Final Environmental Assessment for

Proposed Habitat Conservation Plan and Incidental Take Permit

Copenhagen Wind Farm

Lewis and Jefferson Counties, New York

April 2020

U.S. Fish and Wildlife Service

New York Field Office

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CHAPTER 1. PURPOSE AND NEED

1.1 INTRODUCTION

On October 27, 2017, Copenhagen Wind Farm, LLC (Applicant), a subsidiary of EDF Renewables, Inc., submitted a Habitat Conservation Plan (HCP) (Copenhagen Wind Farm, LLC 2019) as part of an application for an Incidental Take Permit (ITP) in accordance with Section 10(a)(1)(B) of the Endangered Species Act (ESA), as amended (16 U.S.C. § 1531, et seq.), to the U.S. Fish and Wildlife Service (Service). The Applicant requests incidental take authorization for the federally listed Indiana bat (*Myotis sodalis*) and northern long-eared bat (*Myotis septentrionalis*) associated with operation of the Copenhagen Wind Farm (the Project), located in the Town of Denmark, Lewis County and the Towns of Rutland and Champion, Jefferson County, New York (Figure 1-1) during the 25-year life of the Project. The HCP[1] provides a plan to avoid, minimize, and mitigate, to the maximum extent practicable, the impact of that incidental take and is incorporated here by reference.

The Service published a final 4(d) rule for the northern long-eared bat on January 14, 2016 (81 Federal Register [FR] 1900)[2] and any "take"[3] of northern long-eared bats associated with the Project is not prohibited. However, the Applicant chose to include northern long-eared bat as a Covered Species in the HCP so that the species is fully addressed, providing take authorization under the ITP in the event the 4(d) rule is modified or the species is reclassified to endangered within the term of the permit.

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[1] Available at https://www.fws.gov/northeast/nyfo/es/ibat.htm

[2] http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/FRnlebFinal4dRule14Jan2016.pdf

[3] "Take," as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 U.S.C. 1532(19)).

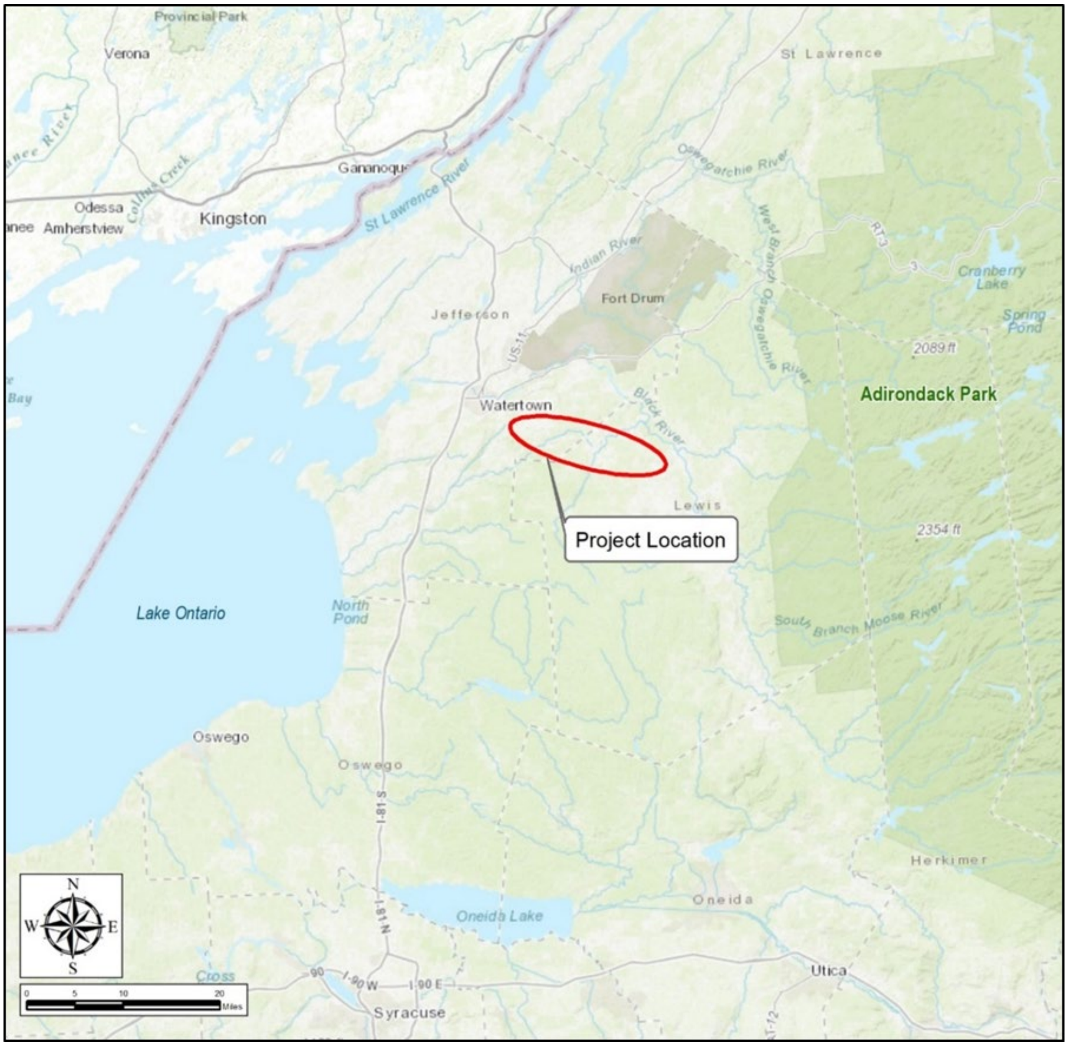

Figure 1-1. Regional Project location.

1.2 REGULATORY CONTEXT

1.2.1 *National Environmental Policy Act*

The National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. § 4321, et seq.), requires Federal agencies to evaluate and disclose the effects of their proposed actions on the human environment. The NEPA process is intended to help Federal agencies make decisions based on an understanding of potential environmental consequences and take actions that protect, restore, and enhance the environment. The Council on Environmental Quality's regulations implementing NEPA (40 C.F.R. Parts 1500–1508) and the Department of the Interior's NEPA implementing regulations (43 C.F.R. Part 46) provide the direction to achieve that purpose.

The purpose of an EA is to determine if significant environmental impacts are associated with a proposed federal action that would require the preparation of an Environmental Impact Statement (EIS) and to evaluate the impacts associated with alternative means to achieve the agency's objectives.

An EA is intended to:

- Briefly provide sufficient evidence and analysis for determining whether to prepare an EIS;
- Aid an agency's compliance with NEPA when no EIS is necessary; and
- Facilitate preparation of an EIS when one is necessary (40 CFR § 1508.9).

To guide an agency's determination whether an EIS should be prepared based on the findings of an EA, the CEQ has identified two distinct factors that should be considered in evaluating significance: context and intensity. "Context" means that the significance of an action must be analyzed in several settings, such as its impact on society as a whole, the affected region, the affected interests, and the locality. Significance varies with the setting of the proposed action. For instance, in the case of a site-specific action, significance will usually depend upon the impacts in the locale rather than in the world as a whole. Both short- and long-term effects are relevant (40 CFR §1508.27(a)). "Intensity" refers to the severity of impact, and a number of subfactors are generally considered in evaluating intensity. Id.

1.2.2 *State Environmental Quality Review Act*

The New York State Environmental Quality Review Act (SEQRA)[4] and its implementing regulations (6 NYCRR Part 617) require all state and local government agencies to consider environmental impacts equally with social and economic factors during discretionary decision-making. Similar to the NEPA process, if an action is determined not to have significant adverse environmental impacts, a determination of non-significance (i.e., Negative Declaration) is prepared. If an action is determined to have potentially significant adverse environmental impacts, an EIS is required.

The following is a brief summary of the Project actions conducted pursuant to SEQRA. On September 4, 2012, the Town of Denmark Planning Board accepted the Draft Scoping Document and adopted a motion that set forth a 30-day public comment period. Following review of all written and oral comments on the Draft Scoping Document, the Planning Board adopted the Final Scoping Document on October 30, 2012. The Planning Board accepted the Draft

[4]Article 8 of NY Environmental Conservation Law can be viewed at http://public.leginfo.state.ny.us/lawssrch.cgi?NVLWO: Accessed January 11, 2018.

Environmental Impact Statement (DEIS)[5] as complete and ready for public review and comment on June 4, 2013. A Public Hearing was held on July 9, 2013 at the Copenhagen Central School and comments were accepted through August 13, 2013. The DEIS was revised as necessary to address substantive comments, and the Final EIS (FEIS)[6] was accepted by the Planning Board as complete on July 10, 2014. The review period for all Interested and Involved Agencies ended on July 30, 2014. The SEQRA process was completed on August 19, 2014, when the Denmark Planning Board issued its Lead Agency Findings Statement. All other required construction and operations permits and approvals for the Project have been obtained, or are currently in the process of being obtained.

Additional regulatory context can be found in Appendix B.

1.3 PROJECT DESCRIPTION

1.3.1 *General Description*

The proposed Project is located on approximately 9,142 acres of leased land, or land that is currently under negotiation to lease ("Permit Area") (Figure 1-2). The Permit Area has a rural and low-density character, with forestland and agriculture as the dominant land uses. The Permit Area is mostly forested, with agricultural fields located along the valley roads and on nearby gentle rolling hills. Residential land use is minimal in the Permit Area, with single-family homes located along public roadways adjacent to the Project. While the mitigation project would be included in any permit conditions, it is not being defined as part of the "Permit Area" where any take of bats is anticipated.

1.3.2 *Project Components*

The Project includes the construction and operation of 40 wind turbines, which will deliver up to 79.9 megawatts (MW) of electrical power to the New York State grid. The Project also involves construction of associated components, including two 328-foot permanent un-guyed meteorological (MET) towers, a 13.5-mile system of gravel access roads, buried 34.5 kilovolt (kV) electrical collector lines, a construction staging area, an operation and maintenance building, and a collection and transforming substation. To deliver power to the New York State power grid, the Applicant proposes to construct a 115 kV transmission line, and a Point of Interconnection facility located adjacent to the existing National Grid Black River – Lighthouse Hill 115kV transmission line. The interconnection route will be comprised of approximately eight miles of overhead line on wooden or steel pole structures, located within a right-of-way located in the Towns of Rutland and Champion, Jefferson County. Additional details regarding project components can be found in Section 2.5 of the DEIS.

[5] Available at https://www.fws.gov/northeast/nyfo/es/ibat.htm

[6] Available at https://www.fws.gov/northeast/nyfo/es/ibat.htm

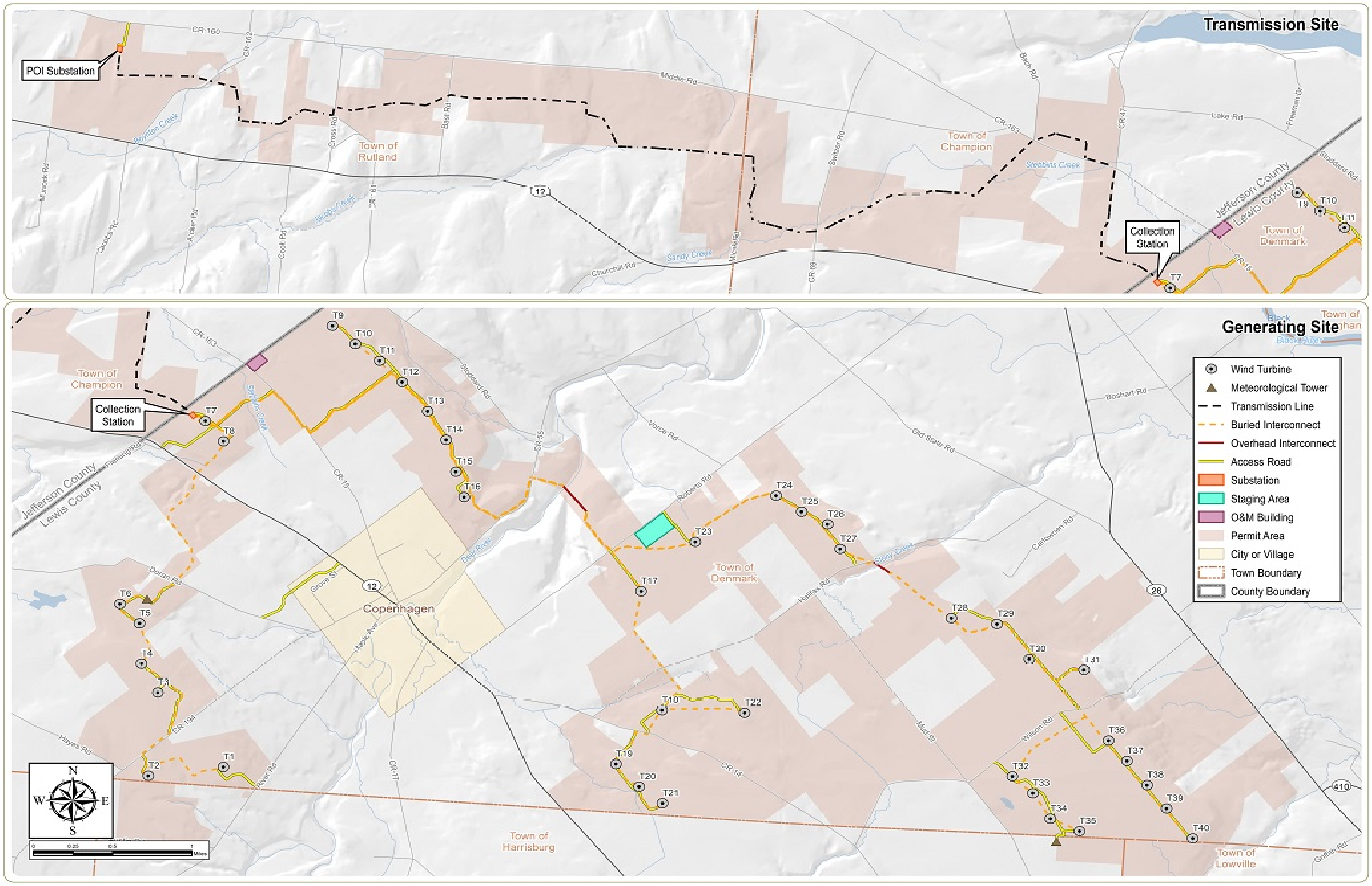

Figure 1-2. Permit Area and Project layout.

1.3.3 *Components with No Take Anticipated*

Several project components are anticipated to result in no impacts to Indiana bats or northern long-eared bats. These include construction, operations of facilities except turbines, maintenance, decommissioning, and mitigation.

Construction

Project construction started in the fall of 2017 for the civil work and was paused during the winter period of 2017 to 2018. Construction resumed in April 2018, and the Project achieved commercial operation on December 27, 2018. Most tree clearing was conducted during the 2016 to 2017 and 2017 to 2018 winter seasons. In a Technical Assistance Letter (TAL) dated October 26, 2015[7], the Service determined that construction of the Project would not result in "take" of the Indiana bat or northern long-eared bat. The U.S. Army Corps of Engineers (USACE) was the lead Federal agency for completing ESA compliance for the construction phase of the Project, due to the need for permits pursuant to Section 404 of the Clean Water Act. However, the USACE has no jurisdiction over the operations of the Project. The USACE and Service completed informal consultation on the construction phase January 15, 2016. Additional details regarding construction can be found in Section 2.6 of the DEIS and Section 4.2.2.1 of the HCP.

Operations

There is no anticipated take of covered species from operations of the MET towers or transmission line as bats generally do not fly into stationary objects. There is no evidence that communication towers or stationary structures have resulted in mortality of bats (Kerns *et al.* 2005), as bats generally do not fly into stationary objects of any kind. We would similarly not anticipate any collisions with transmission lines.

Maintenance

Maintenance activities consist of scheduled maintenance, unscheduled maintenance, electrical system maintenance, and environmental management. In general, wind energy facility maintenance involves periodic activities conducted during daylight hours, typically inside turbines or other structures. In the event of turbine or facility outages, the Supervisory Control and Data Acquisition (SCADA) system will send alarm messages to on-call technicians to notify them of the outage. The Project will always have a local technician on-call who can respond quickly in the event of any emergency. Details can be found in Section 2.7 of the DEIS and Section 4.2.2.2 of the HCP.

[7] Available at https://www.fws.gov/northeast/nyfo/es/ibat.htm

Decommissioning

The Applicant has developed a surety instrument to guarantee the decommissioning of Project components. Components include removal of structures, restoration of soil and vegetation, timetables, and estimates of costs. Additional details regarding decommissioning can be found in Section 2.8 of the DEIS and Section 4.2.2.3 of the HCP.

Mitigation

Implementation of the HCP would include measures to minimize and mitigate the impacts of the take to the maximum extent practicable (see HCP Sections 6.3 and 6.4). Take that cannot be avoided will be mitigated through permanent protection (by gating) of a winter hibernaculum. Construction of a gate will be conducted during the active season to avoid any potential disturbance to hibernating bats. Bats will continue to be able to freely enter and exit the hibernacula and no negative impacts are anticipated.

1.3.4 ***Operations – Covered Activity***

One project component is anticipated to result in take of Indiana bats and northern long-eared bats: operations. Commercial operation of the 40 turbines began in December 2018 and the Applicant anticipates the Project will operate for 25 years. The Applicant included measures to reduce impacts to bats and birds in the HCP and Avian and Bat Protection Plan (ABPP) (Appendix D).

Turbines will be operating when the wind speed is within the operating range (3 meters per second [m/s] to 20 m/s [6.7 miles per hour [mph] to 45 mph]) and there are no component malfunctions or New York Independent System Operator grid constraints. Each turbine has a comprehensive control system that monitors the subsystems within the turbine and the local wind conditions to determine whether the conditions are suitable for operation. Turbines also have systems for monitoring temperature. If an event occurs which is considered to be outside the normal operating range of the turbine (such as low hydraulic pressures, unusual vibrations, or high generator temperatures), the wind turbine will immediately and automatically shut down and report the condition to the operations center. A communication line connects each turbine to the operations center, which closely monitors and, as required, controls the operation of each turbine. The wind turbine system will be integrated with the electric interconnection SCADA to ensure that the Project critical controls, alarms, and functions are properly coordinated for safe, secure and reliable operation.

The turbines are equipped with two fully independent braking systems that allow the rotor to be brought to a halt under all foreseeable conditions. The system consists of aerodynamic braking by the rotor blades (‘pitching’) and by a separate hydraulic-disc brake system. Each wind turbine has a computer to control critical functions, monitor wind conditions, and report data back to the SCADA system. The Project will require full time (during normal working hours) technical and administrative staff to maintain and operate the facility. In the event of turbine or facility outages, the SCADA system (anticipated to be located in the interconnection substation) will send alarm messages to on-call technicians to notify them of the outage. The Project will always have an on-call local technician who can respond quickly in the event of any emergency.

1.4 ACTION AGENCY PURPOSE AND NEED

1.4.1 *Description of the Proposed Action*

The proposed action being evaluated in this EA is the Service's issuance of a 25-year ITP that would authorize take of the Indiana bat and northern long-eared bat, incidental to operation of the Project, and implementation of the conservation in the associated HCP and ABPP, in accordance with the statutory and regulatory requirements of the ESA.

1.4.2 *Purpose and Need of the Proposed Action*

The proposed Federal action considered in this EA is issuance of an ITP in response to a permit application submitted with an HCP in accordance with the requirements of section 10(a)(1)(B) of the ESA. If approved, the ITP would authorize incidental take of Covered Species caused by Covered Activities.

The Service's purpose is to fulfill our ESA section 10 conservation obligations. Non-Federal applicants whose otherwise lawful activities may result in take of ESA-listed wildlife can apply to the Service for a section 10 (a)(1)(B) ITP so that their activities may proceed without potential violation of the ESA section 9 prohibition against such take.

In considering the permit application, the Service must comply with a number of Federal laws and regulations, Executive Orders, and agency directives and policy. As the Service fulfills these responsibilities and obligations we will strive to: ensure that issuance of an ITP and implementation of the HCP achieve long-term conservation objectives for species and ecosystems at ecologically appropriate scales; and ensure that conservation actions under the HCP occur within a spatially explicit landscape conservation design capable of supporting species mitigation projects over the long-term or for a period commensurate with the scope of the take impacts caused by Covered Activities on Covered Species.

The Service's need for the action is to respond to the application for an ITP. Once we receive an application for an ITP, we need to review the application to determine if it meets issuance criteria.

We also need to ensure that issuance of the ITP and implementation of the HCP comply with other applicable Federal laws, regulations, and treaties such as NEPA, NHPA, MBTA, BGEPA, and applicable Executive Orders, as appropriate.

On October 27, 2017, the Service received an ITP application from Copenhagen Wind Farm, LLC. If the application is approved and the Service issues an ITP, the permit would authorize the take of Covered Species caused by Covered Activities as stipulated on the ITP. The ITP may also contain other measures to mitigate adverse effects to other resources under the Service's jurisdiction (e.g., ESA-listed plants, marine mammals, migratory birds, or eagles) caused by Covered Activities under the HCP.

The Service has prepared this EA to:

• inform the public of our proposed and alternative actions and their effects on the human environment;

• seek information from the public; and

• use the information collected and analyzed to make better informed decisions concerning this ITP application.

1.5 SCOPE OF THE EA

This EA evaluates the environmental impacts that may result from the proposed action (the issuance of an ITP and the Applicant's resulting implementation of the HCP) and two other alternatives.

If the Service determines, after providing an opportunity for review and considering comments provided by the public, that the proposed Federal action and resulting implementation of the Applicant's HCP will not result in significant impacts to the human environment, a Finding of No Significant Impact will be issued. If the Service determines that the proposed action is likely to result in significant impacts, then a notice of intent to prepare an EIS will be issued. An EIS involves a more detailed evaluation of the effects of the proposed Federal action and alternatives and mitigation measures proposed to minimize or avoid these effects. The determination must be reasonable in light of the circumstances involved in the particular project being evaluated, and in light of any past, present, or foreseeable future actions.

CHAPTER 2. ALTERNATIVES

NEPA requires that Federal agencies consider a range of reasonable alternatives to the proposed action when evaluating the environmental effects of an action. Accordingly, this chapter describes the Applicant's proposed action and alternatives to the action that are being considered.

2.1 SCOPING PROCESS

The Service's formal scoping process for this Project began April 28, 2015, with the publication of a notice of intent (NOI) to conduct a NEPA analysis in the Federal Register. The Service concurrently issued a press release providing information about the project and the anticipated application for an ITP, along with a link to the NOI and information about how the public could participate, and shared the press release via social media. Local media outlets, including the

Watertown Daily Times[8] and the Daily Courier Observer[9] (serving Massena and Potsdam, NY), subsequently published related articles with information on public participation. North Country Public Radio[10] also broadcast a story within the public comment period. One comment letter was received during the NOI's public comment period (Appendix C). This letter requested information on the proposal for avoiding bird electrocutions and collisions and information on proposed post-construction monitoring. A similar strategy is being used to solicit stakeholder involvement during the public comment phase of this EA: Federal Register publication and coordination with potential interested parties.

Prior Public Outreach

The project has previously undergone public review as part of the local permitting process, pursuant to the requirements of SEQRA and its implementing regulations. Opportunities for detailed agency and public review were provided during the DEIS public comment period (June 4, 2013 through August 13, 2013), including a public hearing conducted by the Lead Agency (Town of Denmark) on July 9, 2013, at the Copenhagen Central School. Eight comment letters as well as oral comments were received[11], which provided 158 individual comments that were considered during the FEIS analysis. The comments covered a wide range of topics addressed in the DEIS. The most commonly raised questions and concerns pertained to biological resources and water resources, particularly with regard to potential impacts to birds, bats, and groundwater.

Chapter 4.0 of the FEIS contains a responsiveness summary to indicate how all of the substantive comments received on the DEIS during the public comment period were addressed. The FEIS was accepted as complete by the Lead Agency on July 10, 2014.

2.2 DEVELOPMENT OF ALTERNATIVES

The scope of reasonable alternatives is defined by the purpose and need for the action and guided by the goals and objectives of the Federal agency. Reasonable alternatives include those that are practical or feasible from both a technical and economic standpoint. Alternatives were developed to address take of Indiana bats and northern long-eared bats during Project operations, and are, therefore, primarily operational alternatives relating to the dates and times of operation and changes in cut-in speed (i.e., the wind speed at which turbines begin generating power and sending it to the grid). The alternatives do not address construction and layout aspects of the

[8] https://www.watertowndailytimes.com/news04/ownenergy-inc-working-on-habitat-conservation-plan-for-the-copenhagen-wind-farm-20150511

[9] https://www.mpcourier.com/news04/ownenergy-inc-working-on-habitat-conservation-plan-for-the-copenhagen-wind-farm-20150511

[10] https://www.northcountrypublicradio.org/news/story/28238/20150504/wind-company-to-make-changes-for-endangered-indiana-bat

[11] Available at https://www.fws.gov/northeast/nyfo/es/ibat.htm

Project, such as turbine siting or construction, because the Project construction was completed prior to the ITP decision.

The alternatives that we considered included:

- Avoidance Alternatives
    - No Action Alternative (No permit issued, TAL Alternative)
- Operational Alternatives
    - Applicant's Proposed Action Alternative (HCP Alternative)
    - Feathering Below Manufacturer's Cut-in Speed Alternative
    - Operate under Other Operational Strategies
    - No Operational Adjustment Alternative

Three alternatives were carried forward for detailed analysis and are discussed in Section 2.3. Each alternative carried forward for detailed analysis meets the purpose and need identified in Section 1.4.2 and is evaluated in the EA to determine the impacts to the human environment.

2.3 ALTERNATIVES RETAINED FOR DETAILED ANALYSES

The following subsection describes in detail the alternatives that are fully evaluated within the EA.

2.3.1 *Alternative 1: No Action (TAL Alternative)*

Under this alternative, the Service would not issue an ITP to Copenhagen Wind Farm and its HCP would not be implemented because take of Indiana bats and northern long-eared bats would be unlikely at the Project. Therefore, Copenhagen Wind Farm would not need an ITP or to implement an HCP.

2.3.1.1 Operational Minimization Measures

Under this alternative, turbines would be operated in a manner that is anticipated to avoid take of both Indiana bats and northern long-eared bats (Table 2-1). The avoidance strategy was developed in consultation with the Service and documented in a TAL.

Table 2-1. Operational Adjustments to Avoid Take of Indiana and Northern Long-eared Bats, Alternative 1

Season	Dates	Cut-In Wind Speed[1] (Blades Feathered Below Cut-In)		Tree Removal
		Turbines Within Home Range of NLEB[2] Maternity Colony	Remaining Turbines	
Spring Migration	4/1 – 5/15	5.0 m/s	3.0 m/s	No[3]
Summer Maternity (until Fall overlap)	5/16 – 7/31	6.9 m/s	3.0 m/s	No[3]
Summer Maternity and Fall Migration	8/1 – 9/30	6.9 m/s	6.9 m/s	No[3]
Fall Swarming and Late Fall	10/1 – 10/31	3.0 m/s (no feathering)	3.0 m/s (no feathering)	Yes
Winter Hibernation	11/1 – 3/31	3.0 m/s (no feathering)	3.0 m/s (no feathering)	Yes

[1] These operational adjustments would occur between ½-hour prior to sunset to ½-hour after sunrise.

[2] NLEB = northern long-eared bat.

[3] Emergency tree and hazard tree removal may be conducted, as needed, following appropriate avoidance protocol.

2.3.1.2 Mitigation

Because take of Indiana bats and northern long-eared bats would be unlikely at the Project under this operational regime, Copenhagen Wind would not need to mitigate for take of listed bats.

2.3.1.3 Monitoring, Reporting, and Adaptive Management

Initial post-construction bird and bat fatality monitoring would occur, as agreed to with the NYSDEC, and the ABPP would be implemented. However, since there would be no ITP and no HCP, ongoing compliance monitoring would not occur. No adaptive management component would be used.

2.3.2 *Alternative 2: Applicant's Proposed Action Alternative*

Under Alternative 2, the Service would issue an ITP to the Applicant to authorize the incidental take of up to 4 Indiana bats and 16 northern long-eared bats associated with Project operation over the 25-year duration. The proposed HCP includes specific measures to avoid, minimize, mitigate, and monitor take of Indiana bats and northern long-eared bats as part of the operations of the Project as described below.

2.3.2.1 Operational Minimization Measures

The Applicant will minimize potential impacts of take of the Covered Species from operation of the Project by implementing seasonal turbine operational adjustments for the term of the ITP (Table 2-2).

Table 2-2. Operational Adjustments to Minimize Take of Indiana and Northern Long-eared Bats, Alternative 2

Season	Dates	Cut-In Wind Speed[1] (Blades Feathered Below Cut-In)	
		Turbines Within Home Range of NLEB[2] Maternity Colony	Remaining Turbines
Spring Migration	4/1 – 5/15	3.0 m/s	3.0 m/s
Summer Maternity until Fall overlap)	5/16 – 7/31	5.0 m/s[3]	3.0 m/s
Summer Maternity and Fall Migration	8/1 – 9/30	5.0 m/s[3]	5.0 m/s[3]
Fall Swarming and Late Fall	10/1 – 10/31	3.0 m/s (no feathering)	3.0 m/s (no feathering)
Winter Hibernation	11/1 – 3/31	3.0 m/s (no feathering)	3.0 m/s (no feathering)

[1] These operational adjustments would occur between nautical sunset and sunrise (i.e., nautical twilight when the sun is 12 degrees or more below horizon).

[2] NLEB = northern long-eared bat.

[3] When temperatures are above 40 degrees Fahrenheit.

2.3.2.2 Mitigation

As indicated above, the estimated levels of take with minimization measures in place are expected to be less than or equal to 4 Indiana bats and 16 northern long-eared bats over the 25-year ITP term.

The Applicant worked with the Service and NYSDEC to secure a project identified as viable mitigation: protection of winter habitat (through installation of a gate to prevent unauthorized human entrance but allow for bats to fly freely). The selected mitigation site is located in Ulster County, New York, and is part of a complex of hibernacula utilized by both Indiana bats and northern long-eared bats. The site has also been identified as a conservation priority by the Service due to the threat of disturbance or destruction of hibernating bats by unauthorized human visitation. The hibernaculum is located on NYSDEC property but is not currently protected by a gate. It is well-known by local residents, and NYSDEC has experienced at least two recent incidents of vandalism directed at research equipment installed in the hibernaculum, indicating unauthorized human visitation is occurring. Bats hibernating in it are considered to be under imminent threat from human visitation, disturbance, and vandalism. The NYSDEC has determined that gating of the hibernaculum is appropriate. The cave gating was completed August 30, 2019.

Management and monitoring of the hibernaculum will be conducted by NYSDEC. Standard designs will be used and bats are anticipated to have no problems with flying through the gate. Monitoring may include the use of speloggers and dataloggers to determine the effectiveness of the gating in preventing unauthorized visitation without negatively impacting the quality of the hibernaculum as winter bat habitat. Additionally, the hibernaculum entrances will be monitored by NYSDEC following gating to determine if the bats accept the gate during fall swarming. It is anticipated that NYSDEC will continue performing biannual surveys of the bat populations within the hibernaculum after gating. Although the mitigation project (a cave gate) is intended to remain in place in perpetuity, the Applicant's obligation to provide funding or other assurances to support maintenance of the gate, management of the habitat for bats, monitoring and reporting, adaptive management, and changed circumstances will apply only during the ITP term. Additional details can be found in Section 6.4 of the HCP.

2.3.2.3 Monitoring, Reporting and Adaptive Management

The overall goals of monitoring are to demonstrate compliance with the ITP and evaluate the effectiveness of the conservation plan in meeting the biological goals and objectives of the HCP.

This will be achieved through operational monitoring and mitigation monitoring. Operational monitoring would be conducted to measure the all-bat mortality rate (from which take of the Covered Species can be calculated using the species composition method – see Section 4.1.1), to document compliance with the ITP, verify effectiveness of the HCP minimization measures, and identify when adaptive management actions are necessary to ensure continued compliance. Mitigation monitoring would be conducted to document compliance with the ITP and verify mitigation effectiveness by ensuring that the mitigation project is functioning as planned. Together, operational monitoring and mitigation monitoring would provide information regarding the success of the conservation plan in achieving the biological goals and objectives of the HCP. Additionally, summer presence monitoring would be conducted periodically (every 10 years)[12] to enable appropriate responses to any changes in northern long-eared bat summer presence within the Permit Area, ensuring continued compliance with the ITP take limits and continued effectiveness of the HCP minimization measures. Monitoring results would be reported to the Service at the end of each monitoring year except for a few specific instances (e.g., report of fatalities of covered species) (See HCP Sections 6.5 and 6.6).

The Applicant would coordinate with the Service to interpret the results of the monitoring surveys, evaluate any new available data (e.g., from regional studies), and make a coordinated

[12] For more information on the 10-year duration, see Q2 in https://www.fws.gov/midwest/endangered/mammals/inba/pdf/inbaS7and10WindGuidanceFinal26Oct2011.pdf

decision regarding any adjustment of on-site minimization strategies as described below to ensure the level of authorized take is not exceeded over the 25-year term of the ITP. Additional details can be found in Sections 6.5, 6.6, and 6.7 of the HCP.

2.3.3 *Alternative 3: Less Restrictive Operations Alternative*

Alternative 3 would be similar to Alternative 2 in that if the project can meet issuance criteria (see Appendix B), the Service would issue a 25-year ITP to authorize the incidental take of up to 6 Indiana bats and 22 northern long-eared bats associated with Project operation, and the Applicant would implement an HCP and ABPP.

2.3.3.1 Operational Minimization Measures

The Applicant will minimize potential impacts of take of the Covered Species from operation of the Project by implementing seasonal turbine operational adjustments for the term of the ITP (Table 2-3).

Table 2-3. Operational Adjustments to Minimize Take of Indiana and Northern Long-eared Bats, Alternative 3

Season	Dates	Cut-In Wind Speed[1] (Blades Feathered Below Cut-In)	
		Turbines Within Home Range of NLEB[2] Maternity Colony	Remaining Turbines
Spring Migration	4/1 – 5/15	3.0 m/s	3.0 m/s
Summer Maternity (until Fall overlap)	5/16 – 7/31	3.0 m/s	3.0 m/s
Summer Maternity and Fall Migration	8/1 – 9/30	3.0 m/s	3.0 m/s
Fall Swarming and Late Fall	10/1 – 10/31	3.0 m/s	3.0 m/s
Winter Hibernation	11/1 – 3/31	3.0 m/s (no feathering)	3.0 m/s (no feathering)

[1] These operational adjustments would occur from ½ hour before sunset to ½ hour after sunrise.

[2] NLEB = northern long-eared bat.

2.3.3.2 Mitigation

Under Alternative 3, mitigation will be similar to that described above, but increased to account for additional amount of take and resulting impacts to covered species and their habitats.

2.3.3.3 Monitoring, Reporting, and Adaptive Management

The monitoring and adaptive management program described above would remain in place. Monitoring costs for any additional mitigation efforts may be higher.

2.4 SUMMARY OF THE ALTERNATIVES

Table 2-4 summarizes those elements that would vary among the no action and action alternatives.

Table 2-4. Comparison of Alternatives Considered for Detailed Analysis

Alternative	Operational Adjustments				Monitoring	Issue ITP and Implement HCP	Implement ABPP
	Spring Migration (4/1 – 5/15)	Summer Maternity (5/16 – 7/31)	Summer Maternity and Fall Migration (8/1 – 9/30)	Fall Swarming and Winter Hibernation (10/1 – 3/31)			
Alternative 1: No Action (TAL Alternative)	feather blades below 5.0 m/s cut-in speed within range of NLEB[3] maternity colony, remaining turbines 3.0 m/s cut-in speed	feather blades below 6.9 m/s cut-in speed within range of NLEB[3] maternity colony, remaining turbines 3.0 m/s cut in speed	feather blades below 6.9 m/s cut-in speed for all turbines	3.0 m/s cut-in speed for all turbines	Post-construction Studies	No	Yes
Alternative 2: Applicant's Proposed Action Alternative[1]	feather blades below 3.0 m/s cut in speed for all turbines	feather blades below 5.0 m/s cut-in speed[4] within range of NLEB[3] maternity colony, remaining turbines 3.0 m/s cut-in speed	feather blades below 5.0 m/s cut in speed[4] for all turbines	3.0 m/s cut in speed for all turbines	Operational Monitoring, Summer Presence Monitoring, and Mitigation Monitoring	Yes	Yes
Alternative 3: Less Restrictive Operations Alternative[2]	feather blades below 3.0 m/s cut in speed for all turbines	feather blades below 3.0 m/s cut in speed for all turbines	feather blades below 3.0 m/s cut in speed for all turbines	feather blades below 3.0 m/s cut-in speed for all turbines 10/1-10/31 no feathering 11/1 – 3/1	Operational Monitoring, Summer Presence Monitoring, and Mitigation Monitoring	Yes if issuance criteria can be met	Yes

[1] These operational adjustments would occur between nautical sunset and sunrise (i.e., nautical twilight when the sun is 12 degrees or more below horizon).

[2] These operational adjustments would occur between ½-hour prior to sunset to ½-hour after sunrise.

[3] NLEB = northern long-eared bat.

[4] When temperatures are above 40 degrees Fahrenheit (virtually no Indiana bat or NLEB activity is anticipated below this temperature in New York).

2.5 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM FURTHER ANALYSIS

NEPA requires that Federal agencies thoroughly consider and objectively evaluate all reasonable alternatives and briefly explain the basis for eliminating those alternatives that were not retained for detailed analysis (40 CFR 1502.14). Some alternatives initially considered were later determined not to meet the purpose and need of either the Service or the Applicant. Other alternatives were found to be lacking in sufficient protection for the Covered Species. This section summarizes why each alternative that was dismissed from further evaluation was eliminated.

2.5.1 *Full Operation Alternative*

Under the full operation alternative, an ITP pursuant to Section 10(a)(1)(B) of the ESA would not be issued by the Service for operation of the Project and the Applicant would not implement any HCP. Indiana and northern long-eared bats would not have the protections or the conservation benefits (e.g., mitigation) afforded to them through development and implementation of an HCP. In addition, the ABPP would not be implemented. The Applicant would not incorporate any feathering or operational curtailment, so impacts to Indiana and northern long-eared bats would not be minimized or avoided. The Applicant would not have coverage for incidental take of Indiana or northern long-eared bats, and would be at risk of violating Section 9 of the ESA. As a result, the Applicant would assume all legal liability for operating the Project without an ITP.

The full operation alternative has a high likelihood of taking endangered and threatened species. This alternative does not meet the Service's goals and objectives for protecting and conserving the Indiana bat and northern long-eared bat. It would fail to minimize take, be in violation of the ESA, and provide no conservation benefits for Indiana and northern long-eared bats. Therefore, the Service could not authorize this alternative, and it was dismissed from further evaluation.

2.5.2 *Other Curtailment Speeds*

The Service considered evaluating alternatives that utilized different operational adjustments, specifically cut-in speeds between 5.0 m/s (proposed by applicant) and 6.9 m/s (considered to avoid take) (e.g., 5.5 m/s, 6.0 m/s, 6.5 m/s). Studies conducted at operating wind energy facilities in a variety of landscapes demonstrate that curtailment is effective in reducing bat mortality, and that an inverse relationship exists between cut-in speed and bat mortality rates (Fiedler 2004; Kerns *et al.* 2005; Baerwald *et al.* 2009; Arnett *et al.* 2011; Good *et al.* 2011). These studies collectively illustrate a general trend of reduced mortality at higher cut-in speeds. However, the very limited number of studies makes it difficult to elucidate statistically-based differences among the impacts that would occur at the Project were it to be operated under cut-in speeds of 5.5 m/s, 6.0 m/s, or 6.5 m/s. For example, none of the available studies considered cut-in speeds of 5.5 m/s or 6.0 m/s. The low amount of take expected at the Project also means that small differences in take between different cut-in speeds would not be likely to result in measurable benefits to the Covered Species.

As additional monitoring data from operating wind energy facilities becomes available, the Service expects that fully developed alternatives utilizing different operational strategies will likely become more reasonable alternatives retained for full evaluation in future NEPA analyses. However, based on the data currently available during preparation of this EA, alternatives using other cut-in speeds between 5.0 m/s and 6.9 m/s were dismissed from further evaluation.

CHAPTER 3. AFFECTED ENVIRONMENT

This chapter describes the existing conditions of the Permit Area and its surroundings. The affected environment is the area and its resources (environmental setting) potentially impacted by the proposed action and alternatives. Relative to the Applicant's proposal, the affected environment includes those settings where any covered activity will occur. The Permit Area consists of approximately 9,142 acres of land that is leased or under negotiation to lease for operation of the wind energy facility and associated transmission line (Figure 1-2). This includes all areas where take of Covered Species is anticipated. Impacts of the alternatives on the resources are described in Chapter 4.0 (Environmental Consequences and Mitigation).

3.1 RESOURCES EVALUATED

The Service has determined that a number of resources will not be impacted by the proposed action or alternatives to the proposed action (Appendix F). One of the primary reasons is that all or most construction associated with the Project will be completed prior to ITP decision. The effects analyzed are related to turbine operations, maintenance activities, and mitigation activities that would result from the Federal action of issuing the ITP and implementation of the proposed HCP and a set of reasonable alternatives.

The Service has determined that the following resources could be impacted by the proposed action (and alternatives):

- Biological Resources
  - Threatened and Endangered Bird and Bat Species (State or Federal)
    - Indiana bat
    - Northern long-eared bat
    - Upland sandpiper (*Bartramia longicauda*)
    - Bald eagle (*Haliaeetus leucocephalus*)
    - Northern harrier (*Circus cyaneus*)
  - Non-listed Bats

  - Non-listed Birds
    - Birds of Conservation Concern
    - Bald and Golden Eagles
- Socioeconomic

3.2 BIOLOGICAL RESOURCES

Fish and wildlife resources within the Permit Area are described in the DEIS Appendix F and H. Specific information on fish and wildlife resources within the Permit Area is presented below, organized into subsections focused on threatened and endangered species, non-listed birds, and non-listed bats.

3.2.1 *Threatened and Endangered Species*

Indiana bat and northern long-eared bat are known to occur or have the potential to occur within the Permit Area. Two State-listed Birds of Conservation Concern (BCC) (bald eagles and upland sandpipers) are known within the Permit Area. In addition, during spring and fall raptor migration surveys, Sanders Environmental Inc. (Sanders)(2013a) observed State-listed northern harrier in the Permit Area. Habitat requirements, distribution, threats, and likelihood of occurrence are assessed below for each of these threatened and endangered species.

3.2.1.1 Indiana Bat

The Indiana bat was one of 78 species first listed as being in danger of extinction under the Endangered Species Preservation Act of 1966 (32 FR 4001, March 11, 1967). The ESA extended full protection to the species. Critical habitat for the Indiana bat has been designated at several hibernacula outside of New York (41 FR 187); however, the Project does not affect those areas. The Indiana bat is also State-listed as threatened under Article 11 of the New York's Environmental Conservation Law (ECL).

The Indiana bat is a temperate, insectivorous, migratory bat that hibernates in mines and caves in the winter and spends summers in wooded areas. The key stages in their annual cycle are: hibernation, spring staging and migration, pregnancy, lactation, volancy/weaning, fall migration, and swarming. While varying with weather and latitude, Indiana bats generally hibernate between mid-fall through mid-spring each year. Spring migration likely runs from mid-March to mid-May each year, as females depart shortly after emerging from hibernation and are pregnant when they reach their summer area. Young are born between late May or early June, with nursing continuing until weaning, which is shortly after young become volant in mid- to late-July. Fall migration typically occurs between mid-August and mid-October.

The basic resource needs for the Indiana bat across the species entire range are safe winter hibernation sites; forested spring staging/fall swarming habitat; connected forested summer habitat for roosting, foraging, and commuting; forested migratory stopover habitat; safe migration passage; insects; and clean drinking water (e.g., streams, riparian areas, and wetlands).

Conservation and recovery of the Indiana bat will require capturing the species' ecological, behavioral, and genetic representation and providing redundancy and resiliency at the species level by conserving healthy bat populations across the species' current range, and managing threats acting upon the species. To do this, our current focus addresses the following conservation needs:

- Managing the effects of white-nose syndrome (WNS);
- Conserving and managing winter colonies, hibernacula, and surrounding swarming habitat;
- Conserving and managing maternity colonies; and
- Conserving migrating bats.

The revised recovery plan (Service 2007) delineates recovery units (RUs) based on population discreteness, differences in population trends, and broad level differences in land use and macrohabitats: Ozark-Central, Midwest, Appalachian, and Northeast (Figure 3-1). To help maintain adaptive capacity for the species, multiple healthy populations should occur in all four RUs.

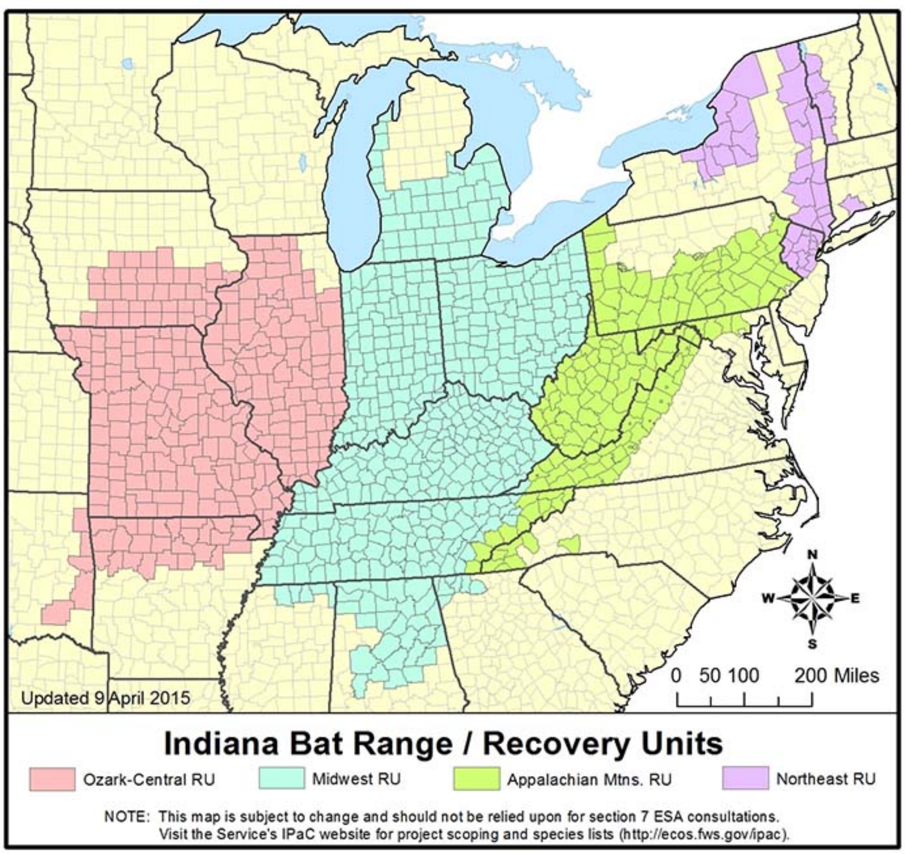

Figure 3-1. Indiana bat range and Recovery Units[13].

Currently, the range-wide status of the species is declining (Figure 3-2, Service 2019) with significant declines in the Northeast, Appalachia, and Midwest RUs. For example, the Northeast

RU has declined from its peak of 53,763 in 2007 to 12,830 in 2017 with a slight increase in 2019 to 13,510. Redundancy of populations has been significantly reduced with several hibernacula now believed to have no Indiana bats and larger percentages of Indiana bats occurring in fewer sites. For example, 87 percent of Indiana bats currently occur at just one location in the Northeast RU and 67 percent occur at two locations in the Appalachia RU.

Current threats to the Indiana bat are discussed in detail in the Recovery Plan (Service 2007) and the 5-Year Review (Service 2009). Traditionally, occupied habitat loss/degradation, winter disturbance, and environmental contaminants have been considered the greatest threats to Indiana bats. The Recovery Plan identified and expounded upon additional threats, including collisions with man-made objects (e.g., wind turbines). The 2009 5-Year Review included the threat of WNS, which is now considered the most significant obstacle to the recovery of the species.

[13] Hibernacula located outside of the Recovery Unit boundaries have not had an Indiana bat record for over 50 years (Service 2015a).

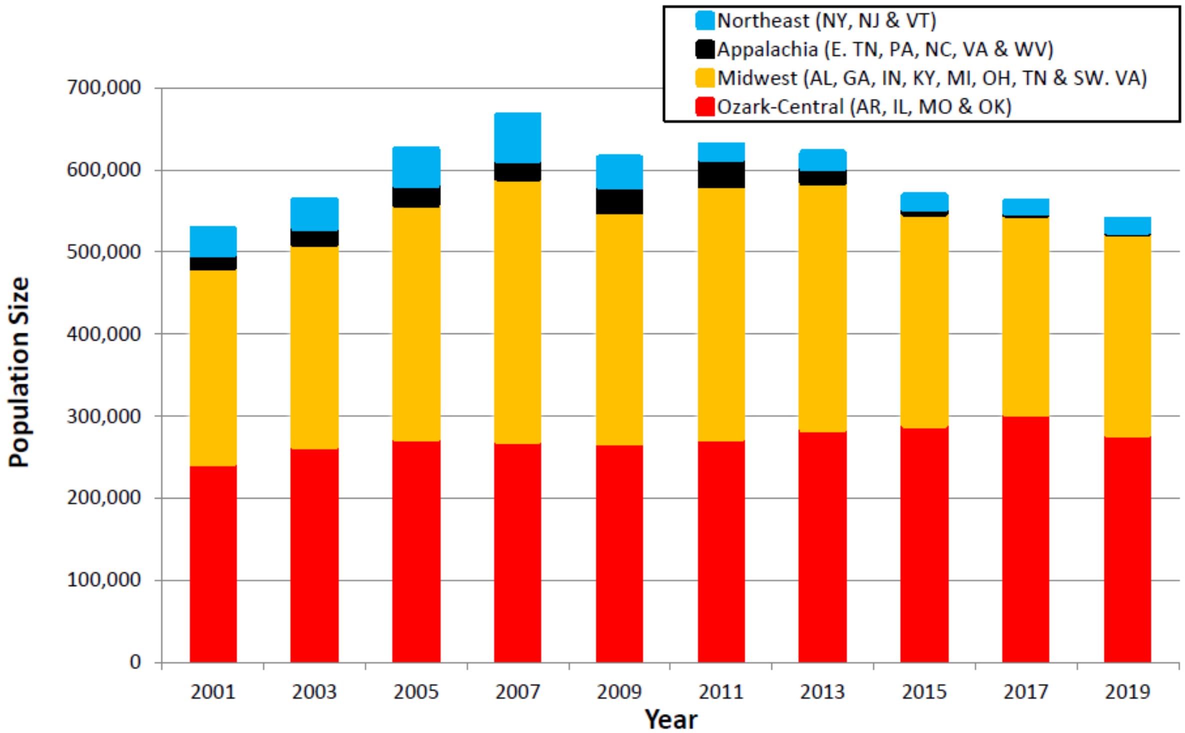

Figure 3-2. Indiana bat population estimates by Recovery Unit from 2001 to 2019.

For a more detailed account of the species description, life history, population dynamics, threats, and conservation needs, refer to: Section 5.1.1 of the HCP, https://www.fws.gov/midwest/endangered/mammals/inba/index.html, and the Service's 2018 Revised Programmatic Biological Opinion for Transportation Projects in the Range of the Indiana Bat and Northern Long-Eared Bat found at https://www.fws.gov/midwest/endangered/section7/fhwa/index.html.

The nearest Indiana bat hibernaculum to the Project is the Glen Park Cave in Jefferson County, which is located approximately 10 to 15 miles (16 to 24 km) northwest of the Permit Area. The maximum population ever recorded in the hibernaculum was 3,129 Indiana bats; the maximum population since 2000 was 2,264 Indiana bats (Service 2007). WNS was confirmed in Glen Park Cave in winter 2007 to 2008 and the latest survey with published survey results (2019) recorded 183 Indiana bats in the hibernaculum (Service 2019).

Indiana bat maternity colonies have been documented in Jefferson County to the north and west of the Permit Area, on Fort Drum and dispersed across the landscape towards Lake Ontario. Bat surveys were conducted for the Project and no Indiana bats were captured or detected (see below for more information). No Indiana bat maternity colonies have been documented within 10 miles (16 km) of the Project turbines and none are believed to occur within the Permit Area. No Indiana bat maternity colonies have been documented in Lewis County.

3.2.1.2 Northern Long-eared Bat

In April 2015, the northern long-eared bat was federally listed as a threatened species under the ESA (80 FR 17974). The northern long-eared bat is also State-listed as threatened under Article 11 of the New York's ECL. Prior to the onset of WNS, the northern long-eared bat was a relatively common bat species in the northeastern and north-central U.S. and much of southern Canada. Section 5.1.2 of the HCP, as well as the northern long-eared bat 4(d) rule[14], and programmatic BO (Service 2016a) provide an in-depth account of the northern long-eared bat. Northern long-eared bats have similar life histories and conservation needs as the Indiana bat. A brief description of northern long-eared bat distribution and status is provided below.

The range of northern long-eared bat is illustrated in Figure 3-3. Northern long-eared bats have been recorded at 89 hibernacula in New York, consisting of abandoned mines, caves, and tunnels, although many of the documented hibernating populations contain only a few individuals and more information is needed on the location of hibernation sites for the species (NYSDEC unpublished data). Summer northern long-eared bat records have been documented in every New York county located outside of New York City. Although population declines due to WNS have resulted in a significant decrease in the number of bats observed per sampling effort, it does not appear that the distribution in New York has contracted (NYSDEC unpublished data).

[14] http://www.fws.gov/midwest/endangered/mammals/nleb/pdf/FRnlebFinal4dRule14Jan2016.pdf

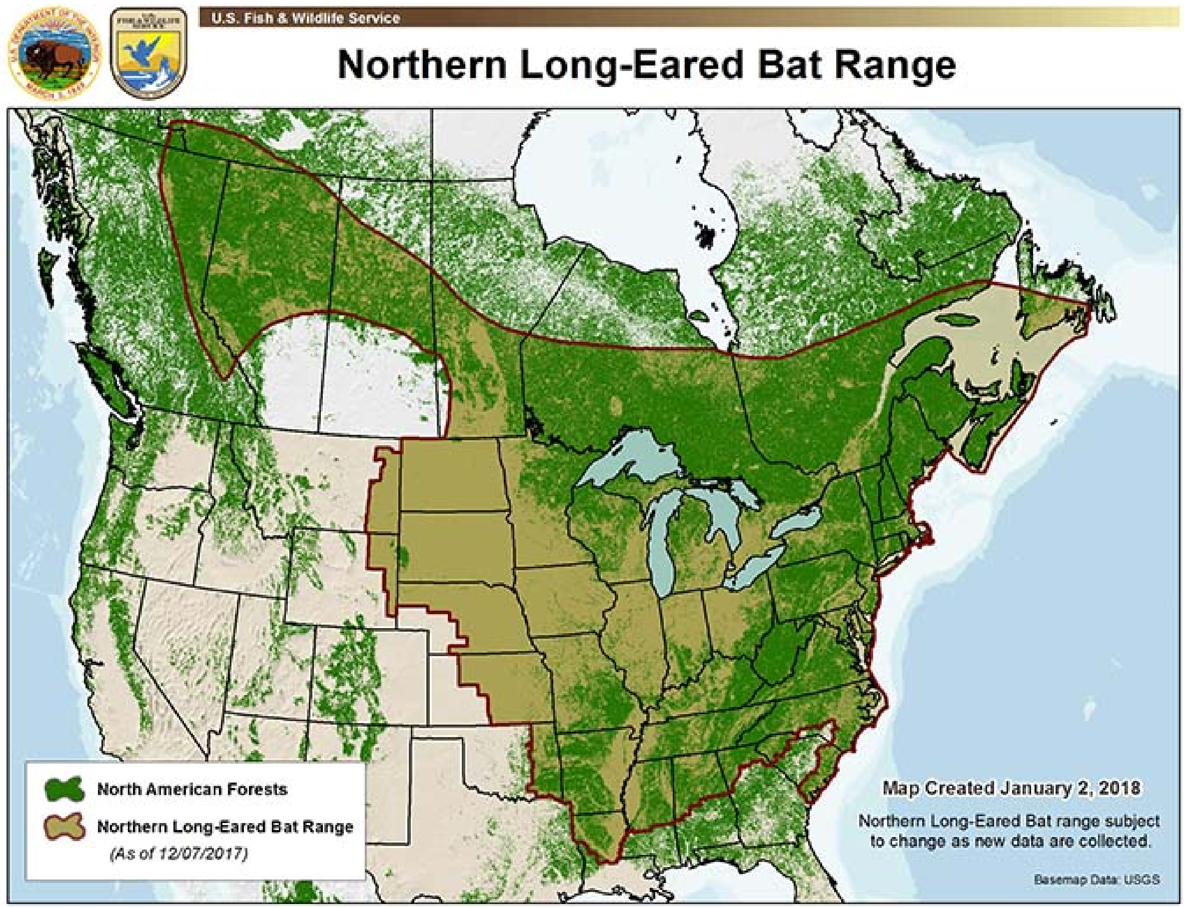

Figure 3-3. Northern long-eared bat range (Service 2018).

The number of northern long-eared bats in New York has been severely affected by WNS since the disease was discovered in the state in 2006. The Service estimates that populations in New York and other northeastern states have declined by as much as 99 percent due to WNS (80 FR 17974). Summer mist-net captures of northern long-eared bats in New York have declined from 0.21 to 0.47 bats/net night pre-WNS (2003 to 2008) to 0.012 bats/net night post-WNS (2011) (Herzog, 2012; unpublished data as cited in 80 FR 17974). Mist-net capture data provided by the NYSDEC from post-WNS surveys (2009 to 2012) conducted by the agency in areas where Indiana bats were expected to be found captured only seven northern long-eared bats over 1,693 net nights (compared to 139 little brown bats and 54 Indiana bats), or 0.004 bats/net night (C. Herzog, NYSDEC, pers. comm. as cited in Copenhagen Wind Farm, LLC 2019).

Northern long-eared bats are known to hibernate in Glen Park (in both the Glen Park Cave and the Glen Park Commercial Cave) and Limerick Cave, the hibernacula located nearest to the Permit Area. As described above in Section 3.1.3.1, WNS was confirmed in Glen Park Cave in winter 2007 to 2008; based on the spread of the disease, it is likely that Limerick Cave was also impacted by WNS during the same winter[15]. No other hibernacula are known to occur within 50 miles (80 km) of the Permit Area; therefore, because the most common migration distances for northern long-eared bats are between 35 miles (56 km) and 55 miles (89 km) (Service 2014a), the Glen Park and Limerick Cave hibernating populations constitute the entire known local population for the Permit Area. It is likely that there are unknown northern long-eared bat hibernacula in the region.

Three northern long-eared bats were captured at three different sites during the mist-net surveys (Sanders 2013b). An adult female northern long-eared bat and a northern long-eared bat of unknown age, sex, and reproductive condition (the bat escaped prior to data being collected) were captured in the western part of the Project and a second adult female northern long-eared bat was captured along the transmission line corridor. Although the two female bats captured during the mist-netting were observed to be non-reproductive, the captures occurred early in the breeding season (6/8/2012 and 6/13/2012) before more obvious signs of reproductive activity (e.g., lactating, pregnancy) would have been apparent. These survey results indicate that northern long-eared bats occur as residents and may also occur as migrants within the Permit Area and along the transmission line during the entire bat active period (spring, summer, and fall). Bats are able to navigate around transmissions lines and other stationary features like MET towers.

3.2.1.3 Upland Sandpiper

The upland sandpiper is listed as a threatened species by the State of New York. The New York Natural Heritage Program (NYNHP) rank for this species is S3B[16] and the following information is summarized from the NYNHP[17]. This species has declined within the state since the mid-1980s, both in distribution and abundance. The overall statewide distribution has decreased 65 percent, while abundance has declined by about 16 percent per year. All regions of the state showed declines in occupancy, and the statewide population appears to be collapsing toward its core in Jefferson County. The primary threats of agricultural conversion and fragmentation are ongoing and expected to increase.

An obligate grassland bird species, their breeding range extends from southern Canada south through the central plains states from the Rocky Mountains east to the Appalachian Mountains. Preferred habitat includes large areas of short grass for feeding and courtship with interspersed or adjacent taller grasses for nesting and brood cover. In the northeastern U.S., airfields currently provide the majority of suitable habitat, though grazed pastures and grassy fields also are used.

[15] https://www.whitenosesyndrome.org/resources/map

[16] Vulnerable in New York - Vulnerable to disappearing from New York due to rarity or other factors (but not currently imperiled); typically 21 to 80 populations or locations in New York, few individuals, restricted range, few remaining acres (or miles of stream), and/or recent and widespread declines. (A migratory animal which occurs in New York only during the breeding season.)

[17] https://guides.nynhp.org/upland-sandpiper/ accessed 8/6/2019

Heavy or early grazing, standing water, burning, and recent manure application may reduce or exclude nesting from fields. Abandoned fields with invading shrubs and trees also sometimes exclude upland sandpipers. Large pastures with small perimeter/area ratios (i.e., fewer edges) seem to be preferred, particularly those that are homogenous in floristic structure (i.e., have few plant species) with nearby barns and fence posts for perching.

Although upland sandpipers were not observed during any of the Project field surveys, correspondence from the NYNHP indicates that this species breeds on-site, and data from the North American Breeding Bird Survey (BBS)[18] and New York State Breeding Bird Atlas (BBA)[19] also indicate that it breeds in the area.

3.2.1.4 Bald Eagle

Bald eagles are listed as a threatened species by the State of New York. In addition, the bald eagle is protected under the Bald and Golden Eagle Protection Act. While breeding and wintering populations are increasing in New York they are still faced with many threats including development, human disturbances, contaminated food base, collision with vehicles, trains, power lines, and wind generators (NYSDEC 2016a).

Bald eagles breed throughout New York State, usually in areas with large bodies of water that support high fish populations. During the non-breeding season, bald eagles are found throughout the state, but they tend to concentrate at wintering areas and roosts at about four open water sites in the state. Important wintering areas in New York include the Delaware, St. Lawrence and Hudson Rivers, as well as the Mongaup River system, the Allegheny River Reservoir, Lake Erie and Lake Champlain (NYSDEC 2016a). Generally, bald eagles tend to avoid areas with human activities. They perch in either deciduous or coniferous trees. Large, heavy nests are usually built near water in tall pine, spruce, fir, cottonwood, oak, poplar, or beech trees. Non-breeding adults and wintering birds are known to have communal roost sites. During the winter, the roost sites may be farther away from food sources. This may be due to the need for a more sheltered, warmer area. Feeding areas during the winter months usually have a high concentration of fish and waterfowl and open water (NatureServe 2015).

A single migratory bald eagle was observed by Sanders (2013a) in the Permit Area during the on-site raptor surveys in 2012. In addition, correspondence from the NYNHP indicates the presence of this species within 10 miles of the Permit Area, and it was recorded in low numbers (1 to 3 birds per year) during six of the last ten Watertown Christmas Bird Counts (National Audubon Society 2013). Habitat within the Permit Area is not suitable for breeding bald eagles,

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[18] The BBS, overseen by the Patuxent Wildlife Research Center of the U.S. Geological Survey, 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.

[19] The BBA is a comprehensive, statewide survey that indicates the distribution of breeding birds in New York State. Point counts were conducted by volunteers within 5-km by 5-km survey blocks across the state (McGowan and Corwin 2008).

and foraging opportunities for this species are also limited due to the absence of any large bodies of water in the area. There are no activities pertinent to the life cycle of the bald eagle that would regularly bring it to the area, except as a migrant or a transient, and the number of bald eagles documented in the area was low.

3.2.1.5 Northern Harrier

The northern harrier is listed as a threatened species by the State of New York. The NYNHP rank for this species is S3B, indicating 21 to 80 breeding occurrences[20]. There is concern about the status of northern harrier populations in New York because of the loss of suitable grassland habitat. Until about the 1950s, breeding northern harriers were considered common throughout the state. Between the 1950s and 1960s the population started to decline for unknown reasons (Andrle and Carroll 1988).

The northern harrier is a bird that is a confirmed breeder across much of New York. The winter range is similar depending on prey abundance and snow cover. Northern harriers use a wide range of open grasslands, shrubland, and salt and freshwater marshes (Andrle and Carroll 1988; McGowan and Corwin 2008). The species hunts by flying low over fields and hovering inflight over prey, and may cover up to 100 miles per day. Its prey, consisting mostly of rodents and small birds, is detected using extremely keen hearing. Nests are placed on the ground, usually in dense cover.

A total of three northern harriers were observed in the Permit Area during the on-site raptor surveys, with behavior suggesting the birds were local residents and not migrants (Sanders 2013a). Correspondence from the NYNHP and data from the BBS and BBA also indicate that it is a confirmed or suspected breeder in the area.

3.2.2 *Non-listed Bats*

Nine species of bat occur in New York State. These include six species of cave-hibernating bats (big brown bat [*Eptesicus fuscus*], eastern small-footed bat [(*Myotis leibii*)], little brown bat, Indiana bat, northern long-eared bat, and tri-colored bat [*Perimyotis subflavus*]) and three species of migratory tree bats (silver-haired bat [*Lasionycteris noctivagans*], eastern red bat [*Lasiurus borealis*], and hoary bat [*Lasiurus cinereus*]). Habitats utilized by these bats include wetlands, agricultural and reverting fields, forests, and developed areas with a variety of micro-habitats used for foraging, roosting, and maternity roosting. Cave bats require specialized habitats for winter hibernacula, where resident bat species congregate during hibernation periods (November through March). Identified hibernacula include limestone caves, old mines, and old well shafts, where a moderated constant temperature and humidity enable hibernating cave bats to survive over the winter. Resident bats migrate relatively short distances to these hibernacula, while migratory tree bats travel farther south to warmer climates. Summer roosts are where bats rest

[20] https://guides.nynhp.org/northern-harrier/ accessed 8/6/2019

during the day, and include buildings, trees, rock piles, and caves depending on species-specific preferences.

Acoustic surveys were conducted at a MET tower in the Permit Area from April through October 2012 (Sanders 2012b). The upper detector recorded 182 calls, of which the majority (N=162, 89 percent) were identified to species. Hoary bat was most frequently recorded (N=94, 51.6 percent), followed by silver-haired bat (N=59, 32.4 percent), red bat (N=7, 3.8 percent), and big brown bat (N=2, 1.1 percent). The remaining 20 calls were only identifiable to group, but all consisted of either big brown bat or various tree bats. The lower detector recorded 99 calls, of which the majority (N=92, 93 percent) were identified to species. Silver-haired bat was most frequently recorded (N=41, 41.4 percent), followed by big brown bat (N=32, 32.3 percent), hoary bat (N=18, 18.1 percent), and red bat (N=1, 1 percent). The remaining seven calls, identifiable only to group, mostly consisted of big brown bat or various tree bats, but also included 1 call identified as a myotid species (i.e., either little brown bat or Indiana bat).

Sanders (2013b) also conducted mist netting and acoustic surveys at 26 sites within the Permit Area. A total of 41 bats of five species were captured during the mist netting: 29 big brown bats, six silver-haired bats, three northern long-eared bats, two hoary bats, and one eastern red bat. Identifiable call sequences were recorded from the following six species: big brown bat (N=446, 45 percent), hoary bat (N=232, 23 percent), silver-haired bat (N=202, 20 percent), red bat (N=35, 3.5 percent), little brown bat (N=31, 3.1 percent), and northern long-eared bat (N=1, 0.1 percent). An additional 48 calls (4.8 percent) were not identifiable to species. Of these, 35 were classified as evening bat, which is not known to occur in New York State. Sanders (2013b) indicated that these classifications are most likely fictitious, caused by approach phase or faint calls, and the true identity of these calls remains unknown. A total of 13 myotid calls were recorded at four different sites that could not be identified to the species level. Based on acoustic characteristics, the unknown myotid calls were tentatively identified as either little brown bat or Indiana bat (Sanders 2013b). A secondary analysis of the myotid calls using three 'candidate' (at the time) acoustic bat identification programs being evaluated by the Service (Kaleidoscope Pro, BCID, and EchoClass) and a follow-up qualitative analysis determined that the 13 call sequences were all little brown bat calls.

3.2.3 *Non-listed Birds*

Non-listed birds occur in the Permit Area year round, and include migrating birds (spring and fall), summer resident breeding birds, and wintering birds. The Service maintains a list of BCC (Service 2008) that are not afforded any additional Federal protection; however, they are recognized by the Service as species, subspecies, or populations of migratory nongame birds that are likely to become candidates for listing under the ESA without additional conservation actions. The Service is most concerned about eagles and BCC species, which are the focus of the baseline information in this section and the environmental effects analysis in Chapter 5. It is assumed that if the Project will not result in significant impacts to BCC species, then non-BCC species will be less affected by the Project.

The Permit Area coincides with the BCC Lower Great Lakes/St. Lawrence Plain Bird Conservation Region (BCR 13; Service 2008). In this region, there are 27 BCC species (Table 3-1). Of the 27 species, 17 have breeding ranges that include Jefferson and Lewis Counties, and ten are not known to breed in these counties (McGowan and Corwin 2008).

To determine the type and number of bird species present within the Permit Area, the NYNHP was consulted and on-site field surveys were conducted during spring and summer 2012, including three different types of breeding bird surveys (i.e., point count survey, owl survey, and meander survey), as well as raptor migration surveys during spring and fall 2012. In addition, on-site observations were recorded during the fall 2012.

Table 3-1. Birds of Conservation Concern Species Listed within Bird Conservation Region 13 and within the Permit Area

Common Name	Scientific Name	New York State Status[1]	Habitat Association	Jefferson and Lewis County Breeding Status[2]	Permit Area Status
Pied-billed Grebe	*Podilymbus podiceps*	T	Small ponds and marshes with thick vegetation	Confirmed	Not documented
Horned Grebe	*Podiceps auritus*	not listed	Small to moderate-sized, shallow freshwater ponds and marshes	Not documented	Not documented
American Bittern	*Botaurus lentiginosus*	SC	Freshwater wetlands and marshes	Confirmed	Not documented
Least Bittern	*Ixobrychus exilis*	T	Freshwater wetlands and marshes with tall vegetation	Probable	Not documented
Black-crowned Night Heron	*Nycticorax nycticorax*	not listed	Wetlands and marshes	Confirmed	Not documented
Bald Eagle	*Heliaeetus leucocephalus*	T	Tall trees near lakes, marshes, rivers	Confirmed	Confirmed[3]
Peregrine Falcon	*Falco peregrinus*	E	Cliffs, buildings, bridges	Not documented	Not documented

Common Name	Scientific Name	New York State Status[1]	Habitat Association	Jefferson and Lewis County Breeding Status[2]	Permit Area Status
Solitary Sandpiper	*Tringa solitaria*	not listed	Freshwater ponds, stream edges, temporary pools, flooded ditches and fields	Not documented	Not documented
Lesser Yellowlegs	*Tringa flavipes*	not listed	Shallow fresh and saltwater habitats	Not documented	Not documented
Upland Sandpiper	*Bartramia longicauda*	T	Open grasslands and meadows	Confirmed	Confirmed by NYNHP
Whimbrel	*Numenius phaeopus*	not listed	Coastal and inland habitat, including fields and beaches	Not documented	Not documented
Hudsonian Godwit	*Limosa haemastica*	not listed	Marshes, beaches, flooded fields, and tidal mudflats	Not documented	Not documented
Marbled Godwit	*Limosa fedoa*	not listed	Mudflats and beaches	Not documented	Not documented
Red Knot	*Calidris canutus*	not listed	Intertidal, marine habitats, near coastal inlets, estuaries, and bays	Not documented	Not documented
Semipalmated Sandpiper	*Calidris pusilla*	not listed	Mudflats, sandy beaches, shores of lakes and ponds, and wet meadows	Not documented	Not documented
Buff-breasted Sandpiper	*Calidris subruficollis*	not listed	Dry grasslands, pastures, plowed fields, and mudflats	Not documented	Not documented
Black Tern	*Chlidonias niger*	E	Marshes	Confirmed	Not documented
Common Tern	*Sterna hirundo*	not listed	Islands, marshes, and beaches of lakes and ocean	Confirmed	Not documented
Black-billed Cuckoo	*Coccyzus erythropthalmus*	not listed	Woodlands and thickets	Confirmed	Confirmed[4]

Common Name	Scientific Name	New York State Status[1]	Habitat Association	Jefferson and Lewis County Breeding Status[2]	Permit Area Status
Short-eared Owl	*Asio flammeus*	E	Large, open areas with low vegetation	Confirmed	Not documented
Red-headed Woodpecker	*Melanerpes erythrocephalus*	SC	Open rural areas with scattered trees	Confirmed	Not documented
Wood Thrush	*Hylocichla mustelina*	not listed	Mature forests	Confirmed	Confirmed[4]
Blue-winged Warbler	*Vermivora pinus*	not listed	Brushy fields, forest edges	Confirmed	Confirmed[4]
Golden-winged Warbler	*Vermivora chrysoptera*	SC	Damp, brushy fields, forest edges	Confirmed	Not documented
Cerulean Warbler	*Dendroica cerulean*	SC	Mature moist or riverside forests	Confirmed	Not documented
Canada Warbler	*Wilsonia Canadensis*	not listed	Thick, moist forest undergrowth	Confirmed	Not documented
Henslow's Sparrow	*Ammodramus henslowii*	T	Weedy fields, wet meadows	Confirmed	Not documented

[1] E=Endangered, T=Threatened, SC=Special Concern.

[2] Species identified in the New York State Breeding Bird Atlas (McGowan and Corwin 2008).

[3] Species identified during 2012 spring and fall raptor migration surveys (Sanders 2013a).

[4] Species identified during 2012 breeding bird survey (Sanders 2012a).

Bird surveys conducted in 2012 documented the occurrence of four BCR 13 BCC species: the black-billed cuckoo, wood thrush, blue-winged warbler (all of which were considered to be nesting in the Permit Area) (Sanders 2012a), and the bald eagle (identified during the spring raptor migration study) (Sanders 2013a). Based upon NYNHP database, the upland sandpiper is known within and immediately adjacent to the Permit Area.

3.3 SOCIOECONOMICS

Section 3.9 of the DEIS and Section 2.2.9 of the FEIS describes the existing socioeconomic conditions throughout the area. As shown in Table 3-2, Jefferson and Lewis Counties have experienced varying rates of population growth, decline, and stagnation over the past 30 years. Meanwhile, the Towns of Denmark, Champion, and Rutland, as well as the Village of Copenhagen, have seen varying trends and rates of either growth or decline.

Local municipal budgets vary substantially between one another, and in some cases from one year to the next. Lewis and Jefferson Counties both increased expenditures by 6 percent from 2009 to 2010. Other changes were more dramatic, including the Town of Rutland (decreased expenditures by 48 percent) and the Village of Copenhagen (increased expenditures by 152 percent). Property taxes are the single largest revenue source for local municipalities in the area. Annual municipal expenditures are recovered through each municipality's tax levy, which is borne by taxable properties according to their respective assessed value. Many factors influence the assessed value of land, including the type of land use on that property.

Table 3-2. Population Statistics for Local Communities, 1980-2010

	2010 Population	Change 2000-2010	2000 Population	Change 1990-2000	1990 Population	Change 1980-1990	1980 Population
Lewis County	27,087	0.5%	26,944	0.6%	26,796	7.0%	25,035
Town of Denmark	2,860	4.1%	2,747	1.1%	2,718	11.0%	2,448
Village of Copenhagen	801	-7.4%	865	N/A	N/A	N/A	N/A
Jefferson County	116,229	4.0%	111,738	0.7%	110,943	25.9%	88,151
Town of Champion	4,494	2.1%	4,400	-3.8%	4,574	12.8%	4,056
Town of Rutland	3,060	4.2%	2,938	-2.8%	3,023	12.6%	2,685

Source: U.S. Census Bureau 2012.

CHAPTER 4. ENVIRONMENTAL CONSEQUENCES

This chapter describes the likely or possible environmental effects of each of the three alternatives described in Chapter 2 on the environmental resources discussed in Chapter 3. Each resource section first addresses effects common to all alternatives, where applicable, and then addresses effects unique to each alternative retained for detailed analysis, where effects are different among alternatives. Each resource section concludes with a summary of the effects each alternative will have on that resources. The level of analysis is commensurate with the estimated impacts associated with Project operations, and therefore, focuses predominantly on bird and bat resources. Only limited analysis is provided for resource areas where only minor effects are anticipated (e.g., socioeconomics). Chapter 5 assesses cumulative effects for resources impacted by any of the alternatives.

Table 4-1 summarizes the three alternatives retained for detailed analysis and their effects on the Covered Species, as well as other potentially impacted species. One additional alternative has been included in this summary table, a Full Operations Alternative. This alternative is not further addressed because it was eliminated from full evaluation. However, its inclusion in this table illustrates the benefit of the operational adjustments and mitigation measures associated with the three alternatives retained for detailed analysis.

Table 4-1. Summary Comparison of Alternatives and Impacts

Element	Alternative 1: No Action (TAL Alternative)	Alternative 2: Applicant's Proposed Action	Alternative 3: Less Restrictive Operations Alternative	Full Operation[1]
Operations	<u>from 4/1 through 9/30</u> feather turbines below cut-in speed from ½ hour prior to sunset to ½ hour after sunrise *and* feather below cut-in speed in the following manner: <u>from 4/1 through 5/15:</u> 5.0 m/s cut-in speed within range of NLEB[2] maternity colony, remaining turbines 3.0 m/s cut-in speed <u>from 5/16 through 7/31:</u> 6.9 m/s cut-in speed within range of NLEB[2] maternity colony, remaining turbines 3.0 m/s cut-in speed <u>from 8/1 through 9/30:</u> 6.9 m/s cut-in speed for all turbines <u>from 10/1 through 3/31:</u> 3.0 m/s cut-in speed for all turbines (no feathering)	<u>from 4/1 through 9/30</u> feather turbines below cut-in speed between nautical sunset and sunrise (i.e., nautical twilight when the sun is 12 degrees or more below horizon) *and* feather below cut-in speed in the following manner: <u>from 4/1 through 5/15:</u> 3.0 m/s cut-in speed for all turbines <u>from 5/16 through 7/31:</u> 5.0 m/s cut-in speed within range of NLEB[2] maternity colony, remaining turbines 3.0 m/s cut-in speed <u>from 8/1 through 9/30:</u> 5.0 m/s cut-in speed for all turbines <u>from 10/1 through 3/31:</u> 3.0 m/s cut-in speed[21] for all turbines (no feathering)	<u>from 4/1 through 10/31</u> feather turbines below cut-in speed from ½ hour prior to sunset to ½ hour after sunrise in the following manner: <u>from 4/1 through 5/15:</u> 3.0 m/s cut-in speed for all turbines <u>from 5/16 through 7/31:</u> 3.0 m/s cut-in speed for all turbines <u>from 8/1 through 10/31:</u> 3.0 m/s cut-in speed for all turbines <u>from 11/1 through 3/31:</u> 3.0 m/s cut-in speed for all turbines (no feathering)	no change in normal manufacturer's cut-in speed *and* no feathering

Element	Alternative 1: No Action (TAL Alternative)	Alternative 2: Applicant's Proposed Action	Alternative 3: Less Restrictive Operations Alternative	Full Operation[1]
HCP and ITP	No	Yes. Minimization and mitigation for winter habitat for both species.	Yes. Minimization and mitigation for winter habitat for both species	No
ABPP	Yes	Yes	Yes	No
Indiana Bat Take	None	Annual Take: 0.16 25-year Project Take: 4 Females: 2 and Males: 2 Reproductive Potential: 3.2 females Impact of Take: 5 females	Annual Take: 0.24 25-year Project Take: 6 Females: 3 and Males: 3 Reproductive Potential: 4.8 females Impact of Take: 8 females	Annual Take: 0.33 25-year Project Take: 8 Females: 4 and Males: 4 Reproductive Potential: 6.4 females Impact of Take: 11 females
Northern Long-eared Bat Take	None	Annual Take: 0.44 25-year Project Take: 15 Females: 11 Males: 4 Reproductive Potential: 18 Impact of Take: 29 females	Annual Take: 0.88 25-year Project Take: 22 Females: 15 and Males: 7 Reproductive Potential: 25 Impact of Take: 40 females	Annual Take: 1.23 25-year Project Take: 31 Females: 21 and Males: 10 Reproductive Potential: 34.4 Impact of Take: 56 females
Threatened and Endangered Birds Take	None	None	None	None
Non-listed Bats Take	81 bats annually	345 bats annually	483 bats annually	690 bats annually

[21] Manufactured cut-in speed

Element	Alternative 1: No Action (TAL Alternative)	Alternative 2: Applicant's Proposed Action	Alternative 3: Less Restrictive Operations Alternative	Full Operation[1]
Non-listed Birds Take (including BCC species)	152 birds annually (range 27 to 384 birds/year); greatest potential for reduced collision mortality to nocturnal migrants from seasonal operational adjustments, due to most restrictive curtailment regime	152 birds annually (range 27 to 384 birds/year); moderate potential for reduced collision mortality to nocturnal migrants from seasonal operational adjustments	152 birds annually (range 27 to 384 birds/year); least potential for reduced collision mortality to nocturnal migrants from seasonal operational adjustment, due to least restrictive curtailment regime	152 birds annually (range 27 to 384 birds/year)
Socioeconomic	Lowest royalty payments	Planned royalty payments	Slightly higher royalty payments	Highest royalty payments

[1] This alternative is not further addressed, because it was eliminated from full evaluation (see Section 2.5.1 of this EA).

[2] NLEB = northern long-eared bat.

4.1 BIOLOGICAL RESOURCES

4.1.1 *Threatened and Endangered Species*

4.1.1.1 Indiana Bat

Alternative 1

Under Alternative 1, the turbines would be operated in accordance with the seasonal operational adjustments outlined in the TAL. These operational adjustments were developed to completely avoid take of the Indiana bat. Because Indiana bat mortality would be avoided, no HCP would be implemented, and no ITP would be issued. Offsite benefits (i.e., protection of winter habitat) would not be realized.

An ABPP would be implemented under Alternative 1. In addition to the avoidance and minimization measures, post-construction monitoring studies would be conducted following the NYSDEC *Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects* (NYSDEC 2016b) and adaptive management measures would be implemented in the event of significant impacts to birds and bats.

Alternative 2

Under Alternative 2, the Applicant would implement seasonal turbine operational adjustments for the term of the ITP (Table 4-1). All turbines would be operated with a cut-in speed of 5.0 m/s[22] during fall migration. This seasonal turbine operational adjustment protocol is designed to target the seasonal period when mortality of Indiana bats is expected to be highest. To minimize potential mortality of the summer resident northern long-eared bats, the 16 turbines within the assumed northern long-eared bat maternity colony area would also be feathered below 5.0 m/s during the summer maternity season with 3.0 m/s everywhere else. Since there is lower risk of spring migration fatalities, lower cut-in speeds of 3.0 m/s would be used (subject to adaptive management should actual mortality be higher than expected).

The population of Indiana bats that may be affected by the Project consists of the Indiana bats that hibernate within approximately 50 miles of the Permit Area, based on the maximum recorded migration distance for Indiana bats in the NERU (42 miles) (C. Herzog, NYSDEC, pers. comm. as cited in Project HCP [Copenhagen Wind Farm, LLC 2019]). Mortality of Indiana bats is expected to be low at the Project based on the low likelihood of Indiana bat occurrence within the Permit Area (Section 3.1.1.1).

Several methods (e.g., use of site-specific post-construction data, surrogate species, collision risk models, species composition) currently exist for quantifying estimated take of listed bat species at wind energy projects; each method has a set of assumptions and limitations. The HCP used

[22] All operational adjustments would occur from nautical sunset to sunrise (i.e., nautical twilight when the sun is 12 degrees or more below horizon)

the species composition method. Lacking site-specific data to develop an informed estimate for the site, the species composition method requires the least number of assumptions. The first step in the species composition approach is to determine the potential level of bat mortality (all species) at the facility. Because no post-construction monitoring data are available for the Project, all publicly available post-construction monitoring data collected after WNS impacts began at wind projects within the anticipated migratory range of the Covered Species (approximately 50 miles) from the Permit Area were considered. This dataset includes the landscape on which occur nearly all bats of the Covered Species that are likely to encounter the Project turbines and it is therefore considered to be most representative of the risk at the Project. Only post-WNS data were used to more closely represent the current and future risk at the Project. Based on the average annual bat mortality rate from this dataset, the bat mortality rate at the Project is expected to be approximately 8.629 bats/MW/year (HCP Table 5.6), or approximately 689.459 total bat fatalities per year over the Project's 79.9 MW.

The next step is to determine what proportion of the overall bat mortality rate may be attributable to Indiana bats. The level of potential mortality for particular bat species can be estimated based on the species composition of the fatalities reported in the post-construction studies from the region. Of the Indiana bat fatalities on record, the nearest to the Permit Area are the two fatalities that occurred in the AMRU, at the North Allegheny project in Blair and Cambria counties in Pennsylvania, approximately 280 miles (450 km) from the Permit Area, and at the Laurel Mountain project in Barbour and Randolph counties in West Virginia, approximately 400 miles (640 km) from the Permit Area. Although these fatalities occurred in a different recovery unit (Appalachian Mountains Recovery Unit [AMRU]) from the Permit Area, a broad-scope dataset incorporating these fatalities was considered to be appropriate for estimating take at the Project based on the current lack of knowledge of Indiana bat risk factors and the limited NERU post-WNS data post-construction fatality information available.

Based on the species composition of the carcasses reported by the studies in the NERU and AMRU, it is estimated that Indiana bats may comprise approximately 0.047 percent of the annual overall bat mortality at the Project (HCP Table 5.8), or approximately one Indiana bat fatality every three years or 0.327 Indiana bat fatality per year. This would result in an estimated take of 8.175 Indiana bats during the 25-year ITP term, before the HCP's minimization measures are considered.

Approximately 85 percent of the estimated Indiana bat take at the Project is expected to occur during the fall migration season and 15 percent in spring (based on observed seasons of Indiana bat fatalities to date; HCP Section 5.2.1.1). The seasonal turbine operational adjustment protocol is anticipated to reduce annual bat mortality due to turbine operations by at least 30 percent during spring and summer and 60 percent during fall with a reduction in the annual rate of Indiana bat take by approximately 50 percent[23]. Assuming this reduction, the estimated annual take from the Project is approximately 0.16 Indiana bat, or 4.04 Indiana bats over the 25-year

[23] (0.30 * 0.15 of take in spring/summer) + (0.60 * 0.85 of take in fall) = 55.5% reduction overall

ITP term. The level of take rounds to one Indiana bat every six to seven years and four total Indiana bats over the 25-year ITP term. Based on the expected seasonality of Indiana bat mortality at the Project, it is most likely that one mortality event may occur during spring and the other three may occur during fall.

There is currently an insufficient amount of data to determine if one sex of Indiana bat is more susceptible to turbine mortality than the other as a large proportion of *Myotis* carcasses recorded in publicly-available monitoring reports to-date were not identified to sex. Because most of the Indiana bat take is expected to occur during the fall migration season when both female and male bats are migrating across the landscape, it was assumed that Indiana bat take from the Project would, in general, affect both sexes equally. Therefore, of the maximum take of four Indiana bats estimated to occur over the 25-year permit term, approximately 50 percent (two Indiana bats) are expected to affect female Indiana bats. Because females drive the survival/reproduction of Indiana bats, only the loss of female bats is modeled (Thogmartin *et al.* 2013). The Service's Region 3 Indiana Bat and Northern Long-eared Bat Resource Equivalency Analysis Models for Wind Energy Projects (REA Models)(Service 2014b; Service *in prep*) were used to estimate the lost reproductive capacity[24] of the two female Indiana bats expected to be taken at the Project under Alternative 2. The reproductive loss associated with the mortality of two female Indiana bats is expected to be approximately three female Indiana bat pups, for a total impact of five female Indiana bats over the 25-year ITP term (plus the anticipated take of two adult males).

To mitigate for the impacts of the take of two adult female Indiana bats over the 25-year ITP term, an important hibernaculum was be gated (HCP Sections 6.4.1.2 and 7.1.6). Management and monitoring of the hibernaculum will be conducted by NYSDEC. Monitoring may include the use of speloggers and dataloggers to determine the effectiveness of the gating in preventing unauthorized visitation without negatively impacting the quality of the hibernaculum as winter bat habitat. Additionally, the hibernaculum entrances would be monitored following gating to determine if the bats accept the gate during fall swarming. It is anticipated that biannual surveys of the bat populations within the hibernaculum would continue after gating. The Applicant would provide funding for repairs or maintenance to the gates, as needed, for the duration of the ITP term. Secure hibernacula protected from disturbances such as human visitation are essential to improve over-winter survival and support the persistence of WNS-impacted bat populations in New York, which may have less of a chance of recovery if protected hibernacula are not available (Maslo *et al.* 2015). In addition to the minimization and mitigation measures implemented under Alternative 2, an intensive monitoring program and adaptive management plan would be implemented.

[24] Lost reproductive capacity refers to the number of female pups that would have been produced had the incidental take not occurred.

Alternative 3

The population of Indiana bats that may be affected by the Project and the method for quantifying estimated take of Indiana bats are the same as those described above for Alternative 2. Under Alternative 3, the Applicant would implement seasonal turbine operational adjustments for the term of the ITP (see Table 3-4). All turbines would be feathered below the cut-in speed of 3.0 m/s ½ hour before sunset to ½ hour after sunrise from April 1 through October 31, subject to adaptive management should actual mortality be higher than expected.

As discussed above, an estimated take of 8.175 Indiana bats is anticipated during the 25-year ITP term, before any minimization measures are considered. Based on the results of cut-in speed curtailment studies conducted to-date, feathering turbines under a cut-in speed of 3.0 m/s is expected to achieve at least a 30 percent reduction in mortality from the average fatality level documented at un-curtailed turbines in the region (HCP Section 6.3.3). Consequently, the estimated annual take from the Alternative 3 is approximately 0.229 Indiana bat[25], or 6 Indiana bats over the 25-year ITP term. The level of take rounds to one Indiana bat every four to five years. Based on the expected seasonality of Indiana bat mortality at the Project, one fatality (18 percent) is anticipated during spring, while the other five would likely occur during fall.

Of the 6 Indiana bats estimated to be taken over the 25-year permit term, approximately 50 percent of the mortality (i.e., three Indiana bats) is expected to affect female Indiana bats. As described for Alternative 2, the Service's Region 3 Indiana Bat and Northern Long-eared Bat Resource Equivalency Analysis Models for Wind Energy Projects Projects (REA Models)(Service 2014b; Service *in prep*) were used to estimate the lost reproductive capacity[26] of the three female Indiana bats expected to be taken at the Project under Alternative 3. The reproductive loss associated with the mortality of three female Indiana bats is expected to be approximately five female Indiana bat pups, for a total impact of eight female Indiana bats over the 25-year ITP term.

Under Alternative 3, the Applicant would implement offsite mitigation measures that would be of sufficient biological value to the Covered Species to fully mitigate for the impact of the taking. The type of mitigation under this alternative would be the same as that described above for Alternative 2 (i.e., the Applicant would provide funding for mitigation projects to protect winter habitat, as well as funding to monitor the mitigation projects). However, more mitigation would likely be needed Under Alternative 3 to offset the increased impact of take that would occur.

[25] 8.175 Indiana bats * 0.3 reduction = 2.453 fewer Indiana bats killed. 8.175 Indiana bats -2.453 Indiana bats /25 years = 0.229 Indiana bats/year

[26] Lost reproductive capacity refers to the number of female pups that would have been produced had the incidental take not occurred.

Summary

Each of the alternatives includes operation of a wind project, which can cause the deaths of Indiana bats. The three alternatives differ with respect to operational adjustments, and the extent of mitigation implemented to offset the impact of taking of Indiana bats:

- Alternative 1 would implement operational adjustments that would entirely avoid Indiana bat fatalities.
- Alternative 2 would result in the take of four Indiana bats (two male and two female) over the 25-year term of the ITP. The reproductive loss associated with the mortality of two female Indiana bats is expected to be three Indiana bat pups, for a total impact of five female Indiana bats over the 25-year ITP term.
- Alternative 3 would result in the take of six Indiana bats (three male and three female) over the 25-year term of the ITP. The reproductive loss associated with the mortality of three female Indiana bats is expected to be five Indiana bat pups, for a total impact of eight female Indiana bats over the 25-year ITP term.

Alternative 1 would not require an ITP, and accordingly, no HCP would be implemented. Under either Alternative 2 or Alternative 3, the Service would issue an ITP, and both would include implementation of an HCP that would require monitoring, as well as winter habitat mitigation projects that would offset the take. Because the take would be higher under Alternative 3, more mitigation would likely be required.

4.1.1.2 Northern Long-eared Bat

Alternative 1

Under Alternative 1, the turbines would be operated in accordance with the seasonal operational adjustments outlined in the TAL. These operational adjustments were developed to completely avoid take of the northern long-eared bat. Because northern long-eared bat mortality would be avoided, no HCP would be implemented, and no ITP would be issued. Offsite benefits (i.e., protection of winter habitat) would not be realized.

An ABPP would be implemented under Alternative 1. In addition to the avoidance and minimization measures, post-construction monitoring studies would be conducted following the NYSDEC *Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects* (NYSDEC 2016b) and adaptive management measures would be implemented in the event of significant impacts to birds and bats.

Alternative 2

Under Alternative 2, the Applicant would implement seasonal turbine operational adjustments for the term of the ITP (Table 4-1). All turbines would be operated with a cut-in speed of 5.0 m/s during fall migration. This seasonal turbine operational adjustment protocol is designed to target the seasonal period when mortality of northern long-eared bats is expected to be highest. To minimize potential mortality of the summer resident northern long-eared bats, the 16 turbines within the assumed northern long-eared bat maternity colony area would also be feathered below 5.0 m/s during the summer maternity season with 3.0 m/s everywhere else. Since there is lower risk of spring migration fatalities, lower cut-in speeds of 3.0 m/s would be used (subject to adaptive management should actual mortality be higher than expected).

Based on the most frequently recorded migration distances for northern long-eared bats (Service 2014a), northern long-eared bats occurring within the Permit Area are expected to belong to the Glen Park hibernating population or populations from other, unknown hibernacula within approximately 50 miles of the Permit Area.

As described above for Indiana bats (Section 4.1.3.1), the species composition method was determined to be the most appropriate method for estimating take. This is based on the lack of available post-construction data at the actual project site. The closest northern long-eared bat fatality records to the Permit Area were recorded in Wyoming and Steuben Counties in western New York. Although these fatalities occurred in a different part of the state, a broad-scope dataset incorporating these fatalities was considered to be appropriate for estimating take at the Project based on the paucity of post-WNS data available. Inclusion of these fatalities is conservative and may overestimate mortality at most wind projects because six of the seven post-WNS fatalities were recorded at one wind energy project, Noble Wethersfield, and may consequently reflect an unidentified difference in mortality at that project. Therefore, the large and standardized post-construction mortality dataset for Pennsylvania wind projects was also included in the take estimate for northern long-eared bats to encompass a greater range of potential mortality.

The same initial steps described above for estimating take of Indiana bats were followed for estimating take of northern long-eared bats. Based on the species composition of the carcasses reported by the studies in the NERU and AMRU, it is estimated that northern long-eared bats may comprise approximately 0.18 percent of the annual overall bat mortality at the Project (HCP Table 5.11), or approximately 1.242 northern long-eared bat fatalities per year. This would result in an estimated take of 31.057 northern long-eared bats during the 25-year ITP term, before the HCP's minimization measures are considered.

Approximately 62 percent of the estimated northern long-eared bat take at the Project is expected to occur during the fall migration season, 13 percent in spring and 25 percent summer (HCP Section 5.2.2.1). The seasonal turbine operational adjustment protocol is anticipated to reduce annual bat mortality due to turbine operations by at least 30 percent during spring and summer and 60 percent during fall with a reduction in the annual rate of northern long-eared bat take by approximately 50-55 percent[27]. Assuming a 50 percent reduction, the estimated annual take from the Project is approximately 0.621 northern long-eared bat, or 15.528 northern long-eared

[27] (0.30 * 0.13 of take in spring) + (0.60 * [0.25 of take in summer + 0.62 of take in fall]) = 56.1% reduction overall

bats over the 25-year ITP term. This level of take rounds to one northern long-eared bat every one to two years and 16 total northern long-eared bats over the 25-year ITP term. Based on the expected seasonality of northern long-eared bat mortality at the Project, take is anticipated in the following manner: two during spring, four during summer, and the remaining ten during fall.

Of the maximum estimated take of 16 northern long-eared bat over the 25-year permit term, all of the take in spring and summer (38 percent of total take; six bats, all female) is expected to affect female bats and approximately 50 percent of the take in fall (62 percent of total take; ten bats, both sexes) expected to affect female northern long-eared bats (five female bats). Thus, a total of 11 of the 16 northern long-eared bat fatalities expected under Alternative 2 would be female bats. There is currently an insufficient amount of data to determine if one sex of northern long-eared bat is more susceptible to turbine mortality than the other as a large proportion of *Myotis* carcasses recorded in publicly-available monitoring reports to-date were not identified to sex. Because most of the northern long-eared bat take is expected to occur during the fall migration season when both female and male bats are migrating across the landscape, it was assumed that northern long-eared bat take from the Project during this season would in general affect both sexes equally. However, due to the presence of a maternity colony within the Permit Area, spring and summer take is expected to affect primarily female northern long-eared bats.

Similar to Indiana bats, because females drive the survival/reproduction of northern long-eared bats, only the loss of female bats is modeled. The Service's Region 3 Indiana Bat and Northern Long-eared Bat Resource Equivalency Analysis Models for Wind Energy Projects (REA Models)(Service 2014b; Service *in prep*) were used to estimate the lost reproductive capacity[28] of the 11 female northern long-eared bats expected to be taken at the Project under Alternative 2.

The reproductive loss associated with the mortality of 11 female northern long-eared bats is expected to be approximately 18 female northern long-eared bats pups, for a total impact of 29 female northern long-eared bats over the 25-year ITP term.

As described above for Indiana bats and in HCP Sections 6.4.1.2 and 7.1.6, to mitigate for the taking of northern long-eared bats, the Applicant would provide for protection of winter habitat for northern long-eared bats. The winter habitat mitigation project is expected to fully offset the impact of take of the northern long-eared bat.

In addition to the minimization and mitigation measures implemented under Alternative 2, an intensive monitoring program and adaptive management plan would be implemented as part of the HCP.

[28] Lost reproductive capacity refers to the number of female pups that would have been produced had the incidental take not occurred.

Alternative 3

The population of northern long-eared bats that may be affected by the Project and the method for quantifying estimated take of northern long-eared bats are the same as those described above for Alternative 2. Under Alternative 3, the Applicant would implement seasonal turbine operational adjustments for the term of the ITP (see Table 3-4). All turbines would be feathered below the cut-in speed of 3.0 m/s from April 1 through October 31, subject to adaptive management should actual mortality be higher than expected.

As discussed above, an estimated take of 31.057 northern long-eared bats is anticipated during the 25-year ITP term, before any minimization measures are considered. Based on the results of cut-in speed curtailment studies conducted to-date, feathering turbines under a cut-in speed of 3.0 m/s is expected to achieve at least a 30 percent reduction in mortality from the average fatality level documented at un-curtailed turbines in the region (HCP Section 6.3.3). Consequently, the estimated annual take from the Project with implementation of the minimization measures is approximately 0.87 northern long-eared bat, or 22 northern long-eared bats over the 25-year ITP term. Based on the expected seasonality of northern long-eared bats mortality at the Project, nine fatalities are anticipated during spring and summer, while the other 13 would likely occur during fall.

Of the maximum estimated take of 22 northern long-eared bat over the 25-year permit term, all of the take in spring and summer (38 percent of total take; eight bats, all female) is expected to affect female bats and approximately 50 percent of the take in fall (62 percent of total take; 14 bats, both sexes) expected to affect female northern long-eared bats (seven female bats). Thus, a total of 15 of the 22 northern long-eared bat fatalities expected under Alternative 3 would be female bats. As described for Alternative 2, the Service's Region 3 Indiana Bat and Northern Long-eared Bat Resource Equivalency Analysis Models for Wind Energy Projects (REA Models)(Service 2014b; Service *in prep*) were used to estimate the lost reproductive capacity of the 15 female northern long-eared bats expected to be taken at the Project under Alternative 3. The reproductive loss associated with the mortality of 15 female northern long-eared bats is expected to be approximately 25 female northern long-eared bats pups, for a total impact of 40 female northern long-eared bats over the 25-year ITP term.

Under Alternative 3, the Applicant would implement offsite mitigation measures that would be of sufficient biological value to the Covered Species to fully mitigate for the impact of the taking. The type of mitigation under this alternative would be the same as that described above for Alternative 2 (i.e., the Applicant would provide funding for mitigation projects to protect winter habitat, as well as funding to monitor the mitigation projects). However, more mitigation would likely be needed Under Alternative 3 to offset the increased impact of take that would occur.

Summary

Each of the alternatives includes operation of a wind project, which can cause the deaths of northern long-eared bats. The three alternatives differ with respect to operational adjustments, and the extent of mitigation implemented to offset the impact of taking of Indiana bats and northern long-eared bats:

- Alternative 1 would implement operational adjustments that would entirely avoid northern long-eared fatalities.
- Alternative 2 would result in the take of 16 northern long-eared bats (five male and 11 female) over the 25-year term of the ITP. The reproductive loss associated with the mortality of 11 female northern long-eared bats is expected to be 18 female northern long-eared bat pups, for a total impact of 29 female northern long-eared bats over the 25-year ITP term.
- Alternative 3 would result in the take of 22 northern long-eared bats (seven male and 15 female) over the 25-year term of the ITP. The reproductive loss associated with the mortality of 15 female northern long-eared bats is expected to be 25 female northern long-eared bat pups, for a total impact of 40 female northern long-eared bats over the 25-year ITP term.

Alternative 1 would not require an ITP, and accordingly, no HCP would be implemented. Under either Alternative 2 or Alternative 3, the Service would issue an ITP, and both would include implementation of an HCP that would require extensive monitoring, as well as winter habitat mitigation projects that would offset the take. Because the take would be higher under Alternative 3, more mitigation would likely be required.

4.1.1.3 Upland Sandpiper

Direct and Indirect Effects Common to All Alternatives

Little data is available specific to the impacts of wind turbines on upland sandpiper. With regard to displacement, a before-and-after-control-impact study in North Dakota and South Dakota found delayed displacement from the constructed wind project and sustained displacement (two to five years post-construction) within 100 meters of a wind turbine (Shaffer and Buhl 2016). This displacement behavior is likely due to site fidelity for the species, such that upland sandpipers may initially return to their breeding grounds near a turbine site post-construction, but intolerance to the wind turbines may cause them to not return in subsequent years (Shaffer and Buhl 2016). A post-construction study in Ontario found little change in breeding density between 0 and 200 meters from the turbine base, but a decrease at 200 to 300 meters (Stantec 2011). Courtship display flights can be within rotor swept zones (Illinois Department of Natural Resources 2007), suggesting potentially elevated collision risk. However, in a post-construction mortality study in northeastern Wisconsin where upland sandpiper was “widespread and fairly common”, and often observed “very close to the wind turbines”, no fatalities to the species were recorded (Howe *et al.* 2002), suggesting possible turbine avoidance behavior. The Ontario study likewise recorded no upland sandpiper fatalities (Stantec 2011). The risk of upland sandpiper collision, disturbance, displacement, or habitat loss as a result of operation of the Project is considered low based on the species’ low frequency of occurrence in the area.

Various seasonal turbine operational adjustments would be implemented under each of the three alternatives. These curtailment strategies were developed to protect the Indiana bat and northern long-eared bat and are not expected to have a significant impact on most listed avian species, since curtailment would occur at night and most of the avian threatened, endangered, and species of special concern are diurnal migrants. Upland sandpiper are night migrants, however, so collision risk to these rare birds may be reduced somewhat when turbine operation is curtailed, particularly if such curtailment happens to occur in foggy weather conditions when birds are most vulnerable to collisions.

Implementation of the ABPP (Appendix D) is also included as part of all three alternatives. The ABPP provides guiding principles and specific implementation strategies for wind developers in order to limit impacts to birds and bats from the Project. In addition to the avoidance and minimization measures in the ABPP, post-construction monitoring studies would be conducted following the NYSDEC *Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects* (NYSDEC 2016b) and adaptive management measures would be implemented in the event of significant impacts to endangered, threatened, or special concern birds.

Summary

None of the alternatives are anticipated to result in significant impacts to upland sandpiper.

4.1.1.4 Bald Eagle

Direct and Indirect Effects Common to All Alternatives

Only migrant or transient bald eagles are anticipated in the Permit Area and only in low numbers (one migrant observed during pre-construction studies)(Appendix D). Consequently, the potential for direct mortality or injury to bald eagles from colliding with wind turbines is low. Similarly, the potential for disturbance, displacement, or habitat impacts that would affect this species are also low. Therefore, potential adverse impacts to bald eagle are considered unlikely.

Implementation of the ABPP is included as part of all three alternatives. The ABPP provides guiding principles and specific implementation strategies for wind developers in order to limit impacts to birds and bats from the Project.

Summary

No adverse effects to the bald eagles are anticipated under any of the alternatives, due to the low number of eagles utilizing the area and low risk to these species.

4.1.1.5 Northern Harrier

Direct and Indirect Effects Common to All Alternatives

Although foraging and courtship behavior by this species suggests the possibility of elevated collision risk, very low northern harrier mortality has been documented from wind turbines, even at sites that have relatively high use by this species (Erickson *et al.* 2002; Howe *et al.* 2002;

Stantec 2011). The risk of northern harrier collision, disturbance, displacement, or habitat loss as a result of operation of the Project is considered unlikely based on the species' low frequency of occurrence in the area and low levels of observed mortality resulting from wind farms.

Various seasonal turbine operational adjustments would be implemented under each of the three alternatives. These curtailment strategies were developed to protect the Indiana bat and northern long-eared bat and are not expected to have a significant impact on most listed avian species, since curtailment would occur at night and most of the avian threatened, endangered, and species of special concern are diurnal migrants.

Implementation of the ABPP is also included as part of all three alternatives. The ABPP provides guiding principles and specific implementation strategies for wind developers in order to limit impacts to birds and bats from the Project. In addition to the avoidance and minimization measures in the ABPP, post-construction monitoring studies would be conducted following the NYSDEC *Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects* (NYSDEC 2016b) and adaptive management measures would be implemented in the event of significant impacts to endangered, threatened, or special concern birds.

Summary

None of the alternatives are anticipated to result in impacts to the northern harrier.

4.1.2 *Non-listed Bats*

To compare alternatives we estimated the potential level of all bat mortality from the Project without any operational adjustments and then applied estimates of anticipated reductions in fatalities based on publicly available curtailment studies and reports (see Appendix E for details).

Based on the average annual bat mortality rate from this dataset, the bat mortality rate at the Project is expected to be approximately 8.629 bats/MW/year (HCP Table 5.6), or approximately 689.459 total bat fatalities per year over the Project's 79.9 MW, absent any operational adjustments.

Alternative 1

Alternative 1 would implement seasonal turbine operational adjustments (Table 2-4) designed to avoid all impacts to Indiana bats and northern long-eared bats. The primary component of this alternative is feathering turbine blades below 6.9 m/s around the NLEB colony in summer and across the entire Project from 8/1 to 9/30. It is anticipated that operational curtailment would also significantly reduce the potential for mortality of non-listed bats, because most bats are known to be able to avoid stationary objects (Kerns *et al.* 2005; Service 2007).

Based on the results of curtailment studies conducted to date, Alternative 1 is expected to achieve at least an 88.3 percent reduction in all-bat mortality from the average fatality level documented at un-curtailed turbines in the region. Consequently, approximately 81 bat fatalities per year[29] would occur each year under Alternative 1. The represents the lowest direct mortality of non-listed bat species among the three alternatives under consideration. The offsite mitigation for the Covered Species that would be implemented as part of the proposed action would not occur, and any benefit to non-listed cave-hibernating bats resulting from this mitigation would not be realized.

Implementation of the ABPP (Appendix D) is included as part of Alternative 1. The ABPP provides guiding principles and specific implementation strategies for wind developers in order to limit impacts to birds and bats from the Project. In addition to the avoidance and minimization measures, initial post-construction monitoring studies would be conducted following the NYSDEC *Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects* (NYSDEC 2016b) and adaptive management measures would be implemented in the event of significant impacts to birds or bats.

Alternative 2

Alternative 2 also includes operational measures (Table 2-2) to reduce mortalities to Indiana bats and northern long-eared bats. The available information from curtailment effectiveness studies conducted to-date suggests that the seasonal turbine operational adjustment protocol would reduce annual bat mortality by at least 30 percent during spring and summer and 60 percent during fall. If we assume that all-bat seasonality rates are proportional to Indiana bats, this will result in a reduction in the annual rate of all-bat mortality by approximately 50 percent[30] to approximately 345 total bat fatalities per year[31].

It is currently unclear if operational adjustments would be equally effective at reducing mortality among different species or species groups. Collectively, hoary bats, eastern red bats, and silver-haired bats comprise the vast majority of all bat fatalities documented at wind facilities, representing 78 percent of total estimated fatalities between 2000 and 2011 (Arnett and Baerwald 2013). Consequently, these three species have provided the bulk of the all-bat fatality data analyzed in the curtailment studies to-date.

The mitigation project that will be implemented to compensate for the take of the Covered Species may result in a benefit to other cave-wintering bat species by providing a secure hibernaculum for all species using the site. The mitigation project will not benefit nor adversely impact hoary, eastern, or silver-haired bats.

Implementation of the ABPP is also included as part of the Alternative 2. The ABPP provides guiding principles and specific implementation strategies for wind developers in order to limit impacts to birds and bats from the Project. There are conservation measures and BMPs that may

[29] 689.459 total bats killed/year * 0.883 reduction = 608.792 less bats = 80.667 (81) total bats killed/year

[30] (0.30 * 0.28 of take in spring/summer) + (0.60 * 0.72 of take in fall) = 51.6% reduction overall

[31] 689.459 total bats killed/year * 0.50 reduction = 344.73 less bats = 344.76 (345) total bats killed/year

be implemented to minimize bat mortality and reduce the amount of habitat disturbed from the Project. In addition to the avoidance and minimization measures, post-construction monitoring studies would be conducted following the NYSDEC *Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects* (NYSDEC 2016b) and adaptive management measures would be implemented in the event of significant impacts to bats.

Alternative 3

Alternative 3 includes an HCP that would provide benefits to non-listed bat species through minimization and mitigation measures, and an ABPP. Turbines would be feathered below 3.0 m/s from ½ hour prior to sunset to ½ hour after sunrise between April 1 to October 31.

Based on the results of curtailment studies conducted to-date, this measure is expected to achieve at least a 30 percent reduction in all-bat mortality from the average fatality level documented at un-curtailed turbines in the region for a total of approximately 483 bat fatalities per year[32]. The represents the highest mortality of non-listed bat species among the three alternatives under consideration.

The mitigation project that will be implemented to compensate for the take of the Covered Species may result in a benefit to other cave-wintering bat species by providing a secure hibernaculum for all species using the site. The mitigation project will not benefit nor adversely impact hoary, eastern, or silver-haired bats.

Summary

Alternative 1 would result in approximately 81 non-listed bat fatalities per year. Implementation of Alternative 2 would result in approximately 345 bat fatalities per year, while Alternative 3 would result in approximately 483 bat fatalities per year.

Alternative 1 does not include an HCP, so offsite mitigation for the Covered Species that could also benefit non-listed cave-wintering bat species would not be implemented. Alternative 2 and Alternative 3 would both provide offsite winter habitat mitigation projects that may also benefit other cave-wintering bat species.

4.1.3 ***Non-listed Birds***

Direct and Indirect Effects Common to All Alternatives

Operational impacts of the Copenhagen Wind Farm are expected to include wildlife displacement due to the presence of the wind turbines and avian mortality as a result of collisions with operating turbines. These potential impacts are discussed in Section 3.3.2.2.2 of the DEIS. As discussed previously in Section 3.2.3, the Service has analyzed the impacts on BCC species

[32] 689.459 total bats killed/year * 0.30 reduction = 206.838 less bats = 482.621 (483) total bats killed/year

because they are the most vulnerable species and it is assumed that if the Project will not result in significant impacts to BCC species, then non-BCC species will be less affected by the Project. None of the BCC species are anticipated to be significantly impacted as a result of any of the Project alternatives.

As summarized in Table 4-1, the Applicant would implement various seasonal turbine operational adjustments under each of the alternatives. While the curtailment strategies were developed to protect the Indiana bat and northern long-eared bat, they may also provide a benefit to some BCC species, namely fall nocturnal migrants. There would be no benefit to diurnally active BCC species from such strategies because any operational minimizations for bats would only occur during nighttime hours. There would potentially be minimal benefits to the nocturnal migrant BCC species that migrate south during periods of operational minimization. Such minimizations could potentially reduce avian collisions with turbines for these species; however, it remains unproven that operational minimizations intended to reduce bat mortality reduce avian mortality. Therefore, only a slight reduction in mortality of BCC species may result from this measure.

A greater reduction to avian mortality is likely to occur through the conservation measures and BMPs from implementation of the ABPP (Appendix D), which would occur under all three alternatives. Should post-construction monitoring indicate that avian mortality exceeds the expected rate or should a mass avian casualty event occur, adaptive management measures, including mitigation, would be implemented as part of the ABPP.

Summary

Minimal adverse effects to the local bird populations are anticipated under any of the alternatives, because it is not anticipated that the Project will result in a significant number of bird deaths that could have population-level impacts.

4.2 SOCIOECONOMICS

Section 3.9 of the DEIS and Section 2.2.9 of the FEIS analyzed effects on local socioeconomics[33]. The implementation of any of the three alternatives will have a small effect on local socioeconomics based upon the operational protocols employed. The Applicant estimates operation and maintenance of the proposed facility could increase local employment demand by up to six full time workers.

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[33] The project at that time included a 47-turbine layout sized at 1.7 MW each, for a total nameplate capacity of 79.9 MW. Since the release of the FEIS, the number of turbines has decreased from 47 turbines to 40 turbines; however, the nameplate capacity of 79.9 MW remains the same for all three alternatives. Therefore, the numbers presented below are not expected to change significantly and are still applicable to the potential socioeconomic impacts associated with the Project.

The operation and maintenance of the proposed facility is anticipated to have a positive impact on municipal budgets through the provision of payments in lieu of taxes (PILOT). Although the structure of such payments has not yet been formalized by the Applicant and local taxing jurisdictions, the annual revenue stream from the PILOT will be distributed among the relevant taxing jurisdictions according to their share as determined by the local combined tax rates and pursuant to the terms of the PILOT Agreement. The operation and maintenance of the proposed facility could bring some positive impact to municipal budgets through the sales taxes associated with facility-related expenditures. Beyond sales taxes and the positive impacts stemming from the Project PILOT (as well as the eventual full taxation of Project infrastructure), the operation of the proposed facility is not expected to have any direct impact on the municipal tax bases in the area.

Although the presence of wind turbines will increase the value of the properties on which they are located and generate income for the participating landowners, the landowners of these properties will not be assessed a higher value to reflect these improvements, due to the allowed tax exemption pursuant to New York State Real Property Tax Law, Article 4, §487. Therefore, the Project should have no effect on future real property tax obligations for each participating landowner.

As summarized in Table 2-4, the Applicant would implement various seasonal turbine operational adjustments under each of the alternatives that involve curtailing the turbines during night time hours when the Covered Species are active. The differences between the operational protocols will have an effect on power production, which in turn will affect the royalty payments made to landowners with turbines on their lands. These payments are based in part on the actual power generation of the turbines; thus, the less restrictive the curtailment, the more energy will be produced, and the higher the royalty payments will be. There are insufficient data to characterize the extent of the effect that restricted operations under any individual alternative will have on royalty payments to the landowners; however, Alternative 1 would have the greatest potential to reduce energy production, while Alternative 3, would have the least potential to reduce energy production. The applicant anticipates that differences in energy production and revenue generated will be significant among the three alternatives. No impacts to socioeconomics are anticipated from mitigation.

CHAPTER 5. CUMULATIVE EFFECTS

5.1 METHODS FOR CUMULATIVE EFFECTS ANALYSIS

The purpose of this cumulative effects evaluation is to determine how environmental conditions may be impacted due to the implementation of each alternative during the 25-year time period. The CEQ defines cumulative effects as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR 1508.7).

During the cumulative effects evaluation for each resource, we first considered whether there is a potential for impact to a resource under any of the alternatives under consideration. If an impact was identified, the following items were considered:

- Geographic scope of the affected resource;
- Past, present, and reasonably foreseeable future actions affecting the resource; and
- Potential cumulative impacts or benefits to that resource based on the incremental impact of each alternative when added to other past, present, and reasonably foreseeable future actions.

If none of the alternatives would result in a direct or indirect effect on a resource, then further analysis of potential cumulative effects was not necessary as there are no expected incremental impacts to that particular resource. Therefore, the cumulative effects evaluation examines the incremental effects of benefits on each resource area for which there are direct or indirect effects or benefits, including:

- Indiana bat
- Northern long-eared bat
- Non-threatened and non-endangered bats
- Non-threatened and non-endangered birds

The cumulative effects evaluation does not examine the following resources, which are not anticipated to have a direct or indirect effect or benefit under any of the alternatives:

- Bald eagle
- Upland sandpiper
- Northern harrier

In addition, socioeconomics and historic and cultural resources were not evaluated, as any of the alternatives would have a negligible effect, which would become diminished when evaluated on a larger geographic scale as is used for determining cumulative effects.

The cumulative effects analysis does not attempt to quantify the effects of past and present actions for all affected resources as it would be impractical to obtain and analyze the values of impacts from all actions. This analysis largely evaluates past and present actions in a general manner, which is more conducive to capturing the cumulative effects of past human actions and natural events. Reasonably foreseeable actions are analyzed the same way with the exception of wind projects. Because of the level of concern for bird and bat mortality from the potential build out of wind energy, this cumulative effects analysis attempts to quantify the effects of present and reasonably foreseeable future wind projects on bird and bat populations, with particular focus on mortality.

The temporal scope of the cumulative analysis extends 25 years into the future, which is the duration of the requested ITP. The analysis area for cumulative effects varies by resource, but is generally defined as the NERU for the bats and BCR 13 for the birds. The threats identified for analysis for birds and bats within the scope of the cumulative effects of this EA include:

- Wind energy development and collisions with other man-made structures
- Habitat loss
    - Silviculture
    - Commercial and Residential Development
- Climate change

Additional threats identified for analysis specific to Indiana bats, northern long-eared bats, and non-threatened and non-endangered bat resources within the scope of the cumulative effects of this EA include:

- Destruction/disturbance of underground hibernacula (e.g., caves, mines)
- White-nose syndrome

5.1.1 *Wind Energy Development and Collisions*

Based on 2019 data compiled by the American Wind Energy Association (AWEA) and CanWEA, there is currently 13,192 MW of wind energy generation in operation within States and Provinces within BCR 13 (Table 5-1). This region encompasses 201,300 km^2, with Ontario comprising the largest portion (42 percent, 84,546 km^2), followed by New York (27 percent, 54,351 km^2), Quebec (14 percent, 28,182 km^2), Ohio (11 percent, 22,143 km^2), Pennsylvania (4 percent, 8,052 km^2), and Vermont (2 percent, 4,026 km^2). We calculated the percentage of land BCR 13 comprises of the total land area of each of these states and multiplied that by the MW installed in each state to estimate the amount of wind development within this area.

The U.S. Energy Information Administration (USEIA) predicts a nationwide growth rate of 3.7 percent annually for installed wind energy capacity between 2015 and 2040 (USEIA 2016). Applying this growth rate to the current installed capacity in BCR 13 over the 25-year life of the Project, the 25-year projected total installed wind capacity is estimated at 3,703 MW (Table 5-1).

The AMRU (Figure 3-3) consists of West Virginia, approximately 75 percent of Pennsylvania, approximately 50 percent of Maryland, approximately 33 percent of Virginia, approximately 12.5 percent of Tennessee, and approximately 16.5 percent of North Carolina. Estimates for the AMRU were made by taking these proportions of the current and future wind energy and adding them together.

Table 5-1. Installed, Under Construction and Projected Wind Energy Development within BCR 13[1]

State	Current and Under Construction		25-Year Predicted Installation
	# MW[2]	# MW	# MW[3]
New York	1,987*0.38	755	1,805
Ontario	5,076 *0.09	457	1,093
Quebec	3,882*0.02	78	187
Ohio	729*0.19	139	332
Pennsylvania	1,369*0.07	96	229
Vermont	149*0.16	24	57
Total	**13,192**	**-**	**-**
Total (BCR 13)	**-**	**1,549**	**3,703**

[1] Numbers are approximated since the locations of projected wind facilities are not known.

[2] From https://canwea.ca/wind-energy/installed-capacity/ and https://www.awea.org/resources/fact-sheets/state-facts-sheets accessed 6/10/2019 multiplied by proportion of the state BCR 13 covers.

[3] Based on a projected annual growth of 3.7 percent per year (USEIA 2016).

There are approximately 2,145 MW within the States that occur within the NERU. The U.S. Energy Information Administration (USEIA) predicts a nationwide growth rate of 3.7 percent annually for installed wind energy capacity between 2015 and 2040 (USEIA 2016). Applying this growth rate to the current installed capacity in BCR 13 over the 25-year life of the Project, the 25-year projected total installed wind capacity is estimated at 5,130 MW (Table 5-2). Many of these turbines will be outside of the actual NERU boundary or within the boundary but outside of specific areas we would anticipate Indiana bats or northern long-eared bats to occur.

Table 5-2. Installed, Under Construction and Projected Wind Energy Development in NERU States[1]

State	Currently Installed/Under Construction[2]	25-Year Predicted Installation
	# MW	# MW[3]
New York	1,987	4,752
Vermont	149	356
New Jersey	9	22
Total	**2,145**	**5,130**

[1] Numbers are approximated since the locations of projected wind facilities are not known.

[2] From AWEA state fact sheets available at https://www.awea.org/resources/fact-sheets/state-facts-sheets accessed 6/10/2019 and multiplied by the percent of the state BCR covers.

[3] Based on a projected annual growth of 3.7 percent per year (USEIA 2016).

5.1.2 *Habitat Loss and Fragmentation*

Silviculture

Statewide forest land area for New York totals approximately 19 million acres, which is about 63 percent of the State's land area (USDA Forest Service 2015a). Although statewide forest area has increased approximately 2 percent since 1993, this trend is slowing. From 1993 to 2007, the annual average increase of forestland was approximately 27,000 acres; however, between 2007 and 2012 the annual average increase of forestland was 9,000 acres. Of the 19 million forested acres in New York, approximately 588,600 acres are within Lewis County and 437,500 acres are within Jefferson County (USDA Forest Service 2015b). Lewis and Jefferson Counties had large increases in forest land in 2007 compared to previous inventories, because these counties occur in a region where farm land is reverting to forestland. However, this trend slowed to 2.8 percent in the 2012 inventory and development increased. These data suggest that the area of forest land in New York may be nearing a peak.

Approximately 84 percent, or 15.9 million acres, of New York's forestland is classified as timberland, an increase of 508,000 acres (1.1 percent growth) since 1993. Only 62,000 of this increase occurred between 2007 and 2012. Across the state, forests are continuing to mature as large amount of timberland have grown to sawtimber size. In 2016, 166 million cubic feet of industrial wood was processed, consisting of 478 million board feet of log production and 2.0 million green tons of pulpwood and chips. Most logs were processed at mills in the State. Of the 166 million cubic feet of industrial wood harvested from the State, about 133 million cubic feet (80 percent) was processed at in-state mills and the remainder was shipped to either Canada or surrounding states. In 2016, there were approximately 140 fixed location, traditional sawmills operating in New York. It is estimated that there could be about 1,800 small capacity mills, such as portable sawmills, processing an additional 60 million board feet (NYSDEC 2017).

Tree harvesting can kill or injure birds and bats if they are present in felled trees, and can cause habitat loss and fragmentation, and changes in plant and animal species diversity and abundance.

Commercial and Residential Development

Urbanization, agriculture, and residential development all occur to some degree in Lewis and Jefferson counties and all these activities are likely to continue into the reasonably foreseeable future. Most development has been concentrated around the City of Watertown and the Fort Drum Military Installation.

Agricultural activities, urbanization, and residential development convert habitat for the length of time that the development is maintained. Development that results in pavement (asphalt, concrete) results in an extreme conversion of habitat with a very slow recovery rate unless pavement is removed. Conversely, some active agricultural lands may be inactive and revert to native habitats within the 25-year permit term, as is currently the trend for Lewis and Jefferson counties.

Impacts to resources from commercial and residential development in Lewis and Jefferson counties include habitat loss, alteration, and fragmentation and changes in plant and animal species diversity and abundance.

5.1.3 *Climate Change*

Temperatures are warming across New York State, with an average rate of warming over the past century of 0.25 °F per decade; this warming is broadly consistent with the trend for the Northeast United States, which was 0.16 ˚F per decade for the 1895 to 2011 period (Horton *et al.* 2014). Climate change effects on bird and bat species may be in the form of increased temperatures, more frequent/intense heatwaves, increased annual precipitation, more severe weather events (e.g., thunderstorms, flooding, and droughts) and less severe winters, all of which may disrupt normal behavior patterns (e.g., breeding, feeding, or sheltering).

In New York's State Wildlife Action Plan, "climate change" was cited as the third most common threat to Species of Greatest Conservation Need (SGCN) and Species of Potential Conservation Need, behind only "pollution" and "invasive and problematic native species" (NYSDEC 2015). NYNHP assessed the climate vulnerability of 119 wildlife species, comprised largely of SGCN, and found that 70 species (59 percent) were vulnerable (Schlesinger *et al.* 2011). Some taxonomic groups were determined to be more vulnerable to climate change than others with the majority of New York's bird and mammal species receiving moderate-to-low rankings for climate change vulnerability (Schlesinger *et al.* 2011).

5.1.4 *Destruction/Disturbance of Hibernacula*

Commercial cave tours, recreational caving, scientific research-related activities, and vandalism are the significant sources of human disturbance to hibernating bats. Human disturbances can cause the bats to arouse from hibernation and more quickly exhaust fat reserves. While disturbance rarely results in immediate mortality, the correlation between the disturbance of hibernating bats and a decrease in population size has been well documented (Barbour and Davis 1969). Some forms of disturbance, such as vandalism, where the bats are directly targeted, can result in immediate mortality (Service 2007).

Commercial cave tours, recreational caving, scientific research-related activities, and vandalism are significant sources of human disturbance to hibernating bats. These impacts can significantly affect the reproductive success and health of resident bats.

5.1.5 *White-nose Syndrome*

A primary threat to cave-hibernating bats in the vicinity of the Project is WNS. Although some populations in the Northeast show some evidence of interannual survival and stabilization post-WNS (Dobony *et al.* 2011; Reichard *et al.* 2014), populations remain at severely reduced levels with increased susceptibility to disease, predation, weather impacts, stochastic events, and other sources of fatality. Even if certain species are not lost to extinction, the species composition of impacted bat communities is expected to change dramatically, as has already been observed in the Northeast.

5.2 INDIANA BATS

5.2.1 *Wind Energy Development and Collisions*

The erection of turbines within the NERU provides one of the few direct (and measurable) mortality sources for Indiana bats when assessing cumulative effects. The currently operational turbines associated with 1,987 MW of power within the NERU states are not anticipated to result in take of any Indiana bats, either because the turbines do not occur within the range of the Indiana bat or the projects are operating under curtailment. Alternative 2 and Alternative 3 of the Copenhagen Project are anticipated to result in annual take of 0.16 Indiana bat and 0.24 Indiana bat, respectively, and would represent one hundred percent of the Indiana bat take from proposed or currently operating projects within the NERU.

For the purposes of this EA, it is assumed that Indiana bat take within the NERU is equal to the risk calculated in the HCP for the Copenhagen Wind Farm Project with similar minimization measures in place (0.002 Indiana bats per MW per year[34]). Further, this assumes that all turbines are within the range of the Indiana bat and that Indiana bats are susceptible to turbine mortality.

[34] 4 Indiana bats/79.9 MW/25 years.

Given the lack of Indiana bat records for portions of the NERU, it is unlikely that all turbines in the NERU have the potential to take the species. However, due to the lack of current site-specific data and the unknown locations of future on-shore wind energy projects within the NERU, the Project's Indiana bat take rate is the best available estimate for the NERU.

These rough estimates are intended to put potential cumulative effects in perspective. The analysis is not applicable at any given site but for the NERU as a whole. In 25 years, with the anticipation of new on-shore turbines becoming operational (for a total of approximately 5,130 MW – Table 5-2), the number of fatalities would increase to approximately 10.26 Indiana bats per year[35] (Table 5-3). However, we would anticipate that any future projects with anticipated take of Indiana bats would operate in a manner to avoid or minimize impacts similar to Copenhagen.

Table 5-3. Cumulative Effects to Bats from the Copenhagen Wind Farm in the NERU States

Species	Impact of Operating Turbines	Alternative 1: No Action (TAL Alternative)	Alternative 2: Applicant's Proposed Action	Alternative 3: Less Restrictive Operations Alternative	NERU Projected Installation 5,130 MW[1]
Indiana Bat	Expected Annual Mortality	0	0.16	0.229	10.26
	Cumulative Project Mortality over 25 year ITP term[2]	0	4	6	256.5
	% of annual mortality in NERU, Year 25	0%	1.6%	2.23%	--
Northern Long-eared Bat	Expected Annual Mortality	0	0.621	0.87	41
	Cumulative Project Mortality over 25 year ITP term[2]	0	16	22	1,026
	% of annual mortality in NERU, Year 25	0%	1.5%	2.1%	--
Non-listed Bats	Annual Mortality	81	345	483	39,758
	Cumulative Project Mortality over 25 year ITP term[2]	2,025	8,625	12,075	993,950
	% of annual mortality in NERU, Year 25	0.2%	0.87%	1.21%	--

[1] Assumes all projects with the potential to impact Indiana bats and northern long-eared bats will operate with similar curtailment strategy as Copenhagen for fatality rate of 0.002 Indiana bat/MW/year, 0.008 northern long-eared bats/MW/year. To calculate fatality rates of non-listed bats across NERU states we used existing post-construction information for an estimated 7.75 non-listed bats/MW/year. 5,130 MW is based on Table 5-2.

[2] Expected annual mortality * 25 years

[35] 5,130 MW*0.002 Indiana bats/MW

5.2.2 *Habitat Loss and Fragmentation*

Future losses in forested habitat are likely to occur in the NERU as a result of silviculture, farming, commercial and residential development, and energy production or distribution, although some of the loss may be offset by concurrent reversion of some nonforested lands to forests.

None of the alternatives under consideration will add to the cumulative effects associated with summer habitat loss, as none of the alternatives include removing forests or trees.

5.2.3 *Climate Change*

Climate influences the biogeography of bats, their access to food, timing of hibernation, reproduction and development, frequency and duration of torpor, rate of energy expenditure, and prey detection ability (Sherwin *et al.* 2013; Luo *et al.* 2014). Temperate zone bats may be more sensitive to climate change than other groups of mammals because many aspects of their ecology are closely linked to temperature.

Modeling suggests that once average summer (May through August) maximum temperatures reach 81.3 degrees F (27.4 degrees C), the climatic suitability of the area for Indiana bat maternity colonies declines. Once average summer maximum temperatures reach 85.8 degrees F (29.9 degrees C), the area is forecast to become completely unsuitable. Initially, Indiana bat maternity colonies may respond to warming temperatures by choosing roosts that have more shade than the roosts that they currently use. When behavioral changes fail to mitigate the effects of high temperature, range shifts are likely to occur. The areal extent of the summer maternity distribution of Indiana bats is expected to decline and become concentrated in the northeastern United States and Appalachian Mountains, which could serve as climate refugia. The western part of the current maternity range (Missouri, Iowa, Illinois, Kentucky, Indiana, and Ohio) is predicted to become climatically unsuitable under most future climates (Loeb and Winters 2013).

None of the three alternatives will increase the effects of climate change; instead, all three alternatives will have varying levels of beneficial impact to the cumulative effects of climate change by reducing greenhouse gas emissions through the production of electricity via wind energy (i.e., a reduction in the amount of fossil fuels used to produce electricity). The difference in effects between the alternatives is small relative to the overall beneficial effect for each alternative.

5.2.4 *Destruction/Disturbance of Hibernacula*

As noted in the Recovery Plan, disturbing hibernating Indiana bats can result in lower survival rates or lower reproductive success (Service 2007). The disturbance causes them to rouse from hibernation, thereby depleting vital energy reserves. The original human disturbance threat primarily centered around commercial cave activities (e.g., cave tours), recreational caving, vandalism, and research activities.

The mitigation gating project associated with Alternative 2 (Proposed Action) and likely associated with Alternative 3 has the potential to affect hibernacula (i.e., alter bat flights or microclimate); however, care will be taken to avoid the potential negative impacts of gating. The mitigation will also contribute to any future positive impacts to overall winter habitat in the NERU resulting from ongoing hibernacula protection and restoration projects conducted by entities such as state resource agencies and other wind developers. Alternative 1 (No Action) would not affect hibernacula.

5.2.5 *White-nose Syndrome*

Since it was first discovered in New York in 2006, WNS has had a considerable negative effect on cave-hibernating bat species in the northeastern United States. Reported mortality associated with the disease is greater than 75 percent in 2 years. More than 5.7 to 6.7 million bats have been killed by the disease, and it has been confirmed in at least 31 states including all of the states within the NERU[36].

Prior to emergence of the WNS threat, the Service considered the Indiana bat to have a "high" recovery potential (i.e., biological/ecological limiting factors and threats were well understood and intensive management was not needed and/or recovery techniques had a high probability of success). The Service now considers the Indiana bat to have a "low" recovery potential, because WNS is poorly understood and we currently have very limited ability to alleviate this threat (Service 2009). The Project is anticipated to reduce cumulative impacts of disturbance to hibernating Indiana bats through gating of an important hibernacula.

5.3 NORTHERN LONG-EARED BAT

5.3.1 *Wind Energy Development and Collisions*

As previously discussed, the erection of turbines within the NERU provides one of the few direct (and measurable) mortality sources for northern long-eared bats when assessing cumulative effects. The currently operational turbines associated with 1,987 MW of power within the NERU are likely resulting in some mortality of northern long-eared bats. Alternative 2 and Alternative 3 of the Copenhagen Project are anticipated to result in additional annual take of 0.621 northern long-eared bat and 0.87 northern long-eared bat, respectively.

With the projected buildout of wind energy facilities within the NERU over the 25-year ITP period, the potential for northern long-eared bat fatalities from wind energy facilities increases in a linear manner, assuming the risk for take for each turbine is equal. For the purposes of this EA, it is assumed that northern long-eared bat take for all anticipated turbines within the NERU is

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[36] Available at: https://www.whitenosesyndrome.org/ (Accessed December 2017).

equal to the risk posed for the Copenhagen Wind Farm Project with similar minimization measures in place (0.008 northern long-eared bats per MW per year[37]). Further, this assumes that all turbines are within the range of the northern long-eared bat and that northern long-eared bats are susceptible to turbine mortality.

As discussed above in Section 5.3.1 for Indiana bat, these rough estimates are intended to put potential cumulative effects in perspective. The analysis is not applicable at any given site, but only for the NERU states as a whole. With the anticipation of new turbines becoming operational during the term of the ITP (5,130 MW in the NERU states by year 25 – Table 5-1), the annual number of northern long-eared bat fatalities would increase to approximately 41 northern long-eared bats per year[38] (Table 5-3).

The take estimates presented herein for northern long-eared bats have been calculated based on somewhat of a worst-case scenario. The estimates assume that risk of take to northern long-eared bats is equal for all turbines within the NERU. However, northern long-eared bats may not occur within the project area of some of the currently installed and proposed projects and have not been observed in post-construction fatality studies at multiple projects. We do not yet have a successful way of predicting which sites pose the greatest risk to northern long-eared bats.

There is no evidence that communication towers or stationary structures have resulted in mortality of bats (Kerns *et al.* 2005), as bats generally do not fly into stationary objects of any kind. We would similarly not anticipate any collisions with transmission lines.

5.3.2 *Habitat Loss and Fragmentation*

Future losses in forested habitat are likely to occur in the NERU as a result of silviculture, farming, commercial and residential development, and energy production or distribution, although some of the loss may be offset by concurrent reversion of some nonforested lands to forests.

None of the alternatives under consideration will add to the cumulative effects associated with summer habitat loss, as none of the alternatives include removing forests or trees.

5.3.3 *Climate Change*

Climate influences the biogeography of bats, their access to food, timing of hibernation, reproduction and development, frequency and duration of torpor, rate of energy expenditure, and prey detection ability (Sherwin *et al.* 2013; Luo *et al.* 2014). Temperate zone bats may be more sensitive to climate change than other groups of mammals because many aspects of their ecology are closely linked to temperature.

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[37] 15.525 northern long-eared bats/79.9 MW/25 years

[38] 5,130 MW*0.008 northern long-eared bats/MW

There is little information available on the effects of climate change on northern long-eared bats. As described above, none of the three alternatives will increase the effects of climate change; instead, all three alternatives will have varying levels of beneficial impact to the cumulative effects of climate change by reducing greenhouse gas emissions through the production of electricity via wind energy (i.e., a reduction in the amount of fossil fuels used to produce electricity). The difference in effects between the alternatives is small relative to the overall beneficial effect for each alternative.

5.3.4 *Destruction/Disturbance of Hibernacula*

Human disturbance to hibernaculum is a threat to cave-hibernating bats, including the northern long-eared bat (Service 2015b). Although disruptions to hibernating northern long-eared bats (and other cave bat species) rarely result in immediate mortality, disturbing hibernating bats can result in lower survival rates or lower reproductive success (Service 2007). The disturbance causes them to rouse from hibernation, thereby depleting vital energy reserves. For instance, Boyles and Bracks (2009) predicted that the survival rate of hibernating little brown bats drops from 96 percent to 73 percent with human visitations to hibernacula. In addition, Amelon and Burhans (2006) stated that the direct and indirect disturbance to caves from recreational use during hibernation posed the greatest threat to northern long-eared bats.

The mitigation gating project associated with Alternative 2 (Proposed Action) and likely associated with Alternative 3 has the potential to affect hibernacula (i.e., alter bat flights or microclimate); however, care will be taken to avoid the potential negative impacts of gating. The mitigation will also contribute to any future positive impacts to overall winter habitat in the NERU resulting from ongoing hibernacula protection and restoration projects conducted by entities such as state resource agencies and other wind developers. Alternative 1 (No Action) would not affect hibernacula.

5.3.5 *White-nose Syndrome*

As previously discussed, WNS has had a considerable negative effect on cave-hibernating bat species since it was first discovered in New York in 2006. Reported mortality associated with the disease is greater than 75 percent in 2 years. More than 5.7 to 6.7 million bats have been killed by the disease and it has been confirmed in at least 33 states, including all of the states within the NERU[39]. The Project is anticipated to reduce cumulative impacts of disturbance to hibernating northern long-eared bats through gating of an important hibernacula which leads to greater survival rates of those already affected by WNS and sensitive to repeated disturbances.

[39] Available at: https://www.whitenosesyndrome.org/ (Accessed 9/6/2018).

5.4 NON-LISTED BATS

There are some differences between tree bats and cave bats. Tree bats are not affected by actions affecting cave hibernacula (e.g., human disturbances) because they do not hibernate in caves. Likewise, tree bats are not affected by WNS; as that disease only affects cave-hibernating species. Tree bat species have experienced the greatest impacts (i.e., highest fatality rates) from operating wind energy facilities, including in the NERU. As a result, this section distinguishes between the impacts on the two groups of non-listed bats where appropriate.

5.4.1 *Wind Energy Development and Collisions*

The Service calculated the Project mortality rate for non-listed bats using the same species composition approach used in calculating potential take for Indiana bats and northern long-eared bats as part of the HCP. Because no post-construction monitoring data are available for the yet-to-be-constructed Project, all publicly available post-construction monitoring data collected after WNS impacts began ("post-WNS") at wind projects within the migratory range of the Covered Species (approximately 50 miles [80 km]) from the Permit Area were considered as representative of the anticipated risk expected at the Project site. This dataset includes the landscape on which the bat species likely to encounter the Project turbines occur, and is therefore considered to be most representative of the risk at the Project. Only post-WNS data were used to more closely represent the current and future risk at the Project. Based on the average annual bat mortality rate from the two wind projects[40] within 50 miles of the Permit Area, the Project is anticipated to result in take of 8.629 bats/MW/year, without curtailment, for a total take of unlisted bat species of 689 bats annually. When the curtailment strategies proposed in Alternative 2 are applied, this would be expected to be 4.31 bats/MW/year for a total of 345 bats annually. When the curtailment strategies proposed in Alternative 3 are applied, this would be expected to be 6.04 bats/MW/year for a total of 483 bats annually.

To calculate the total rate of mortality for non-listed bats across the entire NERU, the mortality rates from nine post-construction bat mortality studies in the NERU were averaged (Table 5-4). For purposes of assessing cumulative impacts to unlisted bats, an average of 7.75 bat deaths are expected per MW.

[40] Maple Ridge in Lewis County, New York and Wolfe Island, in Ontario, Canada.

Table 5-4. Bat Fatality Rates from Post-Construction Studies Wind Energy Facilities in NERU

Wind Project and Location	Monitoring Start/End Date	Year	Reported Mortality Rate (Adjusted for Searcher Efficiency, Scavenger Removal)		Reference
			Bat Fatalities/ Turbine	Bat Fatalities/ MW/Period	
Maple Ridge Lewis County, NY	6/17 – 11/15	2006	24.53	14.87	Jain *et al.* 2007
Noble Bliss Wyoming County, NY	4/21 – 11/14	2008	7.58	5.05	Jain *et al.* 2009c
Noble Clinton Clinton County, NY	4/26 – 10/13	2008	5.45	3.63	Jain *et al.* 2009d
Noble Ellenburg Clinton County, NY	4/29 – 10/13	2008	8.17	5.45	Jain *et al.* 2009e
Cohocton and Dutch Hill Steuben County, NY	4/15 – 11/15	2009	40	16	Stantec 2010
Noble Wethersfield Wyoming County, NY	4/26 – 10/15	2010	24.45	16.3	Jain *et al.* 2011a
Noble Altona Clinton County, NY	4/26 – 10/15	2010	6.51	4.34	Jain *et al.* 2011b
High Sheldon Wyoming County, NY	4/15 – 11/15	2010	3.50	2.33	Tidhar *et al.* 2011a
High Sheldon Wyoming County, NY	5/15 – 11/15	2011	2.67	1.78	Tidhar *et al.* 2011b
Average			**13.7**	**7.75**	

A variety of assumptions have been made in extrapolating non-listed bat mortality throughout the NERU over the next 25 years. The Service has assumed that all turbines in the NERU have an equal risk of killing a non-listed bat and that the distribution of the non-listed species mortality is the same as that that has been assumed for the Project. However, it is unlikely that all turbines in the NERU states have the potential to take all species. Further, although there is the potential for the use of curtailment or technological advances in turbines over the next 25 years that could reduce or eliminate bat mortality at other wind energy facilities, this was not considered when determining the current or future non-listed bat mortality in the NERU. Therefore, some species may see lesser impacts.

Cave bats (with the exception of little brown bats) are anticipated to constitute a smaller percentage of bat fatalities from wind turbines than tree bats. The significance of current bat fatality rates is unknown, especially for migratory tree bats, because of the difficulty in estimating the actual population sizes of these species of bats. Additionally, we do not have a good understanding of population demographic estimates (e.g., population trend or growth rate, mortality rates, fecundity) for many bat species, including migratory tree bats, so it is unclear how annual fatality from wind energy development will impact the long-term population viability of these bat species. High levels of adult loss could be detrimental to bat species, which have an evolutionary strategy focused on high adult survival and low fecundity.

To understand the significance of the current bat fatality rates, it is critical to know the annual mortality from wind turbines, population growth rate, and current size of the population that has to absorb that mortality. Of these, an accurate population size is one of the hardest values to measure. A recent study developed a population model for hoary bats using expert opinion estimates of model parameters, and then compared different scenarios with varying population sizes (Frick *et al.* 2017). Frick *et al.* (2017) estimated the nationwide annual mortality to be 128,469 hoary bats (without any curtailment or conservation measures) and then considered what would happen over 50 years if this loss was applied to populations that ranged from 1 million to 10 million bats. Applying the annual mortality rate to smaller populations will have a greater effect than applying it to larger populations, but concern was raised for even the larger population scenarios. Research is ongoing to estimate population levels and the potential impacts of wind facilities on all species of migratory tree bats.

5.4.2 *Habitat Loss/Fragmentation*

Future losses in forested habitat are likely to occur in the NERU as a result of silviculture, farming, commercial and residential development, and energy production or distribution, although some of the loss may be offset by concurrent reversion of some nonforested lands to forests.

None of the alternatives under consideration will add to the cumulative effects associated with summer habitat loss, as none of the alternatives include removing forests or trees.

5.4.3 *Climate Change*

Specific data is not available on the effects of climate change on most species of non-listed bats in the Permit Area. Modeling predicts that the range of little brown bat may shift significantly northward due to energetic constraints under a warming scenario (Humphries *et al.* 2002). In a study evaluating 16 years of mark-recapture data for little brown bat, Frick *et al.* (2010a) found that reproductive timing, breeding success, and annual survival probability are tightly linked with climate, and that climate change may be implicated, at least in part, in population declines.

None of the three alternatives will increase the effects of climate change; instead, all three alternatives will have varying levels of beneficial impact to the cumulative effects of climate change by reducing greenhouse gas emissions through the production of electricity via wind energy (i.e., a reduction in the amount of fossil fuels used to produce electricity). The difference in effects between the alternatives is small relative to the overall beneficial effect for each alternative.

5.4.4 *Destruction/Disturbance of Hibernacula*

Human disturbance is a threat to all cave-hibernating bats. Of the non-threatened and non-endangered bat species potentially affected by the Project, only the big brown bat, eastern small-footed bat, little brown bat, and tri-colored bat utilize underground hibernacula during the winter months. While the locations of Indiana bat hibernacula are well known, the locations of additional hibernacula used by non-threatened and non-endangered bat species within the NERU are not as widely studied, and these hibernacula may have less protection afforded to them. There are documented instances of vandalism and human entry at bat hibernacula located across the range and this remains a threat to all hibernating species, especially given cumulative effects from WNS.

Alternative 2 (Proposed Action) and Alternative 3 both have the potential to affect hibernacula, and care will be taken to avoid the potential negative impacts of gating. Mitigation proposed by the Applicant will have positive effects to cave-hibernating bats in the form of a gating project at a hibernaculum. This mitigation will contribute to any future positive impacts to overall winter habitat in the NERU resulting from ongoing hibernacula protection and restoration projects conducted by entities such as state resource agencies and other wind developers. Alternative 1 (No Action) would not affect hibernacula.

5.4.5 *White-nose Syndrome*

Although it does not affect tree bats, WNS has had a considerable negative effect on cave-hibernating bat species in the northeastern United States. It is unknown what the overall long-term impact of WNS will be. If the general trend seen in the northeast continues, the effects on population numbers will be significant. One model predicts a 99 percent chance of regional extinction of little brown bats in the northeastern United States within the next 16 years (Frick *et al.* 2010b). However, recent evidence suggests that some little brown bats affected by WNS exhibit rapid wing healing after hibernation (Fuller *et al.* 2011), and due to increased wing functionality, these bats may be able to increase their chances of survival. Cave-hibernating bats that are susceptible to WNS are generally not anticipated to be affected by wind turbines to the same extent as tree bats, and therefore are not exposed to two potentially significant sources of mortality. This can vary by location of the wind facility. Under Alternatives 2 and 3, the Project would be anticipated to reduce cumulative impacts of disturbance to hibernating bats through gating of important hibernacula.

5.5 NON-LISTED BIRDS

For the purposes of this EA, the cumulative effects analysis area for non-threatened and non-endangered avian resources is BCR 13 (Lower Great Lakes/St. Lawrence Plain). The cumulative effects analysis used a 25-year timeframe based on the requested duration of the ITP. The selected spatial and temporal scales provide a reasonable assessment of past, present, and reasonably foreseeable future cumulative effects.

5.5.1 *Wind Energy Development and Collisions*

Based on mortality rates reported for post-construction studies with daily surveys at wind power projects in New York (see Table 9 in SEQRA DEIS), the Project's rate of bird mortality is anticipated to be 0.96 to 5.81 birds/MW. Cumulatively over the 25-year ITP term, the Copenhagen Wind Farm would result in approximately 1,918 to 11,605 bird deaths. These numbers are spread across all bird species. Using those same rates, this Project and the wind turbines associated with 1,549 MW of power that are currently operating or under construction in BCR 13 would collectively result in an average annual mortality of 1,487 to 9,000 birds in BCR13 in Year 1 of Project operations. By Year 25 of Project operations, it is estimated that wind turbines associated with 3,703 MW (Table 5.1) of power would be operational in BCR 13, with a collective average annual mortality of 3,555 to 21,514 non-threatened and non-endangered birds.

These numbers are based on a few conservative assumptions, and are likely overestimated. Firstly, that the full potential generating capacity in BCR 13 over the 25-year HCP term would actually occur. However, there are many constraints and challenges that could limit the full development of the wind resource potential, including the ability to integrate intermittent wind energy into the electric grid, additional transmission capacity that would be required, and wind energy siting and permitting (Optimal Energy, Inc. *et al.* 2014). In addition, no offshore wind turbines have been constructed to date. Also, as further research is conducted to understand the circumstances affecting avian mortality from collision with wind turbines, the results of this research will likely show that the risk of collision is not equal for all turbines. Specifically, the calculations are based on onshore wind turbine mortality rates and the estimates assume that offshore wind turbines pose the same level of risk as onshore wind turbines. Lastly, implementation of curtailment or future turbine technological advances to minimize or eliminate avian collision at wind energy facilities is not considered when determining collision rates.

<u>BCC Birds</u>

Review of publicly available post-construction avian fatality studies at wind power projects in New York State indicates that there were three BCR 13 BCC birds (2 wood thrush and one black-billed cuckoo) recovered out of 315 incidences, suggesting that BCC birds represent up to 1 percent of overall avian collision mortality (Jain *et al.* 2007; 2009a, 2009b, 2009c; Kerlinger 2002; Stantec 2008, 2011). Five BCR 13 BCC species are known within the Permit Area (Table 3-1), including wood thrush and black-billed cuckoo. If 1 percent of the Project's expected 150 annual bird deaths are comprised of BCC species, it is estimated that the Copenhagen Wind Farm will kill one or two of these birds each year. Because Project impacts to BCC species will be so low, there will be no significant contribution to cumulative effects. The anticipated losses to BCR 13 BCC bird populations from wind turbines, including from the Project, are not expected to result in population effects.

In BCR 13, it is estimated that approximately 134,360 birds are killed annually from collisions with towers greater than or equal to 60 m in height (Longcore *et al.* 2012). BCC species in BCR 13 that have been killed from collisions with communication towers east of the Rocky Mountains include: upland sandpiper, red-headed woodpecker, blue-winged warbler, golden-winged warbler, cerulean warbler, Canada warbler, and Henslow's sparrow (Longcore *et al.* 2005). While the total number seems large, this number is spread across all bird species. There is one existing communication tower and one that is granted by the Federal Communications Commission (FCC) but not yet constructed within 25 miles of the center point of the Permit Area (FCC, 2016). There are four existing communication towers and four that are granted but not yet constructed within 50 miles of the center point of the Permit Area (FCC 2016). The existing communication towers range in height from 45 feet to 359 feet (FCC 2016). No population of BCC species from BCR 13 would be significantly impacted from collision with towers, transmission lines, or MET towers.

5.5.2 *Habitat Loss and Fragmentation*

The BCR 13 Bird Conservation Plan cites habitat loss and degradation (e.g., fragmentation, intensive agriculture, pollution, invasive species) as the greatest threat to bird populations in BCR 13 (ACJV 2007). Nearly 95 percent of BCR 13 has been modified from its original condition and is now dominated by agricultural activities or development, including large, urban areas. A large portion of Canada's total human population occurs with BCR 13 (ACJV 2007). BCR 13 uplands were once dominated by deciduous and mixed forests, but are now a mosaic of forests, agricultural fields, early-successional habitat (e.g., abandoned fields reverting to shrubland or young forests), and various forms of human development (ACJV 2007). Land cover with BCR 13 is comprised of agriculture (30 percent), hay/pasture (21 percent), deciduous forest (21.8 percent), mixed forest (8.6 percent) and conifer forest (3.4 percent), urban (5 percent), open water (5.5 percent), and forested wetland (2.6 percent).

It is anticipated that there will be no direct impacts to breeding birds from clearing of forest habitat as a result of any of the alternatives. This is because all clearing associated with the Project occurred during construction, which is not a Covered Activity and has already been completed. No additional habitat loss will occur as a result of any of the alternatives. Therefore, the operation of the Copenhagen Wind Farm will not contribute to the cumulative effects on BCC species from loss of forested habitat.

5.5.3 *Climate Change*

Climate change is affecting the migration cycles and body condition of migratory songbirds, causing decoupling of the arrival dates of birds on their breeding grounds and the availability of the food they need for successful reproduction. Climate change also has the potential to cause abrupt ecosystem changes and increased species extinctions (Service 2010). These impacts are difficult to quantify, however, because vulnerability to climate change varies among species (Schlesinger *et al.* 2011; Langham *et al.* 2015; Stephens *et al.* 2016) and among different populations of the same species (Bay *et al.* 2018).

Because they generate electricity without burning fossil fuels, wind energy projects don't contribute to global warming and can mitigate the well-established causes of global climate change. This happens when electricity delivered to the grid from wind energy projects offsets the generation of energy at existing conventional power plants. According to a 2008 U.S. Department of Energy National Renewable Energy Laboratory report, "Wind energy is a preferred power source on an economic basis, because the operating costs to run the turbines are very low and there are no fuel costs. Thus, when the wind turbines produce power, this power source will displace generation at fossil fueled plants, which have higher operating and fuel costs" (Jacobsen and High 2008). On a long-term basis, wind generated power also reduces the need to construct and operate new fossil fueled power plants (Jacobsen and High 2008). Natural gas is the most frequent marginal fuel unit in New York's power pool, or the one that is turned on or off as the load fluctuates (Patton *et al.* 2017). When the Copenhagen Wind Farm is generating power, electricity generation from natural gas would be reduced within the region, thereby eliminating the associated emissions.

Operation of the Project will not generate greenhouse gases or contribute to accelerating climate change, and will reduce the combustion of natural gas in New York State. When combined with other installed, proposed, and projected wind energy projects within BCR 13 over the 25-year life of the Project, the cumulative reductions in greenhouse gases could be significant.

5.6 CUMULATIVE EFFECTS SUMMARY

Clearing of forested habitat is not anticipated to occur from any of the alternatives evaluated in this EA. Similarly, none of the alternatives will generate greenhouse gases or contribute to accelerating climate change, and all three will reduce the combustion of natural gas in New York State. Consequently, none of the alternatives would contribute to the cumulative effects of forest habitat loss or climate change on threatened, endangered, or non-listed bat or avian species. The contributions to cumulative effects are also quite similar for all evaluated alternatives with respect to destruction/disturbance of hibernacula and WNS (two threats that impact cave bats but not tree bats or birds), as well as for collision mortality to non-listed birds.

Given the extensive mortality documented from WNS, the incremental contribution of the take resulting from operation of the Project under Alternative 2 or Alternative 3 is not a significant contribution to the cumulative effect of mortality from WNS on non-threatened and non-endangered bats in the NERU. The "Changed Circumstances" provision includes adaptive management measures that could be implemented should the Service notify the Applicant that cumulative impacts from WNS, including the Project's take, are resulting in population level impacts to Indiana bat or northern long-eared bat within the NERU or range wide. Because stricter operational curtailment measures would be implemented under Alternative 1 and take of most cave bats would not occur, this alternative would not contribute to the cumulative effect of WNS on cave bat populations within the NERU.

None of the alternatives would contribute to the human disturbance of hibernating non-threatened and non-endangered bats. The mitigation project associated with Alternative 2 and

Alternative 3 could potentially reduce the cumulative impact of cave disturbance to hibernacula for Indiana bat, northern long-eared bat, and non-listed cave bats by gating a local hibernaculum, thereby preventing human disturbance to hibernating bats. The non-threatened and non-endangered bats most likely to benefit from hibernaculum gating are little brown, big brown, and tri-colored bats. Because Alternative 1 would avoid take of Indiana and northern long-eared bats, no mitigation would be required and the cave-gating project would not be implemented.

The three evaluated alternatives have the potential for a minimal contribution to the cumulative effect of non-listed birds, including BCC species, within BCR 13 from collision with wind turbines. It appears that approximately 175 avian species could use the Permit Area at some time throughout a given year. Since mortality is expected to be spread across many species, the quantity of cumulative fatalities is not expected to contribute to population-level effects for any one species. All three alternatives include implementation of the ABPP, which would likely result in reductions in avian mortality through conservation measures and BMPs. All three alternatives include operational curtailment measures to be implemented for Indiana and northern long-eared bats that could reduce the potential for nocturnal migrant collisions to some unknown extent.

APPENDIX A. LITERATURE CITED

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APPENDIX B - ADDITIONAL REGULATORY CONTEXT AND POLICY BACKGROUND

Federal Regulatory Framework

Endangered Species Act

The purpose of the ESA is to provide a means whereby the ecosystems upon which threatened and endangered species depend may be conserved, and to provide a program for the conservation of such threatened and endangered species (ESA §2(b)). The Service is authorized to identify species in danger of extinction and provide for their management and protection. The Service also maintains a list of species that are candidates for listing pursuant to the ESA. Three sections of the ESA pertain to this Project the proposed action, sections 7, 9, and 10.

ESA Section 7

Section 7 of the ESA states that any federal agency that permits, licenses, funds, or otherwise authorizes activities must consult with the Service to make sure its actions will not jeopardize the continued existence of any listed species. This Project is subject to the ESA because the operation of the Project is anticipated to take federally listed endangered Indiana bats.

The Service is considering issuing an ITP under Section 10 of the ESA to authorize this take, which would otherwise be prohibited under Section 9 of the ESA. Prior to issuing an ITP, the Service must internally conduct an ESA Section 7 analysis via formal consultation to ensure it will not jeopardize the continued existence of the species. The regulations governing consultation are found at 50 CFR Part 402. The Service's biological opinion (BO) will evaluate the direct, indirect and cumulative effects of the action, the anticipated take, whether a species' existence will be jeopardized. The BO typically also contains reasonable terms and conditions, or reasonable prudent alternatives, designed to minimize the impacts of the taking, as well as terms and conditions and conservation recommendations that will be incorporated into the Service's decision-making process for this project. We will also make independent findings regarding the above-listed permit issuance criteria.

ESA Section 9

Section 9 of the ESA prohibits the "take" of any fish or wildlife species listed under the ESA as endangered (16 U.S.C.1538). Under Federal regulation, take of fish or wildlife species listed as threatened is also prohibited unless otherwise specifically authorized by regulation (50 CFR 17.31). "Take," as defined by the ESA, means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct" (16 U.S.C. 1532(19)).

Section 9 also prohibits the removal and reduction to possession of any listed plant species "under federal jurisdiction," as well as the removal, damage, or destruction of such plants on any other areas in knowing violation of any state law or regulation or in violation of state trespass law (16 U.S.C. 1538).

The Service's implementing regulations further define the term "harm" to include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 CFR 17.3.). They also define harass as "an intentional or negligent act or omission which creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering" (50 CFR 17.3.).

ESA Section 10

Section 10 of the ESA, among other things, authorizes the Service to issue permits to incidentally take ESA-listed species. Entities pursuing activities that could result in take of federally protected species may apply for an ITP, which protects them from such liability.

As a condition of an ITP, an applicant must prepare and submit to the Service for approval a HCP containing the following mandatory elements set forth under section 10(a)(2)(A) of the ESA:

• The impact that will likely result from the taking;

• What steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to implement such steps;

• What alternative actions to such taking the applicant considered, and the reasons why such alternatives are not being utilized; and

• Such other measures that the Service (under authority delegated by the Secretary of the Interior) may require as being necessary or appropriate for the purposes of the HCP.

Under provisions of the ESA, the Service (under authority delegated by the Secretary of the Interior) will issue an ITP if the application meets the following issuance criteria identified in section 10(a)(2)(B) of the ESA and implementing regulations:

• The taking of the listed species will be incidental;

• The Applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking on the species;

• The Applicant will ensure that adequate funding for implementation of the HCP, including procedures to deal with changed and unforeseen circumstances, will be provided;

• The taking will not appreciably reduce the likelihood of survival and recovery of the species in the wild; and

• Other measures required by the Service as being necessary or appropriate for purposes of the HCP will be implemented.

The Service will document its assessment of the ITP and HCP in an ESA section 10 findings document. If the Service makes the requisite findings, the Service will issue the ITP and approve the HCP. In such cases, the Service will decide whether to issue the ITP conditioned on implementation of the proposed HCP as submitted, or as amended to include other measures the Service determines are necessary or appropriate. If the Service finds that the requisite criteria are not satisfied, the permit request will be denied.

Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act of 1940 (BGEPA), 16 U.S.C. 668, et seq., provides protection to bald eagles (*Haliaeetus leucocephalus*) and golden eagles (*Aquila chrysaetos*) such that it is unlawful to take an eagle. In this statute the definition of "take" is to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb" (16 U.S.C. 668c.). On September 11, 2009, the Service published a final rule (Eagle Permit Rule) under BGEPA authorizing limited issuance of permits to take bald eagles and golden eagles ''for the protection of . . .other interests in any particular locality'' where the take is compatible with the preservation of the bald eagle and the golden eagle, is associated with and not the purpose of an otherwise lawful activity, and cannot practicably be avoided (74 FR 46836-46879). This rule was revised and finalized on December 16, 2017 (81 FR 91494-91554). Revisions included changes to permit issuance criteria and duration, definitions, compensatory mitigation standards, criteria for eagle nest removal permits, permit application requirements, and fees.

On May 2, 2013, the Service announced the availability of the Eagle Conservation Plan Guidance: Module 1 – Land-based Wind Energy, Version 2 (the "Guidance", USFWS 2013a) (78 FR 25758). The Guidance provides a means of compliance with the BGEPA by providing recommendations and in-depth guidance for:

(1) Conducting early preconstruction assessments to identify important eagle use areas;

(2) Avoiding, minimizing, and/or compensating for potential adverse effects to eagles; and

(3) Monitoring for impacts to eagles during construction and operation.

Migratory Bird Treaty Act

The Migratory Bird Treaty Act of 1918 (MBTA), 16 U.S.C. 703, et seq., prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests, except when specifically authorized by the Department of the Interior. The Service is responsible for overseeing compliance with the MBTA. The MBTA protects migratory birds and prohibits the taking, possession, transportation, importation, exportation, and sale/purchase/barter of migratory birds, their eggs, parts, and nests, except as authorized under a valid permit (16 USC § 703; 50 CFR 21; 50 CFR 10). Under the MBTA, "take" is defined as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture or collect." Incidental take is not prohibited by the MBTA. The bird species protected by MBTA are listed in 50 CFR §10.13. In total, 1,007 bird species are protected by the MBTA.

Clean Water Act

In accordance with the Section 404 of the Clean Water Act, the United States Army Corps of Engineers (USACE) has regulatory jurisdiction over Waters of the Unites States. As defined by the USACE, Waters of the United States include all lakes, ponds, streams (intermittent and perennial), and wetlands. Jurisdictional wetlands are defined as "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions" (EPA 2001). Section 404 regulates the discharge of dredged or fill material into waters of the U.S. and a permit is required before activities resulting in the discharge can occur. Under the Clean Water Act, an applicant must demonstrate that to the extent practicable steps were taken to avoid impacts, potential wetland impacts were minimized, and compensation or mitigation is provided, for issuance of a permit by USACE.

National Historic Preservation Act

The Service's issuance of an ITP under ESA Section 10(a)(1)(B) is considered an "undertaking" as defined by regulation and must comply with Section 106 of the National Historic Preservation Act (NHPA)(16 U.S.C. § 470 et seq.) and its implementing regulations at 36 C.F.R. Part 800. Section 106 requires the Service to assess and determine the potential effects on historic properties that would result from the proposed undertaking. When an adverse effect to a historic property cannot be avoided, the Service must consult with State Historic Preservation Office (SHPO), the Tribal Historic Preservation Office, and other interested parties to identify ways to mitigate the effects of the undertaking. This process may result in the development of a Memorandum of Agreement (MOA), which identifies the steps the agency will take to reduce, avoid, or mitigate the adverse effect. The MOA will be submitted to the Advisory Council on Historic Preservation for review and comment. The Service must document NHPA compliance and include such documentation in the administrative record for the HCP.

State Regulatory Framework

New York State Environmental Quality Review Act Process

The New York State Environmental Quality Review Act (SEQRA) requires all state and local government agencies to consider environmental impacts equally with social and economic factors during discretionary decision-making. Similar to the federal NEPA process, if an action is determined not to have significant adverse environmental impacts, a determination of non-significance (i.e., Negative Declaration) is prepared. If an action is determined to have potentially significant adverse environmental impacts, an EIS is required.

The Project has completed an environmental review in accordance with the requirements of SEQRA and its implementing regulations, 6 NYCRR Part 617. On May 5, 2012, an application was submitted by Copenhagen Wind Farm to the Town of Denmark, along with a full Environmental Assessment Form (EAF) for the proposed Project. The submittal of this application, which requires discretionary approval, initiated the SEQRA process for the subject action. On July 7, 2012, the Town of Denmark Planning Board forwarded a declaration of intent to become SEQRA Lead Agency, along with a copy of the EAF document, to potentially interested/involved SEQRA agencies. It was stated in the letter of intent to act as lead agency that, subject to the agreement of all Involved Agencies, the lead agency determination would become effective 30 days from the date of the declaration letter. No agency objected to the Town of Denmark Planning Board assuming the role of Lead Agency. The Town of Denmark, as Lead Agency, subsequently issued a Positive Declaration on August 7, 2012 requiring the preparation of an EIS.

New York State Department of Environmental Conservation Permits

The NYSDEC Division of Environmental Permits administers permits for most major environmental regulatory areas protecting the State's air, water, mineral, and biological resources, subject to the requirements of the Uniform Procedures Act.

Article 11

Under Article 11 (Fish and Wildlife) of the Environmental Conservation Law (ECL), take of threatened and endangered species is prohibited without an incidental take permit from the NYSDEC. For jurisdictional purposes, the NYSDEC determines whether a geographic area in question is occupied habitat, based on verified reports of protected species engaging in one or more essential behaviors at the site. Indiana bat and northern long-eared bat, the covered species that are the subject of the proposed ITP and HCP evaluated in this EA, are also listed as endangered and threatened, respectively, in New York State. In order to obtain a NYSDEC incidental take permit, an applicant must provide a mitigation plan that will result in a net conservation benefit to the protected species impacted by the proposed activity. To meet the net conservation benefit requirement, the mitigation plan must demonstrate that adverse impacts of a proposed activity on a protected species or its occupied habitat will be outweighed by the positive impacts anticipated from the mitigation measures.

Article 15

Under Article 15 (Protection of Waters) of the ECL, the NYSDEC has regulatory jurisdiction over any activity that disturbs the bed or banks of protected streams, including small lakes and ponds with a surface area of 10 acres or less located within the course of a protected stream. Protected streams include any stream, or particular portion of a stream, that has been assigned any of the following classes and standards: AA, AA(T), AA(TS), A, A(T), A(TS), B, B(T), B(TS), C(T) or C(TS) (6 NYCRR Part 701). A classification of AA or A indicates that the best use of the stream is as a source of water supply for drinking, culinary or food processing purposes, primary and secondary contact recreation, and fishing. The best usages of Class B waters are primary and secondary contact recreation and fishing. The best usage of Class C waters is fishing. Streams classified with a (T) or (TS) support trout or trout spawning, respectively, and include seasonal work restrictions. State water quality classifications of unprotected watercourses include Class C and Class D streams. Waters with a classification of D are suitable for fishing and non-contact recreation. An Article 15 permit is required from the NYSDEC for any disturbance to a stream classified C(T) or higher. Based on a review of available NYSDEC stream classification mapping, streams within the Project Site include only Class C and Class C(T) waters. The only protected stream within the Project Site is Boynton Creek. All other streams within the Permit Area are classified by the NYSDEC as class C streams and are not subject to Protection of Waters regulations.

Article 24

The Freshwater Wetlands Act (Article 24 and Title 23 of Article 71 of the ECL) gives the NYSDEC jurisdiction over state-protected wetlands and adjacent areas (100-foot upland buffer). The Freshwater Wetlands Act requires the NYSDEC to map all state-protected wetlands to allow landowners and other interested parties a means of determining where state jurisdictional wetlands exist. To implement the policy established by this Act, regulations were promulgated by the state under 6 NYCRR Parts 663 and 664. Part 664 of the regulations designates wetlands into four class ratings, with Class I being the highest or best quality wetland and Class IV being the lowest. In general, wetlands regulated by the state are those 12.4 acres in size or larger. Smaller wetlands can also be regulated if they are considered of unusual local importance. A 100-foot adjacent area around the delineated boundary of any state-regulated wetland is also under NYSDEC jurisdiction. An Article 24 permit is required from the NYSDEC for any disturbance to a state-protected wetland or an adjacent area, including removing vegetation.

SPDES General Permit

Article 17 (Water Pollution Control) of the ECL protects and maintains New York's surface and groundwater resources. The State Pollutant Discharge Elimination System (SPDES) program was authorized under Article 17 to maintain New York's waters. New York's SPDES program has been approved by the United States Environmental Protection Agency in accordance with the Clean Water Act (CWA), for the control of discharges resulting from surface wastewater and stormwater. However, the SPDES general permit is broader in scope than the CWA, as it authorizes discharges of stormwater from construction activities to surface waters, as well as ground waters. Erosion and sedimentation impacts during construction must be minimized by the implementation of a Stormwater Pollution Prevention Plan and associated erosion and sedimentation control plan developed as part of the SPDES General Permit for construction activities.

Section 401 Water Quality Certification

In accordance with Section 401 of the CWA, construction or operation of facilities that may result in any discharge into waters of the United States are required to obtain a Water Quality Certification from NSYDEC indicating that the proposed activity will not violate water quality standards. Water Quality Certification is required for placing fill or undertaking activities resulting in a discharge to waters of the United States where a USACE Section 404 Nationwide Permit is required.

Relevant State Guidelines and Policies

NYSDEC Guidelines for Commercial Wind Energy Facilities

NYSDEC must consider the potential negative environmental impacts of wind energy production when evaluating proposed projects. As previously discussed, NYSDEC is responsible for issuing Article 11, Article 15, Article 24, and Section 401 Water Quality Certificate permits. The NYSDEC's jurisdiction over these natural resources stems from the following: ECL Article 1, NYSDEC's policies; Article 3, the powers and duties of the Commissioner; and Article 11, the requirements for the protection of fish and wildlife and their habitats. Based on these articles, NYSDEC prepared *Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects* (NYSDEC 2016b) to provide developers guidance on how to characterize bird and bat resources at on-shore wind energy sites, estimate and document impacts resulting from the construction and operation of wind energy projects, and reduce mortality levels through turbine sitting and operational modifications.

The purpose of the guidance document is to set forth protocols for conducting pre-construction and post-construction bird and bat studies at wind energy projects. The guidance provides developers a framework from which to propose site-specific studies to evaluate the potential impacts to birds and bats. In addition, the guidance provides an outline of study methodologies, based on the latest scientific knowledge to assist developers in the planning, development, and monitoring process. By standardizing methods, data can be compared among sites and between years to contribute to a statewide understanding of the ecological effects of wind energy projects. This guidance provides two tracks for pre-construction and post-construction studies: "standard" and "expanded." It is anticipated that all sites will warrant at least the standard studies. However, where site-specific conditions or other information suggest the potential for substantial adverse impacts to birds and/or bats, or their habitats, expanded studies and/or additional years of study designed to further evaluate the specific concerns may be necessary.

A minimum of one year of pre-construction studies is needed for all proposed wind energy projects. Standard pre-construction studies include habitat surveys, to identify existing habitat for state or federally threatened or endangered species, New York State species of special concern, or species of greatest conservation need. If such habitat exists on site or in the surrounding area, additional surveys should be undertaken to determine if any listed or sensitive species are actually present on or near the site. Standard bird surveys include raptor migration surveys, breeding bird surveys, and migrating bird surveys. If the project is proposed in proximity to a feature or resource of concern, then additional expanded bird surveys may be recommended, such as radar studies, expanded raptor migration surveys, waterfowl surveys, targeted breeding bird surveys, and wintering bird surveys. The standard bat survey includes bat acoustic monitoring. Additional bat surveys may be recommended if information suggests that Indiana bats or northern long-eared bats may be present. These expanded bat studies may include mist netting, radio tracking, and roost counts. Standard post-construction monitoring studies include ground searches, searcher efficiency and carcass removal trials, and bird habituation and avoidance studies. Expanded post-construction studies are recommended if the project occurs in proximity to a feature or resource of concern or for projects that NYSDEC determines may adversely impact listed species.

Based on the extensive expert study and analysis provided in the Copenhagen Wind Farm DEIS, the Project is not anticipated to have an undue adverse impact on birds or bats. However, the NYSDEC is requesting post-construction fatality monitoring studies at all wind power projects in New York State, and the Applicant has volunteered to participate in this program in order to further the State's understanding of bird/bat interactions with wind turbines. This study is anticipated to follow the protocols outlined in the NYSDEC's 2016 *Guidelines for Conducting Bird and Bat Studies at Commercial Wind Energy Projects*. Specifics of the study will be developed in consultation with state and federal agencies, including details such as study duration, search frequency, search areas, number and location of turbines to be searched, concurrent data collection and analysis, carcass collection for further study, and mitigation strategies that may be implemented if post-construction monitoring reveals operational impacts in excess of that which is anticipated or that are otherwise considered significant. In addition, a work plan for a post-construction habitat displacement study will be submitted to the NYSDEC for review prior to Project implementation.

APPENDIX C. COMMENT FROM SCOPING PERIOD

RECEIVED
MAY 04 2015
Div. of Policy & Dir. Mgt.

C G Spies

PO Box 171

Pequabuck CT 06781

1 May 2015

Attn: FWS-R5-ES-2014-0050

Public Comments Processing

Division of Policy, Performance, and Management Programs

US Fish and Wildlife Service

5275 Leesburg Pike

Falls Church VA 22041

Re: Copenhagen Wind Farm

There are a couple of things that I would like to see addressed in the application for ITP and HCP.

First is my interest in the detection of morbidity and mortality at the wind turbines. Daily surveillance, preferably at sunrise, is, in my opinion, the only way to get reliable numbers. What has been proposed by the applicant and FWS?

Second is my interest in avoidance of bird electrocutions and collisions at collector lines and transmission lines. What is the proposal for avoidance of electrocution along these lines? What is the proposal for avoidance of collisions where these lines cross streams and wetlands?

Please keep me abreast of this application progress, either by sending me copies of pertinent documents, or by informing me when they are available on regulations.gov.

Thank you.

Christian Spies

C G Spies

860-583-5739

cgspies47@gmail.com

APPENDIX D. Avian and Bat Protection Plan

Avian and Bat Protection Plan for the Copenhagen Wind Farm, Lewis and Jefferson Counties, New York

Prepared by:
Copenhagen Wind Farm, LLC

In consultation with:
Western EcoSystems Technology, Inc.,
and
Sanders Environmental, Inc.

December 2016

Draft Pre-Decisional Document – Privileged and Confidential – Not For Distribution

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1 INTRODUCTION

1.1 PURPOSE AND BACKGROUND

Avian and Bat Protection Plans (ABPPs) are designed to provide guiding principles and specific implementation strategies for wind energy facilities in order to limit impacts to birds and bats. ABPPs help to minimize impacts by providing specific mechanisms by which to ensure regulatory compliance and minimize impacts. This ABPP has been created by Copenhagen Wind Farm, LLC (CWF LLC) in order to outline the position, compliance, and risk assessment strategies for bird and bat impacts at the proposed Copenhagen Wind Farm (Project), as well as to identify Project design and mitigation protocols to reduce these impacts.

The Project is subject to multiple federal and state laws that protect wildlife and their habitats, including species of birds and bats. These laws include the Migratory Bird Treaty Act (MBTA), the Bald and Golden Eagle Protection Act (BGEPA), and the Endangered Species Act (ESA), as well as state statutes. The MBTA protects most birds found on site, with the exception of non-native and non-migratory species, and the BGEPA protects bald (*Haliaeetus leucocephalus*) and golden (*Aquila chrysaetos*) eagles. The ESA protects those species listed under the ESA. Despite efforts to reduce impacts to birds and bats from the Project, impacts to bird and bat species in some or all of these groups may occur. The goal of this document is to outline specific strategies to limit, monitor, and mitigate impacts to birds and bats, including species in these protected groups as well as species with no legal protections, from the construction, operation, and maintenance of the Project.

1.2 CORPORATE POLICY

CWF LLC is committed to natural resource conservation and environmental sustainability. Wind farm design, construction, operation, and maintenance will be conducted in such a manner that minimizes impacts to natural resources, by using best management practices and strategies outlined in this document. CWF LLC recognizes the need to balance wind energy production with simultaneous minimization of impacts to protected and non-protected wildlife, and their habitats, by using the best available scientific information and engineering technology. This ABPP is intended to guide the sustainable development of the Project, by outlining procedures to avoid, minimize, and monitor impacts to birds and bats.

1.3 PROJECT DESIGN AND DEVELOPMENT

The Project is located in the Town of Denmark, Lewis County, and the Towns of Rutland and Champion, Jefferson County, New York (Appendix A). The Project is proposed to consist of up to 40 General Electric (GE) 2.0-116 wind turbines that will deliver up to 79.9 megawatts (MW) of electrical power to the New York State grid. In addition to the wind turbines, the Project will consist of three permanent meteorological (met) towers, a system of gravel access roads, buried 34.5 kilovolt (kV) electrical collector lines, an operation and maintenance (O&M) building, and a collection and transforming station. To deliver power to the New York State power grid, the Project will also include construction of a 115 kV transmission line and a Point of Interconnection facility located adjacent to the existing National Grid Black River – Lighthouse

Hill 115 kV transmission line in the Town of Rutland. The proposed transmission line route will be approximately eight miles (13 kilometers [km]) in length.

1.4 REGULATORY OVERVIEW

1.4.1 The Endangered Species Act

The ESA provides protection to endangered wildlife by making it unlawful to "take" such species. The ESA defines take to include "harass, harm, pursue, hunt, shoot, wound", or "kill" endangered species (16 U.S.C. 1532(19)). The US Fish and Wildlife Service (USFWS) have further defined "harm" to include "significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 C.F.R. 17.3 and 222.102). The ESA was amended to allow the USFWS to issue incidental take permits (ITPs) for ESA-listed species if a project proponent abides by a Habitat Conservation Plan (HCP) See 16 U.S.C. 1539(a)(2); 50 C.F.R. 17.22(b).

CWF LLC is currently working with the USFWS to develop an HCP to address potential impacts to ESA-listed bat species (Indiana bat [*Myotis sodalis*] and northern long-eared bat[41] [*Myotis septentrionalis*]) from the Project. No ESA-listed bird species are expected to be impacted by the Project.

1.4.2 The Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act

The MBTA prohibits the take of migratory birds, and the BGEPA prohibits the take of bald and golden eagles. Take is defined in both statues as to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, destroy, molest, disturb, or otherwise harm individuals, nest or eggs (16 USC 703–711; 50 CFR 21; 16 USC 668−668 (d)). The BGEPA further defines "disturb" to include agitation or bothering a bald or golden eagle to a degree that causes, or is likely to cause, based on the best scientific information available, injury, decreased productivity by interfering with normal breeding, feeding, or sheltering behavior, or nest abandonment. The MBTA does not include provisions allowing take, and does not prohibit incidental take. The BGEPA has an associated permit that authorizes the take of bald and golden eagles that is associated with, but not the purpose of the activity.

1.4.3 Environmental Conservation Law of New York

Section 11-0535 and 6 of the New York code of rules and regulations part 182 provides the authority of the New York State Department of Environmental Conservation (NYSDEC) to list native species as endangered or threatened either based on the criteria for listing (section 182.3)

[41] The northern long-eared bat is listed as threatened with a final 4(d) rule under the ESA (80 FR 17974, 81 FR 1900). The northern long-eared bat is included in the Project's HCP as a Covered Species so that the species is fully addressed commensurate with the other Covered Species, providing take authorization under the ITP that will apply even in the event the 4(d) rule is reversed or the species is up-listed to endangered status within the term of the permit.

or species that are listed as endangered by the U.S. Department of the Interior. The species of birds and bats covered under these statutes in the state of New York that have the potential to occur in Jefferson and Lewis Counties are listed in Table 1.1.

Table 1.1 Federal and New York State Listed Bird and Bat Species with Potential to Occur in Jefferson and Lewis Counties.

Species	Scientific Name	Federal Status	New York State Status
Birds			
Black tern	*Chlidonias niger*		Endangered
Short-eared Owl	*Asio flammeus*		Endangered
Loggerhead shrike	*Lanius ludovicianus*		Endangered
Pied-billed grebe	*Podilymbus podiceps*		Threatened
Least bittern	*Ixobrychus exilis*		Threatened
Bald eagle	*Haliaeetus leucocephalus*		Threatened
Northern harrier	*Circus cyaneus*		Threatened
Upland sandpiper	*Bartramia longicauda*		Threatened
Common tern	*Sterna hirundo*		Threatened
Sedge wren	*Cistothorus platensis*		Threatened
Henslow's sparrow	*Ammodramus henslowii*		Threatened
Common loon	*Gavia immer*		Special Concern
American bittern	*Botaurus lentiginosus*		Special Concern
Osprey	*Pandion haliaetus*		Special Concern
Sharp-shinned hawk	*Accipiter striatus*		Special Concern
Cooper's hawk	*Accipiter cooperii*		Special Concern
Northern goshawk	*Accipiter gentilis*		Special Concern
Red-shouldered hawk	*Buteo lineatus*		Special Concern

Species	Scientific Name	Federal Status	New York State Status
Common nighthawk	*Chordeiles minor*		Special Concern
Whip-poor-will	*Caprimulgus vociferous*		Special Concern
Red-headed woodpecker	*Melanerpes erythrocephalus*		Special Concern
Horned lark	*Eremophila alpestris*		Special Concern
Golden-winged warbler	*Vermivora chrysoptera*		Special Concern
Cerulean warbler	*Setophaga cerulean*		Special Concern
Yellow-breasted chat	*Icteria virens*		Special Concern
Vesper sparrow	*Pooecetes gramineus*		Special Concern
Grasshopper sparrow	*Ammodramus savannarum*		Special Concern
Bats			
Indiana bat	*Myotis sodalis*	Endangered	Endangered
Northern long-eared bat	*Myotis septentrionalis*	Threatened[1]	Threatened
Eastern small-footed bat	*Myotis leibii*		Special Concern

1 The final 4(d) rule published January 14, 2016 (81 FR 1900), exempts all incidental take of northern long-eared bats from otherwise lawful activities from take prohibitions under Section 9 of the Endangered Species Act, except: take of northern long-eared bats in their hibernacula in areas affected by white-nose syndrome; take resulting from tree removal within 0.25 mile (0.4 km) of a known northern long-eared bat hibernaculum; and take resulting from removal of a known northern long-eared bat maternity roost tree or tree removal within a 150-ft (45-m) radius of a known northern long-eared bat maternity roost tree during the pup season (June 1 through July 31). Incidental take resulting from hazard tree removal for protection of human life and property is exempt from take prohibitions regardless of where and when it occurs.

2 PRE-CONSTRUCTION WILDLIFE MONITORING

Preliminary site assessments were conducted to assess the potential risk to bird and bat species given the location of the Project and its turbines. All pre-construction surveys were conducted on the proposed Project site.

Risks to birds were assessed using multiple avian surveying techniques. These surveys were conducted using widely accepted techniques to assess composition and behavior (migrating/breeding/non-breeding) of species of birds within the Project. Avian surveys included breeding bird surveys, meander searches, short-eared owl (*Asio flammeus*) surveys (Sanders 2012a), and raptor watches (Sanders 2012b). Risk to bats was assessed using mist-net surveys in conjunction with concurrent acoustic surveys near netting sites, as well as long-term monitoring acoustic surveys at the on-site meteorological tower (Sanders 2012c, 2013).

2.1 MIGRATORY BIRDS

In the spring and summer of 2012, studies were conducted to determine presence and population of birds at the Copenhagen site, in accordance with the guidelines for conducting bird and bat studies at commercial wind energy project (NYSDEC 2009). During these surveys, 80 point count sites and seven qualitative meander search sites were sampled at the proposed Project. Additionally, 17 of the point count sites were sampled specifically for short-eared owls as requested by the NYSDEC at the initial Project review meeting (2/15/2012). Breeding bird surveys were intended to provide an estimate of the type and relative frequency of species moving through the area in the spring and using habitat in the Project during the nesting season. The overall objective was to determine the late spring/summer presence, absence, and site use by rare, threatened, or endangered bird species such as northern harrier (*Circus cyaneus*), upland sandpiper (*Bartramia longicauda*), short-eared owl, Henslow's sparrow (*Ammodramus henslowii*), grasshopper sparrow (*Ammodramus savannarum*), vesper sparrow (*Pooecetes gramineus*), and sedge wren (*Cistothorus platensis*) (Table 1.1). The northern harrier and upland sandpiper are known to be present at nearby locations (NYSDEC 2012).

2.1.1 Methods

2.1.1.1 Short-eared Owl Surveys

In early May 2012, points were surveyed with a focus on detecting short-eared owls. The surveys were conducted from May 7 to May 11, following protocols set forth in the guidelines for conducting bird and bat studies at commercial wind energy projects (NYSDEC 2009), and the work plan as approved by the NYSDEC. The surveys consisted of morning and evening surveys conducted at 17 of the breeding bird points (Appendix B). Evening surveys were conducted one hour before sunset until two hours after sunset and morning surveys were conducted between one-half hour before sunrise until no later than 10:30 am. Audio playback of short-eared owl calls was used to elicit a response. Methods were completed as outlined below for the breeding bird surveys, except each point surveyed for ten minutes instead of five.

2.1.1.2 Breeding Bird Surveys

Breeding bird point count surveys were conducted during the breeding season from late May through July 20, 2012, from one half-hour before sunrise until no later than 10:30 am. Eighty survey points were selected within good grassland habitat near proposed turbine sites (Appendix B). Each point count covered a circular plot survey centered on the observation point. Point counts were conducted for five minutes and all birds observed (identified by sight or sound) within approximately 328 feet (100 meters [m]) were recorded. Species identification, number of individuals of each species, method of observation (visual or auditory), and behavior (nesting, flying, perching, singing, etc.) were recorded for each observation during the five-minute point count. Care was taken to avoid duplicate counting of individuals at the same point or at multiple points. Locations of visually observed rare, threatened, and endangered species were recorded without disturbing the bird(s).

2.1.1.3 Qualitative Meander Survey

Breeding bird qualitative meander surveys were conducted at the Project to supplement the breeding bird surveys. Meander surveys are used to target unique habitats and/or species with cryptic behavior that may not be detected during traditional point counts. Here, meander surveys targeted the most suitable habitat for rare, threatened, and endangered grassland bird species. Seven meander survey locations were selected for breeding birds (Appendix B). These areas were surveyed monthly in May, June, and July. Sampling occurred between one half-hour before sunrise and 10:30 am. The observer slowly walked around each survey location for a minimum of 30 minutes and no more than 60 minutes. Species identification, number of individuals of each species, method of observation (visual or auditory), and behavior (nesting, flying, perching, singing, etc.) was recorded for each observation.

2.1.1.4 Incidental Sightings

Any incidental sightings of rare, threatened, or endangered species were recorded. Behavior and location data was recorded for all incidental sightings. These sightings included any observations within the Project yet outside of the point count or meander survey locations and sampling times.

2.1.2 Results

2.1.2.1 Short-eared Owl Surveys

No owls of any species were detected during the short-eared owl surveys. A total of 419 observations of 49 other species were observed during short-eared owl surveys (Table 2.1). The majority (72%) of the observations were recorded during the morning surveys. The most frequently observed species were red-winged blackbird (*Agelaius phoeniceus*) at 17.9% relative frequency, American robin (*Turdus migratorius*) at 10.0% relative frequency, song sparrow (*Melospiza melodia*) at 9.1% relative frequency, yellow warbler (*Setophaga petechia*) at 6.4% relative frequency, and bobolink (*Dolichonyx oryzivorus*) at 6.0% relative frequency (Table 2.1). Flyovers and birds observed farther than 328 feet from the point were not included in Table 2.1. Common grackle (*Quiscalus quiscula*), European starling (*Sturnus vulgaris*), belted kingfisher (*Megaceryle alcyon*), and an unidentified duck were all observed as flyovers only and are not included in Table 2.1.

Table 2.1 Number and Percent of Observations, by Species, Recorded during Short-eared Owl Surveys at the Copenhagen Wind Farm.

Species[1]	Morning		Evening	
	# Obs.[2]	% Obs.[3]	# Obs.	% Obs.
AMCR	3	0.9		
AMGO	4	1.3	1	0.8
AMRE	5	1.6		
AMRO	26	8.2	16	12.9
AMWO	1	0.3	5	4.0
BAOR	1	0.3		
BAWW	4	1.3		
BCCH	9	2.8	3	2.4
BHCO	1	0.3		
BLJA	8	2.5	1	0.8
BOBO	13	4.1	12	9.7
BRTH	3	0.9		
BTBW	1	0.3		
BTNW	2	0.6		
BWWA	1	0.3		
CANG	2	0.6		
CHSP	1	0.3		
COYE	10	3.2	2	1.6
DOWO	1	0.3		
EAKI	3	0.9	1	0.8

Species[1]	Morning		Evening	
	# Obs.[2]	% Obs.[3]	# Obs.	% Obs.
EAPH	2	0.6		
EATO	7	2.2	5	4.0
FISP	6	1.9		
GCFL	2	0.6		
GRCA	15	4.7	5	4.0
HETH	5	1.6	3	2.4
HOLA	1	0.3		
KILL	6	1.9	3	2.4
MODO	2	0.6		
NOCA	1	0.3		
NOFL	3	0.9		
OVEN	11	3.5	1	0.8
PUFI	1	0.3		
RBGR	1	0.3	2	1.6
RBGU	1	0.3		
ROPI	2	0.6		
RUGR	2	0.6	1	0.8
RWBL	49	15.5	26	21.0
SAVS	9	2.8		
SOSP	22	6.9	16	12.9
SWSP	2	0.6		

Species[1]	Morning		Evening	
	# Obs.[2]	% Obs.[3]	# Obs.	% Obs.
TRES	9	2.8		
TUVU	8	2.5		
UEFL	1	0.3		
UNBI	2	0.6	1	0.8
UNWA			1	0.8
UNWO	4	1.3		
VEER	1	0.3		
WAVI	2	0.6	2	1.6
WITU	1	0.3	1	0.8
WOTH	1	0.3		
WTSP	3	0.9	3	2.4
YWAR	22	6.9	5	4.0
Total	303		116	

[1] Bird species codes defined and scientific names provided in Appendix D

[2] Number of observations

[3] Percent of observations

2.1.2.2 Breeding Bird Surveys

Detailed reporting of the analysis and results of the breeding bird surveys can be found in Sanders 2012a. The following is provided as a summary for the purposes of this ABPP.

A total of 82 species were observed at the 80 points during point counts (Table 2.2). Over the four complete survey periods, in the months of June and July, 2,529 observations were detected either visually or through audible cues. This number does not include flyover individuals or individuals detected at greater than 328 feet from the point, as they are not contained to the sample area.

The highest number of observations was recorded during the first survey in June, while the lowest number of observations was recorded during the last survey in June. The highest species richness was recorded in the first and second surveys in June. The lowest species richness was recorded in the early July survey.

Table 2.2 Number and Percent of Observations, by Species, Recorded during Breeding Bird Surveys at the Copenhagen Wind Farm.

Species[1]	May Survey	June First Survey		June Second Survey		June Third Survey		Early July Survey	
	Species Detected?	# Obs.[2]	% Obs.[3]	# Obs.	% Obs.	# Obs.	% Obs.	# Obs.	% Obs.
AMKE	Yes	-	-	1	0.2	3	0.6	-	-
AMCR	Yes	16	1.8	9	1.5	4	0.8	4	0.7
AMGO	Yes	9	1.0	-	-	-	-	-	-
AMRE	Yes	11	1.2	8	1.4	7	1.3	5	0.9
AMRO	Yes	67	7.6	22	3.8	34	6.5	47	8.7
AMWO	Yes	3	0.3	5	0.9	-	-	-	-
BAOR	Yes	10	1.1	4	0.7	1	0.2	1	0.2
BARS	-	-	-	1	0.2	-	-	3	0.6
BAWW	Yes	11	1.2	2	0.3	-	-	-	-
BBCU	-	1	0.1	-	-	1	0.2	-	-
BCCH	Yes	14	1.6	17	2.9	13	2.5	16	3.0
BEKI	Yes	1	0.1	-	-	-	-	-	-

Species[1]	May Survey	June First Survey		June Second Survey		June Third Survey		Early July Survey	
	Species Detected?	# Obs.[2]	% Obs.[3]	# Obs.	% Obs.	# Obs.	% Obs.	# Obs.	% Obs.
BGGN	-	1	0.1	1	0.2	-	-	-	-
BHCO	Yes	1	0.1	3	0.5	2	0.4	1	0.2
BLJA	Yes	12	1.4	4	0.7	8	1.5	5	0.9
BOBO	Yes	33	3.7	23	4.0	29	5.5	14	2.6
BRCR	-	1	0.1	4	0.7	5	1.0	1	0.2
BRTH	Yes	1	0.1	1	0.2	-	-	-	-
BTNW	-	7	0.8	4	0.7	-	-	-	-
CANG	Yes	-	-	-	-	-	-	-	-
CEDW	-	-	-	1	0.2	1	0.2		
CHSP	Yes	4	0.5	-	-	-	-	1	0.2
COGR	Yes	10	1.1	-	-	1	0.2	-	-
COYE	Yes	46	5.2	36	6.2	30	5.7	30	5.6
CSWA	-	5	0.6	3	0.5	3	0.6	3	0.6
DOWO	Yes	3	0.3	4	0.7	1	0.2	1	0.2

Species[1]	May Survey	June First Survey		June Second Survey		June Third Survey		Early July Survey	
	Species Detected?	# Obs.[2]	% Obs.[3]	# Obs.	% Obs.	# Obs.	% Obs.	# Obs.	% Obs.
EABL	-	-	-	5	0.9	7	1.3	8	1.5
EAKI	Yes	5	0.6	2	0.3	4	0.8	2	0.4
EAME	-	1	0.1	1	0.2	1	0.2	-	-
EAPH	-	4	0.5	7	1.2	2	0.4	4	0.7
EATO	Yes	15	1.7	6	1.0	16	3.0	15	2.8
EAWP	Yes	10	1.1	5	0.9	2	0.4	2	0.4
EUST	Yes	16	1.8	22	3.8	17	3.2	24	4.5
FISP	Yes	4	0.5	-	-	-	-	-	-
GBHE	Yes	-	-	-	-	-	-	-	-
GCFL	Yes	9	1.0	4	0.7	-	-	-	-
GRCA	Yes	16	1.8	16	2.7	21	4.0	28	5.2
HAWO	-	-	-	2	0.3	5	1.0	2	0.4
HETH	Yes	15	1.7	5	0.9	2	0.4	1	0.2
HOLA	-	1	0.1	-	-	-	-	-	-

Species[1]	May Survey	June First Survey		June Second Survey		June Third Survey		Early July Survey	
	Species Detected?	# Obs.[2]	% Obs.[3]	# Obs.	% Obs.	# Obs.	% Obs.	# Obs.	% Obs.
HOSP	-	3	0.3	10	1.7	23	4.4	22	4.1
HOWR	Yes	7	0.8	1	0.2	-	-	-	-
INBU	-	7	0.8	2	0.3	-	-	-	-
KILL	Yes	9	1.0	-	-	-	-	-	-
LEFL	Yes	1	0.1	2	0.3	-	-	-	-
MALL	Yes	-	-	-	-	-	-	-	-
MODO	Yes	6	0.7	1	0.2	7	1.3	11	2.0
NOCA	Yes	4	0.5	9	1.5	9	1.7	8	1.5
NOFL	Yes	3	0.3	5	0.9	2	0.4	2	0.4
NOMO	-	-	-	5	0.9	3	0.6	6	1.1
OVEN	Yes	21	2.4	24	4.1	30	5.7	18	3.3
PIWO	-	1	0.1	-	-	1	0.2	1	0.2
PUFI	Yes	-	-	-	-	-	-	-	-
RBGR	Yes	4	0.5	2	0.3	-	-	-	-

Species[1]	May Survey	June First Survey		June Second Survey		June Third Survey		Early July Survey	
	Species Detected?	# Obs.[2]	% Obs.[3]	# Obs.	% Obs.	# Obs.	% Obs.	# Obs.	% Obs.
RBGU	Yes	-	-	-	-	-	-	-	-
RBNU	-	1	0.1	3	0.5	1	0.2	-	-
RBWO	-	-	-	1	0.2	-	-	-	-
REVI	Yes	25	2.8	7	1.2	-	-	-	-
ROPI	Yes	5	0.6	1	0.2	4	0.8	6	1.1
RTHA	Yes	-	-	-	-	-	-	-	-
RTHU	Yes	-	-	1	0.2	-	-	-	-
RUGR	Yes	-	-	-	-	-	-	-	-
RWBL	Yes	243	27.5	124	21.3	84	16.0	99	18.4
SAVS	Yes	23	2.6	43	7.4	50	9.5	59	11.0
SCTA	-	-	-	1	0.2	-	-	2	0.4
SNGO	Yes	-	-	-	-	-	-	-	-
SOSP	Yes	89	10.1	64	11.0	58	11.0	-	-
SWSP	-	-	-	1	0.2	1	0.2	1	0.2

Species[1]	May Survey	June First Survey		June Second Survey		June Third Survey		Early July Survey	
	Species Detected?	# Obs.[2]	% Obs.[3]	# Obs.	% Obs.	# Obs.	% Obs.	# Obs.	% Obs.
TRES	Yes	2	0.2	-	-	-	-	-	-
TUTI	-	1	0.1	10	1.7	8	1.5	7	1.3
TUVU	Yes	-	-	-	-	-	-	-	-
UNBI	-	3	0.3	-	-	-	-	-	-
UNSP	-	-	-	2	0.3	-	-	-	-
UNWA	-	1	0.1	-	-	-	-	-	-
UNWO	-	2	0.2	2	0.3	-	-	-	-
VEER	Yes	1	0.1	1	0.2	-	-	-	-
WAVI	Yes	3	0.3	1	0.2	-	-	-	-
WBNU	-	-	-	5	0.9	3	0.6	3	0.6
WIFL	-	14	1.6	1	0.2	-	-	1	0.2
WITU	Yes	2	0.2	-	-	-	-	-	-
WOTH	-	5	0.6	3	0.5	7	1.3	6	1.1
WTSP	Yes	3	0.3	2	0.3	-	-	-	-

Species[1]	May Survey	June First Survey		June Second Survey		June Third Survey		Early July Survey	
	Species Detected?	# Obs.[2]	% Obs.[3]	# Obs.	% Obs.	# Obs.	% Obs.	# Obs.	% Obs.
YBCU	-	-	-	-	-	1	0.2	-	-
YBFL	-	2	0.2	-	-	-	-	-	-
YBSA	-	-	-	1	0.2	-	-	-	-
YWAR	Yes	30	3.4	19	3.3	13	2.5	13	2.4
Total	-	884	-	582	-	525	-	538	-

[1] Bird species codes defined and scientific names provided in Appendix D

[2] Number of observations

[3] Percent of observations

2.1.2.3 Qualitative Meander Survey

A total of 50 species were observed at the seven meander survey locations during the months of April, May, and June (Table 2.3). Meander surveys were not conducted at locations 5, 6, and 7 during the month of May. Some observations were not identified to species because of background noise, volume of birds in the sample, distance of the bird from the area, and incomplete calls/songs. Due to similarities between species, "unidentified" was used if the observer could not make a 100% positive identification. When possible, unidentified species were placed into subcategories such as unidentified woodpecker, unidentified sparrow, etc. Several species were only observed as a flyover or at distances farther than 328 ft from the observer and were not included in Table 2.3. These species were American crow (*Corvus brachyrhynchos*), American goldfinch (*Carduelis tristis*), American redstart (*Setophaga ruticilla*), black-throated green warbler (*Setophaga virens*), hermit thrush (*Catharus guttatus*), mallard (*Anas platyrhynchos*), mourning dove (*Zenaida macroura*), northern rough-winged swallow (*Stelgidopteryx serripennis*), ring-billed gull (*Larus delawarensis*), rock pigeon (*Columbia livia*), and red-tailed hawk (*Buteo jamaicensis*).

Table 2.3 Number and Percent of Observations, by Species and Season, Recorded during Qualitative Meander Surveys at the Copenhagen Wind Farm.

May			June			July		
Species[1]	# Obs.[2]	% Obs.[3]	Species	# Obs.	% Obs.	Species	# Obs.	% Obs.
AMRO	6	13.3	AMRO	15	13.4	AMKE	1	0.3
BHCO	2	4.4	BAOR	3	2.7	AMRO	39	11.4
COGR	2	4.4	BCCH	5	4.5	BARS	18	5.2
COYE	3	6.7	BLJA	3	2.7	BCCH	4	1.2
EAKI	1	2.2	BOBO	4	3.6	BHCO	1	0.3
EAWP	2	4.4	BWWA	3	2.7	BLJA	4	1.2
GRCA	1	2.2	CANG	2	1.8	BOBO	10	2.9
HOLA	2	4.4	COYE	6	5.4	COYE	18	5.2
KILL	3	6.7	EABL	2	1.8	EABL	6	1.7
NOFL	1	2.2	EAKI	1	0.9	EATO	6	1.7
RBGR	1	2.2	EAPH	2	1.8	EUST	37	10.8
RWBL	4	8.9	EATO	5	4.5	GRCA	23	6.7
SAVS	4	8.9	EAWP	2	1.8	HOSP	13	3.8
SOSP	8	17.8	EUST	1	0.9	NOFL	1	0.3
UNSP	2	4.4	GCFL	2	1.8	NOMO	7	2.0
YWAR	3	6.7	GRCA	2	1.8	OVEN	6	1.7
Total:	**45**		INBU	2	1.8	RWBL	68	19.8
			KILL	1	0.9	SAVS	26	7.6
			NOCA	3	2.7	SOSP	19	5.5

May			June			July		
Species[1]	# Obs.[2]	% Obs.[3]	Species	# Obs.	% Obs.	Species	# Obs.	% Obs.
			NOFL	2	1.8	TRES	15	4.4
			NOMO	1	0.9	TUTI	4	1.2
			OVEN	3	2.7	YWAR	17	5.0
			REVI	1	0.9	**Total:**	**343**	
			RWBL	11	9.8			
			SAVS	7	6.3			
			SOSP	10	8.9			
			TUTI	2	1.8			
			WIFL	1	0.9			
			WITU	1	0.9			
			WOTH	2	1.8			
			YWAR	7	6.3			
			Total:	**112**				

[1] Bird species codes defined and scientific names provided in Appendix D
[2] Number of observations
[3] Percent of observations

2.1.2.4 Incidental Sightings

No threatened or endangered species were observed as incidentals. Two rare species, horned lark (*Eremophila alpestris*) and vesper sparrow (*Pooecetes gramineus*), were observed incidentally within the Project area. Two state threatened species, northern harrier (*Circus cyaneus*) and upland sandpiper (*Bartramia longicauda*), were observed in the vicinity of the Project area but were never encountered within the Project boundary and, therefore, were not recorded as incidental sightings.

2.1.3 Discussion

No federally threatened or endangered species were observed during any surveys or as incidental sightings. One state species of concern, horned lark, was observed during a shorted-eared owl point count and the qualitative meander surveys. Two state species of concern, horned lark and vesper sparrow, were recorded as incidental sightings. Two state threatened species, northern harrier and upland sandpiper, were observed in the vicinity of the Project area but were never encountered within the Project boundary and, therefore, were not recorded as incidental sightings.

The species composition and number of bird observations recorded during the pre-construction migratory bird surveys were generally consistent with expected bird occurrence in mixed agricultural landscapes in northern New York.

2.2 RAPTORS

Raptor migration surveys were conducted in order to assess the passage rate of migrating raptors through the Project. These surveys were conducted in accordance with the New York state guidelines for conducting bird and bat studies at commercial wind energy projects (NYSDEC 2009).

2.2.1 Methods

CWF LLC conducted one year of spring and fall pre-construction monitoring for raptors. Raptors were identified and observed from March 1 to May 31 2012 (spring survey), and August 15 to December 1 2012 (fall survey), by an experienced bird biologist using binoculars or a spotting scope. In ideal weather conditions, sampling was attempted five days per week, Monday through Friday. Surveys were conducted from 9:00 am until approximately two hours before sunset. If raptors continued to move through the area after this time, the surveys were extended.

The spring raptor migration survey observation point was established near proposed turbine locations in the northern part of the Project; the fall raptor migration survey observation point was established near proposed turbine locations in the southern part of the Project (Appendix C). These points were chosen with maximum raptor counts as the goal, as their placement allowed a more complete view of the Project than other potential survey points. All raptors were categorized as either "local" or "migrant" based on overall flight direction and behavior based on the Hawk Migration Association of North America (HMANA) Standard Data Collection Protocol for Raptor Migration Monitoring. All raptors considered migrant were tallied by date and hour using the HMANA Daily Reporting Forms.[42]

2.2.2 Results

Ten species of raptors were observed during the spring and fall surveys. Overall, 257 observations of migrant raptors were recorded. The migrant total for the spring season was 215 raptors, while the migrant total for the fall season was 42 raptors. In addition, 130 observations of local raptors were made. The local total for the spring season was 117 raptors, while the local total for the fall season was 13 raptors (Table 2.4).

[42] https://www.hmana.org/data-submission/ssion/

Table 2.4 Number and Percent of Observations, by Species and Month, Recorded during Raptor Surveys at the Copenhagen Wind Farm.

Species[1]	Month			Season Total	Percentage of Total
		Spring Survey: Migrant Raptors			
	March	April	May		
TUVU	43	91	66	200	93.02
BAEA	0	0	1	1	0.47
RTHA	3	4	0	7	3.26
RLHA	1	0	0	1	1.40
AMKE	2	0	1	3	0.47
MERL	1	0	0	1	0.47
UNBU	0	1	1	2	0.93
Total	50	96	69	215	100.00
Percentage of Total	23.26	44.65	32.09	-	-
		Spring Survey: Local Raptors			
	March	April	May		
TUVU	0	0	89	89	76.07
NOHA	1	1	1	3	2.56
RTHA	5	6	9	20	17.09
AMKE	0	1	4	5	4.27
Total	6	8	103	117	100.00
Percentage of Total	5.13	6.84	88.03	-	-

Species[1]	Month				Season Total	Percentage of Total
	Fall Survey: Migrant Raptors					
	August	September	October	November		
TUVU	0	3	7	0	10	23.81
SSHA	0	1	0	0	1	2.38
RSHA	0	4	0	0	4	9.52
BWHA	0	14	0	0	14	33.33
RTHA	0	7	6	0	13	30.95
Total	0	29	13	0	42	100.00
Percentage of Total	0	69.05	30.95	0	-	-
	Fall Survey: Local Raptors					
	August	September	October	November		
TUVU	4	2	0	0	6	46.15
RTHA	3	2	1	0	6	46.15
AMKE	1	0	0	0	1	7.69
Total	8	4	1	0	13	100.00
Percentage of Total	61.54	30.77	7.69	0	-	-

[1] Bird species codes defined and scientific names provided in Appendix D

Migrant raptor passage rates were calculated per hour for the spring and fall observation season (Table 2.5). These rates allow for comparison with similar studies in other locations (Section 2.2.3).

Table 2.5 Migrant Raptor Passage Rates (per hour), by Month, Recorded during Raptor Surveys at the Copenhagen Wind Farm.

Species[1]	Month					Total
Spring Survey						
	March (122 hours)	April (136 hours)	May (179 hours)			437 hours
TUVU	0.35	0.67	0.37			0.458
BAEA	0.00	0.00	0.01			0.002
RTHA	0.02	0.03	0.00			0.016
RLHA	0.01	0.00	0.00			0.002
AMKE	0.02	0.00	0.01			0.007
MERL	0.01	0.00	0.00			0.002
UNBU	0.00	0.01	0.01			0.005
Total	0.41	0.71	0.39			0.492
Fall Survey						
	August (138 hours)	September (170 hours)	October (176 hours)	November (116 hours)	December (6 hours)	606 hours
TUVU	0.00	0.02	0.04	0.00	0.00	0.017
SSHA	0.00	0.01	0.00	0.00	0.00	0.002
RSHA	0.00	0.02	0.00	0.00	0.00	0.007
BWHA	0.00	0.08	0.00	0.00	0.00	0.023
RTHA	0.00	0.04	0.03	0.00	0.00	0.021
Total	0.00	0.17	0.07	0.00	0.00	0.069

[1] Bird species codes defined and scientific names provided in Appendix D

2.2.3 Discussion

No federally threatened or endangered species were observed during the raptor surveys. Two state threatened species were observed during the spring season: a single bald eagle was recorded as a migrant and three northern harriers were recorded as local (not migrant). Two state species of concern were observed during the fall season: a single sharp-shinned hawk (*Accipiter striatus*) and four red-shouldered hawks (*Buteo lineatus*) were recorded as migrants.

The raptor surveys at the Copenhagen site recorded much lower raptor passage rates than passage rates recorded at three other sites with publically available data in the region (NYSDEC 2010). During the spring surveys, the overall passage rate was 0.492 raptor per hour, compared to an average passage rate of 10.2 raptors per hour at the three other sites in the region with spring data available through NYSDEC. During the fall surveys, the overall passage rate was 0.069 raptor per hour, compared to an average passage rate of 8.07 raptors per hour at the three other sites in the region with fall data available through NYSDEC.

2.3 BATS

To evaluate bat use of the Project, multiple surveys were conducted in accordance with the New York state guidelines for conducting bird and bat studies at commercial wind energy projects (NYSDEC 2009). These surveys included long-term acoustic monitoring at the on-site meteorological tower, as well as mist-net and site-specific acoustic surveys. This combination of surveys provided information on the timing of bat migration, as well as summer maternity colony presence/absence for most species.

2.3.1 Methods

2.3.1.1 Long-term Acoustic Monitoring

Long-term acoustic monitoring took place at the Copenhagen site from April 15to October 15, 2012 using two Pettersson D500x detectors (Sanders Environmental, Inc. 2012). These full spectrum, direct recording devices were placed on an existing meteorological tower, with one detector deployed 190 feet (58 meters) above ground level (upper detector) and the other detector deployed approximately three feet (one meter) above ground level (lower detector), both at 30-degree angles. Calls from one half-hour before dusk to one half-hour after dawn were recorded and processed. These files were then processed using the SonoBat 3.13 NY-PA-WV automatic call identification software (J.Szewczak, Arcata CA). Classification to species level was made only if the analysis resulted with a classification that met or exceeded a discriminate probability threshold of 0.90 and an acceptable call quality threshold of 0.80. Classification to a group level was made if the discriminate probability threshold did not exceed 0.90.

2.3.1.2 Mist-netting and Site Acoustic Monitoring

Between May 25 and June 14, 2012, 26 mist-net sites were sampled within the Copenhagen site (Sanders Environmental, Inc. 2013). The mist-net sites were run in an effort to assess the presence or absence of the federally endangered Indiana bat. Bats were captured using mist-nets, following the techniques, methods, and protocols set forth in the Indiana Bat Mist Netting

Guidelines in the USFWS Indiana Bat (*Myotis sodalis)* Revised Recovery Plan, dated March 1999[43].

Acoustic surveys were performed concurrently with the mist-net surveys, as there is some concern over the effectiveness of mist-net surveys in a post-white nose syndrome landscape. One Pettersson D500X bat detector was deployed per night, per mist-net site. The detector was attached to the top of a four-foot (approximately one meter) pole, with the microphone aimed at a 45 degree upward angle. The detector was placed on the edge of open areas (fields, large corridors, creek corridors, etc.), which have fewer obstacles for bats to navigate around. This placement helped ensure call characteristics similar to those used as the basis for software that classifies bat calls to species. Calls were recorded in full spectrum and analyzed with Sonobat 3.06's NE auto classifying software (J.Szewczak, Arcata CA)[44]. Classifications were made only if the analysis resulted with a classification that met or exceeded a discriminate probability threshold of 0.90 and had a minimum acceptable quality of 0.80.

2.3.1.3 Additional Analysis of Acoustic Data

To better assess whether Indiana bats were likely to have been present and recorded during acoustic surveys, WEST, Inc. (Laramie, WY) reviewed the data that were identified by Sonobat as *Myotis* calls.

The echolocation calls of Indiana bats are often difficult to distinguish from other species of *Myotis*. However, some researchers have demonstrated that echolocation calls can be accurately identified with relatively low error rates (Murray *et al.* 1999, O'Farrell *et al.* 1999, Britzke *et al.* 2002, Ford *et al.* 2005, Yates and Muzika 2006, Robbins *et al.* 2008, Allen *et al.* 2010, Britzke *et al.* 2011). WEST, Inc. adopted a multi-level strategy to identify potential Indiana bat echolocation calls. The approach consisted of using three USFWS 'candidate' acoustic bat identification programs (Kaleidoscope Pro, BCID, EchoClass) and following up with qualitative acoustic analysis (USFWS 2013).

The files were submitted to Kaleidoscope Pro 1.0.0 (Wildlife Acoustics, Concord, MA) for automated species analysis. In Kaleidoscope, the four *Myotis* species that were possible to be represented in each of the call files were selected, and selected the level of accuracy to "most accurate." As is expected with this type of analysis, more accurate classifications come at the expense of total number of classifications. In addition, the full-spectrum files were converted to zero-cross files. Conversion was performed using Kaleidoscope with a setting of Division Ratio of 16, which is standard for zero-crossing data collection. Using the zero-crossing files, the files

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[43] The 1999 protocols were used instead of the protocols in the Indiana Bat (*Myotis sodalis*) Draft Recovery Plan First Revision (2007) because the 2007 plan was not officially adopted by the USFWS. The 1999 protocol was used in the mist-netting study plan submitted to and approved by the USFWS prior to conducting surveys for the Project.

[44] Difference software packages were used for the long-term acoustic monitoring and the acoustic monitoring concurrent with the mist-net surveys because the work was conducted on different dates. The software was chosen according to the most recent package available or according to what had been specified in the study plans.

were submitted to BCID (R. Allen, Columbia, MO), another automated software package, for analysis of files to species and to EchoClass 2.0 (Britzke 2013). In BCID, the program was instructed to look for the four4 *Myotis* species possibly present and in EchoClass Species Set 2 was selected, which includes the four Myotids.

Calls identified by candidate programs should be viewed as *potential* Indiana bat calls and not as positively-identified Indiana bat calls for several reasons: 1) error rates of these programs with external data have not been quantified and 2) there is a strong potential for false positives to occur. The search-phase calls of the little brown bats (*Myotis lucifugus*), northern long-eared bats and eastern small-footed bats (*Myotis leibii*), and approach-phase calls of the eastern red bat (*Lasiurus borealis*) can be identified as Indiana bat calls (Britzke *et al.* 2011). To minimize the potential of false positives, any potential Indiana bat calls identified by candidate programs were re-examined by an acoustic expert (i.e., qualitative analysis) to verify the echolocation call sequences were consistent with call characteristics of the Indiana bat. In qualitative call identification, echolocation calls are identified based upon comparison of qualitative and quantitative echolocation call characteristics of unknown calls with those from a known call library (Murray *et al.* 2001, O'Farrell *et al.* 1999, Yates and Muzika 2006). Call characteristics such as minimum frequency, slope, and shape were used to identify Indiana bat calls. Echolocation calls were qualitatively screened in Analook (version 4.9j; © Chris Corben 2004).

2.3.2 Results

2.3.2.1 Long-term Acoustic Monitoring

During the long-term acoustic monitoring period in 2012, the upper acoustic detector recorded 182 calls and the lower acoustic detector recorded 99 calls. The majority of the calls (94 calls, 51.6%) recorded at the upper detector were identified as hoary bat (*Lasiurus cinereus*) calls, while the majority of the calls (41 calls, 41.4%) recorded at the lower detector were identified as silver-haired bat (*Lasiurus noctivagans*) calls (Table 2.6).

Table 2.6 Number of Bat Calls, by Species and Detector, Recorded during Long-term Acoustic Monitoring at the Copenhagen Wind Farm.

Species Group	Number of Calls	
	Upper Detector	Lower Detector
Big brown bat	2	32
Big brown bat/Virginia big-eared bat[1]	0	1
Big brown bat/silver-haired bat	3	3
Eastern red bat	7	1

Hoary bat	94	18
Silver-haired bat	59	41
Hoary bat/silver-haired bat	12	2
Little brown bat/Indiana bat	0	1
Virginia big-eared bat[1]	1	0
Big brown bat/hoary bat	2	0
Silver-haired bat/Virginia big-eared bat[1]	2	0

[1] Based on the known range of this species, which does not include the Project, these calls either consisted of other species in the species group or were classified in error

The highest number of bat calls occurred during the week of July 29, 2012 (survey week 16) at both the upper and lower detectors (23.6% and 25.3% of all calls recorded at each detector, respectively). Bat activity was low in spring and early summer, with number of bat calls per week ranging from zero to three between the week of April 22, 2012 (survey week 2) and the week of June 17, 2012 (survey week 10). Bat activity increased in mid-summer and fall, with the majority of the calls recorded between the week of July 1, 2012 (survey week 12) and the week of August 26, 2012 (survey week 20), with a total of 149 (82.9%) calls recorded at the upper detector and 85 (85.9%) calls recorded at the lower detector during this period. Bat activity the decreased through the rest of the fall season, with only 4.4% and 6.1% of the total calls recorded after the week of August 26, 2012 (survey week 20) at the upper detector and lower detector, respectively. No calls were recorded during the weeks of October 7, 2012 and April 22, 2012 (survey weeks 2 and 26) (Figure 2.1).

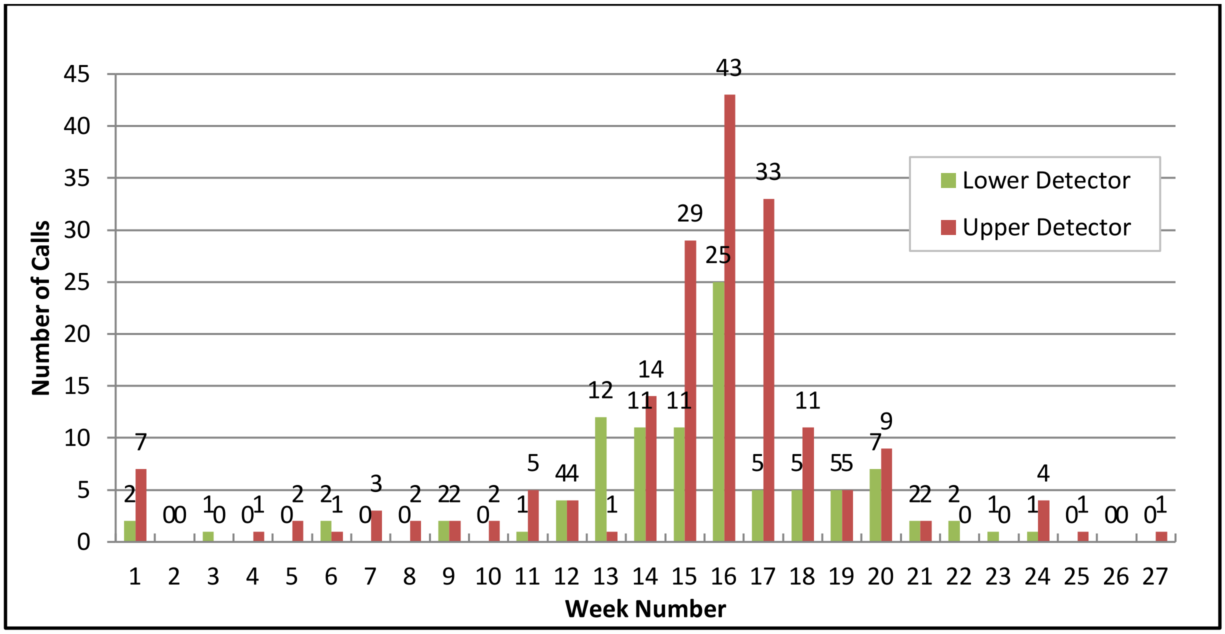

Figure 2.1 Number of Bat Calls, by Survey Week, Recorded during Long-term Acoustic Monitoring at the Copenhagen Wind Farm.

Bat activity was highest during hours two and three of the acoustic surveys (0.5 hour after sunset to 2.5 hours after sunset), with 85 calls (46.7%) recorded at the upper detector and 40 calls (40.4%) recorded at the lower detector during this time period (Figure 2.2). There was a slight increase in bat activity recorded at the upper detector in hours six and seven of the acoustic surveys, with 35 calls (19.2%) recorded during this time period. At the lower detector, a slight increase occurred in hour eight of the acoustic surveys, with 15 calls (15.1%) recorded during this time period. No calls were recorded in hours 12, 13, 14 and 15. Note that as monitoring progressed, the recording period (0.5 hour before sunset to 0.5 hour after sunrise) changed in length with the seasonal changes in sunrise and sunset. The recording period shortened from 12 hours in April to 10 hours in June, then lengthened to 15 hours in October.

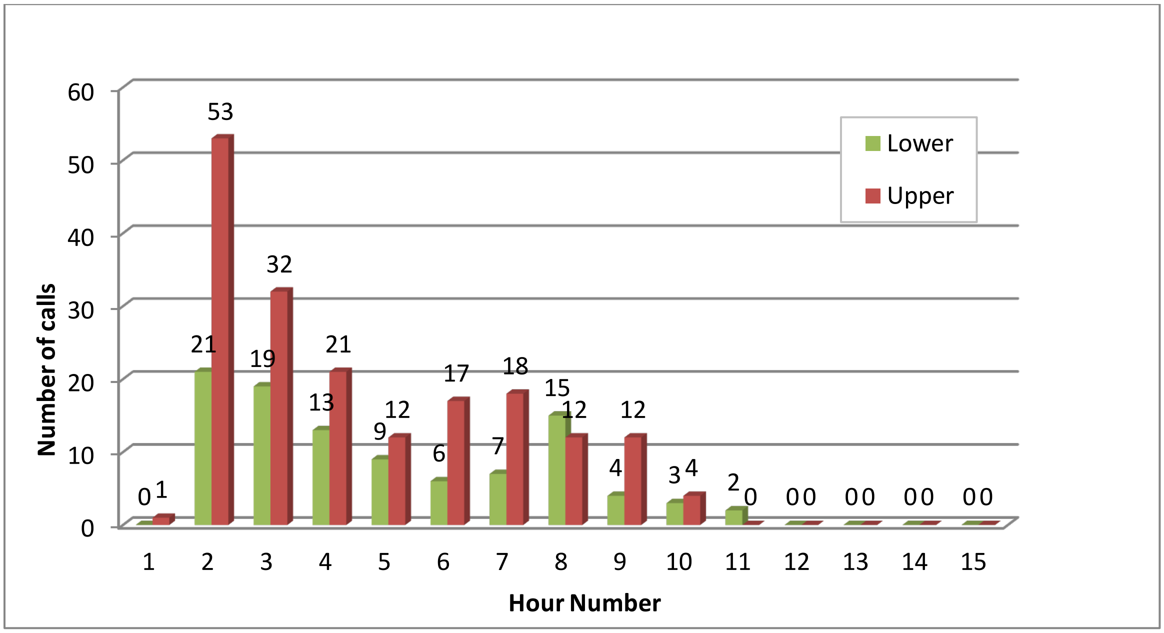

Figure 2.2 Number of Bat Calls, by Survey Hour, Recorded during Long-term Acoustic Monitoring at the Copenhagen Wind Farm.

Bat activity trends were examined by running a correlation analysis between weather data and bat activity. A significant, positive relationship was found between temperature and bat activity at both upper (p=0.000) and lower (p=0.000) detectors. This demonstrates that as temperature increased so did bat activity. An inverse correlation between wind speed and number of calls at the upper and lower detectors was also detected; however, this relationship was not statistically significant (p=0.098, p= 0.118, respectively).

2.3.2.2 Mist-netting and Site Acoustic Monitoring

A total of 41 bats of five species were captured at the 26 mist-net sites (Figure 2.3). No Indiana bats were captured. The species captured consisted of three northern long-eared bats, 29 big brown bats (*Eptesicus fuscus*), six silver-haired bats, one eastern red bat, and two hoary bats. No previously banded bats were captured at any of the mist-net sites, nor were any bats banded during the surveys. No bats were found to have a Reichard Wing Damage Score greater than 1.

At the 26 mist-net sites sampled, 267.5 total hours of acoustic recording were conducted (7.5 hours occurred on nights where rain or cold-outs eventually terminated mist-net sampling). During this survey effort, 1,625 files identified as likely bat calls were recorded. Of those files, 995 (61%) were classified to bat species group by Sonobat. Over the entirety of the sampling, files likely to contain calls were recorded at a rate of 6.0 per hour, and of calls classifiable to bat species group were recorded at a rate of 3.7 per hour.

There were 13 call sequences recorded at four mist-net sites that were classified down to either little brown bat or Indiana bat calls. None of those were determined to be a positive Indiana bat call. Little brown bats were classified from calls at five mist-net sites, but none were caught in mist-nets. Three mist-net sites captured northern long-eared bats but only one of those sites had calls recorded that were classified as northern long-eared bat calls by Sonobat. There were over 440 calls classified as big brown bats from 18 mist-net sites and 29 big brown bats were captured in mist-nets at 12 sites. Six silver-haired bats were captured at three mist-net sites. In addition to those three sites, silver-haired bats were acoustically classified at 15 other mist-sites for a total of 202 calls classified as silver-haired bat sequences. One eastern red bat was captured at a mist-net site that did not have any calls classified as little brown bat sequences, but calls were classified as little brown bat at four other mist-net sites, accounting for 35 calls. Hoary bats were acoustically classified 232 times at 19 mist-net sites; hoary bats were captured in mist-nets at two of those sites. Thirty-five call sequences were classified as evening bats (*Nycticeius humeralis*) at five sites; however, based on the known range of this species, which does not include the Project, these calls were classified in error.

2.3.2.3 Additional Analysis of Acoustic Data

A total of 45 echolocation calls files were examined by WEST, Inc. The most common species predicted by all of three of the candidate acoustic identification programs was the little brown bat (Table 2.7). Little brown bats also were the most common species identified by qualitative analysis. A total of four call files were identified as potential Indiana bats by candidate identification programs (Table 2.8). Three call files were identified by BCID (M6080020.38#, M6082146.24#, and M6090055.27#); two call files were identified by Kaleidoscope Pro (M6080020.38# and M6080044.10#); and one call file was identified by EchoClass (M6080020.38#).

All four potential Indiana bat identifications were identified as little brown bats by qualitative acoustic analysis (Table 2.8) based on specific call parameter values that indicated these call sequences were produced by little brown bats (Table 2.9).

Table 2.7 Species Identification Summary, by Identification Method, for the Additional Analysis of Acoustic Data Recorded at the Copenhagen Wind Farm.

Species	Identification Method			
	BCID	Kaleidoscope Pro	EchoClass 2.0	Qualitative Analysis
Big brown bat	0	0	0	1
Eastern red bat	10	0	0	1
Indiana bat	3	2	1	0
Little brown bat	27	9	3	22
Northern long-eared bat	0	3	0	0
Unknown/Non-Myotis	5	31	41	21
Total Calls	45	45	45	45

Table 2.8 Summary of Indiana Bat Identification Verdict, by Identification Method, for the Additional Analysis of Acoustic Data Recorded at the Copenhagen Wind Farm.

File ID	Date	BCID	Kaleidoscope Pro	EchoClass 2.0	Qualitative Verification
M6080020.38#	June 7	MYSO[1]	MYSO	MYSO	MYLU
M6080044.10#	June 7	Unknown	MYSO	Unknown	MYLU
M6082146.24#	June 8	MYSO	MYLU[2]	Unknown	MYLU
M6090055.27#	June 8	MYSO	Unknown	Unknown	MYLU

[1] MYSO = Indiana bat;

[2] MYLU = little brown bat

Table 2.9 Summary of Call Parameter Values Considered in the Qualitative Analysis of the Additional Analysis of Acoustic Data Recorded at the Copenhagen Wind Farm.

File ID	Acoustic ID	Comments[1, 2]
M6080020.38#	MYLU[2]	Call sequence contained several calls with min. slope < 60 o/s; slope of the body (Sc) < 100 o/s
M6080044.10#	MYLU	Call sequence contained several calls with min. slope < 60 o/s; slope of the body (Sc) < 100 o/s
M6082146.24#	MYLU	Call sequence contained several calls with min. slope < 90 o/s; slope of the body (Sc) < 110 o/s; duration > 4.7 ms
M6090055.27#	MYLU	Call sequence contained several calls with min. slope < 80 o/s; slope of the body (Sc) < 110 o/s; duration > 4.5 ms

[1] Typical Indiana bat calls have minimum slope > 100 o/s; Sc > 125 o/s; duration < 4.5 ms (Murray *et al.* 2001).

[2] MYLU = little brown bat; o/s = octaves per second; ms = milliseconds

Site #	Little Brown *M. lucifugus* Mist Netted	Little Brown *M. lucifugus* Acoustically Detected	Northern Myotis *M. septentrionalis* Mist Netted	Northern Myotis *M. septentrionalis* Acoustically Detected	Big Brown *E. fuscus* Mist Netted	Big Brown *E. fuscus* Acoustically Detected	Silver-Haired *L. noctivagans* Mist Netted	Silver-Haired *L. noctivagans* Acoustically Detected	Red *L. borealis* Mist Netted	Red *L. borealis* Acoustically Detected	Hoary *L. cinereus* Mist Netted	Hoary *L. cinereus* Acoustically Detected	LuSo *M. lucifugus/M. sodalis* Mist Netted	LuSo *M. lucifugus/M. sodalis* Acoustically Detected	Evening *N. humeralis* Mist Netted	Evening *N. humeralis* Acoustically Detected	Total Mist Net Captures	Total Species Detected*	Total Acoustic Detections*
1			1		2	1				1				2		1	3	3	2
2					6	17	1	1	1			7					8	4	25
3					7	49		5		3		19				1	7	4	76
4												4					0	0	4
5			1	1						3		1		1		8	1	3	5
6		3				248		10		28		41		1		23	0	3	330
7					1	3		7				32					1	5	42
8					1	9		1				58					1	3	68
11			1														1	1	0
12		25			1	44		5				2		9		2	1	4	76
13						4		2									0	2	6
14						1		45				17					0	3	63
15						1		1				5					0	3	7
16						1											0	1	1
17					2	13		13				7					2	3	33
18		1			1	24	4	60			1	14					6	4	99
19					1												1	1	0
20								6				4					0	2	10
21		1				4		1									0	3	6
22						10		8				2					0	3	20
23								2				6					0	2	8
24												7					0	1	7
25					2	5	1	25				3					3	3	33
26		1				2		6				1					0	4	10
27					3	10		4			1	2					4	3	16
28	_	_	_	_	2	_	_	_	_	_	_	_	_	_	_	_	2	1	0
Total	**0**	**31**	**3**	**1**	**29**	**446**	**6**	**202**	**1**	**35**	**2**	**232**	**0**	**13**	**0**	**35**	**41**		**947**
Number of Sites w/ Detections	**0**	**5**	**3**	**1**	**12**	**18**	**3**	**18**	**1**	**4**	**2**	**19**	**0**	**4**	**0**	**5**	**14**	**6**	**23**
% of sites captured /detected	**18%**		**11%**		**71%**		**64%**		**18%**		**68%**		*		*				

Yellow cells denote species acoustical classifications where netting did not detect that species.

Red cells denote species captures where the species was not recorded acoustically.

*Acoustic species classifications by site do not include LuSo and Evening Bats as these are either fictitious or outside of reasonable range.

Figure 2.3 Results of Mist-netting and Site Acoustic Monitoring at the Copenhagen Wind Farm.

2.3.3 Discussion

2.3.3.1 Long-term Acoustic Monitoring

Bat activity levels recorded by the long-term acoustic monitoring survey were relatively low. Migratory tree bat species (silver-haired*,* hoary*,* and/or eastern red bats*)* made up the majority of the species recorded during the acoustic monitoring surveys. Cave bats were also present; however, only big brown bat was repeatedly recorded, and this species was detected more often at lower elevations. One little brown/Indiana bat call was recorded, indicating that although one of these species might be present, it does not represent a significant portion of the species composition.

Bat activity was highest during the summer months, peaking from June through October. Activity varied nightly, with number of calls being greater during the hours after dusk than during the hours preceding dawn. Weather affected bat activity, with bat activity decreasing significantly as temperature decrease. Although the relationship between bat activity and wind speed was not found to be statistically significant, bat activity decreased as wind speed increased, with the majority of bat activity occurring in wind speeds less than 6.1 m/s.

2.3.3.2 Mist-netting and Site Acoustic Monitoring

The results of the mist-netting and site acoustic monitoring also indicated that the number of bats utilizing the Project is relatively low. This is especially true for species of *Myotis*; only three *Myotis* bats, all northern long-eared bats, were captured in mist-nets.

2.3.3.3 Additional Analysis of Acoustic Data

Based on the results of the acoustic analysis, WEST concluded that there is insufficient acoustic evidence to indicate the presence of the Indiana bat at this site. Indiana bats (and northern long-eared bats) are addressed in the Project's HCP.

3 RISK ASSESSMENT

3.1 MIGRATORY BIRDS

3.1.1 Collision

Collision with wind turbines is the most obvious and direct impact to birds from wind energy facilities. Birds, particularly songbirds (passerines), have been identified as being vulnerable to such events (Arnett et al. 2007). Impacts to migrating songbirds tend to be higher than impacts to local songbirds, due to migration behavior of some species (Erickson 2007).

Post-construction monitoring of bird and bat mortality due to turbine collisions has been conducted at a number of wind energy facilities throughout the eastern US. Maple Ridge Wind Farm, located west of Lowville, New York, is very close (less than five miles [eight km]) to the Project, and likely provides a good surrogate for estimating the amount of bird and bat mortality due to collisions that may occur at the Project. Post-construction monitoring of the Maple Ridge

Wind Farm was conducted in the summer and fall seasons of 2006, 2007, and 2008. Estimates of bird mortality were calculated for each year (Jain *et al.* 2007, 2009a; and 2009b; Table 3.1).

Table 3.1 Bird Mortality Estimates from Post-construction Monitoring at the Maple Ridge Wind Farm.

Survey Period	Estimated Birds/Turbine/Study Period	Estimated Birds/MW/Study Period	Reference
6/17/2006-11/15/2006	3.13	1.90	Jain *et al.* 2007
4/30/2007-11/14/2007	3.87	2.34	Jain *et al.* 2009a
4/15/2008-11/9/2008	3.42	2.07	Jain *et al.* 2009b

Based on proximity to the Maple Ridge Wind Farm and the similarity of avian habitat between the sites, it is expected that bird mortality at the Project will be similar to the mortality estimated from post-construction monitoring at Maple Ridge. Bird mortality at the Project will be minimized through the implementation of measures designed to reduce bird and bat mortality (Section 4).

Collision with power lines and meteorological towers, particularly the guy lines of towers, may also cause injury or death to birds at wind energy facilities, although these effects are not as well documented as turbine collision impacts (Erickson *et al.* 2005). Bird mortality due to collision with power lines and meteorological towers at the Project will be minimized through implementation of measures designed to reduce bird and bat mortality (Section 4).

3.1.2 Habitat Modification

Concerns have been raised about species of birds avoiding areas near turbines (Drewitt and Langston 2006). Displacement impacts may occur due to the noise produced by the turbines, the general human activity in the area (e.g., maintenance), or the removal of suitable habitat. Habitat modification for the construction of turbines, turbine pads, and roads decreases the amount of available habitat for birds and likely represents an additional threat from wind energy facility development (Leddy *et al.* 1999). In addition, habitat fragmentation caused by the construction of wind facilities can result in a reduction of habitat patch size. This may impact the fitness of songbirds by increasing nest predation and parasitism (USGS 2011). Displacement impacts to birds from the Project will be minimized through implementation of measures to reduce the amount of disturbed and fragmented habitat (Section 4).

3.2 RAPTORS

3.2.1 Collision

Collisions with wind turbines are also a concern for raptors, which are known to be impacted by wind turbines. Incidents of raptor mortality due to wind turbine collision are, however, typically much less frequent than for songbirds. For example, raptors accounted for less than 1% of the bird mortality recorded during the Maple Ridge Wind Farm 2006 post-construction monitoring and less than 5% of the bird mortality recorded during the Maple Ridge Wind Farm 2007 and 2008 post-construction monitoring (Jain *et al.* 2007, 2009a, and 2009b).

The pre-construction surveys indicate the raptor activity is low in the Project, especially for migrating raptors. Bald eagle activity is particularly low, with only one migrant individual recorded during the pre-construction raptor surveys. Based on proximity to the Maple Ridge Wind Farm and the similarity of avian habitat and topography between the sites, it is expected that raptor mortality at the Project will be similar to the mortality estimated from post-construction monitoring at Maple Ridge. Raptor mortality at the Project will be minimized through the implementation of measures designed to reduce bird and bat mortality (Section 4).

3.2.2 Electrocution

Electrocution from transmission and distribution lines poses a potential risk for birds, particularly raptors. The wingspan of raptors is sometimes great enough to contact two conductors or grounded hardware simultaneously on a power line pole, which causes electrocution (Avian Power Line Interaction Committee [APLIC] 2006). Raptor mortality due to electrocution from the transmission and collection lines associated with the Project will be minimized through implementation of measures to reduce the risk of electrocution (Section 4).

3.2.3 Habitat and Nest Disturbance

Habitat disturbance from construction of the Project will likely have minimal direct impacts on raptors because, as indicated in the pre-construction raptor surveys, raptor use of the area is low. Non-migratory local raptors are the raptors most likely to be impacted from habitat disturbance, due in part to the potential for prey species to be impacted by habitat disturbance.

Nest disturbance or destruction is the greatest conservation concern for raptors. Disturbance of raptor nests will be minimized through implementation of measures designed to reduce nest disturbance (Section 4). According to the New York Natural Heritage Program Element Occurrence Database, no active eagle nest sites were located within the Project or vicinity at the time of the raptor surveys (Sanders 2012b).

3.3 BATS

3.3.1 Collision

Bat mortality has been widely documented as a result of collisions with turbine blades (Kunz *et al.* 2007). Tree-roosting species of bats such as hoary bat, silver-haired bat, and eastern red bat have experienced higher mortality rates at wind energy facilities than species of cave bats. This is likely due to the long-range migration undertaken by species of tree bats. It is hypothesized that tree bats prefer to utilize ridge tops as foraging routes and generally fly higher than species of cave bats. The impact to bats varies greatly between wind energy facilities, and the reasons for these variations are not well understood (Cryan and Barclay 2009).

As for birds, the nearby Maple Ridge Wind Farm likely provides a good surrogate for estimating the amount of bat mortality due to collisions that may occur at the Project. Post-construction monitoring of the Maple Ridge Wind Farm was conducted in the summer and fall seasons of 2006, 2007, and 2008. Estimates of bat mortality were calculated for each year (Jain *et al.* 2007, 2009a; and 2009b; Table 3.2).

Table 3.2 Bat Mortality Estimates from Post-construction Monitoring at the Maple Ridge Wind Farm.

Survey Period	Estimated Bats/Turbine/Study Period	Estimated Bats/MW/Study Period	Reference
6/17/2006-11/15/2006	15.20	9.21	Jain *et al.* 2007
4/30/2007-11/14/2007	10.70	6.49	Jain *et al.* 2009a
4/15/2008-11/9/2008	8.18	4.96	Jain *et al.* 2009b

Based on proximity to the Maple Ridge Wind Farm and the similarity of bat habitat between the sites, it is expected that the rate and species composition (Table 3.3) of bat mortality at the Project will be similar to the mortality estimated from post-construction monitoring at Maple Ridge. Bat mortality at the Project will be minimized through the implementation of measures designed to reduce bird and bat mortality (Section 4).

Table 3.3 Species Composition of Bat Carcasses Found during Post-construction Monitoring at the Maple Ridge Wind Farm.

Survey Year	Hoary Bats	Silver-haired Bats	Eastern Red Bats	Little Brown Bats	Big Brown Bats	*Myotis* spp.	Unidentified	Reference
2006	101	36	30	29	11	8	7	Jain *et al.* 2007
2007	100	32	20	31	17	1	1	Jain *et al.* 2009a
2008	61	29	16	24	7	2	1	Jain *et al.* 2009b

3.3.2 Habitat Modification

The effects of habitat modification on bats are poorly understood; however, the greatest impact likely comes from the removal of occupied or potential roost trees. The construction and operation of wind energy facilities increases the level of habitat fragmentation on the landscape, but the impacts to bats are not understood (Kuvlesky *et al.* 2007). Potential impacts to bats from the Project will be minimized through implementation of measures to reduce the amount of disturbed and fragmented habitat (Section 4).

4 AVOIDANCE AND MINIMIZATION

4.1 GOAL

To avoid and minimize impacts to birds and bats and their habitats due to the construction and operation of the Project.

4.2 MEASURES

- Follow the tiered evaluation process outlined in the Wind Energy Guidelines (USFWS 2012) to assess potential impacts of the Project (Table 4.1).
- Design and site turbines, access roads, collection lines, and the transmission line in a way that minimizes the amount of habitat disturbed.
- Design and build the transmission line to follow APLIC suggested practices for minimizing electrocution risk to birds (APLIC 2006).
- Use free-standing (no guy wires) permanent meteorological towers or install bird flight diverters if guy wires must be used.
- Ensure protection of environmental resources through the use of industry Best Management Practices (BMPs) during construction, maintenance and decommissioning of the Project, including:
    - Tubular (non-lattice) turbine towers
    - Turbine lighting according to the minimum Federal Aviation Administration (FAA) requirements
    - Down-shielded lighting at substations, turbine doors, etc.
    - Buried collection lines and telecommunication lines, where possible
    - Stormwater Pollution Prevention Plan
    - No creation of new standing water bodies or wetlands

  - Restoration of temporarily disturbed areas, including construction roads not required for Project O&M
  - Use of existing roads and farm lanes as turbine access roads, where possible
  - Implementation of erosion control and invasive species control plans
  - Removal of trash and debris from work areas daily.

- Minimize the number of trees removed through micro-siting of Project infrastructure; schedule all necessary tree removal while bats are not expected to be present on-site (October 1 to March 31) to avoid impacting roosting bats and nesting migratory birds.

- Post speed limits of 15 mph for access roads and 30 mph for all other roads on site to minimize wildlife collisions.

- Prohibit employees and contractors from bringing unleashed dogs to the site.

- Prohibit employees and contractors from driving vehicles off-road within the site, except if required in the case of emergency.

- Promptly remove, or arrange for the removal of, large animal carcasses when found on site to the extent practicable (e.g., big game, domestic livestock, or feral animals) to avoid attracting raptors and other scavengers.

- Monitor impacts to birds and bats through post-construction monitoring surveys (Section 5.1).

Table 4.1 Progression of the Copenhagen Wind Farm through the Wind Energy Guidelines Tiered Evaluation Process.

Tier	Data Collection	Conclusions	Decision/Project Modifications
1.&2. Site Evaluation and Characterization	Agency coordination; available data pertaining to bird and bat resources within Lewis and Jefferson Counties (Section 1.4.3).	Indiana bat (federally endangered) and northern long-eared bat (federally listed as threatened during the development process for the Project) were identified as potentially occurring within the sites, some forested habitat may suitable. No ESA-listed bird species were identified as potentially occurring in Lewis County or Jefferson County. Most bird and bat species using the Project were considered likely to be common, disturbance-tolerant species based on the predominance of agricultural land uses. Potential for impacts to ESA-listed bat species dependent on presence or absence of the species during summer.	Relative probability of significant adverse impacts = moderate, proceed to Tier 3. Conduct general pre-construction surveys for birds and bats. Continue to coordinate with agencies.
3. Field Studies	Short-eared owl surveys (Section 2.1.1.1), breeding bird surveys (Section 2.1.1.2), qualitative meander survey (Section 2.1.1.3), raptor surveys (Section 2.2), long-term acoustic monitoring (Section 2.3.1.1), mist-netting	Migratory bird, raptor, and bat use of the Project was relatively low and species composition was as expected for the habitat at the site. No ESA-listed bird species were recorded; northern long-eared bats were captured during mist-net surveys but Indiana bats were not. Overall, impacts likely to be similar to those documented at the nearby Maple Ridge Wind Farm based on proximity, similarity in habitat, and lack of unexpected survey results. Impacts to birds and bats can be avoided and minimized through the implementation of appropriate measures. Risk to ESA-listed bat	Relative probability of significant adverse impacts = moderate to high, with certainty regarding mitigation – proceed with permitting, design, and construction following BMPs. CWF LLC will avoid impacts to ESA-listed bat species during construction and is developing an HCP to

Table 4.1 Progression of the Copenhagen Wind Farm through the Wind Energy Guidelines Tiered Evaluation Process.

Tier	Data Collection	Conclusions	Decision/Project Modifications
	and site acoustic monitoring (Section 2.3.1.2).	species could be minimized through targeted seasonal operational adjustments.	address and mitigate adverse impacts to Indiana bats and northern long-eared bats during operation. Conduct Tier 4 post-construction studies, continue to coordinate with agencies.
4. Post-construction Studies	Post-construction monitoring of bird and bat mortality (Section 5.1)	Not yet available.	Not yet available, will follow the adaptive management plan (Section 5.2).

5 POST-CONSTRUCTION MONITORING AND ADAPTIVE MANAGEMENT

5.1 POST-CONSTRUCTION MONITORING

Standard post-construction mortality monitoring at the Project will follow the protocol identified in the TAL request letter, or the protocol identified in the HCP in the event the HCP is finalized during the period of non-listed bird and bat fatality rate estimation outlined below. This protocol is based on the NYSDEC guidelines for conducting bird and bat studies at commercial wind energy projects (NYSDEC 2009) and is designed to monitor bird and bat mortality rates at the Project. Estimates of non-listed bird and bat fatality rates will be calculated from the monitoring data collected at the Project for at least one year to evaluate impacts to non-listed bird and bat species, as recommended in the WEG. Depending on the results, a second year of non-listed bird and bat[45] fatality rates may also be calculated at the Project.

If, at any point over the life of the Project, mortality of an eagle or an ESA-listed species is detected, CWF LLC will notify the USFWS within 24 hours of species identification.

5.2 ADAPTIVE MANAGEMENT

This ABPP represents a process through which CWF LLC plans to minimize impacts to non-listed birds and bats at the Project while maintaining optimal Project operation and generating electricity from the renewable, non-polluting wind energy resource.

The process of adaptive management promotes flexibility in the face of uncertainty, with the expectation that management practices may change over time as the quality and quantity of information behind these practices are improved. Adaptive management prescribes critical monitoring of current practices (see Section 5.1), with an emphasis on a cyclical learning process. Adaptive management provides a means to produce the most effective decision making possible in light of natural variability and the stochastic nature of ecological systems. As such, CWF LLC may implement additional, alternative, or reduced mitigation, monitoring, and/or management depending on the results of Project monitoring.

Results of the post-construction bat and bird mortality monitoring will be evaluated following completion of the monitoring. In the event that the observed mortality rates at the Project are determined to be significantly higher than those reported for other similar regional wind energy projects, CWF LLC will evaluate changes in Project operations that might further avoid or minimize Project impacts on pertinent bird and/or bat species. Specific measures would be dependent on the species impacted. Measures to be implemented are expected to be scientifically proven to sufficiently reduce bird and/or bat mortality while maintaining the economic viability of operating the Project.

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[45] Note that CWF LLC's TAL and ITP, when implemented, may require estimation of bat fatality rates for the duration of those documents.

If mortality of an eagle or an ESA-listed species is detected, consultation with the USFWS will occur.

5.3 KEY RESOURCES

The following individuals are identified as key resources and personnel to assist CWF LLC with bird and bat protection issues. Key partners involved in the development and implementation of this ABPP are indicated with an asterisk*.

Table 5.1 Key Resources for the Copenhagen Wind Farm Avian and Bat Protection Plan.

Resource Type	Name	Address	Phone
Operator	Copenhagen Wind Farm LLC		
Contractor	*To be determined*		
Consultant	Western EcoSystems Technology, Inc.*	415 W. 17th St. Suite 200, Cheyenne, WY 82001	307.634.1756
	Sanders Environmental Inc. *	322 Borealis Way Bellefonte, PA 16823	814.659.8257
Regulatory Agency	USFWS NY FO*	3817 Luker Rd. Cortland, NY 13045	607.753.9334
	NYSDEC*	625 Broadway Albany, NY 12233	631.444.0203
Conservation Group	Bat Conservation International	P.O. Box 162603 Austin, TX 78716	512.327.9721
	National Audubon Society	100 Wildwood Way Harrisburg, PA 17110	717.213.6880

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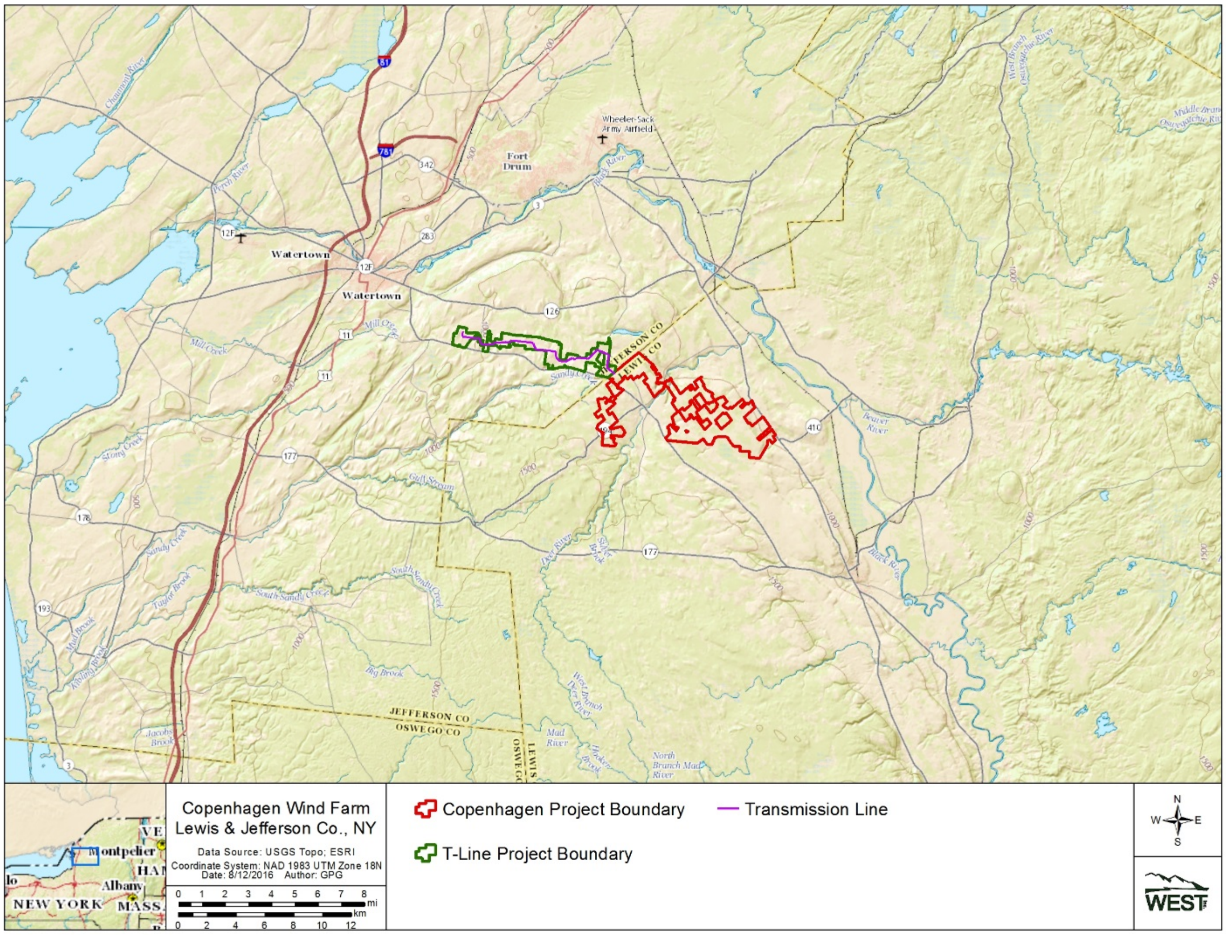
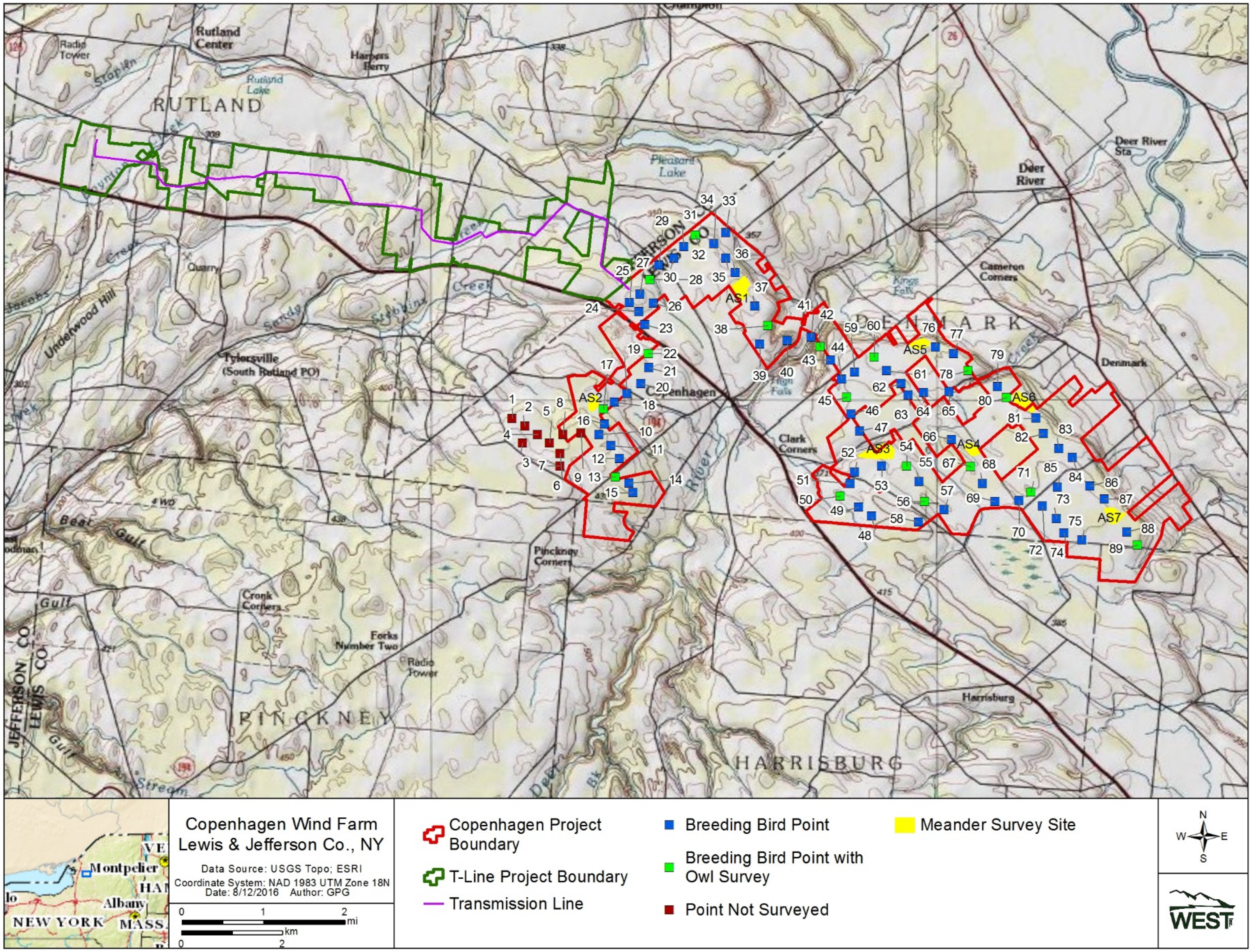
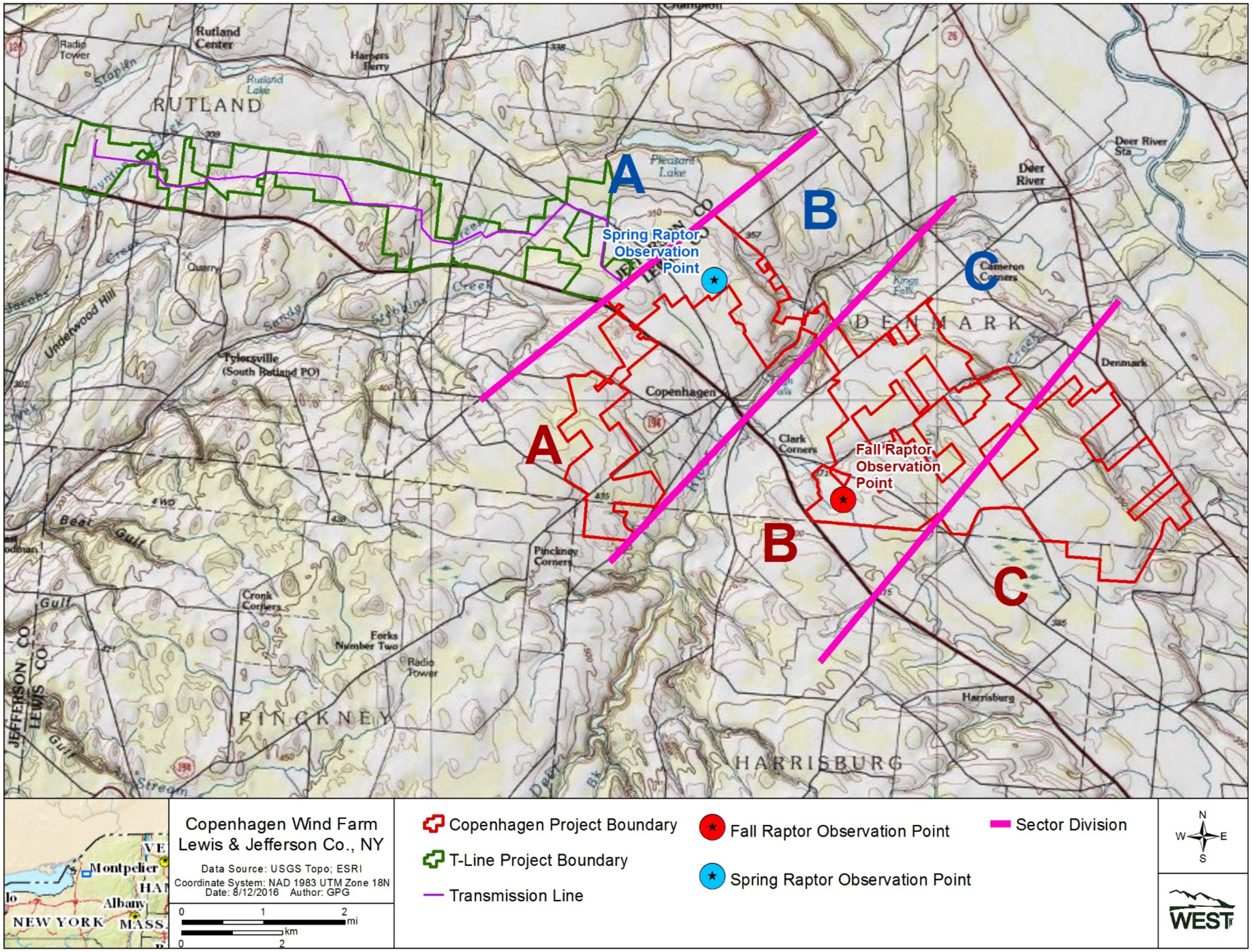
APPENDIX A: MAP OF COPENHAGEN WIND FARM


Copenhagen Wind Farm
Lewis & Jefferson Co., NY
Data Source: USGS Topo; ESRI
Coordinate System: NAD 1983 UTM Zone 18N
Date: 8/12/2016 Author: GPG
Copenhagen Project Boundary
Transmission Line
T-Line Project Boundary
Watertown
Fort Drum
Wheeler-Sack Army Airfield
JEFFERSON CO
LEWIS CO
OSWEGO CO
NEW YORK
Albany
N
W
E
S

APPENDIX B: POINT COUNT SURVEY LOCATIONS


Copenhagen Wind Farm
Lewis & Jefferson Co., NY
Data Source: USGS Topo; ESRI
Coordinate System: NAD 1983 UTM Zone 18N
Date: 8/12/2016 Author: GPG
Copenhagen Project Boundary
T-Line Project Boundary
Transmission Line
Breeding Bird Point
Breeding Bird Point with Owl Survey
Point Not Surveyed
Meander Survey Site
RUTLAND
DENMARK
PINCKNEY
HARRISBURG
Copenhagen
WEST

APPENDIX C: RAPTOR SURVEY LOCATIONS


Copenhagen Wind Farm
Lewis & Jefferson Co., NY
Data Source: USGS Topo; ESRI
Coordinate System: NAD 1983 UTM Zone 18N
Date: 8/12/2016 Author: GPG
Copenhagen Project Boundary
T-Line Project Boundary
Transmission Line
Fall Raptor Observation Point
Spring Raptor Observation Point
Sector Division
Spring Raptor Observation Point
Fall Raptor Observation Point
A
B
C
RUTLAND
DENMARK
PINCKNEY
HARRISBURG
Copenhagen
WEST

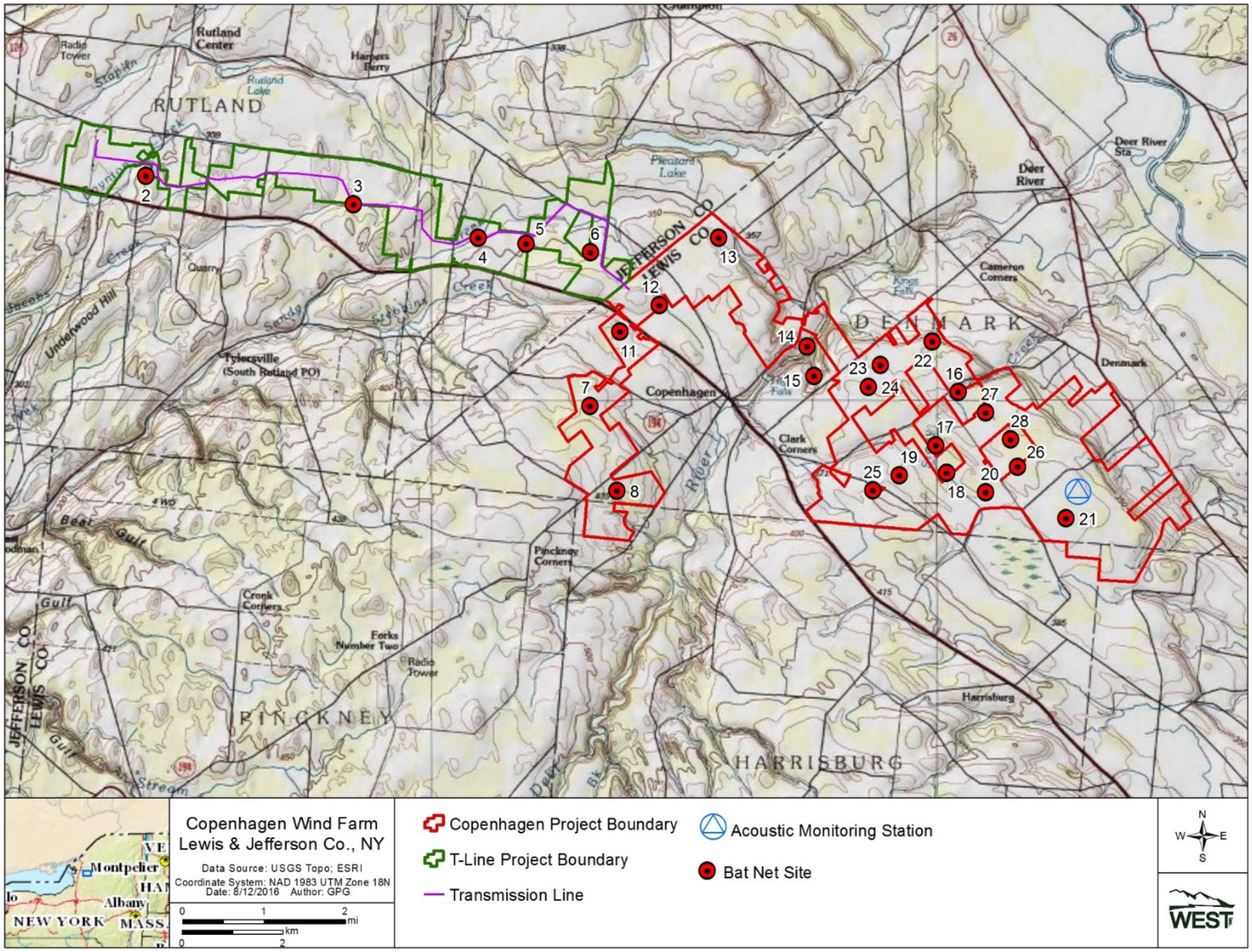
APPENDIX D: BIRD SPECIES CODES

Species	Code
American Crow	AMCR
American Goldfinch	AMGO
American Kestrel	AMKE
American Redstart	AMRE
American Robin	AMRO
American Woodcock	AMWO
Baltimore Oriole	BAOR
Barn Swallow	BARS
Belted Kingfisher	BEKI
Black and White Warbler	BAWW
Black-billed Cuckoo	BBCU
Black-capped Chickadee	BCCH
Black-throated Blue Warbler	BTBW
Black-throated Green Warbler	BTNW
Blue Jay	BLJA
Blue-gray Gnatcatcher	BGGN
Blue-winged Warbler	BWWA
Bobolink	BOBO
Brown Creeper	BRCR
Brown Thrasher	BRTH
Brown-headed Cowbird	BHCO
Canada Goose	CANG
Cedar Waxwing	CEDW
Chestnut-sided Warbler	CSWA
Chimney Swift	CHSW
Chipping Sparrow	CHSP
Common Grackle	COGR
Common Yellowthroat	COYE
Downy Woodpecker	DOWO
Eastern Bluebird	EABL
Eastern Kingbird	EAKI
Eastern Meadowlark	EAME
Eastern Phoebe	EAPH
Eastern Towhee	EATO
Eastern Wood-Pewee	EAWP
European Starling	EUST
Field Sparrow	FISP
Gray Catbird	GRCA
Great Blue Heron*	GBHE
Great-crested Flycatcher	GCFL
Hairy Woodpecker	HAWO
Hermit Thrush	HETH

Herring Gull	HEGU
Horned Lark	HOLA
House Sparrow	HOSP
House Wren	HOWR
Indigo Bunting	INBU
Killdeer	KILL
Least Flycatcher	LEFL
Mallard	MALL
Mourning Dove	MODO
Northern Cardinal	NOCA
Northern Flicker	NOFL
Northern Mockingbird	NOMO
Northern Rough-winged Swallow	NRWS
Ovenbird	OVEN
Pilated Woodpecker	PIWO
Purple Finch	PUFI
Red-bellied Woodpecker	RBWO
Red-eyed Vireo	REVI
Red-tailed Hawk	RTHA
Red-winged Blackbird	RWBL
Ring-billed Gull	RBGU
Rock Pigeon	ROPI
Rose-breasted Grosbeak	RBGR
Ruby-throated Hummingbird	RTHU
Ruffed Grouse	RUGR
Savannah Sparrow	SAVS
Scarlet Tanager	SCTA
Snow Goose	SNGO
Song Sparrow	SOSP
Swamp Sparrow	SWSP
Tree Swallow	TRES
Tufted Titmouse	TUTI
Turkey Vulture	TUVU
Unknown Bird	UNBI
Unknown Duck	UNDU
Unknown Empidonax Flycatcher	UEFL
Unknown Sparrow	UNSP
Unknown Warbler	UNWA
Unknown Woodpecker	UNWO
Veery	VEER
Vesper Sparrow	VESP
Warbling Vireo	WAVI
White-breasted Nuthatch	WBNU
White-throated Sparrow	WTSP

Wild Turkey	WITU
Willow Flycatcher	WIFL
Wood Thrush	WOTH
Yellow Warbler	YWAR
Yellow-bellied Cuckoo	YBCU
Yellow-bellied Flycatcher	YBFL
Yellow-bellied Sapsucker	YBSA

APPENDIX E: MIST-NET AND ACOUSTIC MONITORING LOCATIONS


Copenhagen Wind Farm
Lewis & Jefferson Co., NY
Data Source: USGS Topo; ESRI
Coordinate System: NAD 1983 UTM Zone 18N
Date: 8/12/2016 Author: GPG
Copenhagen Project Boundary
T-Line Project Boundary
Transmission Line
Acoustic Monitoring Station
Bat Net Site
RUTLAND
DENMARK
PINCKNEY
HARRISBURG
Copenhagen
JEFFERSON CO
LEWIS CO
WEST

APPENDIX E. Calculation of Impacts to Non-listed Bats

Estimated All Bat Mortality from the Project

To compare alternatives we estimated the potential level of all bat mortality from the Project without any operational adjustments. To estimate this, all publicly available post-construction monitoring data collected after WNS impacts began ("post-WNS") at wind projects within the migratory range of the Covered Species (approximately 50 miles for Indiana bats in NY and the best information we have on northern long-eared bats rangewide) from the Permit Area were compiled (Table E-1, HCP Table 5-6). Only post-WNS data were used to more closely represent the current and future risk at the Project. Based on the average annual bat mortality rate from this dataset, the bat mortality rate at the Project is expected to be approximately 8.63 bats/MW/year, or approximately **690**[46] **total bat fatalities per year** for the 79.9 MW Project, absent any operational adjustments.

[46] 8.63 bats/MW/year * 79.9 MW = 689.5 total bats/year

Table E-1. HCP Table 5.6

Table 5.6 Adjusted bat mortality rates from publicly available, post-white nose syndrome, post-construction monitoring studies within 50 miles (80 kilometers) of the Copenhagen Wind Farm.

Project Name	State/ Province	Maximum Blade Height	Cut-in Speed	Study Period	Bat Mortality/ MW/Year	Notes	Reference
Maple Ridge	*NY*	397 ft (121 m)	3.5 m/s (11.4 ft/s)	7/12/2012 – 10/15/2012[1]	10.771	Adjusted to an April 1- November 15 estimate	Tidhar et al. 2013a
Wolfe Island, Report 2	*Ontario*	410 ft (125 m)	4.0 m/s (13.1 ft/s)	7/11/2009 – 12/31/2009[1]	8.875	Adjusted to an April 1- November 15 estimate	Stantec Ltd. 2010
Wolfe Island, Reports 3 & 4	*Ontario*	410 ft (125 m)	4.0 m/s (13.1 ft/s)	1/1/2010 – 6/30/2010 and 7/1/2010 – 12/31/2010	11.770	The two 6-month reports were combined into a 12-month estimate, then adjusted to an April 1- November 15 estimate	Stantec Ltd. 2011a, 2011b
Wolfe Island, Reports 5 & 6	*Ontario*	410 ft (125 m)	4.0 m/s (13.1 ft/s)	1/1/2011- 6/30/2011 and 7/1/2011- 12/31/2011	3.100	The two 6-month reports were combined into a 12-month estimate, using only the data from control turbines and turbines excluded from the fall 2011 curtailment study[3], then adjusted to an April 1- November 15 estimate	Stantec Ltd. 2011c, 2012
Average[2]					**8.629**		

[1]Mortality rates were adjusted from the rates provided in reports for those studies with periods lasting shorter than the bat active season (April 1 – November 15), based on the percent of the bat carcasses documented in other reports during the period(s) of the bat active season excluded from the study.
[2] No confidence interval calculated for the average due to the limited number of studies available for the dataset.
[3] Non-trial turbines were operated the same as the control turbines (i.e., normal operations) but the mortality rates were reported separately for the two turbine groups.

Comparison of Alternatives

After determining the total anticipated all bat fatalites/year for the Project site, we estimated the impact of the three alternatives in altering that rate. Each alternative includes operational adjustments (Table E-2).

Table E-2. Comparison of Alternative Operational Adjustments

Alternative	Operational Adjustments			
	Spring Migration (4/1 – 5/15)	**Summer Maternity (5/16 – 7/31)**	**Summer Maternity and Fall Migration (8/1 – 9/30)**	**Fall Swarming and Winter Hibernation (10/1 – 3/31)**
Alternative 1: No Action (TAL Alternative)	feather blades below 5.0 m/s cut-in speed within range of NLEB[3] maternity colony, remaining turbines 3.0 m/s cut-in speed	feather blades below 6.9 m/s cut-in speed within range of NLEB[3] maternity colony, remaining turbines 3.0 m/s cut in speed	feather blades below 6.9 m/s cut-in speed for all turbines	3.0 m/s cut-in speed for all turbines
Alternative 2: Applicant's Proposed Action Alternative[1]	feather blades below 3.0 m/s cut in speed for all turbines	feather blades below 5.0 m/s cut-in speed[4] within range of NLEB[3] maternity colony, remaining turbines 3.0 m/s cut-in speed	feather blades below 5.0 m/s cut in speed[4] for all turbines	3.0 m/s cut in speed for all turbines
Alternative 3: Less Restrictive Operations Alternative[2]	feather blades below 3.0 m/s cut in speed for all turbines	feather blades below 3.0 m/s cut in speed for all turbines	feather blades below 3.0 m/s cut in speed for all turbines	feather blades below 3.0 m/s cut-in speed for all turbines 10/1-10/31 no feathering 11/1 – 3/1

We then considered results of available studies on the effects of various operational adjustments (Table E-3 and Table E-4) and applied those to the alternatives.

Table E-3. HCP Table 6.1 Results from publicly available curtailment effectiveness studies.

Study Name	Normal Cut-in Speed (m/s [ft/s])	Treatment Cut-in Speed (m/s [ft/s])	Mean Percent Reduction in Mortality	Mean Percent Reduction in Mortality Per Cut-in Speed	Source
Fowler Ridge, IN 2011	3.5 (11.5)	3.5 (11.5)	36	36	Good et al. 2012
Mount Storm, WV 2010[a]	4.0 (13.1)	4.0 (13.1)	35	46	Young et al. 2011b
Summerview, Alberta	4.0 (13.1)	4.0 (13.1)	57		Baerwald et al. 2009
Fowler Ridge, IN 2011	3.5 (11.5)	4.5 (14.8)	57	51	Good et al. 2012
Anonymous Project (AN01), USFWS Region 3	3.5 (11.5)	4.5 (14.8)	47		Arnett et al. 2013
Wolfe Island, Lake Ontario	4.0 (13.1)	4.5 (14.8)	48		Stantec Ltd. 2011b
Casselman, PA 2008	3.5 (11.5)	5.0 (16.4)	82	61	Arnett et al. 2009
Casselman, PA 2009	3.5 (11.5)	5.0 (16.4)	72		Arnett et al. 2010
Fowler Ridge, IN 2010[b]	3.5 (11.5)	5.0 (16.4)	50		Good et al. 2011
Criterion, MD 2012[c]	4.0 (13.1)	5.0 (16.4)	62		Young et al. 2013
Pinnacle, WV 2012	3.0 (9.8)	5.0 (16.4)	47		Hein et al. 2013
Pinnacle, WV 2013	3.0 (9.8)	5.0 (16.4)	54		Hein et al. 2014

Table E-3. HCP Table 6.1 Results from publicly available curtailment effectiveness studies.

Study Name	Normal Cut-in Speed (m/s [ft/s])	Treatment Cut-in Speed (m/s [ft/s])	Mean Percent Reduction in Mortality	Mean Percent Reduction in Mortality Per Cut-in Speed	Source
Summerview, Alberta	3.5 (11.5)	5.5 (18.0)	60	66	Baerwald et al. 2009
Fowler Ridge, IN 2011	4.0 (13.1)	5.5 (18.0)	73		Good et al. 2012
Anonymous Project (AN01), USFWS Region 3	3.5 (11.5)	5.5 (18.0)	72		Arnett et al. 2013
Wolfe Island, Lake Ontario	4.0 (13.1)	5.5 (18.0)	60		Stantec Ltd. 2011b
Sheffield, VT[d]	4.0 (13.1)	6.0 (19.7)	62	62	Martin et al. 2017
Casselman, PA 2008	3.5 (11.5)	6.5 (21.3)	82	77	Arnett et al. 2009
Casselman, PA 2009	3.5 (11.5)	6.5 (21.3)	72		Arnett et al. 2010
Fowler Ridge, IN 2010[b]	3.5 (11.5)	6.5 (21.3)	78		Good et al. 2011
Pinnacle, WV 2013	3.0 (9.8)	6.5 (21.3)	76		Hein et al. 2014
Beech Ridge, WV	3.5 (11.5)	6.9 (22.6)	89 [e]	93	Tidhar et al. 2013b
Beech Ridge, WV	3.5 (11.5)	6.9 (22.6)	97 [e]		Young et al. 2014

Table E-3. HCP Table 6.1 Results from publicly available curtailment effectiveness studies.

Study Name	Normal Cut-in Speed (m/s [ft/s])	Treatment Cut-in Speed (m/s [ft/s])	Mean Percent Reduction in Mortality	Mean Percent Reduction in Mortality Per Cut-in Speed	Source

[a] Based on the average reduction of 47% and 22% from first and second halves of the night; note that an average reduction of 61% (72% and 50% from first and second halves of the night) was realized when comparing only nights when treatments were in place (32% and 40% of the time for the first and second halves of the night) to nights when treatments were not in place

[b] Study did not include feathering below cut-in speed

[c] Percent reduction is based on comparison to the previous year's results from mortality monitoring, since there were no control turbines during the year the study was implemented

[d] Raised cut-in speeds were applied only when temperatures were above 49.1 °F (9.5 °C)

[e] Percent reduction based on comparison to average bat mortality at two other West Virginia projects, likely most relevant to what impacts could have been at the site in the absence of feathering

Table E-4. Average reductions in bat mortality by curtailed cut-in speed Table 5-9 (Service 2016b)

Table 5-9. Average reductions in bat mortality by curtailed cut-in speed.

Cut-in speed (m/s)	Average % reduction in mortality
3.5 m/s (feathering only)	34.0 (n=1)
4.0 m/s (feathering only)	46.0 (n=2)
5.0 m/s	66.8 (n=4)
6.5 m/s	76.3 (n=3)
6.9 m/s	88.3 (n=3)

Alternative 1

The primary component of this alternative is feathering turbine blades below 6.9 m/s[47] around the NLEB colony in summer and across the entire Project from 8/1-9/30. Based on the results of curtailment studies conducted to date, Alternative 1 is expected to achieve at least an 88.3% reduction in all-bat mortality from the average fatality level documented at un-curtailed turbines in the region (Tables E-3and E-4)(Service 2016b, Table 5-9). Consequently, approximately **81 total bat fatalities**[48] would be anticipated each year under Alternative 1.

Alternative 2

The primary component of Alternative 2 is feathering below 5.0 mps during fall migration of the covered species and below 3.0 mps[49] during the rest of the covered species active season.

The available information from curtailment effectiveness studies conducted to-date suggests that the seasonal turbine operational adjustment protocol would reduce annual bat mortality by at least 30% during spring and summer and 60% during fall (HCP Section 6.3.3).

Based on the results of curtailment studies conducted to-date, feathering turbines under the manufacturer's rated cut-in speed (3.0 m/s) is expected to achieve at least a 30% reduction in all-bat mortality from the average fatality level documented at un-curtailed turbines in the region during the spring and summer seasons. Although feathering under a manufacturer's rated cut-in speed of 3.0 m/s has not been specifically studied, other studies have documented reductions in bat mortality of 35% to 57% at turbines feathered under the manufacturer's rated cut-in speed (Table E-3). Based on these, the implementation of various cut-in speed treatments has not demonstrated a simple linear relationship with bat mortality reduction (i.e., a higher cut-in speed does not appear to guarantee a greater reduction or have a predictable reduction magnitude). Reductions have varied both across treatments and within the same cut-in speed treatment. The expectation of a 30% reduction when other studies (which looked at feathering under different manufacturer's rated cut-in speeds) seems appropriate. Additionally, 16 of the Project turbines will be feathered under 5.0 m/s from May 16 to July 31, further reducing all-bat mortality at the Project during the spring and summer seasons. Based on the results of curtailment studies, feathering turbines under 5.0 m/s during fall is anticipated to result in 60% reduction in fatalities.

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[47] These operational adjustments would occur ½ hour before sunrise to ½ hour after sunset.

[48] 689.459 total bats * 0.883 reduction = 608.79 less total bats = 80.67 (81) total bats/year

[49] These operational adjustments would occur between nautical sunset and sunrise (i.e., nautical twilight when the sun is 12 degrees or more below horizon).

The seasonal turbine operational adjustment protocol is anticipated to reduce annual bat mortality due to turbine operations by at least 30% during spring and summer and 60% during fall. If we assume that all-bat seasonality rates are proportional to Indiana bats, this will result in a reduction in the annual rate of all-bat mortality by approximately 50%[50]. Applying a 50% reduction to 689 originally anticipated fatalities results in **345 total bat fatalities/year**.

Alternative 3

Turbines would be feathered below 3.0 m/s from ½ hour prior to sunset to ½ hour after sunrise between April 1 to October 31.

Based on the results of curtailment studies conducted to-date, this measure is expected to achieve at least a 30% reduction in all-bat mortality from the average fatality level documented at un-curtailed turbines in the region. Applying a 30% reduction to 690 originally anticipated fatalities results in **483 total bat fatalities/year**.

It is currently unclear if operational adjustments would be equally effective at reducing mortality among different species or species groups. Collectively, hoary bats, eastern red bats, and silver-haired bats comprise the vast majority of all bat fatalities documented at wind facilities, representing 78% of total estimated fatalities 2000-2011 (Arnett and Baerwald 2013). Consequently, these three species have provided the bulk of the all-bat fatality data analyzed in the curtailment studies to-date.

References Cited

Arnett, E.B., and E.F. Baerwald. 2013. Impacts of wind energy development on bats: implications for conservation. Pages 435-456 in R.A. Adams and S.C. Pederson, editors. Bat Evolution, Ecology, and Conservation. Springer Science Press, New York, USA.

United States Fish and Wildlife Service (Service). 2016. Environmental Assessment for Proposed Habitat Conservation Plan and Incidental Take Permit, Wildcat Wind Farm, Tipton and Madison Counties, Indiana. Bloomington, Indiana, USA.

[50] (0.30 * 0.28 of take in spring/summer) + (0.60 * 0.72 of take in fall) = 51.6% reduction overall

APPENDIX F. Resources Not Impacted by the Proposed Action

Resource	Rationale	Additional Details
Geology and Soils	• All ground moving activities were part of construction. • No effects to geological resources or soils are anticipated from turbine operations, maintenance or mitigation activities under any of the considered alternatives.	DEIS Section 3.1 and FEIS Section 2.2.1
Water Resources	• Any impacts were associated with construction. • No effects to water resources are anticipated from turbine operations, maintenance or mitigation activities under any of the considered alternatives.	DEIS Section 3.2 and FEIS Section 2.2.2
Vegetation	• Primary impacts were associated with construction. • Turbine operations and vehicles using existing roads will not affect vegetation. • Limited vegetation clearing and mowing will occur as part of routine maintenance activities. However, these impacts will occur only in areas already cleared or disturbed.	DEIS Section 3.3 and FEIS Section 2.2.3
Visual Resources	• Turbines are already constructed. • The three alternatives differ only with respect to the extent/duration of operational curtailment.	DEIS Section 3.5, Appendices J and K and FEIS Section 2.2.5 and Appendix F

Resource	Rationale	Additional Details
	• Operational adjustments will only be implemented between sunset and sunrise, when the turbines are less visible. • Shadow flicker impacts are only anticipated at one non-participating receptor, which will be mitigated in the event of actual shadow flicker impacts.	
Public Safety	• No anticipated differences among the three alternatives. • The Project has minimized the potential for public safety concerns by adhering to minimum setback distances. • Unauthorized public access to the site will be limited by posting signs and securing the entrances to turbines. • The turbines automatically shut down at wind speeds over the manufacturer's threshold, and they also cease operations if significant vibrations or rotor blade stress is sensed by the turbines' blade monitoring systems. • The O&M staff that work at the site through the life of the Project and decommissioning will continue to follow all applicable Occupational Health and Safety Administration requirements.	DEIS Section 3.10 and FEIS 2.2.10
Other Fish and Wildlife (Non-bird and –Bat)	• No anticipated differences among the three alternatives. • Impacts from turbine rotation will be limited to species occurring within the rotor-swept zone of each turbine, and therefore turbine rotation is not expected to affect terrestrial or aquatic wildlife.	DEIS Section 3.3 and FEIS Section 2.2.3

Resource	Rationale	Additional Details
	• Terrestrial wildlife may be exposed to vehicle encounters on access roads resulting in injury or death, but this exposure is not expected to differ among the alternatives analyzed. Wildlife roadkill is not expected to change from current conditions or affect different species as compared to that which occurs on public roads within and adjacent to the project area. • The animals regularly occurring in the Project area are generally common species accustomed to periodic disturbance from agricultural practices.	
Climate and Air Quality	• No anticipated differences among the three alternatives. • Slight positive impact on air quality by producing electricity with zero emissions. • Electricity delivered to the grid from wind energy projects can off-set the generation of energy at existing conventional power plants. • The operation of the Project is not anticipated to have any measurable effect on climate. • No impacts to air quality or climate are anticipated from the mitigation project.	DEIS Section 3.4 and FEIS Section 2.2.4
Noise	• No anticipated differences among the three alternatives. • The Town of Denmark's Zoning Law requires that the Project operate so that the maximum noise generated does not exceed 45 decibels, A-rated (dBA) at distances beyond 1,250 feet from the turbine, except where allowed by waiver.	DEIS Section 3.7 and Appendix M and FEIS Section 2.2.7 and Appendix J

Resource	Rationale	Additional Details
	• There are no non-participating residences expected to experience sound levels above 45 dBA (Hessler 2012, 2013). • Mitigation activities will not have a significant effect on noise, as mitigation is primarily gating a cave opening, and any noise will be temporary and minor in nature.	
Traffic and Transportation	• No anticipated differences among the three alternatives. • Any traffic associated with long-term operation will likely be concentrated around the O&M facility.	DEIS Section 3.8 and Appendix N and FEIS Section 2.2.8
Community Facilities and Services	• No anticipated differences among the three alternatives. • The Project will not result in any significant adverse long-term impacts to local utilities and energy resources. • The Project will generate up to 79.9 MW of electric power using a renewable resource, which will be available to the people of Jefferson and Lewis Counties and other areas of New York State.	DEIS Section 3.11 and FEIS Section 2.2.11
Communication Facilities	• No anticipated differences among the three alternatives. • The micro-siting of turbines ensures that communication interference will be avoided or negligible. • Consultation with Fort Drum representatives is ongoing regarding potential interference as it relates to the radar system used by the base.	DEIS Section 3.12 and FEIS Section 2.2.12

Resource	Rationale	Additional Details
Landuse and Zoning	• No anticipated differences among the three alternatives. • Operation of the Project does not include any actions that will be incompatible with local land use, zoning, or any future planned development. • Issuance of the ITP and implementation of the HCP would not result in additional impacts to land use.	DEIS Section 3.13 and FEIS Section 2.2.13
Historic, Cultural, and Archaeological Resources	• The three alternatives differ only with respect to the extent/duration of operational curtailment and visual impacts to historic sites. • Operational adjustments will only be implemented between sunset and sunrise, when the turbines are less visible. • No earth disturbance after construction. • No direct physical impacts to historic-architectural resources will occur as a result of operation.	DEIS Section 3.5, 3.6, Appendices J and K and FEIS Section 2.2.5, 2.2.6 and Appendix F