-central New York within both the Central New York region and the Southern Tier region. It borders Onondaga County to the north, Madison and Chenango Counties to the east, Broome and Tioga Counties to the south, and Tompkins and Cayuga Counties to the west.

The Project is located within the Southern New York section of the Appalachian Plateau physiographic province, which is characterized by glacial features including moderate relief, and deeply incised valleys (USDA 2009). Much of Cortland County is forested, providing for timber and maple syrup production. In 2007, there were 587 working farms in Cortland County, occupying 124,824 acres, or 39% of the County. Dairy farming is the primary agricultural activity in the county and corn and hay are the major field crops planted (USDA 2009). New York State forestland, rural residential homes, and private seasonal properties are scattered throughout the county. Natural gas is another resource for the county, with gas wells located in the southern portion thereof. Within the vicinity of the Project, there are several state forests within approximately five miles (as measured to the nearest turbine), including Donahue Woods State Forest (0.5 mile), Taylor Valley State Forest (1.5 miles), Baker School House State Forest (1.9 miles), Dog Hollow State Forest (3.4 miles), and Hoxie Gorge State Forest (4.4 miles). There are no state parks, state forest preserves, state wildlife management areas, or state nature preserves in the vicinity of the Project area.

The land use patterns in the Towns of Cortlandville, Homer, Solon, and Truxton are similar to those of the greater region. The City of Cortland, the County's main population center with 19,204 residents is located in the Town of Cortlandville (US Census Bureau 2010). This populated area stands in stark contrast to the character of the majority of the county land area. Apart from the City of Cortland, small hamlets, and villages; the towns are all rural in nature and generally characterized by wooded uplands and valleys occupied by roads, fields, pastures, and residential/commercial development. The East Branch of the Tioughnioga River flows southwest through the center of the County, with the West Branch flowing South, in the vicinity of these four towns. The two branches meander through valleys between the high wooded ridge lines and meet in the City of Cortland to continue south as the Tioughnioga River, which eventually flows into the Chenango River. The hamlets of East Homer, Homer, McGraw, and Solon are primarily located in these four towns. Major transportation corridors include Interstate Route 81, U.S. Highway 11, New York State Route 417, New York State Route 13, and New York State Route 41. Many of the large, steep wooded ridges in the County have either paved or dirt road/driveway networks allowing private access for timber or other extraction industry purposes.

According to the New York State Office of Real Property Tax Services (NYSORPTS), 63% of all parcels of land within the Town of Cortlandville are designated as residential properties, with Homer, Solon, and Truxton at 70%, 55%, and 52%, respectively (NYSORPTS 2012b). Residential development, consisting of single-family homes and farmhouses, is concentrated along state, county, and local highways mostly in the valleys. However, despite the large amount of land in the region being dedicated to forestry and agriculture, relatively few residents work primarily in those industries. According to the New York State Labor Department, in 2011, 176 residents (1% of those employed) of Cortland County were engaged in Agriculture, Forestry, Fishing, or Hunting as their primary occupation. Consequently, it is reasonable to conclude that most residents commute to areas of more concentrated commercial, industrial, and service activity such as the City of Cortland, south to the City of Binghamton, southwest to the City of Ithaca, or north to the City of Syracuse.

3.13.1.2 Project area Land Use and Zoning

The Project area has a rural and low-density character, with forestland and agriculture as the dominant land uses. The Project area is mostly forested, with agricultural fields located along the valley roads and on nearby gentle rolling hills. Residential land use is minimal in the Project area, with single-family homes located along public roadways adjacent to the Project, including Heath Road, McGraw North Road, and Maybury Road. Also located within the Project area is the Cortland County landfill near the intersection of Warren and Town Line Roads, and the abandoned Intermont ski resort center (and nearby abandoned communications tower) at the eastern end of the Project area just east of County Route 502 (North Tower Road).

According to the NYSORPTS (2012b), the Project area consists of six distinct land use types (Figure 15). The majority of the Project area (approximately 2,813 acres [38%]) is categorized as agricultural lands. Approximately 1,610 acres (22%) is characterized as public parks, wild, forested, and conservation lands, which is described by the NYSORPTS as "reforested lands, preserves, and private hunting and fishing clubs". Vacant land, which constitutes approximately 598 acres (8%), is described as "property that is not in use, is in temporary use, or lacks permanent improvement". Residential land uses make up 1,857 acres, or 25%. Community services land uses, which are described as “property used to provide services to the general public” account for 127 acres, or 2%. Finally, Public facilities land uses account for 504 acres, or 7% of the Project area.

Cortland County has a designated Agricultural District established pursuant to the New York State Agriculture and Markets (NYSA&M) Law. Portions of the Project occur in the Agricultural District (Figure 16).

Three of the four towns have zoning ordinances (the Town of Truxton is the exception), the relevant portions of which are described as follows:

In the Town of Cortlandville, “Chapter 178 of the Town Code – Zoning (2010)” establishes the following zoning districts: AG Agricultural, Residential R-1, Residential R-2, Residential R-3, Neighborhood Business B-1, Highway Commercial Business B-2, Planned Commercial Business B-3, Light Industrial, Office, Business Park I-1, General Industrial I-2, and Planned Unit Development PUD Districts. With the goal of protecting its single source aquifer, the Town has a Wellhead Protection Overlay District and an Aquifer Protection Overlay District. All turbines and infrastructure proposed as part of this project within the Town of Cortlandville are located in the AG Agricultural zoning district and are not within either the aquifer or wellhead protection overlay districts. The AG district is intended to “provide areas within the Town to be used primarily for the raising or producing of agricultural products” (Town of Cortlandville Code §178-11). Within this district there are a number of land uses permitted, uses subject to site plan approval, and uses subject to conditional use permits. Transportation and utility uses require a conditional use permit. Additionally, the Town of Cortlandville has enacted a temporary ban or moratorium on the construction of commercial wind turbines until June 31, 2013 while they consider regulations specifically governing wind energy facilities (Town of Cortlandville 2012). A draft local law for the regulation of wind energy facilities was presented to the Town Board on August 2, 2012.

In Homer, the “Town of Homer Zoning Law (2008)” establishes the following districts: Agricultural, Residence, Lakeside, Business, Industrial, Planned Unit Development, and Aquifer Protection Districts. These districts regulate uses as either permitted, permitted with a conditional use approval, or permitted subject to site plan review. All of the turbines and associated infrastructure sited in the Town of Homer are located within the Town's Agricultural district. This zoning district is set forth to, "protect agricultural lands and uses from incompatible uses…" (Town of Homer Zoning Code §401). Similar to Cortlandville, §403 enumerates utility uses as a permitted conditional use within the Agricultural district. The Town Board is currently considering drafting new regulations regarding the siting of wind energy facilities to supplement the zoning code.

Finally, land uses in the Town of Solon are regulated by the Town of Solon Zoning Law: Local Law #1 for 1999. This includes the following four zoning districts: Residential, Agricultural I, Agricultural II, and Commercial. The zoning law enumerates which uses are permitted in each zoning district. All of the project turbines and most of the associated infrastructure sited in Solon are located within the Agricultural I and II zoning districts. A small portion of electrical collection line crosses through a Residential zoning district at Maybury Road. Necessary structures associated with public utilities are a permitted use within all three districts. Town officials are considering new regulations regarding commercial wind energy facilities.

As stated above, the Town of Truxton does not regulate land uses through zoning, and thus, has not established zoning districts and does not have local zoning regulations. However, the Town does have Site Plan Review, which can deny applications for change of use, and officials are currently considering drafting regulations governing commercial wind energy facilities.
At the current time, the Project Sponsor has not applied for or received any official determinations from the Towns as to the applicability of their zoning laws.

3.13.1.3 Future Land Use

Project compatibility with community character and future land use plans is discernible in general terms through an examination of adopted comprehensive plans or master plans, or zoning ordinances where such plans may not be available. Compatibility with these plans and ordinances is discussed in further detail below:

- The Town of Cortlandville's comprehensive plan was adopted in 1977. As it is considered out of date and no longer effective for such purposes, it is no longer referenced by the Town when considering land use decisions (Webber, 2012). Recent updates to the Town's zoning ordinances provide some indication of intended future land use throughout the Town. The development of a wind power generation facility is compatible with the intent of the Agricultural district, which would encompass all Project turbines within the Town of Cortlandville, subject to the approval of conditional use permits (Town of Cortlandville 2010). Additional discussion regarding district regulations is included below.

- The Town of Homer's comprehensive plan, adopted in 2002, does not specifically address utility development in general or wind farm development in particular as a potential future land use. However, the plan does favor development which respects the rural nature of the surrounding area, incorporates appropriate setbacks between different use types, and provides economic benefits to the Town (Town of Homer 2002). The development of the proposed facility is compatible with such goals.
- The Town of Solon's master plan, adopted in 1980, was expected to last 15 to 20 years. While distributed energy facilities such as wind turbines are not specifically referenced in this plan, it is noted that energy efficiency is a key concern within the plan, due to the 1979 oil crisis. Although energy facilities are not included within the master plan's goals or objectives, the community's rural character and the viability of local agricultural concerns do figure prominently (Town of Solon 1980). The proposed facility is therefore largely compatible with the master plan, as it does not represent an extensive change in land use patterns and may provide additional revenue to agricultural property owners.
- Although the Town of Truxton's Development and Land Use Plan, adopted in 1990, was never implemented through zoning ordinances, it does provide a resource for examining previous future land use goals. Goals for maintaining rural character and the viability of local agriculture are also featured in the Town of Truxton's plan, which (like Solon's) recognizes the importance of energy consumption and production efficiencies. A key difference is noted in discussion of the flexibility of the plan, however. The Town of Truxton's plan specifically asks residents to consider how the "character of Truxton can be best maintained in the presence of inevitable growth and change" (Town of Truxton 1990).
- Cortland County's Consolidated Plan, adopted in 2002, summarizes the context of housing availability and affordability throughout the county. Among the market characteristics detailed within this plan are an assessment of substandard housing conditions, the extent of homelessness within the county, and housing availability for at-risk and other special needs populations (e.g. the developmentally disabled, the elderly, foster care, and rehabilitation centers). The plan identifies objectives for a number of housing-related issues, and also includes a brief "Non-Housing Community Development Plan" for each community within Cortland County. The proposed facility is compatible with the housing strategies outlined within the Consolidated Plan, as it is not expected to result in substantial increases in housing demand that could put vulnerable populations at risk. It is also compatible with the non-housing community development recommendations put forth for each of the Towns of Cortlandville, Homer, Solon, and Truxton

3.13.2 Potential Impacts

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

3.13.2.1 Construction

Land use impacts anticipated to result from Project construction can be quantified in terms of ground disturbance to NYSORPTS land use classifications, NYSA&M Agricultural Districts, and zoning districts. These impacts are summarized below in Table 53.

Table 53. Land Use Impacts

Land Use	Temporary Impact (Acres)	Converted to Built Facilities (Acres)
NYSORPTS Classification		
Agricultural	117.5	28.0
Wild, Forested, Conservation Lands and Public Parks	55.0	12.0
Residential	56.0	7.5
Vacant	19.0	2.5
Public Services	18.5	5.5
Community Services (Public Roadways)	1.0	0.0
Total	**267.0**	**55.5**
NYSA&M Agricultural District		
Cortland County Agricultural District 1	182.0	28.0
Total	**182.0**	**28.0**
Zoning District		
AG (Town of Cortlandville)	35.5	7.5
AG (Town of Homer)	58.0	13.0
AG-1 (Town of Solon)	15.5	3.0
AG-2 (Town of Solon)	101.0	20.0
R (Town of Solon)	1.5	0.0
Total	**211.5**	**43.5**

Construction-related disturbance to agricultural lands, as categorized by NYSORPTS, will total approximately 145.5 acres; as shown in Table 53, most of these impacts will be temporary. Along with this direct impact to agricultural land, movement of equipment and material could result in damage to growing crops, damage to fences and gates, damage to subsurface drainage systems (tile lines), and temporary blockage of farmers' access to agricultural fields. However, wind turbines and associated facilities have been located so as to minimize loss of active agricultural land and interference with agricultural operations, and construction activities will be in accordance with the NYSA&M agricultural protection guidelines included in Appendix G. It is anticipated that landowners will be compensated for any permanent crop damage caused by the construction activities at fair market value.

In addition, construction will result in the temporary disturbance of approximately 56 acres of land categorized as residential, 19 acres of vacant lands, 18.5 acres of public service lands, and one acre of land classified as community service facilities (public roadways). Impacts to residential lands are confined to the properties of participating landowners.

Construction activities could have temporary impacts on forest management/timber harvest activities, as 55 acres of wild/forested lands will be temporarily disturbed. Movement of equipment and materials could temporarily block or damage forest access roads. Timber harvest activities may also need to be curtailed/rescheduled in certain areas to avoid interfering with Project construction. It is anticipated that the landowner will either be compensated for any forest clearing at the fair market value of mature trees of the same species cut or that any marketable timber that results from forest clearing activities will be salvaged and stockpiled for use/removal by the landowner.

There are a number of properties in the area with known gas leases. The development of a wind project is not expected to have any significant adverse impacts on the development of gas extraction or delivery in the area. While some co-ordination will be required with the gas utilities and/or exploration companies during the design and construction phases (to avoid potential impacts to pipelines, wells and other infrastructure); the two industries can and do, readily co-exist across North America.

Photo 8: Gas Well Drilling Rig with Wind Turbines in Background (Clean Technica 2012b).

As a specific example, the Project Sponsor is currently working on a 125 MW wind project in Ontario, the Summerhaven Wind Energy Centre, with its project partners NextEra Energy Canada. This project is located in Haldimand County which is known as one of the highest density gas/mineral exploration areas in South West Ontario. Construction began on this wind farm in June 2012, and while there was (and still is) a high level of consultation with the local gas utilities and transportation companies to locate infrastructure, there have been no obstacles to the development of this project, and construction is due to be completed summer 2013. A second example is the New Richmond wind farm in Gaspe, Quebec, which the Project Sponsor has developed in conjunction with project partners Transalta. There are numerous existing gas leases across this site area. Again, these existing gas leases have not posed a significant threat to the development of the wind farm project, which is due to be completed December 2012.

Given that both gas companies and wind companies generally enter into option to lease agreements with landowners (that are then typically registered against title with the County), the future development rights of both industries are generally well protected.

The Project Sponsor has consulted with landowners and used GIS analysis to identify and locate any existing gas infrastructure on leased lands to ensure this information was included in the constraints analysis and design of the wind farm project. Four known gas well permits have been granted within the Project area. One of these permits has expired with no gas well being drilled. One of the gas wells has been temporarily abandoned. One further well exists that has been plugged and abandoned, and the remaining well has been “plugged back multilateral” according to NYSDEC well data. The locations of the four known gas well permits can be seen on Figure 5A, Well Locations. For known oil and/or gas well permits, a setback of 650 feet was achieved from turbines. Proposed turbine 14 lies 650 feet to the east of a “temporarily abandoned” gas well. Turbine 9 lies approximately 1,000 feet to the southwest of this “temporarily abandoned” gas well. Turbine 28 lies approximately 2,200 feet from an “abandoned, plugged-back multilateral” gas well. As currently proposed the Project presents no risk to these gas wells.

NYSDEC provides no recommendation of minimum setback distance for wind turbines in proximity to gas wells. The NYSDEC recommended setback distance that public buildings should maintain from gas wells (and vice versa) is 150 feet, (please refer to section 5.3.2.1 for a description of the mining regulation). The minimum setback distance recommended by NYSDEC for private dwellings is 100 feet and is 150 feet according to the Public Service Commission. The Ministry of Natural Resources in Ontario, Canada, recommends that if turbines are proposed within 75 meters (246 feet) of any gas wells, further investigation of the potential impacts should be conducted prior to turbine siting (outside of 246 feet no such analysis is required). In consideration of this, the Project Sponsor will maintain a minimum turbine setback distance of 650 feet from gas wells within the Crown City Project area, which will only become a hard constraint should additional gas wells be drilled in the Project area prior to construction. The Project Sponsor will liaise with any gas lease holders on participating parcels to ensure co-operative approach for sharing roads and other infrastructure wherever viable. Given that a setback of 738 feet has been applied between proposed wind turbines and Non-participating property lines then adjacent landowners' gas wells would not be impacted by the Project.

There may be some cumulative impacts if construction of gas wells coincides with the construction of the wind project in terms of impacts on local roads and traffic. Given the relatively short construction window of the Project and the current moratorium on hydro-fracking across New York State, this impact is unlikely and if it did occur, only temporary. Mitigation by way of co-ordination with local roads authorities and gas developers in the area would minimize impacts to local residents.

Although there is no readily available data regarding the rate of residential development within the Project area, the rate is generally understood to be quite low given the agricultural and the rural character of the area. The Sponsor has applied a buffer around turbine locations that is equal to the residence setback buffer (1,642 feet) to define the overall level of impact on future of residential development on neighboring Vacant Non-participating Parcels. An assessment has shown that 531 acres of land will be impacted by the residence setback buffer which is relatively small, given the overall scale of the Project. This is mainly a result of a typical building pattern for the area (i.e., houses being located along roadways) and the Project Non-participating Lot Line Setback of 738 feet.

Evaluation has shown that while 531 acres would fall within the residence setback, there are no parcels that would be completely impacted, solely by the Project, so as to prevent future development of a residence (i.e., available lands remain on Vacant Non-participating Parcels for the development of residences outside of the proposed setback of 1,642 feet. Furthermore, the actions of the Project Sponsor would not prevent any Vacant Non-participating Parcel holder seeking to build a dwelling in the future within the residence setback if they choose to do so, given that the closest possible distance would be the Non-participating lot line setback (of 738 feet), in the event that such a dwelling was built abutting the lot line. See Section 7.0 for additional details.

3.13.2.2 Operation

The Project as proposed is not incompatible with or specifically prohibited by the existing local laws, zoning, and land use patterns within the Towns of Cortlandville, Homer, Solon, and Truxton. The generating portion of the Project will occur entirely on leased land in areas dominated by managed/disturbed forestland and agricultural fields. Only minor changes in existing land uses within the Project area are anticipated as a result of Project implementation. As shown in Table 53, the Project represents a cumulative conversion of approximately 55.5 acres of land from its current use to built facilities. The Project is defined as 7,500 acres of Participating land. A conversion of 55.5 acres of land equates to 0.74% of these Participating lands. In a wider Project area context, the percentage of land permanently converted to built facilities would represent an even smaller change in land use.

Of the 55.5 acres referred above, approximately 12 acres are categorized as wild, forested, conservation lands and public parks, 28 acres are categorized as agricultural, 7.5 acres are categorized as residential, 2.5 acres are categorized as vacant land, and 5.5 acres are categorized as public services by the NYSORPTS. In terms of impacts to agricultural zoning districts, the Project components will occupy approximately 7.5 acres of AG District in the Town of Cortlandville, 13 acres of AG District in the Town of Homer, and 3 and 20 acres of AG-1 and AG-2 district land, respectively, in the Town of Solon. As indicated above, the Town of Truxton does not have established zoning districts. With regard to NYSA&M Agricultural Districts, the Project will occupy 28 acres of Cortland County Agricultural District 1.

During Project operation, additional impacts on land use should be infrequent and minimal. Other than occasional maintenance and repair activities, the Project should not interfere with on-going land use (e.g., agriculture activities, timber management). However, based on TCI and **edr**'s experience with existing wind power projects (e.g., Fenner, Maple Ridge, Howard and TCI's development experience in the US, Canada and UK), the Project may cause a perceived change in land use. As discussed in Section 3.5, the visibility and visual impact of the wind turbines will be highly variable based upon distance, number of turbines in the view, weather conditions, sun angle, the extent of visual screening, scenic quality, viewer sensitivity and/or existing land uses. Where a significant number of the proposed turbines can be seen at the same time, or where the turbines can be viewed from near mid-ground distances (e.g., 0.5 to 1.0 mile), a viewer may perceive a change in the rural characteristics of the area, even though the existing land uses remain substantially unchanged. Such viewing conditions may occur along roads adjacent to the Project, including McGraw North Road, Ames Road, North Tower Road, Maybury Road, East River Road and Syrian Hill Road.

In addition, as indicated in the VIA included as Appendix M1, the landscape surrounding this Project will retain its open space character and overall spatial organization once the Project is in place. Although there are some additions to the vertical and overhead planes in the landscape within the Project area, the surrounding landscape retains much of its rural landscape character because the open sky, topography, and existing patterns of land use will remain dominant. When in operation, the Crown City Wind Energy Project will be another land use in the area that compatibly coexists with the other historically dominant land uses.

3.13.3 Proposed Mitigation

The Project is compatible with the agricultural land use within the Project area. However, the Project will impact agricultural activities (at least temporarily) and although the overall perception of the landscape will remain rural in character, the Project may result in a slight change to the area's landscape character or its perceived land use throughout the area.

In addition to reducing impacts to agricultural land, other mitigation measures that will be undertaken to reduce the impact of the Project on land uses are listed below. These include:

- Lighting turbines (for aviation purposes only) to the extent necessary to comply with FAA requirements. Lighting for the substation and other ground level facilities will be kept to a minimum and generally operated by switch or motion detector.
- Utilizing tubular towers and finishing structures with a single, non-reflective matte off-white finish.
- 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.
- 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.
- Utilization of appropriate setbacks from sensitive receptors and features (residences, roads, Non-participating property lines, overhead power lines, microwave links, etc.).
- Coordination and consultation with holders of gas leases on land in the Project area.

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

3.13.3.1 Regional Land Use Patterns

Implementation of the Project will not cause a change in land use patterns on a regional scale, as the area will retain its historical agricultural land use, therefore no mitigation is proposed. However, to some viewers there may be a perceived change in land use due to the visibility of the turbine structures, where a significant number of the proposed turbines can be seen at the same time.

3.13.3.2 Protected Area Land Use and Zoning

To minimize and/or mitigate impacts to active agricultural land and farming operations, Project siting and construction will fully comply with NYSA&M agricultural protection guidelines (see Appendix G). 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, where feasible, 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.
- Limiting vehicular access to construction roads only.
- Limiting vehicle and equipment traffic and parking to the access road and/or designated work areas such as tower sites and laydown areas. No vehicles or equipment will be allowed outside the work area without prior approval from the landowner and, when applicable, the Environmental Monitor.
- Stripping all topsoil from agricultural areas used for vehicle and equipment traffic and parking.
- 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 work areas in active pastureland to protect livestock, consistent with landowner agreements.
- 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, if necessary, outside of active agricultural areas in locations approved by the Environmental Monitor.

- Restricting crane set-up, erection, and breakdown activities to designated access roads and work pads at the turbine sites.
- Stabilizing restored agricultural areas with seed and/or mulch.
- Removing and disposing of all construction debris offsite at the completion of restoration.
- Removing all excess subsoil and rock from the site. On site disposal of such material may be allowed if approved by the landowner and the Environmental Monitor, with appropriate consideration given to any possible agricultural or environmental impacts.
- Repairing any surface or subsurface drainage structures damaged during construction to as close to preconstruction conditions as possible, unless said structures are to be removed as part of the Project design.
- Re-grading all access roads to allow for farm equipment crossing and to restore original surface drainage patterns or other drainage pattern incorporated into the design.
- Compensation for damaged/lost crops.

Following construction, all disturbed agricultural areas will be decompacted to a depth of 18 inches with a deep ripper or heavy-duty chisel plow. In areas where the topsoil was stripped, soil decompaction shall be conducted prior to topsoil replacement. Following decompaction, all rocks 4 inches and larger in size will be removed from the surface of the subsoil prior to replacement of the topsoil. The topsoil will be replaced to original depth and the original contours will be reestablished where possible. All rocks 4 inches and larger shall be removed from the surface of the topsoil. Subsoil decompaction and topsoil replacement should be avoided after October 1, unless approved on a site-specific basis by the landowner in consultation with the Environmental Monitor and NYSA&M. All parties involved should be cognizant that areas restored after October 1 may not obtain sufficient growth to prevent erosion over the winter months. If areas are to be restored after October 1, necessary provision should be made to restore any eroded areas in the springtime to establish proper growth.

3.13.3.3 Future Land Use

Given that the Project is not incompatible with or specifically prohibited by existing local laws, zoning, and land use patterns within the Towns, and that the proposed facility is compatible with the housing strategies outlined within the County's Consolidated Plan and compatible with the non-housing community development recommendations put forth for each of the Towns of Cortlandville, Homer, Solon, and Truxton, mitigation strategies other than the measures proposed below are not proposed. Although there are some additions to the vertical and overhead planes in the landscape within the Project area, the surrounding landscape retains much of its rural landscape character because the open sky, topography, and existing patterns of land use will remain dominant. When in operation, the

Crown City Wind Energy Project will be another land use in the area that compatibly coexists with the other historically dominant land uses.

3.14 VIBRATIONS

This sub-section is organized as follows:

- 3.14.1 Existing Conditions
- 3.14.2 Potential Impacts
- 3.14.3 Proposed Mitigation

Concerns have been raised regarding negative impacts to the landfill liner materials, due to ground vibrations from the turbines in close proximity to the landfill. In response to these concerns, the Project Sponsor commissioned studies to assess the vibration potential the proposed turbines. ATL Engineering, P.C. (AE) prepared a desktop geotechnical study, which included an assessment of potential issues associated with the Cortland County Landfill. This geotechnical report is included as Appendix E1.

In addition, Dr. Richard Woods prepared a fatal flaw overview report to determine whether the placement of the three wind turbines on the County landfill property is likely to represent an unacceptable hazard to the integrity of the landfill cells and liners. This vibration report is included as Appendix E2. Dr. Woods is Professor Emeritus of Civil Engineering at the University of Michigan Ann Arbor. His research interests have been centered on foundation dynamics, vibration measurements, blasting and other vibration damage, measurement of dynamic soil properties, site characterization for seismic mitigation, and applications of geophysics in geotechnical engineering. He has co-authored a textbook on vibrations of soils and foundations, and published over 100 papers and reports on the subject. He is a Registered Professional Engineer in Michigan, and has previously provided foundation design services for wind turbines in New York State.

3.14.1 Existing Conditions

Four proposed turbines (numbers 12, 13, 18, and 20) will be located on or near the existing Cortland County Landfill. The nearest proposed turbine is approximately 700 feet from the landfill. Based on a telephone interview with Cortland County Superintendent of Highways and Supervisor of Recycling/Solid Waste, Donald Chambers, the landfill encompasses approximately 540 acres and contains three waste areas (cells), referred to as the Towslee Landfill, the Pine Tree Landfill, and the West Side Landfill. The Towslee Landfill is currently closed and is unlined with a synthetic cap. At a distance of approximately 700 feet, turbine number 18 is most proximate to the Towslee

Landfill cell. The Pine Tree Landfill is currently closed and is lined with a single composite liner and leachate collection system. Turbine number 20 is the most proximate to the Pine Tree landfill cell at a distance of approximately 1,250 feet. The West Side Landfill is currently operational and has a dual composite liner system. Approximately 6.9 acres at the south end of the cell is currently capped. Turbine number 13 is the most proximate to the West Side Landfill cell at a distance of approximately 950 feet. According to Mr. Chambers, the north side of the Towslee landfill near turbine 18 was stripped of overburden soil during landfill operations exposing the underlying shale bedrock. Based on aerial photos of the landfill, the area to the west of the West Side Landfill also appears to have been stripped of overburden soil (AE 2012, p. 7).

Wind turbines create ground vibration mainly through structural interaction with their foundations. Although properly designed foundations minimize vibrations, all vibrations cannot be negated, and turbine operation does generate some ground motion. Wind turbines have a large mass situated at considerable height above the ground. This situation can lead to rocking of the turbine mast and foundation. Horizontal sliding is coupled with the rocking in a two-degree-of-freedom mode of vibration. Given that the turbine tower is fixed to the center of the foundation, maximum vertical displacement ('rocking') is generated at the outer edges of the foundation while horizontal displacement ('sliding') is the same magnitude across the entire foundation. The maximums of different vibration waves will change direction as the turbine nacelle rotates to face the wind (Woods 2012, p. 3).

Vibrations generated at the turbine foundation propagate through the ground surrounding the turbine through two principal kinds of seismic waves, surface waves and body waves. Surface waves are analogous to waves on water, with crests and troughs in the approximate shape of sine waves, and travel in the ground near the surface, causing vibrations to a depth up to 100 feet or more. Body waves, on the other hand, travel with a bowl-shaped or hemispherical front that can travel great distances into the earth. As vibratory energy travels outward in the ground from the source, it decays or reduces in amplitude with distance. This reduction is caused by damping or attenuation, and is different for each kind of wave and for each kind of soil or rock. The result of damping is that the height or size of the wave gets smaller the farther you go from the source (i.e., the turbine foundation).

The key properties controlling generation and propagation of vibrations in both rock and soil are modulus and damping. Damping is different for compression and shear, and is estimated from empirical data. Shear modulus is the major property for determination of magnitude of vibration of the turbine-foundation system and for estimating resonant frequency of that system. Shear modulus is most easily determined from shear wave velocity, which can be estimated directly from seismic wave velocity measurements performed in-situ. Seismic testing, in addition to soil borings and rock coring, will be completed at each proposed turbine and ancillary structure location during the detailed design phase of the project. Geometric and mass distribution of the wind turbine and mat foundation are also factors controlling the magnitude of motion of the whole system, amplitude of waves propagated away from the footing, and dominant frequencies of vibration. All motion is driven by wind and modified by mechanical features of the tower, turbine, blades, and foundation mat.

A foundation resting on soil or a slope in a soil depends on additional soil properties, including water table elevation, water content, void ratio, and grain size distribution. All of these soil characteristics contribute to the susceptibility of soil to lose shearing strength during vibration because of the build-up of water pressure in the void space between solid soil particles. Perched water tables may also present a hazard because they are quite local and not necessarily identified by conventional soil exploration programs. It is important, therefore, to understand the local geologic conditions with regard to perched water. The potential for pore water pressure to build up during vibrations is also influenced by the grain size distribution of particles in the soil. If the soil is composed mainly of very fine soils (clays), water pressure in the pores does not build up as fast or to the extent that it may in mainly coarse soils (sand). Those properties are important for the stability of slopes in the landfills unless they are completely founded on rock. Even then there may be drainage beds under liners and those drainage layers behave as soils for slope stability. Adequate distance from a turbine foundation will minimize the likelihood of destabilization of slopes due to vibration.

Shearing strength is the principal feature of soil controlling the stability of slopes and bearing capacity of loaded areas. Where ground water is available to saturate the soil, vibration has the potential to cause a build-up of pressure in the water filling the soil voids and reduce the shearing strength of the soil. Reduced shearing strength increases the potential for slope failure and loss of bearing capacity of soil. Slopes that are at risk include natural slopes of hillsides, cut slopes along roadways or pipelines, or engineered slopes in landfill basins. Ground vibration can also cause loose granular soils to settle and with soil settlement, foundations and structures supported by them will settle. Uneven or differential settlement can cause build-up of stress exceeding the strength of the soil. This behavior is more likely in sandy or gravelly soil than in silty or clayey soils.

Not all ground vibrations will result in large ground motion or loss of shearing strength. Ground vibration causes cycles of stress in soils and rock, and the accumulation of many cycles increases the likelihood of damaging effects. However, there is a threshold of vibration amplitude below which cyclic effects do not accumulate. If the maximum vibrations suffered by the soil are below the threshold, no damaging effects are likely. For most soils, that threshold is linked to shearing strain (related to shearing strength through shear modulus) and has been established at about 0.01% shearing strain. Shearing strain can be calculated from shear wave velocity and amplitude of vibration. If shearing strain is less than 0.01%, soil stability will not be affected by vibration. If shearing strain exceeds 0.01%, then stability will be reduced and the number of cycles of vibration will play a role in determining the amount of damage that that will occur. Although there are some general guidelines, the number of cycles that will cause differential settlement of structures must be determined separately for each type of soil.

Other criteria exist for damage to other construction materials by ground borne vibrations. For example, very large vibrations (like an earthquake) are necessary to damage concrete pavements with only a few cycles of vibration, but accumulation of settlement of sand under pavement due to small vibrations can cause a concrete pavement to crack after many cycles of vibration. Similarly, geo-synthetic materials in a landfill may be able to tolerate a few cycles of moderate vibration, but may yield or tear if the slope underneath has settled unevenly or slipped because of many cycles of above threshold vibrations.

One study of ground motion from wind turbines has been reported (Schofield 2002, p. 1). This report can be accessed online (http://www.ligo.caltech.edu/docs/T/T020104-00.pdf) and included physical measurement of ground motion caused by wind turbines using a seismometer. This report addresses potential for transmission of small amplitude ground motion over relatively long distances and over undefined soil and rock profiles with major topographic features to be traversed. Unfortunately, the distances and ground types are not defined in the Schofield study. Therefore, basic knowledge of ground transmitted vibration, as described above, cannot be applied to other sites, and the conclusions from that study cannot be related to the Crown City Project (Woods 2012, p. 4).

3.14.2 Potential Impacts

According to turbine manufacturers, turbine vibration is minimal on properly functioning wind turbines. This is consistent with the discussion in the Crown City desktop geotechnical review, which indicates that vibrations imposed to the foundation soils during normal turbine operation are relatively low level vibrations (AE 2012, p. 7). This is because turbine foundations must be designed to meet a minimum foundation stiffness, specified by the turbine manufacturer and based on site specific dynamic soil properties. Existing data on subsurface soil conditions at the landfill (as reported on landfill monitoring well logs) indicate that the subsurface soil and bedrock in the area of the landfill are not susceptible to liquefaction. As discussed above and in Section 3.1.2.1, a subsurface investigation will be performed at each proposed turbine site prior to foundation design. Based on their experience with numerous other wind energy projects in the Northeast, AE (2012, p. 8) concluded that ground vibrations from the turbines will not likely be perceptible or problematic, and are not likely to negatively impact adjacent structures or the landfill liner systems.

In the fatal flaw report prepared for the Project, *Description of Vibration Potential*, Woods (2012, p. 6) also indicated that ground vibrations generated by wind turbines are small in magnitude. Normal safe and tolerable vibrations of the wind turbine will guarantee that only small unbalanced forces will occur, and that these forces will cause only small vibrations of the foundation and the ground. Vibrations causing strains above the strain threshold will die out quickly in a short distance under most situations, and vibrations lower than the threshold are unlikely to cause damage. Under some extreme conditions (wind velocity, duration, and direction), vibrations of a large amplitude and many cycles may occur, but such conditions are not anticipated at this site. Distance is a major factor in mitigating vibrations from a wind turbine and was considered along with site specific ground conditions in evaluating potential for damage from wind turbine caused vibrations. Woods (Woods 2012, p.6) concluded that the placement of the wind turbines as proposed does not represent a hazard to the integrity of the landfill. Construction and/or operation of the Project is not expected to have any adverse impacts on the landfill , and it is therefore anticipated that the quality of leachate and its collection and storage systems will not be affected by the installation or operation of wind turbines (Woods 2012, p.6).

Cortland County Planning Department provided a map to the Project Sponsor depicting the area that is considered to be undevelopable within the County landfill boundaries. Mr. Donald Chambers, the Cortland County Supervisor of Recycling/Solid Waste and Superintendent of Highways advised the Project Sponsor of limitations within the landfill. All proposed wind turbines have been located outside of the "undevelopable area" as described and mapped by Mr. Chambers (2008). Although the proposed Project will not impact the existing landfill, future expansion of the landfill cells or other landfill operations will have to consider the installed turbines and associated infrastructure.

3.14.3 Proposed Mitigation

As discussed above, ground vibrations from turbine foundations are not likely to negatively impact the landfill systems (AE 2012, p. 8; Woods 2012, p. 6). The assumptions that support this conclusion will be verified as part of the detailed geotechnical study that will precede detailed design of the turbine foundations. Additional mitigation is not necessary or proposed. However, in order to verify this assumption, the landfill, its leachate, and groundwater quality will continue to be monitored in accordance with NYS Part 360 regulations. Data will continue to be compared to current water and leachate quality data, and any changes or anomalies will be reported and fully investigated by New York State.

4.0 UNAVOIDABLE ADVERSE IMPACTS

The proposed Project will result in significant long-term economic benefits to participating landowners, as well as to the Towns of Cortlandville, Homer, Solon, and Truxton, the local school districts, and Cortland County (see Section 3.9). When fully operational, the Project will provide up to 71 MW of electric power generation with no emissions of pollutants or greenhouse gases to the atmosphere. The development of the site is consistent with surrounding land uses.

Despite the positive effects anticipated as a result of the Project, its construction and operation will necessarily result in certain unavoidable impacts to the environment. The majority of these environmental impacts will be temporary, and will result from construction activities. However, long-term unavoidable impacts associated with operation and maintenance of the Project include turbine visibility from some locations within the area. While the presence of the turbines will result in a change in perceived land use from some viewpoints, their overall contrast with the landscape, as determined through evaluation by an expert panel of landscape architects, is moderate in most locations. Project development will also result in an increased level of sound at some receptor locations (residences) within the study area (Project sound levels are not expected to exceed 43.5 dBA at any residence), a minor loss of forest land, wildlife habitat changes, and some level of avian and/or bat mortality associated with bird/bat collisions with the turbines. As evaluated through site-specific expert analyses, which are presented in Section 3.0 of the DEIS, these impacts are not considered significant, and are outweighed by the benefits of providing a source of clean, renewable energy and displacing some of the energy (and emitted pollutants) created by fossil fuel generators (Driscoll et. al. 2007, p. 7), which result in significant environmental impacts.

Although adverse environmental impacts will occur, they will be minimized through the use of various general and site-specific avoidance and mitigation measures. With the implementation of these mitigation measures, the Project is expected to result in positive, long-term overall impacts that will offset the adverse effects that cannot otherwise be avoided. Should avoidance mitigation measures fail and adverse impacts occur, the Project Sponsor will evaluate the need for turbine specific scheduled curtailment of operations when it is deemed necessary to operate the project in a socially responsible manner.

The following subsections summarize general mitigation and avoidance measures that have been incorporated into the Project design, and specific mitigation and avoidance measures proposed to minimize adverse impacts to specific resources.

4.1 GENERAL AVOIDANCE AND MITIGATION MEASURES

General mitigation measures include compliance with the conditions of various state and federal regulations that govern Project development, as well as the inherent characteristics of the Project. The primary government review/approval processes that currently apply to the Project include:

- State Environmental Quality Review Act (SEQRA).
- New York State Department of Transportation (NYSDOT) and Cortland County Department of Public Works (DPW) highway regulations.
- Federal Clean Water Act regulations (Section 404 permit).
- NYSDEC water resources regulations (Section 401, Article 15).
- NYSDEC SPDES regulations (stormwater management).
- NYS Agricultural Districts law.
- Occupational Safety and Health Administration (OSHA) regulations (standard conditions for safe work practices during construction).

SEQRA regulations require public input into the environmental review of proposed development projects so that potential adverse impacts can be identified prior to Project implementation and avoided or mitigated to the greatest extent practicable. This DEIS was prepared in accordance with these regulations, and provides a primary means by which the potential costs and benefits of the Project are described and weighed in a public forum. Compliance with SEQRA regulations will assure that public and agency comments are solicited and appropriately addressed, Project alternatives are evaluated, and potential adverse impacts are identified and mitigated to the greatest extent practicable. Response to comments and preparation of a Final Environmental Impact Statement (FEIS) will provide the information necessary for the lead agency and other involved agencies to draw conclusions (Findings Statement) regarding the Project's overall environmental impacts, and impose conditions on SEQRA approval, if necessary and where relevant.

Compliance with the other various federal, state, and local regulations governing the development, design, construction and operation of the proposed Project also will serve to minimize adverse impacts. Construction activities and Project engineering will be in compliance with applicable state and local building codes and federal OSHA guidelines to protect the safety of workers and the public. Federal and state permitting required by the USACOE and/or the NYSDEC will serve to protect water resources, along with implementation of a state-approved SPDES permit. Highway permitting at the local, county, and state level will assure that safety, congestion, and damage to highways in the area is avoided or minimized. The Project's siting criteria, guidelines, and design standards that serve to avoid or minimize adverse environmental impacts include the following:

- Siting the Project away from population centers and areas of high-density residential development.
- Following NYSA&M Agricultural Protection Guidelines.
- Minimizing the number of stream and wetland crossings.
- Using existing forest and/or farm roads for turbine access whenever possible, to minimize impacts to soil and ecological resources.
- Designing all electrical lines in a manner that denies any possibility of stray voltage.
- Designing, engineering, and constructing the Project in compliance with various codes and industry standards to assure safety and reliability.
- Limiting turbine lighting to the minimum allowed by the FAA to reduce nighttime visual impacts, and following lighting guidelines to reduce the potential for bird collisions.
- Following construction procedures in accordance with Best Management Practices for sediment and erosion control.
- Installing turbines with appropriate grounding and automatic shutdown/braking capabilities to minimize public safety concerns.
- Complying with the NYS Department of Agriculture and Markets guidelines in order to mitigate impacts on agricultural ground and farming practices

4.2 SPECIFIC MITIGATION MEASURES

Project development and operation will also include specific measures to mitigate potential impacts to specific resources. These were described in detail in Section 3.0, but generally include the following:

- Developing and implementing various plans to minimize adverse impacts to air, soil, and water resources, including a dust control plan, sediment and erosion control plan, Invasive Species Management Plan, and Spill Mitigation plan.
- Documenting existing road conditions, and undertaking public road improvement/repair at no cost to the town or county.
- Evaluating Project impacts on birds and bats through post-construction avian and bat monitoring studies.
- Entering into a PILOT agreement with the local taxing jurisdictions to provide a significant and predictable level of funding for the towns, county, and school districts over the first 20 years of Project operation.
- Close coordination with local first responders.

In addition, the Project Sponsor will implement a Community Outreach and Communications Plan, which will build upon the design and development phase community outreach activities. This plan sets forth an open communication link between the Project Sponsor, Cortland County, and the Towns of Cortlandville, Homer, Solon, and Truxton. The Plan also establishes a complaint resolution procedure, including a toll free number set up by the Project Sponsor for use by local residences. The Community Outreach and Communications Plan is set forth in Appendix L1. If additional, unanticipated mitigation is necessary as a result of unforeseen operational impacts, the Project Sponsor will work with the County to develop an acceptable remedial plan to address any such impacts, with a timeline for implementation.

4.3 ENVIRONMENTAL COMPLIANCE AND MONITORING PROGRAM

The Project Sponsor is committed to develop and operate its projects in a safe and environmentally responsible manner. In addition to the mitigation measures described above, the Crown City Wind Energy Project will develop an environmental compliance program and the Project Sponsor will provide funding for an independent, third party Environmental Monitor (or Monitors) to oversee compliance with environmental commitments and permit requirements. It is anticipated that the Environmental Monitor(s) would be selected by, and report to, the Cortland County Legislature or its designated representative(s). As such, the Legislature will define the qualifications and reporting responsibility of the Environmental Monitor. Typically, this individual (or individuals) would have a degree in environmental science (or similar) and experience in environmental compliance or management. Knowledge of environmental regulations, sediment and erosion control, and agricultural protection are essential, as is completion of the NYSDEC erosion and sediment control training course. Assuming the environmental compliance program is similar to that utilized on the Hardscrabble Wind Power Project in Herkimer County, New York (**edr** 2010), it would include the following components:

1. Planning – Prior to the start of construction, the Environmental Monitors will review all environmental permits and, based upon the conditions/requirements of the permits, prepare an environmental management document (Environmental Compliance Manual) that will be utilized for the duration of the construction and operation of the Project. This document will distill and clearly present all environmental requirements for construction and restoration included in all Project permits and approvals, and will be designed to aid in the management of environmental issues and concerns that may arise during construction of the Project. The Environmental Compliance Manual will include 1) copies of all issued environmental permits and approvals, 2) a compliance matrix that summarizes all relevant permit requirements and identifies the responsible party and time frame (if applicable), and 3) a Project contact list and organizational chart.

2. Training – The Environmental Monitors will hold environmental training sessions that will be mandatory for all contractors and subcontractors before they begin working on the site. The purpose of the training sessions will be to distribute the Environmental Compliance Manual, explain the environmental compliance program in detail, prior to the start of construction, and to assure that all personnel on site are aware of the permitting requirements for construction of the Project.

3. Preconstruction Coordination – Prior to construction, the contractor(s) and the Environmental Monitors will conduct a walkover of areas to be affected by construction activities. The limits of work areas, especially in and adjacent to sensitive resource areas such as wetlands, will be defined by flagging, staking or fencing prior to construction, as needed. This walkover will identify landowner concerns, sensitive resources, limits of clearing, proposed stream or wetland crossings, and placement of sediment and erosion control features. Specific construction procedures will be discussed amongst the group, and updated to become part of the Project layout and construction sequence, as needed. The pre-construction site review will serve as a critical means of identifying any required changes in the construction of the Project early enough in the process to avoid potential delays once construction has begun. Proposed changes to the construction plan will be identified as soon as possible, as changes may require an agency notification period and take time for approval to be received.

4. Construction and Restoration Inspection – The monitoring program will include daily inspection of construction work sites by the environmental monitor. The Environmental Monitor is the primary individual(s) responsible for overseeing and documenting compliance with environmental permit conditions on the Project. The Environmental Monitor will conduct inspections of all areas requiring environmental compliance during construction activities, with an emphasis on those activities that are occurring within jurisdictional/sensitive areas, including cultural resource areas, wetland and stream crossings, and active agricultural lands. When on site, the Environmental Monitor's schedule will include participation in a daily Plan of Day (POD) meeting with the contractors to obtain schedule updates, identify in-field monitoring priorities, and address any observed or anticipated compliance issues. During the course of each visit, multiple operations are likely to be occurring throughout the Project area, and will need to be monitored by the Environmental Monitor. Activities with the potential to impact jurisdictional/sensitive resources, or with greater potential for environmental impact, will receive priority attention from the Environmental Monitor. For instance, installation of an access road across a protected stream would likely receive greater attention than installation of buried electrical collection lines across a successional old field. However, some level of field inspection by the Environmental Monitor will occur at all earth-disturbing work sites during each site visit. The monitor will keep a log of daily construction activities, and will issue periodic/regular (typically weekly) reporting and compliance audits. Additionally, when construction is

nearing completion in certain portions of the Project area, the monitor will work with the contractors to create a punch list of areas in need of restoration in accordance with all issued permits.

Specific to agricultural land impacted by the Project, the Project Sponsor will provide a monitoring and remediation period of no less than two years immediately following the completion of initial restoration (see Appendix G). The two year period will allow for the effects of climatic cycles such as frost action, precipitation, and growing seasons to occur, from which various monitoring determinations can be made. The monitoring and remediation phase will be used to identify any remaining agricultural impacts associated with construction that are in need of mitigation and to implement the follow-up restoration. General conditions to be monitored include topsoil thickness, relative content of rock and large stones, trench settling, crop production, drainage, and repair of severed fences. Impacts will be identified by the Environmental Monitor through on site monitoring of all agricultural areas impacted by construction and through contact with respective farmland operators and NYSA&M.

5.0 ALTERNATIVES ANALYSIS

This section evaluates alternatives to the proposed action, including the methodology and criteria applied for selecting turbine locations and other key Project components. The alternatives described offer a potential range and scope of development and are evaluated in the level of detail to allow for comparative analysis and consideration as prescribed by the SEQRA provisions explained below. With respect to the Project as currently proposed, please see Section 2.5.1 for a detailed discussion of the Project's siting criteria used to develop the current layout.

5.1 SEQRA ALTERNATIVES ANALYSIS REQUIREMENTS

SEQRA (6 NYCRR Part 617) requires that an EIS evaluate all reasonable project alternatives. In determining the scope of alternatives to be considered, the emphasis is on what is "reasonable". As described in §617.9 (b)(5)(v), an EIS must contain a description and evaluation of the range of reasonable alternatives to the action that are feasible, considering the objectives and capabilities of the Project Sponsor. As stated in Section 2.2, the objective of the proposed action is to take advantage of the available wind resource and New York bulk power transmission system interconnection capacity in order to create an economically viable wind-powered electrical-generating facility that will provide a significant source of renewable energy to the New York power grid and contribute to the achievement of the New York RPS. The Crown City Wind Energy Project has a 90 MW interconnection request with NYISO lodged in May 2008, and this 90 MW request was based on the anticipated capacity that the local power grid could likely accommodate (as estimated at the time the request was submitted). Based on the land resource and turbine technology available, along with the preference to limit the project to less than 80 MW, the preferred alternative is therefore to construct a facility that is currently estimated to be of approximately 71 MW of renewable energy capacity.

As discussed in Section 2.5.1, the primary goal of wind turbine siting and design is to maximize the capture of wind energy to assure economic viability, while providing a design that minimizes environmental impacts and meets all turbine vendor site suitability requirements. The proposed location and spacing of the wind turbines and support facilities is initially based upon site suitability, landowner participation, wind resource assessment, environmental resource factors, and review of the site's zoning constraints (where available). Based on these criteria, the Project Area will support 44 turbines each currently with a rated capacity of 1.6 MW, which will deliver up to 71 MW of generation capacity to the New York state grid. Based on a 71 MW project (44 turbines x 1.6 MW), total net generation delivered to National Grid's existing 115 kV line is expected to be approximately 217,686 MWh, or enough electricity to meet the average annual consumption of approximately 29,820 average NYS households (based on average annual electric consumption of 7.3 MWh for New York households [EIA 2012a]).

Additionally, §617.9 (b)(5)(v) provides that the description and evaluation of each alternative should be at a level of detail sufficient to permit a comparative assessment of the alternatives discussed. It is well-established under SEQRA that the degree of detail with which each alternative must be discussed will vary with the circumstances and nature of each proposal.

SEQRA requires analysis of the no action alternative, and otherwise prescribes the range of other alternatives that may be evaluated as appropriate to a given action. The no action alternative analysis should evaluate both the adverse and beneficial changes to the Project that are likely to occur in the reasonably foreseeable future, in the absence of the proposed action. The range of other alternatives may also include, as appropriate, alternative sites, technology, scale or magnitude, design, timing, use and types of actions. Site alternatives, however, may be limited to parcels owned by, or under option to, a private project sponsor (See SEQRA §617.9[b][5][v]).

The Scoping Document adopted on September 13, 2012 requires the DEIS to address an alternative for which no discretionary approvals are needed, or which largely avoids identified adverse impacts. To avoid some of the discretionary approvals that are typical of wind power projects in New York, at a minimum the following would be required:

- None of the four towns would have zoning regulations (thus avoiding local discretionary approvals associated with site plan approvals and/or special use permits).
- No temporary or permanent impacts to state-regulated streams, wetlands or adjacent areas (thus avoid state discretionary approvals associated with Article 15 and/or Article 24 of the Environmental Conservation Law).
- No temporary or permanent impacts to federal-regulated Waters of the U.S. (thus avoiding federal discretionary approvals associated with Section 404 of the Clean Water Act).

However, it is anticipated that any wind power project (regardless of size) would still require the following discretionary approvals (at a minimum):

- Approval of the PILOT agreement by the County IDA.
- Compliance with SEQRA as determined by the Lead Agency.
- Approval under Article 10 of the Public Service Law (if project exceeds 25 MW in capacity).

Therefore, it does not appear possible to construct and operate a commercial-scale wind power project that would not need discretionary approvals. However, the no action alternative (described below in Section 5.7) fulfills this requirement, since no discretionary approvals would be needed.

The DEIS discussion that follows presents the no action alternative, and a range of "reasonable" alternatives as appropriate with regard to the nature of a wind energy project. This range of alternatives consists of alternative project siting, alternative project size, alternative turbine design, size and technology, alternative tower and turbine color, alternative project design/layout, alternative technologies, and alternative construction phasing. These alternatives to the proposed action are evaluated in this DEIS in furtherance of a comparative assessment of each alternative explored, and with a focus on those specific environmental impacts identified that have the potential to be significant. The following alternatives to the proposed action are described and evaluated: alternative Project area location, alternative project design/layout, alternative project size, alternative technologies, alternative construction phasing, and no action.

5.2 ALTERNATIVE PROJECT SITE

Under 6 NYCRR § 617.9(b)(5)(v), site alternatives addressed in an EIS may be limited to parcels owned by, or under option to, a private Project Sponsor. The Project Sponsor does not own, or have under option, any parcels in Cortland County (other than the parcels that are part of the proposed Project). Therefore, there is no requirement to evaluate any alternative Project areas. Nonetheless, this section provides background information on the selection of the Project area, which included consideration of other project sites with available wind resource in the State, to facilitate understanding of siting constraints and the criteria that the Crown City Wind Energy Project employed.

The preliminary selection of wind turbine locations on a regional or statewide basis is constrained by several factors that are essential for the Project to operate in a technically and economically viable manner. These factors include the following:

- adequate wind resource
- adequate access to the bulk power transmission system, from the standpoints of proximity and ability of the system to accommodate the interconnection and accept and transmit the power from the Project
- contiguous areas of available land
- compatible land use
- willing land lease participants and host communities
- limited population/residential development

The ridge tops selected for the Project area are suitable for commercial scale energy production. Across New York State, the wind resource varies based upon a number of factors (and the interaction of these factors) including topography, prevailing wind direction, and location. Commercial scale wind power projects can only be located in certain locations within the state that are conducive to wind energy production. As a general matter, average annual wind speeds at a site should generally be greater than 6.5 meters per second (14.5 mph), at hub height, for commercial operation. The higher the wind speed at a site the more desirable a site is; as the energy produced by a given turbine is a function of the cube of the wind speed. New York has a modest wind resource; however, this renewable resource is not evenly distributed throughout the state. Rather, the wind resource is limited to certain unique areas in the state, which generally include coastal areas, ridgelines, elevated plateaus, and mountain peaks. Further, the Project area's proximity to an existing transmission line also makes this location relatively unique and desirable.

The Project Sponsor selected the proposed site for the Project because of the presence of the anticipated wind resource, the presence of available land and willing landowners, the relative ease of access to the site, and the proximity and relative ease of connecting to the existing electric transmission grid. These factors combined make the proposed site desirable from the standpoint of commercial-scale wind power development.

5.3 ALTERNATIVE PROJECT DESIGN/LAYOUT

5.3.1 Wind Turbine Selection

Several factors drive the selection of wind turbines for the Project, including market competition, market (supply) availability, industry trends, and importantly, site and wind resource suitability. As discussed in Section 2.5.2, the type of wind turbine generator currently proposed for the Project is a 1.6 MW, three-bladed, upwind turbine design with a 100 meter (328 foot) hub height and a 100 meter (328 foot) rotor diameter. Most modern commercial scale wind turbines are three-bladed designs with the rotor position maintained upwind (on the windy side of the tower) using electrical or hydraulic motors in their yaw mechanism (mechanism used to turn the wind turbine rotor to face into the wind). The vast majority of commercial scale turbines sold in world markets have this design.

Wind power projects in New York (both proposed and operational) include turbines that range in size from 660 kW to 3.0 MW. Driven by both economics and technical advancement, the national and international trend in the industry is towards larger turbines, in the form of taller towers and larger rotor diameters. Higher hub heights generally equate to higher wind speeds while larger rotor diameters capture more of the available wind energy. Typical proposed turbines have 78 to 100 meter (256 to 328 feet) tall hub heights and 77 to 112 meter (253 to 367 feet) diameter rotors. The site specific wind resource characteristics are the drivers in selecting the optimal hub height, rotor diameter, as well as the turbine design to maximize wind energy capture and electricity generation. Wind turbines are designed for various wind speed profiles from very energetic Class I regimes (average wind speeds greater than 8.5 m/s [19 mph]) to lower Class III regimes (< 7.5 m/s [17 mph]). These lower Class III wind conditions are typical to

New York State and the Project area, and the use of Class III turbines here is consistent with the stated objectives of the Crown City Wind Energy Project and current industry practices. Alternatively, if the Project specified the use of smaller (lower hub height/smaller rotor diameter/smaller rated capacity) the number of turbines required to meet the Project's stated purpose (of achieving approximately 71 MW of installed capacity), need, and benefits would have to increase. Table 54 provides examples of wind turbine types with capacities below the 1.6 MW rating currently proposed, and then indicates the number of turbines needed to meet the current Project proposal of installed 71 MW. Although the installed megawatts would remain the same under each of these scenarios, it is very likely that the output from these smaller sized wind turbines would not equal the output from the project as currently proposed, due to the lower net capacity factor that would be achieved as a result of the reduction in turbine hub height and consequently, wind speed.

Table 54. Examples of Turbines with <1.6 MW Rating

Turbine Type/Manufacturer	Rated Capacity	Rotor Diameter meters (feet)	Hub Height Range meters (feet)	# of Turbines needed to reach 71 MW
Siemens SWT 1.3	1300 kW (1.3 MW)	62 (203)	Varies	55
Suzlon 950	950 kW	64 (210)	65 (213)	75
Vestas V52	850 kW	52 (171)	65-86 (213-282)	84

Note: This is only a representative example of possible turbines with generating capacities of less than 2 MW and should not be taken as confirmation that these smaller models are even still being manufactured.

Several studies have concluded that people tend to prefer fewer larger turbines to a greater number of smaller ones (Thayer and Freeman 1987; van de Wardt and Staats 1988; Fáilte Ireland 2012, p. 6). Also, the current Project parcels cannot accommodate a project of significantly greater than 44 turbines, due to on-site constraints, turbine spacing requirements, and setbacks. The use of a greater number of smaller turbines (lower hub height and/or smaller rotor diameter) may have the effect of reducing visibility, albeit negligibly (See Section 3.5 for a discussion of visual impacts of the proposed turbines), but would require more participating parcels and would result in additional impacts to other resources due to ground disturbance (associated with more project roads, more project electrical lines, additional land disturbance).

5.3.2 Design/Layout Process

5.3.2.1 Wind Turbines

As presented in Section 2.5.1, the proposed location and spacing of the wind turbines are directly related to the turbine selected for the proposed site and are also based upon site developability, landowner participation, a wind resource assessment, environmental resource factors, and in anticipation of the site's future zoning constraints. Factors considered during turbine placement include the following:

Wind Resource Assessment: Through the use of on-site meteorological data collected at two 60 meter (197 foot) monitoring towers, topographic and surface roughness data, wind flow modeling, long-term weather station data, and wind plant design software, the wind turbines are sited to optimize exposure to wind from all directions, with emphasis on exposure to the prevailing wind directions in the Project area (northwest and south). Additionally, given average wind speeds are greater at higher elevations, a target elevation threshold of 1,600 feet (the lowest proposed turbine being 1,423 feet) was explored for turbine siting. In some cases turbines were sited below the target elevation threshold; however, these turbines were sited in the western or northern perimeter of the Project, which is in line with the general prevailing wind direction. Given the reduction of wake effects at the perimeter of the Project in the prevailing wind direction, in this instance the lower elevation is considered viable by the Project Sponsor.

Gradient. Turbine placement requires a relatively uniform gradient over a sufficiently large area for the construction of the foundation and erection of the turbine. Another consideration concerning gradient is turbine accessibility. If the access to the turbine has an exceedingly high gradient, then the location may not be suitable for development. Thus, excessively steep gradients are typically avoided during wind turbine siting.

Sufficient Turbine Spacing. Siting turbines too close to one another can result in decreased electricity production and excessive turbine wear, due to the creation of wind turbulence between and among the turbines. Each operating wind turbine creates downwind turbulence in its wake. As the flow proceeds downwind, there is a spreading of the wake and recovery to free-stream wind conditions. The Project turbines have been located with enough space between them to minimize wake losses and maximize the capture of wind energy.

Distance from Non-participating Land Parcels. The turbine locations will maintain a minimum setback of 738 feet, (1.5 x the total height of the turbine), from the property line of all adjacent parcels owned by Non-participating neighbors.

Distance from Residences. The turbine locations will maintain a minimum setback of at least 1,642 feet between the tower and the nearest occupied permanent residence (excepted by way of easement). The transforming substation is located at least 1,600 feet from the closest residence. The proposed 115 kV transmission line is located over 200 feet from the closest residence. The new point of interconnection substation is located 500 feet from the closest residence and will be sited as close as possible to the proposed interconnection line in accordance with recommendations from National Grid, as detailed in the System Reliability Impact Study for the Project, which describes the POI substation as being sited within 200 feet of the POI.

Distance from Other Structures and Buildings. The turbine locations will maintain a minimum setback of approximately 500 feet between the tower and all structures or buildings other than year round residences (excepted by way of easement).

Distance from Roads. The turbine locations will also maintain a minimum setback of at least 738 feet from non-seasonal public roads.

Distance from Known Oil and/or Gas Wells: The turbines' area of disturbance has achieved a setback of at least 650 feet from any known oil or gas wells. This distance is greater than the distance required to be maintained between a gas well and an inhabited structure, by part 553.2 – *Surface restrictions* of the *Rules and Regulations for Oil, Gas and Solution Mining - 6 NYCRR Parts 550 - 559, Division of Mineral Resources*, which states that, "No well shall be located nearer than 100 feet from any inhabited private dwelling house without written consent of the owner; nearer than 150 feet from any public building or area which may be used as a place of resort, assembly, education, entertainment, lodging, trade, manufacture, repair, storage, traffic or occupancy by the public; nearer than 75 feet to the traveled part of any State, county, township, or municipal road or any public street, road or highway; or nearer than 50 feet from any public stream, river or other body of water. This regulation, which is adopted in the interest of public safety, does not apply to a building or structure which is incident to agricultural use of the land on which it is located, unless such building is used as a private dwelling house or in the business of retail trade"

Wetlands and Waterbodies. The O&M facility, temporary turbine construction staging area, substation, meteorological tower, or turbine foundations will not be located within delineated federal jurisdictional or state regulated freshwater wetlands. Placement of the electrical collection/transmission lines and access road in wetlands/streams will be avoided to the extent possible.

Communication Interference. Turbines will be sited outside of known microwave pathways or Fresnel zones to minimize the effect that they may have on local communications.

Cultural Resources. Project construction will be conducted in such a way that does not cause any effect to prehistoric or historic archeological resources, as recommended by the Project's Cultural Resources Specialist.

5.3.2.2 Electrical Gathering and Interconnection Line

As a matter of general economical design preference, on most wind projects, it is preferred to build all 34.5 kV electrical collector lines in the shortest, most direct alignment between turbines. However, some portions of the Project's electrical collection system will be buried along existing and proposed access roads to significantly consolidate and minimize impacts to on site vegetative communities. Although underground cabling is the preferred option for the electrical collector system, overhead cables may be used where requested by landowners or where underground installation is prohibited or infeasible due to constraints such as rivers, streams or creek crossings. Overhead cabling may also be used where the electrical collector system route follows a public or private road.

All portions of the buried electrical collection system have been reviewed for alternative routes to avoid wetlands and/or streams that could be considered a jurisdictional Water of the United States. Any portion of the buried electrical collection line system that is proposed to traverse either a wetland or stream will be installed using directional boring techniques, to the extent practical. This installation method assures that no impacts occur to streams or wetlands by boring underneath the feature in question. Additionally, boring pits will be set up well beyond the edges of all streams or wetlands.

A new 115 kV transmission line will run 0.5 mile north from the collection substation to an interconnection point adjacent to the existing Cortland to Labrador 115 kV line owned by National Grid, adjacent to East River Road. The line will be carried on twin wooden poles that traverse a forested slope and agricultural fields. This collection substation location was chosen as it provides a reasonably central point for the collection of electricity from all turbines, and is sited to minimize the visual impact of the substation. In addition, the site is located close to the existing 115 kV line which minimizes both costs and environmental impacts caused by the installation the overhead 115 kV line. As described in Section 2.6.9, the SRIS indicated that there are no impacts that cannot be readily mitigated. Therefore, other potential alternatives for connecting to the power grid were not seriously considered, as they would result in significantly greater impacts.

5.3.2.3 Access Roads

Access road widths will be the minimum necessary to construct, operate and maintain the Project. The Project is utilizing by way of upgrade existing farm roads to the extent practicable. Where an existing road is unavailable or unsuitable, new gravel-surfaced access roads will be constructed. The total length of access road required to service all proposed wind turbine locations is approximately 18.6 miles. These access roads will be reduced from a construction width of up to 40 feet to an operation/maintenance width of up to 20 feet.

5.3.2.4 Substation

Given that the Project has to connect to bulk transmission system, and as discussed above, the proximity of the Project to the existing NYISO controlled grid was a key consideration in locating the entire Project. Hence, the residual options regarding the actual final proposed point of connection were rather limited once the Project location was selected with this factor as one of the key criteria. As part of the options to connect the Project, the Project Sponsor did evaluate the following possible connection points:

<u>Cortland Substation (adjacent to Route 41)</u>

This option was ruled out following a site visit in early 2007. While it is often preferable, for cost reasons, to connect wind projects to existing transmission substations, the main issue that led to this option being ruled out was the need to then construct a lengthy transmission line from the Cortland substation to the Project area, which would involve multiple landowners and also involve addressing varied topography. This option would impact a greater number of local residents and would increase environmental impacts, through deforestation on an increased length of ROW and the visual impact of 5 miles of overhead 115kV interconnection transmission line.

<u>Transmission Corridor Containing 2 x 115kV and 1 x 345 kV</u>

The Project Sponsor evaluated the transmission corridor that leaves Cortland substation and heads in a northeast direction, generally following highway 13. The final Point of Interconnection was selected as being close to the area containing turbines and provided for sufficient space to construct the connection substation utilizing an existing farm road to access the location of the proposed connection substation. It was considered that thus connecting at this location represented the option with the lowest overall impact. The associated landowners were contacted and were willing to contribute their land to the Project. As described in Section 2.6.9, given that NYISO have progressed with studying the connection of at this location, the Project Sponsor has not progressed with an alternative location as a suitable point of connection.

Once the location of the point of connection substation was located the Project Sponsor then sought to identify a feasible location for the transforming substation. Several locations were considered, with two final options being selected, as follows:

<u>Adjacent to Warren Road</u>

Whilst this location satisfied the Project Sponsor's requirements the landowner was not willing to host a substation and hence this option was discontinued.

<u>Final Location Transforming Substation</u>

The final location was chosen based on it providing for;

- a very efficient transmission line right of way to the point of interconnection substation
- the ability for the transforming substation to be located in an area achieving a setback from residences exceeding 1,600 feet and 1,500 feet from the nearest public road

- the ability to use upgrade an existing farm track to access the final location
- the location being screened by trees and thus minimizing the visual impact

Given the above criteria being satisfied the Project Sponsor has not progressed with evaluation of any further locations for the transforming substation

5.4 ALTERNATIVE PROJECT SIZE

The Crown City Wind Energy Project has a 90 MW interconnection request with the NYISO; however, the preferred alternative is to construct a facility that Project area consists of 44 wind turbines totaling 71 MW of capacity with the ability to generate 217,686 MWh per annum of clean energy. The preferred Project size has been determined based on many factors as described in Section 2.5.1 – Project Siting Criteria, but is principally governed by the setbacks used to design the Project and limitations of available land at suitable elevations within the Project area and the requirement to adequately space the turbines to optimize the Project for turbulence created by each turbine. Project area

Economies of Scale

A project of significantly more, or fewer, turbines would pose challenges to the technical or economic feasibility of the Project, and would not meet the stated objectives of the Project. If the proposed number of turbines were significantly reduced, the maximum benefit of the available wind resource would not be realized and the cost of connecting to the New York grid may likely be unviable. If the turbine number was even moderately reduced, the Project economics would be in jeopardy. Economies of scale generally lower costs and the concomitant price a project operator must receive for energy produced, making a larger project more competitive and capable of delivering lower cost energy to the grid, as well as potentially maximizing the return on investment. Regardless of the size of a given wind power project, various development costs are fixed and will remain essentially unchanged. These fixed costs include, but are not limited to transmission interconnection and associated system upgrades, an interconnection substation, transformer, 3 ring bus, operations and maintenance building, construction mobilization, and environmental monitoring and post construction monitoring, as well as all the development and consulting fees associated with permitting efforts and finance establishment and transaction costs. Since these facilities and services are common to all the options regardless of size, turbine choice, or other variables, the cost of these actions/facilities is more-or-less the same, regardless of the number of turbines built. Therefore, by reducing the number of turbines in a given project, the cost per unit turbine would actually increase and the amount of revenue generated to cover these fixed costs would decrease, or have to increase in order for a Project to achieve a hurdle rate of investment.

The significant reduction in merchant power prices in the New York market (between 2008 and 2012 – as a consequence of reduced electrical demand and substantial decreases in natural gas pricing (NYISO, 2012 *Custom Reports*) has further increased upward pressure on the size of wind projects required to be viable, in consideration of the above referred fixed costs. It should be borne in mind that of the revenue components explained in Section 2.3 the only one that a wind project owner can influence is the REC pricing by bidding a higher price in the competitive NYSERDA solicitations. Aside from the fact that such a strategy is likely to impede the chance of successfully gaining a REC contract, it should be noted that the New York electricity consumers would thus pay more for the RECs in the event of having to increase the required revenue for the Project associated with a reduction in the number of turbines. Hence, when considering the economies of scale required for viability, it is important that such an assessment needs to be done in a contemporary manner of the commercial circumstances that will exist specific to the Project in question over its operating life, such as; fixed site establishment costs, cost of connecting to the transmission system, merchant power prices expected to be experienced over the life of the Project, RECs being procured in competitive solicitations, the contemporary view of long-term natural gas prices (as these act to set the merchant power market price level) etc. In this respect, project sizes of previously constructed projects are not necessarily a good comparison as they likely had fundamental differences such as; being financed by NYSERDA grants (prior to the competitive REC solicitations), or other grants, financed in a higher merchant power price environment (which perhaps enabled them to secure a more viable contract for sale of the energy) when natural gas was trading substantially above current prices, lower transmission interconnection costs, lower environmental analysis and monitoring costs etc.

As with environmental impacts, economic benefits would also be reduced proportionately with a smaller project. PILOT payments to local taxing jurisdictions, (which will be based on total installed megawatts), as well as construction expenditures, would be reduced. If the proposed number of turbines were significantly increased, the Project Sponsor would need to obtain more leased land area and the Project would likely have to be over a wider area.

As mentioned previously, various siting constraints dictate the size and layout of a wind power project. These constraints make a significantly larger number of turbines within the Project area unlikely. A larger project would result in location of wind turbine towers in areas that do not have ideal wind resources, and which may not have willing landowner participants. This alternative may also require installation of more turbines in areas with more sensitive resources and/or higher population density and due to the ridge and valley topography at this site, would cause the Project to be less geographically concentrated. Although a larger facility might theoretically have more economic value, the greater environmental impacts, (aesthetics, area of soil disturbance, deforestation, habitat removal, impact to agricultural land etc.) would not justify the marginally increased power generation potential of the Project.

Impact of increasing Wind Turbine Setbacks

To demonstrate the impact that an increase in setbacks would have on the Project, an Alternative Design Analysis is presented in Figure 17a. This figure depicts:

- Residence setbacks of increasing distances including, 1,642 feet, 1,800 feet, 2,000 feet, 2,200 feet;
- All constraints that are factored into the layout design (combined and shown in light grey) including but not limited to, wetlands, public infrastructure, Non-participating property lines, roads, and telecommunication links;
- Turbine locations;
- Turbine ellipses that indicate sufficient turbine spacing to minimize wake effects (due to turbulent air shedding from turbine blades);
- The elevation threshold below which turbine siting is avoided, in order to maximize the use of higher elevations with greater wind speeds.

Given the aforementioned considerations of layout design, the unconstrained white areas in Figure 17a remain available and are targeted for turbine siting. The application of an increase in setback distance from 1,642 feet to 1,800 feet yields no impact to the proposed turbine configuration, as an 1,800 foot setback from residences has already been achieved by the Project Sponsor. This is because the 1,642 foot setback mentioned elsewhere in the DEIS is a minimum acceptable setback. With respect to the proposed layout, a setback increase to 2,000 feet from residences leaves 22 compliant turbines (a 50% reduction in turbines) while a setback increase to 2,200 feet results in a project of 17 turbines (a 60% reduction in turbines). While a project of 17 turbines may reduce adverse impacts to some areas of the site, it would still result in some degree of adverse impact to all of the Project area. The analysis indicates that a residential setback of 2,200 feet would be significantly detrimental to the Project by reducing the number of viable turbines by 60%.

If the Project size was to be reduced to 17 turbines (27MW) by implementing a 2,200 foot setback, several adverse impacts of the Project would be avoided. The main impacts that would be avoided and / or minimized on some residences within the Project area are: sound level increase; visual impact; potential public safety impacts and shadow flicker. This Project alternative would mean that no residences would be impacted by shadow flicker for more than 30 hours per year. The Project, as currently proposed, shows that a shadow flicker impact on 12 residences for more than 30 hours per year has been identified but the Project Sponsor has committed to reduce this to 30 hrs maximum by way of mitigations (refer Section 3.5.3) so there is no net change in this as a consequence of any reduction of turbines. The sound level generated by 17 turbines would be lower than the sound generated by 44 wind turbines, however, the turbines would still be spread out across the Project area, so although there may be a reduction in the sound level experienced, the same receptors within the Project area may still experience some level of sound increase. The visual impact of 17 turbines is less than that of 44 turbines, therefore it is anticipated that fewer turbines would be visible at any one time, from a reduced number of areas. To ensure the safety of the public, the Project Sponsor has implemented setback distances from roads, Non-participating property lines and residences. The Project Sponsor believes that an increase in setback distances, leading to a reduction in the number of turbines ultimately installed would not decrease public safety impacts as the setbacks currently implemented sufficiently mitigate the risk of ice shedding, blade failure or tower collapse and other factors that have been identified as potentially impacting public safety.

In addition to the analysis presented in Figure 17a, the Project Sponsor analyzed the effect, on the proposed layout of increasing the turbine setback from Non-participating properties from 738 feet (the setback currently used) to 1,500 feet in incremental stages. A setback increase to 1,000 feet leaves 32 turbines compliant, (a 27% reduction in turbines), while a setback increase to 1,250 feet leaves 21 compliant turbines, (a 52% reduction in turbines). A setback of 1,500 feet from Non-participating property lines leaves only 15 compliant turbines, effectively reducing the Project size by 65%. Please note that the two alternatives analyses were completed independently of one another to display the effect of increasing each setback distance. If the (residence and Non-participating property line) setback distance increases are implemented together, the number of turbines remaining compliant is reduced at a greater rate.

These actions would impact the economic and technical balance of the previously discussed design and would not achieve the goals of the Project. In addition, it is also proposed that while removing some turbine locations from the Project may reduce some adverse environmental effects to the Project area, this action would increase the distance between turbines and while impacting the same overall Project area, would not significantly reduce the length of underground cabling, or the need for access roads or transforming and POI substations but importantly, would result in a significant reduction in Project benefits to communities through the Pilot scheme and landowners payments along with reducing the amount of renewable energy generation and the Project contribution to the NYS Renewable Portfolio Standard of 30% renewables by 2015.

Based on the findings of the Alternative Design Analysis presented in Figure 17a, along with the analysis completed for increased setback distances from Non-participating property lines, it is apparent that there is minimal potential to site turbines in locations different from the configuration currently proposed, using the siting criteria applied by the Project Sponsor, without significantly reducing the number of turbines and thus impacting Project viability.

In conclusion, since the objective of the Project Sponsor and proposed action, as stated in Section 2.2, is to take advantage of the available wind resource and New York bulk power transmission system interconnection capacity, in order to create an economically viable wind-powered electrical-generating facility that will provide a significant source of renewable energy to the New York power grid, and contribute to the achievement of the New York RPS, a modification to the proposed turbine configuration is not considered viable, as it would result in a reduced number of turbines and thus a drastically smaller and less viable Project. The wider community would not therefore benefit from the full extent of the proposed PILOT, significantly less landowners would benefit from Project payments and the numbers of short and long term jobs created would be drastically reduced. Economies of scale, pertinent to wind energy projects, are discussed above. Therefore, considering that the alternatives described above would not significantly minimize or avoid adverse environmental effects on the Project area, and that should a significant reduction in the number of wind turbines be realized, the goals and objectives of the Project Sponsor and proposed action would not be met, an alternative project size and/or configuration of the proposed Project is not considered to be viable.

5.5 ALTERNATIVE TECHNOLOGIES

The turbines proposed for the Project will utilize the latest in wind power generation technology to enhance Project efficiency and safety and minimize impacts such as noise and bird collisions. The proponent is proposing to develop a project with 71 MW of renewable energy generation capacity. Alternative power generation technologies, such as fossil-fuel and biomass combustion, would not meet the goals of the Project, are not the area of expertise of the Project Sponsor, and would potentially pose more significant adverse environmental impacts, particularly on air quality but also on land use and water resources. Most fossil fuel-fired generating facilities would require significant amounts of water to operate, the use of which may pose impacts to surface water or groundwater resources as well as fish and other aquatic organisms. Conventional power plants also would not advance the RPS goal of generating 30% of the state's power by 2015. According to the NYS Renewable Portfolio Standard 2012 Performance Report, renewable energy production only reached 47% of its annual target as of December 31, 2011 (NYSERDA 2012, p. 4). Approval of projects such as the Crown City Wind Energy Project is needed in order to help meet New York State's RPS goals.

With regard to other renewable sources of generation, large-scale hydroelectric plants have significant impacts on terrestrial and aquatic ecological resources, land use, and aesthetics. Like wind power projects they are also resource dependent, and can also only be developed in places with appropriate water volumes and topographic conditions (which do not exist within the Project area). Other renewable energy technologies, such as solar power and hydrogen, are still either cost-prohibitive or in development. Aside from cost constraints, utility-scale solar power is not likely feasible in an area such as upstate New York, where available sunshine is limited, until such time that electricity tariffs increase along with continued reduction in the cost of solar power. According to EIA (2012d) estimates, the levelized cost for plants entering service in 2017 will average 96$/MWh for wind energy facilities compared to an average of $152.70/MWh for solar photovoltaic and $242/MWh for solar thermal. Therefore, wind is currently the only renewable energy source that can help meet energy needs in a technologically and economically efficient manner. It can also do this without the emission of greenhouse gases and other environmental impacts that alternative power generation technologies would create.

5.6 ALTERNATIVE CONSTRUCTION PHASING

The Project Sponsor proposes to construct the Project in a single phase during a single construction season. Single phase construction will result in a more efficient construction process, with a shorter duration of construction-related impacts, than a multiple phase construction approach, and will allow resources, such as soils, wildlife, and vegetation, that are temporarily impacted by construction, to begin to recover and/or habituate sooner. In contrast, a multiple phase construction process would result in a longer period of construction disturbance, and would be less economically efficient for both the sponsor and the local beneficiaries of the direct and indirect economic benefits of the Project.

5.7 NO ACTION

The no action alternative assumes that the Project area would continue to exist as is. This no action alternative would not beneficially nor adversely affect current land use, ambient noise conditions, traffic or public road conditions, television/communication systems, and would maintain the area's community character, socioeconomic, and energy-generating conditions as they currently exist.

Under this alternative, no wind turbines or infrastructure (e.g., access roads, electrical interconnects, or substations) would be developed in the Project area. Consequently, while none of the potential environmental impacts associated with Project construction and operation would occur, the significant socioeconomic benefits that would accrue to the area if the Project were developed would not be realized. Unrealized economic benefits would include earnings from construction jobs, annual income from permanent jobs, annual lease payments to the landowners, and annual PILOT payments to the involved county, town, and school districts. The total PILOT revenues for the involved county, town, and school district are expected to total $7,100,000 for 20 years of Project operation. In addition, several indirect economic benefits would also not be realized, including "spin off" jobs (due to increased household spending and commercial activity) in the area, that combined with permanent new jobs expected to result from the Project, will result in new annual earnings during the operating years of the Project. Under the no action alternative, multiplier effects from these economic benefits would also not be realized (see Socioeconomic Report in Appendix S for additional detail).

The no action alternative would fail to address the various forms of energy consumed in the state and the need for diversification to help suppress energy prices, whereas the Project directly addresses the need for energy diversification and helps to suppress long-term energy prices through an available renewable energy source and contribute to achievement of the RPS.

The no action alternative would also be inconsistent with New York State's initiatives and policies for rapidly promoting development of renewable energy in the State (as detailed in Section 2.2). In March 2008, New York Governor David Paterson issued an executive order re-instituting the State Energy Planning Board to, among other things, address the fuel diversity issue in the state. Additionally, the State has established a Renewable Portfolio Standard (RPS) with the express intent to support the diversification of energy resources by mandating increases in renewable resources. In so doing, the Public Service Commission stressed the need for a more diverse portfolio of fuels to generate electricity as a means of suppressing wholesale prices for power. Wind power, in particular, is well suited to suppressing wholesale prices as the lack of fuel costs and minimal operating and maintenance costs mean the power can be produced inexpensively once the facility is constructed.

In addition, on January 7, 2009, Governor Paterson announced during his State of the State address the State's new "45 by 15" goal to meet 45 percent of the State's electricity needs through improved energy efficiency and clean renewable energy by the year 2015. Governor Paterson also proposed increasing the Renewable Portfolio Standard (RPS) to 30%.

The no action alternative would fail to promote the State's current goals, and ignores the State's interests in fuel diversity for power production. The no action alternative would, therefore, negatively impact the State's ability to meet its current energy goals. In contrast, the Project would help meet and promote the State's current goals. Furthermore, the benefits of adding 71 MW of clean, renewable electric energy generation capacity to the power grid would be lost with the no-action alternative, and reliance on fossil-fuel-fired generators, which contribute to environmentally adverse emissions of sulfur dioxide (a precursor of acid rain), nitrogen oxide (a smog precursor), and carbon dioxide (a greenhouse gas) would continue unabated.

Given the short-term nature of anticipated construction impacts (approximately 9 months) and the generally minor long-term impacts of Project operation described in this DEIS, compared to the significant economic and environmental benefits that the Project would generate, the no action alternative is not considered a preferred alternative.

6.0 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

The proposed Project will require the irreversible and irretrievable commitment of certain human, material, environmental, and financial resources, as described below. For the most part, the commitment of these resources will be offset by the benefits that will result from implementation of the Project.

Human and financial resources have already been expended by the Project Sponsor, the State of New York (i.e., various state agencies), Cortland County, and the Towns Cortlandville, Homer, Solon, and Truxton for the planning and review of the Project. The expenditure of funds and human resources will continue to be required throughout the permitting and construction phases of the Project (e.g., for environmental reviews and permitting, site plan approval, building and construction inspections).

The Project also represents a commitment of land for the life of the Project, proposed to be 25 years. Specifically, the land to be developed for wind turbines, access roads, the O&M building, and the collection substation and the point of interconnect facility, a total of 55.5 acres, will not be available for alternative purposes for the life of the Project. As a result of the implementation of the Project, there will be relatively minor impacts to environmental resources such as agricultural lands, soils, wildlife habitat, wetlands and streams (see Section 3.0 for additional detail). However, because the turbines/towers are proposed to be removed, and the land reclaimed for alternative uses upon Project decommissioning (see Decommissioning in Section 2.8), the commitment of this land to the Project is neither irreversible nor irretrievable.

Various types of manufacturing and construction materials and building supplies will be committed to the Project. The use of these materials, such as gravel, concrete, reinforcement steel, cables etc., will represent a long-term commitment of these resources, which will not be available for other projects. However, some of these materials (e.g., steel, gravel, cables) will be retrievable following the operational life of the Project, and will likely be retrieved in accordance with Project decommissioning.

Energy resources will be irretrievably committed to the Project, during both the construction and operation of the Project. Fuel, lubricants, and electricity will be required during turbine fabrication and activities associated with the manufacture of turbines and components of the electric collection/interconnect system, as well as operation of various types of construction equipment and vehicles on-site, and for the transportation of workers and materials to the Project area. However, the energy resources utilized to construct and operate the Project will be minor compared to the energy generated by the Project (217,686 MWh) and made available to the people of Cortland County and New York State.

7.0 GROWTH INDUCING AND REDUCING IMPACTS

Certain proposed actions reviewed under the SEQRA process have the potential to trigger further development by either attracting a significant local population, inviting commercial or industrial growth, or by inducing the development of similar projects adjacent to the built facility. The proposed Project does not require a work force greater than approximately five to seven employees during operations, and therefore will not lead to significant growth in local population or housing. Although it is anticipated that the period of construction of the facility will enhance the local economy through the purchase of goods and services, both by the Project Sponsor (construction materials and services) and by temporary construction workforce (hotel nights, catering, etc.) the type and level of expenditures are not of the sort that would generate significant sustained growth of businesses that serve the proposed facility. Lease payments to landowners have the potential to induce growth of local agriculture by providing more capital for landowners to invest in their businesses, if desired. However, secondary/indirect impacts resulting in local growth are not anticipated to occur as a result of the proposed action. The Payment In Lieu Of Tax agreement (PILOT) that ultimately will be executed for the Project to bring in tax revenue to the involved municipalities and school districts has the potential to lower taxes or to improve community facilities for area residents and this may provide some incentive for businesses and residences to locate in the respective Towns, but any associated growth inducing impact is expected to be minimal.

The Crown City Wind Energy Project is proposed, in part, because of the presence of existing resources and facilities that allow the Project to be economically viable. Specifically, the availability of adequate wind, availability of suitable land resource and the proximity to an existing transmission line allow for generation and transmission of the Project's electric output to the state power grid. The presence of the New York RPS creates a market for the energy output thus in their entirety these facts make the Project viable. The occurrence of these resources/facilities might suggest that other wind power projects could be proposed on adjacent lands. However, this would be the case with or without the proposed Project. Its presence alone will not encourage the development of additional wind power projects in the area. In fact, because the existing capacity of transmission facilities will be reduced by the addition of electricity generated by the Crown City Wind Energy Project, future projects will be more difficult to develop if such development could only be accommodated by upgrading the existing transmission line. If this were the case, such upgrades would likely make future projects less economically viable due to the significant cost typically associated with such upgrades which would be borne by the developer. In addition, landowner willingness and environmental sensitivity play a significant role in the location of wind power projects.

Additional wind power projects in the Towns of Cortlandville, Homer, Solon, and Truxton may be limited due to the lack of the following factors, which are all necessary for a viable wind power project in New York State:

- Adequate wind resource
- Proximity to existing transmission lines with available capacity
- Proximity to appropriate transportation corridors
- Land area that can accommodate industry standard setbacks
- Lack of significant environmental resources

The Project layout was designed in accordance with minimum setback distances of 738 feet between proposed turbines and non-seasonal public roads and Non-participating property lines; this distance has been assessed by the Project Sponsor as being acceptable to adequately protect the public and neighboring property owners. In order to assess the effectiveness of TCI's 738 foot setback to mitigate against ice-shedding the Project Sponsor conducted a preliminary risk assessment, which has been included in Appendix Q. As indicated in the risk assessment an independent analysis will be undertaken prior to construction of the project to verify the risk analysis. The proposed setback distance is 1,642 feet between the proposed turbines and existing permanent residences. These setbacks exceed the area around turbines where studies have documented the potential for ice shedding/ice throw may occur, which will adequately protect nearby residents, recreational users (such as hikers, cross country skiers and snowmobilers) and motorists from falling ice of any significant size and protect neighboring land parcels from danger in the event of turbine collapse. Given the existing residential patterns (i.e., houses built primarily along roadsides), along with the limited nature of residential development in the vicinity of the Project area, it is expected that the implementation of the Project will not significantly impact the develop-ability of neighboring vacant parcels in the area.

The Scoping Document adopted September 13, 2012 requested information about the number of acres potentially lost for future development. In response to these concerns:

1. As summarized in Section 1.0, there will be 55.5 acres converted to built facilities (i.e., access roads, turbine bases, etc.), which will be entirely located upon leased lands (i.e., those specific portions of a parcel where infrastructure will be located – wind turbines, access roads, cable right-of-ways, etc.) and will therefore be unavailable for development until such time as the Project is decommissioned. The lease document utilized by TCI for the Project prevents the placement of immovable objects on the leased land (i.e. where Project infrastructure will be placed), but contemplates shared use of access tracks and enables the erection of buildings and other structures elsewhere on the same parcel (containing the leased lands) so long as such activity does not interfere with the wind flow over the leased lands. A summary of the lease terms is included in Section 2.4. Furthermore, the lease agreement stipulates that landowners shall not undertake any action, that may have the effect of constituting a danger to the wind turbines (examples referred in the lease include blasting, excavation, or construction). Of course, such restriction would not be effective if

such activities were undertaken with an adequate setback from the wind turbine or following consultation and agreement. Generally the restrictive covenants are designed a means of protecting the wind farm infrastructure and not for the purpose of unreasonably limiting the landowners rights.

2. A total of 738 acres of Non-participating parcels will fall within the zone of residence setback from turbines.
3. A total of 5, 720 acres of participating parcels will fall within the zone of residence setback from turbines.

Further analysis by the Project Sponsor revealed that 531 acres of Non-participating vacant parcels (i.e., parcels not already containing a residence) would fall within the zone of residence setback. Of these vacant parcels, none would be prevented from building a residence on the parcel solely as a consequence of the 1,642 foot setback from a turbine. Additionally, the Project Sponsor does not control who is able to build structures and in what location on Non-participating parcels.

8.0 CUMULATIVE IMPACTS

In accordance with 6 NYCRR § 617.9(b)(5)(iii)(a), SEQRA requires a discussion of cumulative impacts where such impacts are "applicable and significant." Cumulative impacts are two or more individual environmental effects which, when taken together, are significant or that compound or increase other environmental effects. The individual effects may be effects resulting from a single project or from separate projects.

Where individual effects of the Project may interact with other effects of the Project, such potential cumulative impacts have been addressed in Section 3.0 of the DEIS. As previously indicated, the Project includes 44 wind turbines, which will deliver up to 217,686 MWh per annum of electrical power to the New York state grid. The Project Sponsor does not have any plans for future phases beyond that which is described and evaluated in this DEIS.

Therefore, this section addresses the potential cumulative impacts that may arise from interactions between the impacts of the Crown City Wind Energy Project and the impacts of other projects. In general, cumulative impact analysis of external projects is required where the external projects have been specifically identified and either are part of a single plan or program, or there is a sufficient nexus of common or interactive impacts to warrant assessing such impacts together. Some cumulative impacts are the simple additive effect of the projects (i.e., each will disturb a certain amount of ground surface, wetlands, or natural communities). These additive impacts can be quantified by simply tallying the total impacts resulting from each project, to the extent that such information is known and has been publicly presented. Certain other cumulative impacts may not simply be additive and therefore need a certain level of further analysis. The subsections below discuss whether there are identified projects for which a cumulative impact analysis is required, and assess the extent to which the impacts of such projects will be cumulative with the impacts of the Crown City Wind Energy Project.

Across New York State, numerous wind-powered generating facilities are in the project planning and development phases. The review and approval status of these projects is highly variable, ranging from preliminary site investigations to those with completed system reliability impact studies (a requirement of the New York Independent System Operator [NYISO]), detailed project plans, and landowner agreements.

The NYISO oversees the New York Transmission System (the "Grid") and has in place a process for permitting the interconnection of new electric generating facilities with the Grid. Consequently consideration of a project's status in the NYISO review process is a helpful measure for determining whether a proposed project may or may not be built. The NYISO reviews projects in three main phases: submittal of an interconnection request, preparation of a feasibility study, and completion of a system reliability impact study. This review process separates projects, initially by feasibility to connect to the Grid through a selected transmission facility. Proposed projects in any phase of project review by the NYISO are identified on a comprehensive queue listing maintained by NYISO on their website http://www.nyiso.com. It is reasonable to assume that wind power projects with in-progress system reliability impact studies and with upcoming proposed operation dates may be considered 'proposed' or 'future' projects for the purposes of cumulative impact analysis.

The degree to which other existing and proposed wind projects in the region would have environmental impacts that could contribute to the cumulative impacts associated with the construction and operation of the Crown City Wind Energy Project is dependent on distance. For most resources, wind projects located beyond 10 miles would generally have no direct or indirect impacts on the Crown City Project area or the surrounding Project area, nor contribute to overall cumulative impacts. Projects at that distance would not impact the same habitats, watersheds, recreational facilities, viewsheds, roads, or residents that may be affected by the Crown City Wind Energy Project.

Aside from the proposed Crown City Wind Energy Project, there are currently no operating, approved, or proposed utility-scale wind power projects in Cortland County, nor are there any operating, approved, or proposed projects in the adjacent counties of Onondaga, Cayuga, Tompkins[2], Tioga, Broome, or Chenango. Madison County, located adjacent to Cortland County to the northeast, has three proposed wind power project identified in the NYISO queue each located approximately 25 to 35 miles from the Project area: 1) Munnsville (6 MW), proposed by Airtricity Munnsville Wind Farm, LLC; 2) West Hill Windfarm (31.5 MW), proposed by NY Windpower, LLC; and 3) Rolling Upland Wind (36 turbines; 59.4 MW), proposed by Rolling Upland Wind Farm, LLC. Available information (or lack thereof) for each of these projects is summarized below, along with the relevance of this information in relation to cumulative impacts:

1. Munnsville: Although listed in the NYISO queue with an in-service date of December 2013, the Project Sponsor is not aware of any SEQRA documents available for this Project. Consultation with Town of Stockbridge officials (A. Stepanski, pers. comm.) indicated that no SEQRA review has been initiated for this project, which appears to be a proposed expansion to the operating Munnsville facility, discussed below.
2. West Hill: The Town of Stockbridge Planning Board, acting in its role as SEQRA Lead Agency, issued a Negative Declaration for the West Hill project in January 2009. A Negative Declaration under SEQRA refers to a written determination by the Lead Agency that the implementation of the action will not result in any

[2] Until recently, the NYISO queue had included a wind energy project in the Town of Enfield in Tompkins County, the Black Oak Wind Farm. The proposed site for the 50 MW Black Oak Wind Farm is approximately 30 miles southwest of the Crown City Wind Energy Project. However, this project was withdrawn from the NYISO queue on June 30, 2012, and therefore, is not considered in this cumulative impacts analysis. Should the Black Oak Wind Farm re-engage and eventually be constructed, cumulative impacts would be similar to those evaluated herein for the existing and proposed Madison County projects.

significant adverse environmental impacts. The SEQRA analyses that were conducted in support of this Negative Declaration are not available online (i.e., the website that formerly hosted this material [http://www.westhillwind.com/index.html] is no longer functional). However, per the Negative Declaration the Lead Agency has concluded that this project will not result in any significant adverse impacts. Therefore, it is not anticipated that this project will meaningfully contribute to cumulative impacts when also considering the Crown City Wind Energy Project.

3. Rolling Upland: A Draft Generic Environmental Impact Statement (DGEIS) was released for the Rolling Upland Wind Farm in February 2012, and was reviewed as part of this cumulative impact analysis (RUWF, 2012). However, additional SEQRA documents for this project (e.g., SEIS, FEIS, Findings Statement) have not been released. In addition, the DGEIS for the Rolling Uplands project identifies a potential "Project Corridor" rather than definitive locations of project components. Further, the DGEIS states, "After hearing comments on the DGEIS from the public, governmental agencies and the Planning Board, the Applicant will make final design designations: it will precisely locate turbines; it will select a specific location for underground connection cables and internal project access ways within the previously identified corridors; and it will select final designated construction vehicle routes to and from the Project site. Having made these specific selections the Applicant will also conduct and provide additional studies that will more precisely define any potential impacts of the project…" (RUWF 2012, p. 1-4). Therefore, site-specific impacts that may potentially contribute to cumulative impacts when also considering the Crown City Wind Energy Project cannot be adequately evaluated at this time. However, due to the distance between these two projects, local resources at either of these sites will not experience cumulative impacts.

It is important to note that the assumption that all of these projects would ultimately become operational is dependent on a number of factors, which include completing the NYISO review; completing SEQRA or New York Power Act Article 10 review; completing state, federal, and local permitting; and securing adequate financing for turbine purchase and project construction. Any or all of the proposed projects may not be approved and/or constructed, and therefore would not contribute to cumulative impacts associated with the construction and operation of the Crown City Wind Energy Project. Nonetheless, for the purpose of this analysis of potential cumulative impacts, it is assumed that all of the proposed projects will be approved and constructed.

There are also three operating projects in Madison County, each located approximately 26 to 32 miles northeast of the Project area:

1. Madison Wind Power Project (7 turbines; 11.6 MW), developed by EDP Renewables Wind Energy LLC;
2. Fenner Wind Power Project (20 turbines; 30 MW), developed by Canastota Wind Power LLC; and
3. Munnsville Wind Project (23 turbines; 34.5 MW), developed by Airtricity Munnsville Wind Farm LLC.

Potential cumulative impacts due the proposed/operating projects in Madison County and the Crown City Project are evaluated as follows:

- Geology, Soils, and Topography: Impacts to these resources, which are localized and restricted to site-specific activities, will not be cumulative due to the distance between Madison County and the Crown City Project.
- Water Resources: Impacts to these resources, which are localized and restricted to site-specific activities, will not be cumulative due to the distance between Madison County and the Crown City Project.
- Biological Resources: With the exception of potential impacts to birds and bats, impacts to the remaining biological resources, which are localized and restricted to site-specific activities, will not be cumulative due to the distance between Madison County and the Crown City Project. Please see below for an evaluation of potential cumulative impacts to birds and bats.
- Climate and Air Quality: The Crown City Project will have an incremental and long-term beneficial impact on climate and air quality, and this benefit should be viewed as mitigation for other environmental impacts associated with the Project. In addition, the Madison County projects will have incremental and long-term beneficial impacts on climate and air quality, which also should be viewed as mitigation for any potential cumulative impacts.
- Visual and Aesthetic Resources: Cumulative visual impacts between the Madison County projects and the Crown City Project are not anticipated, again because of distance. While extremely unlikely, even if all seven projects were constructed and were visible from one central location, the Madison County projects would never be simultaneously visible with the Crown City Wind Energy Project because of viewer orientation (i.e., they are in opposite directions). Shadow flicker impacts will not be cumulative due to the distance between Madison County and the Crown City Project.
- Historic, Cultural, and Archaeological Resources: With the exception of potential visual impacts to historic architectural resources, impacts to the remaining cultural resources, which are localized and restricted to site-specific activities, will not be cumulative due to the distance between Madison County and the Crown City Project. Visual impacts to historic architectural resources will not be cumulative due primarily to distance, and as indicated immediately above, the Madison County projects would never be simultaneously visible with the Crown City Wind Energy Project because of viewer orientation (i.e., they are in opposite directions).
- Sound: Sound impacts will not be cumulative due to the distance between Madison County and the Crown City Project.
- Traffic and Transportation: Construction-related impacts to regional roads (i.e., Interstate 81) could be cumulative, but this would only occur if two or more projects were constructed simultaneously and if they

used the same construction delivery routes. Should this situation arise, coordination of transportation routes would be undertaken by the involved project developers/contractors to assure that the duration and extent of impact is minimized and that road repair/restoration work is accomplished at the appropriate time, and at no cost to the affected jurisdictions. Due to the distance between the Project area and proposed wind projects in Madison County, localized construction impacts such as noise and dust will not be cumulative among any of these projects.

- Socioeconomics: The operation and maintenance of the Crown City Project is anticipated to have a positive impact on municipal budgets through the provision of payments in lieu of taxes (PILOT), which is typical for wind power projects in New York State. Therefore, the Madison County projects are also anticipated to have a positive impact on municipal budgets as a result of PILOT agreements. No potential adverse cumulative impacts on local socioeconomics are anticipated.
- Public Safety: Impacts to public safety, which are localized and restricted to site-specific activities (or activities immediately adjacent to a given project), will not be cumulative due to the distance between Madison County and the Crown City Project.
- Community Facilities: Due to distance, there are not shared facilities between Madison County communities and Cortland County communities, therefore cumulative impacts will not occur.
- Communication Facilities: Impacts to these resources, which are localized and restricted to site-specific activities, will not be cumulative due to the distance between Madison County and the Crown City Project.
- Land Use and Zoning: Impacts to these resources, which are localized and restricted to site-specific activities, will not be cumulative due to the distance between Madison County and the Crown City Project.
- Vibrations: Vibration-related impacts, which are localized and restricted to site-specific activities, will not be cumulative due to the distance between Madison County and the Crown City Project.

The most likely cumulative impact resulting from the operation of multiple wind power projects in Cortland and Madison Counties would be avian and bat impacts. Cumulative avian impacts may occur, regardless of the distance between proposed facilities. Based upon a comprehensive analysis conducted for other wind projects across the United States, avian collision with wind turbines is estimated to range from 2.19 (national average) to 1.83 (national average outside California) fatalities per turbine per year (Erickson et al. 2005, p. 1036 and Erickson et al. 2001, p. 2, respectively). Based upon analyses completed in 2007 and 2009 for the Maple Ridge Wind Power Project (located in Lewis County, NY), avian collision with wind turbines is estimated to range from 3.13 to 9.59 fatalities per turbine per year (Jain et al. 2007, p. 3; 2009a, p. 3; 2009b, p.3). Applying this range of impacts to the Crown City Wind Energy Project and existing wind energy facilities in Madison County discussed above, the 94 total turbines could result in an estimated range of 172 to 902 cumulative avian fatalities per year for these four projects. If the 36 turbines proposed for the Rolling Upland Wind Project are included, the 130 total turbines could result in an estimated range of 238 to

1,247 cumulative avian fatalities per year. This does not include the potential impacts associated with the proposed West Hill or Munnsville projects (because information about the number of turbines proposed is unavailable). If either/both of these projects are approved and constructed, the cumulative impacts would likely be greater than the range presented above.

While 172 to 1,247 avian fatalities per year or potentially more may sound large, it is a tiny fraction of the population that migrates through and/or resides in this area. This range of potential avian fatalities is not considered biologically significant, especially in consideration of other sources of bird mortality. On a national scale, the annual bird mortality associated with wind energy facilities (20,000 to 37,000 birds per year [Erickson et al. 2005, p. 1036]) is slight compared to other sources of mortality. A recent National Research Council study concluded that wind energy generation in the United States is responsible for only 0.003% of anthropogenic avian mortality (NRC 2007, p. 51). Other such sources include vehicles (80 million birds per year [Ericson et al. 2001, p. 8]), collisions with buildings (100 million to 1 billion birds per year [Klem 1990, p. 123; 2009, p. 246]), power and transmission lines (130 to 174 million birds per year [Koops 1987, p.1033; Erickson et al. 2005, p. 1033]), communication towers (4 to 50 million birds per year [USFWS 2002, p. 2]), pesticides (67 million birds per year [Pimentel et al. 1992, p. 757]), oil pits (1.5 to 2 million birds per year [USFWS 2002, p. 2]), and predation by domestic cats (100 million to 1 billion birds per year [Coleman & Temple 1996, p. 381; Dauphine & Cooper 2009, p. 205]).

Cumulative impacts to bats may also occur as a result of the wind projects in these three counties, regardless of the distance between proposed facilities. In recent years it has become evident that impacts to bats may actually be more of a concern than potential impacts to avian species (Luxmore 2009). An analysis of bat fatalities at wind energy facilities across the U.S. resulted in an estimate of 3.4 bats per turbine per year (NWCC 2004, p.4). However, because recent studies suggest that bat fatalities at wind farms may be higher in the eastern U.S., it is useful to again include results from the 2006, 2007, and 2008 Maple Ridge Wind Power Project bat fatality study. The estimates derived from these studies range from 8.18 to 24.53 bat fatalities per turbine per year (Jain et al., 2007; p. 3; 2009a, p. 3; 2009b, p. 4). Applying this range of impacts to the Crown City Wind Energy Project and existing wind energy facilities in Madison County discussed above, the 94 total turbines could result in an estimated range of 320 to 2,306 cumulative bat fatalities per year for these four projects. If the 36 turbines proposed for the Rolling Upland Wind Project are included, the 130 total turbines could result in an estimated range of 442 to 3,189 cumulative bat fatalities per year. This does not include the potential impacts associated with the proposed West Hill or Munnsville projects (because information about the number of turbines proposed is unavailable). If either/both of these projects are approved and constructed, the cumulative impacts would likely be greater than the range presented above.

The National Wind Coordinating Collaborative (NWCC) warns that caution must be used when comparing fatality rates across studies due to the use of different estimators and varying search intensities, study lengths, timing, size of search areas, and biases from unaccounted crippling losses (Strickland et al., 2011). Although the results of the passive acoustical monitoring in the Project area were within the range documented by acoustic studies conducted at other wind power project sites in the eastern U.S. and New York State, bat activity at the Crown City site was found to be at the high end of this range. However, the detector was located near a forested edge in close proximity to two ponds, habitat conditions that result in greater bat activity compared to the wide open fields where detectors are often placed (E&E 2012, p. 4-13). Also, it is important to acknowledge that numbers of recorded call sequences are not necessarily correlated with number of bats in the area. Acoustic detectors do not allow for differentiation between a single bat echolocating while flying past a detector once before moving out of the detectable airspace.

These considerations, along with the fact that there have been no studies to date that have linked rates of bat activity documented in pre-construction acoustic surveys to post-construction mortality results make it difficult to assign meaning to detection rates observed in terms of predicting risk to bats from the Crown City Wind Energy Project, as well as cumulative risks from multiple facilities. The effect of bat fatalities due to wind turbines on populations as a whole is not well understood and current research is addressing this issue. The Bats and Wind Energy Cooperative (BWEC), an alliance of state and federal agencies, the wind industry, academic institutions, and non-governmental organizations, is currently researching the interactions of bats and wind turbines with the intent to develop solutions for wind farm siting and mitigation that will minimize or prevent bat mortality from wind turbines. Preliminary data seem to indicate that mortalities primarily occur during periods of lower wind speed, and that temperature, precipitation, and humidity may also be contributors (Arnett et al. 2008, p. 68; 2011, p. 212).

Finally, the potential cumulative impacts of the Project on bats cannot be evaluated without consideration of the extremely high mortality from WNS for several resident species. Mortality of resident bat species is typically low at wind facilities, compared to that of the migratory bat species. If mortality of resident bats is proportional to the level of local populations, risk of mortality likely would be reduced in the wake of WNS, as would the potential cumulative impacts of the proposed Project on these species.

9.0 EFFECTS ON USE AND CONSERVATION OF ENERGY RESOURCES

In a policy titled *Guide for Assessing Energy Use and Greenhouse Gas Emissions in an Environmental Impact Statement* released on July 15, 2009, the NYSDEC Office of Air, Energy, and Climate states, "Global climate change is emerging as one of the most important environmental challenges of our time. There is scientific consensus that human activity is increasing the concentration of [greenhouse gas] in the atmosphere and that this, in turn, is leading to serious climate change. These climate changes will continue to affect the environment and natural resources of the State of New York" (NYSDEC 2009a, p. 1). A subsequent policy titled *Climate Change and DEC Action* released by NYSDEC Commissioner Grannis on October 22, 2010 states, "Based on overwhelming scientific evidence, the New York State Department of Environmental Conservation recognizes that New York State's air and water quality, forests, fish and wildlife habitats, and people and communities, are at risk from climate change. In order to perform its core mission of conserving, improving, and protecting the State's natural resources and environment, DEC must incorporate climate change considerations into all aspects of its activities…" (NYSDEC 2010b, p. 1). In addition, the NYSDEC has revised the Full Environmental Assessment Form (EAF), effective October 2012, which requires a more detailed analysis of a proposed action's potential impact on air quality. Specifically, the revised EAF requires a relative quantification of greenhouse gas emissions such as carbon dioxide and nitrous oxide. Clearly the NYSDEC, whose mission is "to conserve, improve and protect New York's natural resources and environment, and to prevent, abate and control water, land and air pollution, in order to enhance the health, safety and welfare of the people of the state and their overall economic and social well-being", is concerned about the negative effects of climate change and greenhouse gas emissions.

Electricity generated from zero-emission wind energy can displace the electricity generated from conventional power plants, thereby reducing the emissions of conventional air pollutants, such as sulfur and nitrogen oxides (acid rain precursors); mercury, and carbon dioxide (linked to global climate change). Displaced emissions occur because renewable electric generation sources have low marginal operating costs (i.e., fuel). Therefore, renewable energy sources become "must run" sources, displacing generation at fossil fuel plants that have higher marginal operating costs. See Table 20, which compares the average air pollutant emission rate of the proposed Crown City Wind Energy Project to equivalently-sized natural gas, coal, and oil generating facilities.

The proposed Project will have significant, long-term beneficial effects on the use and conservation of energy resources. The operating Project will consist of approximately 71 MW of electrical generating capacity without consuming cooling water or emitting pollutants. Assuming that the average house in New York uses approximately 7.3-megawatt hours (MWh) of electric power per year and that the average house in the United States uses approximately 11.5 MWh of electric power per year (EIA 2012a), and assuming the Project generates approximately

35% of its nameplate generating capacity, this is enough power to support between approximately 18,929 and 29,820 average homes in New York State (based on the New York and national averages).

The Project will add to and diversify the state's sources of power generation, accommodate future growth in power demand through the use of a renewable resource (wind), and over the long term will displace some of the state's older, less efficient, and dirtier sources of power. Wind energy generation results in reductions in air emissions because of the way the electric power system works. Generally, the most expensive power sources will be "backed down" when there is a sufficient source of wind energy available. Given the mechanism that governs the operation of the New York electricity markets, wind energy is a preferred power source, on the day ahead markets, on an economic basis because the operating costs to run the turbines are low and there are no fuel costs. Therefore, wind turbines produce power that reduces the need for generation from individual fossil fuel-fired power plants or units, thereby reducing fuel consumption and the resulting air emissions that would have otherwise occurred (Jacobson and High 2008, p.6). The specific types of fossil fuel-fired power units and associated emissions that will be displaced by wind energy generation vary significantly among states and regions of the country. The displaced emissions of CO_2, NO_X, SO_2, and mercury generally will be greater in regions with large amounts of coal-fired generation and lower in areas where natural gas is the primary fuel (such as New England). However, even in New England, where natural gas is a major source of generation, wind energy backs down some generating units fired by coal and residual oil at certain times (GE Energy 2005, p.13).

According to the Environmental Protection Agency, fossil fuel-fired power plants are responsible for 67% of the nation's sulfur dioxide (SO2) emissions, 23% of nitrogen oxide (NOx) emissions, and 40% of man-made carbon dioxide (CO2) emissions (EPA 2007). Table 20 presents the average amount of air emissions in pounds per megawatt hour (lb/MWh) related to electricity generation from natural gas, coal, oil, and municipal solid waste. These emissions can lead to smog, acid rain, and haze. In addition, these power plant emissions increase the risk of climate change. A comparison of air emissions from Crown City's annual energy generation of approximately 217,686 MWh to the equivalent annual energy generation of traditional forms of electricity generation are also noted in Table 20.

In addition, the process of extraction, treatment, and transport of the fuel to the power plant generates additional emissions. The aforementioned processes are negligible when compared to wind energy as wind is free and readily available at the Project. There are minor emissions related to the operation and maintenance of wind energy facilities; however, in an equivalently sized traditional electricity generation facilities, the operation and maintenance emissions would be similar to that of wind energy and thus negate each other.

In June 2007, former Governor Spitzer and Lieutenant Governor Paterson formed the NYS Renewable Energy Task Force to investigate the implementation of increased renewable energy sources in the State. The Task Force published a report in February of 2008 that is intended to serve as a policy "road map" to address the many challenges we face in reducing our dependence on fossil fuels, stimulating investment in clean energy alternatives, and moving toward a Clean Energy Economy in New York State. The authors of the report recognize the need for, and benefits of, a rapid transition toward the large-scale development of renewable energy sources such as the proposed Crown City Wind Energy Project. In the conclusion of their report, the Task Force provides the following message:

"New York faces compelling reasons to put renewable technologies to use in large scale…New York has significant opportunities to advance these technologies, which will in turn improve our energy security, the reliability of our current energy infrastructure, and create new business opportunities and green collar jobs of every level. If our society is to begin addressing these critical challenges we face, New York must begin transitioning away from relying on conventional energy sources. Rather, we need to adequately educate our citizens to use and accept renewable resources as an integral part of the solution."

In summary, this Project is proposed at a time of significant energy uncertainty, at both the state and national levels. At 71 MW of generation capacity, the Project will generate enough energy annually to serve between approximately 18,929 and 29,820 homes.

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