WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS

VIA EMAIL

November 15, 2006

Brian Killkelley
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RE: Summer and Fall Wildlife Surveys at Tenney Mountain, New Hampshire.

Dear Brian,

Woodlot Alternatives, Inc. (Woodlot) conducted initial bird and bat studies at Tenney Mountain, New Hampshire, during the summer and fall of 2006. This letter report provides a summary of our observations and an overview of some recommended surveys. These recommendations are based upon our considerable experience with pre-construction wind development surveys. These natural resource surveys should be incorporated into the pre-construction assessment of the proposed wind project.

These wildlife surveys are part of the planning process by Wind Works LLC (Wind Works) for a wind power project, which will include the erection of up to 16 turbines along 2 ridge tops ranging in elevations from 580 to 700 meters (m). The proposed wind project is located along the ridges of Tenney and Fletcher Mountain on private land in the town of Groton, New Hampshire.

As part of the assessment and feasibility of Wind Works proposed wind power project, Woodlot began wildlife surveys. During the summer and fall of 2006, Woodlot completed data collection on peregrine falcon (*Falco peregrinus)* activity and bat migration in and around the project area. The following is a summary of our research and proposed recommendations.

PEREGRINE FALCON SURVEYS

Woodlot performed four peregrine falcon surveys from an observation point atop Rattlesnake Mountain in Rumney, New Hampshire (Figure 1). The observation location was located approximately 600 feet above the Main Cliff area where peregrine falcons nest. Peregrine falcons have occupied the Main Cliff area of Rattlesnake Mountain for 13 years and have been nesting there for 12 years. In 2006, a single territorial individual was reported at Bear Mountain in Hebron, New Hampshire (< 6.5 kilometers south of project area on the west side of Newfound Lake). This sighting may indicate a new and future nesting territory in the region. The project area is located between the peregrine falcons at Rattlesnake and a single territorial peregrine falcon at Bear Mountain. Peregrine falcons are bird hunters, catching their

prey at the bottom of high speed vertical dives. Peregrine falcons prey on birds ranging in size from songbirds up to ducks, geese, and herons.

In an attempt to cover the summer and early fall period of peregrine falcon activity when young birds are being trained to hunt by the adults, surveys were conducted on June 23, July 18, July 19, and September 12, 2006. The observation point provided excellent views southward to and across the proposed project area (Tenney and Fletcher Mountains). Surveys were conducted from 9:00 am to 4:00 pm. All observations were recorded on field forms and locations of falcons were plotted onto topographical maps. On July 18, Woodlot was informed by Christian Martin (New Hampshire Audubon senior biologist/endangered species biologist) that for the first time in 12 years, the peregrine falcon nest on Rattlesnake's Main Cliff had failed. Nest failure was likely attributed to heavy spring time rain coinciding with hatching of nestlings. Incidentally, across the state of New Hampshire in 2006, 6 of the 12 nesting pairs of peregrine falcons had similar nest failures.

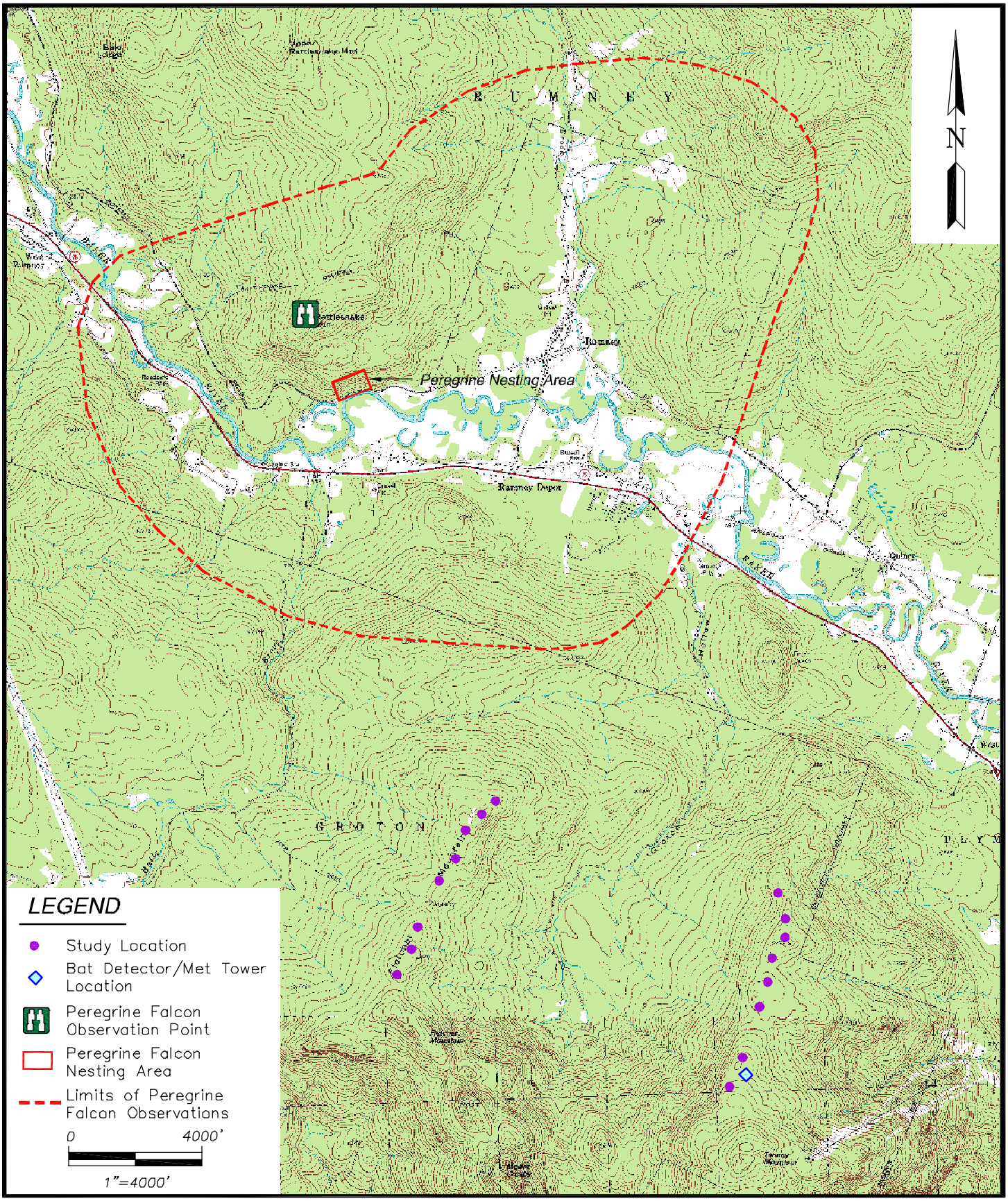
Most peregrine activity observed during the four days of spot mapping was based around the Rattlesnake's Main Cliff nesting area where peregrines were engaged in soaring and hunting behavior (delineated in red on Figure 1). This area was the limit of peregrine falcons observations that could be made during the survey periods. However, this pair may use a larger area and their observed range during the field surveys may have been restricted due to nest failure. Falcons were repeatedly sighted flying and vocalizing over the Baker River valley and flying east to west along Rattlesnakes Mountain's southern exposed cliff faces.

On two occasions, a falcon was observed flying across Route 25 and flying along the lower hillsides below Fletcher Mountain. Flight heights ranged from 0 m (perched on a sand bar in the Baker River) to 150 m (circling above Main Cliff area). Although there were no young to train this year, both adult peregrine falcons were still observed hunting, flying, and engaging in territorial displays around the Main Cliff area during the last survey on September 12. It was important to document that in an unsuccessful breeding year, both adults remained in the area until their departure south during fall migration. No falcons were observed flying or using the air space above the proposed project area.

BAT DETECTOR SURVEYS

Bat surveys included the deployment of three bat detectors at a meteorological (met) tower located in a small forested clearing at the southern tip of Tenney Mountain ridge (Figure 1). Bat detectors were deployed at three heights—high (25 m), low (10 m), and tree (5 m)—in a nearby tree and in the Tenney met tower. Detectors were deployed on July 27 and retrieved on October 16, 2006, for a total of 69 nights, and were programmed to operate from 6 pm to 6 am nightly. Recorded call files were analyzed to species guild and tallied by night. During the 69 night sampling period, the high detector (25 m) recorded 69 nights of data, the low detector (10 m) recorded 43 nights, and the tree detector (5 m) recorded 50 nights. Combined, 162 detector-nights of bat echolocation data were recorded during the fall deployment period.

A total of 62 bat call sequences were recorded during the survey period: 9 at the high detector; 13 at the low detector; and 40 at the tree detector. Detection rates (number of call sequences per detector-night) varied from 0.1 call sequences per detector-night at the high detector, 0.3 at the low detector, and 0.8 at the tree detector, with an overall detection rate of 0.4 call sequences per detector-night (Table 1).



PREPARED BY:

WOODLOT ALTERNATIVES, INC.
ENVIRONMENTAL CONSULTANTS

106036-F001-Peregrine_Bat.dwg

SHEET TITLE:

Peregrine Falcon and Bat Survey Location Map

PROJECT:

Tenney Mountain Wind Project
Groton, New Hampshire

DATE: November 2006
SCALE: 1"=4000'
PROJ. NO.: 106036
FIGURE: 1

The numbers of call sequences per night detected by all three detectors combined were generally very low, ranging from one to five total call sequences. The majority of call sequences were detected by the tree detector (40 calls) and progressively fewer calls were detected at the two higher detectors.

The data suggest that the majority (65%) of bat activity during the sampling period occurred closer to the ground, below the rotor zone of the proposed turbines.

Table 1. Summary of bat detector field survey effort and results at Tenney Mountain, late summer and fall 2006.

Location	Dates	# Nights	# Detector-Nights*	# Recorded sequences	Detection Rate **	Maximum # calls recorded ***
High in MET tower	7/27-8/09, 8/23-10/15	69	69	9	0.1	2
Low in MET tower	7/27-8/09, 8/23-9/10, 10/07-10/15	43	43	13	0.3	2
Tree	7/27-8/09, 8/23-9/11, 10/07-10/15	50	50	40	0.8	5
Overall Results		***162***	***162***	***62***	***0.4***	--

* Detector-night is a sampling unit during which a single detector is deployed overnight. On nights when two detectors are deployed, the sampling effort equals two detector-nights, etc.

** Number of bat passes recorded per detector-night.

*** Maximum number of bat passes recorded from any **single** detector for a 12-hour sampling period.

Due to the similarity of call signatures between several bat species, all classified calls have been categorized into four guilds for presentation in this letter. However, since some species do sometimes produce calls unique only to that species, all calls were identified to the lowest possible taxonomic level before being grouped into the listed guilds. Call sequences were classified to four distinct species guilds: big brown bat guild[1]; red bat-pipistrelle guild[2]; myotid; and unknown[3].

The majority of the recorded call sequences (63%) were labeled as unknown due to very short call sequences (less than seven pulses) or poor call signature formation (probably due to a bat flying at the edge of the detection zone of the detector or flying away from the microphone). Of those calls that were identifiable to species or guild, calls of the myotid guild were the most abundant, followed by those of the big brown guild. The guild/species compositions of call sequences recorded by each detector were similar, with the majority of calls from each detector being identified as unknown. The breakdown of call sequences were 63 percent identified as unknown, 23 percent as mytoid, 11 percent as big brown bat guild, and approximately 3 percent classified as within the red bat-pipistrelle guild (Table 2; Figure 2).

[1] Big brown guild includes big brown bat (*Eptesicus fuscus*), hoary bat (*Lasiurus cinereus*), and silver-haired bat (*Lasionycteris noctivagans*).
[2] Red bat-pipistrelle guild includes eastern red bat (*Lasiurus borealis*) and eastern pipistrelle (*Pipistrellus subflavus*).
[3] This is a conservative classification system that groups species with similar call characteristics into suites, or guilds, for reporting purposes. Despite this guild concept, some call sequences can sometimes be identified more specifically and, to the extent practicable, this was done.

Table 2. Summary of species guild composition of recorded bat call sequences at Tenney Mountain, late summer and fall 2006.

Detector	Guild				Total
	Big brown guild	Red bat/ Eastern pipistrelle	Myotid	Unknown	
High	3	--	--	6	**9**
Low	--	--	1	12	**13**
Tree	4	2	13	21	**40**
Total	***7***	***2***	***14***	***39***	***62***

Within each guild, some individual call sequences were identified to species (Figure 3). Of the 14 call sequences in the myotid group, 12 were identified simply as *Myotis* spp., one as northern myotis (*Myotis septentrionalis)*, and one as little brown bat (*Myotis lucifugus)*. Only two eastern red bats represented the red bat-eastern pipistrelle guild. Finally, of the seven big brown guild sequences, two were believed to be hoary bats, two were classified as silver-haired/big brown bats, and three were classified as silver-haired bats. No calls were identified as Indiana bat (*Myotis sodalis*) or the endangered eastern small-footed bat (*Myotis leibii)*, although these calls can be very difficult to distinguish from those of other myotids.

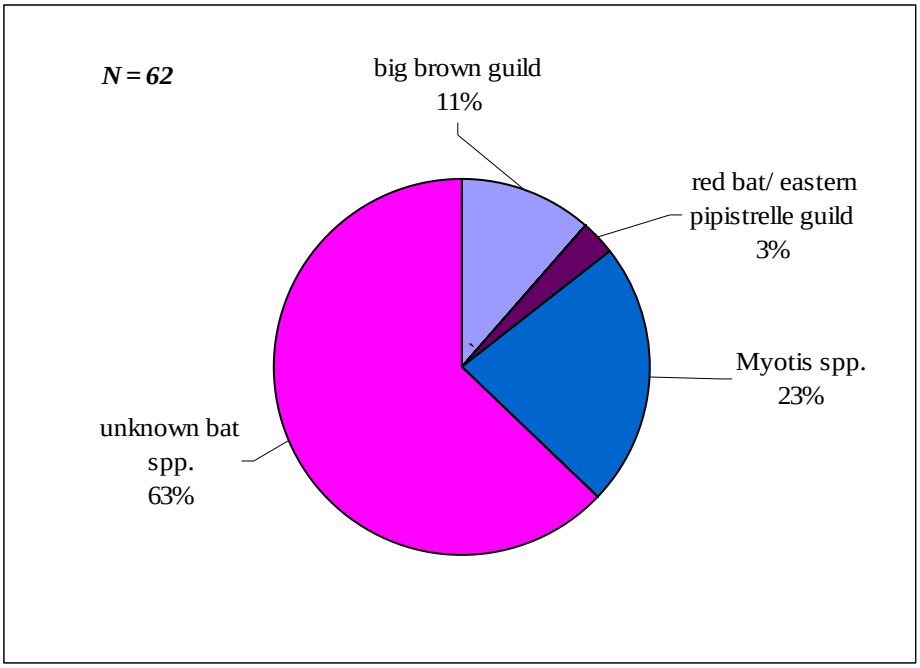


Figure 2. Pie chart summary of bat species guild composition of recorded call sequences for all three bat detectors deployed at Tenney Mountain, July 27 to October 15, 2006.

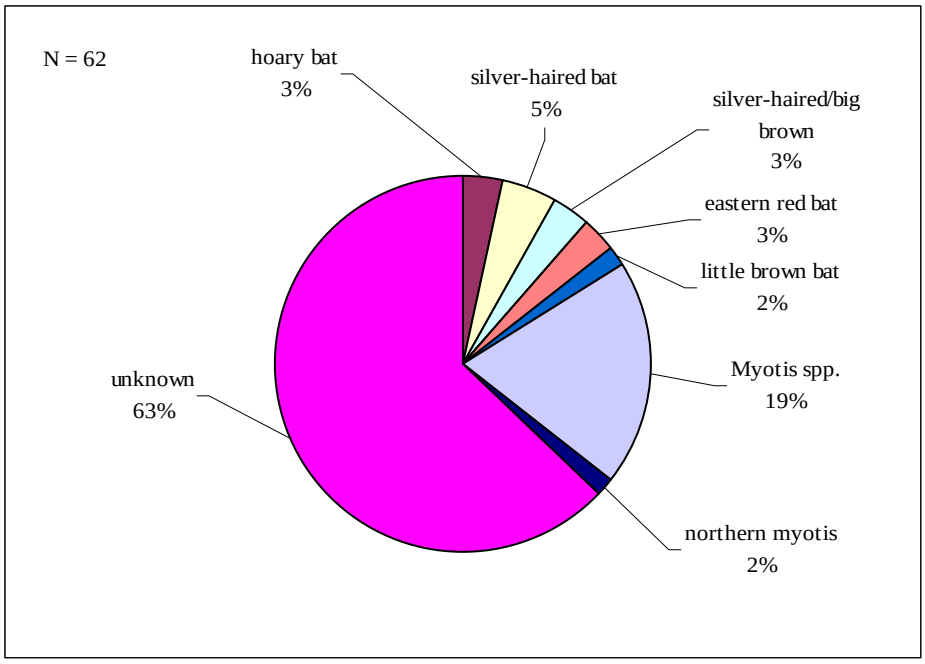


Figure 3. Pie chart summary of bat species composition identified from recorded call sequences for the three bat detectors deployed at Tenney Mountain, July 27 to October 15, 2006.

The tree detector (5 m) recorded more bat echolocation call sequences than did either the low or high detector. This could indicate lower flights of bats through the area or bats foraging for insects at lower elevations. At least seven different species of bats were identified. Considerable room for error exists in identification of bats based upon acoustic calls alone, especially if a site or regionally specific library of recorded reference calls is not available. Also, detection rates are not necessarily correlated with the actual numbers of bats in an area, because it is not possible to differentiate between individual bats.

SUMMARY

Peregrine falcon activity was observed and documented in the vicinity of the project during the summer of 2006. From the four surveys, all observed peregrine falcon movements were within a 1.5 km radius of their nesting area on Rattlesnake Mountain. Adult falcons were mostly engaged in territorial and hunting behavior. Flight heights ranged from 0 m to 150 m above the ground. During the sampling period, peregrine falcons were not observed flying over the project area.

Bat detector surveys during late summer and early fall 2006 period have provided information on bat activity in the vicinity of the proposed wind power project. The surveys documented species that would be expected in the area based on the species' range and abundance, as well as the habitats in the project area. The overall low passage rate of all of the detection data indicates that bat activity during the fall 2006 migration period at Tenney Mountain to be low. The tree detector recorded more bat echolocation calls indicating lower flight heights of bats through the project area. Conducting bat surveys in the spring would complement fall 2006 bat studies and provide a good index of bat use and migration through the project area over time.

POTENTIAL FUTURE STUDIES

Understanding the scale of migration and use of the project area by birds and bats could be accomplished by various methods. Currently, there is no standard approach to pre-construction studies but what we've experienced in the northeast is that certain natural resource topics come up repeatedly. In general, the risk of collisions by bird and bats is typically the biggest agency concern for wind power projects. Several methods are available to assess the use of an area by migrant birds and bats. These methods vary in effort and cost, depending on the type of migration being surveyed and the type of data being collected. Based upon our experience in the industry to date, we would recommend considering the following outside consultation and environmental studies.

1) Consultation

We recommend that additional, more formal consultation with state and federal fish and wildlife biologist be conducted. Included in this consultation should be Christian Martin a senior biologist with New Hampshire Audubon Society who has been working on threatened and endangered species around the state, including the peregrine falcon. Christian would be a valuable resource and could provide insight into the feasibility of the project from a natural resource standpoint. These conversations will provide a framework for a more detailed scope of natural resource studies. These consultations will help Wind Works gauge what the particular agencies are looking for and what the wind power industry is doing as part of the permitting process within New Hampshire. Different agencies recommend different types and duration of natural resource studies (i.e., United State Fish and Wildlife Service recommends conducting three years of pre-construction studies, while the state may not require as much survey effort).

2) Seasonal Bird Migration Surveys

Nighttime radar surveys provide insight (passage rates, flight heights, and flight direction) into migration patterns over a proposed site (but can be costly). Daytime field surveys throughout the spring migration period (March to May) also provide an index of migration activity over time (less costly). These daytime surveys should target all avian species such as songbirds, shorebirds, waterfowl, and migrating raptors.

An index of nighttime migration activity in the project area could be documented by conducting early morning transect surveys (i.e., from sunrise to 9:00 am). Such transect surveys can document the presence, species composition, relative abundance, and habitat use of nocturnal migrants using the study area as stopover habitat, but without the need to conduct the surveys at night. These should be conducted at regular intervals throughout the spring migration season.

Daytime (diurnal) raptor surveys could also be conducted in conjunction with other daytime surveys to identify the magnitude, species composition, relative abundance, and flight characteristics of raptors migrating through the project area. Such surveys should document bird species, flight height, flight direction, behavior, and habitat type. Flight pathways of observed birds should be marked on a map. The diurnal migration surveys should be conducted from 9:00 am to 3:00 pm at fixed locations that provide a good view of the project area. These surveys can be conducted during spring and fall migration periods.

3) Breeding Bird Surveys

Breeding Bird Survey are a useful survey technique to document and characterize the breeding bird assemblage at each site in a quantitative manner. This survey will help assess risk to the local breeding bird community. Bicknell's thrush (*Catharus bicknelli*) is a non-issue for this particular project, but

concern for other species may be raised by the agency. Some bird species and their habitats are considered to be more at risk from wind power development than others. Point counts modeled after the United State Fish and Wildlife Service Breeding Bird Survey methods could be used to count individuals of each species located at a series of survey points. Anywhere from 20 to 40 survey points should be sampled at each site, with the orientation and distribution of survey points dependent upon the proposed orientations and locations of turbine arrays, transmission lines, and roads. We recommend conducting surveys on two consecutive mornings in two different weeks (May and June), for a total of four mornings per season. During each sampling event, each point should be visited during the peak hours (4:30 am to 10:30 am) at which birds sing.

4) Peregrine Falcon Surveys

Due to the unsuccessful breeding attempt in 2006 at Rattlesnake Mountain and the possibility of a new peregrine falcon territory south of the project area (Bear Mountain) it would be advisable to continue peregrine falcon surveys during summer and fall of 2007. The length and duration of study will likely depend on discussions with agency personnel and outside consultants. The surveys could target adult and juvenile falcons use and behavior in the area and be based on open discussion with New Hampshire Fish and Game.

5) Bat Surveys

One option would be bat echolocation surveys during the spring 2007 migration period. Surveys could target both ridge tops to cover the extent of the project area. Bat detectors would generally remain in place to capture data for 8eight weeks in spring 2007 (i.e., Mid-April through the end of May). Another option would involve mist-netting of bats (e.g., small-footed bats, which is endangered in New Hampshire) in and around the project area.

OTHER WILDLIFE STUDIES

Other wildlife studies should be based on agency consultation and full disclosure and discussion of the relevant wildlife issues. Other wind power projects have conducted reconnaissance-level field surveys for pine marten (*Martes americana*), black bear (*Ursus americanus*), bobcat (*Lynx rufus*), and moose (*Alces alces*).

If you have any questions about our recommendations, please call us at any time. We would be more than happy to present the results of the field surveys to Wind Works, or the agency, or in any meetings. We look forward to discussing these types of survey efforts with you in further detail, as well as exploring how we could continue to assist you with this or other Wind Works projects in the future.

Sincerely,
Woodlot Alternatives, Inc.

Derek Hengstenberg

Derek Hengstenberg
Project Scientist

WAI Project Number 106136