Cassadaga Wind Project

Case No. 14-F-0490

1001.22 Exhibit 22

Terrestrial Ecology And Wetlands

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EXHIBIT 22 TERRESTRIAL ECOLOGY AND WETLANDS

(a) Plant Communities

Plant communities and vegetation occurring within the Facility Site were identified and characterized during on-site field surveys during the spring and fall of 2015, and winter of 2016. A vascular plant species inventory was conducted that included those vascular plant species that were identifiable while on the Facility Site. Two hundred fourteen unique native and non-native plant species were uncovered by this inventory. The plant list is attached as Appendix JJ; nomenclature follows the New York Flora Atlas (Weldy et al., 2015).

Plant communities were mapped for all land area within the Facility Site using GIS software. Designation of plant community types was based on data collected during field surveys, aerial photo interpretation, and roadside observations (see Figure 22-1 for a depiction of on-site plant communities). All of the major plant communities found within the Facility Site are common to New York State. Forestland is the dominant community type in the Facility Site, followed by active agriculture, while successional shrubland, successional old field, open water, and developed/disturbed communities occur to a lesser extent. Descriptions of dominant vegetation within the Facility Site are provided below for each of these ecological communities. Detailed descriptions of wetland community types encountered during on-site wetland delineations is provided below in 1001.22 (j).

(1) Forests

Forestland constitutes the largest ecological community type within the Facility Site, occupying approximately 5,142 acres (64% of the Facility Site). Specific forest communities encountered resemble six different forest types described in the *Ecological Communities of New York State* (Edinger et al., 2014). These forests occur throughout the Facility Site, on ridgetops, steep hillsides, and interspersed between agricultural areas. Specific forest types within the Facility Site are described below.

Beech-maple Mesic Forest

The majority of forests within the Facility Site are beech-maple mesic, dominated by American beech (*Fagus grandifolia*) and sugar maple (*Acer saccharum*). Other canopy species in these forests include red maple (*Acer rubrum*), white ash (*Fraxinus americana*), black cherry (*Prunus serotina*), white pine (*Pinus strobus*), hop hornbeam (*Ostrya virginiana*), eastern hemlock (*Tsuga canadensis*), cucumber tree (*Magnolia acuminata*), and witch hazel (*Hamamelis virginiana*). The understory of these forests typically contains a diverse array of ferns and forbs, including Christmas fern (*Polystichum acostichoides*), intermediate woodfern (*Drypoteris intermedia*),

marginal woodfern (*Dryopteris marginalis)*, hay-scented fern (*Dennstaedtia punctilobula*), wild leek (*Allium tricoccum*), yellow trout lily (*Erythronium americanum*), beech drops (*Epifagus virginiana*), plantain-leaved sedge (*Carex plantaginea*), violets (*Viola* spp.), jack-in-the-pulpit (*Arisaema triphyllum*), and Canada mayflower (*Maianthemum candadense*).

Conifer Plantation

Conifer plantations are common within the Facility Site, with planted timber species including European larch (*Larix decidua*), Norway spruce (*Picea abies*), red pine (*Pinus resinosa*), and Scotch pine (*Pinus sylvestris*). The understory in these plantations is limited, but can include partridgeberry (*Mitchella repens*) and intermediate woodfern.

Floodplain Forest

Floodplain forests are sparse in the Facility Site, but occur along larger streams subject to periodic flooding events. In the Facility Site, the best example of this vegetation type occurs along the banks of Mill Creek, where it parallels County Route 77 north of Sinclairville. Trees in floodplain forests within the Facility Site are typically dominated by black willow (*Salix nigra*), with eastern cottonwood (*Populus deltoides*) and sycamore (*Platanus occidentalis*) present as well. Common shrubs include silky dogwood (*Cornus amomum*), red osier dogwood (*Cornus sericea*), honeysuckles (*Lonicera* spp.), hawthorn (*Crataegus* sp.), Allegheny blackberry (*Rubus allegheniensis*), and multiflora rose (*Rosa multiflora*). Understory herbaceous plants typically include true forget-me-not (*Myosotis scorpiodis*), creeping buttercup (*Rancunculus repens*), crooked-stem aster (*Symphyotrichum prenanthoides*), and dame's-rocket (*Hesperis matronalis*).

Hemlock Hardwood Swamp

Hemlock-hardwood swamps are a common association of the forested wetlands in the Facility Site. These swamps are generally dominated by eastern hemlock, with yellow birch (*Betula alleghaniensis*), red maple, green ash (*Fraxinus pennsylvanica*) common as well. Shrubs in these swamps include American hornbeam (*Carpinus caroliniana*), American elm (*Ulmus americana*), and spicebush (*Lindera benzoin*). Common herbaceous species include foamflower (*Tiarella cordifolia*), partridgeberry, wild sarsaparilla (*Aralia nudicaulis*), goldthread (*Coptis trifoliata*), sensitive fern (*Onoclea sensibilis*), golden ragwort (*Packera aurea*), and bristly dewberry (*Rubus hispidus).* Graminoids including manna grasses (*Glyceria* spp.) and sedges (*Carex* spp.) often occur in these swamps as well.

Hemlock-Northern Hardwood Forest

Hemlock-northern hardwood forests in the Facility Site are dominated by eastern hemlock, with American beech occasionally co-dominant. Other tree species occasionally present include yellow birch, sugar maple, and red maple. Where hemlock is dominant, very little light reaches the forest flora and understory tends to be very sparse. Partridge berry, indian-pipe (*Monotropa uniflora*), and beech drops are some of the understory species found in these habitats.

Successional Northern Hardwoods

Sucessional northern hardwoods are common on the Facility Site, and generally develop in locations that have been cleared for farming or logging. Although all of the forests within the Facility Site were likely cleared at some point in recent history, the forests identified as successional have been cleared and allowed to grow back more recently, and still contain species common in successional shrublands and successional old field. Common canopy species in these forests include eastern cottonwood, white pine (*Pinus strobus*), black locust (*Robinia pseudoacacia*), hawthorn, apple (*Malus pumila*), balsam fir (*Abies balsamea*), northern white cedar (*Thuja occidentalis*), red maple, and quaking aspen (*Populus tremuloides*). These forests typically also have a substantial shrub layer, including species such as Allegheny blackberry, red raspberry (*Rubus idaeus*), multiflora rose, buckthorn (*Rhamnus cathartica*), gray dogwood (*Cornus racemose*), honeysuckles, and hobblebush (*Viburnum lantanoides*). The herbaceous layer in these forests varies, but often contains species suited to disturbance, such as New York fern (*Thelypteris noveboracensis*), hay-scented fern, bracken fern (*Pteridium aquilinum*), common speedwell (*Veronica officinalis*), goldenrods (*Solidago* spp.), asters, timothy (*Phleum pretense*), and colt's foot (*Tussilago farfara*).

(2) Successional Shrubland

As defined by the *Ecological Communities of New York State* (Edinger et al., 2014), successional shrublands are sites that develop after they have been cleared, and have at least 50% cover by shrub species. Successional shrublands occupy approximately 311 acres (4% of the Facility Site). This community type represents a successional step between old field habitats and successional forest, and often contains a similar suite of species. Shrubs common in successional forests of the Facility Site include northern arrowwood (*Virburnum dentatum*), gray dogwood, Allegheny blackberry, multiflora rose, buckthorn, and honeysuckles. Herbaceous species typically include a wide variety of asters and goldenrods, as well as orchard grass (*Dactylis glomerata*), Queen Anne's lace (*Daucus* carota), common burdock (*Arctium minus*), and black-eyed susan (*Rudbeckia hirta*). Vines, such as riverbank grape (*Vitis riparia*), may be present as well.

(3) Successional Old Field

As defined by the *Ecological Communities of New York State* (Edinger et al., 2014), 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. Within the Facility Site successional old field occupies approximately 233 acres (3% of the Facility Site). This community is located primarily along roadsides, adjacent to active agricultural fields, or in fields that have recently been taken out of agricultural production. Successional old fields often contain relatively high plant diversity. Species common in these sites areas include orchard grass, timothy, and Kentucky bluegrass (*Poa* pratensis), goldenroads, asters, tall buttercup (*Ranunculus repens*), red clover (*Trifolium pretense*), white clover (*Trifolium repens*), ox-eye daisy (*Leucanthemum vulgare*), Queen Anne's lace, chicory (*Cichorium intybus*), common burdock, common milkweed (*Asclepias syriaca*), black-eyed susan, cow vetch (*Vicia cracca*), and field basil (*Clinopodium vulgare*). Shrubs such as honeysuckle, northern arrowwood, dogwoods, and Allegheny blackberry are also components of this community, but represent less than 50% of total vegetative cover.

(4) Active Agriculture

Active agricultural land is common on the Facility Site, occupying approximately 2,252 acres (28% of the Facility Site). It consists of several different types of terrestrial cultural communities, as defined in the *Ecological Communities of New York State* (Edinger et al., 2014), including cropland/field crops (hayfields and greenchop), cropland/row crops (planted mostly in corn), and pastureland (mostly grazing for dairy cattle). For the purposes of this Application, tree plantations were considered forests rather than active agriculture.

(5) Open Water

Open water habitats are sparse on the Facility Site, occupying only about 12 acres (0.1% of the Facility Site), and generally of consist of lacustrine and riverine systems as defined by the *Ecological Communities of New York State* (Edinger et al., 2014). Specific lacustrine communities include eutrophic ponds and agricultural ponds; while riverine systems are typically confined rivers. Emergent aquatic vegetation often grows on the margins of these communities. Typical plant species include narrowleaf cattail (*Typha angustifolia*), broadleaf cattail (*Typha latifolia*), common reed (*Phragmites australis*), sedges (*Carex* spp.), bulrushes (*Scirpus* spp.), rushes (*Juncus* spp.). Shrubs such as willows (*Salix* spp.) and dogwoods (*Cornus* spp.) may be common on the margins as well. True submersed aquatic plants may also occur in these open water habitats.

(6) Disturbed/Developed

Disturbed/developed land consists of a combination of several "cultural communities" as defined in the *Ecological Communities of New York State* (Edinger et al., 2014). Disturbed/developed lands occur throughout the Facility Site, although due to the rural nature of the landscape, disturbed and developed areas only occupy approximately 113 acres (1% of the Facility Site). Disturbed/developed lands are characterized by the presence of buildings, parking lots, paved and unpaved roads, lawns, gravel mines, and gas/oil infrastructure. 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 (*Phytolacca americana*), bull thistle (*Cirsium vulgare*), ragweed (*Ambrosia artemesiifolia*), curly dock (*Rumex crispus*), and various upland grasses including green bristle grass (*Setaria viridis*), orchard grass (*Dactylis glomerata*), barnyard grass (*Echinochloa*), and red fescue (*Festuca rubra*).

(b) Impacts to Plant Communities

Construction and operation of the Facility will result in impacts to plant communities. These impacts include vegetation clearing and disturbance from construction, as well as permanent loss of vegetated habitats by conversion to built facilities. Facility-related impacts to all plant communities identified in the mapping of ecological communities described above in support of 1001.22(a) were calculated in ArcGIS based on the following assumptions:

Table 22-1. Impact Assumptions

Facility 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 acre per turbine (pedestal plus crane pad)
Access Roads	75' wide per linear foot of road	60' wide per linear foot of road	20' wide per linear foot of road
Buried Electrical Collection Lines	40' wide per linear foot of line per collection line circuit	40' wide per linear foot of line per collection line circuit	None
Overhead Electrical Collection Lines	100' wide per linear foot of line	15' wide per linear foot of line	0.10 acre per pole

Facility Components	Typical Area of Vegetation Clearing	Area of Total Soil Disturbance (temporary and permanent)	Area of Permanent Soil Disturbance
Overhead Transmission Line	100' wide per linear foot of line	15' wide per linear foot of line	0.10 acre per pole
Permanent 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)	2.5 acres	2.5 acres	2 acres
Staging Area	5 acres per staging area	5 acres per staging area	None
Collection Station	3 acres	3 acres	2 acres
POI Substation	5 acres	5 acres	3 acres

The impact assumptions were used to calculate the total impact to vegetation communities that could result from Facility construction and operation. The method of calculating impacts ensures a very conservative estimate of impacts to vegetation is provided. Impacts are calculated by component, which does not account for overlap in facility component areas. For example, in areas where collection line and access roads are co-located, the disturbance resulting from the access road is added to the disturbance resulting from collection line, without accounting for overlap in these areas. This method accounts for differences in timing of vegetation disturbance. For example, if access roads are constructed prior to installation of collection line, the vegetation may be restored along access road margins but then re-disturbed during collection line installation. This method is especially conservative for impacts to forests, because forests cleared at any point during construction will not have regenerated by the time the vegetation would be re-disturbed.

A total of up to 606.6 acres of vegetation will be disturbed by Facility construction (i.e., less than 8% of the Facility Site). Of this area, 516.7 acres (85% of disturbance) will be disturbed only temporarily, including areas where collection line is buried underground, construction staging areas, and the margins of access roads and turbine construction workspaces. Approximately 89.9 acres of vegetation will be permanently converted to built facilities, which represents only 1% of the Facility Site. Permanent built facilities include turbine foundations and pads, access roads, an O&M building, meteorological tower foundations, transmission line and overhead collection line poles, the collection substation, and the POI substation.

Forest clearing impacts can be characterized as one of three types. The first is permanent loss, where forests would be replaced with built facilities (access roads, turbines, etc.). There is expected to be approximately 53.9 acres of forest impacted in this manner. The second is forested conversion, where forests would be cleared and maintained as successional communities for the life of the Facility (areas under the turbines, beneath overhead collection lines, and along buried collection lines). This type of disturbance is anticipated to result in up to 253.8 acres of impact to forests. Finally, temporary impacts are those where forest would be allowed to regrow following construction (e.g. along the periphery of access roads and turbine sites). Approximately 78.5 acres of forest will be disturbed in this manner, and allowed to regrow following construction. In these areas, the Applicant will only remove stumps where necessary to install underground components, will not use herbicides to prevent sprouting, and will not remove trees as part of routine vegetation management during Facility operation. Ecological succession will restore the forested condition of these areas over time. As stated above, impacts to vegetation, especially forests, are conservatively estimated in this Application because disturbance resulting from each Facility component is added together, without accounting for areas of overlap in clearing for multiple components.

Construction of the Facility will result in temporary disturbance of up to approximately 143.8 acres of active agriculture vegetation, and up to approximately 22.7 acres of active agricultural land will be permanently lost to built facilities. For a detailed description of impacts to agricultural lands, please see 1001.22(q). Construction of the Facility will result in temporary disturbance of 16.5 acres of successional old field, 17.2 acres of successional shrublands, and 7.0 acres of disturbed/developed communities. The Facility will ultimately result in loss of 6.5 acres of successional old field, 2.6 acres of successional shrublands, and 4.2 acres of disturbed/developed communities. No temporary disturbance or permanent loss of open water vegetation communities, as defined by the ecological communities mapping procedure described in 1001.22(a), are anticipated. However, please see 1001.23(b)(4) for a discussion of impacts to surface waters, as defined by on-site wetland and stream delineations, anticipated as a result of Facility construction and operation. Temporary and permanent impacts to vegetation communities will not result in extirpation or significant reduction in any ecological community type. Temporary and permanent impacts to all ecological community types is provided below in Table 22-2.

Table 22-2. Vegetation Impacts

Cover Type	Temporary Impact (acres)	Permanent Loss (acres)	Regenerating Forest (acres)	Forest Conversion to Successional Communities (acres)	Total Impact (acres)
Forest	-	53.9	78.5	253.8	386.2
Successional Shrubland	17.2	2.6	-	-	19.8
Successional Old Field	16.5	6.5	-	-	22.9
Active Agriculture	143.8	22.7	-	-	166.5

Cover Type	Temporary Impact (acres)	Permanent Loss (acres)	Regenerating Forest (acres)	Forest Conversion to Successional Communities (acres)	Total Impact (acres)
Open Water	0.0	0.0	-	-	0.0
Disturbed/Developed	7.0	4.2	-	-	11.2
Total	184.5	89.9	78.5	253.8	606.6

As stated above in 1001.22(a), a vascular plant species inventory of portions of the preliminary Facility Site took place during the fall of 2015, which documented over 200 plant species. Of these species, 10 are listed on the *Prohibited and Regulated Invasive Species List* for New York State (NYSDEC, 2014). These species are listed below, with botanical nomenclature and common names following the New York Flora Atlas (Weldy et al., 2015):

- black locust (*Robinia pseudoacacia*)
- buckthorn (*Rhamnus cathartica*)
- Canada thistle (*Cirsium arvense*)
- common reed (*Phragmites australis*)
- garlic mustard (*Alliaria petiolata*)
- Japanese barberry (*Berberis thunbergii*)
- Japanese knotweed (*Reynoutria japonica*)
- Morrow's honeysuckle (*Lonicera morrowii*)
- multiflora rose (*Rosa multiflora*)
- purple loosestrife (*Lythrum salicaria*)

An Invasive Species Control Plan (ISCP) for the Facility site is attached as Appendix FF. This plan includes a summary of the survey methods the Applicant will use to identify existing invasive species already present on-site. It also contains a description of proposed control measures, which include construction materials inspection, target species treatment and removal, construction equipment sanitation, and site restoration in accordance with the Facility's SWPPP. In addition, the ISCP includes monitoring methods that will take place during construction to ensure that workers are educated about best management practices (BMPs) and that control measures are being implemented. A two-year post construction monitoring program is also described, with a no net increase of invasive plant species cover goal. However, it should be noted in the context of this goal that invasive plants, by their nature, increase in coverage over time, even in the absence of new disturbance. In the event that the ISCP goals are not met, then a revised control plan containing additional control actions and an extended monitoring term will be developed. Finally, the ISCP discusses an invasive plant treatment plan that would be used should new occurrences of invasive plant species become established.

Although the seed mix that will be used in site restoration is not available at this time, typical upland and wetland seed mixes that could be used are summarized below (please visit http://www.ernstseed.com/seed-mixes/ for additional detail):

- Wetland Areas – ERNST FACW Meadow Mix 122 or similar:
    - Fox sedge (31%)
    - Virginia wildrye (20%0
    - Lurid sedge (14%)
    - Green bulrush (5%)
    - Blue vervain (4%)
    - Wood reedgrass (3.5%)
    - Soft rush (3%)
    - Blunt broom sedge (3%)
    - Hop sedge (3%)
    - Other forbs and graminoids (each 2% or less)

- Upland Areas/Erosion Control Areas – ERNST Eastern Ecotype Native Grass Mix 177 or similar:
    - Indiangrass (30%)
    - Big Bluestem (30%)
    - Switchgrass (20%)
    - Virginia wildrye (16%)
    - Autumn bentrgrass (4%)

- Lawn Areas – ERNST Conservation Mix 5311 or similar:
    - Creeping red fescue (30%)
    - Kentucky bluegrass (50%)
    - Annual ryegrass (10%)
    - Perennial ryegrass (10%)

(c) Measures to Avoid, Minimize, and Mitigate Plant Community Impacts

Mitigation of impacts to vegetation will be (and has been) accomplished primarily through careful site planning. Large areas of forest and wetland are being avoided to the extent practicable. Therefore, these ecologically valuable

communities within the Facility Site will be largely protected from disturbance. Facility 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 Facility construction to protect adjacent undisturbed vegetation and other ecological resources (please see the Preliminary SWPPP summarized in Exhibit 21 for additional detail).

Mitigation measures to avoid or minimize impacts to vegetation will also include delineating sensitive areas (such as wetlands) where no disturbance or vehicular activities are allowed, educating the construction workforce on respecting and adhering to the physical boundaries of off-limit areas, complying with guidance provided by Environmental Monitors, employing best management practices during construction, and maintaining a clean work area within the designated construction sites. In addition, as previously discussed in 1001.22(a) above, all plant communities identified within the Facility Site are common to New York State. Therefore, no impacts to unique or rare natural communities will result from Facility construction. 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.

Measures that will be taken to achieve a no net increase in invasive species coverage throughout the area disturbed by Facility construction is provided in the ISCP, which is described above in 1001.22 (b) and attached as Appendix FF.

(d) Vegetation, Wildlife, and Wildlife Habitats

(1) Plant communities and Species

See Plant Communities discussion above in association with 1001.22(a). The Plant Species Inventory is attached as Appendix JJ.

(2) Bat Surveys

Preconstruction monitoring surveys for birds and bats were designed by Stantec Consulting (Stantec) in consultation with U.S. Fish and Wildlife Service (USFWS) and New York State Department of Environmental Conservation (NYSDEC), and in accordance with NYSDEC *Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects* (NYSDEC, 2009) and USFWS *Land-Based Wind Energy Guidelines* (USFWS, 2012a). A draft *Work Plan for Pre-Construction Bird and Bat Studies* was submitted to the USFWS and NYSDEC in June 2013. After a series of meetings and approvals by NYSDEC and USFWS, the work plan was finalized and

provided to the USFWS and NYSDEC in July 2013. The studies were conducted in 2013 and 2014, and final reports of all the studies were provided to the USFWS and NYSDEC. The Applicant met with these agencies again on January 25, 2016 in order to continue coordination with USFWS under the *Land-Based Wind Energy Guidelines*. At this meeting, the Applicant, NYSDEC and the USFWS discussed the fact that no additional bat species presence/absence surveys were planned at the Facility Site, and ultimately no further pre-construction surveys were deemed necessary by either the USFWS or NYSDEC at this meeting.

Results of the bat studies are summarized below in this section, and results of the avian surveys are summarized below in 22(d)(3).

Passive acoustic surveys were conducted using Anabat model SDI detectors to record echolocating bat calls in overnight periods from 6 pm to 6 am. Per NYSDEC Guidelines, detectors were placed at 3 meters above ground level and 45 meters above ground level. In 2013, two detectors were placed on a constructed meteorological tower, and one detector was placed in a tree at 3 meters above ground level. An additional meteorological tower was constructed in 2014, so in 2014 all detectors (four total) were placed on meteorological towers.

Acoustic calls were recorded nightly during the late summer emergence and fall migration periods as well as the spring migration and activity periods for bats, with data collected from August 14 to October 21 in 2013 and from April 16 to October 15, 2014. Call data were downloaded from the detectors and analyzed using CFRead© software. Calls recorded on the Anabat devices were identified to bat species wherever possible. However, some calls are difficult or impossible to determine to species level due to different species of bats calls overlapping in the range of frequencies they produce. Therefore, some calls were narrowed down to "guild" or a group of species possible for the call. For each species or guild at each detector, mean detection rates (call/detector-night) were calculated. Additional detail regarding methodology for the data collection and analysis of the acoustic surveys in provided in the Bird and Bat Survey Report in Appendix KK.

The detectors measured a total of 2,771 bat call sequences in 843 detector-nights, for an average of 3.3 bat call sequences per detector-night. The majority of calls (58%, 1,598 calls) were from the big brown bat/silver-haired bat (BBSH) guild. Of these call sequences, 8% were identified as silver-haired bat (*Lasionycteris noctivagans*) and 4% were identified as big brown bat (*Eptesicus fuscus*), with the remaining calls unable to be identified to species level. Approximately 3% (77 calls) of the call sequences were identified as originating from the eastern red bat/tri-colored bat (RBTB) guild, with calls from both the eastern red bat (*Lasiurus borealis*) and the tri-colored bat (*Perimyotis subflavus*, formerly eastern pipistrelle (*Pipistrellus subflavus*) identified, confirming that both of these species are present within the Facility Site. Only 1% of the call sequences (39 calls) were identified as originating

from the guild including species in the genus *Myotis* (MYSP), which includes Indiana bat (*Myotis sodalis*), eastern small-footed bat (*Myotis leibii*), little brown bat (*Myotis lucifugus*), and northern long-eared bat (*Myotis septentrionalis*). *Myotis* calls were not able to be further identified to the genus level. However, these calls are unlikely to have originated from Indiana bat, because the Facility Site is not within this species' known range. The hoary bat (*Lasiurus cinereus*) call can usually be distinguished from other bats, and for this reason the hoary bat was not placed in a guild. Approximately 4% of the call sequences were attributed to hoary bat. Approximately 35% of the call sequences (959 calls) were not able to be identified to one of the guilds described above, and were placed in the unknown (UNKN) guild. These were further divided into high frequency unknown (HFUN) and low frequency unknown (LFUN) guilds. Based on known ranges of frequencies of calls different bat species produce, it was determined that HFUN calls could originate from eastern red bat, tri-colored bat, or species in the genus *Myotis*. LFUN calls could originate from big brown bat, silver-haired bat, and hoary bat. Approximately 32% (309 calls) of the UNKN calls were from the HFUN guild, while 68% (650 calls) were from the LFUN guild.

The numbers of bat calls recorded cannot be correlated with the number of bats in an area because acoustic detectors cannot differentiate between individuals. Therefore, the results of the acoustic surveys cannot be used to determine the total number of bats inhabiting an area. The survey results do confirm that silver-haired bat, big brown bat, eastern red bat, tri-colored bat, hoary bat, and at least one species within the genus *Myotis* do occur within the Facility Site. The presence of northern long-eared bat (*Myotis septentrionalis*), a state- and federally-listed threatened species, could not be confirmed or refuted by this study, although calls confirmed as *Myotis* sp. were infrequent (1% of all recorded calls). Additional discussion regarding northern long-eared bat at the Facility Site and potential impacts to this species is provided below in 1001.22(f).

(3) Avian Surveys

A description of the planning process, guideline compliance, and agency consultations for avian surveys conducted by Stantec is the same as the process for bat surveys described above in 1001.22(d)(2), with the exception of the eagle use point count survey. This eagle survey was planned in accordance with USFWS *Eagle Conservation Plan Guidance* (USFWS, 2013). A description of the study, along with all other avian studies that were conducted, was included in the *Work Plan for Pre-Construction Bird and Bat Studies*, which was submitted to and approved by NYSDEC and USFWS in July, 2013. The studies were conducted in 2013 and 2014, and final reports were submitted to USFWS and NYSDEC. At a meeting with USFWS and NYSDEC on January 25, 2016, the Facility's risk to eagles was discussed, and the Applicant stated it believes risk to eagles is low based on pre-construction surveys and mortality data but that a section in the BBCS will include ongoing risk assessment to eagles during Facility operation. The USFWS also requested at this meeting that the Applicant obtain the most

recent data from NYSDEC on bald eagle nest locations. The Applicant has done so, and results of those data are summarized under the heading *Eagle Use Point Count Surveys*, below. No further pre-construction surveys were deemed necessary by either agency during this meeting.

Five separate pre-construction avian studies were conducted to characterize existing use of the Facility Site by birds. Each of these surveys is described below.

Fall Bird Migration Surveys

Fall bird migration surveys were conducted in September 2013 for the purpose of the characterizing and quantifying stopover use by migrating birds within the Facility Site. Fourteen sample point locations were chosen within three habitat categories designated by dominant vegetation cover, including agricultural, forest edge, and overgrown field. Data sampling was conducted once per week during the month of September between sunrise and 10:00 am at each of the 14 locations. All birds that could be identified by sight or sound including soaring raptors, waterfowl, and other fly-overs were recorded.

The biologist conducting the surveys observed 601 individual birds from 27 different species during these surveys. No federal or state threatened, endangered, or state species of special concern was observed during the surveys. The relative abundance (RA) of the species is reported here. This metric is a way to quantify the number of individuals of a species in relation to other species observed. RA takes into account the total number of individuals detected, the number of times each point count location was surveyed, and the number of survey points. In agricultural habitats, Canada goose (*Branta canadensis*) and American crow (*Corvus brachyrhynchos*), had highest relative abundance (RA = 4.69 and 2.31, respectively). In forest edge habitats, cedar waxwing (*Bombycilla cedrorum*) had highest relative abundance (RA = 2.00), followed by blue jay (*Cyanocitta cristata*) and American crow (RA = 1.33 for both species). In overgrown field habitat, blue jay had highest relative abundance (RA = 2.00) followed by American crow (RA = 1.58). Three large flocks of Canada geese were observed during the fall bird migration surveys, but no other flocks of migrating waterbirds or waterfowl were observed. A full list of species observed with the frequency and relative abundance of each is provided in the Bird and Bat Survey Report in Appendix KK.

Results of the fall bird migration surveys provide a suitable reflection of the fall bird community within the Facility Site and surrounding areas. The species detected were generally common, regionally abundant, and typical of the habitats in which they were observed. Drab plumage of songbirds in the fall may inhibit an observer's ability to differentiate among similar species, and lack of birdsong in the fall may inhibit auditory detection of songbirds. These factors may affect species composition and species richness estimates. However, the selected points

sampled the various available habitats within the Facility Site, and have primary habitat characteristics representative of the Facility Site and surrounding areas. The surveys were timed to coincide with the peak migration in September.

Spring Raptor Migration Surveys

Spring raptor migration surveys were conducted approximately once every seven days from March 1 to May 26, 2014, for a total of 96 observation hours. Observations were made from eagle point count location number 7 (north of East Road in the Town of Charlotte), a centrally located point that provided good views of the Facility Site. As stated in the *Work Plan for Pre-Construction Bird and Bat Studies*, which was approved by NYSDEC and USFWS, based on the Facility's location near the south shore of Lake Erie, and because there is no specific migratory pathway for raptors near the southern shore of Lake Erie in the fall, fall raptor migration surveys were not conducted for the Facility. Surveys occurred between 9 am and 5 pm on days with suitable weather conditions to support migration (following wind, no precipitation). For each observation, a Stantec biologist recorded the species, number of individuals, sex and age class (if possible), behavior, flight height and direction, time of sighting, and location of each bird relative to the Facility Site. The biologist recorded hourly weather information, including temperature, wind speed and direction, percent cloud cover, cloud type and height, and general sky conditions. Incidental observations of other bird species also were recorded. Data were compiled to calculate daily and seasonal observation rates, and for those observations where raptors were observed within one quarter mile of a proposed turbine location, the percentage of raptors seen below 150 meters, the maximum height of the proposed turbines.

Stantec recorded 157 raptor observations, representing 11 different species, including American kestrel (*Falco sparverius*) (n=7 individuals), bald eagle (*Haliaeetus leucocephalus*) (n=6), broad-winged hawk (*Buteo platypterus*) (n=17), golden eagle (*Aquila chrysaetos*) (n=1), northern harrier (*Circus cyaneus*) (n=1), osprey (*Pandion haliaetus*) (n=3), red-shouldered hawk (*Buteo lineatus*) (n=3), red-tailed hawk (*Buteo jamaicensis*) (n=34), rough-legged hawk (*Buteo lagopus*) (n=5), sharp-shinned hawk (*Accipiter striatus*) (n=4), and turkey vulture (*Cathartes aura*) (n=64). In addition, several observations were unable to be identified to species, including one accipiter hawk (*Accipiter* sp.), five buteo hawks (*Buteo* sp.), and six raptors unable to be identified to genus or family. Turkey vulture was most common, followed by red-tailed hawk and broad-winged hawk. Overall spring seasonal passage rate was 1.6 raptors per hour, with greatest passage rates observed between 1 pm and 2 pm.

Of the 157 raptors observed, 143 (91%) occurred within one quarter mile of a proposed turbine site (the "turbine area"). The average minimum flight height of raptors within the turbine area was 60.1 meters, compared to 100.4 meters for raptors observed outside the turbine area. Of the raptors observed within the turbine area, 123 (86% [78% of total observations]) occurred at flight heights below the proposed maximum turbine blade-tip height of 150

meters (492 feet) for at least a portion of their flight. Turkey vultures represented the greatest number of observations below the maximum turbine blade-tip height (n = 63, 40% of total observations). Data recorded on behavior both inside and outside of the turbine area show that soaring or gliding behaviors were most common (n = 153, 80%), followed by powered flight behaviors (n = 22, 11%), with foraging, perching, and aerial display behaviors observed only rarely.

No federally listed threatened or endangered species were observed during spring raptor migration surveys. Golden eagle, a state-listed endangered species, which is also federally protected under the Bald and Golden Eagle Protection Act (BGEPA), was observed once. Bald eagle, which is state-listed as threatened and protected under BGEPA, was observed six times throughout the survey. Additional surveys specifically designed to document bald and golden eagles were also conducted for the Facility; see *Eagle Use Point Count Surveys* heading below. One northern harrier, which is a state-listed threatened species (NYSDEC, 2016f), was also documented once during the surveys. In addition, observers also documented three state species of special concern: osprey (n = 3), red-shouldered hawk (n = 3) and sharp-shinned hawk (n = 4).

In addition to raptors, 54 non-raptor avian species were documented during spring raptor migration surveys. These were recorded in order to provide a comprehensive list of species that use the Facility Site (see Wildlife Inventory, attached as Appendix JJ). None of the species observed were federally or state-listed threatened or endangered species, nor were any state species of special concern (NYSDEC, 2016f).

Raptors were also observed during the eagle use point count surveys that took place from July 2013-July 2014. The only additional raptor observed during the eagle point count surveys not observed during spring raptor migration surveys was Cooper's hawk (*Accipiter cooperi*). Additional detail regarding results of the eagle point count surveys is provided below, under the *Eagle Use Point Count Surveys* heading.

Results from other spring raptor migration studies conducted within New York State and within the northeastern United States were reviewed and compared to those conducted for the Facility. The passage rate at Cassadaga was 1.6 raptors/hour, which was near the lower end of the range of passage rates documented in New York State (0.1–25.6 raptors/hr), and within the range of passage rates documented elsewhere in the northeastern U.S. (0.2–6.8 raptors/hour). The passage rate of 1.6 raptors/hour is also below the median of documented rates for New York State (median = 3.7 raptors/hour) and the northeastern United States (1.9 raptors/hour) (see the Bird and Bat Survey Report in Appendix KK for references to the studies reviewed in this comparison). The comparison suggests that raptor activity, passage rates, and species composition at the Facility Site is typical of the region.

Compared to the nearest Hawk Migration Association of North America's (HMANA) Hawk Watch sites, the Facility's overall passage rate was extremely low relative to the average passage rate at the Ripley Hawk Watch (116.6 raptors/hour) and Hamburg Hawk Watch (56.9 raptors/hour), located 23 miles and 36 miles from the Facility Site, respectively (HMANA 2014a, 2014b). These hawk watch sites are located less than 1 mile from the southern shore of Lake Erie, which is a migratory corridor for raptors migrating north in the spring. Since migrating raptors are reluctant to cross broad stretches of water such as the Great Lakes, raptors migrating northward through the region concentrate and move northeast along the edge of the Great Lakes' southern shores (Dunne et al., 1984). The Facility raptor survey site is over 14 miles from the lakeshore.

Spring Breeding Bird Surveys

Breeding bird point count surveys took place in May and June of 2014 at 85 bird point count locations along 16 survey transects. Fifty nine survey points were in close proximity to proposed turbine locations (referred to as the "survey points") and 26 control points were chosen in areas where no impact is anticipated (referred to as the "control points"). Points were spaced approximately 125 meters apart, and were chosen in order to sample various habitats. Surveys were conducted between sunrise and approximately 10 am in weather conditions conducive to hearing birdsong and seeing birds move about in vegetation and in flight. All birds identified by sight or sound, including soaring raptors, waterfowl, and other fly-overs, were recorded during a 5-minute session at each survey point and control point. Survey locations were assigned to one of five habitat categories based on dominant vegetation cover: agricultural, forest edge, hardwood forest, mixed (hardwood and conifer) forest, and over-grown field.

The surveys detected 2,461 individual birds, including flyovers and individuals greater than 100 meters from the observer. Seventy-two unique species were detected, excluding one flycatcher that could only be identified to genus. A list of species observed during the spring breeding bird surveys is included in the Bird and Bat Survey Report, in Appendix KK.

Excluding flyovers, the surveys recorded 67 species and 1,799 individuals within 100 meters of the survey and control points. In agricultural habitat, red-winged blackbird (*Agelaius phoeniceus*) had the greatest relative abundance among both survey points (RA = 4.00) and control points (RA = 5.75), followed by bobolink (*Dolichonyx oryzivorus*) (RA = 3.04 and 3.00). In forest edge habitat, red-winged blackbird had the greatest relative abundance among both survey points (RA = 1.85) and control points (RA = 2.29), followed by song sparrow (*Melospiza melodia*) among survey points (RA = 1.33) and American robin (*Turdus migratorius*) among control points (RA = 1.13). In mixed forest habitat, ovenbird (*Seiurus aurocapillus*) had the same relative abundance in both survey points and control points (RA = 0.75), while eastern towhee (*Pipilo erythrophthalmus*) had the highest relative

abundance among only survey points (RA = 0.96). In over-grown field habitat, red-winged blackbird had the highest relative abundance in both survey points (RA = 2.63) and control points (RA = 7.17), followed by common yellowthroat (*Geothlypis trichas*) among survey points (RA = 1.50) and song sparrow among control points (RA = 1.25). While no control points were established in hardwood forest habitat, eastern towhee (RA = 1.25) and red-eyed vireo (*Vireo olivaceus*) (RA = 0.58) had the greatest relative abundances among survey points.

Species detected during breeding bird surveys are generally common, regionally abundant and typical of the habitats in which they were observed. Red-winged blackbird, a common grassland species, was the most commonly detected species and had the highest relative abundance values among survey points and control points in three of the five habitats surveyed: agricultural, forest edge, and over-grown field. Eastern towhee, ovenbird, and red-eyed vireo, all forest interior species, were commonly detected at hardwood forest and mixed forest points in the Facility Site. Stantec did not detect any state- or federally listed endangered or threatened species, or state species of special concern. The selected points sampled the various available habitats within the Facility Site, and have primary habitat characteristics representative of the Facility and surrounding areas. The surveys were timed to coincide with the peak breeding season in May and June, targeted optimal weather conditions to facilitate the maximum detection of birds, and used standard point count survey methods. Therefore, the results of the surveys provide a suitable reflection of the breeding bird community within the Facility and surrounding areas.

Eagle Use Point Count Surveys

As part of the assessing the risk to eagles, Stantec requested data on nearest known bald eagle nest sites from NYSDEC. NYSDEC first provided known bald eagle nest locations on July 1, 2013. These nests were known to be present as of October 2012. There were four historic bald eagle nests within 10 miles of the Facility. The closest historic nest to a Facility turbine location was 4.2 miles away (Nest NY 194). The other three nests were over 6.5 miles from the nearest turbine (please see Figure 1 of the eagle use point count memo).

NYSDEC provided Stantec updated bald eagle nest locations on March 21, 2016. Currently there are 11 known historic bald eagle nests within 10 miles of the Facility (please see Figure 1 of the eagle use point count memo). There are two territories within 10 miles that consist of multiple nests, only one of which would be occupied by a single pair in a given year (the other nests are considered alternate nest sites). Excluding alternate nests, there are eight territories within 10 miles of the Project, including two newly reported nests on Chautauqua Lake, roughly 9 miles southwest of the Project, and one newly reported nest to the northwest near the shore of Lake Erie. There are three historic nests (two territories) within 5 miles of the Project. The closest historic nest to a Facility turbine location is 3.6 miles away (Nest NY 277A). This nest was first recorded in 2013. Its associated alternate nest (Nest

NY 277B) was first recorded in 2014, according to email correspondence as cited in the eagle use point count memo.

The number of known eagle nests within 10 miles of the Project increased from four in 2013 to 11 in 2016, though it is unclear whether the increase is a function of new nest establishment or improvement of NYSDEC's eagle nest database. The number of known nests within 5 miles of the Project increased from one in 2013 to three in 2016 (however one is an alternate nest). Currently the closest known nest to the Project (NY Nest 277A) is over 3 miles away. Eagle use surveys, described below, encompassed the later part of the eagle breeding season in 2013 and the early to later portions of the breeding season in 2014. Although NY Nest 277A was not mapped when NYSDEC first provided nest location information, activity from that pair in the vicinity of the Project would have been represented in the survey results, particularly in results for Point Count #10 which was closest to the nest (no eagles were observed at Point Count #10). In the case of three other newly reported nests, the three nests on Chautauqua Lake and the nest near the shore of Lake Erie, it is not known whether they were established after 2013; however their proximity to fish-bearing waters and a major shoreline likely obviates the need for these eagles to occur in the Facility Site. Three additional nests newly reported in 2016 were alternate nests belonging to two separate territories.

Bald and golden eagle point count surveys were conducted for one full year, from July 30, 2013 through July 23, 2014. Point count surveys consisted of one-hour visual surveys at 14 locations within the Facility Site, each with an 800-meter radius and covering an area of 2 square kilometers. Stantec surveyed 14 points each cycle, for a total of 18 cycles (each cycle occurring approximately once every three weeks) and a total of 252 survey hours. Surveys took place in a variety of weather conditions, except in those situations where visibility was reduced. In addition to eagles, occurrences of songbirds, waterfowl, and other raptors were noted during the survey as incidental observations.

Four bald eagle observations were made during the surveys, three of which were inside the turbine area (the fourth was in an area no longer proposed to host turbines). Eagles were observed in approximately 0.01% of the 15,120 survey minutes conducted for the study. Bald eagles were observed during all four seasons (January, April, August, and October). Behavior included flapping or gliding, and soaring; no courtship displays, territorial displays, or foraging behaviors were observed. One of the observations was a juvenile, two were subadults, and one was an adult. No golden eagles were observed during the eagle point count surveys. Additional information on results of the eagle point count surveys is included in Appendix LL.

One bald and six golden eagle observations were made during spring raptor migration surveys conducted as part of the pre-construction surveys for the Facility. The methods and results of this survey are described under the *Spring Raptor Migration Surveys* heading, above.

Additional raptor and waterbird species were observed incidentally during the eagle point count surveys. These included American kestrel (n=9 individuals), broad-winged hawk (n=4), Cooper's hawk (n=1), great blue heron (*Ardea herodias*) (n=4), northern harrier (n=8), red-shouldered hawk (n=2), red-tailed hawk (n=75), rough-legged hawk (n=6), sharp-shinned hawk (n=6), and turkey vulture (n=197), as well as two observations of a buteo hawk unable to be identified to species.

Habitat Assessment

Stantec also performed a habitat assessment that evaluated the presence of suitable habitat for listed species documented by the New York Natural Heritage Program (NYNHP) as occurring within the vicinity of the Facility Site. Details on methodology and results of this study are provided in 1001.22(f).

(4) Amphibians and Reptiles

The New York State Amphibians & Reptile Atlas Project (Herp Atlas) was a survey conducted over ten years (1990-1999), that was designed to document the geographic distribution of New York State's herpetofauna (NYSDEC, 2007a). The USGS 7.5-minute topographic quadrangle is the unit of measurement for data collection for the Herp Atlas. Data from this survey was queried for the Cassadaga, Hamlet, and Cherry Creek USGS 7.5-minute quadrangles which encapsulate the Facility Site. Based on a preliminary review of the atlas data, it is estimated that 31 species could occur within the Facility Site (see Wildlife Inventory attached as Appendix JJ). These include common species such as painted turtle (*Chrysemys picta*), common snapping turtle (*Chelydra serpentina*), common garter snake (*Thamnophis sirtalis*), smooth green snake (*Liochlorophis vernalis*), four-toed salamander (*Hemidactylium scutatum*), northern dusky salamander (*Desmognathus fuscus*), northern red-backed salamander (*Plethodon cinereus*), mudpuppy (*Necturus maculosus*), red-spotted newt (*Notophthalmus viridescens*), American toad (*Bufo americanus*), spring peeper (*Pseudacris crucifer*), bull frog (*Rana catesbeiana*), green frog (*Rana clamitans*), and wood frog (*Rana sylvatica*).

Amphibians within the Facility Site typically use both wetlands with adjacent uplands. Many of the wetlands within the Facility Site provide good habitat for these species, particularly those that are less disturbed. Forested wetlands in the Facility Site tend to have adjacent uplands that are less disturbed than those that are not forested, because areas that are not forested tend to be active agricultural fields, or areas that are mowed annually. Several

vernal pools were observed within the Facility Site during on-site delineations conducted in 2015. Vernal pools are inundated by snowmelt in early spring, but dry up by the middle of the growing season. Vernal pools represent an important habitat for amphibian species. Because these habitats are isolated from other water sources and do not contain water year round, fish cannot live in them. Because fish will prey on amphibian eggs, vernal pools are a safe place for amphibians to lay eggs without threat of fish predation. Of the amphibian species known from the Facility Site, blue-spotted salamander, Jefferson's salamander, and wood frog are most suited to vernal pools, and may use the vernal pools that occur within the Facility Site (NYSDEC, 2015).

Turtles that could occur in the Facility Site prefer slow-moving water with vegetated banks and soft bottoms, such as ponds, beaver ponds, and marshes. Turtles bask on fallen logs or rocks in the water where they can absorb solar thermal energy. Most of the wetland habitats in the Facility Site are not ideal turtle habitat, either because they are too disturbed, too shaded, or lack areas with open water. However, some suitable habitat is present, for example, at delineated Wetland BBB on the north side of Route 306 (County Touring Route 85), approximately 2.5 miles northwest of Cherry Creek. Snakes of the Facility Site may also use upland areas adjacent to wetlands, however, they are more likely to be found farther from water than the other reptiles and amphibians. Snakes use a variety of habitats including upland and wetland grasslands, meadows, marshes, open woods, and lawns.

(5) Descriptions of Wildlife Habitat

The various plant communities that occur within the Facility Site (see 1001.22(a)) each provide habitat for different wildlife species. A discussion of habitat that is provided by each of the types of ecological communities is provided under the headings below.

Forest

Forests within the Facility Site provide habitat for species that prefer forest conditions, the characteristics of which may include fewer predators, darker and more protected nesting sites, less disturbance, more even moisture, and available nesting sites in tall trees. Forest-interior species identified within the Facility Site by Stantec during the spring breeding bird surveys include American redstart (*Setophaga ruticilla*), black-and-white warbler (*Mniotilta varia*), blackburnian warbler (*Setophaga fusca*), black-throated blue warbler (*Setophaga caerulescens*), black-throated green warbler (*Setophaga virens*), brown creeper (*Certhia americana*), hooded warbler (*Setophaga citrina*), ovenbird (*Seiurus aurocapilla*), red-eyed vireo, scarlet tanager (*Piranga olivacea*), veery (*Catharus fuscescens*), and wood thrush (*Hylocichla mustelina*). Mammals that may utilize forests on the Facility Site include black bear (*Ursus americanus*), porcupine (*Erethizon dorsatum*), red squirrel (*Sciurus vulgaris*), and whitetail deer

(*Odocoileus virginianus*). Amphibians such as gray treefrog (*Hyla versicolor*), wood frog, and a variety of salamanders likely use forested habitats within the Facility Site as well.

Successional Shrubland

Successional shrublands within the Facility Site provide habitat for species that prefer more open environments than forests, but not as open as grasslands. These species include brown thrasher (*Toxostoma rufum*), American woodcock (*Scolopax minor*), willow flycatcher (*Empidonax traillii*), gray catbird (*Dumetella carolinensis*), dark-eyed junco (*Junco hyemalis*), eastern towhee, cedar waxwing, song sparrow, American goldfinch (*Spinus tristis*), common yellowthroat, yellow-breasted chat (*Icteria virens*), and golden-winged warbler (*Vermivora chrysoptera*). Whitetail deer, red fox (*Vulpes vulpes*), and eastern cottontail are also typically found in brushy 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 (*Procyon lotor*), striped skunk (*Mephitis mephitis*), and opossum (*Didelphis virginiana*).

Old Field

Old field communities in the Facility Site provide habitat for species that prefer open grasslands. Bird species that utilize old field habitats include bobolink, eastern meadowlark (*Sturnella magna*), savannah sparrow (*Passerculus sandwichensis*), red-winged blackbird, eastern kingbird (*Tyrannus tyrannus*), and eastern bluebird (*Sialia sialis*). Old field communities in the Facility Site also provide habitat for the state-threatened Henslow's sparrow ((*Ammodramus henslowii*) (see discussion in 1001.22(f)(5)). Raptors such as red-tailed hawk and American kestrel use old field habitats for hunting prey. Mammals such as coyote (*Canis latrans*), whitetail deer, eastern cottontail, and a variety of moles, mice, and shrews typically use old field communities for hunting, grazing, and foraging. Old field habitats typically have a high diversity and abundance of flowering forbs, which provide food for bees and butterflies.

Active Agriculture

Active agriculture provides some marginal habitat for wildlife species in the Facility Site. Although pasture lands and hayfields may be too disturbed for nesting and breeding, some birds including eastern meadowlark, tree swallow (*Tachycineta bicolor*), barn swallow (*Hirundo rustica*), killdeer (*Charadrius vociferous*), and brown-headed cowbird (*Molothrus ater*) use these areas for foraging. Flocks of Canada geese often use agricultural fields as stopover sites during migration. Additionally, whitetail deer and black bears may eat corn off the stalks growing in cornfields.

Open Water

Open water sites support diverse communities of wildlife species, and provide habitat for a suite of species different from that supported by terrestrial habitat types in the Facility Site. Waterbirds such as wood duck (*Aix sponsa*), mallard (*Anas platyrhynchos*), blue-winged teal (*Anas discors*), green heron (*Butorides* virescens), great blue heron, belted kingfisher (*Megaceryle* alcyon), and Canada goose utilize habitat provided by open water sites. Raptors such as bald eagles may occasionally use open water communities in the Facility Site for hunting fish, however, this type of use is not common because the water bodies within the Facility Site are generally not large enough for this purpose. Open water areas in the Facility Site provide habitat for a variety of aquatic vertebrates and invertebrates. Fish species within the Facility Site are found in these open water habitats, see 1001.22(e) for more information on fish species. These streams also provide habitat for aquatic insects that provide prey for fish species, such as mayflies, stoneflies, and caddisflies. Other aquatic invertebrates found in these habitats include clams, mussels, and crayfish. Frogs, toads, and salamanders may use ponds within the Facility Site as egg-laying sites, and turtles likely use slow moving streams and other open waters for foraging and basking. Many mammals use open water communities as well, including beaver (*Castor canadensis*), muskrat (*Ondatra zibethicus*), and mink (*Neovision vision*).

(e) Species Lists

(1) Plant Inventory

The plant species inventory is described in 1001.22(a), and the species list is attached as Appendix JJ.

(2) Wildlife

A comprehensive wildlife inventory that included both on-site observations and review of existing data sources was performed that covered the vicinity of the Facility Site. This inventory identified species that could occur in the Facility Site at some time during the year, and are based on on-site surveys, existing data, and/or the availability of suitable habitat, and identify species that could occur in the Facility Site at some time during the year. Based on this review, a total of up to approximately 310 wildlife species could use the Facility Site at some time during the year. The complete list is attached as Appendix JJ.

The headings below discuss the particular methods and data sources that were used to create the wildlife inventory list.

Mammals

Publicly available information regarding the locations of mammalian species in Western New York is generally not available. Therefore, the occurrence of mammalian species was documented through observations during on-site field surveys for other studies such as wetland and stream delineations. Field observations included direct observations of individuals as well as observations of signs of occurrence such as tracks or scat, and evaluation of available habitat. In addition, an inquiry for any site-specific mammal occurrence data was submitted to the NYSDEC (Region 9 and Central Office). NYSDEC staff indicated that site-specific records for mammal occurrences are not available. Species known to occur in the Facility Site based on field observation of individuals and sign include white-tailed deer, mink, eastern cottontail, beaver, red fox, gray squirrel, red squirrel, eastern chipmunk, and coyote. Additional mammals expected to use the Facility Site based on available habitat include black bear, raccoon, porcupine, opossum, skunk, muskrat, woodchuck (*Marmota monax*), weasels (*Mustela* sp.), and a variety of mice and shrews. The list of species observed on-site and expected on-site is included in the Wildlife Inventory, attached as Appendix JJ.

To characterize and document bat activity within the Facility Site, Stantec conducted on-site acoustic bat surveys. The methods and findings of the bat studies completed in support of the Facility are described in 1001.22(d). Bat species confirmed on-site are identified in the Wildlife Inventory attached as Appendix JJ, and the most commonly documented species included hoary bat, red bat, big brown bat, and silver-haired bat.

Birds

To determine the type and number of bird species present within the Facility Site, existing data sources and on-site observations were compiled to generate a complete list of bird species that use the Facility Site. Sources of information are listed below, and further discussion of the databases that were queried is included in the subsections following this list:

- USGS Breeding Bird Survey (BBS)
- NYS Breeding Bird Atlas (BBA)
- Audubon Christmas Bird Count (CBC)
- Bird Migration Surveys Conducted by Stantec during the Fall of 2013
- Habitat Assessment Conducted by Stantec during the Fall of 2013
- Raptor Migration Surveys Conducted by Stantec during the Spring of 2014
- Breeding Bird Surveys Conducted by Stantec during the Spring of 2014
- Eagle Point Count Surveys Conducted by Stantec during 2013 and 2014

USGS Breeding Bird Survey (BBS)

The North American Breeding Bird Survey (BBS), overseen by the Patuxent Wildlife Research Center of the USGS, is a long-term, large-scale, international avian monitoring program that tracks the status and trends of North American bird populations. Each survey route is 24.5 miles long, with 3-minute point counts conducted at 0.5-mile intervals. During the point counts, every bird seen or heard within a 0.25-mile radius is recorded. The Sheridan survey route runs north to south through the Facility Site, and is approximately 1.1 miles west of the nearest turbine. Most of the 114 species recorded on this route since 1968 have been common birds of forest, forest edge, woodland, old field, grassland, and wetland habitats. The most commonly observed species include red-winged blackbird, European starling, American robin, barn swallow, song sparrow, gray catbird, common yellowthroat, American goldfinch, bobolink, common grackle, savannah sparrow, red-eyed vireo, mourning dove, and American crow (Pardieck et al., 2015).

New York State Breed Bird Atlas

The NYS Breeding Bird Atlas (BBA) is a comprehensive, statewide survey that indicates the distribution of breeding birds in New York State. Point counts are conducted by volunteers within 5-km by 5-km survey blocks across the state (McGowan and Corwin, 2008). The Facility Site is located within or immediately adjacent to 14 New York State BBA blocks (1369B, 1369D, 1468A, 1468B,1469A, 1469B, 1469C, 1469D, 1568A, 1568B, 1569A, 1569B, 1569C, 1569D). These blocks were queried for bird species occurrence data. A total of 121 species were observed within the survey blocks (see Appendix JJ). Many of the species were also identified by one of the other data sources, but several species were unique to the BBA data, including blue-winged teal (*Anas discors*), red-headed woodpecker (*Melanerpes erythrocephalus*), winter wren (*Troglodytes troglodytes*), yellow-breasted chat, Louisiana waterthrush (*Seiurus motacilla*), Canada warbler (*Wilsonia canadensis*), and savannah sparrow (NYSDEC, 2007b).

Christmas Bird Count

Most avian species present in the summer breeding season migrate south for the winter (e.g., warblers, flycatchers, and thrushes), leaving only year-round species that are not seasonally displaced and species that travel south from more northern climates to winter in New York. Data from the Audubon's Christmas Bird Count (CBC) provides an overview of the birds that inhabit the region during early winter. The primary objective of the CBC is to monitor the status and distribution of wintering bird populations across the Western Hemisphere. Counts take place on a single day during a three-week period around Christmas, when volunteers comb a 15-mile (24 km) diameter circle in order to tally up all bird species and individuals observed. The Dunkirk-Fredonia Count circle overlaps the northeastern corner of the Facility Site. This circle also overlaps the shore of Lake Erie, and many of the records from this circle are bird species whose habitat is

specific to large lakes or marine environments (e.g., redhead (*Aythya americana*), double-crested cormorant (*Phalacrocorax auritus*), a variety of gulls). Such species were not included in the wildlife inventory because they are likely associated with Lake Erie and are not expected in terrestrial habitats far from the shore. Eighty-two species identified in the CBC data were included in the species list for the Facility Site. Most were also documented by the BBA and BBA, but several were unique to CBC data, including snow bunting (*Plectrophenax nivalis*), common redpoll (*Carduelis flammea*), snowy owl (*Bubo scandiacus*), northern mockingbird (*Mimus polyglottos*), and gadwall (*Anas strepera*) (National Audubon Society, 2016).

Fish

Data were retrieved from Version 45 of the NYSDEC Statewide Fisheries Database via a site-specific request from the Region 9 office of the NYSDEC. The following streams that cross the Facility Site were queried for lists of species documented to live in those streams: Blaisdell Creek, Canadaway Creek, Cassadaga Creek, Cherry Creek, Clear Creek, Conewango Creek, Fuller Golf Creek, Mill Creek, and Pickett Brook. Much of the Facility Site is high in the watershed, and the streams within the Facility Site are generally smaller than the streams where fish species in these streams were documented as occurring. However, all of the fish species documented in these streams by the NYSDEC Statewide Fisheries Database are included in the Wildlife Inventory (attached as Appendix JJ) in order to conservatively report all species that could possibly occur. A total of 67 unique fish species were identified. These include larger fish valued by anglers such as brown trout (*Salmo trutta*), brook trout (*Salvelinus fontinalis*), rainbow trout (*Oncorhynchus mykiss*), smallmouth bass (*Micropterus dolomieui*), largemouth bass (*Micropterus salmoides*), northern pike (*Esox lucius*), muskellunge (*Esox masquinongy*), bluegill (*Lepomis macrochirus*), white crappie (*Poxomis annularis*), and black crappie (*Poxomis nigromaculatus*). Smaller fish that are preyed upon by these larger fish are supported by these streams as well, including pumpkinseed (*Lepomis gibbosus*), a variety of darters (*Etheostoma* spp. and *Perca* spp.), shiners (*Cyprinella* spp., *Notropis* spp., and other genera), and minnows (*Pimephales* spp.).

Amphibians and Reptiles

Information on amphibians and reptiles for the Facility Site was compiled from the New York State Amphibians & Reptile Atlas (Herp Atlas), a 10-year survey conducted over ten years (1990-1999) designed to document the geographic distribution of New York State's herpetofauna (NYSDEC, 2007a). Information on amphibians and reptiles expected to occur within the Facility Site and an evaluation of suitable habitat for these species is provided in 1001.22(d) above.

Terrestrial Invertebrates

Based on the size of the Facility Site and on-site observation of habitat types available, a wide range of terrestrial invertebrates are likely to occur. These include a variety of insects such as butterflies, ants, bees, beetles, mosquitoes, fleas, crickets, ladybirds, fireflies, cicadas, flies, and grasshoppers. Arachnids including spiders, ticks, and mites are common throughout the Facility Site. Worms including earthworms and nematodes are common invertebrates that live in the soil. Invertebrates are important components of ecological communities within the Facility Site because they serve a variety of ecosystems services and functions, including pollination, providing prey for birds, bats, and rodents, expediting nutrient cycling, and aerating the soil.

(f) Impacts to Vegetation, Wildlife, Wildlife Habitats, and Wildlife Travel Corridors

(1) Construction- and Operation-Related Impacts to Vegetation

With respect to impacts to vegetation, construction and operational impacts are addressed above in 1001.22(b). A total of up to approximately 516.7 acres (6% of the Facility Site) of vegetation will experience temporary disturbance as result of Facility construction, and a total of up to 89.9 acres (1% of the Facility Site) of vegetation will be permanently lost through conversion to Facility components. No plant community will be extirpated or significantly reduced as a result of the Facility. The Applicant has taken measures to avoid, minimize, and mitigate for vegetation impacts to the extent practicable.

(2) Construction-Related Impacts to Wildlife and Wildlife Habitats

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, amphibians, and invertebrates that are unable to move out of the area being disturbed by construction. Tree clearing will occur outside of the breeding period for birds and bats (May 1 to October 1) in order to avoid impacts to 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.

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 sedimentation 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. Although these impacts are possible, they are expected to be minor due to the substantial mitigation efforts that the Applicant will take to avoid impacts to aquatic habitats. Please see the discussion of measures to avoid and mitigate impacts to surface waters in Exhibit 23(b)(5).

Habitat Disturbance/Loss

As mentioned previously, Facility 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 509.7 acres of wildlife habitat will be temporarily disturbed during construction, while permanent loss through conversion of natural habitat to built facilities will total 85.7 acres (calculations include wildlife habitat, excluding areas with vegetation that is disturbed/developed). 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). Changes in vegetation could also influence the behavior of bats by changing microclimatic conditions and the quality of habitat for foraging or roosting bats (National Research Council, 2007). 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 Facility Site would return to areas that were temporarily disturbed following the completion of construction activity. Significant adverse impacts on bat and bird populations are not expected during construction of the Facility. Tree clearing will conducted between October 1 and May 1, outside of the nesting season for birds and the activity period for bats.

On a landscape scale, there is abundant availability of habitats similar to those of the Facility within the nearby landscape. It is anticipated that 166.5 acres of agricultural lands will be disturbed during construction. Natural communities will also experience construction-related disturbance, including approximately 386.2 acres of forest,

19.8 acres of shrubland, and 22.9 acres of old field that will be directly impacted by Facility construction. No open water habitats within the Facility Site will be disturbed, however, please see 1001.23(b)(4) for a discussion of impacts to surface waters, as defined by on-site wetland and stream delineations, anticipated as a result of Facility construction and operation.

Displacement

Some wildlife displacement will also occur due to increased noise and human activity as a result of Facility 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 Facility construction include grassland bird species such as bobolink, eastern meadowlark, red-winged blackbird, and savannah sparrow, and forest species such as forest-dwelling warblers, ovenbird, and veery. Within New York State, peak breeding time for birds common to agricultural, grassland, and forest 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 to 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 Facility Site. 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) Operation-Related Impacts to Wildlife and Wildlife Habitats

Operation-related impacts to wildlife include direct habitat loss, habitat degradation through forest fragmentation, disturbance/displacement due to presence of wind turbines, and avian and bat mortality as a result of collisions with operating turbines.

Habitat Loss

A total of 85.7 acres of wildlife habitat will be permanently lost from the Facility Site (i.e., converted to built facilities). This habitat loss represents only approximately 1% of the 8062-acre Facility Site. Approximately 26% of this loss (approximately 22.7 acres) will occur in agricultural lands, which have limited wildlife habitat value. In addition, approximately 248.0 acres of forest are expected to be converted to a successional community (old field,

shrubland, or saplings) for the life of the Facility. Given the relatively small area of lost or converted natural communities, habitat loss/conversion resulting from Facility development is not considered significant.

Forest Fragmentation

In order to assess forest fragmentation impacts to songbird and bat populations as a result of construction of the Facility, Stantec performed a fragmentation analysis that provided background on habitat fragmentation effects, quantified the acreage of forest anticipated to result in edge effects, assessed potential impacts of fragmentation on birds based on results of on-site spring breeding bird surveys conducted in 2014, and assessed potential impacts to bats based on a review of literature regarding bat habitat requirements and behavior. The fragmentation analysis is attached as Appendix MM, and summarized below.

Forest habitat fragmentation occurs when large blocks of contiguous forest are divided or broken into smaller patches as a result of clearing or canopy removal. Fragmentation can occur at a variety of scales and patterns, each with a distinctive influence on the habitat needs of individual species. The potential effects of habitat fragmentation depend in part on the original extent of intact forested habitat and how much habitat will be impacted during and after construction. The relative impacts of forest habitat removal/conversion also depend on the configuration of impacted areas and types of anticipated activity (e.g., traffic volume, noise levels, visual disturbances) to occur in the affected areas. The potential effects of habitat fragmentation on bird communities also largely depend on the mixture of resident and migratory species present prior to impact, and how seasonally sensitive those species are to fragmentation.

According to Stantec's analysis, the Cassadaga Wind Project area, (depicted in Figure 2 of the PSS), consists of 35,365 acres, of which about 22,930 acres (65%) are forested. Existing land uses in and around the Facility Site include agricultural fields, a variety of roads, low density residential development, and infrastructure associated with natural gas extraction. Existing forested habitat at Cassadaga is fairly fragmented in the western portion of the Facility, and less fragmented in the eastern portion, where up to 58 turbines and associated infrastructure are proposed in relatively non-fragmented areas (see Figure 1 of the Fragmentation Memo in of Appendix MM). Clearing for all components associated with the Facility is expected to remove approximately 319[1] forested acres (1.4% of forested habitat in Project area). New York Department of Environmental Conservation has suggested

[1] Forest clearing used in the fragmentation analysis totals 319 acres, while impacts to forests calculated in the vegetation impacts analysis is 376.7 acres (see 1001.22(b). The vegetation impact analysis uses a highly conservative estimation method where impacts from clearing for each Facility component are added together without accounting for overlap of clearing areas of different components. As explained above in 1001.22(b), this method is especially conservative for forests because, even if an area is disturbed at two different times during construction, the forest will not have regenerated during the time between the two disturbance events. The estimate of 319 acres of for clearing is also conservative, because the Applicant is currently proposing to build up to 58 turbines, and may ultimately not build at all 58 turbine locations. Further, the Application includes two options for a section of overhead collection that has forested clearing associated with it. One of these options will not be built so the final forest clearing amount will be lower than what is presented in the Application.

the effects of clearing on forest birds extend into the adjacent forest for 300 feet in all directions from cleared areas. Including this 300 foot buffer, 1,664 acres of forest (7.3% of forested area) may be impacted by clearing associated with the Facility.

Fragmentation Impacts to Birds

The categorization of bird species as "forest-interior specialists", "interior-edge generalists", "edge species", or "field-edge species", as outlined by Whitcomb et al. (1981; as cited in Villard, 1998) and modified by Freemark and Collins, (1992; as cited in Villard, 1998) can be useful in conceptual understanding of potential impacts of habitat fragmentation (Villard, 1998). Forest-interior habitat located deep within woodlands is sheltered from influence of forest edges and open habitats. Bird species that utilize forest interior habitat ('forest-interior species') prefer these sheltered conditions due to availability of certain types of food, less nest disruption, and fewer predators. Conversely, forest edge habitat is typically sunnier, warmer, drier, windier, prone to more disturbance, and supports a higher density of predators than interior habitat. Bird species that utilize forest edge ('edge species') are often generalists in terms of habitat needs, are well adapted to these conditions, and can find their nesting and foraging requirements at forest edges (LandOwner Resource Centre, 2000). Importantly, however, presence in a particular habitat does not necessary indicate unaffected reproductive success. Also, while such categorizations are useful in evaluating theoretical impacts of habitat fragmentation, bird species do not always conform to distinct categorizations as preferring "edge" or "interior" habitats.

Pre-construction breeding bird survey results and point counts conducted during fall migration provide an opportunity to assess potential impacts associated with habitat fragmentation as a result of development and operation of the Facility. Stantec documented both forest-interior and edge species during spring breeding and fall migration surveys at the Facility Site (see 1001.22 (d) for additional detail on these studies). During spring breeding bird surveys, most of the forest-interior individuals were observed in forested (hardwood forest and mixed forest) habitat (n=139, 70%). Interior-species were also observed in non-forested habitats, and non-interior species were observed in forested habitats, indicating variation in utilization among different habitats in the Facility Site during spring breeding season. Since no forested habitat was surveyed during fall migration surveys, and since songbirds are cryptic during fall due to drab plumage and minimal singing, observations of forest-interior species during fall were infrequent. One hooded warbler, a predominantly interior species, was observed in over-grown field habitat during fall migration surveys (Stantec, 2015). Breeding bird point count surveys were not designed to quantify reproductive success rates.

Table 22-3. Locations of Forest-interior Species Observed During Breeding Bird Surveys, Spring 2014

Forest-interior Species	Non-forest Total (59 points)	Forest Total (26 points)	All Points Total (85 points)	% Observed in Forested Habitat
American redstart	4	5	9	56
black-and-white warbler	2	8	10	80
blackburnian warbler	1	0	1	0
black-throated blue warbler	0	2	2	100
black-throated green warbler	0	8	8	100
brown creeper	0	1	1	100
hooded warbler	12	19	31	61
ovenbird	16	36	52	69
red-eyed vireo	16	26	42	62
scarlet tanager	5	13	18	72
veery	1	6	7	86
wood thrush	3	15	18	83
Total	60	139	199	70

Despite being partially fragmented, the Facility Site supports large numbers of fragmentation-sensitive interior species. Forest-interior species such as hooded warbler, ovenbird, red-eyed vireo, scarlet tanager, and wood thrush (all observed during breeding bird surveys) are sensitive to fragmentation and may experience reproductive dysfunction associated with fragmentation (Donovan and Flather, 2002). Ground or open-nesting species are most sensitive to fragmentation, and may experience low nesting success due to nest predation and nest parasitism (Lampila et al., 2005). Species in this category include hooded warbler, black-and-white warbler, black-throated blue warbler, ovenbird, and veery (Cornell University, 2015). These species were frequently observed at the Facility Site, with individuals utilizing both forested and forest-edge habitats. Forest-edge habitat had the greatest number of birds observed, the greatest species richness, and the greatest diversity index during breeding bird surveys (Stantec, 2015). Large areas of forest-edge are created when continuous forest is fragmented, providing suitable habitat and supporting edge-adapted species, as observed at the Facility Site.

Construction and use of access roads generally present lower levels of threat to bird communities than highways and other major roads, due to smaller sizes (thus less clear-cutting), lower levels of traffic, and lower vehicle speeds (Jacobson, 2005). The primary potential habitat-related impacts to songbirds that could be anticipated as a result of construction and operation of the Facility may be increased predator activity along edges, which could either reduce reproductive success or remove viable habitat for certain vulnerable species (e.g. ground nesting songbirds). Certain species that are least tolerant of edges, or more susceptible to nest

predation, may suffer reduced reproductive success over the long-term, based on cumulative landscape conversion in the Facility Site and region.

Empirical studies of the effects of constructing wind projects on breeding bird populations with similar landscapes elsewhere in New York have not documented substantial shifts in species presence or distribution before and after construction. A breeding bird study was conducted after construction of the Howard Wind Project in Steuben County, New York, to assess the potential bird avoidance and/or habituation to turbines in a fragmented landscape. Surveys did not document systematic shifts in species composition or abundance based on proximity to turbines, nor did they document behavioral avoidance of turbines. Only the passerine subtype creepers and nuthatches exhibited statistically significant patterns of avoidance across the 2-year study (West, Inc., 2014).

Given that only 1.4% of forested habitat within the Project area is expected to be cleared (7.3% of habitat indirectly impacted assuming a 300-foot buffer/affected area), that access roads will have low levels of vehicle use, and that the Facility Site already consists of a patchwork of forested and non-forested habitats, it is unlikely that this Facility poses a significant risk of habitat-related impacts to bird communities. The interior species observed in the Facility Site will likely continue to persist after clearing associated with the Facility. Habitat-related impacts associated with wind projects are expected to be less than those associated with activities requiring greater percentages of deforestation, larger-scale construction activities, and greater human presence, such as large-scale agriculture, logging, transportation, and urban development. Species sensitive to fragmentation are currently present in partially-fragmented areas of the Facility Site, and utilize forested and non-forested habitats. Given the persistence of these species, and the fact that minimal amounts of additional habitat fragmentation is unlikely to drastically alter the landscape, it is likely that these species will continue to persist after small amounts of additional fragmentation.

Fragmentation Impacts to Bats

Potential effects of habitat fragmentation on bats are not well understood. Potential mechanisms of impact may vary among species but could include increased parasitism and/or predation, narrowed niche breadth, or shifts in home ranges (Segers and Broders, 2014). Forest structure plays an important role in determining the suitability of foraging habitat, with different species selecting foraging habitat according to their prey preferences and flight morphology. Large bats such as migratory hoary bats, eastern red bats, and silver-haired bats tend to be less maneuverable and prey on larger insects (Aldridge and Rautenbach, 1987; Fenton, 1990). As a result, these species tend to forage in open habitats or above the forest canopy. Small, highly maneuverable bats such as northern long-eared bats and eastern small-footed bats typically forage closer to

the ground, often beneath the forest canopy. Many bat species forage along forest edges, riparian corridors, and other gaps in the forest. Accordingly, a matrix of forest types and structural elements including gaps, edges, and corridors likely increase the overall diversity of bats in an area, provided a sufficient amount of roost opportunities and access to water (Krusic et al., 1996).

The clearing of linear corridors (e.g., access roads) and patches (e.g., turbine clearings) in an otherwise forested landscape will increase the amount of edge habitat present and reduce the amount of forest interior habitat. Accordingly, bat species that forage along forest edges and within open areas are likely to benefit from these activities whereas available habitat will be reduced for species preferring to forage within forest interior. Indeed, bat species appear to respond differently to forest thinning or clearing, probably due to a combination of prey availability, foraging behavior, or influence of forest structure on factors such as wind speed (Patriquin and Barclay, 2003; Segers and Broders, 2014). Forest interior specialists, such as northern long-eared bats, have shown a positive association with forest patch size, although effects differed among males and females (Henderson et al., 2008). However, forest fragmentation typically does not negatively impact bat diversity or abundance in a forested landscape unless remnant forest patches are very small or widely isolated (e.g., Lesinski et al., 2007; Medelin et al., 2010).

As described above, a small percent of forested habitats within the Facility Site will be cleared, and remaining forest habitat should provide ample roosting opportunity for bats. While loss of individual roost trees could certainly occur as a result of forest clearing, most bat species that reproduce in New York are not thought to be limited by day roost availability. Specifically, roost habitat is not considered a limiting factor for the federally threatened northern long-eared bat, which could occur in the Facility Site (USFWS, 2016). Further, impacts to wetland resources, which provide preferred foraging habitat for many bat species in the region, will be avoided and minimized to the extent practicable. Accordingly, construction of the Facility is not expected to negatively impact the suitability of foraging or roosting habitat for bats. The distribution of species across the Facility Site may shift somewhat as a result of creating additional edge habitat and cleared corridors, although sufficient intact forest patches will remain for species that forage within the forest interior habitats as well as those that prefer open habitats and edges.

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 Facility infrastructure represents a very small percentage of the site following construction. Therefore, overall land use is relatively unchanged by wind power development. However,

the true amount of wildlife habitat altered by a wind power facility can extend beyond the functional facility footprint, due to the presence of tall structures and increased human activity. The following subheadings address potential disturbance/displacement impacts to breeding birds, waterbirds, raptors, and game species.

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 habitats. 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; Leddy et al., 1999). Post-construction surveys at the Noble Wethersfield Windpark in Wyoming County, New York concluded that one avian species, the bobolink, showed an effect of turbine displacement following construction, with significantly fewer bobolinks within 246 feet (75 m) of turbines situated in hayfields. However, another species, the savannah sparrow, did not show a significant difference in abundance with distance from turbines (Kerlinger and Guarnaccia, 2010).

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, or forested land that does not provide grassland habitat. 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 and Guarnaccia, 2007). 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 m) 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 appeared to have been displaced by the turbines (Kerlinger, 2002). 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 and Guarnaccia, 2007). Minimal displacement in wooded areas was also documented following construction of the Noble Bliss Wind Farm in Wyoming County, New York. 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 (Kerlinger and Guarnaccia, 2009).

Waterbirds

The potential impacts of the Facility on migrating or foraging waterfowl should not be significant. Wind turbines are sited in uplands, for the most part away from the open water habitats that waterbirds prefer. There are no lakes within the Facility Site. Sometimes waterbirds, such as migrating geese, do forage in upland farm fields in substantial numbers. Disturbance/displacement impacts to waterbirds that use farm fields are not expected as a result of operating wind turbines, because these birds are generally well-adapted to disturbed environments with heavy human influence (e.g., along highways, in busy public parks, often near tall buildings, etc.).

The conclusion that Facility operation is unlikely to cause significant disturbance or displacement impacts to waterbirds is supported by 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). Based on these study results and the fact that the wind turbines are generally not near waterbird habitat, the proposed Facility 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. A study conducted at a 129 MW wind farm in Wisconsin measured use by raptors at the site both pre- and post-construction. Species observed during the study (either pre-construction, post-construction, or both) included American kestrel, bald eagle, broad-winged hawk, great horned owl, northern harrier, osprey, peregrine falcon, red-shouldered hawk, red-tailed hawk, turkey vulture, as well as a few unidentified accipiter and buteo hawk species. This is a similar suite of species to those identified at the Facility

Site (see 1001.22(d)(3) under the headings *Spring Raptor Migration Survey* and *Eagle Use Point Count Survey* for more information on raptor species observed in the Facility Site). The study found that abundance of raptors in all species groups was lower in the first year of post-construction monitoring than it was pre-construction; this reduction was attributed to disturbance from construction and ongoing presence of wind turbines. American kestrel, red-winged hawk, and turkey vultures experienced the greatest declines. (Garvin et al., 2011). The results of this study suggest that some displacement of raptors into similar nearby habitats is likely at the Facility.

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; the Applicant's consultant has 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.

Bird and Bat Collision Risk

In order to assess potential collision risk as a result of Facility operation, Stantec conducted a literature review of existing post-construction bird and bat fatality data for wind farms within 50 miles of the Facility Site and for wind farms throughout New York State. The review compiled average bird and bat mortalities per turbine per year for twenty five seasons of monitoring at 13 wind facilities, four of which are located within 50 miles of the Facility Site (Bliss, Sheldon, Steel Winds I & II, and Wethersfield). The average bat mortality was 11.7 bat fatalities/turbine/year for wind energy projects across New York State, and 9.7 bat fatalities/turbine/year for those wind energy projects within 50 miles of the Facility Site. The Facility will eventually be built with up to 58 turbines, therefore, using the average bat fatality rate from wind energy projects within 50 miles of the Facility Site, the Facility may result in approximately 563 bat fatalities per year. However, this estimate is conservatively estimated, and the Facility is likely to result in less bat mortality than this estimate suggests. Not all of the projects from which the average was calculated were employing BMPs for reducing bat mortality. Feathering below cut-in speed has been shown to significantly reduce bat collision mortality impacts. The American Wind Energy Association recently published a voluntary operational BMP that could reduce bat impact mortality by up to 30% (AWEA, 2015). The Applicant plans to implement this BMP, which consists of reducing blade rotation speed when wind speed is low during the bat fall migration period at certain temperature thresholds, thereby reducing collision risk. This operational measure is likely to result in less mortality than the average calculated from projects where at least some are not employing bat protection BMPs.

Average bird mortality was 4.0 birds fatalities/turbine/year for wind energy projects across New York State, and 5.1 birds/turbine/year for those wind energy projects within 50 miles of the Facility Site. Assuming the fatality rate for the Facility will be equal to the average calculated from wind energy projects within 50 miles, the Facility could result in approximately 296 bird fatalities per year. Table 22-4 provides bird and bat mortality estimates for each of the studies conducted in Stantec's review.

Table 22-4. Annual Per-Turbine Bird and Bat Mortality Rates Estimated for Operating Commercial Wind Energy Facilities in New York.

Facility (Year)	Within 50 miles of Facility Site?	Bat Mortality/ Turbine/Year	Bird Mortality/ Turbine/Year	Reference
Altona (2010)	N	6.51	1.55	Jain et al. 2011a
Altona (2011)	N	0.64	n/a	Kerlinger et al. 2011
Bliss (2008)	Y	7.58	4.3	Jain et al. 2009a
Bliss (2009)	Y	8.24	4.45	Jain et al. 2010a
Chateaugay (2010)	N	3.66	2.4	Jain et al. 2011b
Clinton (2008)	N	5.45	1.43	Jain et al. 2009b
Clinton (2009)	N	9.72	1.5	Jain et al. 2010b
Cohocton/Dutch Hill (2009)	N	40.4	4.7	Stantec 2010
Cohocton/Dutch Hill (2010)	N	25.62	2.06	Stantec 2011
Cohocton/Dutch Hill (2013)	N	8.03	3.96	Stantec 2014b
Ellenburg (2008)	N	8.17	2.09	Jain et al. 2009c
Ellenburg (2009)	N	8.01	5.69	Jain et al. 2010c
Hardscrabble (2012)	N	21.34	6.86	Ritzert et al. 2013
Howard (2012)	N	20.09	2.5	West 2013
Howard (2013)	N	4.29	0.75	Lukins et al. 2014
Maple Ridge (2006)	N	20.31	9.48	Jain et al. 2007
Maple Ridge (2007)	N	18.53	6.31	Jain et al. 2008
Maple Ridge (2008)	N	8.92	3.76	Jain et al. 2009d
Maple Ridge (2012)	N	13.38	n/a	Tidhar et al. 2013
Munnsville (2008)	N	2.9	2.22	Stantec 2009
Sheldon (2010)	Y	3.5	2.64	Tidhar et al. 2011a
Sheldon (2011)	Y	2.67	2.36	Tidhar et al. 2011b
Steel Winds I & II (2012)	Y	5.83	3.97	Stantec 2013a
Steel Winds I & II (2013)	Y	15.3	15.5	Stantec 2014b
Wethersfield (2010)	Y	24.45	2.55	Jain et al. 2011c

Review of mortality as a result of collision at other wind energy facilities provides an estimate of collision mortality that could result from the Cassadaga Wind Project. However, the exact impact of the Facility on collision mortality cannot be known until the Facility is in operation. The Applicant will conduct post-construction bat and bird fatality

monitoring which will quantify fatalities caused by the Facility. Please see 1001.22(h)(3) for details on the Post-Construction Monitoring Plan.

(4) Construction- and Operation-Related Impacts to Wildlife Travel Corridors

There are no documented wildlife travel corridors within the Facility Site. Although raptors and songbirds do use the Facility Site during migration, use by these birds is not as dense as at spring raptor migration corridors located along the southeastern shore of Lake Erie (see 1001.22 (d) for a discussion of raptor passage rates at the Ripley Hawk Watch and Hamburg Hawk Watch sites in comparison to passage rates at the Facility Site). Therefore, the Facility is not anticipated to have adverse impacts to continental-scale migration corridors. Smaller scale travel corridors that are not used for migration but are used for local movement between resource patches likely exist within the Facility Site. These include deer trails, areas between wetlands and uplands that reptiles and amphibians cross in order to access breeding grounds, and large patches of forest that mammals may travel through while foraging. Some of the largest patches of undisturbed forest that could be used as travel corridors occur in the Boutwell Hill State Forest, which is centrally located within the Facility Site. All Facility components have been sited outside of the State Forest, with the exception of some collection line which is proposed to be located adjacent to the existing Boutwell Hill Road. Because the only disturbance proposed in the State Forest is adjacent to existing disturbance, no significant impacts to travel corridors within the State Forest should result from construction or operation of the Facility. Construction and operation of the Facility could have some minor impacts on travel corridors in other forested areas of the Facility Site. However, forested areas like these are not unique, and wildlife with preferences for forested habitats are likely to find alternative travel corridors in adjacent similar habitat. Many species (e.g., whitetail deer, coyotes, various birds, rodents) will be able to continue to use existing travel corridors even if Facility construction and operation result in some breaks in forested cover. For these reasons, impacts to wildlife travel corridors are expected to be minimal.

(5) Threatened, Endangered, and Special Concern Species

The Applicant compiled a list of state- and federal-listed species that could occur in the Facility Site based on a site-specific correspondence and database queries from USFWS, the New York Natural Heritage Program (NYNHP), NYSDEC state and regional offices, and direct observations made on-site. The USFWS maintains an online database called the Information for Planning and Conservation (IPAC) where users can request site-specific information for known occurrences of federally-listed threatened, endangered, and candidate species listed under the Endangered Species Act. NYNHP tracks threatened, endangered, and special concern plant and animal species that occur throughout the state, as well as ecological communities that are unique or of special ecological

significance. The Applicant requested site-specific data from both of these sources in order to determine the presence of threatened, endangered, candidate, or special concern species that may occur in the Facility Site (see Appendix NN). The Applicant also requested site-specific data from the NYSDEC Region 9 office regarding fish species known to occur in streams whose tributaries are located within the Facility Site (see 1001.22(e)(2) for additional information about this request). Results of this request were compared against lists of species listed at the state and federal levels. Finally, of the list of species observed on-site during Stantec's and EDR's on-site surveys, the Applicant identified those species listed federally or at the state level. Table 22-5 provides the list of all species identified through these methods, as well as a brief description of the ecological requirements, the source whereby each species is known to occur within the vicinity of the Facility Site, and whether the species was actually observed during on-site surveys.

From the above sources, it was determined that three federally-listed species could occur within vicinity of the Facility Site. Two mollusks, the clubshell mussel (*Pleurobema clava*) and the rayed bean mussel (*Villosa fabalis*), are both listed as federally endangered species. One mammal, the northern long-eared bat (*Myotis septentrionalis*) is a federally-listed threatened species. All three of these species are also state-listed with the same designations (clubshell and rayed bean are state-listed endangered and northern long-eared bat is state-listed threatened). Two additional state-listed endangered species (golden eagle and short-eared owl) and four additional state-listed threatened species (bald eagle, Henslow's sparrow, northern harrier, and sedge wren) were identified through these sources. The NYSDEC also keeps records on species of special concern. These species are not listed, but their conservation needs do "warrant attention and consideration" (NYSDEC, 2016f). Seven species of special concern were identified either through site-specific correspondence with NYNHP or through direct observation on-site (common loon, Cooper's hawk, osprey, red-headed woodpecker, red-shouldered hawk, sharp-shinned hawk, and the West Virginia White, a butterfly species). NYNHP also indicated that a great blue heron rookery (a breeding colony) is located within ten miles of the Facility Site. This agency tracks those rookeries with 50 nests or greater (NYNHP, 2015a), it is assumed that the rookery identified by NYNHP has at least 50 nests. Although this species is not listed, it is considered Protected under New York State Law, and may not be hunted or taken at any time in New York State.

New York State maintains a Comprehensive State Wildlife Strategy that includes a list of Species of Greatest Conservation Concern (SGCN) (NYSDEC, 2016i). This list includes species that are rare or declining, and divides species into three categories. The first is Species of Greatest Conservation Need – High Priority (SGCN-HP). The status of these species is known and conservation is needed within the next ten years. The second category is Species of Greatest Conservation Need (SGCN). The status of these species is known, and conservation action is needed, although need for conservation action is not as imperative as for those in the High Priority Category.

The third category is Potential Species of Greatest Conservation Need (PSCGN). These are species whose status is poorly known, but there is an identified threat the species, or features of its life history make it vulnerable to threats. Many of the species listed as threatened, endangered, or of special concern are also identified as SGCN. In addition, eleven species observed within the Facility Site that are not listed as threatened, endangered, or of special concern are listed as SGCN or SGCN-HP (see Table 22-5).

Table 22-5. New York State Special Status Species Occurring or Likely to Occur within the Facility Site

Species	NYS Status	SGCN Status[1]	Ecology	Source[2]	Observed on-site?
Golden Eagle *Aquila chrysaetos*	Endangered	SGCN	Found in open and semi-open country; avoids large stretches of forests. May transiently utilize habitat within the Facility Site. One occurrence documented during spring raptor migration surveys.	ST	Yes
Short-Eared Owl *Asio flammeus*	Endangered	SGCN-HP	Found in open country, such as prairie, meadows, marshes, and open woodland. More common as a winter resident in New York State. Not documented during on-site surveys.	NHP	No
Clubshell Mussel *Pleurobema clava*	Endangered[3]	N/A	Found in clean, loose sand and gravel substates in small and mid-sized rivers and streams. Some suitable habitat is present within the Facility Site. No surveys for invertebrates have been conducted.	FWS	No
Rayed Bean Mussel *Villosa fabalis*	Endangered[3]	N/A	Typically found in smaller, headwater streams, but also occasionally found in large rivers or glacial lakes. Prefers sand or gravel substrates. Suitable habitat is present within the Facility Site. No surveys for invertebrates have been conducted.	FWS	No
Black Redhorse *Moxostoma duquesnei*	Endangered	SGCN	Occurs in clean, fast flowing creeks and rivers with bottoms of gravel, rock, or sand. Suitable habitat is present within the Facility Site. No surveys for fish have been conducted.	DEC	No
Bald Eagle *Haliaeetus leucocephalus*	Threatened	SGCN	Usually breeds in riparian and lacustrine habitats. Preferentially roosts in conifers. May transiently utilize habitat within the Facility Site. Six observations during spring raptor migration surveys and 3 observations inside the turbine area in eagle use point count surveys.	ST NHP	Yes
Henslow's Sparrow *Ammodramus henslowii*	Threatened	SGCN-HP	Often found in patchy, weedy old fields. Suitable habitat occurs within the Facility Site in the form of abandoned fields. Not observed during on-site surveys.	NHP	No
Northern Harrier *Circus cyaneus*	Threatened	SGCN	Found in meadows, grasslands, marshes, and cultivated fields. Nests on the ground, often in shrubby habitat. Suitable habitat for this species occurs within the Facility Site. One observation during spring raptor migration surveys and eight observations during eagle use point counts.	ST NHP	Yes
Sedge Wren *Cistothorus platensis*	Threatened	SGCN-HP	Usually found in moist, tall-grass meadows with scattered bushes. There may be suitable habitat within the Facility Site for this species. Not observed during on-site surveys.	NHP	No
Northern Long-Eared Bat *Myotis septentrionalis*	Threatened[4]	SGCN-HP	Winter habitat is caves where temperature and moisture remain even. Summer roost habitat consists of trees with cracked or exfoliating bark, and summer foraging habitat is consists of forest understories. Suitable habitat is present within the Facility Site. Presence of this species was not confirmed or refuted during on-site surveys.	FWS	No
Eastern Sand Darter *Ammocrypta pellucida*	Threatened	SGCN	Occurs in streams with sandy substrates, and are threatened by siltation habitat fragmentation. Suitable habitat is likely limited within the Facility Site. No surveys for fish have been conducted.	DEC	No
Common Loon *Gavia immer*	Special Concern	SGCN	Breeds on remote, undisturbed lakes. Winter and migration habitat includes lakes, rivers, estuaries, and coastlines. Suitable habitat is not present within the Facility Site. Not observed during on-site surveys.	NHP	No
Cooper's Hawk *Accipiter cooperii*	Special Concern	N/A	Forest-dwelling raptor that breeds in deciduous, mixed, and coniferous forests. Suitable habitat for this species occurs within the Facility Site. One observed during on-site eagle point count surveys, and one flyover observed during spring breeding bird surveys.	ST	Yes
Osprey *Pandion haliaetus*	Special Concern	N/A	Prefers open water habitat, including saltmarshes, rivers, ponds, reservoirs, estuaries, and lakes. Often build large stick nests above open water. May transiently utilize habitat within the Facility Site. Three observations during spring raptor migration surveys.	ST	Yes
Red-Headed Woodpecker *Melanerpes erythrocephalus*	Special Concern	SGCN-HP	Prefers river bottomlands, wooded swamps, and open grasslands with trees. Breeding habitat is characterized by the presence of dead trees for nest sites, snags for roosting, and open ground for foraging. Not observed during on-site surveys.	NHP	No
Red-Shouldered Hawk *Buteo lineatus*	Special Concern	SGCN	Forest-dwelling raptor that prefers wet areas such as swamps and forested wetlands. Suitable habitat for this species occurs within the Facility Site. Three observations during spring raptor migration surveys, and two observations during eagle point count surveys.	ST	Yes

Species	NYS Status	SGCN Status[1]	Ecology	Source[2]	Observed on-site?
Sharp-Shinned Hawk *Accipiter striatus*	Special Concern	N/A	Forest-dwelling raptor found in deciduous or mixed woodlands. Suitable habitat for this species is within the Facility Site. Four observations during spring raptor migration surveys and six observations during eagle point count surveys.	ST	Yes
Redfin Shiner *Lythrurus umbratilis*	Special Concern	SGCN	Occurs in small- to mid-sized streams in a variety of ecological settings. Dwells in pools, and prefers streams with sand and gravel bottoms and some vegetation. No surveys for fish have been conducted.	DEC	No
West Virginia White Butterfly *Pieris virginiensis*	Special Concern	N/A	Found in moist deciduous or mixed forests. Feeds and lays eggs on toothworts (*Cardamine diphylla* and *D. concatenata*). Declining due to invasion by garlic mustard. Suitable habitat is present within the Facility Site. No surveys for invertebrates have been conducted.	NHP	No
Great Blue Heron *Ardea Herodias*	Protected	N/A	Found in wetland habitats including marshes, riverbanks, lakes, and ponds; they occasionally forage in grasslands and agricultural fields. Although great blue heron occurs occasionally in the Facility Site, rookery habitat is not present. One observation during breeding bird surveys; incidentally observed during spring raptor migration surveys.	ST NHP	Yes
Brown Thrasher *Toxostoma rufum*	N/A	SGCN-HP	Found in shrublands, dense regenerating woods, and forest edges. Suitable habitat is present within the Facility Site. Incidentally observed during spring raptor migration surveys.	ST	Yes
Bobolink *Dolichonyx oryzivorus*	N/A	SGCN-HP	Prefers tall grasslands, including pastures, old fields, and meadows. Suitable habitat is present within the Facility Site. One hundred forty-three observations on-site during spring breeding bird surveys; incidentally observed during spring raptor migration surveys.	ST	Yes
Eastern Meadowlark *Sturnella magna*	N/A	SGCN-HP	Habitat consists of grasslands, including farm fields, old fields, meadows. Suitable habitat is present within the Facility Site. Nine observations during spring breeding bird surveys; incidentally observed during spring raptor migration surveys.	ST	Yes
Four-Toed Salamander *Ambystoma laterale*	N/A	SGCN-HP	Forested habitats surrounding swamps, marshes, and beaver ponds. Suitable habitat is present within the Facility Site. One incidental observation during wetland delineations.	EDR	Yes
American Kestrel *Falco sparverius*	N/A	SGCN	Generally occupy open areas with few trees, such as grasslands and agricultural fields. Suitable habitat is present within the Facility Site. Seven observations during spring raptor migration surveys; nine observations during eagle point count surveys.	ST	Yes
Ruffed Grouse *Bonasa umbellus*	N/A	SGCN	Prefers forest interior with scattered clearings, but may also be found in areas growing back after disturbance. Suitable habitat is present within the Facility Site. One observation during spring breeding bird surveys; observed incidentally during spring raptor migration surveys.	ST	Yes
Wood Thrush *Hylocichla mustelina*	N/A	SGCN	Found in shady, deciduous and mixed forests. Suitable habitat is present within the Facility Site. Sixteen on-site observations during spring breeding bird surveys.	ST	Yes
Scarlet Tanager *Piranga olivacea*	N/A	SGCN	Found in deciduous and mixed forests. Suitable habitat is present within the Facility Site. Fourteen on-site observations during spring breeding bird surveys.	ST	Yes
Silver-Haired Bat *Lasionycteris noctivagans*	N/A	SGCN	A migratory bat that resides in deciduous and mixed forests, often near water. Roost in bark crevices and hollows. Suitable habitat present within the Facility Site. At least 125 calls identified during on-site bat surveys.	ST	Yes
Red bat Lasiurus borealis	N/A	SGCN	A migratory bat that often resides in forested areas; does not overwinter in caves. Suitable habitat present within the Facility Site. At least 67 calls identified during on-site surveys.	ST	Yes
Hoary bat *Lasiurus cinereus*	N/A	SGCN	Prefers forested habitats and roosts on trees, hidden by foliage. Suitable habitat is present within the Facility Site. At least 98 calls identified during on-site surveys.	ST	Yes

[1] SGCN Status refers to the species' status under the Comprehensive State Wildlife Strategy. SGCN = Species of Greatest Conservation Need, SGCN-HP = Species of Greatest Conservation Need – High Priority.

[2] Source: ST = observed on-site by Stantec biologists, EDR = observed by EDR biologists, NHP = New York Natural Heritage Program site-specific request for data, FWS = US Fish & Wildlife Service IPaC consultation, website (IPaC) for federally-listed species, DEC = identified by DEC Region 9 office following a request for fisheries data.

[2] Also federally-listed as endangered.

[3] Also federally-listed as threatened.

Impacts to Special Status Plants and Significant Ecological Communities

No threatened, endangered, candidate, rare plant species, or significant ecological communities were identified by either the USFWS IPaC results or the NYNHP response letter, nor were any observed on-site during ecological surveys. Therefore, Facility construction and operation are not expected to result in adverse impacts to protected plants or to significant ecological communities.

Impacts to Special Status Birds

Impacts Based on Results of On-Site Avian Surveys

No federally threatened or endangered bird species were documented in the Facility Site. Pre-construction surveys documented several state-listed bird species in the Facility Site during the migratory period or incidentally during eagle point count surveys, including golden eagle (endangered), bald eagle (threatened), northern harrier (threatened), osprey (special concern), red-shouldered hawk (special concern), Cooper's hawk (special concern), and sharp-shinned hawk (special concern). Raptor mortality rates have generally been low at projects in the region/state. Raptor mortalities documented at existing wind farms within 50 miles of the Facility Site have consisted primarily of red-tailed hawks, a common species, although a few instances of sharp-shinned hawk mortality have occurred at these projects. A review of publicly available results from post-construction surveys did not uncover any records of northern harrier, osprey, or red-shouldered hawk mortality at wind energy projects in New York.

While the risk to raptors is low, each of the raptor species observed on-site could be expected to pass through the Facility Site during seasonal migration, during which they could be at risk of collision with turbines during Facility operation. There are no known eagle nests within the Facility Site, and the closest documented eagle nest is more than 3 miles away. Threatened or endangered raptor species were not documented during breeding bird point count surveys. Small numbers of Cooper's hawk (1) and sharp-shinned hawk (2) were observed incidentally during eagle point counts during summer; otherwise, incidental raptor observations from eagle point counts occurred during the spring or fall migration.

Eagle activity in the vicinity of the Facility Site as assessed during point count surveys and during other on-site surveys including raptor migration surveys was low (10 eagle observations in the Project area in 348 observation hours). The behaviors of individual eagles observed were not behaviors that are thought to be associated with greater collision risk at wind projects (courtship, territorial displays, or foraging). There are no features within the Project area that are likely to concentrate eagles or eagle activity. To date, no bald eagle fatalities have occurred at operational commercial-scale wind projects. Therefore, even if the number of eagle nests within 10 miles of the

Facility increased between 2013 and 2016 (see discussion of eagle nest sites above in 22(d)(3), collision risk to eagles at the Facility is still expected to be low.

There were five special status bird species that were identified by NYNHP as occurring within 10 miles of the Facility Site, but were not documented during on-site surveys: short-eared owl (endangered), Henslow's sparrow (threatened), sedge wren (threatened), common loon (special concern), and red-headed woodpecker (special concern). Impacts to these species are generally not anticipated, because they either do not use the Facility Site at all, or they use the Facility Site so infrequently as to not be detected during on-site surveys approved by NYSDEC and USFWS. However, because high-quality habitat for Henslow's sparrow exists within the Facility Site, further consideration is given to impacts to this species below, under the heading Impacts Based on Results of Habitat Assessment.

Facility construction impacts would occur primarily during forest clearing required for access roads and turbine pads. Forest clearing is to be conducted between October 1 and May 1, which is outside of the nesting period for other raptor species, minimizing or avoiding potential direct impacts to threatened and endangered bird species. Further, the lack of documented breeding populations of these species within the Facility Site indicates a low potential for impacts. Potential habitat-related impacts such as fragmentation effects are discussed in 1001.22(f)(3).

Impacts Based on Results of Habitat Assessment

In order to determine whether habitat with potential to support listed species is present within the Facility Site, Stantec conducted a habitat assessment at each of 14 eagle point count location in the Facility Site (see 1001.22(d)(3) for details on the eagle observation study). The assessment was specific to habitat requirements for a list of rare birds documented within 10 miles of the Facility Site provided by NYNHP on August 12, 2012. The list included state-threatened bald eagle, Henslow's sparrow, northern harrier, and sedge wren (*Cistothorus platensis*), as well as the species of special concern common loon (*Gavia immer*), and one protected bird, the great blue heron. Within an 800-meter radius around each of the point count locations (covering approximately 500 acres), cover types were recorded and percent canopy cover of forests was estimated. In addition, those areas with potential suitable habitat were noted and recorded while traveling between eagle point count sites.

No habitat within the Facility Site with potential to support federally listed avian species, state-listed species bald eagle, and special concern species common loon, or the protected great blue heron was identified in the habitat assessment. There are no lakes in the Facility Site with potential to support breeding of bald eagle or common loon, which nest on lakes greater than 25 acres in size (NYSDEC, 2016b). There are no wooded freshwater

swamps or water bodies with islands where great blue heron typically establish rookeries (NYSDEC, 2016d). These species are not expected to occur more than just occasionally in the Facility Site, due to lack of suitable habitat. The lack of documented breeding populations of these species within the Project indicates a low potential for impacts.

Breeding habitat for northern harrier includes extensive open wetlands, freshwater marshes, wet, lightly grazed pastures, fallow grasslands, meadows and cultivated fields (Smith et al., 2011). Using aerial photography and NWI data, Stantec identified a freshwater emergent wetland complex with associated shrub wetlands in the northeast portion of the Facility Site which could be suitable breeding habitat for northern harrier. Similarly, sedge wren nest in predominately wet meadows or hayfields dominated by sedges (NYSDEC, 2016h); wet meadows could occur in and surrounding this marsh. No hayfields dominated by sedges were identified by Stantec at the point count locations. Stantec did not observe northern harrier or sedge wren during late summer and fall surveys conducted at the Facility Site, however sedge wren are difficult to detect outside the breeding season. There are no proposed Facility components in this marsh, and this habitat will not be disturbed by construction or operation of the Facility. Therefore, the Facility should not result in impacts breeding grounds of northern harrier or sedge wren (see the Habitat Assessment Memo in Appendix OO).

Thirteen areas within the Facility Site were identified by Stantec as having potential habitat for Henslow's sparrow. Suitable habitat for this species includes moist fallow fields and meadows, weedy hayfields, pastures lacking shrubs, wet meadows, and hillsides with sedges (NYSDEC, 2016e), and the species typically breeds in relatively large fields, greater than approximately 30 hectares (Zimmerman, 1988; Mazur 1996 as cited in Herkert, 2003). Of the thirteen areas identified, six were further designated as having the greatest potential to support Henslow's sparrow. Stantec surveyed these greatest potential areas in the spring during breeding bird surveys and did not detect Henslow's sparrow, therefore direct impacts to breeding Henslow's sparrow during construction are not anticipated. During Facility operation, direct impacts in the form of turbine-related collision fatality could potentially occur; although to date no Henslow's sparrow fatalities have been reported by operational wind projects with publicly available fatality monitoring results.

Impacts to Species of Greatest Conservation Need

Seven avian species (brown thrasher, bobolink, eastern meadowlark, American kestrel, ruffed grouse, wood thrush, and scarlet tanager) with SGCN status were observed during on-site surveys. Of these, brown thrasher was only incidentally observed during spring raptor migration surveys, and ruffed grouse was observed once during breeding bird surveys, as well as being incidentally observed during spring raptor migration surveys. These species occur in such low numbers that Facility construction and operation are unlikely to adversely impact population

numbers. The other five species (bobolink, eastern meadowlark, American kestrel, wood thrush, and scarlet tanager) were observed in greater numbers within the Facility site. Although Facility construction and operation could have an adverse impact on individuals of these species, suitable habitat is abundant within the Facility Site, and will be available during and after construction. Furthermore, these species are not listed as threatened or endangered or of special concern, and have population numbers statewide that are more stable than species listed under one of these protection statuses. Therefore, it is not anticipated that Facility construction or operation will have a significant effect on regional, statewide or range wide populations.

Impacts to Special Status Mammals

Special status bat species that may occur in the Facility Site based on their known range include the state- and federally-listed threatened northern long-eared bat (*Myotis septentrionalis*), and state species of special concern eastern small-footed bat (*Myotis leibii*). The NYNHP only identified northern long-eared bat as a concern for the Facility Site. Both of these species hibernate during winter and can be found in forested areas throughout the northeast during spring, summer, and fall. Forested habitats within the Facility Site could provide roosting habitat for northern long-eared bats and foraging habitat for both species, whereas presence of eastern small-footed bats in the Facility Site is unlikely due to absence of preferred roosting habitat for the species (rocky outcrops or talus slopes). *Myotis* species were detected at low levels acoustically in the Facility Site during pre-construction surveys, although not identified to species. Potential impacts to these bat species could include loss of foraging/roosting habitat associated with tree removal, direct mortality due to tree clearing, and turbine-related mortality during Facility operation.

Potential direct mortality of listed bats during construction will be avoided through conducting forest clearing between October 1 and May 1, outside of the spring and summer reproductive period. As indicated by Stantec, several studies have documented that northern long-eared bats roost in a wide variety of tree species (e.g. Sasse and Pekins, 1996; Broders and Forbes, 2004), are not habitat limited during the summer in forested areas (USFWS, 2016), and persist in areas despite removal of preferred roost trees (Silvis et al. 2015). As such, forest clearing associated with the Facility is not expected to result in significant habitat-related impacts to either the northern long-eared bat or the eastern small-footed bat. Potential effects of habitat fragmentation on bats are addressed in 1001.22(f)(3).

Turbine-related mortality of northern long-eared bats has been documented at low levels at wind projects in the northeast, with 43 mortalities (less than 1% of bat mortality) documented at 19 facilities. The USFWS concluded that, despite some monitoring limitations, northern long-eared bats were rarely detected as mortalities, even when they were known to be common on the landscape around wind energy facilities (USFWS, 2016).

No eastern small-footed bat mortalities have been documented at any wind projects in New York, and only 1 has been documented in Pennsylvania, based on publicly available data. Also, Stantec understands that no northern long-eared mortality has occurred at projects implementing feathering below normal manufacturer cut-in speed. The USFWS has concluded that the level of observed northern long-eared bat mortality at wind farms does not constitute a significant risk to the species, particularly in light of voluntary industry BMPs establishing the voluntary operating protocol of feathering turbines below normal cut-in speed (USFWS, 2016), which will be implemented at the Facility during the fall migration period.

Silver-haired bat, red bat, and hoary bat are species with SGCN status whose calls were positively identified during on-site acoustic surveys. Direct mortality through Facility construction will be limited, because tree clearing will take place between October 1 and May 1, outside of the breeding and activity periods for these species (see 1001.22(f)(2) for a discussion of construction-related impacts to bats). Additionally, Facility operation could result in some collision mortality to these species (see 1001.22(f)(3) for a discussion of operation-related impacts to bats). However, the Applicant has developed avoidance, minimization and mitigation measures (see 1001.22(h)(4) for a discussion of the Bird and Bat Conservation Strategy (BBCS)). These species are not listed as threatened or endangered or special concern, and have population numbers statewide that are more stable than species listed under one of these protection statuses. Therefore, it is not anticipated that Facility construction or operation will have a significant effect on statewide or range wide populations.

Impacts to Special Status Fish

Three fish that are either state-listed or considered to be of special concern were identified by NYSDEC region 9 offices as occurring within streams that cross (or whose tributaries cross) the Facility Site. These include the endangered black redhorse (*Moxostoma duquesnei*), threatened eastern sand darter, and special concern redfin shiner. These three species each have different habitat requirements, although all three are stream dwelling fish whose status is threatened by pollution and siltation. The black redhorse was reported by NYSDEC as having been recorded in Cassadaga and Conewango Creeks. It is a bottom feeding fish that prefers swift, clean, creeks and rivers with sand, gravel, or rock substates (NYSDEC, 2016a). The eastern sand darter was identified by NYSDEC as having been caught in Conewango Creek. This small fish requires streams with sandy bottoms; it often buries itself in sand, leaving only its eyes exposed, in order to hide from prey and predators and to maintain its position in fast-flowing waters. The species is threatened by loss of clean sandy substrate due to siltation (NYSDEC, 2016c). The redfin shiner was identified by NYSDEC as having been caught in Cassadaga Creek. It is a small fish that dwells in pools of streams with moderate or low gradient with sand and gravel bottoms. NYSDEC indicates that elsewhere in its range, the species has been shown to not by highly sensitive to environmental change (NYSDEC, 2016g). All three of these fish species are also considered SGCN.

Impacts to any of the special status fish species discussed above are not anticipated as a result of Facility construction or operation. The Facility Site contains very little suitable habitat for these fish because most of the streams are headwater streams high in the watershed that are too small for any fish to live in or have only intermittent flow. The fish were identified from streams which will not be directly crossed by Facility components (Cassadaga Creek and Conewango Creek), although Facility components will intersect with some of their tributaries. Where Facility components cross such tributaries that contain fish habitat, best management practices recommended by NYSDEC and USACE will be implemented that will avoid and minimize impacts to fish. These include establishing "no equipment access" and "restricted activities" areas in and around streams, employing an erosion and sedimentation control plan, and adhering to a work period restriction for conducting in-stream work, designated in consultation with NYSDEC. In addition, places where collection lines cross NYSDEC protected streams (all of which have a rating of C(T) in the Facility Site – see 1001.23(b) for an explanation of the NYSDEC protected stream classification system), the collection line is anticipated to be installed either by directional drilling or spanned over the stream. This will further avoid and minimize impacts to fish habitat, ensuring that no impacts to black redhorse, eastern sand darter, and redfin shiner result from Facility construction or operation. Please see 1001.23(b)(5) and1001.23(e)(2) for additional detail on avoidance and minimization measures for impacts to surface waters and aquatic organisms, respectively.

Impacts to Special Status Amphibians and Reptiles

The four-toed salamander is a small salamander that is listed as SGCN-HP. It lives in forested habitats surrounding swamps, bogs, marshes, vernal pools, and other aquatic habitats without fish (Massachusetts Division of Fish and Wildlife, 2007). One four-toed salamander was observed during wetland delineations in forested wetland fringe habitat associated with delineated Wetland BBB. This state-protected wetland is currently anticipated to have the collection line that crosses it spanned overhead, which will avoid impacts to four-toed salamanders that may occur in this location. No other facilities are proposed to be sited here. Four-toed salamanders could also occur elsewhere in the Facility Site, including in areas that might be disturbed during construction. However, impacts to populations of the four-toed salamander will be minimized by avoiding areas of mature forest adjacent to open-water wetlands to the extent practicable.

Impacts to Special Status Invertebrates

The clubshell is a tannish-yellow mussel, with broad dark green rays. This species is generally found in clean, coarse sand and gravel in runs, often just downstream of a riffle, and cannot tolerate mud or slackwater conditions. Live clubshells are often buried in up to four inches of substrate (Badra, 2011). The range of this mollusk historically extended from New York west to Illinois, and south to Alabama. However, the species has been extirpated across much of its range and is now assumed to be restricted to just 12 streams. At the time clubshell was listed as

endangered by the USFWS in 1993, the species was thought to be extirpated from New York State. However, in 2005, it was rediscovered in Cassadaga Creek (USFWS, 2008, NatureServe, 2015). Cassadaga Creek will not be crossed by Facility Components, but its tributaries including Mill Creek and other unnamed tributaries, will be crossed by Facility components.

The rayed bean mussel is typically found in small, headwater creeks (usually in or near shoal or riffle areas), but has also been found in larger rivers and along the shallow, wave-swept shores of lakes (Carman, 2001). It prefers gravel and sand substrates, and is often found near the roots of aquatic vegetation. The rayed bean relies on fish hosts for dispersal of juveniles into upstream habitats. Threats to this species include industrial and agricultural pollution, siltation, and competition by invasive zebra mussels (USFWS, 2012b). The species has been extirpated from about 71% of its known historical range. It is known from the Conewango Creek Watershed, which drains the eastern portion of the Facility Site. Portions of these upper tributaries will be crossed by Facility components.

Facility construction will avoid and minimize impacts to streams as much as possible by implementing appropriate erosion and sediment control measures, crossing all streams perpendicularly to minimize disturbance, ensuring trenching of non-permanent streams (which are tributaries to the potential habitat of this species) is done in the dry to the extent practical, and abiding by NYSDEC *Stream Crossings: Guidelines and Best Management Practices* (NYSDEC, 2016j). Additionally, in cases where buried collection line is the only Facility component and there is potential mussel habitat, collection line will be installed via horizontal directional drilling to ensure avoidance of impacts to waters with potential mussel habitat (see Figure 22-2 for locations of proposed directional drills). Following these measures will ensure that adverse impacts to the rayed bean as a result of construction and operation of the Facility are avoided and minimized to the maximum extent practicable.

The West Virginia White is a butterfly species of special concern that has been identified within the Facility Site. Suitable habitat for this species includes rich mesic, relatively undisturbed deciduous forests, which are abundant within the Facility Site. The main host plants for its larvae are two very common spring ephemerals of mesic deciduous forests in the toothwort genus (two-leaved toothwort (*Cardamine diphylla*) and cut-leaved toothwort (*C. concatenata*)), although other species in the mustard family may be used as well (NYNHP, 2015b). A major threat to this species is invasion of mesic forests by garlic mustard (*Alliaria petiolata*). Garlic mustard is closely related to toothworts, and the West Virginia White will lay its eggs on garlic mustard. However, this plant is poisonous to the young larvae, so larvae that emerge on garlic mustard plants do not survive. An additional threat is forest fragmentation, which restricts available habitat because the West Virginia white avoids open areas. Forest fragmentation and disturbance also negatively impact this species because toothworts do not thrive in disturbed habitats.

It is assumed that the West Virginia white is present within the Facility Site because of the likely widespread presence of its preferred host plant species. Direct mortality impacts from Facility construction would be limited to larval individuals of West Virginia white that are unable to avoid direct construction disturbance. Additionally, construction and operation could result in adverse impacts to habitat, both in direct loss of habitat and through degradation of forest habitat through fragmentation. However, rich mesic forests within the Facility Site that support the West Virginia White and its host plants are abundant throughout the Project area, and only about 1.4% of the forests that exist within the Project area will be cleared for Facility construction. Therefore, it is anticipated that this species will continue to utilize the remaining undisturbed suitable habitat within the Facility Site during construction and operation. Ongoing operational activities are not expected to have an adverse impact of the West Virginia white. Furthermore, the Applicant is taking measures to avoid the spread of garlic mustard (see 1001.22(b) for a discussion of invasive species control measures, and Appendix FF for the ISCP), invasion of which is a major threat to the species. This measure will minimize and mitigate for potential impacts to the West Virginia white.

(g) Measures to Avoid or Mitigate Impacts to Vegetation, Wildlife and Wildlife Habitat

With respect to measures to avoid or mitigate impacts to plant communities (including vegetation), please see 1001.22(c) above.

With respect to wildlife and wildlife habitat, 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. In order to reduce impacts to birds and bats, the Applicant plans to conduct tree clearing between October 1 and May 1, when these wildlife species are not nesting or roosting in tree canopies. Please see 1001.22 (h)(3) for details on the BBCS, which includes this and other measures that the Facility will take to avoid, minimize, and mitigate for impacts to birds and bats.

To avoid and minimize impacts to aquatic resources resulting from construction-related siltation and sedimentation, an approved sediment and erosion control plan and SWPPP will be implemented. The sediment and erosion control plan and Preliminary SWPPP are described in 1001.23(c)(1), and the Preliminary SWPPP is attached as Appendix GG. Proper implementation of these plans will assure compliance with NYSDEC SPDES regulations and New York State Water Quality Standards. In addition, a Spill Prevention, Containment and Counter Measures (SPCC) Plan has been

developed and will be implemented to minimize the potential for unintended releases of petroleum and other hazardous chemicals during Facility construction and operation (see Exhibit 23 for additional information).

Mitigation for impacts related to permanent habitat loss and forest fragmentation will be accomplished through careful site design. Facility access roads and collection lines have been sited along the edges of agricultural fields and forests, in order to minimize impacts to, and fragmentation of, both of these habitat types. Cleared forest land along Facility access roads and at the periphery of turbine sites will be allowed to grow back and reestablish forest habitat in areas where it was cleared, which over the long term will provide shrubland or forested habitat for species that require these types.

The Facility has been designed to minimize bird and bat collision mortality (see discussion of BBCS in 1001.22(h)(3)). In an effort to reduce avian and bat impacts, electrical collection lines between the turbines will generally be buried to the maximum extent practicable. Lighting of the turbines (and other infrastructure) will be minimized to the extent allowed by the Federal Aviation Administration (FAA), and will follow specific design guidelines to reduce collision risk (e.g., using blinking lights with the longest permissible off cycle). Guy wires, which have been shown to increase collision mortality, will not be used (Longcore et. al, 2008).

Operational bird and bat protection measures will also reduce avian and bat collision mortality. The American Wind Energy Association recently published a voluntary operational BMP that could reduce bat impact mortality by up to 30% (AWEA, 2015). The Applicant plans to implement this BMP, which consists of reducing blade rotation speed when wind speed is low during the bat fall migration period at certain temperature thresholds, thereby reducing collision risk. A description of the Bird and Bat Conservation Strategy is provided in 1001.22(h)(4)

The Applicant plans to conduct post-construction monitoring for avian and bat mortality; please see 1001.22(h)(2) for details regarding these plans.

(h) Avian and Bat Impact Analysis and Monitoring Program

(1) Avian and Bat Impacts

As previously mentioned numerous pre-construction avian and bat studies have been conducted, which were based on the July 2013 *Work Plan for Pre-Construction Avian and Bat Surveys.* Copies of all reports prepared in accordance with this work plan were provided to NYSDEC personnel in April 2015, and these reports are appended to this Article 10 Application. Full detail on methodology and results of these studies is provided in 1001.22(d). A

comprehensive analysis of construction and operation-related impacts to birds and bats, as well as their habitats, as a result of the Facility is provided in 1001.22(f).

The Facility is one of at least three other commercial-scale wind farms currently proposed to be built in Chautauqua County. The other two in development are the Arkwright Summit Wind Farm, a 78.4 MW project located in the Town of Arkwright, and the Ball Hill Wind Energy Project, a 100 MW project located in the Towns of Villenova and Hanover. It is the Applicant's understanding based on publically available information that the Arkwright Summit Wind Farm has completed SEQRA and has obtained local zoning permits from the Town of Arkwright. The Ball Hill Wind Energy Project is currently in the SEQRA review process. Assuming both Projects were to proceed through the permitting process and obtain all the required approvals, the Applicant does not know when either of the Projects anticipate commencing construction. Despite the uncertainty with respect to these projects, nevertheless, the Applicant has reviewed the potential for impacts to birds and bats due to the Cassadaga Wind Project occurring within the context of potentially increasing wind energy generation in the region. The cumulative impact to birds and bats from these three wind farms is analyzed below, and includes cumulative impacts of 1) direct collision mortality, 2) habitat loss, and 3) forest fragmentation region-wide.

Cumulative Collision Mortality

As discussed above in Section 1001.22 (f), the Facility is expected to kill birds and bats during operations. Birds and bats are likely to sustain these same effects at other wind energy facilities, as well, resulting in a potential for cumulative or additive effects. Stantec prepared an analysis of the cumulative effects of bird and bat mortality attributable to the Facility in the context of other existing and future wind energy facilities in New York State (see Appendix PP). According to data compiled by the American Wind Energy Association, there are 1,014 turbines with 1,749 MW of installed capacity currently in New York (AWEA, 2016). Growth in the wind sector has been rapid over the previous few years, and the U.S. Energy Information Administration's energy forecasts recently indicated a nationwide growth rate of 2.2% annually for installed wind energy capacity between 2012 and 2040 (USEIA, 2015). Assuming the Facility comes on line in 2017, and installed capacity in the state grows at 2.2% per year for the 25-year life of the Facility, there will be an estimated total capacity of 3,147 MW and 1,825 turbines in New York State by the year 2042 (average turbine capacity = 1.7 MW).

Cumulative Impacts to Birds

Average bird mortality is 4.0 birds per turbine per year for wind energy projects across New York State and 5.1 birds per turbine per year for projects within 50 miles of the Facility. By applying the state-wide average avian mortality rate of 4.0 birds per turbine per year to the current installed capacity of wind projects in New York (1,014 turbines), it can be estimated that wind energy facilities in New York State currently kill 4,056 birds each year.

Using the local average of 5.1 birds per turbine per year derived from post-construction studies at four wind energy projects within 50 miles of the Facility, it is estimated that the Facility will result in 296 bird deaths per year. This is 7.3% of the total estimated bird mortality from currently installed wind projects in New York. It is estimated that the Facility will kill a total of approximately 7,400 birds over its 25-year operational life. Using the assumptions presented above, wind energy projects in New York will kill roughly 142,000 birds during the Facility's 25-year operational life. The Project's contribution will be roughly 5.2% of the total bird mortality estimated to occur from installed wind projects in New York through year 2042.

Of the bird mortality estimated to occur at the Facility, roughly 70% will be composed of birds from the passerine group. There is no evidence suggesting that a wind energy facility has caused significant population-level impact to any one species of bird. This is largely because nocturnal migrant passerines most at risk of collision are regionally abundant (NRC, 2007; Johnson et al., 2002; Arnold and Zinc, 2011). To provide context for consequences of bird mortality at the Facility and other wind energy facilities in New York State, Stantec evaluated population level impacts for five example species: American woodcock, wood thrush, black-throated blue warbler, red-eyed vireo, and golden-crowned kinglet. Partners in Flight priority species for the Alleghany Plateau region. American woodcock, wood thrush, and black-throated blue warbler are all considered to be Partners in Flight priority species for the Alleghany Plateau region, and each have been found during post-construction carcass searches at wind energy facilities within 50 miles of the Facility Site. Red-eyed vireo and golden-crowned kinglet were included to represent common species frequently killed at New York State wind energy facilities.

Stantec reviewed post-construction monitoring data from operating New York wind projects from 2006 through 2012 to determine the proportion of total fatalities for each of the five example species. The total 666 bird carcasses found in these studies included 12 black-throated blue warblers (1.8%), 10 American woodcocks (1.5%), 4 wood thrushes (0.6%), 76 red-eyed vireos (11.4%), and 71 golden-crowned kinglets (10.%). Using these proportions, along with the projected number of turbines (1,825) operating in New York in 2042, Stantec then calculated the cumulative number of birds of each species expected to be killed using the average mortality rate for New York projects (4.0 birds per turbine per year) as well as the highest observed fatality rate in New York State (15.5 birds per turbine per year). The annual mortality for each example species can then be compared to the statewide population numbers. Stantec concluded that even under the worst-case scenario, the cumulative mortality of all wind energy projects Statewide are likely to kill <1% of the populations of American woodcock, wood thrush, black-throated blue warbler, red-eyed vireo, and golden-crowned kinglet. In summary, the cumulative operation of current and future wind energy facilities in New York State are not expected to cause population-level effects to avian resources, even those species of conservation concern. For additional information, see Appendix PP.

Cumulative Impacts to Bats

Average bat mortality is 11.7 bats per turbine per year for wind energy projects across New York State and 9.7 bats per turbine per year for projects within 50 miles of the Facility. By applying the state-wide average avian mortality rate of 11.7 bats per turbine per year to the current installed capacity of wind projects in New York (1,014 turbines), it can be estimated that wind energy facilities in New York State currently kill approximately 12,000 bats each year. Using the local average of 9.7 bats per turbine per year derived from post-construction studies at four wind energy projects within 50 miles of the Facility, it is estimated that the Facility will result in 563 bat deaths per year. This is 4.7% of the total estimated bat mortality from currently installed wind projects in New York. It is estimated that the Facility will kill a total of approximately 14,000 bats over its 25-year operational life. Using the assumptions presented above, wind energy projects in New York State will collectively kill roughly 416,000 bats during the Facility's 25-year operational life, of which more than 320,000 will be migratory tree-roosting bats. The Project's contribution will be roughly 3.4% of the total bat mortality estimated to occur from installed wind projects in New York through year 2042.

It should be noted that the average mortality rates were determined from review of post-construction monitoring studies at facilities that did not employ feathering, curtailment, or other operational adjustments to minimize bat mortality. As described below in Section 1001.22 (h)(4), the Applicant plans to abide by the voluntary operational protection measures outlined in the American Wind Energy Association's recently published voluntary BMPs for bat conservation (AWEA, 2015), which have been shown to reduce bat mortality up to 30% or more (Baerwald et al., 2009; Young et al., 2011; Stantec, 2013b; AWEA, 2015). Consequently, the implementation of these measures is expected to reduce the actual bat mortality from Facility operation from 563 to 394 bat deaths per year. Over the 25-year operational life of the Facility, implementation of the voluntary operation protection measures can be expected to lower bat deaths from approximately 14,000 to approximately 9,800. The statewide fatality rate for bats may also decline as the implementation of operational adjustments becomes more common.

Of the bat mortality estimated to occur at the Facility Site, it is expected that approximately 77% will be comprised of migratory tree-roosting bats (e.g., eastern red bat, hoary bat, and silver-haired bat). Looking at future wind energy development in New York, it is impossible to determine to what extent the cumulative estimate of 320,000 bat fatalities over 25 years will cause population-level impacts, because no baseline population estimates exist for migratory tree bat species. The remaining 23% of the mortality is expected to impact cave-hibernating bats (e.g., little brown bat, big brown bat, northern long-eared bat, Indiana bat, tri-colored bat). A fungal disease called white-nose syndrome (WNS) has emerged as the largest single source of mortality for cave-hibernating bats in recent years. Turner et al. (2011) documented an 88% decline in overall numbers of hibernating bats comparing pre-

and post-WNS counts at 42 sites in 5 northeastern states. At these sites, northern long-eared bats decreased by 98%, little brown bats by 91%, tri-colored bats by 75%, Indiana bats by 72%, big brown bats by 41%, and eastern small-footed bats by 12% (Turner et al., 2011). In 2012, the USFWS estimated total bat mortality reached 6.7 million bats since discovery of the disease in 2006 (USFWS, 2012c). With the exception of northern long-eared bat, baseline population data is generally not available for cave-migrating bats, either, making determination of population-level impacts impossible for most species.

The USFWS (2016) estimates there are 228,480 northern long-eared bats in New York State. Any project within the species' range has the potential to take northern long-eared bats, particularly during the fall migratory season. Publicly available post-construction monitoring results in New York State reported 8 northern long-eared bat fatalities at four wind energy facilities, two of which are within 50 miles of the proposed Facility. Based on the fatalities documented in these post-construction monitoring reports, <1% of bats killed in New York have been northern long-eared bats. As a result, Stantec concluded that cumulative mortality at the Facility and all other wind facilities in New York State is not likely to lead to population-level declines in northern long-eared bats. This is consistent with a 2016 determination by the USFWS that "there may be adverse effects posed by wind-energy development to individual northern long-eared bats; however, there is no evidence suggesting that effects from wind-energy development has led to significant declines in this species, nor is there evidence that regulating the incidental take that is occurring would meaningfully change the conservation or recovery potential of the species in the face of WNS. Furthermore, with the adoption by wind-energy facilities of the new voluntary standards, risk to all bats, including the northern long-eared bat, should be further reduced."

In summary, bat mortality at wind energy facilities contributes to overall bat mortality, and the Facility's resulting bat mortality will contribute cumulatively to other wind facility mortality. Compared to the effects of WNS, cave-dwelling bat mortality at wind energy facilities is minor. However, wind energy facilities kill more migratory tree-roosting bats than any other known documented source. By 2042, wind facilities in New York are predicted to result in approximately 416,000 bat fatalities, most of these being migratory tree-roosting bats. The effect of cumulative mortality on overall bat populations is uncertain because current population sizes are unknown. Cumulative mortality at the proposed Facility will account for roughly 3.4% of the cumulative mortality of bats in the assumed 25 years of operation (potentially 2.4% with implementation of operational adjustments). This is not expected to be a significant addition to the cumulative bat mortality at wind energy facilities in New York State. For additional information, see Appendix PP.

Cumulative Habitat Loss

Construction of the Facility is anticipated to result in up to 386.2 acres of forest clearing. Although some of this will be allowed to regenerate and is only a temporary (although long-term) impact, the analysis provided here uses total area of forest clearing in order to present a conservative analysis. As described above in 1001.22(b), 386.2 acres is also a conservative estimate because the vegetation impact analysis totals the vegetation disturbance from each Facility component without accounting for overlap in clearing areas for different components. The Facility will also result in permanent loss of 2.6 acres of successional shrublands, 6.5 acres of successional grasslands, and 22.7 acres of agricultural land. Facility operation will not result in any permanent loss of open water habitats as defined classification of vegetation communities presented in 1001.22(b), but please see 1001.23(b)(4) for a discussion of impacts to surface waters, as defined by on-site wetland delineations.

According to the SEIS2 for the Arkwright Summit Wind Farm, the project is anticipated to result in a total impact of up to 444 acres of forestland, as well as permanent loss of 54 acres of successional shrubland and old field habitats and 13 acres of agricultural land. No permanent impacts to open water cover types were reported in the SEIS2 (EDR, 2015). The Ball Hill Wind Project will result in disturbance of approximately 156 acres of forests, as well as permanent loss of approximately 10 acres of successional old field, 5 acres of successional shrubland, 53 acres of agricultural land (including hayfields, row crops, pastures, and tree farms/vineyards), and 0.3 acres of open water habitats.

Therefore, the cumulative impact of habitat loss from these three wind energy projects will be approximately 986.2 acres of forests (some of which will regenerate over the long term), 78.1 acres of successional shrublands and old field habitats, 88.7 acres of agricultural land, and 0.3 acres of open water. Loss of these communities represents loss of habitats for various bird and bat species that use these areas for foraging, hunting, roosting, nesting, breeding, protection, and other life history uses. The area of habitat lost represents just a small fraction of the available habitat within the region. Typically loss of forested habitats is of particular concern because of the unique role that forests play in providing cover and high-quality habitat for native and sensitive species, and because it takes longer for them to regenerate than the other community types. Chautauqua County covers a total land area of approximately 695,337 acres (New York State GIS Program Office, 2016). According to National Land Cover Database (NLCD) cover type data, forests (including deciduous forest, evergreen forest, mixed forest, and woody wetlands), occupy approximately 375,792 acres (54% of total land cover) within the county (Homer et al., 2015). Therefore, only about 0.3% of the available forested habitat within Chautauqua County will be lost as a cumulative result of these three wind projects.

Cumulative Forest Fragmentation

An in-depth forest fragmentation analysis was conducted for this Article 10 Application, which quantified the area within 300 feet of Facility components in order to calculate total area of forests that will not be cleared but that will experience edge effects as a result of being located near Facility components (see 1001.22(f)(3) under the heading Forest Fragmentation). The study found that approximately 1664 acres would experience edge effects, in addition to the 319 acres of forest that would be lost as a result of clearing[2]. This suggests that the ratio of area of forests cleared to area of induced edge impacts is approximately 1:5.2. This ratio can be used to extrapolate the forest fragmentation effects from the Arkwright and Ball Hill projects. Although this method, in theory, is not as accurate as performing a 300 foot buffering analysis for the Arkwright and Ball Hill projects, complete data to conduct such an analysis are not publicly available. Therefore, applying this ratio is a reasonable method to estimate forest fragmentation using available data.

The analysis suggests that a total of approximately 4,784 acres of forests would experience edge effects due to cumulative effect forest fragmentation in these three projects (1,664 acres from Cassadaga, 2,309 acres from Arkwright, and 811 acres from Ball Hill). This represents a loss of habitat for forest interior species, a list of which is included in Table 22-3. However, forest interior habitat (defined as areas greater than 300 feet from a forest edge) is still available within in Chautauqua County. GIS analysis of NLCD data shows that there is approximately 375,792 acres of forest in Chautauqua County (including deciduous forest, evergreen forest, mixed forest, and woody wetlands), of which approximately 151,520 is greater than 300 feet from a forest edge (Homer et al., 2015). Therefore, the 4,784 acres of forest that will experience edge effects as a result of these three projects is only 3% of available forest interior habitat that exists in Chautauqua County. This analysis is a conservative estimate because any breaks in forest are considered to be the edge of a forested area from which 300 feet is measured, even if such breaks are naturally occurring. For example, an unbroken forest with a natural open water wetland in the middle of it is assumed to be fragmented by the wetland, even though the wetland could be undisturbed, high quality, natural habitat. This conservative analysis shows that ample forest interior habitat will exist in the region even after the Facility and other proposed wind projects are built.

[2] Please note that the 319 acres reported for the fragmentation analysis is less than the 376.7 acres reported under the *Cumulative Habitat Loss* heading. The difference between these two numbers is a result two different methods of calculating impacts. A method by which the impacts from each Facility component are added together without accounting for overlap in areas of clearing estimates 376.7 acres of impact to forests, while a method whereby the total disturbance buffer is overlaid on forested communities estimates 319 acres of impact. Both methods are conservative estimates of total impact, as explained in 1001.22(f)(3) under the heading *Forest Fragmentation*.

(2) Northern Long-Eared Bat Impact Analysis

A literature and impact analysis for northern long-eared bat is provided in 1001.22(f) under the heading *Impacts to Special Status Mammals*. The analysis suggests that due to low detection rates of *Myotis* sp., the Applicant's commitment to clear trees only between October 1 and May 1, and low historical incidence of northern long-eared bat fatalities at existing wind farms, impacts to northern long-eared bat are not anticipated as a result of construction or operation of the Facility. Please see 1001.22(f) for additional detail.

(3) Avian and Bat Post-Construction Monitoring

A Post-Construction Monitoring program that will assess the direct and indirect impacts of the Facility on bird and bat species will be developed. Post-construction monitoring will include: standard carcass searches of selected turbines; searcher efficiency trials to determine percentage of carcasses found by searchers; carcass removal trials to estimate the length of time that a carcass remained in the field for possible detection; adjusted fatality estimates for birds and bats based on the results of searcher efficiency trials and carcass removal trials to estimate bird and bat mortality within the Facility Site; acoustic bat surveys to determine the relationship between bat activity data and bat fatalities; and breeding bird avoidance and habituation surveys to assess the species composition and relative of abundance of birds along a gradient from turbines, and between Facility areas and reference areas. The post-construction monitoring program, including specifics on study duration, search frequency, search areas, number and location of turbines to be searched, concurrent data collection and analysis, and carcass collection, will be developed in consultation with the NYSDEC and USFWS.

(4) Bird and Bat Conservation Strategy (BBCS)

The Applicant is developing a BBCS which will outline measures to avoid, minimize, and mitigate impacts to avian and bat species (an outline is included in Appendix QQ). Specifically, the BBCS will outline the pre-construction monitoring surveys that have already been completed, in accordance with Tiers 1-3 of the USFWS *Land-Based Wind Energy Guidelines* (USFWS, 2012a). The BBCS will also include a discussion of impact avoidance and minimization measures that will be taken to reduce impacts to birds and bats. In order to reduce bird and bat mortality during nesting and roosting, the Applicant plans to conduct tree clearing between October 1 and May 1. The Applicant plans to abide by the voluntary operational protection measures outlined in the American Wind Energy Association's recently published voluntary BMP for bat conservation (AWEA, 2015). These measures have been shown to reduce bat mortality up to 30%, reducing blade rotation speed when wind speed is low during the fall migration, thereby reducing collision risk. The BBCS will further describe post construction monitoring,

which will be in accordance with Tier 4 of the *Wind Energy Guidelines* and NYSDEC *Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects* (NYSDEC, 2009). The BBCS will also describe how impact avoidance/minimization measures may be adjusted if determined to be necessary based on the results of future studies, and what mitigation will be considered should unexpected impacts to birds and bats occur. Finally, the BBCS will include a section devoted to eagle conservation, which will include information on pre-construction eagle surveys, eagle-specific avoidance and minimization measures, post-construction monitoring for eagles, ongoing eagle risk assessment, and adaptive management measures that could be taken should unexpected impacts to eagles arise.

(i) Map Showing Wetland Boundaries

Wetland delineations within the Facility Site were conducted within a 200-foot wide corridor centered on linear Facility components (e.g., access roads, buried electrical interconnect, overhead transmission line), and within a 200-foot radius of turbines and other components such as permanent meteorological towers, operations and maintenance (O&M) building, and substations. This area in which delineations took place is referred to as the Delineation Study Area throughout this Exhibit. Wetland delineations were conducted by EDR personnel during the fall of 2015, in accordance with the three-parameter methodology described in the U.S. Army Corps of Engineers (Corps) *Wetland Delineation Manual* (Environmental Laboratory, 1987), and further described by the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: North Central and Northeastern Region* (USACE, 2012). Wetland boundaries were defined in the field by sequentially numbered pink surveyor's flagging marked "wetland delineation", the locations of which were documented using Global Positioning System (GPS) technology with sub-meter accuracy. Wetlands identified by these methods are referred to as delineated wetlands throughout this Exhibit.

In order to define boundaries out to 500 feet from Facility components, EDR personnel used interpretation of aerial imagery signatures, on-site observations, analysis of topography, and existing data bases of wetland mapping maintained by National Wetland Inventory (NWI) and NYSDEC. Wetlands identified in this way are referred to as approximate wetlands throughout this Exhibit. During the winter of 2016, changes in the Facility layout were proposed in order to reduce wetland impacts and accommodate landowner preferences. In areas where the Facility layout had not been investigated for wetlands in the growing season of 2015, on-site wetland approximations were conducted in January 2016 (please see the Wetland Delineation Report, attached as Appendix RR, for maps showing locations of delineated and approximated wetlands). Wetland delineations will be conducted in these areas during the growing season of 2016, when an accurate evaluation of vegetation, hydrology, and soils can be made. These wetlands are also referred to as approximate wetlands throughout this Exhibit. All delineated and approximate wetlands described here are depicted in Figure 22-2.

Please also note that the Applicant intends on coordinating with USACE and NYSDEC personnel to conduct jurisdictional determination site visits during the 2016 growing season.

(j) Description of Wetlands

Descriptions of each wetland community type delineated within the Delineation Study Area are presented below. At each delineated wetland, data were collected from one or more sample plots (depending on the size and diversity of ecological communities of the delineated area), and recorded on USACE Routine Wetland Determination forms (Attachment B of the Wetland Delineation Report, included as Appendix RR of this Application). Data collected at each of the wetlands included dominant vegetation, hydrology indicators, and soil characteristics. Data collected for streams included information on channel width (mean high water mark), water depth, substrate material, bank condition and gradient. Additional detail on wetland delineation and data collection methods is described in the Wetland Delineation Report. Also included in the Wetland Delineation Report is a table of all of the wetlands delineated within the Delineation Study Area, which indicates whether they are streams or wetlands, acreage (wetlands) or linear feet (streams) within the Delineation Study Area, and whether they are expected to fall under state or federal jurisdiction (or both). Many wetlands identified contained more than one community type, and in many cases a delineated area included both wetlands and streams.

Forested Wetland (PFO) – A total of 38 wetlands delineated and approximated within the Delineation Study Area contained forested wetland communities. These communities are dominated by trees that are 20 feet or taller, but also include an understory of shrubs and herbaceous species. They were typically dominated by red maple and green ash, with occasional American elm, yellow birch, and American hornbeam. Understory vegetation typically included saplings of the above mentioned species, or shrub species such as dogwoods, willows, and spice bush. Herbaceous species in forested wetlands included sedges, sensitive fern, manna grasses, spotted jewelweed (*Impatiens capensis*), cinnamon fern (*Osmunda cinnamomea*), and true forget-me-not. Evidence of wetland hydrology in the forested wetlands included water-stained leaves, water marks, moss trim lines, drainage patterns, surface water, high water table, saturated soils, microtopographic relief, and saturation visible on aerial imagery. Hydric soils observed in forested wetlands included a variety of hydric soil indicators described in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: North Central and Northeastern Region* (USACE, 2012). A common indicator was depleted matrix (indicator F3). A depleted matrix is a soil stratum with a matrix with at least 60% of a chroma of 2 or less, and thickness requirements that depend on depth within the soil profile. Soils with a depleted matrix below a dark surface (indicator A11) were also common. Clay content was typically higher in the depleted matrices than in the

surface horizons directly above them. Most of the hydric soils in forested wetlands contained redox concentrations (indicators F6 and F8).

Scrub-Shrub Wetlands (PSS) – A total of 43 wetlands delineated and approximated within the Delineation Study Area were found to contain scrub-shrub vegetation. Scrub-shrub wetlands within the Delineation Study Area are characterized by dense stands of shrub species less than 20 feet tall, including willows, viburnums, and dogwoods. Herbaceous vegetation in these areas includes sensitive fern, arrow-leaved tearthumb (*Polygonum sagittatum*), field horsetail (*Equisetum arvense*), reed canary grass (*Phalaris arundinacea*), willowherb (*Epilobium* spp.), and various sedges. Evidence of wetland hydrology in the scrub-shrub wetlands identified within the Delineation Study Area included water-stained leaves, saturated soils, and microtopographic relief. Hydric soil indicators in scrub-shrub wetlands were similar to those found in forested wetlands.

Emergent Wetlands (PEM) – A total of 47 wetlands delineated and approximated within the Delineation Study Area contained emergent vegetation communities. These wetlands are dominated by herbaceous vegetation, and are generally characterized by soils that remain saturated or inundated throughout the year. Although the Cowardin et al. (1979) classification was used to classify wetlands, some of the emergent wetlands in this category could be best described as wet meadow (Reschke, 1990). Wet meadow wetlands are usually found in poorly drained, low-lying depressional areas. Wet meadow wetlands may resemble grasslands and are typically drier than emergent marshes, except during periods of seasonal high water. They generally lack standing water for most of the year, though snow melt, storm water runoff, and/or a high water table allows the soil to remain saturated for a significant portion of the growing season.

Emergent wetlands and wet meadows identified in the Delineation Study Area are typically dominated by plants such as broadleaf cattail, sedges, rushes, darkgreen bulrush (*Scirpus atrovirens*), reed canary grass, late goldenrod (*Solidago gigantea*), wool grass (*Scirpus cyperinus*), spotted Joe-pye weed (*Eutrochium maculatum*), white turtlehead (*Chelone glabra*), rice cutgrass (*Leersia oryzoides*), willowherb, and boneset (*Eupatorium perfoliatum*). Evidence of wetland hydrology in the emergent wetlands identified within the Delineation Study Area included inundation, drainage patterns, high water table, saturated soils, microtopographic relief, and saturation visible on aerial imagery. A depleted matrix (indicator F3) was a common hydric soil indicator at the emergent wetlands, as were redox dark surface (indicator F6) and redox depressions (F8). Mucky soils were often observed in these wetlands as well; the indicator loamy mucky mineral (F1) was common.

Open Water (OW) – Seven open water areas were delineated in the Delineation Study Area; these were usually adjacent to other wetland community types. They include small farm ponds, man-made impoundments, beaver ponds

or naturally occurring ponds. These ponds occur in a variety of settings, including open fields, scrub-shrub, and forested environments. With the exception of the beaver and naturally occurring ponds, these ponds are typically excavated or diked, with well-defined banks, some of which support a fringe of emergent wetland vegetation. 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. Soils at these wetlands were typically evaluated on the emergent vegetation fringe. Soils were mucky, and fit the description of either loamy mucky mineral soils (indicator F1) or black histic soils (indicator A3). Hydrogen sulfide odor (indicator A4) was occasionally evident at soils pits dug in these wetlands.

Streams – A total of 60 streams were delineated and approximated within the Delineation Study Area. These streams are mostly located within forests, and generally have a gentle to moderate gradient (0-5%). Most of the identified streams appear to be perennial, with a rocky substrate, well-defined banks and established floodplains. Water depths within the channels with stream flow averaged 2-10 inches.

(k) Wetland Functional Assessment

A functions and values assessment was conducted following the general methodology described in the *Wetlands Functions and Values: Descriptive Approach* in the September 1999 supplement to *The Highway Methodology Workbook* (Supplement) by the New England Division of the USACE (USACE, 1995).

Wetland functions are ecosystem properties that result from the biologic, geologic, hydrologic, chemical and/or physical processes that take place within a wetland. These functions include:

1. Groundwater Recharge/Discharge
2. Floodflow Alteration
3. Fish and Shellfish Habitat
4. Sediment/Pollutant Retention
5. Nutrient Removal/Retention/Transformation
6. Production (Nutrient) Export
7. Sediment/Shoreline Stabilization
8. Wildlife Habitat

Wetland values are the perceived benefits for society that can be derived from the ecosystem functions and/or other characteristics of a wetland. Values attributed to wetlands in the Supplement include the following:

1. Recreation
2. Education/Scientific Value
3. Uniqueness/Heritage
4. Visual Quality/Aesthetics
5. Threatened or Endangered Species Habitat

Wetlands functions and values recognized under Article 24 of the Environmental Conservation Law are similar to those described in the Supplement, and include:

1. Flood and storm control by the hydrologic absorption and storage capacity of wetlands;
2. Breeding, nesting and feeding habitat for many forms of wildlife, including migratory wildfowl and rare species such as the bald eagle and osprey;
3. Protection of subsurface water resources and recharge of ground water supplies;
4. Recreation by providing areas for hunting, fishing, boating, hiking, bird watching, photography, camping and other uses;
5. Pollution treatment by serving as biological and chemical oxidation basins;
6. Erosion control by serving as filtering basins, absorbing silt and organic matter and protecting channels and harbors;
7. Education and scientific research by providing outdoor bio-physical laboratories, living classrooms and training/education resources;
8. Open space and aesthetic appreciation by providing often the only remaining open areas along crowded river fronts and coastal regions;
9. Sources of nutrients in freshwater food cycles and nursery grounds and sanctuaries for fish.

Based on "Considerations/Qualifiers" outlined in the Supplement, EDR developed a spreadsheet that includes several basic considerations that help identify the primary functions and values provided by wetlands. These considerations include observed vegetation conditions, hydrologic conditions, size, adjacent area conditions, and the availability of public access. The spreadsheet containing results of the qualitative assessment is included as Appendix D of the Wetland Delineation Report (Appendix RR). Specific conditions within each of these consideration areas were also defined to allow each wetland's functions and values to be evaluated based on data collected during field delineation. All 98 wetlands identified within the Delineation Study Area were entered into the spreadsheet and the various wetland characteristics identified for each. Based on these data, the primary functions and values provided by each wetland were determined. Typical functions and values of the delineated wetlands within the Facility Site included providing minor or major wildlife habitat, groundwater recharge/discharge, nutrient removal/retention/transformation, flood flow

alteration, sediment/shoreline stabilization, and providing fish habitat. Functions and values were only evaluated for wetlands that were observed during the growing season, and where vegetation, soils and hydrological data were collected as part of a formal delineation. Functions and values assessments will be conducted on areas where wetland boundaries were approximated following formal delineations of these areas during the growing season of 2016.

(l) Offsite Wetlands Analysis

As described in 1001.22(i), wetland boundaries within 500 feet of all Facility components were mapped using interpretation of aerial imagery signatures, on-site observations, analysis of topography, and existing data bases of wetland mapping maintained by NWI and NYSDEC. This mapping was used to inform an analysis of hydrological connections to offsite wetlands, including those that are state mapped wetlands protected by NYSDEC. A total of 267 wetlands within 500 feet of proposed Facility components were identified. The results of the wetland delineation suggest that all delineated wetlands fall under federal jurisdiction, due to visual hydrologic connectivity observed in the field and review of available spatial data. Many of the 267 wetlands identified within 500 feet of Facility components are hydrologically connected to the 98 wetlands identified within the Delineation Study Area, and would be likely be considered federally jurisdictional by USACE. Jurisdiction over federally regulated wetlands will ultimately be determined by the USACE.

The analysis of hydrological connections also identified six state-mapped wetlands that are hydrologically connected to delineated and approximated wetlands. These include state-mapped wetlands CS-8, CS-9, HA-3, HA-4, and HA-7. State wetland HA-8 is hydrologically connected to approximate wetlands within 500 feet of proposed Facility components, but does not appear to be hydrologically connected to any delineated wetlands in the Delineation Study Area. Delineated wetlands that are hydrologically connected to state-protected wetlands may be considered jurisdictional by NYSDEC under the Freshwater Wetlands Act (Article 24 and Title 23 of Article 71 of the Environmental Conservation Law [ECL]). Such delineated and approximated wetlands include BBB, WWW, YYY, RRRR, and 6H. With respect to State jurisdiction under ECL Article 24, NYSDEC may identify its authority as to any delineated and verified wetland that meets State criteria.

(m) Wetland Impacts

During construction, potential direct or indirect impacts to wetlands and surface waters may occur as a result of the installation of access roads, the upgrade of local public roads, the installation of above-ground or buried electrical interconnects, installation of the overhead transmission line, and the development and use of temporary workspaces around the turbine sites. Direct impacts, including clearing of vegetation, earthwork (excavating and grading activities),

and the direct placement of fill in wetlands and surface waters, are typically associated with the development of access roads and workspaces around turbines. The construction of access roads is 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 overhead or buried electrical lines (transmission and 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 collection lines or from pole installation along the overhead transmission line. Indirect impacts to wetlands and surface waters may result from sedimentation and erosion caused by adjacent 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 collection and transmission routes, turbine sites, staging area(s), meteorological towers, or the substations.

Construction of the Facility is anticipated to result in disturbance of up to 23.11 acres of wetlands. Of this disturbance, 21.56 acres will be disturbed only temporarily, while 1.55 acres are anticipated to be permanently lost. These impacts represent a conservative estimate for several reasons. First, the Facility evaluated herein includes up to 58 wind turbines. Depending on the turbine model selected, fewer turbines may actually be built. In addition, the Applicant is currently in discussions with landowners who have temporary staging areas proposed on their properties. These discussions are likely to result in eliminating staging area related impacts to wetlands. Finally, the Applicant will install buried interconnect via directional drilling, where practicable, to eliminate impacts to forested wetlands in cases where buried collection line is the only Facility component. Implementation of these measures will reduce wetland impacts from the acreages presented in this Application. Temporary and permanent impacts to wetlands for each wetland proposing to be impacted are presented below in Table 22-6. Impacts were calculated based on disturbance assumptions presented in Table 22-1 of 1001.22(b).

Table 22-6. Wetland Impacts

Wetland ID[1]	Type[2]	NYSDEC Wetland ID	Temporary Impact (square feet)	Permanent Impact (square feet)	Facilities Crossing Wetland[3]	Anticipated Crossing Methodology, If Impacted by Buried Interconnect Only
A	PFO/PSS		52,354.3	5,129.9	BI, AR, WT	
A	PFO/PEM		20,178.1	3,410.5	BI, AR, WT	
A	PFO		3,424.2	0.0	WT	
B	PEM/WM		20,716.7	0.0	AR, WT	
D	PEM		1.6	0.0	AR	
H	PEM		543.2	0.0	BI	Trench
K	PFO		215.4	0.0	AR	
M	PFO/PSS		5,988.8	1,200.2	BI, AR	
N	PFO/PSS		0.0	0.0	BI	Horizontal Direction Drill

Wetland ID[1]	Type[2]	NYSDEC Wetland ID	Temporary Impact (square feet)	Permanent Impact (square feet)	Facilities Crossing Wetland[3]	Anticipated Crossing Methodology, If Impacted by Buried Interconnect Only
O	PFO/PSS		0.0	0.0	BI	Horizontal Direction Drill
P	PSS		25,423.0	137.7	BI, AR	
Q	PSS		4,569.0	765.9	BI, AR	
R	PEM		6,912.5	1,503.5	BI, AR	
U	PEM		17,799.9	0.0	BI	Trench
V	PFO		733.7	0.0	BI, AR	
W	PEM		5,596.4	0.0	WT	
X	PEM		2,123.0	35.1	BI, AR	
Y	PFO		3,609.9	0.0	WT	
Z	PFO		2,471.1	174.2	BI, AR, WT	
BB	PFO		1,372.3	226.9	BI, AR	
EE	PFO		3,765.0	0.0	AR, WT	
FF	PFO		5,256.7	0.0	BI, AR, WT	
HH	PEM		2,031.6	0.0	WT	
JJ	PFO		0.1	0.0	AR	
NN	PEM/WM		27,414.5	0.0	SA	
OO	PSS/PEM		5,030.0	2,122.0	AR	
PP	PSS		2,280.1	0.0	BI, WT	
PP	PSS/OW		1,665.4	0.0	OI	
QQ	PSS/OW		7,094.9	0.0	WT	
RR	PFO		6,508.4	0.0	OI	
XX	OW		4,917.0	212.1	BI, AR	
ZZ	PFO/PSS/OW		25,651.7	0.0	WT	
BBB	PFO/PSS/PEM/OW	HA-4	28,217.4	0.0	OI	
GGG	PSS		6,581.4	0.0	WT	
HHH	PEM		1,577.0	19.0	BI, AR	
JJJ	PEM		401.0	1.7	AR	
KKK	PFO		1,527.2	0.0	WT	
LLL	PSS/PEM		16,686.2	0.0	OI	
LLL	PEM		1,234.1	0.0	WT	
MMM	PEM		1,009.3	113.9	BI, AR	
OOO	PSS/PEM		4,971.5	1,880.1	AR	
PPP	PFO/PEM		2,177.9	0.0	WT	
QQQ	PFO		6,200.5	407.8	BI, AR, WT	
RRR	PEM		935.2	542.0	AR	
WWW	PSS	CS-8[4]	39,874.9	8,712.0	OT	
XXX	PSS		2,360.3	0.0	OT	
YYY	PSS	CS-9	56,974.9	8,712.0	OT	
ZZZ	PSS		15,245.4	0.0	OT	
AAAA	PEM		6,117.6	0.0	OT	
BBBB	PSS		31,673.2	0.0	OT	
CCCC	PEM		1,233.6	0.0	BI	Trench
EEEE	PFO		64,399.2	4,356.0	OT	
FFFF	PEM		2,888.3	0.0	OT	
GGGG	PEM		2,067.5	0.0	OT	
HHHH	PFO		16,336.2	0.0	OT	
IIII	PEM		2,862.3	0.0	OT	
JJJJ	PFO		12,584.4	0.0	OT	
JJJJ	PSS		2,738.8	0.0	OT	
KKKK	PEM		3,268.3	0.0	OT	

Wetland ID[1]	Type[2]	NYSDEC Wetland ID	Temporary Impact (square feet)	Permanent Impact (square feet)	Facilities Crossing Wetland[3]	Anticipated Crossing Methodology, If Impacted by Buried Interconnect Only
KKKK	PSS		4,008.2	0.0	OT	
LLLL	PFO		32,578.0	0.0	OT	
MMMM	PFO		29,723.5	0.0	OT	
OOOO	PFO/PEM		1,960.6	0.0	OI	
OOOO	PFO		1,713.9	0.0	OI	
QQQQ	PFO		2,283.4	0.0	OI	
RRRR	PSS/OW	HA-7	20,601.0	0.0	OI	
SSSS	PFO		10,603.0	0.0	OI	
TTTT	PFO		282.1	0.0	OI	
TTTT	PSS/PEM		17,965.6	0.0	OI	
UUUU	PFO		3.3	0.0	OI	
UUUU	PSS		12,877.4	0.0	OI	
UUUU	PEM		887.9	0.0	OI	
WWWW	PEM		894.5	0.0	BI	Trench
XXXX	PEM		283.4	0.0	BI	Trench
YYYY	PFO/PEM		1,948.3	0.0	AR, OT, SA	
5B	PEM		370.6	0.0	OT	
5B	PFO/PEM		249.3	0.0	OT	
5B	PFO		1,390.4	0.0	OT	
5B	PFO/PSS/PEM		20,123.8	0.0	OT	
5C	PFO		11,473.4	0.0	OT	
5E	PEM		314.0	0.0	BI	Trench
5E	PSS		21.4	0.0	BI	Trench
5P	PSS		10,926.3	0.0	OI	
5Q	PEM		2,311.3	0.0	OI	
5U	PSS		6,668.6	0.0	OI	
6E	PSS		4,246.1	0.0	BI	Trench
6H	PFO	HA-3	0.9	0.0	AR	
6I	PFO		25,581.1	5,121.7	BI, AR	
6K	PFO		909.9	0.0	AR	
6M	PSS/PEM		2,970.2	1,055.7	BI, AR	
6M	PFO		34,785.6	7,604.2	BI, AR	
6N	PFO		10,886.9	2,422.0	BI, AR	
6Q	PEM		852.6	0.0	BI	Trench
6R	PEM		12,753.8	5,197.7	AR	
6S	PSS/PEM		15,588.5	6,285.8	BI, AR	
6T	PSS		1,360.0	0.0	OT	
6V	PEM		3,441.9	0.0	BI	
6W	PSS		7,049.5	6.3	AR	
6X	PSS		5,692.9	0.0	BI	Trench
7A	PSS		22,854.6	0.1	OI	
Total Square Feet			939229.7	67356.0		
Total Acres			21.56	1.55		

[1]Wetlands with the same ID may appear more than once in the table in cases where wetlands are mapped as separate polygons. For example, wetlands connected by a culvert are typically mapped as separate polygons.

[2]PEM = palustrine emergent marsh, PSS = palustrine scrub shrub, PFO = palustrine forested, WM = wet meadow, OW = open water

[3]Includes facilities that cause temporary or permanent impacts. BI = buried interconnect, OI = overhead interconnect, AR = access road, WT = wind turbine, OT = overhead transmission line, SA = staging area.

[4] Delineated wetland WWW does not overlap NYSDEC wetland CS-8, but may be hydrologically connected.

In addition to impacts to wetlands, the construction and operation of the Facility will result in temporary and permanent impacts to areas within 100 feet of ECL Article 24 wetlands (as currently mapped). The total impact to regulated adjacent areas is 3.4 acres. Of this area, 2.9 acres will experience temporary disturbance while 0.5 acres will be permanently lost. This small area of permanent loss to 100 foot adjacent uplands is unavoidable. A portion, 0.2 acres, will be converted overhead collection line poles in the vicinity of NYSDEC wetland HA-4/ delineated wetland BBB. Pole locations have purposely been sited to avoid impacts to the wetland itself. The collection line must cross this valley in order to connect Facility components. Because the NYSDEC wetland extends well downstream and upstream of the selected crossing location, moving the collection line either downstream or upstream would not avoid impacts to 100 foot adjacent areas. Similarly, an additional 0.1 acres of permanent impact to 100 foot adjacent uplands will result from placement of overhead collection line poles in the vicinity of NYSDEC wetland HA-7/delineated wetland RRRR. Pole locations have purposely been sited to avoid impacts to the wetland itself. Furthermore, this overhead interconnect is sited alongside an existing road, and therefore, is utilizing existing disturbance. It has been sited so as to minimize impacts. Finally, 0.2 acres of impact to upland adjacent areas is proposed in the vicinity of NYSDEC wetland HA-3/ approximated wetland 6H. In this area, an access road will be permanently placed within a small portion of the 100 foot adjacent area. This access road was sited in an area of existing clearing. Moving the access road away from the 100 foot adjacent area would result in additional tree clearing, ultimately resulting in forest loss and fragmentation. The road has been sited so as to minimize such impacts. Due to these considerations, the Facility is anticipated to result in up to 0.5 acres of permanent impact to 100 foot adjacent areas. However, final impact calculations to NYSDEC regulated adjacent areas (and wetlands) cannot be determined until NYSDEC identifies its full jurisdiction under Article 24 of the ECL, which is anticipated to take place during the 2016 growing season. Table 22-7 summarizes impacts at each 100-foot adjacent area to be impacted by the Facility.

Table 22-7. Impacts to 100-Foot Upland Areas Adjacent to Article 24 Wetlands

NYSDEC Wetland/EDR Delineated or Approximated Wetland	Temporary Impact (acres)	Permanent Impact (acres)	Facilities Crossing Adjacent Area[1]
HA-3/6H	0.9	0.2	BI, AR
HA-4/BBB	0.5	0.2	OI
HA-7/RRRR	0.6	0.1	OI
CS-9/YYY	0.9	0.0	OT
Total	2.9	0.5	

[1]Includes facilities that cause temporary or permanent impacts. BI = buried interconnect, OI = overhead interconnect, AR = access road, OT = overhead transmission line.

(n) Measures to Avoid/Mitigate Wetland Impacts

The Facility layout was designed, in part, through an iterative process of identifying wetland locations and siting Facility components to avoid and minimize impacts to surface waters and wetlands wherever practicable. The revised Facility

layout achieves this by locating turbines outside of wetlands and by routing access roads and collection lines around wetlands and streams where practicable. Where such avoidance was not practicable (typically where linear wetlands and streams were encountered), narrow and/or previously disturbed portions of the wetlands were chosen for crossing locations. Wetland impacts have been minimized substantially due changes in the Facility design. A 75-turbine layout, proposed early in Facility siting, was evaluated at a reconnaissance level for wetland and stream resources. This layout would have resulted in permanent impacts to 4.77 acres of wetlands. Therefore, this proposed layout represents a 68% reduction in permanent wetland impacts, with just a 23% reduction in the number of turbines. See Exhibit 9 for a comparison of other impacts from the 75-turbine layout and the currently proposed layout.

As described in 1001.22(m), the Applicant is anticipating installing collection line via directional drilling at forested wetlands where buried collection line is the only Facility component, which eliminates wetland impacts in those areas where it is used. In many cases, wetlands and streams will be spanned by either overhead collection line or transmission line, eliminating the need for in-stream work in these locations. The Applicant intends to span overhead those streams protected under ECL Article 15. Construction and operation of the Facility will be done in accordance with the standards established by ECL Article 15.

Despite avoiding and minimizing wetland impacts where practicable, some wetland impacts are unavoidable. Mitigation in New York State is somewhat complicated by the fact that the USACE generally prefers to use an approved "in-lieu-fee" program when available, whereas the NYSDEC Article 24 regulations do not allow use of such a program. In addition, it is anticipated that the majority of wetland impacts will occur in wetlands regulated by the USACE only; however, this cannot be confirmed until the full extent of NYSDEC Article 24 jurisdiction is understood (as previously indicated, jurisdictional determinations from both the USACE and NYSDEC are anticipated to take place during the growing season of 2016). Therefore, the Applicant will ultimately propose compensatory mitigation that will be determined in consultation with NYSDEC and USACE. This mitigation will ensure "no net loss" of wetlands, and may include the purchase of credits from an approved in-lieu-fee program, creation of an on-site compensatory mitigation area, restoration or enhancement of wetlands in the impacted watershed, or some combination of these options.

Indirect impacts to wetlands resulting from construction could include siltation and degradation of downstream water quality. These impacts are not anticipated as a result of this Facility, because the Applicant will take appropriate measures to prevent these impacts. Specific mitigation measures for indirect impacts to wetlands include:

- *No Equipment Access Areas:* Except where crossed by permitted access roads or through non-jurisdictional use of temporary matting, streams will be designated "No Equipment Access," thus prohibiting the use of motorized equipment in these areas.

- *Restricted Activities Area:* A buffer zone of 100 feet, referred to as "Restricted Activities Area", will be established where Facility 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;
    - No storage of any petroleum or chemical material; and
    - No disposal of excess concrete or concrete wash water.
- *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 Facility. Silt fences, hay bales, and temporary siltation basins will be installed and maintained throughout Facility construction. Exposed soil will be seeded and/or mulched to assure that erosion and siltation is kept to a minimum along wetland boundaries. Specific control measures are identified in the Facility Preliminary Stormwater Pollution Prevention Plan (SWPPP), and the location of these features will be indicated on construction drawings and reviewed by the contractor and other appropriate parties prior to construction. These features will be inspected on a regular basis to assure that they function properly throughout the period of construction, and until completion of all restoration work.
- *Work Period Restriction for Stream Crossings*: Construction in streams protected under Article 15 will comply with work period restrictions that are established to protect fish spawning and migration. The work period restriction is from October 1 to April 30 for streams with trout and from March 15 to June 15 for other protected streams (NYSDEC, 2005). However, site-specific consultation with NYSDEC stream biologists may result in less restrictive no-work periods. For example, the Final Environmental Impact Statement (FEIS) for the Arkwright Summit Wind Farm noted that NYSDEC personnel indicated that in-stream work could take place outside of the seasonal work restriction window, as determined on a case-by-case basis (EDR, 2016). Seasonal work period restrictions on in-stream work during Facility Construction will be established in consultation with NYSDEC. All of the protected streams within the Facility Site are C(T) streams, and these are anticipated to either be spanned overhead or bored locations where collection lines cross them, so as reduce impacts to streams and avoid in-stream work.

Please note, a discussion of mitigation measures for impacts to surface waters (including streams) and ground water is provided in 1001.23(b)(5), and a discussion of mitigation measures for impacts to aquatic biological resources is provided in 1001.23(e)(2).

Environmental Compliance and Monitoring Program

The Applicant is committed to developing and operating the Facility in a safe and environmentally responsible manner. In addition to the mitigation measures described above, an environmental compliance and monitoring program is summarized below, and the Applicant will provide funding for an independent, third party environmental monitor to oversee compliance with environmental commitments and permit requirements. The environmental compliance and monitoring program will 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 Facility. This document will distill and clearly present all environmental requirements for construction and restoration included in all Facility permits and approvals, and will be designed to aid in the management of environmental issues and concerns that may arise during construction of the Facility. 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 Facility 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 Facility.

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 Facility 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 Facility 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 Facility. 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 Facility Site, 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 Facility 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 Facility, the Applicant will provide a monitoring and remediation period of no less than two years immediately following the completion of initial restoration. 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 New York State Department of Agriculture and Markets (NYSDAM).

(o) State and Federal Endangered or Threatened Species

Please see the discussion of state and federal threatened and endangered species documented within or adjacent to the Facility Site, along with potential impacts and mitigation for such species, in 1001.22(f). Discussion of mitigation for wildlife and wildlife habitat is provided in 1001.22(g). These measures will mitigate impacts to threatened and endangered species, even though it is not specific to such species. Discussion of the BBCS for the Facility is provided in 1001.22(h)(4); measures described in this plan will mitigate impacts to threatened and endangered avian and bat species within the Facility Site.

(p) Invasive Species Prevention and Management Plan

An invasive species control plan (ISCP) is described in 1001.22(b) and attached as Appendix FF.

(q) Agricultural Impacts

Agricultural land was documented within the Facility Site in the same manner that other vegetation community types were identified. Please see 1001.22(a) for a discussion of vegetative community mapping methodology. Agricultural lands in the Facility site consist of field crops (e.g., hayfields and greenchop), row crops (planted mostly in corn), and pastureland (mostly grazing for dairy cattle). For the purposes of this Application, tree plantations were considered forests rather than active agriculture.

The Facility layout has been designed to avoid impacts to active agricultural lands to the extent practicable. Access roads have been sited along the edges of fields and forests in order to minimize impacts to both. Proposed access roads have been sited along existing access roads to the extent practicable. However, some impacts to agricultural lands are unavoidable. Construction of the Facility will result in disturbance of up to approximately 166.2 acres of agricultural vegetation, of which approximately 143.8 acres will be restored following construction. Up to approximately 22.4 acres will be permanently lost to built facilities for the operational life of the Facility.

Mitigation measures to protect and restore any agricultural soils within the Facility Site will be undertaken during and after construction, and will include restoration of temporarily disturbed agricultural land according to the *New York Department of Agriculture and Markets Guidelines for Agricultural Mitigation for Windpower Projects* (see Appendix D). For example, topsoil will not be stripped during saturated conditions when such actions would damage agricultural soils. Existing farm roads will be used for temporary access to farmland to the extent practicable. However, 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. All vehicular movements and construction activity will be restricted to areas where topsoil has been removed. All temporarily disturbed agricultural soils will be restored following construction. This process will generally involve the following sequence of activities:

1. Removal of gravel or other temporary fill.
2. Decompaction of compacted subsoils to a depth of 18 inches using a deep ripper or heavy duty chisel plow.
3. Disking and removal of stones (four inches and larger in size) from decompacted subsoil.
4. Spreading of stockpiled topsoil over the decompacted subsoil, and reestablishing pre-construction contours to the extent practicable.
5. Disking and removal of stones (four inches and larger in size) following the spreading of topsoil.
6. Seeding and mulching topsoil. Seed selection in agricultural fields will be based on guidance provided by the landowner and NYSDAM personnel.

Please also note that based on recent consultation with NYSDAM personnel, complete adherence to the *Guidelines for Agricultural Mitigation for Windpower Projects* is not necessarily required in all locations. As discussed with NYSDAM personnel, the Applicant and/or Environmental Monitor will consult with NYSDAM during construction when deviation from the *Guidelines* is necessary.

Soil impacts occurring during the construction of the Facility 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 will assure compliance with the construction plans/documentation and soil protection measures described above.

REFERENCES

Aldridge, H.D.J.N, and I.L. Rautenbach. 1987. *Morphology, Echolocation and Resource Partitioning in Insectivorous Bats*. The Journal of Animal Ecology 56(3): 763–778.

American Wind Energy Association (AWEA). 2015. *Wind Energy Industry Announces New Voluntary Practices to Reduce Overall Impacts to Bats by 30 Percent.* Press Release. Available at: http://www.awea.org/MediaCenter/pressrelease.aspx?ItemNumber=7833. Accessed February, 2016.

AWEA. 2016. *U.S. Wind Energy State Facts, New York Wind Energy*. Available at: http://awea.files.cms-plus.com/FileDownloads/pdfs/New%20York.pdf (Accessed May 2, 2016).

Arnold, T.W., and R.M. Zinc. 2011. *Collision Fatality Has no Discernible Effect on Population Trends in North American Birds*. PLoS ONE 6(9): e24708. Doi:10.1371/journal.pone.0024708.

Baerwald, E.F., J. Edworthy, M. Holder, and R.M.R. Barclay. 2009. *A Large-scale mitigation Experiment to Reduce Bat Fatalities at Wind Energy Facilities*. Journal of Wildlife Management 73:1077-1081.

Badra, P.J. 2001. *Special Animal Abstract for Pleurobema clava (Northern Clubshell)*. Michigan Natural Features Inventory. 4 pp.

Broders, H.G., and G.J. Forbes. 2004. *Interspecific and Intersexual Variation in Roost-Site Selection of Northern Long-Eared and Little Brown Bats in the Greater Fundy National Park Ecosystem*. Journal of Wildlife Management 68: 602-610.

Carman, S.M. 2001. *Special Animal Abstract for Villosa fabalis (Rayed Bean Mussel)*. Michigan Natural Features Inventory. 2 pp.

Cornell University. 2015. *Cornell Lab of Ornithology: All About Birds*. Available at: https://www.allaboutbirds.org. (Accessed January, 22 2016).

Cowardin, L.M., V. Carter, F.C. Goblet and E.T. LaRoae. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service, OBS-79/31, Washington, D.C.

Dunne, P., D. Keller, and R. Kochenberger. 1984. *Hawk Watch: A Guide for Beginners*. Cape May Bird Observatory, Cape May, NJ. 2002 reprint.

Edinger, G.J., D.J. Evans, S. Gebauer, T.G. Howard, D.M. Hunt, and A.M. Olivero (editors). 2014. *Ecological Communities of New York State.* Second Edition. A revised and expanded edition of Carol Reschke's Ecological Communities of New York State. New York Natural Heritage Program, New York State Department of Environmental Conservation, Albany, NY.

Donovan, T M., and C.H. Flather. 2002. *Relationships among North American Songbird Trends, Habitat Fragmentation, and Landscape Occupancy*. Ecological Applications 12:364-374.

Ecology and Environment. 2016. *Supplemental Draft Environmental Impact Statement for the Ball Hill Wind Project*. Prepared for Ball Hill Wind Energy, LLC. January, 2016.

EDR. 2015. *Second Supplemental Environmental Impact Statement (SEIS2) for Arkwright Summit Wind Farm*. Prepared for Arkwright Summit Wind Farm, LLC. October, 2015.

Environmental Laboratory. 1987. *Corps of Engineers Wetland Delineation Manual.* Technical Report Y-87-1. U.S. Army Corps of Engineers: Waterways Experiment Station; Vicksburg, MS.

Fenton, M.B. 1990. *The Foraging Behavior and Ecology of Animal-Eating Bats*. Canadian Journal of Zoology 68: 411–422.

Freemark, K.E., and B. Collins. 1992. *Landscape Ecology of Birds Breeding in Temperate Forest Fragments.* Pages 443 – 454 *in* Ecology and conservation of Neotropical migrant landbirds. J.M. Hagan III and D.W. Johnston, Eds. Smithsonian Institution Press, Washington, D.C.

Garvin, J.C., C.S. Jennelle, D. Drake, and S.M. Grodsky. 2011. *Response of Raptors to a Windfarm*. Journal of Applied Ecology 48:199-209.

Henderson, L.E., L.J. Farrow, and H.G. Broders. 2008. *Intra-Specific Effects of Forest Loss on the Distribution of the Forest-Dependent Northern Long-Eared Bat (*Myotis septentrionalis*)*. Biological Conservation 141: 1819–1828.

Herkert, J.R. 2003. *Effects of Management Practices on Grassland Birds: Henslow's Sparrow*. Northern Prairie Wildlife Research Center, Jamestown, ND. Northern Prairie Wildlife Research Center Online. Available at: http://www.npwrc.usgs.gov/resource/literatr/grasbird/hesp/hesp.htm. (Accessed November 2013).

Hawk Migration Association of North America (HMANA). 2014a. *Hawkcount. Hawkwatch Site Profile - Hamburg*. Available at: https://hawkcount.org/siteinfo.php?rsite=364. (Accessed October 1, 2014).

HMANA. 2014b. *Hawkcount. Hawkwatch Site Profile - Ripley*. Available at: https://hawkcount.org/siteinfo.php?rsite=381. (Accessed October 1, 2014).

Homer, C.G., J.A. Dewitz, L. Yang, S. Jin, S., P. Danielson, G. Xian, J. Coulston, N.D. Herold, J.D. Wickham, and K. Megown. 2015. *Completion of the 2011 National Land Cover Database for the conterminous United States-Representing a decade of land cover change information*. Photogrammetric Engineering and Remote Sensing 81(5):345-354.

Jacobson, S.L. 2005. *Mitigation Measures for Highway-caused Impacts to Birds.* USDA Forest Service Gen. Tech. Rep. http://www.fs.fed.us/psw/publications/documents/psw_gtr191/psw_gtr191_1043-1050_jacobson.pdf.

Jain, A., P. Kerlinger, R. Curry, and L. Slobodnik. 2007. *Annual report for the Maple Ridge wind power project post-construction bird and bat fatality study—2006*. Annual report prepared for PPM Energy and Horizon Energy. Curry

and Kerlinger, Cape May Point, New Jersey, USA. Available at: http://www.wind-watch.org/documents/wp-content/uploads/maple_ridge_report_2006_final.pdf.

Jain, A. P. Kerlinger, R. Curry, and L. Slobodnik. 2008. *Annual report for the Maple Ridge wind power project post-construction bird and bat fatality study—2007*. Annual report prepared for PPM Energy and Horizon Energy. Curry and Kerlinger, Cape May Point, New Jersey, USA.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Quant, D. Pursell. 2009a. *Annual Report for the Noble Bliss Windpark, LLC*. *Postconstruction Bird and Bat Fatality Study – 2008*. Prepared by Curry and Kerlinger, LLC.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, J. Histed, and J. Meacham. 2009b. *Annual Report for the Noble Clinton Windpark, LLC. Postconstruction Bird and Bat Fatality Study – 2008*. Prepared by Curry and Kerlinger, LLC.

Jain, A., P. Kerlinger, R. Curry, L. Slobodnik, A. Fuerst, and C. Hansen. 2009c. *Annual Report for the Noble Ellenburg Windpark, LLC. Postconstruction Bird and Bat Fatality Study – 2008*. Prepared by Curry and Kerlinger, LLC.

Jain, A. P. Kerlinger, R. Curry, and L. Slobodnik. 2009d. *Annual report for the Maple Ridge wind power project post-construction bird and bat fatality study—2007. Annual report prepared for PPM Energy and Horizon Energy*. Curry and Kerlinger, Cape May Point, New Jersey, USA.

Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2010a. *Annual Report for the Noble Bliss Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2009*. Prepared for Noble Environmental Power, LLC.

Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2010b. *Annual Report for the Noble Clinton Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2009*. Prepared for Noble Environmental Power, LLC.

Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2010c. *Annual Report for the Noble Ellenburg Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2009.* Prepared for Noble Environmental Power, LLC.

Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2011a. *Annual Report for the Noble Altona Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2010*. Prepared for Noble Environmental Power, LLC.

Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K. 2011b. *Annual Report for the Noble Chateaugay Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2010.* Prepared for Noble Environmental Power, LLC.

Jain, A., Kerlinger, P., Slobodnik, L., Curry, R., Russel, K., Harte, A. 2011c. *Annual Report for the Noble Wethersfield Windpark, LLC Post-Construction Bird and Bat Fatality Study - 2010*. Prepared for Noble Environmental Power, LLC.

Johnson, G.D., W.P. Erickson, M.D. Strickland, R.E. Good, and P. Becker. 2000. *Avian and Bat Mortality Associated in the Initial Phase of the Foote Creek Rim Windpower Project, Carbon County, Wyoming: November 3, 1998-October 31, 1999*. Report to SeaWest Energy Corp. and Bureau of Land Management.

Johnson, G. D., W. P. Erickson, M. D. Strickland, M. F. Shepherd, D. A. Shepherd, and S. A. Sarappo. 2002. *Collision Fatality of Local and Migrant Birds at a Large-scale Wind-power Development on Buffalo Ridge, Minnesota*. Wildlife Society Bulletin 30:879-887.

Kerlinger, P. 2002. *An Assessment of the Impacts of Green Mountain Power Corporation's Wind Power Facility on Breeding and Migrating Birds in Searsburg, Vermont*. Report to National Renewable Energy Laboratory, U.S. Department of Energy. Golden, CO.

Kerlinger, P., and J. Guarnaccia. 2007. *Phase I Avian Risk Assessment Roaring Brook Wind Power Project, Lewis County, NY.* Prepared for PPM Energy. July 2007.

Kerlinger, P., and J. Guarnaccia. 2009. *Breeding Bird Survey – 2009 Noble Bliss Windpark, Wyoming County, New York*. Prepared for Noble Environmental Power, LLC. Prepared by Curry & Kerlinger, LLC, Cape May Point, NJ.

Kerlinger, P., and J. Guarnaccia. 2010. *Grassland Nesting Bird Displacement Study – 2010, Noble Wethersfield Windpark, Wyoming County, New York*. Prepared for Noble Environmental Power, LLC. Prepared by Curry & Kerlinger, LLC, Cape May Point, NJ.

Koford, R., A. Jain, G. Zenner, and A. Hancock. 2005. *Avian Mortality Associated With the Top of Iowa Wind Farm*. Iowa Cooperative Fish & Wildlife Research Unit, Iowa State University. Ames, IA.

Krusic, R.A., M. Yamasaki, C.D. Neefus, and P.J. Pekins. 1996. *Bat habitat use in the White Mountain National Forest*. Journal of Wildlife Management 60(3): 625–631.

Lampila, P., M. Monkkonen, and A. Desrochers. 2005. *Demographic Responses by Birds to Forest Fragmentation*. Conservation Biology 19:1537–1546.

LandOwner Resource Centre with Support from Ontario Ministry of Natural Resources. 2000. *Conserving the Forest Interior: A Threatened Wildlife Habitat*. http://www.lrconline.com/Extension_Notes_English/pdf/forInterior.pdf.

Leddy, K., K. Higgins, and D. Naugle. 1999. *Effects of Wind Turbines on Upland Nesting Birds in Conservation Reserve Program Grasslands*. Wilson Bulletin 111:100-104.

Lesiński, G., M. Kowalski, B. Wojtowicz, J. Gulatowska, and A. Lisowska. 2007. *Bats on Forest Islands of Different Size in an Agricultural Landscape*. Folia Zoologica 56(2): 153–161.

Longcore T., C. Rich, and S.A. Gauthreaux Jr. 2008. *Height, Guy Wires, and Steady-Burning Lights Increase Hazard of Communication Towers to Nocturnal Migrants: A Review and Meta-Analysis*. Auk 125 (2):485-492.

Longcore, T., C. Rich, P. Mineau, B. McDonald, D. Bert, L. Sullivan, E. Mutrie, S. Gauthreaux Jr., M. Avery, R. Crawford, A. Manville II, E. Travis, and D. Drake. 2012. An Estimate of Avian Mortality at Communication Towers in the United States and Canada. PLoSONE 7(4):1-17.

Massachusetts Division of Fish and Wildlife. 2007. *Four-toed Salamander*. Natural Heritage and Endangered Species Program. Last updated 2007. Available at: http://www.mass.gov/eea/docs/dfg/nhesp/species-and-conservation/nhfacts/hemidactylium-scutatum.pdf. (Accessed March, 2016).

McGowan, K.J., and K.J. Corwin. 2008. *The Second Atlas of Breeding Birds in New York State*. Cornell University Press, Ithaca, NY.

Medelin, R.E., M.B. Connior, K.F. Gaines, and T.S. Risch. 2010. *Responses of Bats to Forest Fragmentation in the Mississippi River Alluvial Valley, Arkansas, USA*. Diversity 2: 1146–1157.

National Audubon Society. 2016. *The Christmas Bird Count Historical Results [Online]*. Available at http://www.christmasbirdcount.org. (Accessed February 2016).

National Research Council. 2007. *Environmental Impacts of Wind-Energy Projects*. Prepared by the Committee on Environmental Impacts of Wind Energy Projects.

NatureServe. 2015. *NatureServe Explorer: An Online Encyclopedia of Life*. Version 7.0. NatureServe. Arlington, Virginia. Available at: http://www.natureserve.org/explorer (Accessed February 2016).

New York Natural Heritage Program (NYNHP). 2015a. *Online Conservation Guide for* Ardea herodias. Available at: http://www.acris.nynhp.org/guide.php?id=6752. (Accessed February 23rd, 2016).

NYNHP. 2015b. *Online Conservation Guide for* Pieris virginiensis. Available at: http://www.acris.nynhp.org/guide.php?id=6752. (Accessed February 23rd, 2016)

New York State Department of Environmental Conservation (NYSDEC). 2007a. *New York State Amphibian and Reptile Atlas Data*. Bureau of Wildlife, Albany NY. November 20, 2007.

NYSDEC. 2007b. *New York State Breeding Bird Atlas 2000 [Internet]. 2000 - 2005*. Release 1.0. Albany, New York. Updated June 11, 2007. Available at: http://www.dec.ny.gov/animals/7312.html. (Accessed February 2016).

NYSDEC. 2009. *Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects*.

NYSDEC. 2014. *New York State Prohibited and Regulated Invasive Plants*. September, 2014. Available at: http://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf. (Accessed January 2016).

NYSDEC. 2015. *New York Natural Heritage Program Conservation Guide for Vernal Pool*. Available at: http://www.acris.nynhp.org/report.php?id=9902. (Accessed February 2016).

NYSDEC. 2016a. Black Redhorse Fact Sheet. Available at: http://www.dec.ny.gov/animals/26041.html. (Accessed March, 2016).

NYSDEC. 2016b. *Common Loon Fact Sheet*. Available at: http://www.dec.ny.gov/animals/7074.html. (Accessed February, 2016).

NYSDEC. 2016c. *Eastern Sand Darter Fact Sheet*. Available at: http://www.dec.ny.gov/animals/26040.html. (Accessed March, 2016).

NYSDEC. 2016d. *Great Blue Heron Fact Sheet*. Available at: http://www.dec.ny.gov/animals/61491.html. (Accessed February 2016.

NYSDEC. 2016e. Henslow's Sparrow Fact Sheet. http://www.dec.ny.gov/animals/59554.html. (Accessed February 2016).

NYSDEC. 2016f. *List of Endangered, Threatened and Special Concern Fish and Wildlife Species of New York State*. Available at: http://www.dec.ny.gov/animals/7494.html. (Accessed February 2016).

NYSDEC. 2016g. *Redfin Shiner Fact Sheet*. Available at: http://www.dec.ny.gov/animals/26014.html. (Accessed March, 2016).

NYSDEC. 2016h. *Sedge Wren Fact Sheet*. Available at: http://www.dec.ny.gov/animals/59556.html. (Accessed February 2016).

NYSDEC. 2016i. *Species of Greatest Conservation Need*. Available at: http://www.dec.ny.gov/animals/9406.html. (Accessed February 2016).

NYSDEC, 2016j. *Stream Crossings: Guidelines and Best Management Practices*. Available at http://www.dec.ny.gov/permits/49066.html. (Accessed February 2016).

New York State GIS Program Office. 2016. *County Boundaries*. GIS Shapefile. Last updated January 15, 2016.

Pardieck, K.L., D.J. Ziolkowski Jr., and M.-A.R. Hudson. 2015. *North American Breeding Bird Survey Dataset 1966-2014, version 2014.0*. U.S. Geological Survey, Patuxent Wildlife Research Center. Available at: www.pwrc.usgs.gov/BBS/RawData/. (Accessed January 2016).

Patriquin, K.J., and R.M.R. Barclay. 2003. *Foraging by Bats in Cleared, Thinned and Unharvested Boreal Forest*. Journal of Applied Ecology 40: 646–657.

Reschke, C. 1990. *Ecological Communities of New York State*. New York Natural Heritage Program, New York State Department of Environmental Conservation, Latham, NY.

Sasse, D.B., and P. Pekins. 1996. *Summer Roosting Ecology of Northern Long-Eared Bats (*Myotis septentrionalis*) in the White Mountain National Forest.* British Columbia Ministry of Forests Working Paper 23:91-101.

Segers, J.L., and H.G. Broders. 2014. *Interspecific effects of forest fragmentation on bats*. Canadian Journal of Zoology 92: 665–673.

Silvis, A., W.M. Ford, and E.R. Britzke. 2015. *Effects of hierarchical roost removal on northern long-eared bat (*Myotis septentrionalis*) maternity colonies*. PLoS One 10(1): e0116356. doi:10.1371/journal.pone.0116356.

Smith, K.G., S.R. Wittenberg, R.B. Macwhirter, and K.L. Bildstein. 2011. *Northern Harrier (Circus cyaneus), The Birds of North America Online*. A. Poole, Ed. Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America at: http://bna.birds.cornell.edu/bna/species/210/articles/habitat. (Accessed November 2013).

Stantec Consulting. 2009. *Post-construction monitoring at the Munnsville Wind Farm, New York, 2008*. Prepared for E.ON Climate and Renewables.

Stantec Consulting. 2010. *Cohocton and Dutch Hill Wind FarmsYear 1 Post-Construction Monitoring Report, 2009 for the Cohocton and Dutch Hill Wind Farms In Cohocton, New York*. Prepared for Canandaigua Power Partners, LLC and Canandaigua Power Partners II, LLC.

Stantec Consulting. 2011. *Cohocton and Dutch Hill Wind Farms Year 2 Post-Construction Monitoring Report, 2010 for the Cohocton and Dutch Hill Wind Farms In Cohocton, New York*. Prepared for Canandaigua Power Partners, LLC and Canandaigua Power Partners II, LLC.

Stantec Consulting. 2013a. *Steel Winds I and II Post-Construction Monitoring Report, 2012*. Prepared for First Wind Management, LLC

Stantec Consulting. 2013b. *Fall 2011 and Spring/summer 2012 Post-construction Monitoring, Mortality Estimate, Acoustic Analysis and Curtailment Study for the Laurel Mountain Wind Energy Project in Randolph and Barbour Counties, West Virginia*. Stantec Consulting Services Inc., Topsham, Maine, USA. February 2013.

Stantec Consulting. 2014a. *Cohocton and Dutch Hill Wind Farms 2013 Post-Construction Wildlife Monitoring Report*. Prepared for Canandaigua Power Partners, LLC and Canandaigua Power Partners II, LLC.

Stantec Consulting. 2014b. *Steel Winds I and II Post-Construction Monitoring Report, 2013*. Prepared for First Wind Management, LLC

Stantec Consulting Services, Inc. (Stantec). 2015. *Cassadaga Wind Project Bird and Bat Survey Report*.

Strickland, M.D., E.B. Arnett, W.P. Erickson, D.H. Johnson, G.D. Johnson, M.L. Morrison, J.A. Shaffer, and W. Warren-Hicks. 2011. *Comprehensive Guide to Studying Wind Energy/Wildlife Interactions*. Prepared for the National Wind Coordinating Collaborative, Washington, DC.

Tidhar, D., Z. Courage, and K. Bay. 2011a. *Fatality and Acoustic Bat Monitoring Study for the High Sheldon Wind Farm, Wyoming County, New York*. *Final Report: April 15 – November 15, 2010*. Prepared for High Sheldon Wind Farm, Sheldon Energy, LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc., NE/Mid-Atlantic Branch, Waterbury, Vermont.

Tidhar, D., L. McManus, D. Solick, Z. Courage, and K. Bay. 2011b. *Post-construction Fatality Monitoring Study and Bat Acoustic Study for the High Sheldon Wind Farm, Wyoming County, New York. Final Report: April 15 –*

November 15, 2011. Prepared for High Sheldon Wind Farm, Sheldon Energy LLC, Chicago, Illinois. Prepared by Western EcoSystems Technology, Inc., NE/Mid-Atlantic Branch, Waterbury, Vermont.

Tidhar, D., J. Ritzert, M. Sonnenberg, M. Lout, and K. Bay. 2013. *2012 Post-construction Fatality Monitoring Study for the Maple Ridge Wind Farm, Lewis County, New York. Final Report: July 12 – October 15, 2012*. Prepared for EDP Renewables North America by Western EcoSystems Technology, Inc. NE/Mid-Atlantic Branch, Waterbury, Vermont.

Turner, G.G., D.M. Reeder, and J.T. Coleman. 2011. A Five-Year Assessment of Mortality and Geographic Spread of White-nose Syndrome in North American Bats and a Look to the Future. Bat Research News 52: 13–27.

U.S. Army Corps of Engineers (USACE). 1995. *The Highway Methodology Workbook Supplement. Wetland Functions and Values: A Descriptive Approach*. U.S. Army Corps of Engineers, New England Division. NENEP-360-1-30a. 32 pp.

USACE. 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: North central and Northeastern Region*.

United States Energy Information Administration (USEIA). 2015. *Annual Energy Outlook 2015 with Projections to 2040*. Office of Integrated and International Energy Analysis, Washington, DC. April 2015.

U.S. Fish and Wildlife Service (USFWS). 2008. *Clubshell (*Pleurobema clava*) 5-Year Review: Summary and Evaluation*. U.S. Fish and Wildlife Service, Pennsylvania Field Office.

USFWS. 2012a. *Land-Based Wind Energy Guidelines*. March 23, 2012. Available at: http://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf. (Accessed February, 2016).

USFWS. 2012b. *Rayed Bean (freshwater mussel)* Villosa fabalis *Fact Sheet*. January, 2012. Available at: http://www.fws.gov/midwest/endangered/clams/rayedbean/pdf/RayedBeanFactSheet.pdf. (Accessed February, 2016).

USFWS. 2012c. *White-nose Syndrome: a Devastating Disease of North American Bats*. U.S. Fish and Wildlife Service. August 2012. Available at: http://whitenosesyndrome.org/sites/default/files/resource/white-nose_fact_sheet_9-2012.pdf (Accessed March 16, 2016).

USFWS. 2013. *Eagle Conservation Plan Guidance Module 1–Land-based Wind Energy Version 2*. April 2013. Available at https://www.fws.gov/migratorybirds/pdf/management/eagleconservationplanguidance.pdf.

USFWS. 2016. *Endangered and Threatened Wildlife and Plants; 4(d) Rule for the Northern Long-Eared Bat*. Federal Register Vol. 81 (6):1900-1922. January 14, 2016.

Villard, M. 1998. *On Forest-Interior Species, Edge Avoidance, Area Sensitivity, and Dogmas in Avian Conservation*. Auk 115(3): 801–805.

Weldy, T., D. Werier, and A. Nelson. 2015. *New York Flora Atlas*. [S. M. Landry and K. N. Campbell (original application development), USF Water Institute. University of South Florida]. New York Flora Association, Albany, New York. Available at: http://newyork.plantatlas.usf.edu (Accessed January 2016).

West, Inc. 2013. *2012 Post-Construction Monitoring Studies for the Howard Wind Project Steuben County, New York*. Prepared for Howard Wind, LLC.

Western EcoSystems Technology, Inc. (West, Inc.). 2014. *2012 and 2013 Breeding Bird Avoidance and Habituation Studies for the Howard Wind Project, Steuben County, New York.*

Whitcomb, R.F., J.F. Lynch, P.A. Opler, and C.S. Robbins. 1981. *Effects of Forest Fragmentation on Avifauna of the Eastern Deciduous Forest*. Pages 125 – 205 *in* Forest island dynamics in man-dominated landscapes. R.L. Burgess and D.M. Sharpe, Eds. Springer-Verlag, New York.

Young, D.P., S. Nomani, W.L. Tidhar, and K. Bay. 2011. *NedPower Mount Storm Wind Energy Facility, Post-Construction Avian and Bat Monitoring, July - October 2010*. Western EcoSystems Technology, Inc. Cheyenne, Wyoming, USA. February 10, 2011.

Zimmerman, J.L. 1988. *Breeding Season Habitat Selection by the Henslow's sparrow (*Ammodramus henslowii*) in Kansas*. Wilson Bulletin 100(1): 17–24.