Exh. EANL-AC-3

Memorandum

To: Essex A North Lot Solar Project Folder

Date: November 1, 2024

Project #: 58972.01

From: Meg Lout, CWB®, Senior Bat Biologist

Re: Results of Bat Acoustic Monitoring

Introduction

On behalf of Essex A North Lot Solar, LLC ("Petitioner") and at the request of Encore Renewable Energy ("Encore"), VHB completed a bat acoustic monitoring survey in support of in support of a planned a 3.5-megawatt ("MW") alternating current ("AC") ground-mounted solar project ("Group A" or "Project"). The Project consists of the installation and operation of a solar electric generation facility within the GlobalFoundries campus. GlobalFoundries Power LLC ("GF Power") is an owned subsidiary of GlobalFoundries and operates as a public service company. The Project is sited on an approximate 38.6-acre Study Area, on the GlobalFoundries property, located between Maple Street (Vermont Route 117) and Robinson Parkway in the City of Essex Junction, Vermont. The objective of the survey was to determine the presence or probable absence of the state and federally endangered northern long-eared bat (*Myotis septentrionalis*) and the state endangered tri-colored bat (*Perimyotis subflavus*), a species anticipated to be listed as federally endangered in 2024. A project location map is provided in **Appendix 1**.

Methods

Passive Acoustic Monitoring

VHB deployed three Pettersson D500x Ultrasonic Detectors ("Detectors") between June 18 and July 27, 2024 (see **Appendix 2**). Sites 1 and 2 were deployed for 5 detector-nights, while Site 3 was deployed for four, totaling the minimum required level of effort of 14 detector-nights, per the U.S. Fish and Wildlife Service's ("USFWS") Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines ("Guidelines," USFWS 2024). The Detectors were connected to a D500x directional microphone via a cable connection cord and the microphone was raised to approximately 21 feet (7 meters) above ground level. Photographs of the Detectors, and settings and parameters used for the analysis are provided in **Appendix 3**. The survey began approximately 30 minutes prior to sunset and continued until 30 minutes after sunrise (USFWS 2024). A clap test was used to determine equipment functionality prior to deployment and collection. Weather data from Five Corners - KVTESSEX21 (Weather Underground) was summarized for the nights of monitoring from which data were analyzed is provided in **Appendix 4**. Weather Underground data was also consistent with data provided by The National Weather Service Station's Burlington International Airport (KBTV).

Qualitative Analysis and Manual Vetting

Data analyses were completed by a qualified VHB Bat Biologist using Kaleidoscope Pro ("KPro") software (Version 5.4.7), auto classifier version 5.4.0 (S/A: -1), and manually vetted using SonoBat 4.2.2 nE ("SonoBat," see **Appendix 5**). Each sound file (.wav format) was assigned a text file using SonoBat. Sound files were then scrubbed in SonoBat using the recommended default setting to remove noise files. After scrubbing the data, copies of the attributed files that had passed the call quality threshold were auto-classified using KPro with the species selected for Vermont, excluding the Indiana bat (*M. sodalis*), a species that does not occur in Chittenden County. Species presence each night is based on a maximum likelihood estimate of 0.05 or less, as assigned by KPro, and manual vetting.

Results

KPro auto-classified a total of 263 call sequences (or calls) that resulted in a presence determination for four species, including: big brown bat *(Eptesicus fuscus*; n=158 calls); hoary bat (*Lasiurus cinereus*; n=74 calls); little brown bat (*M. lucifugus*; n=19 calls); and silver-haired bat (*Lasionycteris noctivagans*; n=12 calls). The key for the suite of bat species and guilds included in the analyses are provided in **Table 1**. The number of calls per species and maximum likelihood estimates ("MLE"s) are provided by detector-night in **Tables 2-4.**[1] Representative spectrograms are provided in **Figures 1-4.**

Table 1 Bat species and guilds that were recorded during acoustic monitoring surveys at Essex A North Lot Solar.

Common Name	Scientific Name	Species/Guild Abbreviation
Big brown bat	*Eptesicus fuscus*	EPFU
Eastern red bat	*Lasiurus borealis*	LABO
Silver-haired bat	*Lasionycteris noctivagans*	LANO
Hoary bat	*Lasiurus cinereus*	LACI
Little brown bat	*Myotis lucifugus*	MYLU
Northern long-eared bat	*Myotis septentrionalis*	MYSE
Eastern small-footed bat	*Myotis leibii*	MYLE
Tri-colored bat	*Perimyotis subflavus*	PESU
Big brown/Silver-haired bat		EPFU/LANO
Unknown *Myotis*		UNMY
Unknown low frequency		UNLF
Unknown high frequency		UNHF

[1] The "Number of calls Auto-classified" may be different that the "Total Number of Calls" due to manual vetting. The Total Number of Calls is the correct number of calls per species or guild on a given detector-night.

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Table 2. The number of bat calls by detector-night that were recorded at Site 1 between June 18 and July 27, 2024, at Essex A North Lot Solar.

June 18-19, 2024						
Species/Guild	**EPFU**	**LACI**	**LANO**	**MYLU**	**EPFU/LANO**	**UNMY**
# Calls Auto-classified	0	0	0	0	0	0
# Calls Confirmed	7	0	0	0	1	0
MLE	1	1	1	1	-	-
Total # Calls	7	0	0	0	1	0
June 19-20, 2024						
# Calls Auto-classified	3	1	0	1	0	0
# Calls Confirmed	0	1	0	1	3	0
MLE	0.02	0.4	1	0.11	-	-
Total # Calls	3	1	0	1	3	0
June 21-22, 2024						
# Calls Auto-classified	4	3	1	1	0	0
# Calls Confirmed	0	0	0	1	3	0
MLE	<0.01	<0.01	1	0.11	-	-
Total # Calls	4	3	1	1	3	0
June 28-29, 2024						
# Calls Auto-classified	13	3	0	1	0	0
# Calls Confirmed	4	0	0	1	4	0
MLE	0	0.11	1	0.11	-	-
Total # Calls	17	3	0	1	4	0
July 26-27, 2024						
# Calls Auto-classified	13	5	0	0	0	0
# Calls Confirmed	0	0	0	0	4	0
MLE	0	0.04	1	1	-	-
Total # Calls	13	5	0	0	4	0
GRAND TOTAL # CALLS	***44***	***12***	***1***	***3***	***15***	***0***

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Table 3. The number of bat calls by detector-night that were recorded at Site 2 between June 18 and July 27, 2024, at Essex A North Lot Solar.

June 18-19, 2024						
Species/Guild	**EPFU**	**LACI**	**LANO**	**MYLU**	**EPFU/LANO**	**UNMY**
# Calls Auto-classified	12	4	0	0	0	0
# Calls Confirmed	2	0	0	0	4	0
MLE	0	0.02	1	1	-	-
Total # Calls	14	4	0	0	4	0
June 19-20, 2024						
# Calls Auto-classified	4	8	1	2	0	0
# Calls Confirmed	0	0	1	2	0	0
MLE	0.22	0	1	0.01	-	-
Total # Calls	4	8	1	2	0	0
June 21-22, 2024						
# Calls Auto-classified	2	4	0	0	0	0
# Calls Confirmed	0	0	0	0	2	0
MLE	0.14	<0.01	1	1	-	-
Total # Calls	2	4	0	0	2	0
June 28-29, 2024						
# Calls Auto-classified	13	3	1	1	0	0
# Calls Confirmed	3	0	0	1	3	0
MLE	0	0.11	1	0.11	-	-
Total # Calls	16	3	0	1	3	0
July 26-27, 2024						
# Calls Auto-classified	23	6	2	10	0	0
# Calls Confirmed	2	0	0	9	0	1
MLE	0	<0.01	1	0	-	-
Total # Calls	25	6	2	9	0	1
Grand Total # Calls	***61***	***25***	***3***	***12***	***9***	***1***

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Table 4. The number of bat calls by detector-night that were recorded at Site 3 from June 18-29, 2024 bat Essex A North Lot Solar.

June 18-19, 2024						
Species/Guild	**EPFU**	**LACI**	**LANO**	**MYLU**	**EPFU/LANO**	**UNMY**
# Calls Auto-classified	8	4	3	2	0	0
# Calls Confirmed	0	0	1	2	0	0
MLE	<0.01	<0.01	0.8	0.01	-	-
Total # Calls	8	4	4	2	0	0
June 19-20, 2024						
# Calls Auto-classified	13	15	3	0	0	0
# Calls Confirmed	4	0	0	0	4	0
MLE	<0.01	0	1	1	-	-
Total # Calls	17	15	3	0	4	0
June 21-22, 2024						
# Calls Auto-classified	7	14	1	1	0	0
# Calls Confirmed	5	1	0	1	7	0
MLE	<0.01	0	1	0.11	-	-
Total # Calls	12	15	1	1	7	0
June 28-29, 2024						
# Calls Auto-classified	13	3	1	1	0	0
# Calls Confirmed	3	0	0	1	3	0
MLE	0	0.11	1	0.11	-	-
Total # Calls	16	3	0	1	3	0
GRAND TOTAL # CALLS	***53***	***37***	***8***	***4***	***14***	***0***

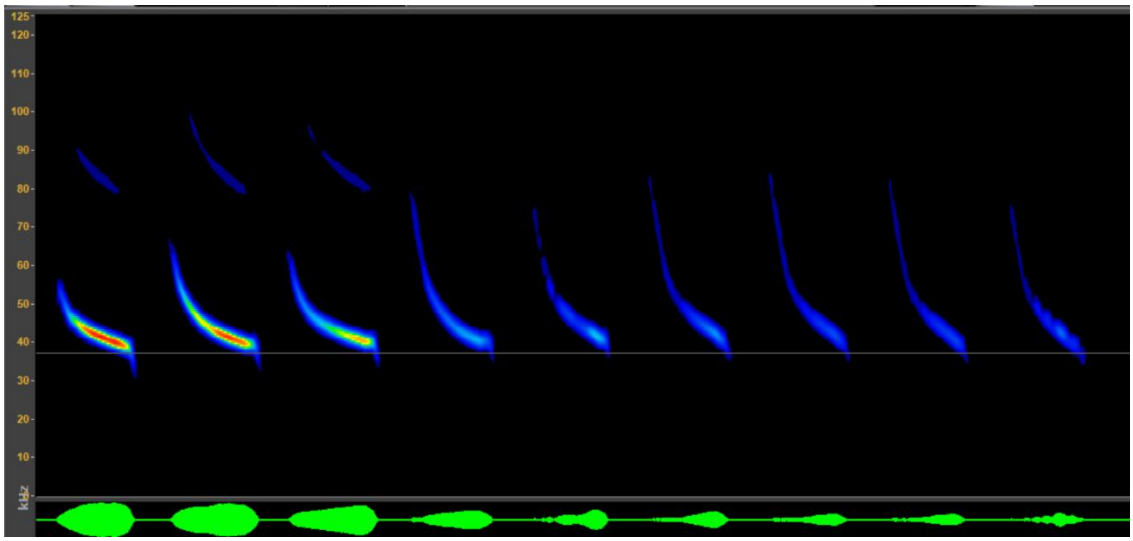


Figure 1. *Representative spectrogram of a little brown bat (Myotis lucifugus) recorded at Site 1 on June 18, 2024, at Essex A North Lot Solar.*

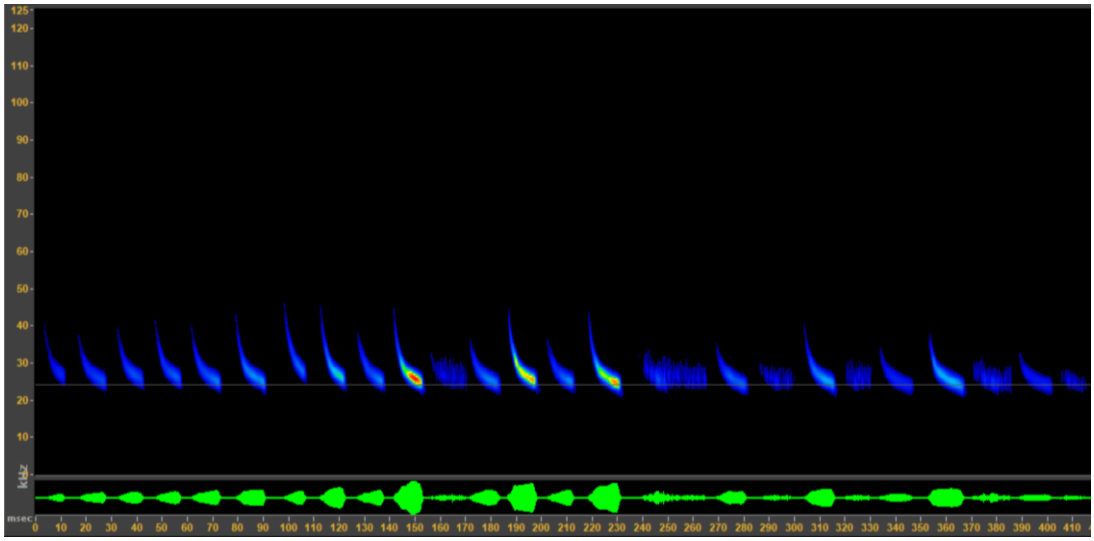


Figure 2. *Representative spectrogram of a big brown bat (Eptesicus fuscus) recorded at Site 1 on June 28, 2024, at Essex A North Lot Solar. The mean number of calls per second is low, such that other species with similar calls are ruled out.*

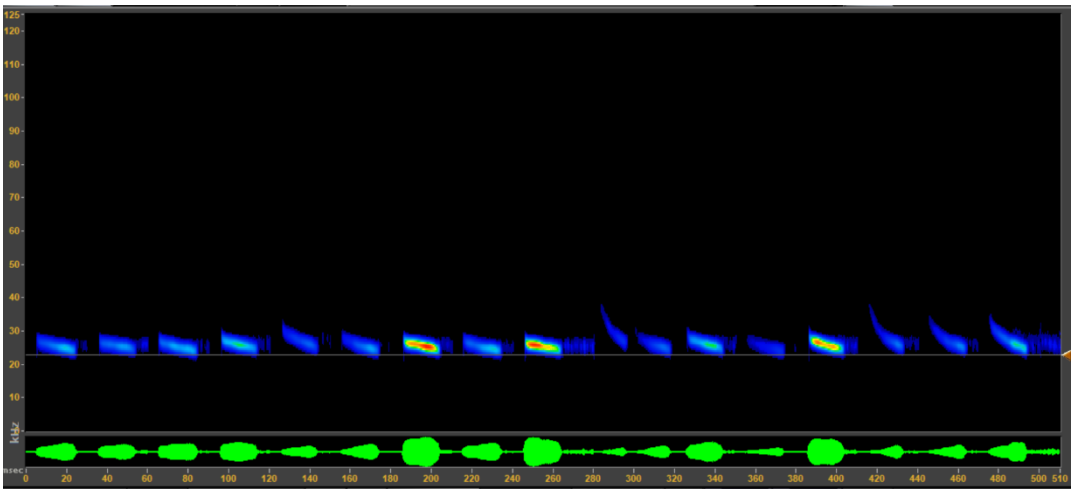


Figure 3. *Representative spectrogram of a silver-haired bat (Lasionycteris noctivagans) recorded at Site 2 on June 18, 2024, at Essex A North Lot Solar.*

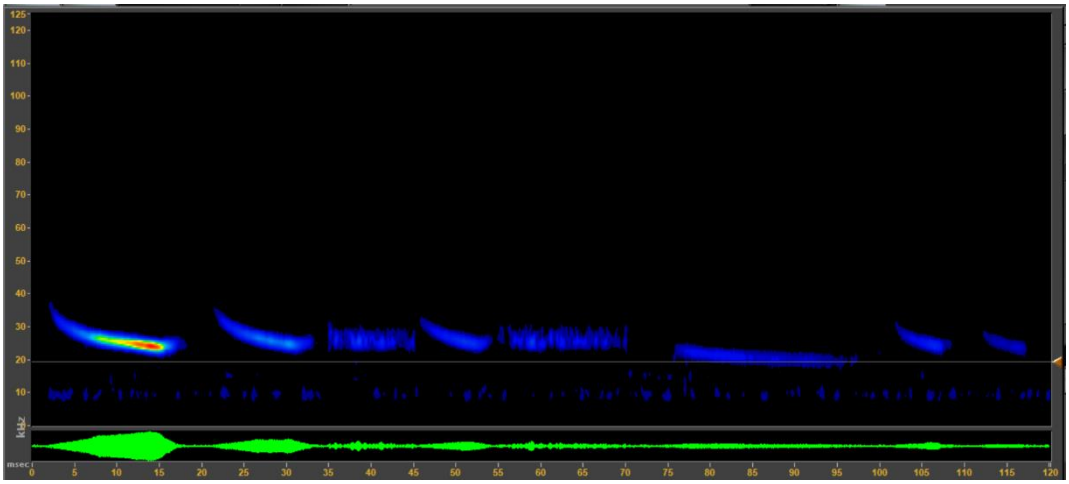


Figure 4. *Representative spectrogram of a hoary bat (Lasiurus cinereus) recorded at Site 1 on June 19, 2024, at Essex A North Lot Solar.*

Memorandum

Conclusion

The acoustic monitoring survey resulted in a probable absence determination for the northern long-eared bat and tri-colored bat. The species that were confirmed to be present are the hoary bat, big brown bat, silver-haired bat and little brown bat (see **Tables 2-4**). Based on these findings, it is VHB's understanding that no Time-of-Year restrictions will be required for the Project.

Appendices

1. Project Location Map
2. Detector Location Map
3. Acoustic Monitoring Data Form
4. Weather Data
5. Qualified Personnel

References

U.S. Fish and Wildlife Service. 2024. *Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines*. Available on-line at Range-wide Indiana Bat and Northern Long-eared Bat Survey Guidelines | FWS.gov

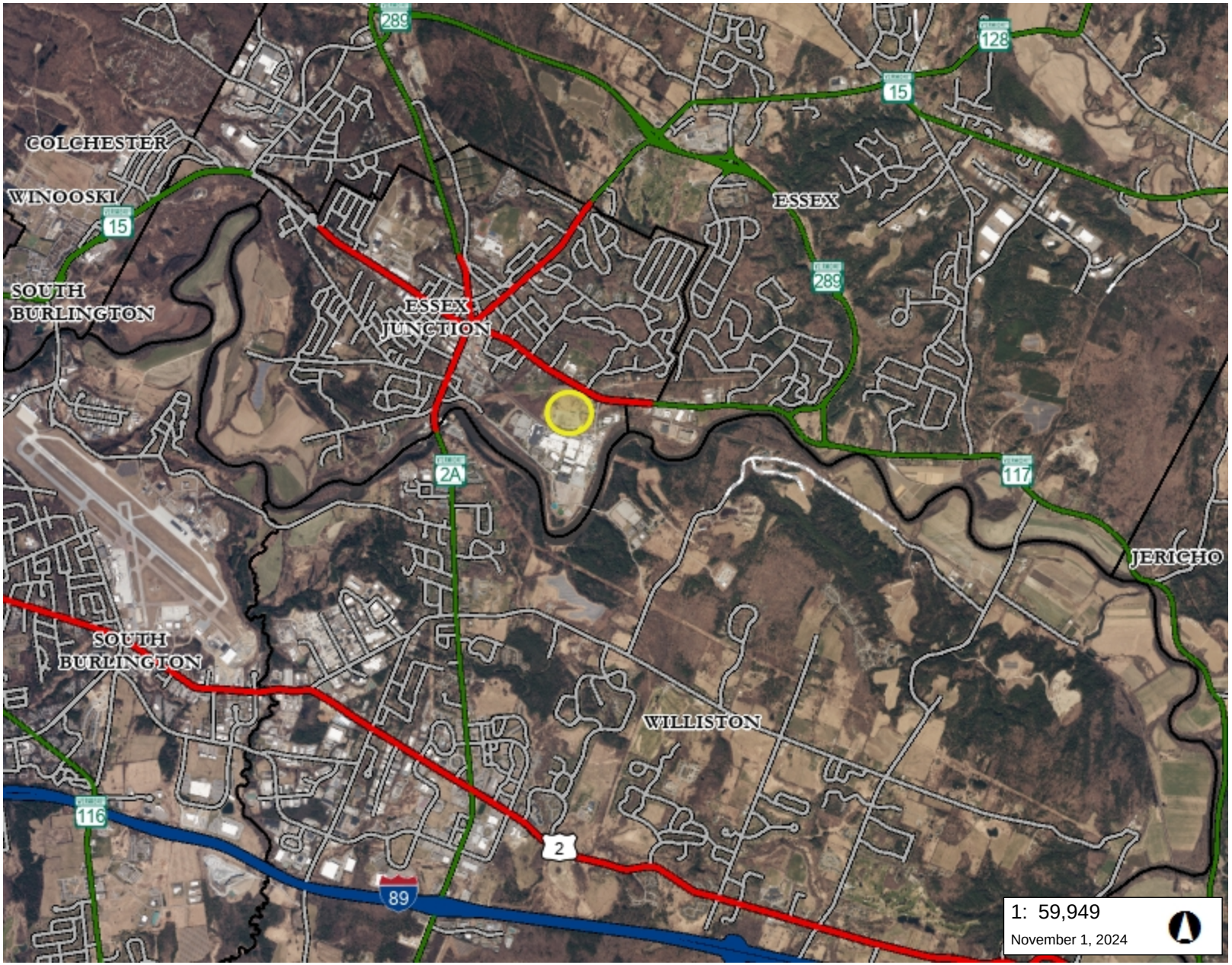
Appendix 1: Project Location Map

VERMONT

Project Location Map

Vermont Agency of Natural Resources

vermont.gov



LEGEND

Roads

- Interstate
- US Highway; 1
- State Highway
- Town Highway (Class 1)
- Town Highway (Class 2,3)
- Town Highway (Class 4)
- State Forest Trail
- National Forest Trail
- Legal Trail
- Private Road/Driveway
- Proposed Roads

Town Boundary

NOTES

Map created using ANR's Natural Resources Atlas

3,045.0 0 1,522.00 3,045.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 4996 Ft. 1cm = 599 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

Appendix 2: Detector Location Map

VERMONT

Detector Location Map

Vermont Agency of Natural Resources

vermont.gov

LEGEND

Roads

- Interstate
- US Highway; 1
- State Highway
- Town Highway (Class 1)
- Town Highway (Class 2,3)
- Town Highway (Class 4)
- State Forest Trail
- National Forest Trail
- Legal Trail
- Private Road/Driveway
- Proposed Roads

Town Boundary

Detection Cone

1: 7,494

November 1, 2024

381.0 0 190.00 381.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere 1" = 624 Ft. 1cm = 75 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.

NOTES

Map created using ANR's Natural Resources Atlas

Appendix 3: Acoustic Monitoring Data Form

Bat Survey Data Form (~~Capture and~~ Acoustics)

mlout@vhb.com

If found, please return to: ~~JTyburec/Tucson jtyburec@mac.com~~

Project:	58972.01	**County:**	Essex	**Site#:**	1-3	**Night#:**	1-3	**Site Name:**	Area A	**Date:**	6/18/24
Latitude: 44.48221		Longitude: -73.09909						Datum: NAD83	Elevation:	ID By: MSL	
Observers: MSL, CP								Start Time: 19:00		End Time: 06:30	

~~Conditions:~~	Time:	Temp:	Wind:	Clouds:	Time:	Temp:	Wind:	Clouds:	Time:	Temp:	Wind:	Clouds:
	NA											

Moon Effect: NA	Start:	**Land Use:** Urban / Agriculture / Forest / Water / Wetland / Barren *(describe)*:
	Stop:	

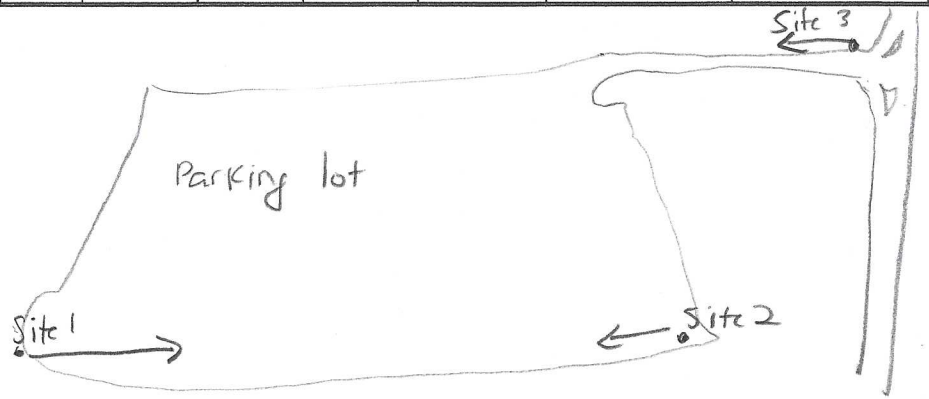
NETS/TRAPS:	**A:**	**B:**	**C:**	**D:**	**E:**	**F:**
Pool size WxL						
~~Swoop WxL~~						
~~Photo?~~						

BD#	Latitude	Longitude	Mic	Ht	clutter	gain	trigger	interval	Start time	Stop Time	Photo?
1	44.48201	-73.10095	Pett.	7	none	45	160	5s	19:00	06:30	Y
2	44.48151	-73.09757	Pett.	7	none	45	160	5s	19:00	06:30	Y
3	44.48315	-73.09568	Pett.	7	none	45	160	5 s	19:00	06:30	Y

Site Description:

See report

Remarks:



Site sketch (label to match Nets/Traps and BD# above)

Photograph 1. View looking south at the profile of Site 1.

Photograph 2. View looking southeast into the detection cone of Site 1.

Photograph 3. View looking south at the profile of Site 2.

Photograph 4. View looking west into the detection cone of Site 2.

Photograph 5. View looking North at the profile of Site 3.

Photograph 6. View looking west into the detection cone of Site 3.

Appendix 4: Weather Data

Time	Temp.	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precip.	Condition
June 18-19, 2024									
6:54 PM	91 °F	71 °F	52 %	S	8 mph	0 mph	29.76 in	0.0 in	Partly Cloudy
7:54 PM	89 °F	72 °F	57 %	SSW	7 mph	0 mph	29.78 in	0.0 in	Partly Cloudy
8:54 PM	85 °F	72 °F	65 %	S	6 mph	0 mph	29.79 in	0.0 in	Partly Cloudy
9:54 PM	83 °F	71 °F	67 %	S	6 mph	0 mph	29.80 in	0.0 in	Partly Cloudy
10:54 PM	83 °F	71 °F	67 %	S	7 mph	0 mph	29.80 in	0.0 in	Fair
11:54 PM	82 °F	70 °F	67 %	S	5 mph	0 mph	29.82 in	0.0 in	Partly Cloudy
12:54 AM	81 °F	71 °F	72 %	S	6 mph	0 mph	29.82 in	0.0 in	Fair
1:54 AM	80 °F	71 °F	74 %	S	8 mph	0 mph	29.82 in	0.0 in	Fair
2:54 AM	81 °F	71 °F	72 %	S	9 mph	0 mph	29.82 in	0.0 in	Fair
3:54 AM	80 °F	71 °F	74 %	S	8 mph	0 mph	29.84 in	0.0 in	Fair
4:54 AM	80 °F	71 °F	74 %	SSW	9 mph	0 mph	29.85 in	0.0 in	Fair
5:54 AM	80 °F	71 °F	74 %	SSW	5 mph	0 mph	29.87 in	0.0 in	Mostly Cloudy
6:54 AM	81 °F	71 °F	72 %	SSW	6 mph	0 mph	29.88 in	0.0 in	Mostly Cloudy
June 19-20, 2024									
6:54 PM	87 °F	71 °F	59 %	SSW	10 mph	0 mph	29.83 in	0.0 in	Partly Cloudy
7:54 PM	86 °F	74 °F	67 %	SSW	13 mph	0 mph	29.84 in	0.0 in	Mostly Cloudy
8:54 PM	85 °F	73 °F	67 %	SSW	9 mph	0 mph	29.85 in	0.0 in	Mostly Cloudy
9:54 PM	83 °F	73 °F	72 %	SSW	9 mph	0 mph	29.86 in	0.0 in	Partly Cloudy
10:54 PM	82 °F	73 °F	74 %	SSW	6 mph	0 mph	29.86 in	0.0 in	Fair
11:54 PM	81 °F	73 °F	77 %	S	9 mph	0 mph	29.86 in	0.0 in	Fair
12:54 AM	81 °F	72 °F	74 %	SSW	8 mph	0 mph	29.85 in	0.0 in	Fair
1:54 AM	80 °F	72 °F	76 %	S	7 mph	0 mph	29.86 in	0.0 in	Fair
2:54 AM	80 °F	72 °F	76 %	SSW	6 mph	0 mph	29.86 in	0.0 in	Fair
3:54 AM	79 °F	71 °F	77 %	SSW	7 mph	0 mph	29.86 in	0.0 in	Fair
4:54 AM	79 °F	71 °F	77 %	SW	6 mph	0 mph	29.85 in	0.0 in	Fair
5:54 AM	79 °F	71 °F	77 %	SW	7 mph	0 mph	29.85 in	0.0 in	Mostly Cloudy

Time	Temp.	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precip.	Condition
6:54 AM	79 °F	71 °F	77 %	SW	6 mph	0 mph	29.87 in	0.0 in	Mostly Cloudy
June 21-22, 2024									
6:54 PM	75 °F	64 °F	69 %	NNW	8 mph	0 mph	29.77 in	0.0 in	Mostly Cloudy
7:54 PM	74 °F	64 °F	71 %	CALM	0 mph	0 mph	29.75 in	0.0 in	Cloudy
8:54 PM	73 °F	63 °F	71 %	CALM	0 mph	0 mph	29.75 in	0.0 in	Cloudy
9:54 PM	72 °F	63 °F	73 %	CALM	0 mph	0 mph	29.75 in	0.0 in	Cloudy
10:54 PM	71 °F	63 °F	75 %	W	3 mph	0 mph	29.74 in	0.0 in	Cloudy
11:54 PM	71 °F	65 °F	81 %	S	3 mph	0 mph	29.72 in	0.0 in	Cloudy
12:37 AM	70 °F	65 °F	84 %	SW	3 mph	0 mph	29.73 in	0.0 in	Cloudy
12:54 AM	70 °F	65 °F	84 %	CALM	0 mph	0 mph	29.72 in	0.0 in	Cloudy
1:54 AM	70 °F	65 °F	84 %	SSW	3 mph	0 mph	29.71 in	0.0 in	Cloudy
2:54 AM	69 °F	64 °F	84 %	CALM	0 mph	0 mph	29.70 in	0.0 in	Cloudy
3:54 AM	69 °F	64 °F	84 %	CALM	0 mph	0 mph	29.69 in	0.0 in	Cloudy
4:54 AM	68 °F	65 °F	90 %	NNW	3 mph	0 mph	29.69 in	0.0 in	Cloudy
5:24 AM	68 °F	66 °F	93 %	NNW	3 mph	0 mph	29.69 in	0.0 in	Rain
5:33 AM	68 °F	66 °F	93 %	NNW	5 mph	0 mph	29.70 in	0.1 in	Rain
5:43 AM	68 °F	66 °F	93 %	CALM	0 mph	0 mph	29.70 in	0.1 in	Light Rain
5:54 AM	68 °F	66 °F	93 %	NW	5 mph	0 mph	29.70 in	0.1 in	Light Rain
6:03 AM	68 °F	66 °F	93 %	NNW	6 mph	0 mph	29.70 in	0.0 in	Rain
6:17 AM	68 °F	65 °F	90 %	WNW	8 mph	0 mph	29.71 in	0.0 in	Light Rain
6:32 AM	67 °F	65 °F	93 %	NW	9 mph	0 mph	29.71 in	0.0 in	Light Rain
6:54 AM	66 °F	64 °F	93 %	NW	7 mph	0 mph	29.70 in	0.1 in	Light Rain
June 28-29, 2024									
6:54 PM	74 °F	44 °F	34 %	S	9 mph	0 mph	29.74 in	0.0 in	Mostly Cloudy
7:54 PM	71 °F	47 °F	42 %	S	6 mph	0 mph	29.75 in	0.0 in	Mostly Cloudy
8:54 PM	68 °F	47 °F	47 %	SSE	6 mph	0 mph	29.76 in	0.0 in	Cloudy
9:54 PM	65 °F	49 °F	56 %	SE	6 mph	0 mph	29.77 in	0.0 in	Cloudy

Time	Temp.	Dew Point	Humidity	Wind	Wind Speed	Wind Gust	Pressure	Precip.	Condition
10:54 PM	65 °F	48 °F	54 %	SSE	5 mph	0 mph	29.77 in	0.0 in	Fair
11:54 PM	64 °F	49 °F	58 %	ESE	5 mph	0 mph	29.76 in	0.0 in	Fair
12:54 AM	64 °F	47 °F	54 %	ESE	7 mph	0 mph	29.75 in	0.0 in	Fair
1:54 AM	66 °F	45 °F	47 %	S	6 mph	0 mph	29.75 in	0.0 in	Fair
2:54 AM	66 °F	46 °F	48 %	SSW	7 mph	0 mph	29.75 in	0.0 in	Fair
3:54 AM	67 °F	46 °F	47 %	S	10 mph	21 mph	29.75 in	0.0 in	Fair
4:54 AM	68 °F	46 °F	45 %	S	13 mph	24 mph	29.74 in	0.0 in	Fair
5:54 AM	65 °F	49 °F	56 %	S	17 mph	29 mph	29.75 in	0.0 in	Light Rain
6:54 AM	63 °F	50 °F	63 %	S	18 mph	32 mph	29.76 in	0.0 in	Light Rain
July 26-27, 2024									
6:54 PM	80 °F	55 °F	42 %	WNW	8 mph	0 mph	29.70 in	0.0 in	Fair
7:54 PM	77 °F	55 °F	46 %	WNW	7 mph	0 mph	29.71 in	0.0 in	Fair
8:54 PM	75 °F	56 °F	51 %	WNW	6 mph	0 mph	29.71 in	0.0 in	Fair
9:54 PM	74 °F	57 °F	55 %	CALM	0 mph	0 mph	29.72 in	0.0 in	Fair
10:54 PM	69 °F	59 °F	70 %	SE	3 mph	0 mph	29.73 in	0.0 in	Partly Cloudy
11:54 PM	68 °F	60 °F	76 %	E	3 mph	0 mph	29.74 in	0.0 in	Fair
12:54 AM	65 °F	60 °F	84 %	E	3 mph	0 mph	29.74 in	0.0 in	Fair
1:54 AM	64 °F	59 °F	84 %	E	3 mph	0 mph	29.74 in	0.0 in	Fair
2:54 AM	63 °F	59 °F	87 %	E	3 mph	0 mph	29.75 in	0.0 in	Fair
3:54 AM	62 °F	58 °F	86 %	NE	3 mph	0 mph	29.74 in	0.0 in	Fair
4:54 AM	61 °F	57 °F	87 %	CALM	0 mph	0 mph	29.75 in	0.0 in	Fair
5:54 AM	60 °F	57 °F	90 %	ENE	3 mph	0 mph	29.77 in	0.0 in	Partly Cloudy
6:54 AM	61 °F	57 °F	87 %	E	3 mph	0 mph	29.78 in	0.0 in	Fair

Appendix 5: Qualified Personnel

Certifications

Certified Wildlife Biologist, VT

Eligible Bat Surveyor, VT

Memberships

The Wildlife Society

Northeast Bat

Working Group (PP)

Bat Capture and Acoustic Analysis Training

Advanced Acoustics Master Class (bats) with Joe Szeczak, 2024, 2021

Acoustic Identification of Eastern Bat Species, Vesper Bat Detection Services, LLC., 2022

Combined Field Techniques-Bat Survey Solutions, 2017

Bat Acoustic Data Management Course, Bat Surveys Solutions, 2016

Other Relevant Positions

Board Member, The Vermont Bat Center

Advisory Group Member, Vermont Mammals Scientific

Permits

Federally Permitted Bat Biologist (TE64393C-1)

Meghan Lout, CWB

Senior Bat Biologist

Meghan recently rejoined VHB after three years as a Senior Bat Biologist with the Vermont Agency of Transportation (VTrans). Meghan has extensive experience in the design and conduct of field monitoring associated with environmental compliance under the National Environmental Policy Act (NEPA) and Sections 7 and 10 of the Endangered Species Act (ESA) as they relate to rare, threatened, and endangered bats. Meghan is a federally permitted bat biologist (TE64393-1), a Certified Wildlife Biologist, and a board member of Vermont's Mammals Scientific Advisory Group. In addition, she serves as Past President of The Northeast Bat Working Group after fulfilling roles as both President and President-elect.

Meghan's professional experience includes managing and implementing a variety of surveys for bats, including hibernaculum, mist-netting, harp trapping and affixing radio transmitters, banding bats, and conducting emergence surveys. Meghan is also a regionally recognized leader in acoustic monitoring and the associated analyses.

22 years of professional experience

Education

Applied Biostatistics, University of Massachusetts, 2011

M.S. Ecology, Evolution and Population Biology, Purdue University, 2009

Thesis: Species Interactions at Range Boundaries Along a Tropical Elevational Gradient. Meghan studied patterns in the song differentiation of congeneric bird species at range boundaries in a tropical montane cloud forest to compliment extinction rate predictions of endemic birds through computer modeling.

B.S. Wildlife and Fisheries Conservation, University of Massachusetts, 2003.

Certificate in Tropical Reforestation, The School for Field Studies (Australia), 2002

Capture Experience

VHB and Vermont Fish and Wildlife Department – Vermont – 2024

VHB lead an Indiana bat maternity colony study and captured, radio-tagged, tracked, and conducted emergence surveys at roost trees of Indiana bats.

Vermont Fish and Wildlife Department – Vermont – 2022

Mist-netting little brown bat maternity colonies and processing and banding approximately 100 individuals.

Meghan Lout, CWB

Vermont Fish and Wildlife Department – Vermont – 2019

Mist-netting, affixing transmitters, and tracking eastern small-footed bats at slate quarry.

Vermont Fish and Wildlife Department – Vermont – 2018

Siting and deploying mist-nets with the Vermont Fish and Wildlife Department for the Vermont BioBlitz at North Branch Nature Center. Meghan monitored nets and processed the one bat captured (silver-haired bat).

Vermont Fish and Wildlife Department – Vermont – 2017

Siting, deploying and checking mists with Vermont Fish and Wildlife Department for the Vermont BioBlitz at Mercy Farm.

VTrans – Vermont – 2017

Lead biologist for a Section 7 Consultation that included mist-netting Myotis bats at a bridge replacement project. Responsibilities included siting and deploying mist-nets, processing bats, outfitting four northern long-eared bats with transmitters, tracking individuals to roosts, and conducting exit surveys at roost locations.

Vermont Fish and Wildlife Department, New York State Department of Environmental Conservation (NYSDEC), U.S. Fish and Wildlife Service – Vermont, 2017

Assisted with tracking of five Indiana bats (transmitters affixed by the NYSDEC) as they emerged from Barton Hill Mine and flew to Vermont.

National Parks Service – Kentucky, 2017

Meghan attended a field course as an assistant, and advanced student, that included the capture of bats at Mammoth Cave National Park using harp traps and mist-nets (see table on page 4 for species captured).

Vermont Fish and Wildlife Department – Vermont – 2017

Deployed mist-nets and a harp trap at newly discovered northern long-eared bat and little brown bat maternity colonies (due to Meghan's capture and tracking efforts). A total of 39 little brown bats and one eastern red bat were captured within 30 minutes of opening nets, which required rapid and appropriate handling of bats. All little brown bats were processed and banded.

Wind Energy Developments – Maryland and New York, 2011-2016

Meghan coordinated and assisted with mist-netting surveys, transmittering, and tracking at least four Indiana and northern long-eared bats each at proposed and operational wind energy facilities.

Meghan Lout, CWB

University of Kentucky, Idaho, 2005

Meghan was the field crew leader who sited mist-net locations, captured, transmittered, and tracked 30 northern long-legged myotis. She tracked tagged bats to day-roost locations and conducted night-time telemetry on transmittered individuals.

Hibernacula Surveys

Moriah, NY – 2018, 2022, 2024

Meghan identified hundreds of Indiana bats, little brown bats, and eastern small-footed baths at each survey.

East Dorset, VT – 2018-2020, 2023, 2024

Meghan identified dozens of little brown bats and norther long-eared bats.

Dover, VT – 2018

Meghan identified approximately five hibernating little brown bats.

Fur and Tissue Sampling

Robertson Mill Pond Preserve – North Carolina, 2019

Meghan collected fur and tissue samples from two live southeastern myotis bats and one eastern red bat that were captured in mist-netting surveys for the State of Georgia. She has also collected hundreds of fur and tissue samples from wind-turbine killed bats.

See table on page 4 for a list of fur and tissue samples taken from bat casualties recovered at wind energy facilities for research being conducted by Frostburg State University, Frostburg, MD.

Bat Habitat Assessments

Meghan has conducted habitat assessments consistent with the U.S. Fish and Wildlife Service's current guidance of a given year for the Indiana bat, northern long-eared bat, and tri-colored bat. She is also experienced in performing building structural assessments for other bat species.

- VTrans, seven Projects throughout Vermont, 2024
- All Structure Projects while working for VTrans – 2020 – 2023
- Burlington Parks and Recreation, Burlington Bike Path, Phase 4 – VT, 2019
- VTrans, Coggman Bridge Rehabilitation Project – VT, 2018
- Massachusetts Department of Transportation (MassDOT) and Federal Railroad Administration (FRA), Patriot Corridor Rail Project – MA, 2018
- Mount Snow, Mount Snow Phase 1 Project, VT, 2018
- Green Mountain Power, Lake Dunmore Dam – VT, 2018
- VTrans & FRA, Leicester Wye Project – VT, 2017

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- Encore Renewables, Magee Hill Solar Project – VT, 2017
- VTrans & FRA, Middlebury Bridge and Rail Project – VT, 2016 and 2017
- City of Saint Albans & VTrans, Saint Albans Multi-Modal Connector Project, VT, 2016
- Vermont Gas, Gas Pipeline Project – VT, 2016
- VTrans, Bridge 77 Project – VT, 2016
- Babson College, The Innovation Center Project – MA, 2016
- VTrans, Bridge No. 7, 11, and 46 – VT, 2016
- Invenergy, Beech Ridge Expansion Wind Project – WV, 2015
- EDP Renewables North America, Confidential Wind Project – MD, 2014
- Private Developer, Confidential Wind Project – PA, 2012

Bridge/Culvert/Structural Inspections

- VTrans, 10 structures throughout Vermont, 2024
- The National Parks Service, Sleeping Bear Dunes National Seashore,
- 37 structural inspections – MI, 2024
- Numerous bridge inspections while with VTrans – 2020-2023
- VTrans, Coggman Bridge Rehabilitation Project – VT, 2018
- VTrans, Westminster Bridge Rehabilitation Project – VT, 2018
- VTrans, & FRA, Middlebury Bridge and Rail Project – VT, 2017
- VTrans, Bridge No. 7, 11, and 46 – VT, 2016
- VTrans, Bridge 77 Project – VT, 2016

Bat-Handling and Survey Experience by Species

APPROXIMATE NUMBER OF BATS HANDLED (LOCATIONS)								
SPECIES	# CAPTURED (LOCATIONS/YEARS)	# BATS TRANS-MITTERED/ TRACKED	# BATS BANDED	#BATS WITH FUR AND TISSUES SAMPLED	# BATS GUANO COLLECTED	APPROXIMATE # BAT CARCASSES IDED AT WIND PROJECTS (LOCATIONS/YRS)[1]	AREAS SURVEYED (FOR LIVE CAPTURES ONLY)	APPROXIMATE # HOURS WITH SPECIES
Eptesicus fuscus	75 (VT, 2017/2020; KY, 2017)	-	75	-	-	100 (WV, MD, NY, ME, NH, PA), 2012-2016	Structures, flight corridors near water	19
Lasiurus borealis	51 (ID, 2004; NY/PA, 2014; VT/KY, 2017; NC, 2019)	-	20	1	-	1,000 (WV, MD, NY, ME, NH, PA), 2012-2016	Wooded areas	122
Myotis leibii	38 (VT, 2017/2020; KY, 2017)	2	36	-	-	-	Cave entrances	0.5
Nycticeius humeralis	33 (KY, 2017)	-	0	-	-	-	Wooded areas, cave entrances	1
Myotis grisescens	41 (KY, 2017)	-	0	-	-	-	Cave entrances	5
Lasiurus cinereus	91 (ID, 2004; NY/PA, 2012-2015; KY, 2017)	-	10	-	-	600 (WV, MD, NY, ME, NH, PA), 2012-2016	Open areas, some near water	75
Myotis Austroriparius	2 (NC, 2019)	-	2	2	2		Wooded swamp	0.5
Myotis sodalis	24 (VT, 2024; KY, 2017)	8	24	-	8	3 (IN, 2014; VT, 2017)	Cave entrances, forested clearings	11
Myotis lucifugus	160 (VT, 2016/2017; KY, 2017)	-	106	-	40	550 (MD, PA) 2010-2012	Houses, structures	65
Myotis septentrionalis	14 (VT, 2017/2019; KY, 2019)	12	57	-	-	5 (MD/PA, 2013; VT, 2019)	Flight corridor, cave entrances	7
Myotis volans	30 (ID, 2004)	30	30	-	30	-	Forested areas near water	5
Corynorhinus rafinesquii	18 (KY, 2017)	-	30	-	-	-	Wooded areas, cave entrances	3.5
Lasiurus seminolus	-	-	-	-	-	10 (WV and MD) 2012-2016	High elevations, wooded clearings	2
Lasionycteris noctivagans	28 (ID, 2004; OH, 2010; NY/PA 2014/2015; KY, 2017; VT, 2017/2018; NC, 2019)	-	-	-	-	250 (WV, MD, NY, ME, NH, PA) from 2012-2016	Wooded areas near water	5
Perimyotis subflavus	26 (KY, 2017)	-	50	-	-	5 (NH, WV), 2015	Cave entrances	6.5

Meghan Lout, CWB

Bat Fatality Monitoring

West Virginia, Maryland, New Hampshire, Pennsylvania, New York, 2011-2015 Meghan was project manager/field coordinator for or monitor at more than 20 post- construction fatality monitoring studies at wind energy facilities from 2010 through 2015 (see the table below). Meghan confirmed the identification of hundreds of injured and dead bats, including Myotis, Perimyotis and migratory tree bats (see table that follows.)

Representative wind energy projects where Meghan was the technical lead in avian and bat identification either visually and/or acoustically.

WIND ENERGY FACILITY	DEVELOPER	LOCATION	YEARS	SURVEY TYPE[1]
Jericho Rise Wind Project	EDP Renewables North America	Lewis County, NY	2015	P/A, LTA
Quilt Block Wind Project	EDP Renewables North America	Lafayette County, WI	2015	other
Kimberly Run Wind Project	Everpower Wind Holdings	Somerset County, PA	2016	LTA
Mason Dixon Wind Project	Everpower Wind Holdings	Somerset County, PA	2017	LTA
Highland North Wind Project	Everpower Wind Holdings	Somerset County, PA	2018	P/A, LTA
Stiles Brook Wind Project	Avangrid (Iberdrola Renewables)	Windham and Grafton Counties, NH	2015	P/A, LTA
Groton Wind Project	Avangrid (Iberdrola Renewables)	Grafton County, NH	2012-2015	LTA
Pinewood Wind Project	Apex Clean Energy LLC	Pulaski County, NC	2012-2015	LTA
Rocky Forge Wind Project	Apex Clean Energy LLC	Botetourt County, NC	2012-2015	LTA
Beech Ridge Wind Project	Invenergy LLC	Greenbrier and Nicholas Counties, WV	2011-2015	LTA, FM
Beech Ridge Expansion	Invenergy LLC	Greenbrier and Nicholas Counties, WV	2015	other
Arkwright Summit Wind Project	EDP Renewables North America	Freedonia County, NY	2015-2016	P/A, LTA
Marble River Wind Project	EDP Renewables North America	Clinton County, NY	2014-2015	MN, P/A, LTA, FM
Maple Ridge I and II Wind Projects	EDP Renewables North America	Lewis County, NY	2014	P/A, LTA, FM
Fair Winds Wind Project	Exelon Generation LLC	Garrett County, MD	2014	P/A, LTA, FM
Spruce Ridge Wind Project	EDP Renewables	Grafton County, NH	2014	LTA
Lempster Wind Project	Avangrid (Iberdrola Renewables)	Sullivan County, NH	2012-2014	other
Criterion Wind Project	Exelon Generation LLC	Garrett County, MD	2011-2014	MN, LTA
Beethoven Wind Project	Beethoven LLC	McPherson County, SD	2014	other
Howard Wind Project	Everpower Wind Holdings LLC	Steuben County, MD	2012-2013	LTA, FM
Greenfield Wind Project	EDP Renewables North America	Lackawanna County, PA	2012	other
Number 9 Wind Project	EDP Renewables North America	Aroostic County, ME	2013	LTA
Hardscrabble Wind Project	Avangrid (Iberdrola Renewables)	Herkimer County, NY	2013	LTA, FM
Stony Creek Wind Farm	Stony Creek LLC	Somerset County, PA	2012	other
Cape Vincent Wind Project	BP Wind Energy North America	Jefferson County, NY	2012	other
Alder Stream Wind Project	Pattern Energy	Franklin County, ME	2012	LTA
High Sheldon Wind Farm	Invenergy LLC	Wyoming County, NY	2011	LTA, FM
Forward Wind Project	Sun Edison	Somerset County, PA	2010	FM
Lookout Wind Project	Sun Edison	Somerset County, PA	2010	LTA

[1]Mist-netting (M), Presence/Probable Absence Acoustic (P/A); Long-Term Acoustics (LTA), Fatality Monitoring (FM)

Bat Identification, Handling and Banding Experience at The Vermont Bat Center

SPECIES	2015	2016	2017	2018	2019	2022	2023	2024
	# BATS/ # BATS BANDED	# BATS/ # BATS BANDED	# BATS/ # BATS/BANDED	# BATS/ # BATS/BANDED	# BATS/ # BATS/BANDED	# BATS/ # BATS/BANDED	# BATS # BATS/BANDED	# BATS # BATS/BANDED
Eptesicus fuscus	26 / 16	45 / 22	38 / 22	58 / 18	4 / 1	-/-	4 / 1	17 / 16
Eptesicus fuscus (pups, hand-raised)	17/10	14/4	12/11	4 / 2	- / -	-/-	-/-	-/-
Myotis lucifugus	4 / 1	15/10	13/10	13/6	5/-	12/-	11/-	5/4
Myotis septentrionalis	1 / 1	5 / 2	1 / -	1 / -	2/-	3/-	1/-	-/-
Myotis Leibii	-/-	-/-	-/-	-/-	2/-	-/-	-/-	2/1
Lasiurus cinereus	1 / -	1 /-	-/-	-/-	-/-	1/-	-/-	-/-
Perimyotis subflavus	-/-	-/-	-/-	-/-	-/-	-/-	-/-	-/-
Nycticeius humeralis	-/-	-/-	-/-	-/-	-/-	-/-	-/-	1/-
Lasiurus borealis	-/-	-/-	-/-	-/-	-/-	-/-	-/-	1/-
Tadarida brasiliensis	-/-	-/-	-/-	-/-	-/-	-/-	-/-	7/-
Corynorhinus rafinesquii	-/-	-/-	-/-	-/-	-/-	-/-	-/-	1/-

Meghan Lout, CWB

Bat Acoustic Monitoring

Meghan is an expert in acoustic monitoring, proper conduct of surveys, data management, and subsequent reporting requirements. She has used Anabat, Song Meter (SM) 2BAT and SM3BAT, and Pettersson D500x Acoustic Detectors. Meghan conducts acoustic analyses using Bat Call Identification, Kaleidoscope Pro, approved versions and SonoBat. Meghan was the technical lead at the following projects:

Active Acoustic Monitoring

- National Parks Service, Sleeping Bear Dunes National Lakeshore, MI, 2024
- VTrans – various projects, 2020-2023
- Civil Engineering Associates, Vermont National Country Club—VT, 2019
- VTrans, Woodford Roadcut Civil Engineering Associates, Vermont National Country Club—VT, 2019
- CRW Consulting Brattleboro Housing Demolition Project – VT, 2018
- VTrans, Coggman Bridge Replacement Project—VT, 2018
- VTrans, Westminster Bridge Replacement Project—VT, 2018
- VFWD, Weybridge Street Mitigation Surveys—VT, 2018
- VTrans & FRA, Middlebury Bridge and Rail Project—VT, 2017
- VTrans, Encore Renewables, Magee Hill Solar Project—VT, 2017
- VTrans, Bridge No. 6 Rehabilitation Project—VT, 2016
- VTrans, Bridge No. 11 Replacement Project—VT, 2016
- VTrans, Bridge No. 46 Replacement Project—VT, 2016
- VTrans & FRA, Middlebury Bridge and Rail Project—VT, 2016

Passive Acoustic Monitoring

- VTrans - seven projects throughout VT, 2024
- Encore Renewables - two projects in VT, 2024
- The City of Burlington, City Center, 2024
- VTrans – 20 Projects, VT (State-wide), 2021
- VTrans – 35 Projects, VT (State-wide), 2020
- Civil Engineering Associates, Vermont National Country Club—VT, 2019
- VTrans, Woodford Roadcut—VT, 2019
- Dramby Environmental Consulting, Confidential Project—TN, 2019
- Killington/Pico Ski Resort, Squeeze Play Terrain Park—VT, 2019
- U.S. Forest Service, Goshen Emergency Spillway Project—VT, 2019
- VTrans, Woodford Road Cut—VT, 2019
- VHB Bat Training Workshop, Robertson Mill Pond Preserve—NC, 2019
- VTrans, Coggman Bridge Replacement Project—VT, 2018

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- Project and technical lead for MassDOT projects, 2019
  - Connecticut River and bikeway construction, Chicopee
  - Reconstruction of Route 143, Worthington
  - Bridge replacement, New Marlborough
  - Bridge superstructure replacement, Middlefield
  - Bridge replacement, Sheffield
  - Resurfacing on the Ashuwillticook Rail Trail, Adams/Cheshire/Lanesborough
  - Bridge replacement, Pittsfield
  - Culvert replacements, Dennis
  - Culvert replacements, Saugus
  - Bridge Replacement, Lynn and Saugus
- VTrans, Westminster Bridge Replacement Project—VT, 2018
- VFWD & VTrans, North Branch Nature Center Bioblitz—VT, 2018
- MassDOT & PanAmerican Railways Patriot Corridor Fall Swarming Surveys—MA, 2018
- Project and technical lead for MassDOT Transportation Projects, 2018
  - Reconstruction of Routes 6 and 28, Wareham
  - Intersection Improvements, Hingham
  - Columbia Greenway Rail Trail Construction, Westfield
  - Glendale Road Reconstruction, Southampton
  - Pedestrian Bridge Rehabilitation, Brookline
  - Road Widening, Lennox
  - Ashuwillticook Rail Trail Extension, Lanesborough/Pittsfield
  - Intersection Improvements, Pembroke
  - Corridor Improvements on Route 123, Norton
  - Road Resurfacing, Marshfield and Hingham
  - Bridge Preservation, Randolph
  - Highway Lighting Upgrade in Interstate 91, Chicopee/West Springfield
- Washington Gas, Offset J Loop Project—VA, 2018
- National Parks Service, Mammoth Cave National Park—KY, 2017
- FRA & VTrans, Middlebury Bridge and Rail Project—VT, 2017
- Encore Renewables, Magee Hill Solar Project—VT 2017
- MassDOT Transportation Projects—MA, 2017
  - Goshen Resurfacing Project
  - Sheffield Bridge Replacement
  - Agawam/West Springfield Bridge Replacement
  - Congamond Road Reconstruction Project

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- Shrewsbury Resurfacing and Widening Project
- Raynham Bridge Replacement
- Berkley/Freetown Resurfacing Project
- Fitchburg/Lunenburg/Leominster Reconstruction Project

- Babson College, Innovation Center Project (presence/probable absence and fall swarming/spring emergence surveys), Wellesley, MA, 2016 and 2017
- Cold River Camp Inventory, Appalachian Mountain Club, NH, 2016
- Bridge No. 11 Replacement Project, VTrans, Montpelier, VT, 2016
- Bridge No. 46 Replacement Project VTrans, Saint Johnsbury, VT, 2016
- Middlebury Bridge and Rail Project, FRA & VTrans, Middlebury, VT, 2016
- Avangrid (Iberdrola Renewables), Stiles Brook Wind Project—VT, 2015
- EDP Renewables North America, Jericho Rise Wind Project—NY, 2015
- EDP Renewables North America, Kimberly Run Wind Project—PA, 2015
- EDP Renewables North America, Mason Dixon Wind Project—PA, 2015
- EDP Renewables North America, Highland North Wind Project—PA, 2015
- Avangrid (Iberdrola Renewables), Groton Wind Plant—NH, 2012-2015
- Apex Clean Energy, Pinewood Wind Project—VA, 2012-2015
- Apex Clean Energy, Rocky Forge Wind Project—VA, 2012-2015
- EDP Renewables North America, Arkwright Summit Wind Project—NY, 2015
- EDP Renewables North America, Marble River Wind Project—NY, 2015
- EDP Renewables North America, Maple Ridge I and II Wind Projects—NY, 2014-2015
- Exelon Generation, Fair Winds Wind Project—MD, 2014
- EDP Renewables North America, Spruce Ridge Wind Project—NH, 2014
- Exelon Generation, Criterion Wind Project—MD, 2011-2014
- EDP Renewables North America, Number Nine Wind Project—ME, 2013
- Avangrid (Iberdrola Renewables), Hardscrabble Wind Project—NY, 2013
- VT Electric Company—VT, 2012
- Pattern Energy, Alder Stream Wind Project—ME, 2012
- Everpower Wind Holdings, Howard Wind Project—NY, 2012
- Invenergy, High Sheldon Wind Farm—NY, 2011
- Invenergy, Beech Ridge Wind Project—WV, 2011
- Sun Edison, Look out Wind Project—PA, 2010

Meghan Lout, CWB

Expert Testimony

Surfside Crossing Partners, LLC – Massachusetts, 2019

Meghan reviewed documents prepared by the Massachusetts Natural Heritage and Endangered Species Program, and reports and interpretation of acoustic data of Project opponents to provide rebuttal exert and live testimony related to whether the State's No Take Determination for the northern long-eared bat was made in accordance with the Massachusetts Endangered Species Act.

Other Professional Experience

2020-2023-Present : Vermont Agency of Transportation: Biologist/Bat Specialist

- Review transportation projects for impacts to natural resources
- Primary Job Responsibilities: write Resource Identification Memorandums and NEPA Clearances; Conduct surveys for RT&E species; wetland delineations and permitting; Army Corps of Engineers permitting

2016-2020: Vanasse Hangen Brustlin (VHB): Wildlife Biologist/Bat Specialist

- Conduct/Supervise wildlife surveys for RT&E Species, primarily bats
- NEPA and ESA reporting
- Developing Scopes of Work and Study Plans for RT&E species

2011-2016: Western EcoSystems Technology, Inc.: Wildlife Biologist/Project Manager (Vermont)

- Conduct/supervise wildlife surveys for RT&E species
- Train field technicians
- NEPA and ESA field research, permitting, and reporting for wildlife studies at wind energy facilities
- Developing Scopes of Work and Study Plans for RT&E species

2011 Springfield College—Adjunct Professor of Ecology (fall semester; Springfield, MA) Adjunct Professor of Ecology: Biology 260 (Ecology), 261 (Ecology lab)

2011 University of Massachusetts: Wood Thrush Field Biologist (Amherst, MA)

- Assisted with nest searches, mounting transmitters on and tracking fledglings for research investigating population decline

2010-2011 Stantec Consulting—Avian and Bat Migration Technician (Topsham, ME)

- Supervised pre and post-construction surveys at proposed and operational wind energy facilities in Pennsylvania.
- Assisted with bat acoustic monitoring data analysis and writing technical reports.

Meghan Lout, CWB

2006-2009 Purdue University—Graduate Student Research (West Lafayette, IN and Costa Rica)

- Investigated song differentiation of nightingale thrushes at range boundaries to test hypotheses addressing forces underlying species distributions, and whether such interactions could affect range shifts and subsequent extinction rates predicted by climate change models.
- Recorded and analyzed avian vocalizations; territory mapping.

2005 University of Kentucky—Bat Research Technician (Lexington, KY and northern ID)

- Supervised a research project investigating the roosting and foraging ecology of bats in response to various forest management practices
- Mist-netted, processed and mounted transmitters on, and tracked bats to roosts using radio telemetry equipment

2005 USGS/Northern Prairie Wildlife Research Center—Sandhill Crane Research Technician (Jamestown, ND and North Platte River in NE)

- Assisted with rocket-netting, processing, mounting transmitters on, and tracking foraging and roosting sandhill crane using null-peak telemetry to understand use of the North Platte River by cranes

2004 Utah State University—Ferruginous Hawk Research Assistant (Logan and Uintah Basin, UT)

- Conducted aerial and ground-based hawk and eagle surveys for research assessing the impact of oil and gas well developments on ferruginous hawk
- Banded, mounted transmitters on nestlings and tracked until dispersal

2003-2004 The Peregrine Fund—California Condor Field Biologist (Northern, AZ)

- Assisted with reintroduction/monitoring of the California condor
- Tracked, handled, chelated sick birds and monitored behavior

2000-2001 U.S. Fish and Wildlife Service—Ornithology Intern (North Chatham, MA and The Eastern MA National Wildlife Refuge Complex)

- Monitored shorebirds, conducted staging counts and censuses
- Conducted passerine, marsh-bird, waterfowl and horseshoe crab surveys
- Assisted with gull population and nocturnal predator control

Presentations

- The Vermont Agency of Transportation, VHB, and Stantec Team Together for Statewide Bat Monitoring, Northeast Transportation and Wildlife Conference, Mystic, CT, 2024
- The Vermont Agency of Transportation, VHB, and Stantec Team Together for Statewide Bat Monitoring, Northeast Bat Working Group Conference, Saratoga, NY, 2024
- State-wide Monitoring for the Northern Long-eared Bat, Northeast Bat Working Group Conference, Burlington, VT, 2023

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- NEBWG 2023 AND 2024
- Acoustic Monitoring Results and Mitigation for Bat Species at Transportation Projects Throughout Vermont, Northeast Bat Working Group Conference Manchester, NH 2022
- Northern long-eared Bats and Little brown Bats at the Middlebury Bridge and Rail Project, Vermont, Northeast Bat Working Group Conference, Manchester, NH 2022
- Acoustic Monitoring Results and Mitigation for the Northern Long-eared bat (Myotis Septentrionalis) at Transportation Projects throughout Vermont, Northeast Bat Working Group Conference, virtual, 2021
- National Bat Week Presentations for VTrans – 2020 and 2021
- Avoidance, Minimization and Mitigation of Vermont Bats, Vermont Institute of Natural Sciences Bat Panel, 2021
- Acoustic Monitoring of the Northern Long-eared Bat Throughout Vermont, Northeast Bat Working Group Conference, 2021
- Presence of the Northern Long-eared Bat in Urban Vermont, Northeast Bat Working Group Conference – Saratoga Springs, NY, 2020
- Presence of the Northern long-eared Bat at Historic Hibernaculum—State College, PA, 2019
- Identifying Suitable Habitat for Rare, Threatened and Endangered Bats—Vermont Electric Company, South Burlington, VT, 2018
- Unexpected Use of Anthropogenic Structures and Urban Areas by the Northern Long-eared Bat—Northeast Bat Working Group and Small Mammals Colloquium Conference, Roanoke, VA, 2018
- Land Use Review Guidance for Bats—Vermont Fish and Wildlife's Land Use Review Training for Northern Long-eared Bats in VT, Castleton, VT, 2017
- Unexpected Co-habitation of Bridge Roosts by Myotis Bats—Northeast Bat Working Group Conference, Amherst, MA, 2017
- Bats, Regulations and Vermont Projects—Vermont Society of Engineers, Waterbury, VT, 2017
- Bats of New Hampshire—Appalachian Mountain Club, North Chatham, NH, 2016
- Bats and Bridges—Northeast Transportation and Wildlife Conference, Lake Placid, NY, 2016
- Using Acoustic Monitoring to Determine Impacts of Wind Energy to Migratory Songbirds, Cornell University – Ithaca, NY, 2015
- Species Interactions at Range Boundaries Along a Tropical Elevational Gradient, Purdue University – West Lafayette Indiana, 2010