2011 Mist Net Survey Report

for the Wild Meadows Wind Project
Grafton and Merrimack Counties, New Hampshire

Prepared for

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1.0 Introduction

Eight species of bats occur in New Hampshire, including the little brown bat (*Myotis lucifugus*), northern long-eared bat, (*M. septentrionalis*), eastern small-footed bat (*M. leibii*), silver-haired bat (*Lasionycteris noctivagans*), tri-colored bat (*Perimyotis subflavus*), big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), and hoary bat (*L. cinereus*; BCI 2001). Although none of these species are federally listed, the U.S. Fish and Wildlife Service (USFWS) proposed listing the northern long-eared bat as endangered as of October, 2013 and the little brown bat is a candidate for federal listing. In New Hampshire, the eastern small-footed bat is state-listed as endangered, and the eastern red bat, silver-haired bat, hoary bat, northern long-eared bat, and tri-colored bat are considered species of special concern in the state. New Hampshire may soon list the little brown bat and the northern long-eared bat as threatened or endangered due to significant population declines as a result of White-nose Syndrome (WNS).

Both acoustic sampling and mist net surveys can be used at proposed wind facility sites to survey for bats. Pre-construction acoustic surveys at the proposed Wild Meadows Wind Project area (Project) occurred from August 19 to October 22, 2009, and from April 8 to August 19, 2010. At a meeting on April, 1, 2010 the New Hampshire Fish and Game Department (NHFGD) and US Fish and Wildlife Service (USFWS) expressed an interest in adding mist netting to the study plan at the Project due to the recent decline in bat populations as a result of WNS and the presence of a bat hibernaculum in the Project vicinity in Mud Mine. Mud Mine is located near the northeast corner of the Project area. It was last surveyed in 2007, and at that time contained 3 little brown bats and 57 northern long-eared bats (New Hampshire Natural Heritage Bureau 2010). Attempts to survey the mine more recently were unsuccessful as the entrance to the mine was fully iced over (E. Brunkhurst, NHFGD, pers. comm., March 31, 2011)

Because of these factors, mist netting surveys were added to the study plan and the methods of the surveys were discussed and agreed upon during a follow-up meeting with the NHFGD, Stantec, and Atlantic Wind in Concord, New Hampshire on March 31, 2011, and were conducted during 10 nights from June 26 through August 8, 2011. While acoustic surveys provide baseline information on bat activity levels and general species composition, and allow for simultaneous data collection at multiple locations at varying heights above ground level and across long time periods, species identification can be difficult for species whose echolocation call characteristics overlap. In particular, species belonging to the genus *Myotis* have very similar echolocation call characteristics, making visual species identification from acoustic data difficult. While a mist net survey does not have the ability to survey the same spatial or temporal extent as acoustic surveys, it does allow for the ability to collect precise species information on captured individuals.

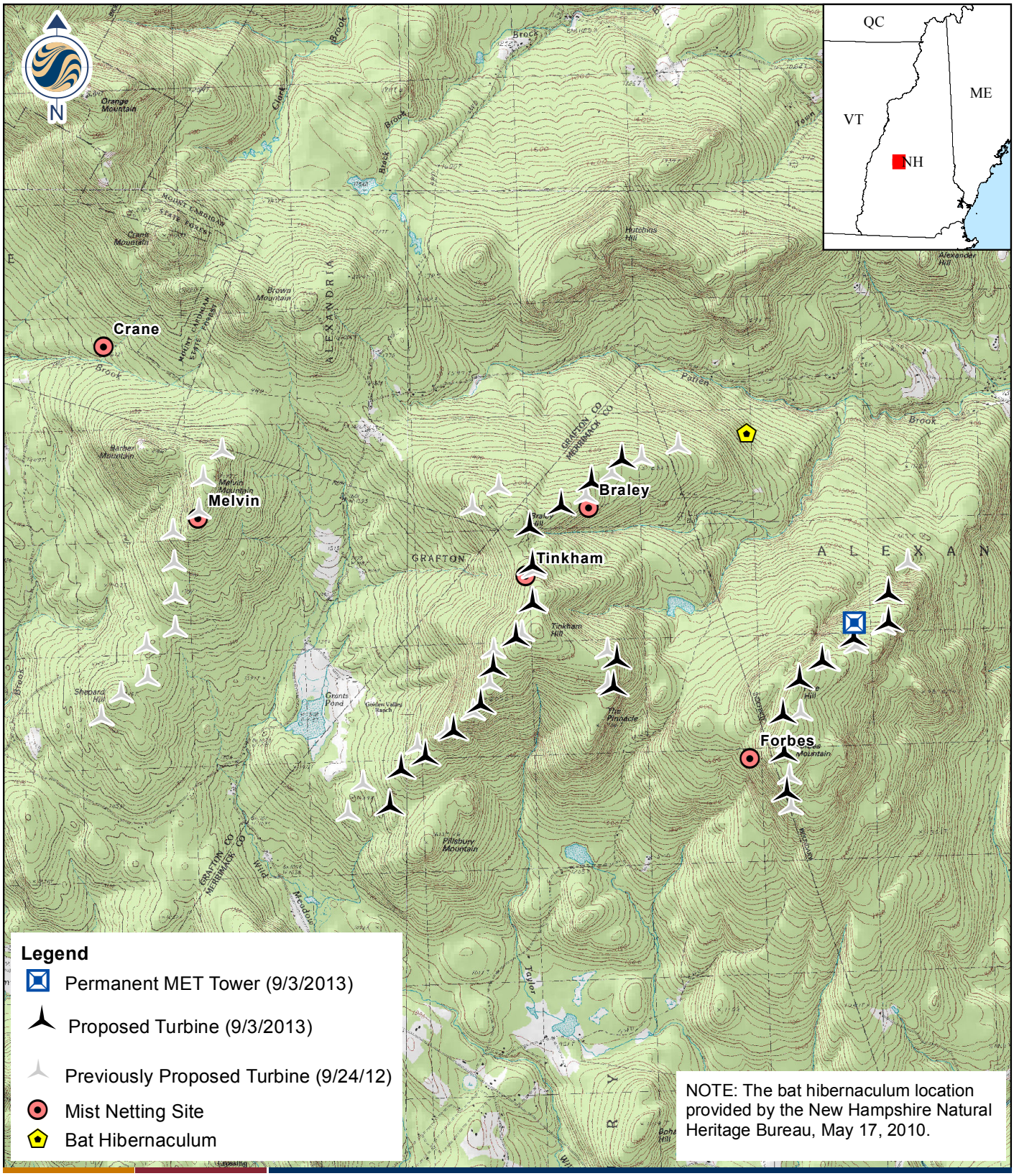

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Figure No.
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Title
2011 Mist Netting Sites
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2.0 Methods

The primary objective of the 2011 mist net survey was to document the bat species present along the ridges of the Project area, with a focus on northern long-eared bats due to the proximity of the Project to Mud Mine and at NHFGD's request. The Indiana bat (*Myotis sodalis*) is the only bat species for which a mist net survey protocol has been developed. Indiana bats are not known to occur in New Hampshire. However, other *Myotis* species in the Northeast share many behavioral and ecological traits with Indiana bats. In lieu of an accepted survey protocol for bats native to New Hampshire, the Indiana bat survey protocol developed by the USFWS 2007) was followed, as discussed with USFWS and NHFGD. The acceptable Indiana bat survey period occurs between May 15 and August 15. Sites should be surveyed for a minimum of two nights, and a minimum of two net-sets per site are required, resulting in a minimum of four net-nights (2 net-sets per site x 2 survey nights per site). Net sets should be placed across presumptive travel corridors (e.g., streams or logging trails) and should fill the entire airspace side-to-side and from ground level to canopy height. A successful survey night occurs when temperatures are above 10° Celsius (C; 50° Fahrenheit [F]), wind speeds are low, and there is no precipitation. In addition to the methods derived from the Indiana bat protocol, it was decided that two additional nights of netting would occur at any site where a northern long-eared bat was captured.

During the 2011 mist net survey, the proposed Project area was located near or around five distinct mountain peaks: Braley Hill, Crane Mountain, Forbes Mountain, Melvin Mountain, and Tinkham Hill (Figure 1-1). As of 2013, Melvin Mountain and Crane Mountain are now outside, but in the vicinity of the proposed Project area. Mist net surveys at Melvin Mountain and Crane Mountain still provide valuable data documenting bat species presence near the Project area. Five survey sites were identified based on proximity to probable northern long-eared bat habitat and on opportunities to place mist net sets across presumptive travel corridors. There were no suitable mist net sites on the summits of Tinkham Hill, Braley Hill, and Forbes Mountain, so mist nets were placed slightly off the peak of each mountain where better canopy closure provided more suitable mist net set locations. At Melvin Mountain, mist nets were deployed on the summit. Crane Mountain was recently logged and had no suitable mist net set locations at or on the way to the summit; therefore, mist net sets were deployed along a forest road at the southern portion of the parcel.

Capture effort consisted of erecting two mono-filament nylon mist-net sets (Avinet, Inc., Dryden, NY) spaced at least 30 meters (m; (98 feet [']) apart at each net site. Nets ranged from 6 to 12 m (19.7 to 39.4') in length, and were vertically stacked three nets (7.8 m [25.6']) high in order to completely fill the flight corridor. Net sets were placed perpendicular to potential travel corridors such as logging trails, breaks in a tree line, or over streams or wetlands.

Tinkham Hill (mist net site elevation = 671 m [2,200']): The Tinkham mist net site included three net sets, and was located approximately 550 m north and downslope from the summit of Tinkham Hill. Each set was three nets high. Two of the sets were 9 m long, and one was 6 m long. One set was deployed across the access road leading to the Tinkham temporary

meteorological (met) tower clearing. A 9-m and 6-m net was also deployed across a four-wheeler trail that traversed the saddle between Tinkham Hill and Braley Hill. The surrounding forest was a mix of recently harvested hardwood forest, dominated by beech (*Fagus grandifolia*), yellow birch (*Betula alleghaniensis*), and cherry (*Prunus* sp.). Dominant tree species had a diameter-at-breast height (dbh) range of 4 to 8 inches and a canopy height of 6 to 10 m. The forest understory was relatively cluttered and the forest canopy was fairly open due to recent harvesting.

Figure 2-1. Tinkham mist net site at the Wild Meadows Wind Project, Summer 2011.

Melvin Mountain (mist net site elevation = 640 m [2,100']): The Melvin mist net site was located southeast of the summit of Melvin Mountain, along a series of logging trails that led to the temporary met tower clearing. The surrounding forest showed signs of recent areas of partial harvest and was dominated by thick patches of mature red spruce (*Picea rubens*), interspersed with areas of mature hardwood species, including yellow birch, cherry, and sugar maple (*Acer saccharinum*). Dominant tree species had an approximate dbh range of 4 to 10 inches and a relatively low canopy height of approximately 10 m. Where no recent harvesting had occurred, the forest understory was primarily cluttered. The forest canopy was intermediate between open and closed, with canopy gaps scattered throughout the stand from harvesting. Soils appeared very thin at the site, and large portions of the trail had been eroded to expose the underlying bedrock. Three mist net sets were deployed across the main logging trail leading to the summit. Each set contained three mist nets; one set was 9 m long and two were 6 m long.

Figure 2-2. Melvin Mountain mist net site at the Wild Meadows Wind Project, Summer 2011.

Forbes Mountain (mist net site elevation = 495 m [1,625']): The Forbes Mountain access was difficult due to steep terrain and degraded logging roads. The mist nets were located approximately 300 m downslope and southwest from the summit of Forbes Mountain. The surrounding forest was dominated by mixed age hardwood forest composed of sugar maple, yellow birch, and cherry. Dominant tree species had a dbh range of 5 to 10 inches and a canopy height of approximately 10 m. Evidence of older forest harvests was apparent, and the resulting understory growth was often dense with raspberry (*Rubus* sp.) and blackberry (*Rubus* sp.). Logging trails were wide and the resulting large gap in canopy left less than ideal mist netting conditions. Although relatively open, the mist net site was a corridor through the forest canopy through which foraging and commuting bats would be funneled. Two mist net sets were deployed across at either end of the opening. One set was 9 m long and 3 nets high, and a second set was 9 m long a single net high.

Figure 2-3. Forbes Mountain mist net site at the Wild Meadows Wind Project, Summer 2011.

Crane Mountain (mist net site elevation = 454 m [1,489']): The Crane Mountain mist net site was located near Brown Brook about one kilometer southwest of Crane Mountain. The surrounding forest was dominated by mature hardwood species, including sugar maple, yellow birch, and cherry. Additionally, there was smaller component of mature softwood including red spruce and white pine (*Pinus strobus*). Dominant tree species had a dbh range of 6 to 12 inches and a canopy height of approximately 12 m. Three mist nets were deployed along an unimproved logging road leading from a large log landing and running parallel to a tributary of Brown Brook. Each set contained three mist nets; one set was 9 m long and two were 6 m long.

Figure 2-4. Crane Mountain mist net site at the Wild Meadows Wind Project, Summer 2011.

Braley Hill (mist net site elevation = 663 m [2,175']): The Braley Hill mist net sites were located along a trail that leads from the gap between the summits of Braley Hill and Tinkham Hill. The site was approximately 600 m east of the summit of Braley in an area dominated by mature hardwood species, including sugar maple, beech, and yellow birch, interspersed with patches of mature red spruce forest with a relatively open understory. Dominant tree species had a dbh range of 6 to 16 inches and a canopy height of approximately 12 m. There was some evidence of recent partial harvests (strip cuts) within 300 m (1,000') of the mist net sites. Three mist net sets were deployed across the snowmobile trail. Each set contained 3 mist nets; one set was 9 m long and two were 6 m long.

Figure 2-5. Braley Hill mist net site at the Wild Meadows Wind Project, Summer 2011.

Bats captured during surveys were to be identified by species by a biologist permitted by the NHFGD. The weight, age, sex, reproductive condition, and forearm length were to be recorded for all captured individuals. Individuals were to be outfitted with metal arm bands supplied by NHFGD. In order to assist with ongoing studies into effects of WNS, physical abnormalities were to be noted and a score given based on the severity of those abnormalities following a system developed by John Reichard at Boston University: *Wing-Damage Index Used for Characterizing Wing Condition of Bats Affected by White-Nose Syndrome*. The scoring system ranks abnormalities from 0 (few to none) to 3 (high) based on the amount of depigmentation of the wing, the presence of scars on wing membranes, or the presence of flaking skin along the forearms. In order to minimize the spread of WNS, Stantec followed the most current decontamination procedures outlined by the USFWS. Prior to the start of field work, all nets and equipment that had previously come into contact with bats were sanitized in a 10 percent bleach solution. Disposable paper bags were to be used for weighing bats and were to be discarded after one use. Calipers were to be sanitized after each use. Disposable latex gloves were worn over handling gloves and changed regularly throughout the night, as needed.

3.0 Results

Surveys began when minimum nightly temperatures were warm enough to initiate netting activity (above 50°F) to conform to Indiana bat survey protocol and to ensure surveys occurred

during the known summer residency period. The first survey night was conducted on June 26, 2011, and the last survey night was conducted on August 8, 2011, during which time a total of 10 survey nights were conducted. One bat was captured during 50.5 survey hours at 5 survey sites (Table 3-1).

Table 3-1. Summary of 2011 Wild Meadows mist net survey effort and results.

Site	# Net-nights*	# Cumulative net hours	# Bats captured	Capture Rate**
Tinkham	6	10.25	0	0
Melvin	6	10	0	0
Forbes	4	10	0	0
Crane	6	10.25	0	0
Braley	6	10	1	0.17
Overall Results	***28***	***50.5***	***1***	**--**

* Net-nights is a sampling unit during which a single net set is deployed during a single survey night. When two net sets are used during a survey night, the sampling effort equals two net-nights, etc.

** Number of bats captured per net-night

The single bat capture was a juvenile female big brown bat, captured at the Braley Hill mist net survey site at 1:50am on July 21, 2011. It weighed 21.5 grams, had a forearm length of 48.2 millimeters, and was outfitted with NHFGD band # 43151. It had no evidence of WNS in the form of membrane depigmentation or scarring, and was therefore given a WNS score of 0.

4.0 Discussion

The primary objective of the summer mist net survey was to document bat species present in and near the Project area. Mist net sites were placed along the higher elevation ridgelines within and around the Project area where turbines are being proposed so that individuals captured could be considered to be using the ridges, and therefore at risk of direct impacts from the wind facility. However, only one individual was captured. It is not surprising that a low capture rate was observed at high elevation survey locations. Mist net surveys can be biased toward those species that fly beneath the forest canopy such as North American *Myotis* species (Hayes and Gruver 2000, Kalcounis *et al.* 1999, Weller and Lee 2007). In New England, these same species are generally found in higher concentrations at lower elevations where

temperatures can be warmer and more stable, leading to lower energetic expenditure for reproductive females (Brack *et al.* 2002).

Still, bats are present and active at higher elevations, albeit in lower concentrations. Therefore, the capture of only a single individual seems best explained by the effects of WNS, although we are not aware of pre-WNS bat mist netting data from this area for comparison. As stated previously, mist net surveys can be biased toward species that fly beneath the forest canopy, and these same species are affected by WNS. WNS is causing unprecedented mortality among at least six species of hibernating bats in North America (Frick *et al.* 2010): eastern small-footed bat, little brown bat, northern long-eared bat, tricolored bat, big brown bat, and Indiana bat (USGS 2010). Three additional species have evidence of the fungus but no reports of mortality: cave myotis (*Myotis velifer*), southeastern bat (*M. austroriparius*) and gray bat (*M. grisescens*; Turner et al. 2011). All 25 bat species in the United States that rely on hibernation have the potential to be affected by WNS (USGS 2010).

An estimated 5.5 to 6.7 million bats or more have died since mortalities were first recorded in 2007, and currently WNS has been identified in 16 states and 4 Canadian provinces, with 3 additional states having unconfirmed cases (USFWS 2012). Total mortality averaged 95 percent at closely monitored WNS hibernacula that had multiple years of infection in New York, Massachusetts, and Vermont in 2009 (Turner and Reeder 2009), and an analysis of 42 sites in five states (NY, PA, VT, VA, and WV) found an overall population decrease of 88 percent, ranging from a 12 percent decline for small-footed bats to a 98 percent decline for northern long-eared bats (Turner *et al*. 2011). These observed decreases in little brown bat populations follow predictions by Frick *et al*. (2010) that the little brown bat may become regionally extinct in the Northeast in 7 to 30 years (Turner *et al*. 2011).). Although individual bats have been shown to recover from WNS, the recovery process is physiologically demanding and recovery rates are thought to be low in cold, higher elevation habitats (Cryan *et al.* 2013). Recent research has documented variable immunological response to WNS among individual little brown bats, although interactions between WNS, immunological response, and energetic demands are not well established (Moore *et al.* 2013). Cave counts for little brown bats in 5 caves in New York where WNS was first documented declined sharply for 2-3 years, then stabilized or even increased slightly, although this trend was not observed for other species (Herzog 2013).

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