Kitty Hawk Wind

AVANGRID

Construction and Operations Plan

Appendix T - Offshore Bat Acoustic Survey Report

September 30, 2022

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Appendix T – Offshore Bat Acoustic Survey Report

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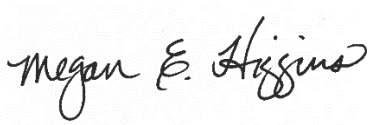
TETRA TECH		
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Revision Summary				
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01	01 Mar 2021	Tetra Tech, Inc.	Brian Benito, Jr.	Marcus Cross
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02	None	None	Updated based on Project name

As of Q3 2022, the Company has updated the Project name from “Kitty Hawk Offshore Wind Project” to “Kitty Hawk North Wind Project”.

The technical content of this report has not been changed since the previous submission.

Construction and Operations Plan
Kitty Hawk North Wind Project
Lease Area OCS-A 0508

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ACRONYMS AND ABBREVIATIONS

Company	Kitty Hawk Wind, LLC
ESP	Electrical Service Platform
Lease Area	designated Renewable Energy Lease Area OCS-A 0508
Project	Kitty Hawk North Wind Project
U.S.	United States of America
USFWS	U.S. Fish and Wildlife Service

T.1 INTRODUCTION

Kitty Hawk Wind, LLC (the Company), a wholly owned subsidiary of Avangrid Renewables, LLC proposes to construct, own, and operate the Kitty Hawk North Wind Project (the Project). The Project will be located in the designated Renewable Energy Lease Area OCS-A 0508 (Lease Area). The Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf was awarded through the Bureau of Ocean Energy Management competitive lease auction of the Wind Energy Area offshore of North Carolina. The Lease Area covers 49,536 hectares and is located approximately 44 kilometers offshore of Corolla, North Carolina, (Figure T-1).

At this time, the Company proposes to develop approximately 40 percent of the Lease Area in the northwest corner closest to shore (19,814 hectares; the Wind Development Area). The Project will connect from the electrical service platform (ESP) through offshore export cables (within a designated corridor) and onshore export cables to the new onshore substation in the City of Virginia Beach, Virginia, where the renewable electricity generated will be transmitted to the electric grid.

The offshore components of the Project, including the wind turbine generators, ESP, and inter-array cables, will be located in federal waters within the Lease Area, while the offshore export cable corridor will traverse both federal and state territorial waters of Virginia.

The Company contracted Tetra Tech, Inc. to deploy an acoustic bat detector during offshore survey activities in 2020 within the Wind Development Area. The acoustic detector was attached to the survey vessel Gerry Bordelon, which operated across the entire Wind Development Area for 77 nights between May and November 2020, to assess the presence/absence of bats in the Wind Development Area. The results from this survey provide an environmental baseline for bats, which will support permitting activities and detailed Project siting for the Project.

T.1.1 Project Area Description

For the purposes of this document, the Project Area is defined as the Wind Development Area (Figure T-1). This area is within the Mid-Atlantic Bight, which is an oceanic region that spans coastal and offshore waters from Cape Cod, Massachusetts, to Cape Hatteras, North Carolina, and is characterized by a broad expanse of gently sloping, sandy-bottomed continental shelf. In this area, the shelf extends up to 150 kilometers offshore, where the waters reach to about 200 meters deep.

T.1.2 Bat Species Potentially Occurring in the Project Area

Migratory tree bats have the potential of occurring in the Project Area during migration based on species range and documented offshore occurrence. Tree bats generally migrate to southwestern and southern parts of the United States (U.S.) to overwinter (Cryan 2003, Cryan et al. 2014), including North Carolina and Virginia (LeGrand et al. 2020), and have been documented in the offshore environment (Hatch et al. 2013). Even though roosting opportunities are essentially absent, a small number of migratory tree bats may potentially be transient in the Wind Development Area during migratory periods (spring and late summer/early fall), and have been observed offshore during fall migration (Johnson et al. 2011; Sjollema 2011; Hatch et al. 2013; Peterson et al. 2014; Dowling et al. 2017). However, their use of the Wind Development Area would “likely be rare” (BOEM 2015) and offshore use is expected to be “very low and limited to spring and fall migration periods” and “under very specific conditions like low wind and high temperatures” (BOEM 2020).

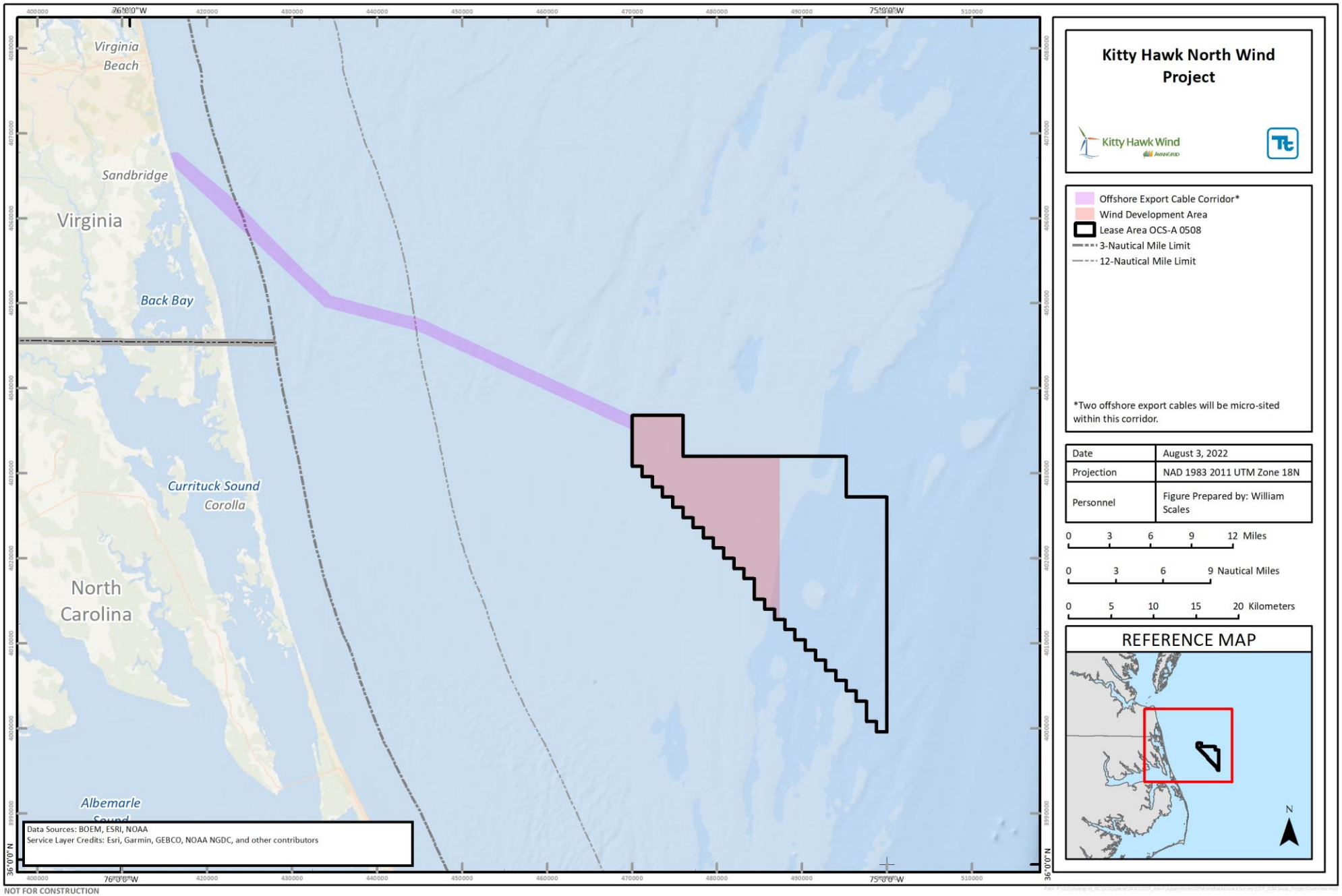

Figure T-1. Wind Development Area and Export Cable Corridor

Eastern red bats (*Lasiurus borealis)* are the most frequently encountered species off the Atlantic Seaboard during fall migration and may regularly travel along the Outer Continental Shelf during migration (Hatch et al. 2013, Peterson et al. 2014, Dowling et al. 2017). In the Mid-Atlantic, 78 percent of all bat detections offshore were from eastern red bats, and they were observed up to 43 kilometers offshore (Hatch et al. 2013, Sjollema et al. 2014). Silver-haired bats (*Lasionycteris noctivagans)* in particular may migrate along coastlines, and both silver-haired and hoary bat were recorded off the northeastern Atlantic Coast (Cryan 2003, NJDEP 2010). The eastern r ed bat, silver-haired bat, and hoary bat (*Lasiurus cinereus)* also represent the most commonly found species during post-construction mortality studies at most operational land-based wind energy facilities in North America (Arnett et al. 2008). Seminole bat (*Lasiurus seminolus)* and northern yellow bat (*Lasiurus intermedius)* are also long-distance migrants but their use offshore is unknown.

Regional migrants primarily consist of cave-hibernating bat species that also migrate during the fall (Stantec 2016, Peterson et al. 2014), but exhibit lower activity in the offshore environment than the long-distance migratory tree bats (Sjollema et al. 2014, BOEM 2020). In the Mid-Atlantic, the maximum distance any *Myotis* species (e.g., northern long-eared bat [*Myotis septentrionalis]*, little brown bat [*Myotis lucifugus]*, eastern small-footed bat [*Myotis leibeii]*, and southeastern myotis [*Myotis austroriparius]*) were detected offshore was 11 kilometers (Sjollema et al. 2014). Big brown bats (*Eptesicus fuscus),* little brown bats, and northern long-eared bats occur along coastal Virginia, and are associated with coastal islands (Peterson et al. 2014; Table T-1). Little brown bats and big brown bats have been observed traveling from Martha's Vineyard to the mainland in the late summer and fall, most likely to reach hibernacula on the mainland (Dowling et al. 2017). Although northern long-eared bats are found on Martha's Vineyard in abundance, they have not been observed to be seasonally migrating to the mainland for winter hibernation during nanotag tracking surveys (Dowling et al. 2017). While in a different region, the Biological Assessment for Vineyard Wind 1 indicated that there are no records of northern long-eared bats on the Atlantic Outer Continental Shelf, and concluded that it was "extremely unlikely" that this species would pass over offshore portions of that project (BOEM 2019). No recorded offshore presence has been confirmed, although unknown Myotis species (possibly little brown bats and northern long-eared bats) have frequently been documented on coastal islands, and occasionally in offshore environments (Peterson et al. 2014, Sjollema et al. 2014), but predominantly at distances much closer to the mainland than the Wind Development Area. Tri-colored bats (*Perimyotis subflavus)* have been acoustically documented on large islands up to 8 kilometers offshore (Johnson and Gates 2008), although they have not been detected in distant offshore environments.

A total of 17 bat species are known to occur in Virginia and North Carolina, 14 of which have the potential to occur onshore adjacent to the Project Area (Table T-1; Harvey et al. 2011, NCWRC 2015, VDGIF 2018, BCI 2020). The ranges of the federally endangered Indiana bat (*Myotis sodalis*), gray bat (*Myotis grisescens*), and Virginia big-eared bat (*Corynorhinus townsendii virginianus*) do not occur along the coast of Virginia or North Carolina and represent the three species unlikely to be present in the Project Area. While bat distribution and abundance offshore is largely unknown (Pelletier et al. 2013), available information indicates that migratory tree bats (hoary, eastern red, Seminole, northern yellow bat, and silver-haired bats) have the potential to pass through the Wind Development Area. However, a small number of bats are expected in the Wind Development Area (BOEM 2020) given its distance from shore (BOEM 2015). The potential occurrence of the remaining nine bat species (evening bat [*Nycticeius humeralis*], big brown bat, little brown bat, northern long-eared bat, eastern small-footed bat, southeastern myotis, tri-colored bat, Brazilian free-tailed bat [*Tadarida brasiliensis*], and Rafinesque's big-eared bat [*Corynorhinus rafinesquii*]) is very low, as they are not generally observed offshore (Sjollema et al. 2014, Dowling and O'Dell 2018, BOEM 2020).

Table T-1. Bat Species Potentially Occurring in the Project Area.

Common Name	Scientific Name	Migratory Status a/	Offshore Presence	Federal Status b/
Brazilian free-tailed bat	*Tadarida brasiliensis*	Long-distance migrant	No offshore records found.	–
Eastern red bat	*Lasiurus borealis*	Long-distance migrant	Numerous historical and current accounts in offshore environments up to 322 kilometers offshore. Observed by boats with no land nearby.	–
Hoary bat	*Lasiurus cinereus*	Long-distance migrant	Numerous historical and current accounts in offshore environments up to 80 kilometers offshore. Observed by boats with no land nearby and some occurrences of non-residents in Bermuda 1,046 kilometers from nearest mainland.	–
Northern yellow bat	*Lasiurus intermedius*	Long-distance migrant	No offshore records found.	–
Seminole bat	*Lasiurus seminolus*	Long-distance migrant	Have been observed during fall migration and winter on the island of Bermuda (1,046 kilometers from the coast of the U.S.).	–
Silver-haired bat	*Lasionycteris noctivagans*	Long-distance migrant	Numerous historical and current accounts in offshore environments up to 210 kilometers offshore. Observed by boats with no land nearby and some occurrences of non-residents in Bermuda 1,046 kilometers from nearest mainland.	–
Eastern small-footed bat	*Myotis leibeii*	Regional migrant	Has only been observed in coastal environments and islands very close to land such as Mount Desert Island, ME (<0.8 kilometers). Unidentified *Myotis* species have been recorded in offshore environments up to 137 kilometers from mainland.	–
Evening bat	*Nycticeius humeralis*	Regional migrant	No offshore records found.	–
Little brown bat	*Myotis lucifugus*	Regional migrant	Often found on large islands with suitable habitat up to 8 kilometers offshore such as Nova Scotia, Martha's Vineyard (MA), and Mount Desert Island (ME). Has been observed regionally migrating from Martha's Vineyard to mainland.	SSA
Northern long-eared bat	*Myotis septentrionalis*	Regional migrant	Often found on large islands with suitable habitat up to 8 kilometers offshore such as Nova Scotia, Martha's Vineyard (MA), and Mount Desert Island (ME). Unidentified *Myotis* species have been recorded in offshore environments up to 137 kilometers from mainland.	SSA, T

Common Name	Scientific Name	Migratory Status a/	Offshore Presence	Federal Status b/
Rafinesque's big-eared bat	*Corynorhinus rafinesquii*	Regional migrant	No offshore records found.	–
Southeastern myotis	*Myotis austroriparius*	Regional migrant	No offshore records found.	–
Tri-colored bat	*Perimyotis subflavus*	Regional migrant	Often found on large islands with suitable habitat up to 8 kilometers offshore such as Nova Scotia, Martha's Vineyard (MA), and Assateague Island (MD and VA).	SSA, P
Big brown bat	*Eptesicus fuscus*	Non-migratory	Often found on large islands with suitable habitat up to 8 kilometers offshore such as Nova Scotia, Martha's Vineyard (MA), Assateague Island (MD and VA), and Mount Desert Island (ME).	–

a/ Sources: Griffin 1940, Zimmerman 1998, Buresch 1999, Broders et al. 2003, Menzel et al. 2003, Wingate 2007, Johnson and Gates 2008, Harvey et al. 2011, Pelletier et al. 2013, Hatch et al. 2013, Sjollema 2011, Pelletier et al. 2013, Sjollema et al. 2014, Smith and McWilliams 2016, Dowling et al. 2017, USFWS 2018a, and BCI 2020.

b/ SSA = Undergoing Species Status Assessment (USFWS 2020a); P = Under petition to be listed on the Endangered Species Act (USFWS 2017). T= Threatened or E= Endangered under the Endangered Species Act (USFWS 2018a)

T.1.3 Federally Protected Bats

Of the 45 species of bats known to occur in the continental U.S., 5 species and 2 subspecies are currently federally listed as threatened or endangered, and protected under the federal Endangered Species Act (USFWS 2018a). These include the Florida bonneted bat (*Eumops floridanus*), gray bat, Indiana bat, Mexican long-nosed bat (*Leptonycteris nivalis*), northern long-eared bat, Ozark big-eared bat (*Corynorhinus townsendii ingens*), and Virginia big-eared bat. Of these species, the northern long-eared bat is known to occur in coastal Virginia and North Carolina and is not likely to occur in the Wind Development Area. The tri-colored bat, which is also not likely to occur in the Wind Development Area, is currently under a status review for listing under the Endangered Species Act as a threatened or endangered species with designated critical habitat (USFWS 2017). The status review for the tri-colored bat began in December 2017 and is still pending. In addition to these species, the U.S. Fish and Wildlife Service (USFWS) is conducting a discretionary status review of the little brown bat (USFWS 2021). The USFWS expects to release the findings of the status review for northern long-eared bat (see T.1.3.1 below), tri-colored bat, and little brown bat in the spring of 2021, and publish the regulatory guidance pertaining to the review in the fall of 2022 (USFWS 2020a).

T.1.3.1 Northern Long-eared Bat

The USFWS currently prohibits some forms of incidental take (e.g., within hibernacula or from tree removal activities) of northern long-eared bat within the white-nose syndrome zone (USFWS 2016). The white-nose syndrome zone includes all counties affected by white-nose syndrome and an additional 150-mile onshore buffer around these counties. The zone now encompasses the entire northern long-eared bat range within the U.S., including North Carolina and Virginia; the zone does not extend offshore to the Wind Development Area (USFWS 2020b).

T.2 METHODS

Tetra Tech, Inc. conducted acoustic bat monitoring in the Project Area from 13 May through 07 Nov 2020, using a single bat detector station mounted near the top of a roving offshore research vessel.

T.2.1 Acoustic Detectors

A Wildlife Acoustics Song Meter SM4BAT Monitoring System (bat detector) recorded bat activity in full spectrum format for the duration of the acoustic monitoring survey using the settings in Attachment T-1. The detector was powered by internal D-cell batteries and recorded bat activity from 1 hour before sunset until 1 hour after sunrise each day. The incoming echolocation calls were recorded onto high-capacity data storage cards, which were exchanged monthly while the ship was in port by trained technicians and then uploaded to a secure cloud-based server. The technicians also checked the functionality of the bat detector during each card exchange visit during the survey period.

The detector was mounted on the highest point of the Gerry Bordelon vessel (a 50-meter geophysical research vessel). The detector station description and survey effort are provided in Table T-2, and a photograph can be found in Attachment T-2. The SMM-U1 microphone was mounted on the top of a railing with an unobstructed view of the sky. The detector remained in its original location on the vessel during the survey, however the vessel travelled continuously and returned to port each month. Onboard GPS and Daily Progress Report notes allowed accurate georeferencing of each bat pass and an estimation of survey effort (nights the Gerry Bordelon spent primarily within the Wind Development Area, which were distributed throughout the area shown on Figure T-1).

Table T-2. Site Description and Survey Effort, 2020.

Site Description	Survey Dates	Detector-Nights	Percent of Nights Operational
Detector mounted on the Gerry Bordelon vessel, traveling offshore of the coast of Virginia and North Carolina.	13 May – 07 Nov 2020	77	100

T.2.1.1 Acoustic Analysis

Bats emit pulses of high frequency sound to navigate in their environment and search for prey. A single pulse (or call) is generally not helpful for identifying species; however, a series of pulses (also known as an echolocation sequence or bat pass) can more reliably be used to assign a species classification. A bat pass is defined as an echolocation sequence with two or more call pulses separated by two or more seconds (Loeb et al. 2015).

Analysis of bat acoustic data was conducted using a two-phased approach: 1) filter data with a USFWS approved software program (see USFWS 2019) to remove non-bat sounds and assign an initial species or group classification, and 2) manually review and cross-validate a subset of this data using an additional, independent echolocation software program to confirm species presence. The Project acoustic data was filtered and classified using Kaleidoscope Pro (Wildlife Acoustics, Inc.) version 4.2.0, with the classifier "Bats of North America 4.2.0" for species of bats in Virginia and North Carolina. Classifiers were further modified to reflect the species with the potential to occur in the Project Area (Table T-2). A sensitivity level of "0 balanced/neutral" was used per Wildlife Acoustics and USFWS (2019) recommendations.

Every bat pass auto-classified as a species and each unidentified bat pass was manually reviewed with Kaleidoscope Pro to remove noise and ensure accurate activity rates. After filtering and initial classification

of the acoustic data, species presence was cross-validated and manually confirmed for a subset of the data using SonoBat (SonoBat, Inc.) version 4.2.0, with the Southeast regional classifier to confirm presence. SonoBat was used for this step because of its extensive reference library of known echolocation sequences and superior spectrogram platform for reviewing full spectrum calls. During manual review, a recording was considered as suitable for species level identification if 1) the recording included search phase pulses, 2) the individual call pulses within the bat pass were not oversaturated, and when possible 3) the individual call pulses included the presence of harmonics. Eastern red bat and Seminole bat passes are not able to be accurately distinguished from each other through manual vetting and were placed in a single group due to similar call characteristics. Bat passes lacking sufficient detail to be identified at the species level were classified as "unidentified high frequency bat" if the characteristic frequency was greater than or equal to 35 kilohertz, and "unidentified low frequency bat" if the characteristic frequency was lower than 35 kilohertz. All bat passes in the Wind Development Area were manually vetted. Finally, bat passes were limited to those recorded within the Wind Development Area for activity rates and activity graphs by date.

T.3 RESULTS

T.3.1 Bat Acoustic Survey Results

During the 2020 acoustic survey, 77 nights were sampled from 13 May to 07 Nov 2020 (Table T-2). The detector station was fully operational during the entire survey period. A total of 2 bat passes were recorded within the Wind Development Area and identified to the species level or frequency group. One bat pass occurred on 24 Sep 2020 and was identified as an eastern red bat. The second pass occurred on 25 Oct 2020 by an unidentified high frequency bat. This resulted in an overall mean activity rate of 0.03 bat passes/night, with a standard error of 0.02.

T.3.1.1 Species Presence and Activity Rates

Bat passes identified in the Wind Development Area included one eastern red bat/Seminole bat and one unidentified high frequency bat (Table T-3). Both bat passes were recorded in the northern section of the Wind Development Area and the farthest was 56 kilometers offshore (Figure T-2). Fifty-five (55) silver-haired bat and 49 unidentified low frequency bat passes were recorded approximately 39 kilometers offshore along the offshore export cable corridor (outside of the Wind Development Area); however, they were recorded during only two nights of activity (14 Oct and 15 Oct). In addition, a bat was incidentally observed roosting on the ship on the night of 24 Sep through 28 Sep; a photo is available in Attachment T-3.

Table T-3. Average Activity Rates (Bat Passes/Detector Night) Recorded per Species in the Wind Development Area, 2020

Species	Activity Rate	Standard Error
Eastern Red Bat/Seminole Bat	0.01	0.01
Unidentified High Frequency Bat	0.01	0.01

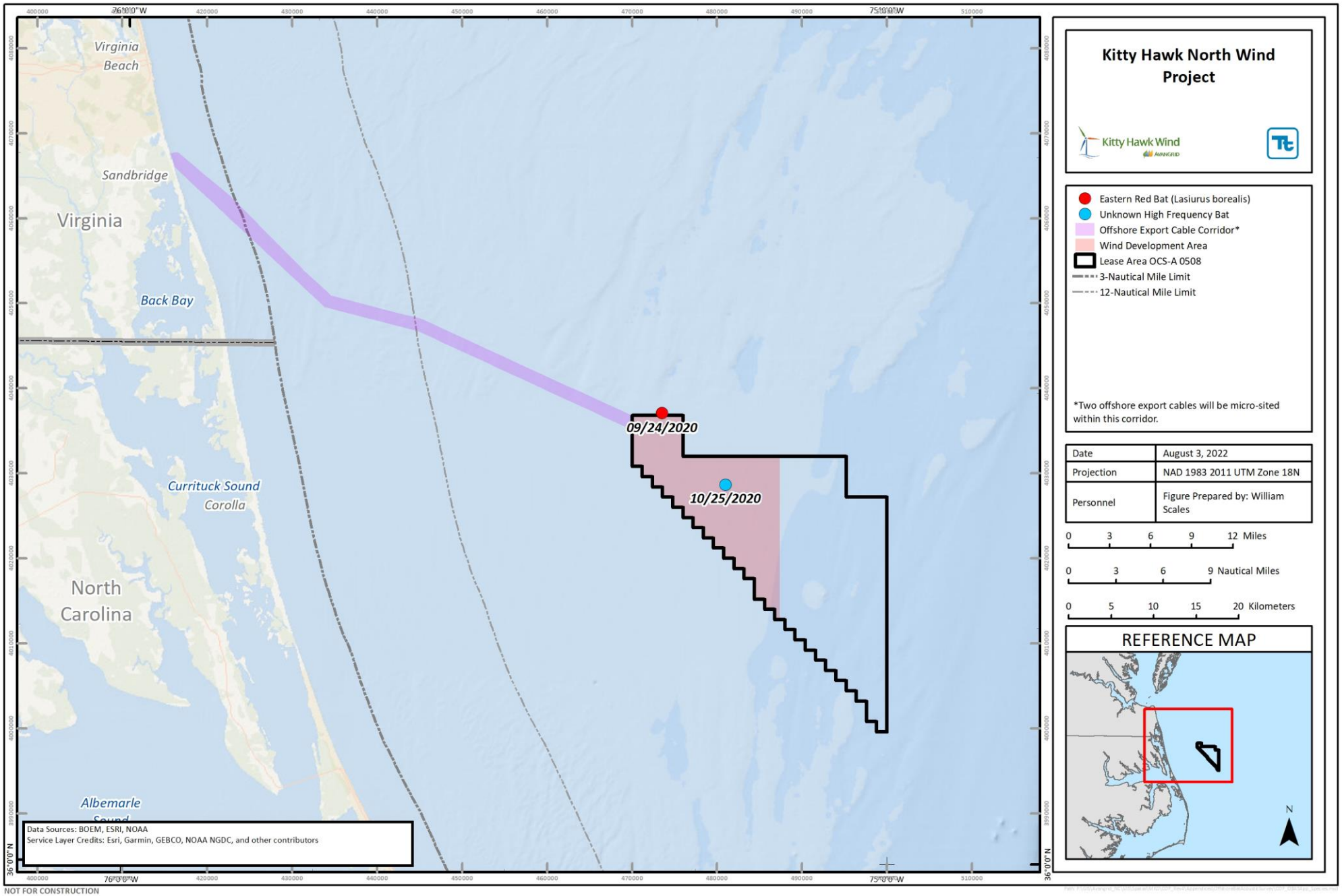

Figure T-2. Bat Passes by Location in the Wind Development Area

T.3.1.2 Timing of Activity

Both of the bat passes in the Wind Development Area were recorded during the fall migration period, one at the end of September (24 Sep 2020) and one at the end of October (25 Oct 2020).

T.4 DISCUSSION

T.4.1 Protected Bats

Based on publicly available information, the likelihood of occurrence of the federally threatened northern long-eared bat in the Wind Development Area is low based on the lack of evidence that this species forages or travels offshore. In addition, this species is closely associated with forests and rarely travels more than 305 meters from forested habitats (USFWS 2011). No Myotis species were acoustically confirmed during the survey.

T.4.2 Other Bat Species

Survey results indicate that bats rarely travel offshore in the Wind Development Area, and only during the migration period. During the survey, only long-distance migratory tree bats were confirmed; Eastern red bat/Seminole bat in the Wind Development Area and silver-haired bat in the offshore export cable corridor (outside the Wind Development Area). Although the acoustic signatures of eastern red bat cannot be distinguished from Seminole bat, the activity documented in this survey likely represents eastern red bat because they are Virginia's most common tree bat, and are commonly documented offshore (Hatch et al. 2013, Dowling et al. 2017, VDWR 2021). Eastern red bats are the most frequently encountered species off the Atlantic Seaboard during fall migration and may regularly travel along the Outer Continental Shelf during migration (Hatch et al. 2013, Dowling et al. 2017).

This survey indicates that the Wind Development Area is used in a limited capacity by long-distance migrants in the fall. The survey covered 77 days, including 25 days of the fall migration period from 24 Sep to 07 Nov. Although the understanding of offshore bat activity and behavior is limited, migratory tree bats are the most common species observed offshore. Increase in population size after the summer breeding season and coastal navigation during migration may explain why the majority of offshore encounters with migratory tree bats occur during the fall (Cryan 2003). In addition, bat activity offshore may increase at the end of the summer because females no longer need to return to the roost to nurse young throughout the evening and are able to travel longer distances into the ocean to forage (Pelletier et al. 2013). The two bat passes detected in the Wind Development Area may also simply represent two instances of wayward bats.

In addition to migration, bats have been documented foraging around ships during the night and roosting and resting on the ship during the day in the offshore environment (Thompson et al. 2015). A similar situation occurred during this survey as the eastern red bat/Seminole bat recording on 24 Sep, 47 kilometers from shore, coincided with a bat observed roosting on the ship 24-28 Sep while within the Wind Development Area. Bat species are thought to forage offshore due to two attributes of open water environments: lack of obstacles that could remove barriers to insect capture, and the temperature over large bodies of water is more stable and may remain warmer than nearby land, and thus sustain insect activity (Pelletier et al. 2013). Numerous types of insects are present offshore, providing foraging opportunities and energy during migration and long-distance travel (Cheng and Birch 1978). Even large-scale insect migrations occur in coastal environments and offshore, which likely impact bat activity rates and would also draw bats out into the offshore environment (Russell et al. 1998, Wikelski et al. 2006, Srygley and Dudley 2008).

T.4.3 Conclusion

The results of this offshore bat acoustic survey indicate that presence of bats in the Wind Development Area is rare. These results are supported by both the *Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf Offshore North Carolina: Revised Environmental Assessment*, which found that, while rare, bat use offshore may include occasional transitory migratory tree bats (BOEM 2015), and by the cumulative impacts analysis found in the *Supplemental Environmental Impact Statement for Vineyard Wind 1*, which found that cave-hibernating bats do not typically occur offshore (BOEM 2020).

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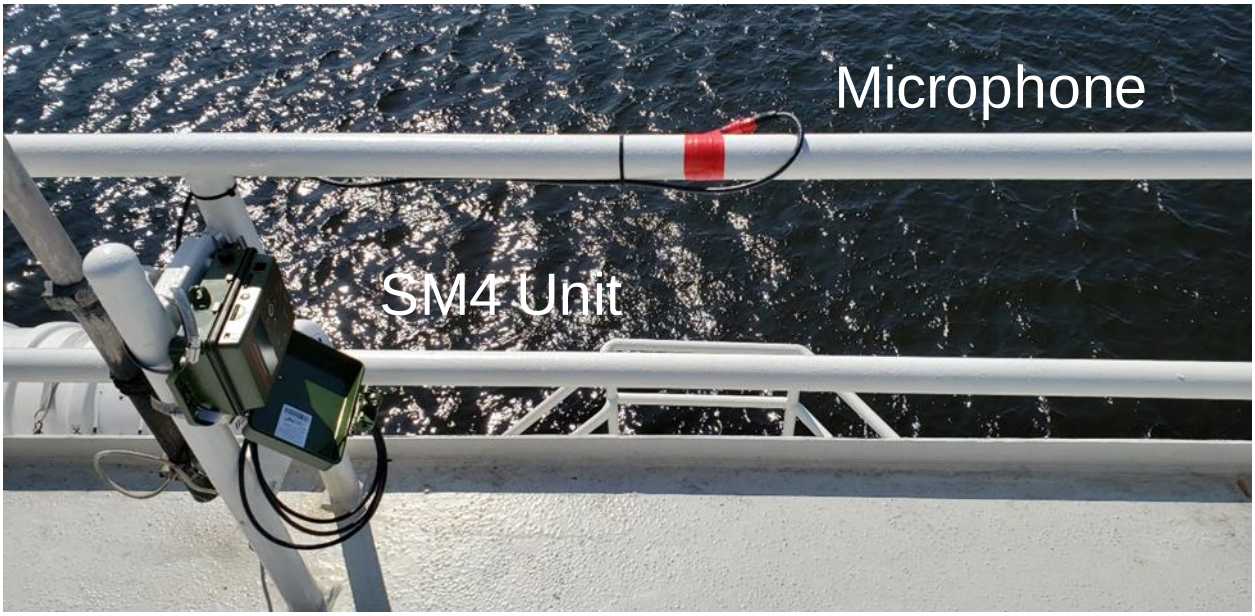
Attachment T-1. Hardware and Software Parameters and Settings

Platform	Parameter	Setting
Hardware		
Wildlife Acoustics SM4BAT	Data type	Full spectrum
	Trigger window	2 seconds
	Trigger max	15 seconds
	Sampling rate	256,000
	Gain	12 decibels
	Minimum trigger frequency	16 kilohertz
	File format	.WAV
	Survey window	1 hour before sunset to 1 hour after sunrise
Software		
Kaleidoscope Pro v4.2.0	Signal of interest	16–120 kilohertz
	Duration	2–500 milliseconds
	Minimum pulses	2
SonoBat v4.2.1	Classifier	Southeast

Attachment T-2. Equipment Photographs


Microphone
SM4 Unit

Attachment T-3. Bat Photograph