United States Department of the Interior

FISH AND WILDLIFE SERVICE
3817 Luker Road
Cortland, NY 13045

November 16, 2016

Colonel David A. Caldwell
District Engineer, New York District
U.S. Army Corps of Engineers
26 Federal Plaza, Rm. 2109
New York, NY 10278

Attention: Mr. Brian Orzel

RE: Formal Section 7 Consultation for Amy's Kitchen, Inc., and Science of the Soul manufacturing and conference facilities, Town of Goshen, Orange County, NY

Dear Colonel Caldwell:

The enclosed document is in response to your October 17, 2016, request for formal consultation for the Amy's Kitchen, Inc., and Science of the Soul manufacturing and conference facilities pursuant to Section 7 of the Endangered Species Act of 1973 (ESA) (87 Stat. 884, as amended; 16 U.S.C. 1531 *et seq.*).

Section 7(a)(2) of the ESA requires Federal agencies to ensure that actions that they fund, authorize, or carry out are not likely to jeopardize the continued existence of a threatened, endangered, or proposed species. This Biological Opinion (Opinion) was prepared in accordance with Section 7 of the ESA. The AKRF, Inc., "Impact Assessment for the Indiana and Northern Long-Eared Bat" dated April 8, 2016, and revised August 18, 2016, referred to as the biological assessment, and the U.S. Army Corps of Engineers (Corps) request for formal consultation was accepted by the U.S. Fish and Wildlife Service (Service) on October 17, 2016. This Opinion is based on information provided in the biological assessment, as well as other sources of information cited herein, including, but not limited to, additional project documents, and information in our files. The Service has determined that the project as proposed is not likely to jeopardize the continued existence of Indiana bats or northern long-eared bats.

If you have any questions, please contact Noelle Rayman of my staff at (607) 753-9334.

Sincerely,

Patricia Cole

for David A. Stilwell
Field Supervisor

Enclosure

Biological Opinion

for the

Proposed Amy's Kitchen, Inc., and Science of the Soul Project
Town of Goshen,
Orange County, New York

for the

Endangered Indiana Bat
(*Myotis sodalis*)

and the

Threatened Northern Long-Eared Bat
(*Myotis septentrionalis*)

Submitted to the:

U.S. Army Corps of Engineers
New York District

November 16, 2016

Prepared by:
Noelle Rayman-Metcalf
U.S. Fish and Wildlife Service
New York Field Office
3817 Luker Road
Cortland, NY 13045
607-753-9334

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INTRODUCTION

This document transmits the U.S. Fish and Wildlife Service (Service) New York Field Office's (NYFO) Biological Opinion (Opinion) based on our review of proposed construction of the Amy's Kitchen, Inc., and Science of the Soul manufacturing and conference center project located in the Town of Goshen, Orange County, New York, and the effects on the federally-listed endangered Indiana bat (*Myotis sodalis*) and the federally-listed threatened northern long-eared bat (NLEB; *Myotis septentrionalis*) in accordance with Section 7 of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C 1531 *et seq*.). The U.S. Army Corps of Engineers' (Corps) October 17, 2016, request for formal consultation was received on October 17, 2016, along with the biological assessment (BA) entitled, "Impact Assessment for the Indiana and Northern Long-Eared Bat" dated April 8, 2016, and revised August 18, 2016, prepared by AKRF, Inc.

This Opinion is based on information provided in the BA and Final Environmental Impact Statement (EIS), a meeting, conference calls, and electronic mail exchanges among the Service, Corps, the New York State Department of Environmental Conservation (NYSDEC), AKRF, Inc., and counsel for Amy's Kitchen, Inc. A complete administrative record of this consultation is on file at the Service's NYFO, Cortland, New York.

CONSULTATION HISTORY

The NYFO began coordination with AKRF, Inc., on behalf of Amy's Kitchen and Science of the Soul on April 2014. A chronological summary of coordination events and actions associated with this consultation is presented below.

April 23, 2014 – the NYFO received lead agency notice for the Amy's Kitchen and Science of the Soul commercial development and conference facility project.

May 28, 2014 – the NYFO received notice of positive State Environmental Quality Review Act (SEQRA) declaration and notice to prepare a Draft EIS from the Town of Goshen Planning Board, Orange County, New York.

June 19, 2014 – the NYFO sent a letter to Mr. Lee Bergus, Chairman, Town of Goshen Planning Board, regarding early coordination and to outline concerns for the proposed project.

July 14, 2014 – the NYFO received a scoping document for Draft EIS for the Amy's Kitchen and Science of the Soul proposed commercial development project.

September 26, 2014 – the NYFO received a revised scoping document for DEIS.

June 29, 2015 – the NYFO received a draft scoping document for DEIS.

September 25, 2015 – the NYFO received reports from AKRF, Inc., titled, "Acoustic Bat Survey Report, Amy's Kitchen Project Site, Goshen, NY," dated September 2015, for an

acoustic bat survey and "Federal Endangered Species and Bank Swallow Assessment" dated September 2014.

October 29, 2015 – a meeting was held at the NYSDEC Region 3 New Paltz Office with the NYFO, AKRF, Inc., Drake Loeb PLLC, and Lang and Tully P.C., to address concerns the federal agencies had for state and federally-listed species. AKRF, Inc., consultants acting on behalf of Amy's Kitchen and Science of the Soul, were advised of the potential need for formal consultation.

November 10, 2015 – the NYFO sent an email to AKRF, Inc., requesting additional project information as a result of discussions held at the NYSDEC office meeting October 29, 2015.

April 19, 2016 – the NYFO received a report from AKRF, Inc., titled "Impact Assessment for the Indiana and Northern Long-Eared Bat, Amy's Kitchen and Science of the Soul, Goshen, NY" dated April 8, 2016.

May 2, 2016 – the NYFO received notice of completion of the Draft EIS and public hearing information from AKRF, Inc., from Mr. Lee Bergus, Chairman, Town of Goshen Planning Board.

May 31, 2016 – the NYFO hosted a conference call with the NYSDEC, Corps, AKRF, Inc., Amy's Kitchen, Sive Paget and Reisel PC, and Jacobowitz and Gubits, LLP, to discuss impacts on Indiana and NLEB as a result of the project, provided request for additional information, and advised formal consultation.

June 23, 2016 – the NYFO sent a letter with additional information request regarding the proposed project.

August 22, 2016 – the NYFO received a revised "Impact Assessment for the Indiana and Northern Long-Eared Bat, Amy's Kitchen and Science of the Soul, Goshen, NY" dated August 18, 2016.

September 30, 2016 – the NYFO received Final EIS from AKRF, Inc., for review.

October 11, 2016 – the NYFO received from AKRF, Inc., five (5) conservation easement documents for review as part of the mitigation plan for the proposed project.

October 17, 2016 – the Corps sent letter to the NYFO requesting formal and informal consultation for the Amy's Kitchen and Science of the Soul commercial development project.

October 20, 2016 – the NYFO sent the Corps a letter acknowledging receipt of their request and that formal consultation on the Indiana and NLEB had been initiated (starting on October 17, 2016) on the Amy's Kitchen and Science of the Soul commercial development project.

November 16, 2016 – the NYFO issued its final Opinion to the Corps.

BIOLOGICAL OPINION

DESCRIPTION OF THE PROPOSED ACTION

As defined in the ESA Section 7 regulations (50 CFR 402.2), "action" means "all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by federal agencies in the United States or upon the high seas." The "action area" is defined as "all areas to be affected directly or indirectly by the federal action and not merely the immediate areas involved in the action." The direct and indirect effects of the actions and activities must be considered in conjunction with the effects of other past and present federal, state, or private activities, as well as the cumulative effects of reasonably certain future state or private activities within the action area.

This Opinion evaluates the activities associated with the construction, operation, and maintenance of the Amy's Kitchen, Inc., frozen food manufacturing facility and the Science of the Soul conference center. The BA outlines activities that may adversely or beneficially affect the Indiana bat and the NLEB. The following opinion addresses whether implementation of the project is likely or not likely to jeopardize the continued existence of both bat species.
The following project background and area descriptions are summarized and/or directly copied from the BA and are incorporated by reference.

Project Location and Description

Project Location

The project site is located in the Town of Goshen, north of New York State Route (SR) 17M, east of the Town of Wawayanda, west of the Village of Goshen, and south of the West Hills Country Club (Figures 1 and 2). The action area totals approximately 423.97 acres and comprises properties for the frozen food manufacturing and conference facilities, access road improvements, and conservation areas in the Town of Goshen, Orange County, New York (Figure 2). The site is bisected in a north-south direction by the Wallkill River and generally lies south of Echo Lake Road and the future Orange County Heritage Trail extension west of Hartley Road, although portions of the project site lie north of Echo Lake Road and the Heritage Trail.

The project site itself consists of the Ver Hage and Echo Lake properties, where the Amy's Kitchen manufacturing facility and Science of the Soul Conference Center would be located, respectively, as well as two additional adjacent properties herein referred to as the "Lipoff" and "Strong Farm" properties. The Lipoff property would remain as vacant land and the Strong Farm property would remain in its current agricultural use while providing limited volunteer parking and overflow attendee parking (if needed) during the daytime hours of a three-day Science of the Soul Annual Conference. Land uses in the immediate vicinity of the project site include rural residential, farmland, institutional, and rural commercial uses.

Two additional areas are required for improvements related to the proposed project, but would not be owned or controlled by either Amy's Kitchen, Inc., or Science of the Soul, and so are not considered part of the project site, but should be considered within the action area of the

proposed project. These sites are for access road improvements and for placement of utilities along the Heritage Trail (Figure 2).

Three other parcels (Figure 2) are included in a conservation easement for the federally-listed bat species. These parcels include an additional approximately 14.4-acre tax parcel (the western portion of the "Lipoff" property) already owned by an entity affiliated with Amy's Kitchen, Inc., an additional approximately 5.3-acre parcel north of the Ver Hage property and south of Echo Lake Road that is soon to be under contract to purchase from Al Turi Landfill, Inc., and an approximately 8.1-acre portion of the Echo Lake property located in the Town of Wawayanda. Two additional areas within the proposed project area will be under a conservation easement and are discussed further on page 9 (Conservation Measures - H). With that said, a total of five separate conservation easements are planned.

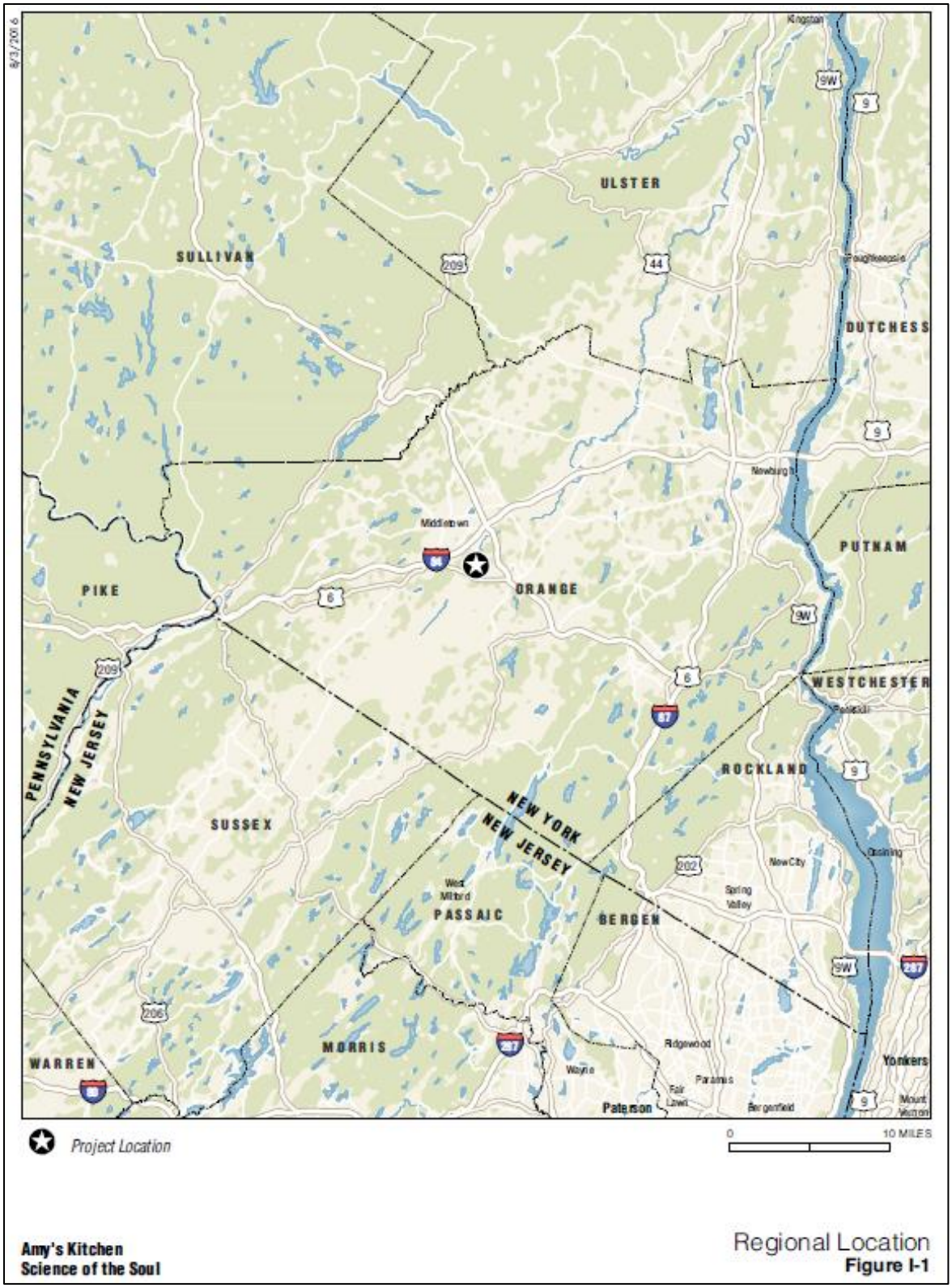

Figure 1. Project location map.

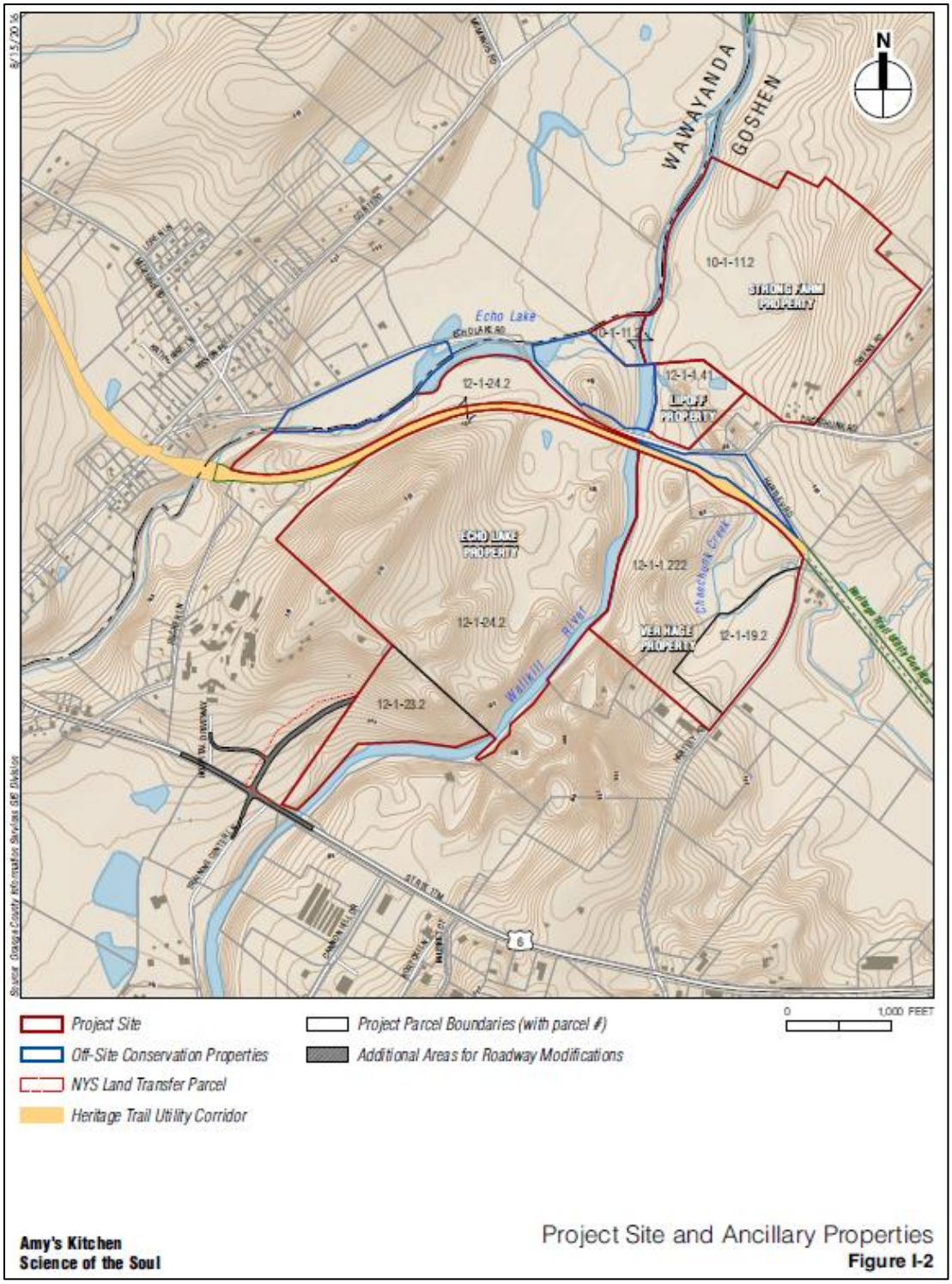

Figure 2. Map indicating the four (4) properties (red outline) that make up the project area, including offsite areas for access road modifications and offsite conservation areas.

Project Description

Amy's Kitchen, Inc., and Science of the Soul

Amy's Kitchen proposes to construct a 369,000-square-foot frozen food manufacturing facility on a 60.1-acre property located on the Ver Hage property along Hartley Road in the Town of Goshen, New York. Science of the Soul proposes to construct a conference center on the Echo Lake property comprising a 200,000-square-foot open-air pavilion with four associated restroom buildings (5,000 square feet each); one two-story 80,000-square-foot multi-purpose/family area building; one two-story 38,000-square-foot central building; one one-story 8,000-square-foot maintenance barn; two caretaker residences, 2,400 square feet each; one 4,500-square-foot guest house; and associated pervious and impervious parking areas to accommodate approximately 2,043 cars and 130 buses on a 195-acre property located on SR 17M and Echo Lake Road in the Town of Goshen, New York. A warehouse is also planned on an approximately 11.6-acre subdivided parcel on Hartley Road.

Potable Water

Potable water supply to the Amy's Kitchen, Inc., manufacturing facility would be provided by a new private utility connection to the City of Middletown water supply. Amy's Kitchen, Inc., estimates an average daily demand of approximately 375,000 gallons per day (gpd) at full buildout. An approximately eight (8)-inch diameter line would be constructed within the Heritage Trail corridor and would connect with existing City of Middletown water supply lines in the vicinity of the City of Middletown wastewater treatment plant (WWTP). No pumping stations would be constructed along the Heritage Trail corridor. A private transportation corporation would be created to allow potable water to be supplied to Amy's Kitchen, Inc., manufacturing facility, Science of the Soul Conference Center, and the future warehouse use on Hartley Road.

Wastewater

It is anticipated that Amy's Kitchen, Inc., would generate an average daily flow of approximately 300,000 gallons per day (gpd) of wastewater (including sanitary wastewater and process wastewater) at full buildout. Amy's Kitchen, Inc., intends to convey wastewater to the City of Middletown wastewater treatment plant through a new private force-main within the Heritage Trail. An approximately eight (8)-inch diameter wastewater force-main would be constructed within the Heritage Trail corridor and would connect to the City of Middletown WWTP.

Two (2) below-ground pumping stations would be required to ensure pre-treated wastewater effluent conveyance to the Middletown WWTP. One (1) pumping station would be located within the Echo Lake property and one (1) pumping station would be located within the Ver Hage property.

A wastewater pre-treatment plant would be constructed on the project site to reduce the high biological oxygen demand (BOD) that is characteristic of Amy's Kitchen, Inc., manufacturing process wastewater. The wastewater pre-treatment plant would be located in a fenced compound

at the north end of the employee parking lot. The enclosed structure would contain the treatment works, exterior enclosed sludge storage tank, equalization tank, selector tank, and aeration basin. The wastewater pre-treatment plant would be approximately 500 feet from the nearest point on the Heritage Trail.

Site Access

A new roadway and a new vehicular bridge across the Wallkill River would provide direct access for Amy's Kitchen, Inc., manufacturing facility to SR 17M across the Echo Lake property. In addition to employee vehicle trips, Amy's Kitchen, Inc., anticipates approximately 56 truck trips (entering or exiting) per day. Emergency access would be provided from Hartley Road.

Site access would be from a new access road intersecting with SR 17M approximately 200 feet west of the existing Training Center Lane. Based on initial consultations with the New York State Department of Transportation (NYSDOT), the proposed project would need to upgrade the intersection of SR 17M at the location of the proposed site entrance to include turning lanes and a traffic signal. To facilitate these improvements, the proposed project involves a land transfer of an approximately 8.2-acre portion of SBL 12-1-101 from the state of New York to the Town of Goshen. The purpose of the land transfer would be to improve access and safety for the project, and for the Mid-Hudson Psychiatric Center and the Orange County Transfer Station located nearby.

Accessing the Amy's Kitchen, Inc., manufacturing facility from SR 17M requires an additional bridge over the Wallkill River. This bridge also serves to provide a second access to the Science of the Soul Conference Center in an emergency situation.

The portion of the proposed access road between the new driveway to the New York State Office of Mental Health (OMH) and a wetland onsite has been shifted approximately 38 feet to the east and away from the Mid-Hudson Psychiatric Center. This relocated roadway would allow OMH more flexibility to accommodate future potential projects on its property. The realignment of the access road would result in slightly greater disturbance to federally-regulated wetlands than previously planned, but not in excess of the 0.1-acre threshold that would require an Individual Permit through the Corps. To avoid even greater disturbance to federally-regulated wetlands and the construction of a long retaining wall, the access road has been further modified to eliminate a previously planned sidewalk.

The new access road would serve the Mid-Hudson Psychiatric Center, Science of the Soul, and Amy's Kitchen, Inc. The new roadway would be located approximately 200 feet west of the existing Training Center Lane, which would be relocated to align opposite the Science of the Soul and Amy's Kitchen, Inc., access to form a full movement signalized intersection with SR 17M.

While it is understood that the Town would continue to own the portion of the new access road located on Town-owned property, Amy's Kitchen, Inc., and Science of the Soul would be

responsible for snow-removal and maintenance of the full length of this roadway, as well as the nearby landscaped areas to ensure access and adequate site distances are maintained.

Wallkill River Bridge

A new Warren-truss bridge would be constructed across the Wallkill River to connect the Ver Hage property to the Echo Lake property and the access road to SR 17M. Bridge abutments would be located outside the boundaries of the Wallkill River and any associated wetlands, but within the 100-year floodplain. A gas line (the size of which would be determined through consultation with New York State Electric and Gas Corporation) would be suspended underneath the cantilevered pedestrian walkway on the north side of the bridge. The bridge would be constructed in accordance with NYSDOT.

A guard house would be provided east of the bridge to allow access control to the loading dock and employee parking areas.

Emergency Access from Hartley Road

Two (2) emergency access driveways would be provided off Hartley Road, one providing access to the south side of the Amy's Kitchen, Inc., manufacturing facility (the loading docks) and one providing access to the north side of the manufacturing facility and the Warehouse Use. The proposed project no longer includes a guard house at either of the emergency access driveways.

Project Phasing

Phasing of the proposed project is detailed in Figure 3. Full build-out of Amy's Kitchen would occur in two phases. Phase 1 would total 226,000 square feet – 215,000 square feet of production space and 11,000 square feet of office space – to be opened in 2019. Phase 2 would include a 140,000-square-foot expansion (134,000 square feet of production space plus 6,000 square feet of office area) to be opened by 2023. An accessory 3,000-square-foot medical clinic would be constructed during Phase 1 in a free-standing building on the project site. Phase 1 would also include construction of the new access road from SR 17M, relocation of Training Center Lane, a bridge across the Wallkill River, internal driveways and employee parking, water supply lines, wastewater force-main, and the on-site wastewater pre-treatment system. Site landscaping, stormwater management, and lighting would also be completed. It is anticipated that Phase 1 would take approximately 24 months to complete.

The following is a timeline of general activities associated with the project:

- Tree clearing is anticipated to begin December 1, 2016;
- Full site grading is anticipated to be complete in Spring 2017;
- Full build-out of Phase 1 is anticipated by the end of 2019; and
- Full build-out of Phase 2 is anticipated by the end of 2023.

Construction activity would begin with site work (clearing and grading) of the access road improvement area, access road alignment on the Echo Lake property, and the bridge landing area on the Ver Hage property. Delivery of earth-moving equipment and limited construction worker access to the project site would be provided directly from SR 17M and by the existing driveway to the Echo Lake property on Echo Lake Road and by the existing driveway to the Ver Hage property on Hartley Road. Neither the Echo Lake Road driveway nor the Hartley Road driveway would be used as long-term construction site access points. Since the initial focus of construction is the clearing and grading of the access road from SR 17M to the upper portion of the Echo Lake property and the Wallkill River bridge location, that road would become the primary construction access to the project site.

While rough grading occurs on the Echo Lake property and the Wallkill River bridge is constructed, installation of utilities serving the proposed project would be underway. A significant amount of investment is required to bring utilities to the project site and this must occur before construction can commence on building foundations and super-structure. The water supply and wastewater force-main would be constructed within the Heritage Trail Utility Corridor while the gas line would be constructed along the access road from SR 17M. Installation of the Wallkill River bridge would follow to allow for construction access to the Ver Hage property from SR 17M.

Once the access road and bridge have been substantially completed and would allow for construction truck traffic, transfer of excess fill material from the Echo Lake property to the Ver Hage property would commence. Since the grading plan for the proposed project contemplates a roughly balanced cut-and-fill across the project site, excavated material from the Echo Lake property would be used to fill the Ver Hage property. With the access road and bridge completed in the earliest construction phase, very limited construction traffic would use either Hartley Road or Echo Lake Road.

Amy's Kitchen, Inc.

Following rough grading on the Ver Hage property, construction of building foundations and site utilities would commence, followed by construction of site buildings for the Amy's Kitchen, Inc., manufacturing facility. Electrical connections for both Amy's Kitchen, Inc., and Science of the Soul Conference Center would be pulled from existing transmission lines along Hartley Road and/or Echo Lake Road.

Phase 2 of Amy's Kitchen, Inc., manufacturing facility would total 140,000 square feet – a 134,000-square feet expansion of production space and an additional 6,000 square feet of office space.

Warehouse Use

An approximately 11.6-acre portion of the Ver Hage property would be subdivided for a future approximately 70,000-square-foot Warehouse Use that would have access from the Amy's Kitchen, Inc., manufacturing facility internal site driveway.

Science of the Soul

Science of the Soul proposes to construct a conference center on the Echo Lake property. The conference center would comprise an approximately 200,000-square-foot open-air pavilion with four (4) associated restroom buildings (approximately 5,000 square feet each); one (1) two-story approximately 80,000 square-foot multi-purpose/family area building; one (1) two-story approximately 38,000 square-foot central building; one (1) one-story approximately 8,000 square-foot maintenance barn; two (2) caretaker residences, approximately 2,400 square feet each; one (1) approximately 4,500 square-foot guest house; and associated pervious and impervious parking areas to accommodate approximately 2,043 cars and 130 buses.

The conference center would be used to host one (1) annual three (3)-day national conference, with attendance of up to 12,000 people. The national conference would typically be held over a three (3) day period, either Friday through Sunday or Saturday through Monday. Each day's program for a national conference would run from 9:00 a.m. until 1:00 p.m.

In addition, Science of the Soul would hold one (1) regional two (2)-day conference per year, with approximately 1,200 to 2,000 attendees over a weekend. The regional conference would be held in the two-story multi-purpose/family area building. The regional conference would start mid-day on a Saturday and conclude on a Sunday afternoon.

Regular weekly meetings on Sunday mornings for local congregants, estimated between 200 and 400 people, would be held in the multi-purpose building. During the week, a small number of volunteers (10 to 15 people) would attend to normal administrative and property management tasks. The Conference Center would not be used for weddings or other cultural events, nor would it be rented to the general public for any use.

Access to Science of the Soul would be from the new entrance roadway off SR 17M, which would also serve the Amy's Kitchen, Inc., manufacturing facility. Emergency access and such other access as the Town may require, and as the County might permit, would be provided from Echo Lake Road with a permeable hard surface.

The two (2) caretaker residences would serve as permanent residences for two (2) on-site caretaker households. The five-bedroom guest house would be used by Science of the Soul traveling speakers attending the national conference and for national board members and distinguished guests. The Guest House would be vacant at all other times.

Guest House

The guest house has since been relocated to minimize the fragmentation of the existing forested area on the Echo Lake Property. The relocation enables a shifting of the driveway closer to the Science of the Soul Conference Center, as well as a reduction in the length of the driveway. This relocation reduces the length of the driveway approximately 1,100 feet (approximately forty percent (40 percent) of its previous length) and would reduce directly and indirectly affected habitat for threatened and endangered bat species.

Strong Farm

Science of the Soul would restore the main residence and some of the agricultural structures on the property. The two (2) other residential structures would be rented to tenants or used for volunteer housing during the national and regional conferences. Continuation of the former dairy farm use is not proposed. The Strong Farm property would also be used for volunteer parking for the Science of the Soul Conference Center during the national conference for three (3) days of the year. Volunteer parking would be provided in hayfields or orchards, and not in areas used for crop farming, as well as for overflow parking in some areas of the property during the national and regional conferences. No grading or earth work is proposed to accommodate temporary parking in this area. Slopes in these areas are approximately six to eight percent, which could accommodate temporary parking one to three days per year.

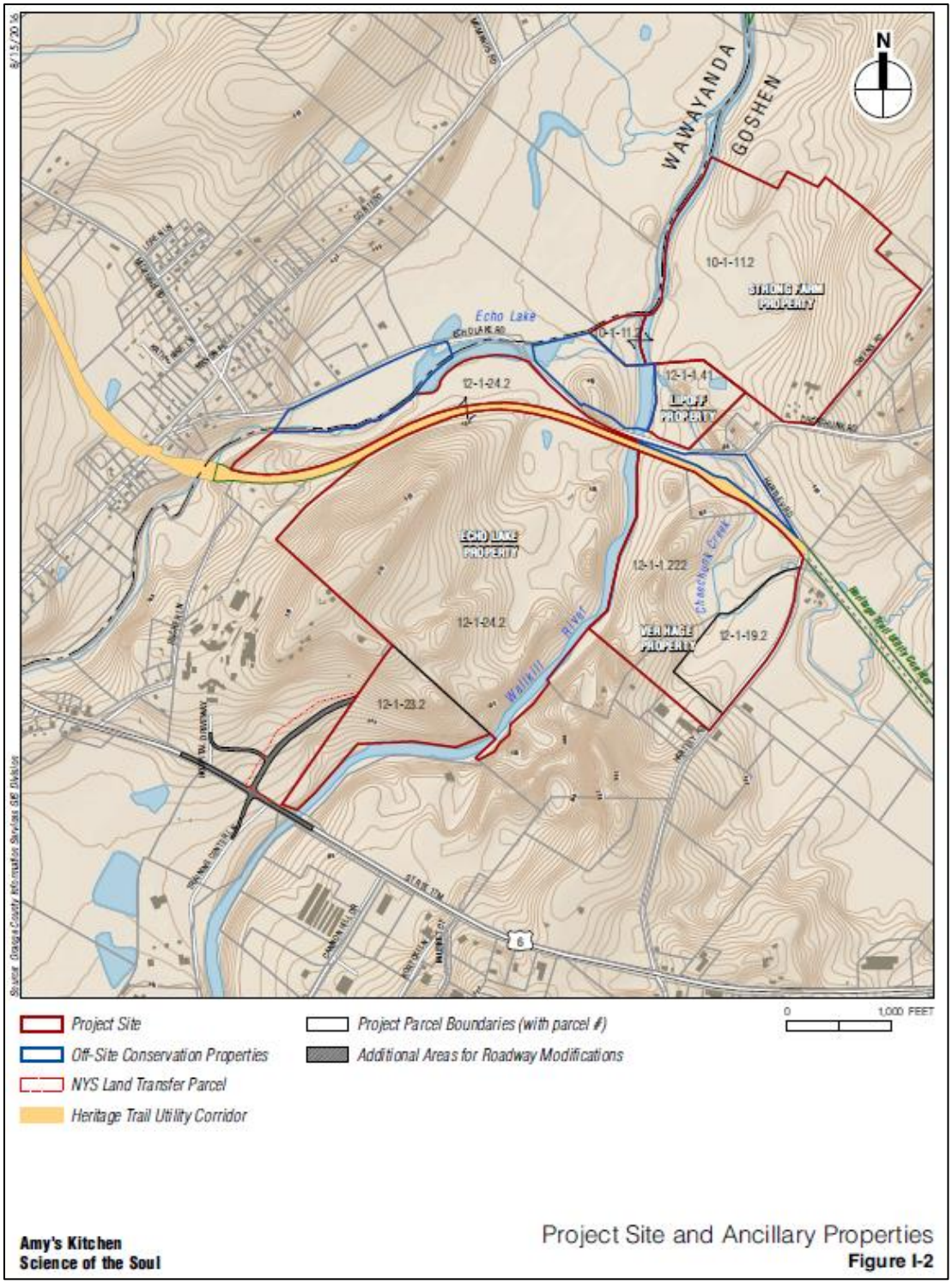

Figure 2. Map indicating where the four (4) properties (red outline) are that make up the project area, including offsite areas for access road modifications and offsite conservation areas.

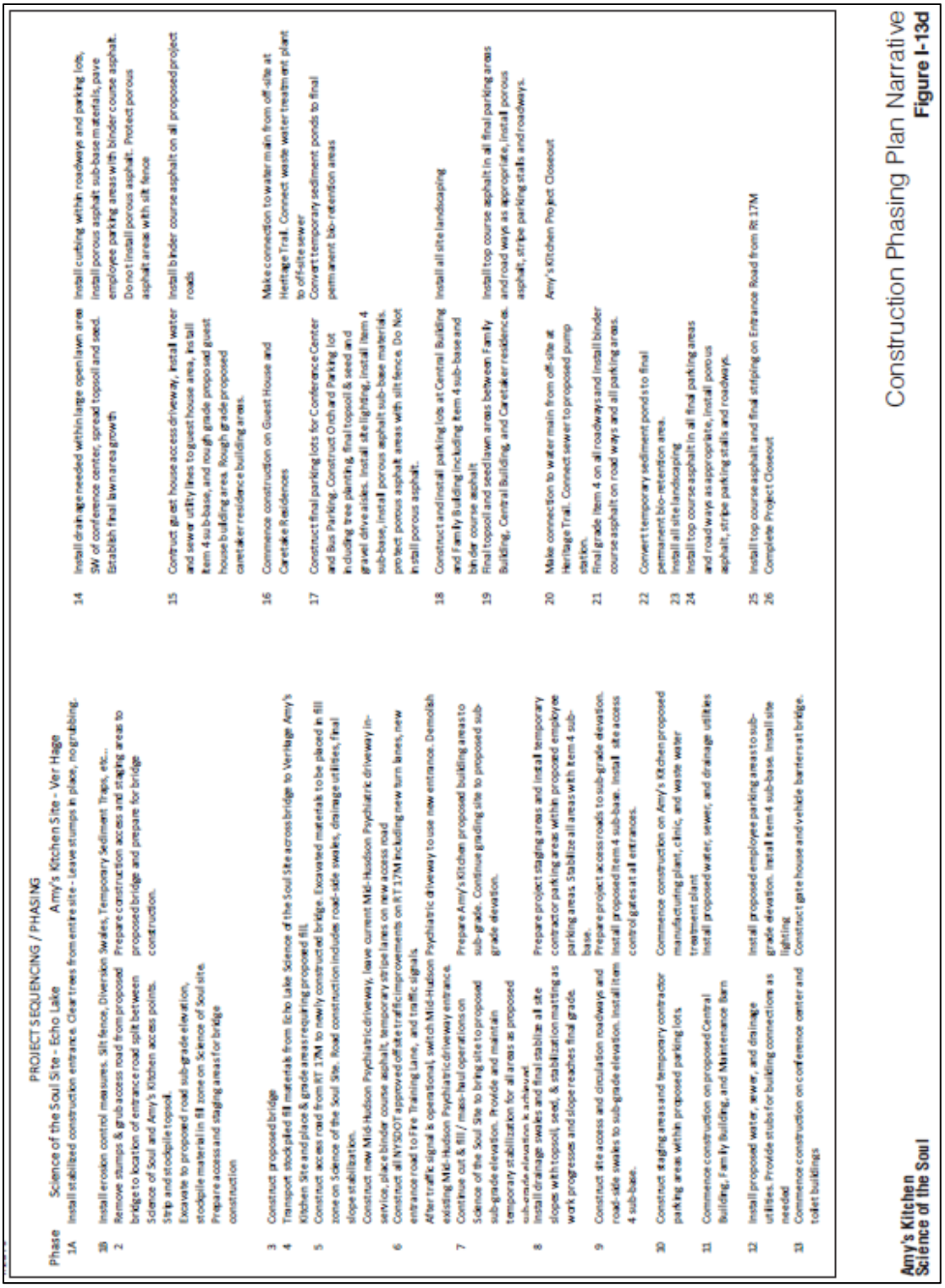

Figure 3. Construction phasing for the Amy's Kitchen, Inc., and Science of the Soul manufacturing and conference facility project.

The total footprint of ground disturbance within the 423.97-acre project area will be approximately 150.76 acres. The remaining 263.21 acres of the site will remain undisturbed and

be protected in perpetuity under conservation easements (Table 1). The proposed developed area is generally concentrated in areas considered old field and successional southern hardwood habitat to reduce the need to remove more forested areas than necessary, although approximately 48.88 acres of forest will be removed as part of the proposed project.

Table 1. Acreages of disturbance to different habitat types on the project site and other properties for access road improvements and conservation easement properties. Note that this table, as provided by AKRF, Inc., contains an error. It should read 263.21 total acres of undisturbed habitat rather than 273.21.

Acreages of Disturbance to Different Habitat Types on the Project Site and Ancillary Properties

Community Type	Total Acres	Acres Disturbed	Acres Undisturbed
Project Site			
Beech-Maple Mesic Forest (W)	0.94	0.00	0.94
Cropland/Field Crops	33.94	0.00	33.94
Cropland/Row Crops	27.92	0.00	27.92
Ditch/Artificial Intermittent Stream	0.89	0.00	0.89
Floodplain Forest (W)	11.59	0.00	11.59
Red Maple - Hardwood Swamp	1.26	0.05	1.22
Sedge Meadow	5.53	0.00	5.53
Shallow Emergent Marsh	5.56	4.32	1.25
Successional Old Field	96.31	74.74	21.56
Successional Shrubland	27.18	16.67	10.51
Successional Southern Hardwoods (W)	175.23	48.88	126.35
SUBTOTAL	***386.35[1]***	***144.66***	***241.69***
Ancillary Properties			
NYS Land transfer parcel			
Successional Shrubland	3.32	3.32	0.00
Successional Southern Hardwoods (W)	4.90	2.78	2.12
SUBTOTAL	***8.22***	***6.10***	***2.12***
New Conservation Properties			
Floodplain Forest (W)	7.15	0.00	7.15
Successional Old Field	6.22	0.00	6.22
Successional Southern Hardwoods (W)[2]	16.03	0.00	16.03
SUBTOTAL	***29.40***	***0.00***	***29.40***
TOTAL	**423.97**	**150.76**	**273.21**

Notes:
[1] Total Acres were calculated using tax parcel boundaries obtained from Orange County GIS and do not match property tax records of parcel acreage presented in Table 1 above.
[2] Excludes 4 acre portion of Wawayanda parcel for potential future residential development (W) Woodland

The federal action being evaluated in this Opinion is the Corps' issuance of a Clean Water Act (33 U.S.C 1344) Section 404 Nationwide Permit No. 39 to place fill material into approximately 0.081 acres of waters of the United States, including wetlands, in association with construction of an access road to the development and a bridge over the Wallkill River. An Article 24 Permit from the NYSDEC is also being sought for this project.

Table 2. Temporary and permanent wetland impacts associated with the proposed project.

Federally Regulated Wetland Disturbance

Wetland	Temporary/ Permanent	Acres	Description of Disturbance
Wetland J Extension (Echo Lake Property)	Permanent	0.007	Access road
Wetland K (Echo Lake Property)	Permanent	0.054	Access road
Wetland J (Wallkill River)	Permanent	0.015	Slope armoring for bridge abutment on Echo Lake property
Wetland J (Wallkill River)	Temporary	0.005	Temporary construction period disturbance for bridge installation
Wetland J (Wallkill River)	Permanent	0.005	Slope armoring for bridge abutment on Ver Hage property
Wetland J (Wallkill River)	Temporary	0.004	Temporary construction period disturbance for bridge installation
Total Temporary Disturbance		0.009	
Total Permanent Disturbance		**0.081**	

Source: Lanc & Tully

Conservation Measures

Conservation measures represent actions pledged in the project description that the action agency or the applicant will implement to further the species' recovery. Such measures may be tasks recommended in the species' recovery plan, should be closely related to the action, and should be achievable within the authority of the action agency or applicant. The beneficial effects of conservation measures are taken into consideration in the Service's conclusion of jeopardy or non-jeopardy to the listed species, and in the analysis of incidental take. Such measures, however, must minimize adverse effects to listed species within the action area in order to be factored into the Service's analyses.

The following conservation measures include both typical best management practices (BMPs) for commercial development and measures specifically designed to avoid, minimize, and compensate for impacts of the proposed project on the Indiana bat and NLEB. The Service has analyzed the effects of the proposed action considering that the project will be implemented as proposed (including all conservation measures).

A. **Wintertime tree clearing**: The applicant proposes to clear trees from the proposed development between October 31 to March 31 when bats are in hibernation. This will avoid direct effects to the Indiana bat and NLEB from tree removal. Prior to clearing, the limits of proposed clearing will be clearly demarcated on the site with orange construction fencing or flagging (or similar) to prevent inadvertent over-clearing of the site.

B. **Project footprint centered on old field and shrubland**: The design layout of the Amy's Kitchen, Inc., manufacturing facility and Science of the Soul Conference Center is primarily centered on existing areas of old field and shrubland in order to minimize tree removal and encroachment into wooded areas, although some wooded areas will be cleared for the proposed project.

C. **Best Management Practices for outdoor nighttime lighting**: The outdoor lighting plan for the proposed project would include several BMPs that are recommended for reducing

effects on bats (Patriarca and Debernardi 2010, Gaston *et al*. 2012, Stone 2013). All lights would have motion sensors and dimmers, pole heights would be limited to a maximum of 19 feet in order to keep the light close to the ground and allow bats to potentially still fly through the dark air space above, the lights would be downward directional and angled no more than 30 degrees above the horizontal plane to limit spill outside of the intended areas, and wall-mounted lights on the sides of the building would use warm white LED lighting.

D. **Minimal nighttime operation of the Science of the Soul Conference Center**: Operation of the Science of the Soul Conference Center would end by 9:00 p.m. and nighttime lighting would be limited to small parking areas, paths, and internal roads, which would leave the vast majority of the Echo Lake property dark and would minimize potential lighting effects on bats.

E. **Orchard-style design of the Science of the Soul parking area**: The orchard-style parking area for the Science of the Soul Conference Center would be heavily planted with native trees and kept unlit at night except for a small portion in order to soften the edge between the conference center's grounds and the preserved woodland area to the west, buffering the preserved woodland from sound and light associated with the conference center.

F. **Porous Pavement and Gravel/Grass Parking Spaces**: Porous pavement would be installed in a strip at the downslope end of parking aisles, with standard asphalt pavement used for the remainder of the parking area. Porous pavement consists of high permeability asphalt pavement with layers of stone beneath the pavement, designed to temporarily hold the water quality volume and allow for infiltration. The Science of the Soul Conference Center parking would also include 1,280 gravel and/or grass parking spaces (out of approximately 1,940 parking spaces). These measures reduce runoff and minimize the need for site clearing to accommodate additional stormwater management facilities, thereby contributing to preservation of bat foraging and roosting habitat onsite.

G. **Integrated Pest Management (IPM)**: To minimize the use of pesticides/herbicides, all Amy's Kitchen, Inc., and Science of the Soul Conference Center landscaping will utilize IPM practices. The IPM focuses on long-term prevention of plant pests and pathogens by managing the ecosystem to keep pests from becoming a problem. The IPM uses a combination of methods including: cultural controls (practices to reduce pest establishment such as growing a healthy crop that can withstand pest attacks, using disease-resistant plants, modifications to irrigation or fertilizer application); biological controls (use of natural enemies and competitors); mechanical controls (such as mulches for weed management and physical barriers to exclude wildlife pests); and lastly, chemical controls (use of pesticides only when needed, spot treatment rather than prophylactic or broad spraying, to minimize their use). The use of IPM will minimize the potential for impacts to bats from chemical spraying or the consumption of insects that have absorbed pesticides.

H. **On- and offsite habitat protection**: The applicant proposes to preserve, via permanent conservation easements, 165 acres of woodland habitat (successional southern hardwood forest, floodplain forest, red maple-hardwood swamp, and beech-maple mesic forest) that would provide Indiana bat and NLEB with potential foraging and roosting habitat. In addition to the woodland preservation, approximately 22 acres of old field, 11 acres of shrubland, 6 acres of sedge meadow, 1 acre of shallow emergent marsh, and 62 acres of cropland would be preserved on the project site and represent potential foraging habitat for Indiana bats.

Permanent preservation also would occur at three offsite properties totaling 27.8 acres and comprise of a mix of old field, successional southern hardwood forest, and floodplain forest. These habitats may provide foraging habitat for both bat species. The Wawayanda and Lipoff west properties may also provide roosting habitat for Indiana bat, and the Wawayanda property may provide roosting habitat for northern long-eared bat.

In total, the proposed project would preserve approximately 263.6 acres of land (Figure 4) under five separate easements and are as follows:

1) Ver Hage Property at 111 and 103 Hartley Road, Town of Goshen, Orange County, New York – 38.9 acres

2) Lipoff Property at 12 and 38 Echo Lake Road, Town of Goshen, Orange County, New York – 26.2 acres

3) Echo Lake Property at 41 Echo Lake Road, 2832 SR 17M and at an unknown location along Echo Lake Road, Town of Goshen, Orange County, New York – 97.2 acres

4) Strong Farm Property at 212 Cheechunk Road, Town of Goshen, Orange County, New York – 96 acres

5) Hartley Road Property at 121 Hartley Road, Town of Goshen, Orange County, New York – 5.3 acres

I. **Retention and enhancement of buffers**: The applicant is taking several measures to maintain existing linear buffers in several locations within the project area to protect river and stream foraging/travel corridors for bats. The linear buffers highlighted below are included in the areas under conservation easement (see H above). The entire five easement areas can be considered a buffer in and of itself as these areas will protect foraging and travel corridors and reduce noise and light impacts on bats, but below specifically identifies linear areas along aquatic systems that are highly utilized by bat species.

1) An approximately 200 feet width of existing woodland and successional old field/shrubland would remain between Cheechunk Creek and the facility's limits of disturbance, providing a buffer between the developed areas of the property

and the high quality foraging habitat likely provided by the creek's corridor. Indiana bats and NLEBs would be expected to continue using the creek's corridor for foraging and/or as a commuting route to the same extent as at present.

2) The approximately 0.35-mile-long segment of riparian forest currently bordering the eastern side of the Wallkill River along the Ver Hage property's western boundary would also be undeveloped and remain as potential foraging habitat and a potential commuting route for both Indiana bats and NLEBs.

3) Along the eastern side of the Echo Lake property, an approximate 200-foot-wide, wooded buffer would separate the road from the Wallkill River to the west and potentially attenuate some of the vehicle noise and filter some of the light emitted from the vehicles' headlights and the planned motion-activated road lighting, but the crossing of the entry road over the Wallkill River by way of the proposed bridge would introduce vehicle noise and lighting directly to the river's corridor.

4) At least 75 feet of existing floodplain forest would remain between Cheechunk Creek and the warehouse's limits of disturbance at the closest point, providing a buffer between the developed areas of the property and the high quality foraging habitat likely provided by the creek's corridor.

5) East of the bus parking area, a wooded buffer would remain between the conference center and the Wallkill River corridor, and Indiana bats would be expected to forage and commute along this approximately 0.3-mile-long segment of the river corridor between the proposed entry road bridge over the river and the northern boundary of the property at Echo Lake Road as the acoustic bat survey indicated this area to have greater Indiana bat foraging activity than the project site's open field and field-woodland edges.

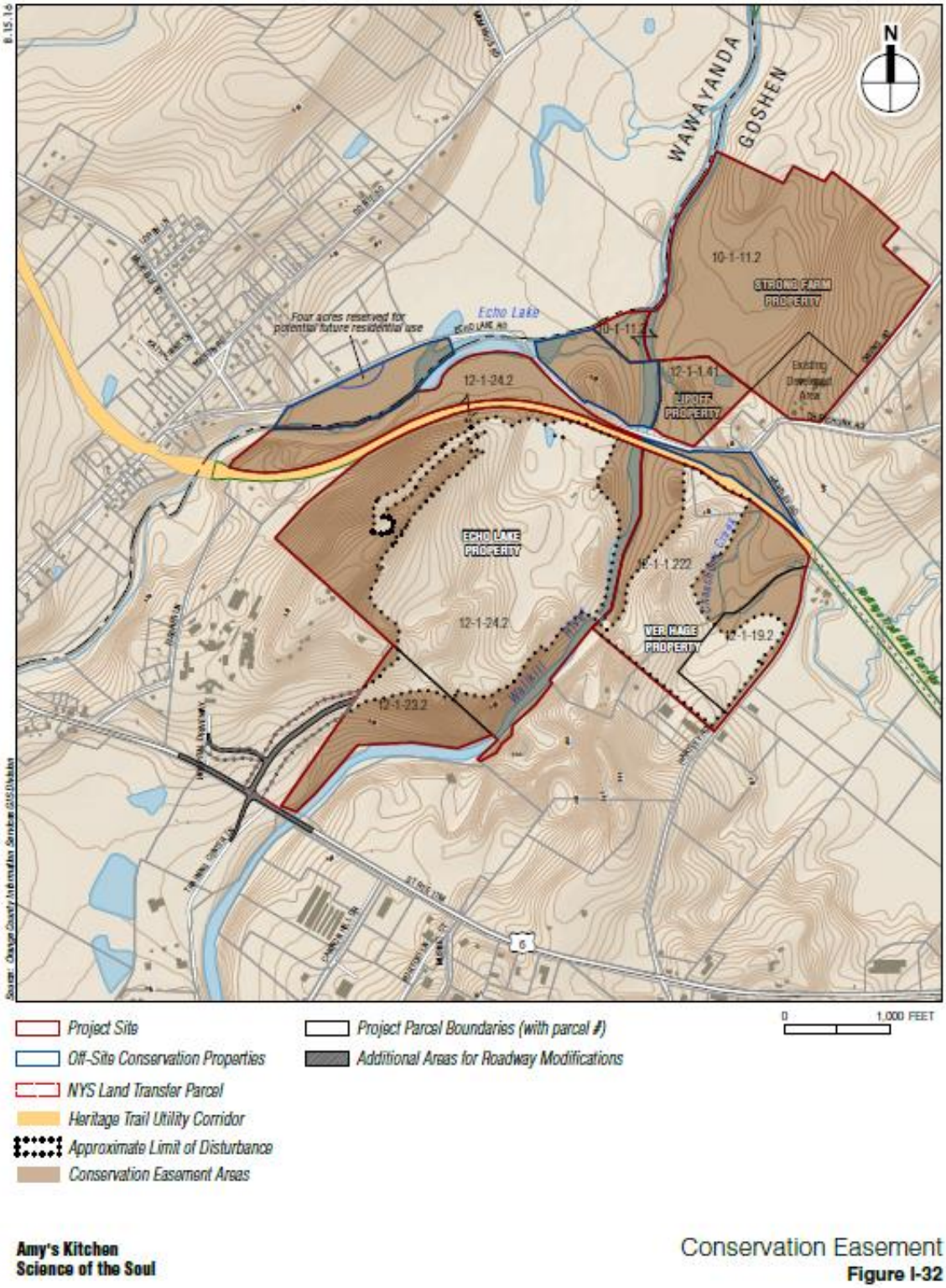

Figure 4. Map indicating areas for permanent conservation easements (brown areas) within and adjacent to the project site.

ANALYTICAL FRAMEWORK FOR THE JEOPARDY AND ADVERSE MODIFICATION DETERMINATIONS

Jeopardy Determination

The following analysis relies on the following four components:

1) The Status of the Species, which evaluates the rangewide condition of the listed species addressed, the factors responsible for that condition, and the species' survival and recovery needs;

2) The Environmental Baseline, which evaluates the condition of the species in the action area, the factors responsible for that condition, and the relationship of the action area to the survival and recovery of the species;

3) The Effects of the Action, which determines the direct and indirect impacts of the proposed federal action and the effects of any interrelated or interdependent activities on the species; and

4) Cumulative Effects, which evaluates the effects of future, non-federal activities in the action area on the species.

In accordance with policy and regulation, the jeopardy determination is made by evaluating the effects of the proposed federal action in the context of the species' current status, taking into account any cumulative effects, to determine if implementation of the proposed action is likely to cause an appreciable reduction in the likelihood of both the survival and recovery of listed species in the wild.

The jeopardy analysis in this Opinion emphasizes the rangewide survival and recovery needs of the listed species and the role of the action area in providing for those needs. It is within this context that we evaluate the significance of the proposed federal action, taken together with cumulative effects, for purposes of making the jeopardy determination.

Status of the Species

This section will provide an overview of the biology and conservation needs of the two bats and designated critical habitat that is pertinent to the "Effects of the Action" section (*e.g.*, a description of the annual life cycle, spring emergence habitat, fall swarming habitat).

Northern Long-eared Bat

The NLEB ranges across much of the eastern and north central United States, and all Canadian provinces west to the southern Yukon Territory and eastern British Columbia (Nagorsen and Brigham 1993; Caceres and Pybus 1998; Environment Yukon 2011). In the United States, the species' range reaches from Maine to Montana, south to eastern Kansas, eastern Oklahoma,

Arkansas, and east through the Gulf States to the Atlantic Coast (Whitaker and Hamilton 1998; Caceres and Barclay 2000; Amelon and Burhans 2006). The species' range includes the following 37 states plus the District of Columbia: Alabama, Arkansas, Connecticut, Delaware, Georgia, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Vermont, Virginia, West Virginia, Wisconsin, and Wyoming. Historically, the species has been most frequently observed in the northeastern United States and in the Canadian Provinces, Quebec and Ontario, with sightings increasing during swarming and hibernation (Caceres and Barclay 2000). However, throughout the majority of the species' range it is patchily distributed, and was historically less common in the southern and western portions of the range than in the northern portion of the range (Amelon and Burhans 2006).

Although they are typically found in low numbers in inconspicuous roosts, most records of NLEBs are from winter hibernacula surveys (Caceres and Pybus 1998). More than 780 hibernacula have been identified throughout the species' range in the United States, although many hibernacula contain only a few (1 to 3) individuals (Whitaker and Hamilton 1998). Known hibernacula (sites with one or more winter records of NLEB) include: Alabama (2), Arkansas (41), Connecticut (8), Delaware (2), Georgia (7), Illinois (21), Indiana (25), Kentucky (119), Maine (3), Maryland (8), Massachusetts (7), Michigan (103), Minnesota (11), Missouri (more than 269), Nebraska (2), New Hampshire (11), New Jersey (7), New York (90), North Carolina (22), Oklahoma (9), Ohio (7), Pennsylvania (112), South Carolina, (2), South Dakota (21), Tennessee (58), Vermont (16), Virginia (8), West Virginia (104), and Wisconsin (67). The NLEB have been documented in hibernacula in 29 of the 37 states in the species' range. Other states within the species' range have no known hibernacula due to no suitable hibernacula present, lack of survey effort, or existence of unknown retreats.

The current range and distribution of NLEB must be described and understood within the context of the impacts of white-nose syndrome (WNS), a fungal disease adversely impacting hibernating, insectivorous bat species in the eastern half of the United States and Canada. Prior to the onset of WNS, the best available information on NLEBs came primarily from surveys (primarily focused on Indiana bat or other bat species) and some targeted research projects. In these efforts, NLEBs were frequently encountered and considered the most common myotid bat in many areas. Overall, the species was considered to be widespread and abundant throughout its historic range (Caceres and Barclay 2000).

White-nose syndrome has been particularly devastating for NLEBs in the northeast, where the species was believed to be the most abundant. There are data supporting substantial declines in NLEB populations in portions of the Midwest due to WNS. In addition, WNS has been documented at more than 100 NLEB hibernacula in the southeast, with apparent population declines at most sites. White-nose syndrome has not been found in any of the western states to date and the species is considered rarer in the western extremes of its range. Further declines are expected as the disease continues to spread across the species' range.

Indiana Bat

The current range of the Indiana bat includes much of the eastern half of the United States, from Oklahoma, Iowa, and Wisconsin east to Vermont, and south to northwestern Florida. The species has disappeared from, or greatly declined, in most of its former range in the northeastern United States due to the impacts of WNS. The current revised recovery plan (Service 2007) delineates recovery units based on population discreteness, differences in population trends, and broad level differences in land use and macrohabitats. There are currently four proposed recovery units (RU) for the Indiana bat: Ozark-Central, Midwest, Appalachian Mountains, and Northeast.

Historically, the Indiana bat had a winter range restricted to areas of cavernous limestone in the karst regions of the east-central United States. Hibernacula are divided into priority groups that have been redefined in the Service's Draft Recovery Plan (Service 2007):

- Priority 1 (P1) hibernacula typically have a current and/or historically observed winter population of greater than or equal to 10,000 Indiana bats;

- P2 have a current or observed historic population of 1,000 or greater, but fewer than 10,000;

- P3 have current or observed historic populations of 50 to 1,000 bats; and

- P4 have current or observed historic populations of fewer than 50 bats.

Based on 2009 winter surveys, there were a total of 24 P1 hibernacula in seven states: Illinois (1); Indiana (7); Kentucky (5); Missouri (6); New York (3); Tennessee (1); and West Virginia (1). One additional P1 hibernaculum was discovered in Missouri in 2012. A total of 55 P2, 151 P3, and 229 P4 hibernacula are also known from the aforementioned states, as well as 15 additional states.

The historical summer range of the Indiana bat is thought to be similar to its modern range. However, the bat has been locally extirpated due to fragmentation and loss of summer habitat. The majority of known maternity sites have been located in forested tracts in agriculturally dominated landscapes such as Missouri, Iowa, Indiana, Illinois, southern Michigan, western Ohio, and western Kentucky, as well as the Northeast, with multiple spring emergence telemetry studies.

From 1965 to 2001, there was an overall decline in the range-wide population of the Indiana bat (Service 2007). Despite the discovery of many new, large hibernacula during this time, the rangewide population estimate dropped approximately 57 percent from 1965 to 2001, which has been attributed to various causes (*e.g.*, habitat loss/degradation, forest fragmentation, winter disturbance, and environmental contaminants). Between 2001 and 2007, the estimated rangewide population increased from 496,027 to 635,349 Indiana bats (Service 2015). According to the 2015 Range-wide Population Estimate for the Indiana Bat (Service 2015), the total known Indiana bat population is estimated to be approximately 523,636, a 111,713

(17.6 percent) decrease from the 2007 rangewide estimate (Figure 5, Service 2015). This decrease is primarily attributed to the impacts of WNS.

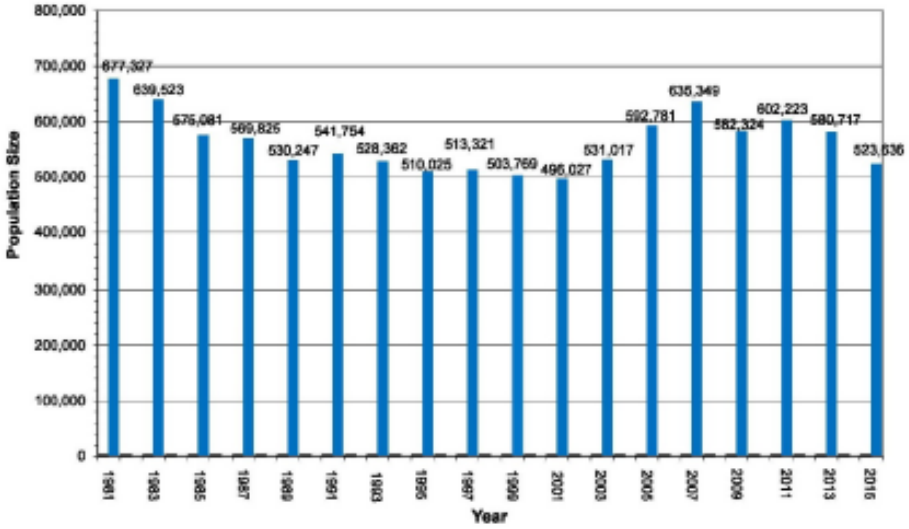

Figure 5. Indiana bat rangewide population estimates from 1981–2015 (Service 2015).

Critical Habitat

Critical habitat has been designated for the Indiana bat. Thirteen winter hibernacula (11 caves and 2 mines) in six states were designated as Critical Habitat for the Indiana bat in 1976 (Federal Register, Volume 41, No. 187). At the time the Critical Habitat was designated (September 24, 1976), no primary constituent elements were identified. Therefore, the Service has identified the physical and biological features that make the designated caves or mines important to the conservation of Indiana bats. The important conservation features include:

- The mine or cave's physical structure, configuration, and all openings that create and regulate suitable microclimates for hibernating bats within;
- The associated karst hydrology and stream recharge area/watershed; and
- The amount and condition of surrounding forested habitat that is used by the bats during the pre-hibernation swarming period each fall.

The Service determined that it is not prudent to designate Critical Habitat for the NLEB (Federal Register, Volume 81, No. 81).

Life History and Biology

The Indiana bat and NLEB are both temperate, insectivorous, migratory bats that hibernate in mines and caves in the winter and spend 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, generally both species will 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 (able to fly) in mid- to late-July. Fall migration likely occurs between mid-August and mid-October.

The following is a brief description of various components of life history and biology for both species. Please see the various "Resource" descriptions throughout the document for more detailed information.

Summer Habitat and Ecology

Suitable summer habitat[1] for NLEB and Indiana bat consists of a wide variety of forested/wooded habitats where they roost, forage, and travel. This habitat may also include some adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, old fields, and pastures. This includes forests and woodlots containing potential roosts, as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. The NLEBs are typically associated with upland forests with generally more canopy cover than Indiana bats. The NLEBs seem to be focused in upland, mature forests (Caceres and Pybus 1998) with occasional foraging over forest clearings, water, and along roads (Van Zyll de Jong 1985). However, most NLEB hunting occurs on forested hillsides and ridges, rather than along riparian areas preferred by the Indiana bat (Brack and Whitaker 2001, LaVal *et al*. 1977).

Many species of bats, including the Indiana bat and NLEB, consistently avoid foraging in or crossing large open areas, choosing instead to use tree-lined pathways or small openings (Patriquin and Barclay 2003, Yates and Muzika 2006). Further, wing morphology of both species suggests they are adapted to moving in cluttered habitats. Thus, isolated patches of forest may not be suitable for foraging or roosting unless the patches are connected by a wooded corridor.

Maternity Colonies and Roosts

Upon emergence from the hibernacula in the spring, females seek suitable habitat for maternity colonies. Coloniality is a requisite behavior for reproductive success. The NLEB maternity colonies range widely in size, although 30-60 may be most common (Service 2014). Indiana bat maternity colonies also vary greatly in size, with most documented maternity colonies containing

[1] See the Service's current summer survey guidance for our latest definitions of suitable habitat.

less than 100 adult females. Both species show some degree of interannual fidelity to single roost trees and/or maternity areas. Unlike Indiana bats, male NLEBs are routinely found with females in maternity colonies. Maternity colonies of both species use networks of roost trees often centered around one or more primary (Indiana bat) or central-node (NLEB) roost trees. Indiana bat maternity colonies use a minimum of 8-25 trees per season (Callahan *et al*. 1997; Kurta *et al*. 2002). The NLEB roost networks also include multiple alternate roost trees and male and non-reproductive female NLEBs may also roost in cooler places like caves and mines (Barbour and Davis 1969, Amelon and Burhans 2006).

Roost tree preferences vary between the two species. Indiana bats are known to use a wide variety of tree species (greater than or equal to 5 inches diameter at breast height (dbh)) based on presence of cracks, crevices, or presence of peeling bark. A typical Indiana bat primary roost is located under exfoliating bark of a dead ash, elm, hickory, maple, oak, or poplar, although any tree that retains large, thick slabs of peeling bark may be suitable. Primary Indiana bat roosts usually are in trees that are in early-to-mid stages of decay. The NLEBs are known to use a wider variety of roost types than Indiana bats. The NLEBs roost in cavities, underneath bark, crevices, or hollows of both live and dead trees and/or snags (typically greater than or equal to 3 inches dbh). Indiana bats and NLEBs (more frequently) have also been occasionally found roosting in structures like barns and sheds (particularly when suitable tree roosts are unavailable).

Reproduction

Young NLEBs and Indiana bats are typically born in late-May or early June, with females giving birth to a single offspring. Lactation then lasts 3 to 5 weeks, with pups becoming volant between early July and early August.

Migration

Males and non-reproductive females may summer near hibernacula, or migrate to summer habitat some distance from their hibernaculum. Indiana bats are known to often migrate hundreds of kilometers from their hibernacula (Service 2007). In contrast, NLEBs are not considered to be a long-distance migrant, typically 40-50 miles. Migration is an energetically demanding behavior for the NLEB and Indiana bat, particularly in the spring when their fat reserves and food supplies are low and females are pregnant.

Winter Habitat and Ecology

Suitable winter habitat (hibernacula) for both species includes underground caves and cave-like structures (*e.g*., abandoned or active mines, railroad tunnels, and other locations where bats hibernate in winter). There may be other landscape features being used by NLEBs during the winter that have yet to be documented. Generally, both species hibernate from October to April depending on local weather conditions (November-December to March in southern areas and as late as mid-May in some northern areas).

Hibernacula for NLEBs typically have significant cracks and crevices for roosting, relatively constant, cool temperatures (0-9 degrees Celsius), and with high humidity and minimal air currents. Specific areas where they hibernate have very high humidity, so much so that droplets of water are often seen on their fur. Within hibernacula, surveyors find them in small crevices or cracks, often with only the nose and ears visible.

Caves that meet temperature requirements for Indiana bats are rare. Most Indiana bats hibernate in caves or mines where the ambient temperature remains below 10ºC (50.0ºF), but infrequently drops below freezing (Hall 1962, Myers 1964, Henshaw 1965, Humphrey 1978). Caves that historically sheltered the largest populations of hibernating Indiana bats were those that provided the largest volumes and structural diversity, thus ensuring stable internal temperatures over wide ranges of external temperatures, with a low likelihood of freezing (Tuttle and Kennedy 2002).

Indiana bats generally hibernate in large clusters, sometimes with other species, with densities of 300 to 484 bats per square foot (Service 2007). The NLEBs tend to roost singly or in small groups (Service 2014), with hibernating population sizes ranging from a just few individuals to around 1,000 (Service unpublished data). The NLEBs display more winter activity than other cave species, with individuals often moving between hibernacula throughout the winter (Griffin 1940, Whitaker and Rissler 1992, Caceres and Barclay 2000). Both NLEBs and Indiana bats have shown a high degree of philopatry to the hibernacula used, returning to the same hibernacula annually.

Spring Staging and Fall Swarming Habitat and Ecology

Upon arrival at hibernacula in mid-August to mid-November, NLEBs and Indiana bats "swarm," a behavior in which large numbers of bats fly in and out of cave entrances from dusk to dawn, while relatively few roost in caves during the day. Swarming continues for several weeks and mating occurs during the latter part of the period. After mating, females enter directly into hibernation, but not necessarily at the same hibernaculum where mating occurred. A majority of bats of both sexes hibernate by the end of November (by mid-October in northern areas).

After hibernation ends in late March or early April (as late as May in some northern areas), most NLEBs and Indiana bats migrate to summer roosts. Females emerge from hibernation prior to males. Reproductively active females store sperm from autumn copulations through winter. Ovulation takes place after the bats emerge from hibernation in spring. The period after hibernation and just before spring migration is typically referred to as "staging," a time when bats forage and a limited amount of mating occurs. This period can be as short as a day for an individual, but not all bats emerge on the same day.

In general, NLEBs and Indiana bats use roosts in the spring and fall similar to those selected during the summer. Suitable spring staging/fall swarming habitat happens in forested/wooded habitats where they roost, forage, and travel, which is most typically within 5 miles of a hibernaculum. This includes forested patches as well as linear features such as fencerows, riparian forests, and other wooded corridors. These wooded areas may be dense or loose aggregates of trees with variable amounts of canopy closure. Isolated trees are considered

suitable habitat when they exhibit the characteristics of a suitable roost tree and are less than 1,000 feet (ft) from the next nearest suitable roost tree, woodlot, or wooded fencerow.

Threats

Current threats to the Indiana bat are discussed in detail in the 2007 Draft Recovery Plan (Service 2007) and the most recent 5-Year Review (Service 2009). Traditionally, habitat loss/degradation, forest fragmentation (lack of connectivity), winter disturbance, and environmental contaminants have been considered the greatest threats to Indiana bats. The Draft Recovery Plan identified and expounded upon additional threats including collisions with manmade objects (*e.g.*, wind turbines).

Factors affecting the NLEB are detailed in the final rule listing the NLEB as a threatened species (Federal Register, Vol. 80., No. 63) and the final 4(d) rule (Federal Register, Vol. 81., No. 9).

No other threat is as severe and immediate for the Indiana bat and NLEB as the disease WNS. It is unlikely that Indiana bat and NLEB populations would be declining so dramatically without the impact of WNS. Since the disease was first observed in New York in 2007 (later biologists found evidence from 2006 photographs), WNS has spread rapidly in bat populations from the Northeast to the Midwest and the Southeast. Population numbers of the NLEB have declined by 99 percent and by 70 percent for Indiana bat in the Northeast, which, along with Canada, has been considered the core of the species' range. Although there is uncertainty about how quickly WNS will spread through the remaining portions of these species' ranges, it is expected to spread throughout their entire ranges. In general, the Service believes that WNS has significantly reduced the redundancy and resiliency of both the Indiana bat and NLEB.

Although significant Indiana bat and NLEB population declines have only been documented due to the spread of WNS, other sources of mortality could further diminish the species' ability to persist as they experience ongoing dramatic declines. Specifically, declines due to WNS have significantly reduced the number and size of Indiana bat and NLEB populations in some areas of their range. This has reduced these populations to the extent that they may be increasingly vulnerable to other stressors that they may have previously had the ability to withstand. These impacts could potentially be seen on two levels. First, individual Indiana bat and NLEB sickened or struggling with infection by WNS may be less able to survive when also impacted by other stressors. Second, Indiana bat and NLEB populations impacted by WNS, with smaller numbers and reduced fitness among individuals, may be less resilient, making them more prone to extirpation. The status and potential for these impacts will vary across the range of these species.

Analysis of the Species/Critical Habitat Likely to be Affected

The Service has reviewed the BA and supporting information for the proposed project. The BA evaluated the potential and likely effects of a variety of actions on the Indiana bat and NLEBs. There are no other federally listed or proposed species known or likely to occur within the action area.

The Service concurs with the Corps' determination that the project may adversely affect the Indiana bat and NLEB due to the loss or alteration of roosting and foraging habitat. Critical habitat has been designated for the Indiana bat, but none of those critical habitat areas occur within the project area. Therefore, the proposed project is not likely to adversely modify critical habitat for the species. No critical habitat has been designated for the NLEB.

Action Area

The "action area" is defined by regulation as all areas to be affected directly or indirectly by the federal action and not merely the immediate area involved in the action (50 CFR § 402.02). The action area is not limited to the "footprint" of the action nor is it limited by the federal agency's authority. Rather, it is the biological determination of the reach of the proposed action on listed species. For the purposes of this Opinion, the action area encompasses the 423.97-acre project site located in the Town of Goshen, Orange County, New York. The Service generally agrees with the action area described in the BA (see Project Location above).

ENVIRONMENTAL BASELINE

Under Section 7(a)(2) of the ESA, when considering the "effects of the action" on federally listed species, the Service is required to take into consideration the environmental baseline. The environmental baseline includes past and ongoing natural factors and the past and present impacts of all federal, state, or private actions and other activities in the action area (50 CFR 402.02), including federal actions in the area that have already undergone Section 7 consultation, and the impacts of state or private actions that are contemporaneous with the consultation in process. As such, the environmental baseline is "an analysis of the effects of past and ongoing human and natural factors leading to the current status of the species, its habitat (including critical habitat), and ecosystem, within the action area (Service and National Marine Fisheries Service [NMFS] 1998, page 4-22)." The environmental baseline is, therefore, a "snapshot" of the species' health at a given point in time, but it does not include the effects of the proposed action.

Status of the Species in New York

In New York, winter counts range from 22 Indiana bats in 1981 (Hailes Cave only) to 52,803 in 2006-2007. In that 25-year span, new sites or new sections of sites were discovered and added to the surveys. In addition, in 2004-2005, the survey methodology in New York of taking photographs and counting bats back at the office was modified with enhanced digital photography imaging. As stated above, the primary threat to Indiana bats and NLEBs in New York at this time is WNS. Winter 2014-2015 results estimated 15,564 Indiana bats in New York.

There is no similar statewide population estimate available for the NLEB as this species is exceedingly challenging to survey in the winter. For example, historically, approximately 1,151 NLEBs were observed, but summer capture rates suggest this species was far more abundant than Indiana bats prior to WNS.

Status of the Species in the Action Area

An Indiana bat and NLEB hibernaculum is known within 9.5 miles from the project site. In addition, in 2005, the NYSDEC tracked a female Indiana bat from the Williams Mine Complex (multiple Indiana bat hibernacula located approximately 33 miles from the project site) to a summer roost tree within 2.5 miles of the project site, suggesting that the project site is likely to be part of the summer home range of a maternity colony. There are no known NLEB roost trees near the project site. An acoustic bat detection survey was conducted by AKRF, Inc., at three locations between August 6 and August 15, 2015, within the project site to document the potential presence of Indiana bats and NLEB (Figure 6; AKRF 2015). Acoustic surveys inform the presence of foraging or commuting bats by detecting feeding buzzes and echolocation calls, but cannot be used to determine whether bats also roost within the survey location. The surveys documented the probable presence of both bat species at detector location #1 (Lipoff Property) and Indiana bats only at detector locations 2 and 3 (Ver Hage Property) (AKRF 2015). While the results do not determine presence of maternity colonies and/or roost trees, it does infer that both bat species are likely using the project site for foraging, traversing, and/or potentially roosting as suitable foraging and roosting habitat was identified throughout the project site.

Given the proximity of the site to a hibernaculum, it is also possible that the site is used as fall swarming habitat by both species for mating and winter hibernation preparation.

Amy's Kitchen
Science of the Soul

Bat Recording Locations
Figure 2

Figure 6. Map of proposed project site indicating locations of acoustic bat detectors used for identification of presence of Indiana and northern long-eared bats.

Factors Affecting Indiana Bat and NLEB Environment within the Action Area

The factors affecting Indiana bats and NLEB in the action area are a subset of the threats affecting the species rangewide, as discussed above.

Loss and Degradation of Roosting and Foraging Habitat

The proposed project is located in an area where larger forest blocks remain; however, these blocks have become fragmented over time due to clearing for transmission and/or gas line rights-of-way, residential and commercial development, and agriculture production. The area continues to exhibit increasing development pressure. Outside of the project's boundaries, an unknown amount of forest habitat is being converted, fragmented, and/or degraded on an annual basis, thereby reducing forest habitat available for roosting and foraging. Reductions to non-forested habitat (*i.e.*, field edges and riparian buffers) where bats may forage or travel through also are likely occurring within the Town of Goshen.

White-Nose Syndrome

The effects of WNS are present for bats that occur within the action area. All Indiana bat hibernaculum are confirmed as WNS-positive. All Indiana bats are anticipated to be exposed to *Pseudogymnoascus destructans* (*Pd*), the fungus that causes WNS, during hibernation. The nearest known hibernacula to the action area are Bull Mine and the Williams Mine Complex (approximately 9.5 and 33 miles away, respectively); both sites are considered WMS-positive. (See http://www.whitenosesyndrome.org/about/where-is-it-now for a current map of where WNS has been found).

The Williams Mine Complex, located in the Town of Rosendale, Ulster County, NY, is considered a Priority 1 hibernaculum meaning current and/or historically observed winter population of greater than or equal to 10,000 Indiana bats. This complex is likely where both Indiana and NLEBs identified within the project area are overwintering.

There has been no WNS surveillance conducted in the action area, but given the location, it is almost certain that bats from affected hibernacula utilize this area during summer. We do not know how WNS is currently affecting the Indiana bats or NLEBs that are in the action area (*i.e.*, we do not know if the populations in maternity colonies and hibernacula to which these bats belong have declined). As noted previously, according to 2015 rangewide population estimates, the Northeast RU has lost approximately 70 percent of its Indiana bats since the onset of WNS, and up to 99 percent of NLEBs have been lost within the Northeast. As previously discussed, we expect declines to continue in the coming years as WNS has now been documented in all recovery units.

EFFECTS OF THE ACTION

"Effects of the action" refers to the direct and indirect effects of an action on listed species or critical habitat, together with the effects of other activities interrelated and interdependent with that action which will be added to the environmental baseline. The ESA defines indirect effects

as those caused by the proposed action and that are later in time, but are still reasonably certain to occur (50 CFR § 402.02). Interrelated actions are those that are part of a larger action and depend on the larger action for their justification. Interdependent actions are those that have no independent utility apart from the action under consideration.

This section includes an analysis of the direct and indirect effects of the proposed actions on the species and/or critical habitat and its interrelated and interdependent activities. While analyzing direct and indirect effects of the proposed action, the Service considered the following factors:

Proximity of the action: Indiana bats and NLEBs occur directly at the site during the spring and summer and potentially during fall swarming. As stated in the Status of the Species in the Action Area, the project is approximately 2.2 miles from a known Indiana bat roost tree. No roost trees for either bat species have been identified within the project site. However, AKRF, Inc., identified suitable roosting habitat for both Indiana bat and NLEB onsite.

The Bull Mine hibernaculum is located approximately 9.5 miles from the project site, and the Williams Mine Complex of hibernacula is about 33 miles away. No effects to wintering bats or any hibernacula are anticipated from the proposed project.

Distribution: The project will result in impacts to both bat species at one location impacting one maternity colony for each species.

Timing: Direct effects to both the Indiana bat and NLEB from tree removal will be avoided as tree removal activities will occur while bats are in hibernation (October 31-March 31). This avoids critical roosting and reproductive periods. Effects are anticipated the following spring, upon the species' return to the site.

Nature of the effect: The proposed project activities are expected to result in: a) permanent loss of potential foraging and roosting habitat through removal of that habitat (*e.g.*, removal of roost trees and foraging habitat); and b) alteration and/or modification of normal Indiana bat and NLEB behaviors (*e.g.*, reproduction effects, foraging effects, and sheltering behaviors). Additional details are discussed below.

Duration: The proposed action will cause the permanent destruction, alteration, and fragmentation of the habitat for Indiana bats and NLEBs utilizing the site throughout various needed times of the year. However, some potential foraging and roosting habitat will remain within and adjacent to the project area post construction. Short-term impacts are anticipated to individual bats during the first few years after the loss of habitat and alteration.

Disturbance frequency: The disturbance of the site is proposed to begin in winter 2016-2017, with clearing of the site to prepare for construction activities. The construction itself will occur during the two phases of the project through 2023, when full build-out is complete. Disturbance will be periodic over five spring staging and migration, summer roosting/foraging, and/or fall migration periods while the proposed project is being constructed. After completion of the construction, the disturbance (especially from night-time traffic, lighting, and noise) may be

continuous until both bat species can acclimate to nearby suitable habitat and modify their normal behavior patterns.

Disturbance intensity: Approximately 150.76 acres of potential roosting and foraging habitat for both Indiana bat and NLEB will be permanently lost within the project area. However, construction and operation of the proposed project would affect a total of approximately 198 acres of potential foraging habitat and approximately 63 acres of potential roosting habitat for the Indiana bat and NLEB. This includes clearing and grading of existing habitat (the BA termed these "direct effects"), as well as alteration due to fragmentation, edge effects, motor vehicle traffic and noise, and nighttime lighting (the BA termed these "indirect effects"). Table 3 presents the total approximate acreage of bat habitat that would be affected by the proposed project.

Table 3. Approximate acreage of impacts to both bat species.

	Approximate Acreage of Bat Habitat Affected by the Proposed Project	
Impact	**Foraging**	**Roosting**
Direct Common Habitat	35	32
Direct Indiana Bat Only	93	3
Direct Northern Long-Eared Bat Only	0	0
Total Direct	***128***	***35***
Indirect Common Habitat	0	0
Indirect Indiana Bat Only	41	0
Indirect Northern Long-Eared Bat Only	28.8	27.8
Total Indirect	***69.8***	***27.8***
Total Impact	**197.8**	**62.8**
Notes: Total impact cannot be obtained through summing foraging and roosting habitat as significant overlap exists between functions.		

Analysis of the Effects of the Action

Loss of Roosting and Foraging Habitat

The primary effect of the proposed activities on Indiana bats and NLEBs in the action area will be the loss and alteration of forest. All tree removal will occur in winter to avoid the potential for killing or injuring roosting bats or disturbing roosting and foraging bats.

Indiana bat

No known roosts will be impacted by the project (closest are 2.2 miles from the project). As stated above, the construction of the project would impact approximately 261 acres of potential foraging and roosting habitat. Of this, 150.76 acres will be cleared (permanently lost). To assess potential effects of the loss of this habitat, we consider the potential home range of the known Indiana bat maternity colony. One way that we do this is by buffering known roosts by 2.5 miles and assessing the amount of forest within that area and how much of that is being impacted or

protected by the proposed action. Approximately 42.5 percent of this buffered area is considered forested and approximately 0.6 percent of the forested habitat will be removed as a result of the proposed project. We then consider that home ranges of individual bats are much smaller than the 12,566.12 acres within a 2.5-mile circle. The average home range sizes of individual Indiana bats (Menzel *et al*. 2005; Sparks *et al*. 2005; Watrous *et al*. 2006; Kniowski and Gehrt 2014; Jachowski *et al*. 2014) ranges between 205.1-827.8 acres. The loss of 150.76 acres represents approximately 0.012 percent of a home range for an individual Indiana bat. Colonies have larger home ranges than individual bats with areas of overlapping core roosting/foraging areas and areas that do not overlap.

Northern Long-Eared Bat

No known NLEB roosts will be impacted by the project. To assess potential effects of the loss of forest on NLEB, we buffer known roosts by 1.5 miles and assess the amount of forest within that area and how much of that is being impacted or protected by the proposed action. We have no known NLEB roosts nearby to conduct a similar analysis as can be done for Indiana bats for the project site. However, the loss of 150.76 acres represents 0.033 percent of a 1.5-mile circle of a potential colony home range, if all acres were considered suitable habitat. In most cases not all acres are suitable habitat for bats. Individual NLEB home ranges have been minimally estimated at 148.8-173.7 acres (Owen *et al*. 2003; Lacki *et al*. 2009). The loss of 150.76 acres may result in loss of approximately 100 percent of a home range for an individual NLEB. Colonies have larger home ranges than individual bats with areas of overlapping core roosting/foraging areas and areas that do not overlap.

Indiana Bats and Northern Long-Eared Bat

This loss of forest results in smaller remaining forest patches and, when combined with disturbance and lighting/noise from the project (see below), is anticipated to result in reduced foraging and/or roosting in these forest patches.

While Indiana bats and NLEBs using the affected forest patches for foraging will have alternative foraging habitat available within the action area, they will likely have to shift or expand their foraging ranges into areas that may be previously unused by them to make up for the loss of foraging habitat. The impact of shifting flight patterns and foraging areas on individual bats will vary. Recovery from the stress of hibernation and migration may be slower as a result of the added energy demands of searching for new foraging habitat especially in an already fragmented landscape such as this one where forested habitat is becoming more limited with increasing development. Pregnant females displaced from preferred foraging areas will have to expend additional energy to search for alternative foraging habitat which would likely result in reduced reproductive success (failure to carry to full-term or failure to raise pup through first summer) for some females. Females that do give birth may have pups with lower birth weights given the increased energy demands associated with longer flights, or their pups may experience delayed development. These longer flights would also be experienced by pups once they become volant which could affect the survival of these pups as they enter hibernation with potentially reduced fat reserves. Bats may also experience higher rates of predation or competition when searching for new foraging areas. Overall, the effect of the loss of foraging

habitat on individual bats from the maternity colony in the action area is anticipated to range from no effect to death. The effect on the colony would then be reduced reproduction and loss of a small portion of the colony. These effects are anticipated to be relatively short-lived as Indiana bats and NLEBs are anticipated to acclimate to the altered landscape.

In areas with WNS, there are additional energetic demands for Indiana bats and NLEBs. For example, WNS-affected bats have less fat reserves than non-WNS-affected bats when they emerge from hibernation (Reeder *et al*. 2012; Warnecke *et al*. 2012) and have wing damage (Reichard and Kunz 2009, Meteyer *et al*. 2009) that makes migration and foraging more challenging. Females that survive the migration to their summer habitat must partition energy resources between foraging, keeping warm, successful pregnancy and pup-rearing, and healing.

Alteration of Roosting and Foraging Habitat - Effects on Habitat Quality

In addition to permanent loss of 150.76 acres of roosting and foraging habitat, the proposed actions are anticipated to result in a decrease in quality of some of the remaining potential roosting and foraging habitat within up to an additional approximately 110 acres. Factors that may lead to reduced habitat quality include habitat fragmentation, increased human disturbance (*e.g*., noise, lighting, dust), and water quality impacts. These are discussed below. Buffers along the Wallkill River and Cheechunk Creek will be in place in some areas of the project site to attenuate the effects these factors.

Construction Lighting

Lighting is not anticipated during construction and, therefore, will not affect either of the bat species.

Construction Noise

In contrast to the well-documented sensitivity of bats during hibernation, the sensitivity of bats to disturbances during the summer is poorly understood. As with most animals, it is likely that non-hibernating bats initially experience increased acute stress levels in response to new and unfamiliar disturbances, such as loud noises (Bowles 1995), but any effects this may subsequently have on their condition, reproduction, or survival are unknown. Some studies outside the hibernation season have shown foraging and nursing behaviors of bats to be easily disrupted by disturbances from human activities, including cave tourism (Mann *et al*. 2002), music concerts (Shirley *et al*. 2001), and even minor vegetation clearing near roost trees (Callahan 1993). Bats have also been shown to avoid foraging in noisy environments, including roadside areas that are subjected to traffic noise (Schaub *et al*. 2008, Murphy *et al*. 2009, Siemers and Schaub 2011, Bennett and Zurcher 2013). Reductions in maternity colony size and complete colony abandonment following disturbances have been reported (Barbour and Davis 1969, Stihler and Hall 1993). Other studies, however, have found loud, low frequency noises and reverberations associated with aircrafts and military training activities to have no noticeable effect on foraging or roosting locations of bats (Shapiro and Hohmann 2005, LeRoux 2010). Some bats, including the Indiana bat and NLEB, are known to roost along interstate highways, near airports, and under bridges (Sparks *et al*. 1998, Keeley and Tuttle 1999) suggesting they are

tolerant of roosting amidst some noises and vibrations associated with human activity. The foraging behaviors and roosting locations of Indiana bats on military bases were found to be similar between nights with and without loud artillery training exercises (Shapiro and Hohmann 2005), which also suggests that they are not easily disturbed by certain loud noises outside the hibernation period. Similarly, Indiana bats have been found to continue to roost adjacent to areas with active construction activities, which indicates an ability to acclimate to construction noises (U.S. Forest Service (USFS) 2011). To our knowledge, there have not been any studies of the sensitivity of NLEBs to construction noises or other forms of noise disturbance. However, Indiana bats and NLEBs have been observed roosting in areas with substantial noise levels, such as at the Indianapolis International Airport (Sparks *et al*. 1998), which is anecdotal evidence that they can be tolerant of certain noise disturbances during roosting. Foraging Indiana bats and NLEBs, in contrast, are expected to be sensitive and vulnerable to acoustic habitat degradation caused by road traffic noise (Schaub *et al*. 2008), like other gleaning Myotis bats are (Schaub *et al*. 2008, Siemers and Schaub 2011).

The hearing ranges of the Indiana bat and NLEB have not been described, but are likely similar to that of the congeneric little brown bat (*Myotis lucifigus*). Little brown bats detect sounds of 10-130 kHz (Moss and Schnitzler 1995), with peak sensitivity between 35 and 40 kHz (Grinnell 1963). Echolocation calls of Indiana bats and NLEBs range 41-75 kHz and 49-117 kHz, respectively (Fenton and Bell 1981, Miller and Treat 1993). Noises from heavy construction equipment (*e.g*., rock crushers, graders, dozers, and loaders) typically fall well below these frequency ranges (Delaney and Grubb 2004) and are, therefore, unlikely to be highly audible to Myotis bats or interfere with their ability to echolocate. However, higher frequency noises that might be generated during construction, such as those that are comparable to passing cars and light trucks, can displace Myotis bats from foraging and affect foraging efficiency (Schaub *et al*. 2008, Siemers and Schaub 2011). Nighttime construction activity for the proposed project would not occur during the non-hibernation period when Indiana bats and NLEBs may be present (April through October) and, therefore, would not have the potential to disturb their foraging activity. Potential effects of construction noise on Indiana bats and NLEBs would be limited to the daytime when the bats are inactive and occupying their day roosts.

Significant changes in noise levels in an area may result in temporary to permanent alteration of bat behaviors. The novelty of these noises and their relative volume levels will likely dictate the range of responses from individuals or colonies of bats. At low noise levels (or farther distances), bats initially may be startled, but they would likely habituate to the low background noise levels. At closer range and louder noise levels (particularly if accompanied by physical vibrations from heavy machinery and the crashing of falling trees), bats are likely to be startled to the point of fleeing from their day-time roosts and in some cases may experience increased predation risk. For projects with noise levels greater than levels usually experienced by bats, and that continue for multiple days, bats roosting within or close to these areas are likely to shift their focal roosting areas further away or may abandon these roosting areas completely.

Given the residential, commercial community, and lands actively farmed nearby, it is unlikely that noise generated during construction of the facility will greatly exceed ambient noise levels. While noise during tree clearing may be more severe than the rest of the construction activities, this activity is scheduled to take place when the bats will not be on the site. Overall, it is

reasonable to assume that some Indiana bats and NLEBs may be temporarily disturbed by noise and vibration of construction activities within or directly adjacent to previous roosting habitat and that combined with the loss of forest habitat, we would anticipate a shift in roosting behavior away from the project.

Construction Water Quality Impacts

Stormwater runoff from disturbed soil during construction could contaminate surface water on the site, rendering it unfit for bats to drink, or interfering with breeding of aquatic insects on which bats may feed. Insects associated with aquatic habitats make up part of the diet of Indiana bats; therefore, impacts to water quality may result in temporary, short-term indirect effects on foraging Indiana bats and NLEBs during spring, summer, and autumn. However, soil control methods (*i.e*., fencing, temporary sediment traps) incorporated will minimize erosion and subsequent sedimentation, thus reducing potential impacts on aquatic ecosystems.

Temporary measures, such as the installation of silt fence, diversion swales, and temporary sediment traps, will be incorporated into the project prior to construction, and would be monitored and maintained constantly during construction to protect water quality. These measures are detailed in their Stormwater Pollution Prevention Plan (SWPPP) and Erosion and Sediment Control Plan (ESCP), as noted in the Final EIS. However, it is still possible to have periods where erosion and sedimentation may cause short-term declines in aquatic insect populations in adjacent wetlands. Since potential impacts from sedimentation are expected to be localized and remain within the project area, foraging Indiana bats and NLEBs will be able to relocate upstream or downstream to forage. The Service believes that water quality impacts may cause a temporary reduction in the prey base and drinking resources for both bat species. However, we presume that the surrounding landscape will continue to provide an abundant prey base of both terrestrial and aquatic insects during project construction, operation, and maintenance. Therefore, any potential direct effects to Indiana bats and NLEBs from a reduction in water quality are anticipated to be insignificant.

Project Operation and Maintenance Lighting and Noise

- Lighting

Artificial nighttime lighting can simultaneously benefit some bat species while being detrimental to others. The species that benefit are those that forage in illuminated areas to take advantage of the increased density and weakened predator avoidance abilities of insects that are attracted to the light. Both foraging activity and food intake rates of such species can be substantially greater in artificially illuminated areas than in dark areas (Geggie and Fenton 1985, Rydell 1992, Blake *et al*., 1994, Azam *et al*. 2015), although there is sometimes a tradeoff with a higher risk of predation and vehicle collision mortality (Rydell 1991, Stone *et al*. 2015). Most of the bat species that are attracted to, and can benefit from, artificial night lighting are “fast-flying” species that are adapted to foraging over large open spaces, with many belonging to the genera Pipistrellus and Eptesicus (Geggie and Fenton 1985, Murphy *et al*. 2009, Patriarca and Debernardi 2010, Stone 2013).

Many other species of bats, in contrast, avoid foraging in areas with artificial night lighting and are often otherwise adversely affected by lights (Furlonger *et al*. 1987; Rydell 1992; Stone *et al*. 2009, 2012; Polak *et al*. 2011). Common among them are "slow-flying" species of the genus Myotis, which includes the Indiana bat and NLEB (Furlonger *et al*. 1987; Murphy *et al*. 2009; Stone *et al*. 2009, 2012; McGuire and Fenton 2010; Azam *et al*. 2015; Rowse *et al*. 2016). Lighting can disrupt commuting routes and/or delay emergence of Myotis bats, and in turn, shorten their feeding time in a given night and reduce the growth rates of juveniles (Downs *et al*. 2003, Boldogh *et al*. 2007, Patriarca and Debernardi 2010). The avoidance of night lighting by some bat species and the attraction to it by others within the same community can lead to a competitive advantage for the latter and competitive exclusion of the former, as the species that are able to benefit can sometimes proliferate in abundance at the others' expense (Arlettaz *et al*. 2000). Indirectly, lighting can also negatively affect bat species that avoid lighting by drawing their prey away from dark areas, reducing insect reproduction (Perkin *et al*. 2011), and altering insect community composition and trophic interactions (Stone 2013).

The effects of artificial night lighting on the Indiana bat and NLEB have not been directly studied. As noted above, both species belong to the genus Myotis, which contains several species in North America and Europe that have been shown to be adversely affected by artificial light. However, Indiana bats are known to occur where there is abundant light pollution, including within suburban residential neighborhoods (Belwood *et al*. 2002), along interstate highways (Service 2008), and at major international airports (Sparks *et al*. 1998, 2005), suggesting that this species may not strongly avoid artificial illumination, at least at a broad spatial scale. Indiana bats radio-tracked at the Indianapolis International Airport exhibited a significant preference for foraging in dark versus light areas of the airport, but it could not be determined whether this was due to differences in lighting rather than differences in habitat type and natural prey availability (Sparks *et al*. 2005).

The NLEB tends to avoid foraging and roosting near edges and open areas in favor of interior forest (Owen *et al*. 2003, Patriquin and Barclay 2003, Carter and Feldhammer 2005, Morris *et al*. 2010, Segers and Broders 2014). As such, exposure of NLEBs to light pollution is likely to be limited to general sky glow rather than direct, local light sources in most cases and is, therefore, less likely to have either beneficial or adverse effects to this species than bats that forage in open areas where artificial night lighting is most prevalent.

Amy's Kitchen, Inc., Manufacturing Facility

Outdoor nighttime lighting for the proposed food preparation facility on the Ver Hage property would include 78 pole-mounted, white light-emitting diode (LED) lights in parking areas and roadways, and 12 wall-mounted, warm white LED lights on the sides of the building. White LED lights have been recommended over more traditional metal halide and mercury lights for minimizing impacts to bats because they do not produce light in the ultraviolet spectrum and are, therefore, expected to be less attractive to insects (Patriarca and Debernardi 2010, Stone 2013). White LED lights nevertheless have strong emissions in blue-green spectra and have been found in some cases to be highly attractive to insects (Pawson and Bader 2014) and negatively affect commuting and foraging conditions for Myotis bats (Stone *et al*. 2012, Rowse *et al*. 2016). Yet, LED lights are energy efficient and can help minimize the breadth of light pollution because they

are highly directional, easily dimmable, and well-suited to being switched on and off in concert with demand since they operate at full efficiency with no time required to warm up (Gaston *et al*. 2012).

The outdoor lighting plan for the Amy's Kitchen, Inc., manufacturing facility would incorporate BMPs to minimize potential impacts to bats (Gaston *et al*. 2012, Stone 2013). With these BMPs in place, lighting would be greatly minimized and highly constrained within the boundaries of the facility, where Indiana bats and NLEBs would not be expected to occur regardless of lighting because no suitable foraging habitat would be present following the development of the facility. These BMPs, in combination with the maintenance of a wooded buffer between the manufacturing facility and Cheechunk Creek to the east and the Wallkill River to the west, would limit the facility's outdoor lighting from reaching the creek and river.

The proposed lighting plan for the entry road would include 13 pole-mounted, white LED lights. The entry road lights would turn on at dusk to 50 percent illumination and have motion sensors that would increase illumination to 100 percent when activated. Based on operations at Amy's Kitchen, Inc., comparable food manufacturing facility in Medford, OR, it is estimated that approximately 530 employee automobiles would enter or exit the facility via the entry road between the hours of 7:00 p.m. and 6:00 a.m., when bats in the area would be active. As such, the road lights would be frequently activated to 100 percent illumination, and when combined with the emissions of the automobiles' headlights, would potentially cause Indiana bats and/or NLEBs to avoid foraging in the vicinity of the roadway. Further, Myotis bats are known to avoid LED lights even when they are dimmed (Rowse *et al*. 2016), although dimming still reduces the spatial extent of the affected area. An approximately 200-foot-wide, wooded buffer that would separate a long segment of the road from the Wallkill River to the west before crossing the proposed bridge would block much of the light from reaching the river corridor (both at full illumination and when dimmed), where foraging activity of the bats is expected to be the greatest. The effects of isolated light sources on bats are not far reaching when the light is filtered by forest vegetation (Altringham and Kerth 2016). Where the entry road would approach and cross the Wallkill River, however, some direct illumination of this segment of the river corridor would be caused by the road lights on the approaches and the headlights of automobiles crossing the bridge. This lighting, combined with the physical presence of the road and the noise of the automobiles would be expected to have cumulative effects (Altringham and Kerth 2016) that would displace Indiana bats and NLEBs from using this segment of the Wallkill River corridor as a commuting route and/or foraging area, and require them to use alternative areas up- or down-river. To minimize any such potential effects, the entry road lights would have a maximum mounting height of 19 feet to help keep the light close to the ground and reduce the volume of illuminated space so bats might still fly through the dark air space above the lights (Stone 2013), and the lights would be downward directional and angled no more than 30 degrees above the horizontal plane to reduce spill outside of the roadway (Gaston *et al*. 2012, Stone 2013).

Warehouse

The future warehouse has not been designed in detail and no lighting plan has been developed. However, the warehouse's frontage, parking area, and tractor trailer loading docks would face Hartley Road immediately to the east and the Amy's Kitchen, Inc., manufacturing facility immediately to the west, such that areas in which most outdoor nighttime lighting would likely be needed would not be in close proximity to foraging or roosting habitat for either Indiana bats or NLEBs. The rear of the building that would abut the floodplain forest along Cheechunk Creek would be expected to have minimal, if any, outdoor lighting, which would not be likely to reach the creek's corridor and affect foraging conditions for Indiana bats or NLEBs.

Science of the Soul

Excluding the entry road, outdoor lighting infrastructure for the Science of the Soul Conference Center would include 48 pole-mounted, white LED lights and 12 wall-mounted warm white LED lights. The lights would be concentrated around the open air pavilion, ancillary buildings and their small parking areas, internal roads, and the southeastern quadrant of the orchard parking area.

Operation of outdoor lights for the proposed Science of the Soul Conference Center would be minimal because large nighttime events are not anticipated and nighttime uses would be infrequent. See the BA for details. Outdoor lighting for these uses would generally be limited to pathways, roads, and small portions of the parking areas that are the closest to the center's buildings. The hours of the outdoor lighting and maximum lighting levels would be regulated by the Town of Goshen Planning Board's Site Plan approval.

As with the Amy's Kitchen, Inc., manufacturing facility, all lighting would be downward directional and angled no more than 30 degrees above the horizontal plane in order to limit spill and follow recommended BMPs for minimizing the effects of artificial lighting on bats (Stone 2013) and wildlife in general (Gaston *et al*. 2012). The pole-mounted lights would have a height of 15-19 ft which would help keep the light close to the ground and reduce the volume of illumination so bats might still fly through the dark air space above the lights (Stone 2013). In addition, the proposed lighting would be zoned so that only those fixtures needed to support site activities would be turned on. Other than preparation for the national and regional events, all activities would cease and the Center would close at 9:00 p.m.

Given this limited usage of outdoor artificial lighting during operation of the Conference Center, both spatially and temporally, it is unlikely that foraging or roosting conditions for Indiana bats and NLEBs would be significantly degraded in the adjacent, undeveloped portions of the property. Lighting would be directional and downward such that it would be contained within the limits of the conference facility, where both species may be unlikely to forage or roost regardless of lighting. Adjacent, undeveloped portions of the property, where potential foraging and roosting habitat for both species would remain, would be exposed to little or no artificial lighting coming from the grounds of the Conference Center. The orchard parking area would be unlit as to encourage its potential use as foraging habitat and to buffer any light from the Conference Center from reaching the remnant forest to the west. Therefore, any Indiana bats or

NLEBs foraging adjacent to the Conference Center would not be expected to be affected by the nighttime lights operated within the Center's grounds.

- Noise

Motor vehicle noise from Hartley Road, Cheechunk Road, SR 17M, and Echo Lake Road are the predominant sources of anthropogenic noise to which the four properties of the project site are exposed. In addition, heavy truck and machinery activity associated with the operation of a waste processing facility, adjacent to the Ver Hage and Echo Lake properties, is a significant contribution of noise under existing conditions. A noise analysis conducted for the proposed project's EIS determined that operation of the Amy's Kitchen, Inc., manufacturing facility would result in a negligible increase of 2.1 dBA above current daytime ambient noise levels. Operation of the Science of the Soul Conference Center would also result in a negligible daytime increase of 2.0 dBA, except during the national and regional events, when the maximum predicted noise level increment would be 7.6 dBA. However, because the national and regional events would only take place a few days each year, operation of the Conference Center would not produce a continuous and regular increase in noise levels. Nighttime noise associated with the operation of the Amy's Kitchen, Inc., manufacturing facility would be primarily limited to the entry and exit of an estimated 530 employee vehicles and 9 delivery trucks along the entry road between the hours of 7:00 p.m. and 6:00 a.m. The rooftop HVAC system would also be operational. The warehouse is largely conceptual at this time, but minimal nighttime activity and noise would be expected. The Science of the Soul Conference Center would not be operational after 9:00 p.m., and as such, would not cause a measurable increase in existing nighttime noise levels on the Echo Lake property.

As discussed under "Construction Noise," roosting Indiana bats have demonstrated a tolerance of high levels of certain anthropogenic noises, including those associated with interstate highways, major airports, and military artillery ranges. The small incremental increases in daytime and nighttime noises that would be generated by the operation of the proposed project would not be expected to cause roost site abandonment or other significant effects to roosting Indiana bats. It should be noted that the projected increases in existing noise levels do not consider attenuation factors, such as ground, air absorption, and vegetation and are, therefore, highly conservative. Wooded portions of the project site used for roosting by Indiana bats would greatly attenuate noises coming from the food manufacturing facility, entry road, and Conference Center such that the increases in many portions of the project site would be even further negligible. Similarly, roosting NLEBs, which tend to avoid open areas and edges, and would be most likely to occur in the forest interior, would be expected to perceive little if any change in anthropogenic noise levels during the operation of the proposed project.

Road noise and the physical presence of vehicles can disrupt foraging behaviors of Indiana bats (Zurcher *et al*. 2010, Bennett and Zurcher 2013), and likely NLEBs as well, given the effects of road noise on other gleaning bat species of the same genus (Schaub *et al*. 2008, Siemers and Schaub 2011, Altringham and Kerth 2016). Nighttime operation of the entry road would, therefore, potentially displace Indiana bats from foraging in the vicinity of the road; NLEBs would not be expected to occur in the roadside habitat regardless of the road's operation because of their common avoidance of sharp edges like those that would be created by constructing the

road through this forested area. Road noise effects on Indiana bats and NLEBs would likely be greatest where the proposed bridge would cross the Wallkill River. There, road noise, combined with the nighttime lighting (discussed above) would potentially affect usage of this segment of the river corridor as a foraging area and require the bats to forage up- or down-river. While vehicle noise would potentially degrade foraging conditions for Indiana bats elsewhere along the entry road, these effects would likely be limited to within about 200 ft of the road (Schaub *et al*. 2008, Siemers and Schaub 2011) due to the attenuation of the sound provided by the bordering woodland. Assuming a 200-foot effect zone extending from both sides of the road, the road would be expected to impact approximately 41.3 acres of potential foraging habitat for Indiana bats. Large amounts of foraging habitat in this portion of the Echo Lake property would, therefore, be expected to be unaffected by noises generated by the nighttime operation of the entry road, and remain available to Indiana bats.

Operation and Maintenance Water Quality Impacts

Stormwater management facilities are proposed for the purpose of water quality treatment and stormwater quantity control. Stormwater treatment would be provided through a combination of filtration and infiltration. Several of the proposed practices provide runoff reduction volume credits (RRV), including porous pavement, bio-retention areas, and dry swales. In order to minimize site disturbance and mimic existing drainage patterns, existing topography would be held to the greatest extent possible when determining the proposed site grading. The stormwater management system would be designed to comply with the latest design standards of the NYSDEC General Permit for Stormwater from Construction Activity (GP-0-15-002) or its successor.

In addition, final project plans will address de-icing agents as well as development of an Operation and Maintenance Program (which is noted in the SWPPP) and is completed once all long-term treatment areas are installed. This will include use of less-damaging de-icing materials (*i.e*., calcium chloride) and proper storage and use of de-icing materials. The SWPPP would ensure that runoff from project site impervious surfaces would not adversely affect the quality or quantity of waters in the Wallkill River or Cheechunk Creek. De-icing agents have been documented as having short-term effects on aquatic macroinvertebrates depending on dilution rates. Even though application of these agents will occur during the winter, potential indirect effects to Indiana bats, if they occur, would be during the spring and summer foraging periods. De-icing agents are not expected to reach levels to affect most aquatic insects, but it is possible that some pollution intolerant species could be temporarily eliminated from the affected surface waters. If this occurs and they are species that Indiana bats and NLEBs consume as prey, then it could result in a short-term indirect effect on foraging behavior. However, the Indiana bat and NLEB are considered selective opportunistic foragers and thus would be able to locate additional aquatic and/or terrestrial insects nearby.

Stormwater runoff from parking lot pavement during operation of the facility could contaminate surface waters on the site, rendering it unfit for bats to drink, or interfering with breeding of aquatic insects on which bats may feed. These effects will be avoided by the implementation of the SWPPP and soil conservation BMPs during operation by the treatment of stormwater runoff in catch basins.

Hydrocarbons (*e.g*., fuel) may leak from vehicles onto pavement and affect water quality resulting in reduced densities of aquatic insects that bats consume. However, if chemicals did reach surface waters (wetlands, streams), a short-term reduction in both aquatic and terrestrial insects could occur, thus reducing the spring, summer, or autumn prey base for foraging Indiana bats and NLEBs. If this occurred, it would be localized, thus allowing foraging bats to move nearby and continue foraging.

In addition, direct consumption of contaminated waters from the retention basin or wetlands is a possibility. However, we anticipate reduced overall use of the site for foraging and insignificant adverse effects to Indiana bats from uptake of potential contaminants.

Effects on Fall Swarming Habitat

The Indiana bat is reported to exhibit fall swarming behavior within 20 miles of a P1 and P2 hibernacula and within 10 miles of a P3 and P4 hibernacula (Service 2011). The NLEB is known to exhibit swarming behavior within approximately 4.55 miles from a known roost tree (Lowe 2012). The project will result in no impacts to fall swarming habitat or fall swarming bats as the Williams Mine Complex (where both bat species overwinter) is greater than 20 miles from the proposed project site, and because there are no known NLEB roosts within or near the proposed project site.

Effects on Wintering Bats

The project will result in no impacts to hibernating bats or any hibernacula as the nearest known overwintering sites are approximately 9.5 (Bull Mine) and 33 (Williams Mine Complex) miles away from the proposed project.

Beneficial Effects

As discussed in the Conservation Measures section, the applicant is permanently protecting 263.6 acres of foraging and roosting habitat within the action area. While permanent protection of existing foraging and roosting habitat will not offset the loss and degradation of these habitat patches, it will prevent the loss of those particular patches and maintain roosting/foraging sites for Indiana bats and NLEBs in the action area.

In addition, the site plan includes multiple areas for buffer retention and one area for enhancement through tree planting. With these several BMPs in place, lighting would be greatly minimized and constrained within the boundaries of the facility, where Indiana bats and NLEBs would not be expected to occur because no suitable foraging habitat would be present following development of the facility. These BMPs, in combination with the maintenance of a wooded buffer between the manufacturing facility and Cheechunk Creek to the east and the Wallkill River to the west, would limit the facility's outdoor lighting from reaching the creek and river. Riparian corridors are highly preferred foraging habitat for Indiana bats, and to a lesser extent, NLEBs, and the acoustic bat survey conducted found activity levels of these and other bat species to be substantially greater at the two survey locations along Cheechunk Creek than the

upland survey location. With wooded buffers remaining in place, outdoor lighting around the manufacturing facility would not be expected to affect the use of the Cheechunk and Wallkill riparian corridors as foraging habitat by Indiana bats and NLEB.

Summary

We estimate that adult female and/or juvenile Indiana bats and NLEBs from one maternity colony for each species may be impacted by the proposed activity. The combined effects of tree removal, lighting, noise, and disturbance at the site are anticipated to result in the loss and alteration of roosting and foraging habitat for some individuals of these colonies. Short-term reproductive loss of this local maternity colony is anticipated as a result of the proposed action. The amount of proposed tree clearing or anticipated induced development is not believed to be extensive enough to cause a maternity colony to be permanently displaced from its traditional summer range. However, we anticipate that Indiana bat and NLEB will acclimate over time to forested/early successional conserved areas outside the disturbed portions of the project site, but within the current colony home range after construction is complete.

CUMULATIVE EFFECTS

Cumulative effects include the effects of future state, tribal, local, or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to Section 7 of the ESA.

SUMMARY OF EFFECTS

Impacts to Individuals

As discussed in the Effects Analysis section, potential effects of the action include effects to Indiana bats and NLEBs present within the action area upon return from hibernation. Effects generally include temporary reduced reproduction of individual bats as a result of having to expend additional energy seeking out alternate foraging and roosting habitat. In addition, a shift in home range for some individual bats from exposure to continuing noise and disturbance is anticipated.

Amy's Kitchen, Inc., and Science of the Soul have included multiple conservation measures to avoid and minimize impacts to Indiana bats and NLEBs. The potential for effects caused by the removal of suitable foraging and roosting habitat is expected to be greatest during the following spring and early summer when bats return from hibernation. Impacts to bats could be minor as bats may acclimate sooner than expected to flying further to find suitable foraging and roosting habitat. However, as discussed above, bats impacted by WNS have additional energetic demands and reduction in flight ability. This compounds the stress of having to find new roosting and/or foraging habitat. Some individuals may have to expend additional energy finding prey, experience higher predation risk, and may experience complications with pregnancy and rearing young, resulting in reduced reproductive potential.

The continued implementation of the Amy's Kitchen, Inc., monitoring effort will provide additional information on the effect of the proposed actions on affected bats.
While analyzing the effects of the proposed action, we identified the life stages that would be exposed to the stressors associated with the proposed action, and analyzed how those individuals would respond upon exposure to the stressors. From this analysis, we determined that:

1) There is no designated critical habitat for the Indiana bat in New York and none designated at all for the NLEB, and thus, none will be adversely-modified.

2) No hibernating bats nor their hibernacula will be exposed to the project stressors as there are no hibernacula within the vicinity of the Action Area.

3) Indiana bats and NLEBs during the spring/early summer will be exposed to stressors from foraging and roosting habitat removal upon return from hibernation, and from some construction, operation, and maintenance during spring, summer, and fall. Indiana bats and NLEBs are likely to adversely respond to some of these stressors, but conservation measures in place should avoid and minimize impacts.

We identified the life stages that would be exposed to the stressors associated with the proposed action, and analyzed how those individuals would respond upon exposure to the stressors. From the analysis, we determined that:

1) Pregnant females may experience reduced reproductive success by being displaced from preferred foraging and/or roosting areas and will have to spend additional energy to search for alternative habitat which would likely result in reduced reproductive success (for failure to carry to full-term or failure to raise pup through first summer); and

2) Adults may be killed by higher rates of predation or competition when searching for new roosting/foraging areas.

<u>Impacts to Populations</u>

As we have concluded that individual Indiana bats and NLEBs are likely to experience some reductions in their annual or lifetime reproductive success, we need to assess the aggregated consequences of the anticipated reductions in fitness (*i.e*., reproductive success and long-term viability) of the exposed individuals on the population to which these individuals belong.

Individuals of one maternity colony of each species will be affected. The effects are not expected to measurably decrease the fitness of these maternity colonies for several reasons. Any removal of potential roost trees will be done in the winter months when bats are hibernating which will avoid the chance of killing adults or pups.

Further, not every bat from the single anticipated colony for each species is likely to be exposed to stressors associated with the proposed action as they occur within a small portion of a colony's potential home range. Finally, we anticipate that most impacts will occur within the first spring after tree clearing. Bats are expected to acclimate to this change and seek out alternate habitat

nearby. In addition, the applicant has placed other conservation measures to reduce noise and lighting impacts, which Indiana bats and NLEBs also should acclimate to over time. All impacts are anticipated to be short-term in nature. We do not anticipate a long-term reduction in any maternity colony fitness because both bat species are expected to acclimate to changes in the landscape given ample suitable habitat remaining within and adjacent to the project area that will be available to them after future hibernation events.

Impacts to the Species Rangewide

Long-term reductions in any exposed maternity colony's fitness resulting from this project are unlikely to occur. Thus, no component of the proposed action is expected to reduce the reproduction, numbers, or distribution of the Indiana bat or NLEB rangewide. While we recognize that the status of the species for both species is declining, we find that the proposed project is unlikely to have population-level impacts and thus, is also unlikely to decrease the overall reproduction, numbers, or distribution of the Indiana bat or NLEB. Therefore, we do not anticipate a reduction in the likelihood of both survival and recovery of the species as a whole.

CONCLUSION

After reviewing the current status of the Indiana bat and NLEB, the environmental baseline for the action area, the effects of the proposed activities as proposed by Amy's Kitchen, Inc., Science of the Soul, and the cumulative effects, it is the Service's biological opinion that the action, as proposed, is not likely to jeopardize the continued existence of either the Indiana bat or NLEB. Critical habitat for the Indiana bat has been designated at a number of locations throughout its range; however, this action does not affect any of those designated critical habitat areas and no destruction or adverse modification of that critical habitat will occur. No critical habitat has been designated for the NLEB.

INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and federal regulations under Section 4(d) of the ESA prohibit the taking of endangered and threatened species, respectively, without special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to engage in any such conduct. Harm is further defined by the Service to include significant habitat modification or degradation that results in death or injury to listed species by significantly impairing essential behavioral patterns such as breeding, feeding, or sheltering (50 CFR § 17.3). Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns that include, but are not limited to, breeding, feeding, or sheltering (50 CFR § 17.3). Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of Section 7(b)(4) and Section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited under the ESA, provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement (ITS).

Northern Long-Eared Bat

On January 5, 2016, the Service published a final species-specific rule pursuant to Section 4(d) of the ESA for the northern long-eared bat (50 CFR § 17.40(o)), which became effective February 16, 2016. The Section 4(d) rule defines prohibited take of the northern long-eared bat, which is limited to certain circumstances and activities within the full suite of prohibitions otherwise applicable to threatened species under 50 CFR § 17.31. Any incidental take of the northern long-eared bat that may occur from the proposed action is not considered prohibited take under the NLEB 4(d) rule. Therefore, the taking does not require exemption from the Service. Accordingly, there are no reasonable and prudent measures or terms and conditions required for the northern long-eared bat. This Opinion satisfies the Corps' responsibilities under Section 7(a)(2) of the ESA relative to the northern long-eared bat for the proposed action.

Indiana bat

The measures described below are non-discretionary and must be undertaken by the Corps so that they become binding conditions of any permits and/or approvals, as appropriate, for the exemption in Section 7(o)(2) to apply. The Corps has a continuing duty to regulate the activity covered by this ITS. If the Corps:

1) Fails to require applicants or contractors to adhere to the terms and conditions of the ITS through enforceable terms that are added to the permit, authorization, or funding document; and/or

2) Fails to retain oversight to ensure compliance with these terms and conditions, the protective coverage of Section 7(o)(2) may lapse. In order to monitor the impact of incidental take, the applicant must report the progress of the action and its impact on the species to the Service as specified in the ITS (50 CFR § 402.14(I)(3)).

AMOUNT OR EXTENT OF TAKE ANTICIPATED

The Service anticipates incidental take of the Indiana bat will be difficult to detect for the following reasons:

1) The individuals are small and occupy summer habitats where they are difficult to find;

2) Indiana bats form small (*i.e.*, 25-100 individuals), widely dispersed maternity colonies under loose bark or in the cavities of trees, and males and non-reproductive females may roost individually which makes finding the species or occupied habitats difficult;

3) Finding dead or injured specimens during or following project implementation is unlikely;

4) The extent and density of the species within its summer habitat in the action area is unknown; and

5) Most incidental take will be non-lethal and undetectable.

Because of the difficulty in determining a level of take based on the number of Indiana bats that will be adversely affected, the Service has decided that it is appropriate use habitat acreage as a surrogate in order to identify the level of authorized incidental take.

We anticipate take by harm of a small percentage of Indiana bats within approximately 198 acres of potential foraging habitat and approximately 63 acres of potential roosting habitat, including the permanent removal of 150.76 acres of suitable habitat. "Harm," as defined within the definition of "take" in the ESA, means an act that actually kills or injures wildlife. Such acts may include significant habitat loss and/or alteration where the act actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3). This impact is anticipated in the first spring/summer after tree removal has occurred and foraging patterns/range may be shifted. Alternative foraging areas are available in the action area and likely used (little foraging data are available) and limited impacts are anticipated in subsequent years.

EFFECT OF THE TAKE

In the accompanying Opinion, the Service determined that this level of anticipated take is not likely to result in jeopardy to the Indiana bat.

REASONABLE AND PRUDENT MEASURES

The Service believes the following reasonable and prudent measure(s) are necessary and appropriate to minimize impacts of incidental take of the Indiana bat:

1) The Corps and the applicant will ensure that the described proposed project components, including all conservation measures, will occur as planned and documented in the BA and Final EIS.

2) The Corps and the applicant must monitor their activities associated with the proposed project to determine if the Terms and Conditions of this Opinion are being implemented adequately in order to ensure that take is minimized and provide an annual report of those activities to the Service.

TERMS AND CONDITIONS

In order to be exempt from the prohibitions of Section 9 of the ESA, the Corps must ensure that the applicant complies with the following terms and conditions, which implement the reasonable and prudent measures described above. These terms and conditions are non-discretionary.

1) The applicant shall ensure that all appropriate/applicable conservation measures and Terms and Conditions are included in contracts for work conducted at the project site. This Term and Condition is associated with Reasonable and Prudent Measures 1 and 2.

2) The applicant shall submit draft easement language to the Corps, Service, and NYSDEC by January 31, 2017, for Corps, Service, and NYSDEC approval. This Term and Condition is associated with Reasonable and Prudent Measures 1 and 2.

3) The applicant shall ensure that conservation easements are in place by July 31, 2017, and shall provide a copy of the signed easements to the Corps, Service, and NYSDEC. This Term and Condition is associated with Reasonable and Prudent Measures 1 and 2.

4) The applicant shall provide shapefiles of the final clearing limits and conservation areas by December 31, 2017. This Term and Condition is associated with Reasonable and Prudent Measures 1 and 2.

5) The Service, Corps, and NYSDEC, and their representatives shall have access to conservation lands (protected) for future research and monitoring, and will notify the applicant one week prior to needing access. This Term and Condition is associated with Reasonable and Prudent Measure 2.

Monitoring and Reporting Requirements

In order to monitor the impacts of incidental take, the federal agency or any applicant must report the progress of the action and its impact on the species to the Service as specified in the incidental take statement (50 CFR § 402.14(i)(3)).

1) The applicant shall provide an annual report (or as-built plans) summarizing the activities described in this Opinion by December 31, 2017-2024, and include limits of disturbance, phase of construction, any minor changes to project plans, etc.

2) The Corps/applicant may request an extension, for the Service's consideration, to the time limitations in meeting the requirements outlined in all terms and conditions or monitoring requirements.

3) If found, the Corps/applicant shall report any dead bats located in the project area during construction, operations, and maintenance, or monitoring activities, regardless of species, within 24 hours to the Service's NYFO at 607-753-9334 and NYSDEC 845-256-3000 (Region 3, New Paltz Office), and subsequently transported on ice to that office. No one, with the exception of those permitted to handle bats, should attempt to handle any live bat, regardless of its condition; report bats that appear to be sick or injured to NYFO and the NYSDEC or the New York State Health Department. The NYFO and/or NYSDEC will make a species determination on any dead or moribund bats. If an Indiana bat or NLEB is identified, NYFO will contact the appropriate Service law enforcement office. In the extremely rare event that someone has been bitten by a bat, please keep the bat in a container and contact the Orange County Public Health Service at 845-291-2331.

In conclusion, individuals associated with one maternity colony of Indiana bats and NLEBs will be impacted within approximately 198 acres of suitable foraging habitat and approximately 63 acres of suitable roosting habitat. The reasonable and prudent measures, with their implementing

terms and conditions, are designed to avoid and minimize the impact of incidental take of Indiana bats that might otherwise result from the proposed action. If, during the course of the action, this level of incidental take is exceeded, such incidental take represents new information requiring reinitiation of consultation and review of the reasonable and prudent measures provided. The Corps must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the reasonable and prudent measures and/or conservation measures.

CONSERVATION RECOMMENDATIONS

Section 7(a)(1) of the ESA directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid the adverse effects of a proposed action on listed species or critical habitat, to help carry out recovery plans, or to develop information.

The Service has identified the following actions that, if undertaken by the applicant or Corps, would further the conservation and assist in the recovery of the Indiana bats and NLEBs.

1) Assist with WNS investigations (No Recovery Actions specific to WNS in draft Recovery Plan, but Action 3.5.1 addresses disease threats). For example, the Corps could:

    a. Provide funding for WNS research activities; and

    b. Allow staff to participate in research projects.

2) Work with the Service to develop standard BMPs and programmatic consultation approaches to address potential impacts to Indiana bats from residential and commercial development projects. (Recovery Actions 2.1.3-Minimize development and encourage activities that prevent degradation or destruction of summer habitat on private lands, 2.6.1-Minimize adverse impacts to the Indiana bat and its habitat during review of federal, state, county, municipal, and private activities with a federal nexus under the ESA Section 7(a)(2)).

3) Pursue additional acquisition of parcels or easements to protect Indiana bat roosting, foraging, and commuting habitat. (Recovery Actions 2.1-Manage habitat on private lands, 2.2-Conserve and manage Indiana bats and their habitat on federal lands, 2.4.2-Identify and conserve foraging habitat, water sources, and travel corridors).

4) Perform post-construction acoustic monitoring to monitor the effects of the action on the Indiana bats and the NLEBs. This information would be helpful in determining if these bat species continue to use the project area for potential foraging and/or roosting post-construction. A scope of work must be approved by the NYSDEC and the Service prior to commencing.

In order for the Service to be kept informed of actions minimizing or avoiding adverse effects or benefiting listed species or their habitats, the Service requests notification of the conservation recommendations carried out.

REINITIATION NOTICE

This concludes formal consultation on the actions outlined in the information presented with the October 17, 2016, requests for initiation of formal consultation. As written in 50 CFR § 402.16, reinitiation of formal consultation is required where discretionary federal agency involvement or control over the action has been retained (or is authorized by law), and if:

1) The amount or extent of incidental take of Indiana bat is exceeded;

2) New information reveals the agency action may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion;

3) The agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this Opinion; or

4) A new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, any operations causing such take must cease pending reinitiation.

LITERATURE CITED

Allee King Rosen and Fleming, Inc. [AKRF]. 2015. Acoustic bat survey report, Amy's Kitchen project site, Goshen, NY. Prepared for Amy's Kitchen, Petaluma, CA. Submitted to the U.S. Fish and Wildlife Service New York Field Office and the New York State Department of Environmental Conservation, September 25, 2015.

Altringham, J. and G. Kerth. 2016. Bats and roads. Pp. 35-62 in: Bats in the anthropocene: conservation of bats in a changing world (C.C. Voigt and T. Kingston, Eds). Springer-Verlag Publishing, Germany.

Amelon, S. and D. Burhans. 2006. Conservation assessment: *Myotis septentrionalis* (northern long-eared bat) in the eastern United States. Pages 69-82 in Thompson, F. R., III, editor. Conservation assessments for five forest bat species in the eastern United States. U.S. Department of Agriculture (USDA) Forest Service, North Central Research Station, General Technical Report NC-260. St. Paul, Minnesota. 82pp.

Arlettaz R., S. Godat, and H. Meyer. 2000. Competition for food by expanding pipistrelle bat populations (*Pipistrellus pipistrellus*) might contribute to the decline of lesser horseshoe bats (*Rhinolophus hipposideros*). Biological Conservation 93:55-60.

Azam, C. C. Kerbiriou, A. Vernet, J-F. Julien, Y. Bas, L. Plichard, J. Maratrat, and I. LeViol. 2015. Is part-night lighting an effective measure to limit the impacts of artificial lighting on bats. Global Change Biology. 21: 4333-4341.

Barbour, R.W., and W.H. Davis. 1969. Bats of America. The University of Kentucky Press, Lexington, Kentucky. 311pp.

Belwood, J.J. 2002. Endangered bats in suburbia: observations and concerns for the future. Pp. 193-198 in A. Kurta and J. Kennedy (eds.), The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, TX.

Bennett V.J. and A.A. Zurcher. 2013. When corridors collide: Road-related disturbance in commuting bats. Journal of Wildlife Management. 77:93-101.

Blake, D., A.M. Hutson, P.A. Racey, J. Rydell, and J.R. Speakman. 1994. Use of lamplit roads by foraging bats in southern England. Journal of Zoology 234:453-462.

Boldogh, S., D. Dobrosi, and P. Samu. 2007. The effects of illumination of buildings on house-dwelling bats and its conservation consequences. Acta Chiropterologica 9:527-534.

Bowles, A.E. 1995. Responses of wildlife to noise. In: Wildlife and recreationists: coexistence through management and research. R.L. Knight and K.J. Gutzwiller, eds. Island Press, Washington, D.C.

Brack, Jr., V. and J.O. Whitaker, Jr. 2001. Foods of the northern myotis, *Myotis septentrionalis*, from Missouri and Indiana, with notes on foraging. Acta Chiropterologica 3:203–210.

Caceres, M.C. and M.J. Pybus. 1998. Status of the northern long-eared bat (Myotis septentrionalis) in Alberta. Alberta Environmental Protection, Wildlife Management Division, Wildlife Status Report No. 3, Edmonton, AB, 19pp.

Caceres, M.C. and R.M.R. Barclay. 2000. *Myotis Septentrionalis*. Mammalian Species 634:1-4.

Callahan, E.V. 1993. Indiana bat summer habitat requirements. M.S. Thesis. University of Missouri, Columbia. 84 pp.

Callahan, E.V., R.D. Drobney, and R.L. Clawson. 1997. Selection of summer roosting sites by Indiana bats (*Myotis sodalis*) in Missouri. Journal of Mammalogy, 78:818-825.

Carter, T.C., and G.A. Feldhamer. 2005. Roost tree use by maternity colonies of Indiana bats and northern long-eared bats in southern Illinois. Forest Ecology and Management 219:259-268.

Delaney, D.K. and T.G. Grubb. 2004. Sound recordings of road maintenance equipment on the Lincoln National Forest, New Mexico. USDA Forest Service, Rocky Mountain Research Station Research Paper RMRS-RP-49, Fort Collins, CO.

Downs, N.C., V. Beaton, J. Guest, J. Polanski, S.L. Robinson, and P.A. Racey. 2003. The effects of illuminating the roost entrance on the emergence behaviour of *Pipistrellus pygmaeus*. Biological Conservation 111 :247-252.

Environment Yukon. 2011. Yukon Bats. Government of Yukon, Environment Yukon, Whitehorse, Yukon. 22pp.

Fenton, M.B. and G.P. Bell. 1981. Recognition of species of insectivorous bats by their echolocation calls. Journal of Mammology. 62:233-243.

Furlonger, C.L., H.J. Dewar, and M.B. Fenton. 1987. Habitat use by foraging insectivorous bats. Canadian Journal of Zoology 65 :284-288.

Gaston K.J., T.W. Davies, and J. Hopkins. 2012. Reducing the ecological consequences of night-time light pollution: options and developments. Journal of Applied Ecology 49:1256-66.

Geggie, J.F., and M.B. Fenton. 1985. A comparison of foraging by *Eptesicus fuscus* (Chiroptera: Vespertilionidae) in urban and rural environments. Canadian Journal of Zoology 63:263-266.

Griffin, D.R. 1940. Reviewed notes on the life histories of New England cave bats. Journal of Mammalogy, 21(2):181-187.

Grinnell, A.D. 1963. Neurophysiology of audition in bats: intensity and frequency parameters. Journal of Physiology (London) 167:38-66.

Hall, J.S. 1962. A life history and taxonomic study of the Indiana bat, *Myotis sodalis*. Scientific Publications No. 12. Reading Public Museum and Art Gallery, Reading, PA.

Henshaw, R.E. 1965. Physiology of hibernation and acclimatization in two species of bats (*Myotis lucifugus* and *Myotis sodalis*). Ph.D. Dissertation. University of Iowa, Iowa City, IA. 143 pp.

Humphrey, S.R. 1978. Status, winter habitat, and management of the endangered Indiana bat, *Myotis sodalis*. Florida Scientist 41:65-76.

Jachowski, D.S., J.B. Johnson, C.A. Dobony, J.W. Edwards, and W.M. Ford. 2014. Space use and resource selection by foraging Indiana bats at the northern edge of their distribution. Endangered Species Research. 24: 149-157.

Keeley, B.W. and M.D. Tuttle. 1999. Bats in American bridges. Bat Conservation International Resource Publication 4.

Kniowski A.B. and S.D. Gehrt. 2014. Home range and habitat selection of the Indiana bat in an agricultural landscape. The Journal of Wildlife Management. 78(3): 503-512.

Kurta, A., S.W. Murray, and D.H. Miller. 2002. Roost selection and movements across the summer landscape. Pp. 118-129 in A. Kurta and J. Kennedy (eds.), The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, TX. 253 pp.

Lacki, M.J., D.R. Cox, L.E. Dodd, and M.B. Dickinson. 2009. Response of northern bats (*Myotis septentrionalis*) to prescribed fires in eastern Kentucky forests. Journal of Mammalogy. 90(5):1165-1175.

LaVal, R.K., R.L. Clawson, M.L. LaVal, and W. Caire. 1977. Foraging behavior and nocturnal activity patterns of Missouri bats, with emphasis on the endangered species *Myotis grisescens* and *Myotis sodalis*. Journal of Mammalogy, 58(4):592-599.

LeRoux, D.S. 2010. Monitoring long-tailed bat (*Chalinolobus tuberculatus*) activity and investigating the effect of aircraft noise on bat behaviour in a modified ecosystem. M.S. Thesis. University of Waikato, New Zealand.

Lowe, A.J. 2012. Swarming behavior and fall roost-use of little brown (*Myotis lucifigus*), and northern long-eared bats (*Myotis septentrionalis*) in Nova Scotia, Canada. M.S. Thesis. St. Mary's University, Halifax, Nova Scotia.

Mann, S.L. R.J. Steidl, and V. Dalton. 2002. Effects of cave tours on breeding *Myotis velifer*. Journal of Wildlife Management. 66:618-624.

McGuire, L.P. and Fenton, M.B. 2010. Hitting the wall: light affects the obstacle avoidance ability of free-flying little brown bats (*Myotis luc□fugus*). Acta Chiropterologica 12:24 7-250.

Menzel, J.M., W.M. Ford, M.A. Menzel, T.C. Carter, J.E. Gardner, J.D. Garner, and J.E. Hofman. 2005. Summer habitat use and home-range analysis of the endangered Indiana bat. Journal of Wildlife Management. 69(1): 430-436.

Meteyer, C.U., E.L. Buckles, D.S. Blehert, A.C. Hicks, D.E. Green, V. Sheam-Bochsler, N.J. Thomas, A. Gargas, and M.J. Behr. 2009. Histopathologic criteria to confirm white-nose syndrome in bats. Journal of Veterinary Diagnostic Investigation 21:411-414.

Miller, L.A. and A.E. Treat. 1993. Field recordings of echolocation and social signals from the gleaning bat *Myotis septentrionalis*. Bioacoustics 5:67-87.

Morris, A.O., D.A. Miller, and M.C. Kalcounis-Reuppell. 2010. Use of forest edges by bats in a managed pine forest landscape. Journal of Wildlife Management 74: 26-34.

Moss, C.F. and H. Schnitzler. 1995. Behavioral studies of auditory information processing. In: Hearing by bats. R.R. Fay and A.N. Popper, eds. Springer-Verlag, New York.

Murphy, S., D. Hill, AND F. Greenaway. 2009. Pilot study of a technique for investigating the effects of artificial light and noise on bat activity. Report to the People's Trust for Endangered Species.

Myers, R.F. 1964. Ecology of three species of myotine bats in the Ozark Plateau. Ph.D. Dissertation. University of Missouri, Columbia, MO. 210 pp.

Nagorsen, D.W. and R.M. Brigham. 1993. Bats of British Columbia. Royal British Columbia Museum, Victoria, and the University of British Columbia Press, Vancouver. 164 pp.

Owen, S.F., M.A. Menzel, W.M. Ford, B.R. Chapman, K.V. Miller, J.W. Edwards, and P.B. Wood. 2003. Home-range size and habitat used by the northern myotis (*Myotis septentrionalis*). American Midland Naturalist 150:352-359.

Patriarca, E. and P. Debernardi. 2010. Bats and light pollution. Centro Regionale Chirotteri, Turin, Italy. Available from: http://www.centroregionalechirotteri.org/download/eurobats/Bats%20and%20light%20pollution.pdf

Patriquin, K.J. and R.M. Barclay. 2003. Foraging by bats in cleared, thinned, and unharvested boreal forest. Journal of Applied Ecology, 40:646-657.

Pawson, S.M. and M.K-F. Bader. 2014. LED lighting increases the ecological impact of light pollution irrespective of color temperatures. Ecological Applications. 24(7): 1561-1568.

Perkin E.K., F. Hölker, J.S. Richardson, J.P. Sadler, C. Wolter, and K. Tockner. 2011. The influence of artificial light on stream and riparian ecosystems: questions, challenges, and perspectives. Ecosphere, 2, art122.

Polak, T., C. Korine, S. Yair, and M. Holderied. 2011. Differential effects of artificial lighting on flight and foraging behaviour of two sympatric bat species in a desert. Journal of Zoology, 285: 21-27.

Reeder, D.M., C.L. Frank, G.G. Turner, C.U. Meteyer, A. Kurta, E.R. Britzke, M.E. Vodzak, S.R. Darling, C.W. Stihler, A.C. Hicks, R. Jacob, L.E. Grieneisen, S.A. Brownlee, L.K. Muller, and D.S. Blehert. 2012. Frequent arousal from hibernation linked to severity of infection and mortality in bats with white-nose syndrome. PLoS ONE 7(6):1-10.

Reichard, J.D. and T.H. Kunz. 2009. White-nose syndrome inflicts lasting injuries to the wings of little brown myotis (*Myotis lucifugus*). Acta Chiropterologica 11(2):457-464.

Rowse, E.G., D. Lewanzik, E.L. Stone, S. Harris, and G. Jones. 2016. Dark matters: The effects of artificial lighting on bats. Pp. I 87-213 in: Bats in the anthropocene: Conservation of bats in a changing world (C.C. Voigt and T. Kingston, Eds). Springer-Verlag Publishing, Germany.

Rydell, J. 1991. Seasonal use of illuminated areas by foraging northern bats *Eptesicus nilssoni*. Holarctic Ecology 14:203-207.

Rydell, J. 1992. Exploitation of insects around streetlamps by bats in Sweden. Functional Ecology 6:744-750.

Schaub, A., J. Ostwald, and B.M. Siemers. 2008. Foraging bats avoid noise. Journal of Experimental Biology 211:3174-3180.

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

Shapiro, A. and M.G. Hohmann. 2005. Summary of threatened and endangered bat related restrictions on military training, testing, and land management. U.S. Army Corps of Engineers Report ERDC/CERL TR-05-13.

Shirley, M.D.F., V.L. Armitage, T.L. Barden, M. Gough, P.W. Lutz, D.E. Oatway, A.B. South, and S.P. Rushton. 2001. Assessing the impact of a music festival on the emergence behavior of a breeding colony of Daubenton's bats (*Myotis daubentonii*). Journal of Zoology 254:367-373.

Siemers, B.M. and A. Schaub. 2011. Hunting at the highway: traffic noise reduces foraging efficiency in acoustic predators. Proceedings of the Royal Society B 278: 1646-1652.

Sparks, D.W., J.A. Laborda, and J.O. Whitaker, Jr. 1998. Bats of the Indianapolis International Airport as compared to a more rural community of bats at Prairie Creek. Proceedings of the Indiana Academy of Science 107: 171-180.

Sparks, D.W., C.M. Ritzi, J.E. Duchamp, and J.O. Whitaker, Jr. 2005. Foraging habitat of the Indiana bat, (*Myotis sodalis*) at an urban-rural interface. Journal of Mammalogy 86:713-718.

Stihler, C.W. and J.S. Hall. 1993. Endangered bat populations in West Virginia caves gated or fenced to reduce human disturbance. Bat Research News. 34(4): 130.

Stone, E.L., G. Jones, and S. Harris. 2009. Street lighting disturbs commuting bats. Current Biology 19:1123-1127.

Stone, E.L., G. Jones, and S. Harris. 2012. Conserving energy at a cost to biodiversity? Impacts of LED lighting on bats. Global Change Biology 18:2458-65.

Stone, E.L. 2013. Bats and lighting: overview of current evidence and mitigation. Bats and Lighting Research Project, University of Bristol, U.K. Available from: www.bats.org.uk.

Stone E.L., S. Harris, and G. Jones. 2015. Impacts of artificial lighting on bats: a review of challenges and solutions. Mammalian Biology 80:213-9.

Tuttle, M.D., and J. Kennedy. 2002. Thermal requirements during hibernation. Pages 68-78 In Kurta, A., and J. Kennedy, editors. The Indiana bat: biology and management of an endangered species. Bat Conservation International, Austin, TX.

U.S. Forest Service [USFS]. 2011. Fort Drum Military Installation Cantonment Area Indiana Myotis Survey. USDA, U.S. Forest Service Green Mountain Agreement #09-PA-11092000-106. Prepared by J.B. Johnson, J.W. Edwards, W.M. Ford, K. Cunningham, and J.L. Rodrigue. 61 pp.

U.S. Fish and Wildlife Service [Service]. 2007. Indiana Bat (*Myotis sodalis*) Draft Recovery Plan: First Revision. U.S. Fish and Wildlife Service, Fort Snelling, MN. 258 pp.

_____. 2008. Revised 2007 Rangewide Population Estimate for the Indiana Bat, *Myotis sodalis*. Available at: http://www.fws.gov/midwest/endangered/mammals/inba.html

_____. 2009. Indiana Bat (*Myotis sodalis*) 5-year Review: Summary and Evaluation. U.S. Fish and Wildlife Service, Midwest Region, Bloomington, Indiana.

_____. 2011. Indiana bat Section 7 and Section 10 guidance for wind energy projects. Available at: http://www.fws.gov/midwest/endangered/mammals/inba/windenergyguidance.html

_____. 2014. Northern Long-eared Bat Interim Conference and Planning Guidance. Service Regions 2, 3, 4, 5, & 6. Available at http://www.fws.gov/midwest/endangered/mammals/nlba/pdf/NLEBinterimGuidance6Jan2014.Pdf.

_____. 2015. Revised 2015 Range-wide Population Estimate for the Indiana Bat, *Myotis sodalis*. Available at: http://www.fws.gov/midwest/endangered/mammals/inba/inbasummersurveyguidance.html

U.S. Fish and Wildlife Service and National Marine Fisheries Service [Service and NMFS]. 1998. Endangered Species Consultation Handbook - Procedures for Conducting Consultation and Conference Activities under Section 7 of the Endangered Species Act. Washington, D.C.

Van Zyll de Jong, C.G. 1985. Handbook of Canadian mammals. Volume 2: Bats. National Museum of Natural Sciences, Ottawa, Ontario. 212 pages.

Warnecke, L., J.M. Tumera, T.K. Bollinger, J.M. Lorch, V. Misrae, P.M. Cryan, G. Wibbelt, D.S. Blehert, and C.K.R. Willis. 2012. Inoculation of bats with European *Geomyces destructans* supports the novel pathogen hypothesis for the origin of white-nose syndrome. PNAS 109(18):6999-7003.

Watrous, K.S., T.M. Donovan, R.M. Mickey, S.R. Darling, A.C. Hicks, and S.L. Von Oettingen. 2006. Journal of Wildlife Management. 70(5): 1228-1237.

Whitaker, J.O. and W.J. Hamilton. 1998. Mouse-eared bats, Vespertilionidae. In Mammals of the eastern United States, Third Edition. Comstock Publishing Associates, a Division of Cornell University Press, Ithaca, New York, pp.89-102.

Whitaker, J.O. and L.J. Rissler. 1992. Seasonal activity of bats at copperhead cave. Proceedings of the Indiana Academy of Science 101:127-134.

Yates, M.D. and R.M. Muzika. 2006. Effect of forest structure and fragmentation on site occupancy of bat species in Missouri Ozark Forests. The Journal of Wildlife Management 70(5):1238-1248.

Zurcher, A.A., D.W. Sparks, and V.J. Bennett. 2010. Why the bat did not cross the road? Acta Chiropterologica 12:337-340.