



Survey Report for  
**Alpine Ocean Seismic Survey Inc. on behalf of  
Ocean Wind LLC**

Project:  
**Ocean Wind High Resolution Geophysical and  
Geotechnical Survey**

Description:  
**Protected Species Observer Report**

Survey Dates:  
**06/18/2017 – 08/01/2017**

Project Number:  
**10969**

Lease Reference Number:  
**OCS-A 0498**

Report Status:  
**Final for Approval**





## REPORT AUTHORIZATION AND DISTRIBUTION

<b>Field</b>	Protected Species Observers/Passive Acoustic Monitoring Operators	L Slater, D Reynolds, S Tufano, R O'Connell, T Scott-Heagerty, K Sanders, H Ingram, L Cabrera, G De Leon, J Boliver, S Juarez
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<b>Revision</b>	<b>Date</b>	<b>Title</b>
0	08/30/2017	Draft
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### Distribution

PDF

## **SERVICE WARRANTY**

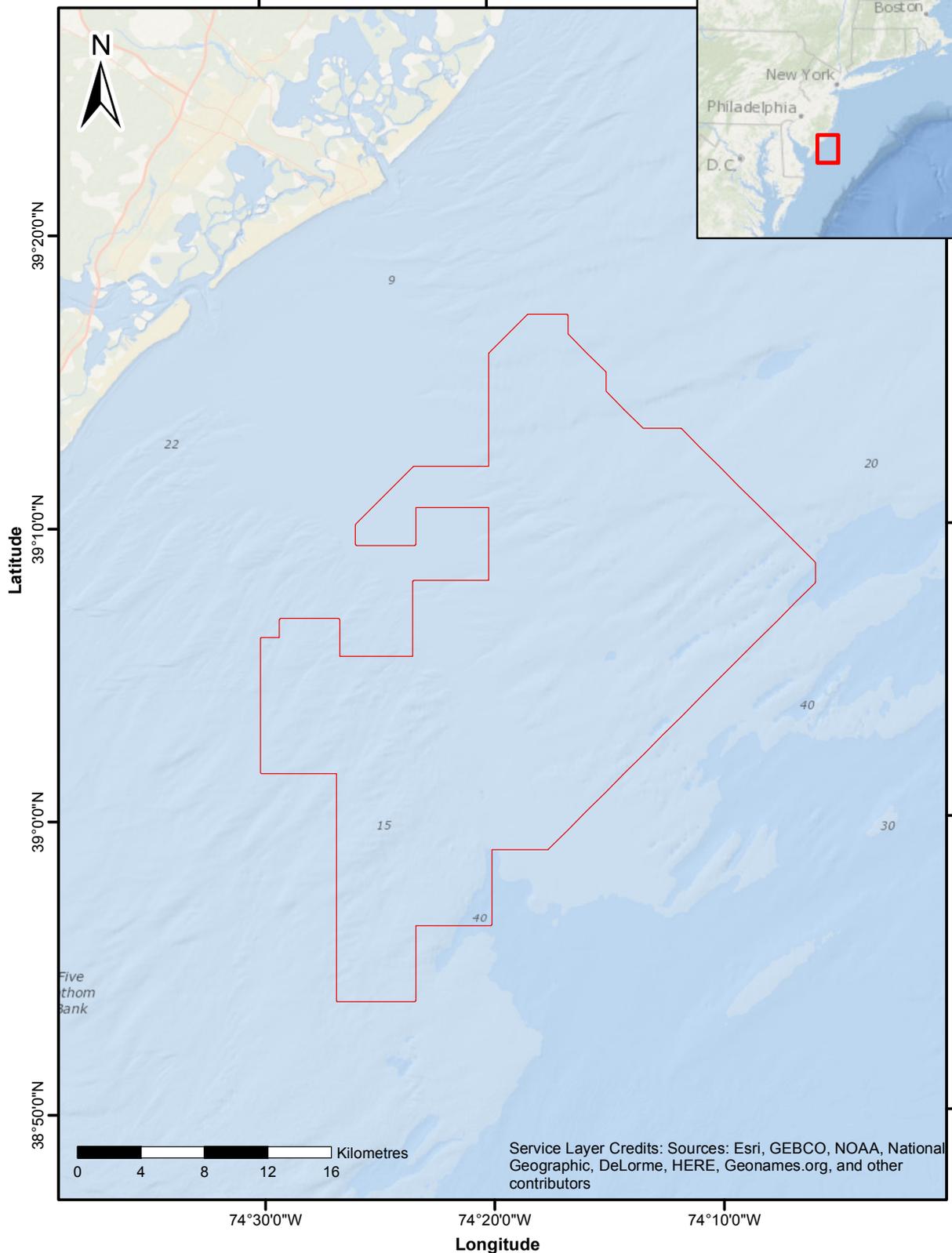
## **USE OF THIS REPORT**

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### LOCATION MAP



<p><b>Key</b></p> <p><span style="border: 1px solid red; display: inline-block; width: 15px; height: 10px; vertical-align: middle;"></span> OCW01 Lease Area</p>	<p><b>Coordinate System:</b> NAD 1983 UTM Zone 18N  <b>Projection:</b> Transverse Mercator Datum: North American 1983  <b>Central Meridian:</b> -75.0°E</p>
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## GLOSSARY OF TERMS AND ABBREVIATIONS

BOEM	Bureau for Ocean Energy Management
COTI	Clip on thermal imaging
DMAs	Dynamic Management Areas
EZ	Exclusion Zone
FLIR	Forward-looking Infrared
IHA	Incidental Harassment Authorization
IR	Infrared
MV	Motor Vessel
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NVDs	Night-vision devices
PAMS	Passive Acoustic Monitoring System
PSO	Protected Species Observer
RV	Research Vessel
SAP	Site Assessment Plan
SMA	Seasonal Management Areas
USBL	Ultra-short baseline

## 1 INTRODUCTION

The following Protected Species Observer (PSO) Report has been developed by Gardline Geosurvey Ltd. for Alpine Ocean Seismic Survey Inc. (Alpine) on behalf of Ocean Wind LLC. This report is being submitted in accordance with the requirements of Ocean Wind LLC Site Assessment Plan (SAP). The current report provides a summary of all PSO activities executed during the Ocean Wind high resolution geophysical and geotechnical survey for Ocean Wind LLC.

Pursuant to Ocean Wind's Commercial Lease of Submerged Lands for Renewable Energy Development on the Outer Continental Shelf OCS-A 0498 (Lease), Addendum C, Stipulation 4.5.4 and the Incidental Harassment Authorization (IHA) from the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NMFS), the purpose of this report is to provide a summary of the survey activities, all PSO reports, and an estimate of the number of listed marine mammals, sea turtles, or Atlantic sturgeon observed and/or taken<sup>1</sup> during these survey activities. In addition, as per Bureau for Ocean Energy Management's (BOEM's) request, the current report also provides an assessment of the visual observation techniques and technologies as well as the passive acoustic monitoring system (PAMS) employed during the survey.

In compliance with the SAP Survey Plan, Lease Stipulation 4.5.4, and the IHA, this report is being submitted 90 days from the commencement of survey operation as authorized by BOEM.

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<sup>1</sup> Lease Stipulation 1.12: "take" as defined in 16 U.S. Code § 1532 – to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct.

## 2 SUMMARY OF MITIGATION AND MONITORING PROTOCOLS

In accordance with the Lease, BOEM requires lessors to implement mitigation and monitoring to avoid and/or minimize potential impacts to marine species during survey activities. In addition, Ocean Wind, LLC acquired an IHA to further support survey operations from the NOAA, NMFS on 06/08/2017.

As stipulated in the IHA and in Addendum C of the Lease, the survey was run in accordance with a number of mitigation measures which cover vessel strike avoidance, the reduction of risk of disturbance and injury from geophysical survey operations, and reporting requirements. These measures include limitations of vessel speed, avoidance measures, maintenance of protected species exclusion zones (EZ), and shutdown/ramp-up procedures for survey equipment operations. Although the survey occurred outside of any seasonal management areas (SMAs), designated survey personnel monitored the NMFS's North Atlantic Right Whale Reporting Systems for the species' presence in the vicinity of survey operations. The technical details of the protected species monitoring can be found in the BOEM approved Ocean Wind Offshore Wind Farm High Resolution Geophysical and Geotechnical Survey Plan (Survey Plan) and associated Alternative Monitoring Plan which were determined complete and sufficient on 06/15/2017 and 05/19/2017, respectively.

On 06/29/2017, BOEM confirmed that the field verification activities conducted by Alpine/Gardline during the Ocean Wind LLC 2017 SAP and Lease Area Reconnaissance Surveys met the requirements of Lease Stipulation 4.4.6.2.

One vessel was utilized for operations during the survey. The research vessel (RV) *Ocean Researcher* surveyed the offshore waters of the Lease area (see Location Map) on a 24-hour day schedule with visual PSOs and a PAMS.

Visual monitoring was conducted by PSOs during all daylight operations using the naked eye (supplemented with reticule binoculars and a range-finder stick). During night time, PSOs utilized night-vision binoculars with clip on thermal imaging (COTI), infra-red (IR) LED spotlights and forward-looking infrared (FLIR) thermal imaging technology.

A PAMS was used during operations when visibility was diminished (fog or darkness). In addition, the PAMS was deployed during the lowlight hours at dawn and dusk, in order to calibrate distance estimations between the visual and acoustic monitoring systems in the event of a detection. The PAMS used during the survey was a Gardline MK4.1 system which comprised six hydrophones; three medium frequency and three high frequency. The hydrophone array was wired into a tow cable, an electric cable of 250m in length, and towed behind the vessel.

### 3 SUMMARY OF SURVEY ACTIVITIES

The survey was conducted by Alpine/Gardline on behalf of Ocean Wind LLC, in accordance with the BOEM approved Survey Plan. The project dates conducted by the RV *Ocean Researcher* were 06/18/2017 to 08/01/2017.

Reconnaissance level surveys were conducted of seabed conditions to inform geotechnical reconnaissance investigations and metocean instrument deployment within Ocean Wind LLC's Lease area. The specifications of the survey equipment utilized are listed in Table 3.1. A full Marine Site Characterization Report detailing the survey operations will be provided with the final Construction and Operation Plan.

Table 3.1 Survey equipment specifications

Equipment	Sample Model type	Frequency (kHz)
Shallow sub-bottom profiler (pinger)	GeoPulse 5430A transmitter	1.5–18
Medium sub-bottom profiler (sparker)	Geo-Source 400LW multi-tip sparker	0.05–5
Ultra-short baseline (USBL)	Sonardyne Ranger Pro USBL	19–34

## 4 MONITORING EFFORT SUMMARY

### 4.1 Monitoring Effort

During the survey there was a total of 1000 hours and 21 minutes of monitoring effort, equivalent to 4582 trackline miles (where simultaneous monitoring effort by the PSOs and PAMS is counted separately). The PSOs undertook 809 hours and 29 minutes of visual monitoring effort, equivalent to 3707 trackline miles, and the PAMS Operators undertook 190 hours and 52 minutes of acoustic monitoring effort, equivalent to 874 trackline miles (Table 4.1).

Table 4.1 Summary of monitoring effort during the Ocean Wind Offshore Wind Farm survey

Vessel Activity	Visual monitoring effort		Acoustic monitoring effort	
	Minutes	Trackline miles	Minutes	Trackline miles
Transit	7485	571	0	0
Equipment Test	1998	152	598	46
Survey Line	26183	1999	9701	740
Standby	12903	985	1153	88
<b>Totals</b>	<b>48569</b>	<b>3707</b>	<b>11452</b>	<b>874</b>

### 4.2 North Atlantic Right Whale Monitoring

North Atlantic right whales were not expected to be encountered during the survey due to the combination of season and location. The survey occurred outside of any SMAs, and on no occasion did the vessel enter a critical right whale habitat. However, as stipulated in the lease, the lead PSO checked the Mandatory Ship Reporting system, the Whale Alert app and the Interactive North Atlantic Right Whale Sightings Map (available at <https://www.nefsc.noaa.gov/psb/surveys/>) on a daily basis to monitor the presence of any Dynamic Management Areas (DMAs). No DMAs were established within or adjacent to the region during the survey. As stipulated in the lease, vessel speed did not exceed 10 knots throughout survey operations.

## 5 SIGHTING SUMMARY

### 5.1 Marine Mammal and Turtle Encounters

As per the Survey Plan, Lease Stipulation 4.5.3 and the IHA, PSOs recorded the necessary data elements required by Appendix B to Addendum C of the Lease in standard forms for all protected species observations. A copy of these forms is included in Appendix A.

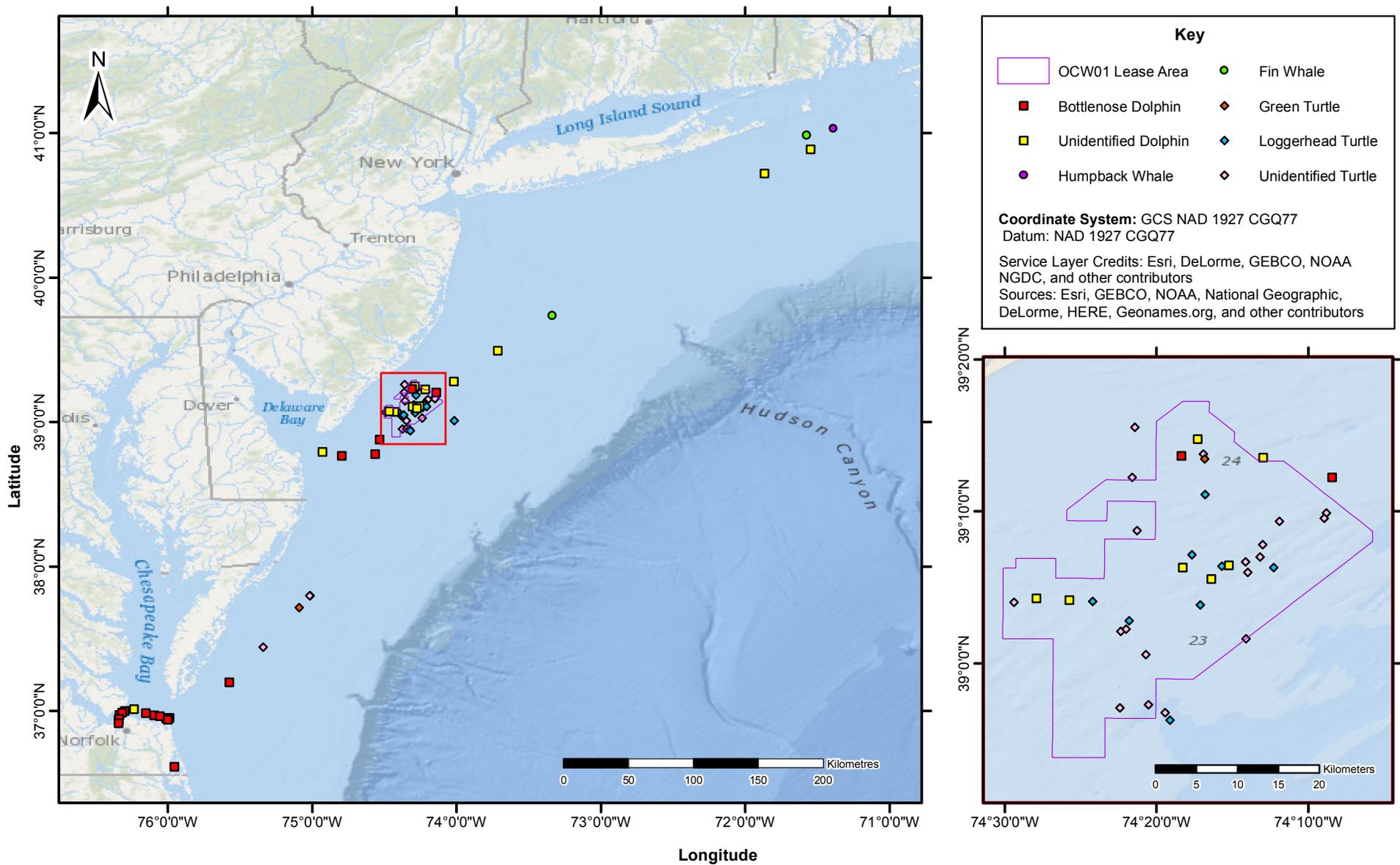
There were 66 visual sightings of marine mammals and sea turtles and 5 acoustic detections of marine mammals throughout the duration of survey activities (mobilization through demobilization). Of these, 26 visual sightings and 4 acoustic detections occurred whilst on survey within the Lease Area. A summary of these sightings is provided in Table 5.1, and a map of the sightings is presented in Figure 5.1. Encounters included; humpback whale (*Megaptera novaeangliae*), fin whale (*Balaenoptera physalus*), common bottlenose dolphin (*Tursiops truncatus*), loggerhead turtle (*Caretta caretta*), and green turtle (*Chelonia mydas*).

The following species for which take was authorized under the IHA were not observed during the survey: short-beaked common dolphin (*Delphinus delphis*), harbor porpoise (*Phocoena phocoena*), and harbor seal (*Phoca vitulina*). There were also no encounters of North Atlantic right whale (*Eubalaena glacialis*).

Table 5.1 Summary of marine mammal and sea turtle encounters during the Ocean Wind Offshore Wind Farm survey

Species	Daylight		Night time	
	Number of Sightings	Number of Acoustic Detections	Number of Sightings	Number of Acoustic Detections
Fin whale	2	0	0	0
Humpback whale	1	0	0	0
Common bottlenose dolphin	18	0	0	0
Unidentified dolphin sp.	11	2	0	3
Green turtle	3	0	0	0
Loggerhead turtle	8	0	1	0
Unidentified turtle sp.	20	0	2	0
<b>Totals</b>	<b>63</b>	<b>2</b>	<b>3</b>	<b>3</b>

Figure 5.1 Map of marine mammals and sea turtles encountered during the Ocean Wind Offshore Wind Farm survey



## 5.2 Marine Mammal and Turtle Mitigation

In accordance with the mitigation protocols identified in the Survey Plan, there were 20 shutdowns of the high resolution geophysical equipment due to the close proximity of marine turtles during survey operations and 5 delays to the start of survey operations due to the close proximity of marine mammals or sea turtles during the pre-shoot monitoring period. Additional information regarding the species encountered and the mitigation action implemented during the Ocean Wind Offshore Wind Farm surveys is provided in Appendix A and Appendix B, respectively.

## 5.3 Marine Mammal and Turtle Exposure

As stated previously, Ocean Wind, LLC acquired an IHA which authorized the take of small numbers of marine mammals by acoustic harassment during survey operations. As a result of the precautionary mitigation and monitoring plan implemented during survey activities, no species covered by the IHA were exposed to the sound sources. There were 20 exposures of sea turtles to the sound sources during survey activities. Table 5.2 summarizes the take authorized by the Ocean Wind, LLC IHA as well as the number of listed marine mammals and sea turtles observed and/or exposed to the sound sources. In addition, no dead or injured marine mammals or sea turtles were observed during the survey.

**Table 5.2 Summary of estimated exposures of marine mammal and sea turtle during the Ocean Wind Offshore Wind Farm survey**

Species	Numbers Authorized for Take by IHA	Number of Individuals Encountered	Number of Individuals Encountered whilst on Survey in the Lease Area	Estimated Number of Exposures
Fin whale	5	4	0	0
Humpback whale	NA	3	0	0
Short-beaked common dolphin	32	0	0	0
Common bottlenose dolphin	286	172	10	0
Unidentified dolphin sp.	NA	53 <sup>1</sup>	8 <sup>1</sup>	0
Harbor porpoise	4	0	0	0
Harbor seal	1	0	0	0
Green turtle <sup>2</sup>	NA	3	2	1
Loggerhead turtle <sup>2</sup>	NA	9	7	6
Unidentified turtle sp. <sup>2</sup>	NA	22	14	13

<sup>1</sup> This figure is an underestimation as there were five acoustic detections of unidentified dolphin sp. where the number of individuals present could not be determined. Four of these acoustic detections occurred within the lease area.

<sup>2</sup> The taking of small numbers of sea turtles by acoustic harassment is authorized by the Incidental Take Statement (ITS) for sea turtles provided in the Endangered Species Act Section 7 Consultation Biological Opinion for Commercial Wind Lease Issuance and Site Assessment Activities on the Atlantic Outer Continental Shelf in Massachusetts, Rhode Island, New York and New Jersey Wind Energy Areas (NER-2012-9211).

## 6 EFFECTIVENESS OF DETECTION METHODS

During the survey, three detection methods were used. To detect marine mammals acoustically, a PAMS was operated during night time operations or hours of diminished visibility. For visual sightings of marine mammals and sea turtles, reticule binoculars were used during daylight hours; while night-vision binoculars supplemented with COTI, IR spotlights, and FLIR thermal technology were used at night. The following sections detail the effectiveness of PAMS and night-vision technology.

### 6.1 PAMS Effectiveness

The acoustic detection of marine mammals is generally not as restricted by the weather as visual observations, although the range of hydrophones is occasionally reduced during poor weather conditions due to increased levels of background noise from wave action, precipitation or swell noise. The primary limitation of PAMS is that animals must be vocalizing in order to be detected; therefore, it is ineffective at monitoring turtle and pinniped species or cetacean species that are not vocalizing.

The PAMS array detected marine mammals throughout the operational period, with a total of five acoustic detections. Due to the faintness of the vocalizations detected it was not possible to determine the distance of the animals during the five detections. Three acoustic detections occurred during the hours of darkness, and two detections occurred during periods of heavy fog. No detections were visually confirmed. There were five visual detections of animals that were not acoustically detected whilst the PAMS was deployed. However, it should be noted that these five visual observations were of sea turtles, a species group known not to vocalize regularly. These results demonstrate that PAMS is effective at detecting vocalizing animals otherwise undetected through visual methods.

### 6.2 Night-vision Effectiveness

There were a total of three sightings using night vision binoculars, all of marine turtles within 50m of vessel.

The observers reported that the night vision binoculars were conducive for night time monitoring as they provided an instantaneous display of the surrounding environment. Disadvantages of the equipment were reported as the narrow field of view and low-resolution monochrome image. The night vision binoculars cover approximately one quarter of the field of view of the naked eye, therefore the area over which marine animals are detectable was considerably reduced. The image quality impacted the ability of the observer to discern animals with small surface presence, particularly at greater distances, and also to determine fine-scale features for species identification.

The following conditions were reported to reduce effectiveness of the night vision binoculars:

- Levels of background and ambient light. In particular, it was reported that scanning the aft of the vessel was difficult due to bright artificial light (and associated heat) on the aft deck. It was estimated that approximately 20% of the vessel's circumference was not able to be monitored by the night vision devices (NVDs) due to a combination of visual obstruction and excess light and heat.

However, the excess light enabled visual monitoring without the use of NVDs in this area, therefore the exclusion zone could still be monitored effectively.

- Poor weather conditions including fog, rain, and high sea states associated with a wind Force greater than 4. These conditions affected the night-vision binoculars in the same manner as daylight monitoring. The effects of rain were compounded by having to conduct monitoring from inside the bridge as the NVDs were non-waterproof.
- Moon phase and cloud cover. A full moon with a clear sky would greatly increase the effectiveness of the night vision binoculars as it maximized the available light to be magnified by the night vision binoculars. That being said, greater cloud cover at low altitudes could improve monitoring conditions when close to the coast due to reflecting anthropogenic light sources.

It should be noted that there were no occasions during the survey when any combination of the above conditions impacted the effectiveness of NVDs within the 200m exclusion zone.

The FLIR technology was also used in conjunction with night vision binoculars. Over the course of the survey, no sightings were recorded while using the FLIR technology. Observers noted that the FLIR technology was not as effective as the night-vision binoculars for scanning the sea surface due to its greater magnification and therefore more limited field of view. Furthermore, it was reported that the FLIR had a slow update rate, i.e. there was a delay in image display of approximately 0.5 to 2 seconds, and that the image sensor was ineffective at capturing fast moving objects. These disadvantages were reported to particularly affect the use of the FLIR in detecting delphinids, as this species group surfaces quickly and in an often unpredictable manner.

### 6.3 Distance Estimation Methods

During the survey, the PSOs used two methods to estimate the distance of marine animals from the vessel during daylight hours: reticule binoculars and range finder sticks. Both instruments were calibrated regularly against the vessel's radar with objects such as other vessels, and the results were recorded in a standardized form.

A total of 20 distance estimation comparisons were conducted during the survey (Table 6.1). A comparison of the average differences in the accuracy of distance estimation showed that the range finder sticks tended to be more accurate, having an average percentage error of 11.4% compared with 19.9% for the reticule binoculars. The reticule binoculars tended to overestimate distance (n=14), whereas the range finder sticks over- and underestimated distances in similar proportions (both n=8), and provided accurate distance estimations on four occasions. Both pieces of equipment had greater accuracy at shorter distance; percentage error the ranger finder sticks reduced to 4.1% whilst the percentage error of reticule binoculars was reduced to 9.6% up to 500m.

**Table 6.1 Summary of comparison of distance estimations during the Ocean Wind Offshore Wind Farm survey**

Distance provided by the system onboard (m)	Range Finder		Reticule Binoculars	
	Distance (m)	Error (%)	Distance (m)	Error (%)
500	500	0	482	3.6
1666	1500	9.96	1210	27.37
470	500	6.38	482	2.55
350	400	14.29	402	14.86
1100	1100	0	1207	9.73
2300	2000	13.04	2424	5.39
2300	1750	23.91	2420	5.22
500	500	0	482	3.6
500	500	0	616	23.2
555	500	9.91	610	9.91
800	1000	25	1050	31.25
800	1100	37.5	1210	51.25
800	1000	25	1212	51.5
1350	1250	7.41	1232	8.74
926	1000	7.99	1207	30.35
926	1000	7.99	1214	31.10
800	700	12.5	8177	2.13
1850	2000	8.11	2450	32.43
1660	1500	9.64	1197	27.89
1660	1500	9.64	1240	25.30
<b>Average</b>		<b>11.41</b>		<b>19.87</b>

## APPENDICES

## APPENDIX A PROTECTED SPECIES OBSERVATIONS

Table A 1 Summary of protected species observations during the Ocean Wind Offshore Wind Farm survey

ID #	Vessel Name	Observer's Name	Date	Start of Watch (UTC)	End of Watch (UTC)	Survey Start Position	Survey End Position	Wind Direction (compass)	Beaufort Force	Swell (o=low <2m; m=medium [2-4m]; l=large >4m)	Visibility (p=poor <1km; m=moderate [1-5km]; g=good >5km)	Cloud Cover (%)	Glare (%)	Time of Encounter (UTC)	Encounter Position	Distance to Animal from Source	Bearing to Animal	Detection Method (visual [v]; acoustic [a]; both [b])	Species or Species Group	Species ID Certainty	Sound Source Activity	Animal's Direction of Travel (vessel-relative)	Total # observed	# juveniles (visual sightings only)	Animal Description	Animal sex	Animal Behavior	Behavioral Reaction Observed	Mitigation Action Taken
1	RV Ocean Researcher	Rory O'Connell	25/06/2017	22:00	23:00	41°04.75N 71°22.34N	40°58.04N 71°24.98W	S	3 o	g		20	30	22:15 - 22:45	41°01.72N 71°23.33W	1000	230 v		Humpback whale	Sure	Not firing	Parallel to opposite direction of ship	3	1	Low bushy blow, dorsal fin, dark colour	Unknown	Transiting, regular blows on the surface	None	None
2	RV Ocean Researcher	Sam Tufano	25/06/2017	23:00	00:00	40°58.04N 71°24.98W	40°51.87N 71°34.73W	SW	3 o	g		20	30	23:41 - 23:45	40°53.14N 71°32.81W	2500	150 v		Unidentified dolphin species	Sure	Not firing	Parallel to opposite direction of ship	10	0	Small, dark bodies	Unknown	Surfacing, traveling	None	None
3	RV Ocean Researcher	Heidi Ingram	26/06/2017	10:57	12:00	39°45.66N 73°18.01W	39°39.63N 73°27.14W	NW	3 o	g		10	20	11:06 - 11:24	39°44.21N 73°20.20W	3000	180 v		Fin whale	Most likely	Not firing	Parallel to same direction of ship	3	0	Tall columnar blow, tall falcate dorsal located far back on body	Unknown	Traveling	None	None
4	RV Ocean Researcher	Heidi Ingram, Dave Reynolds	26/06/2017	13:00	14:00	39°32.41N 73°28.59W	39°25.63N 73°48.48W	NW	3 o	g		10	30	13:20 - 13:23	39°29.48N 73°42.84W	700	310 v		Unidentified dolphin species	Sure	Not firing	Parallel to opposite direction of ship	2	0	Medium sized dolphin, brown/gray body	Unknown	Traveling slowly	None	None
5	RV Ocean Researcher	Heidi Ingram	26/06/2017	15:00	16:00	39°17.33N 74°00.02W	39°11.74N 74°07.99W	NW	3 o	g		10	30	15:17 - 15:19	39°16.74N 73°01.02W	1000	120 v		Unidentified dolphin species	Sure	Not firing	Away from ship	2	0	Medium sized dolphin	Unknown	Traveling	None	None
6	RV Ocean Researcher	Dave Reynolds, Lee Slater	26/06/2017	16:00	17:00	39°11.74N 74°07.99W	39°05.69N 74°15.29W	NW	3 o	g		10	30	16:50 - 16:51	39°06.69N 74°14.14W	150	180 v		Unidentified turtle species	Sure	Not firing	Milling	1	0	Medium sized, large flippers, defined scuted, light yellow green colour, defined scales on head	Unknown	Swimming slowly	None	None
7	RV Ocean Researcher	Sam Tufano	26/06/2017	20:00	21:11	39°08.35N 74°14.67W	39°06.25N 74°14.61W	S	2 o	g		10	40	21:02 - 21:06	39°06.45N 74°15.22W	1100	320 v		Unidentified dolphin species	Sure	Not firing	Parallel to opposite direction of ship	5	1	Medium sized dolphin, brown/gray body	Unknown	Traveling, surfacing	None	None
501	RV Ocean Researcher	Sam Tufano, Lee Slater	28/06/2017	02:35	03:25	39°06.38N 74°16.41W	39°05.51N 74°19.65W	SW	3 o	p		80	0	02:55 - 03:10	39°06.30N 74°18.26W	Unknown	Unknown	a	Unidentified dolphin species	Sure	Not firing	Unknown	Unknown	Unknown	Faint whistles around 10-12kHz	Unknown	Unknown	None	None
502	RV Ocean Researcher	Sam Tufano, Lee Slater	29/06/2017	03:51	04:22	39°06.38N 74°16.33W	39°05.51N 74°15.97W	SW	6 o	p		30	0	03:58 - 04:06	39°05.56N 74°16.40W	Unknown	Unknown	a	Unidentified dolphin species	Sure	Reduced (SBP, USBL)	Unknown	Unknown	Unknown	Faint distant whistles around 10-12kHz	Unknown	Unknown	None	None
8	RV Ocean Researcher	Heidi Ingram	30/06/2017	11:54	12:58	39°16.39N 74°15.28W	39°12.51N 74°19.43W	SW	6 m	g		30	20	12:35 - 12:39	39°13.66N 74°18.35W	400	260 v		Common bottlenose dolphin	Most likely	Not firing	Parallel to opposite direction of ship	10	0	Medium sized dolphin with short beak, brown/gray body	Unknown	Traveling slowly	None	None
503	RV Ocean Researcher	Heidi Ingram	01/07/2017	14:00	14:24	39°04.21N 74°26.27W	39°04.29N 74°26.34W	SW	4 o	p		70	40	14:05 - 14:11	39°04.17N 74°25.72W	Unknown	Unknown	a	Unidentified dolphin species	Sure	Reduced (SBP, Sparker, USBL)	Unknown	Unknown	Unknown	Faint whistles ranging from 10-14 kHz	Unknown	Unknown	None	None
504	RV Ocean Researcher	Heidi Ingram	01/07/2017	14:37	15:39	39°04.29N 74°27.22W	39°04.21N 74°26.12W	SW	4 o	g		70	40	14:46 - 15:32	39°04.29N 74°27.92W	Unknown	Unknown	a	Unidentified dolphin species	Sure	Reduced (SBP, Sparker, USBL)	Unknown	Unknown	Unknown	Faint whistles ranging from 6.5-16 kHz	Unknown	Unknown	None	None
9	RV Ocean Researcher	Heidi Ingram	02/07/2017	14:10	15:24	39°11.03N 74°08.37W	39°12.68N 74°07.53W	NW	3 o	g		20	30	14:12 - 14:14	39°09.91N 74°08.81W	200	320 v		Unidentified turtle species	Sure	Not firing	Towards ship	1	0	Medium sized, large flippers, defined scuted, light yellow green colour	Unknown	Swimming slowly, did not surface	None	Delay
10	RV Ocean Researcher	Rory O'Connell	02/07/2017	16:39	17:00	39°09.34N 74°11.89W	39°08.99N 74°11.95W	W	1 o	g		20	30	16:39 - 16:40	39°09.34N 74°11.89W	75	150 v		Unidentified turtle species	Sure	Firing (SBP, Sparker, USBL)	Parallel to opposite direction of ship	1	0	Medium sized, large flippers, light yellow green colour	Unknown	Swimming slowly, surfaced for one breath	None	Shutdown
11	RV Ocean Researcher	Sam Tufano	02/07/2017	19:00	20:00	39°07.61N 74°14.18W	39°04.67N 74°17.99W	SW	2 o	g		20	10	19:20 - 19:23	39°06.41N 74°15.70W	500	300 v		Loggerhead turtle	Most likely	Firing (SBP, Sparker, USBL)	Parallel to opposite direction of ship	1	0	Large carapace with pronounced scutes, large brown/yellow square head	Unknown	Swimming slowly at the surface, took three breaths before diving	None	None
12	RV Ocean Researcher	Lee Slater, Heidi Ingram	03/07/2017	14:00	15:00	39°10.77N 74°07.25W	39°13.12N 74°09.94W	SW	1 o	g		30	20	14:31 - 14:46	39°12.24N 74°08.43W	1500	210 v		Common bottlenose dolphin	Most likely	Not firing	Crossing perpendicular ahead of ship	10	1	Medium sized, gray dolphin, slightly falcate dorsal	Unknown	Slowly traveling	None	None
13	RV Ocean Researcher	Sam Tufano, Lee Slater	03/07/2017	16:35	17:00	39°11.12N 74°16.80W	39°11.85N 74°15.42W	SW	1 o	g		30	20	16:35 - 16:37	39°11.12N 74°16.80W	25	180 v		Loggerhead turtle	Sure	Firing (SBP, Sparker, USBL)	Parallel to opposite direction of ship	1	0	Baby turtle, brown/yellow carapace square head	Unknown	Slowly traveling	None	Shutdown
14	RV Ocean Researcher	Heidi Ingram, Dave Reynolds	04/07/2017	09:39	10:05	39°13.26N 74°20.29W	39°12.07N 74°21.80W	SW	3 o	g		60	0	10:00 - 10:01	39°12.24N 74°21.59W	300	260 v		Unidentified turtle species	Sure	Reduced (SBP, Sparker, USBL)	Crossing perpendicular ahead of ship	1	1	Small-shelled sea turtle	Unknown	Surfaced twice to breath	None	None
15	RV Ocean Researcher	Dave Reynolds	04/07/2017	13:10	14:00	39°12.29N 74°18.84W	39°10.92N 74°20.95W	SW	2 o	m		80	10	13:10 - 13:16	39°00.54N 74°00.78W	5	40 v		Loggerhead turtle	Sure	Firing (SBP, Sparker, USBL)	Milling	1	0	Light brown, square head, ridge along the center of carapace	Unknown	Milling, avoiding vessel	None	Shutdown
16	RV Ocean Researcher	Rory O'Connell	04/07/2017	16:22	17:00	39°13.76N 74°16.92W	39°13.64N 74°18.61W	NE	2 o	g		30	20	16:22 - 16:24	39°13.76N 74°16.92W	50	90 v		Unidentified turtle species	Sure	Firing (SBP, Sparker, USBL)	Parallel to opposite direction of ship	1	0	Baby turtle, brown/yellow carapace square head	Unknown	Slowly traveling	None	Shutdown
17	RV Ocean Researcher	Tom Scott-Heagerty	05/07/2017	02:10	02:47	39°16.68N 74°19.17W	39°15.55N 74°21.41W	NE	2 o	p		30	0	02:45 - 02:47	39°15.55N 74°21.41W	20	90 v		Unidentified turtle species	Sure	Firing (USBL)	Parallel to opposite direction of ship	1	0	Small-shelled sea turtle	Unknown	Swimming slowly under the surface	None	Shutdown
18	RV Ocean Researcher	Sam Tufano, Tom Scott-Heagerty	05/07/2017	17:03	17:56	39°00.58N 74°20.71W	39°02.11N 74°22.35W	NE	3 o	g		80	30	17:03 - 17:05	39°00.58N 74°20.71W	100	210 v		Unidentified turtle species	Sure	Firing (SBP, Sparker, USBL)	Parallel to opposite direction of ship	1	0	Light brown shell	Unknown	Swimming slowly under the surface	None	Shutdown
19	RV Ocean Researcher	Underwater Engineer	05/07/2017	17:03	17:56	39°00.58N 74°20.71W	39°02.11N 74°22.35W	NE	3 o	g		80	30	17:56	39°02.11N 74°22.35W	150	90 v		Unidentified turtle species	Sure	Not firing	Parallel to opposite direction of ship	1	0	Light brown shell	Unknown	Swimming under surface	None	Delay
20	RV Ocean Researcher	Heidi Ingram	07/07/2017	12:15	13:09	39°00.03N 74°24.91W	39°02.27N 74°21.99W	Variable	1 o	p		100	0	13:08 - 13:09	39°02.27N 74°21.99W	30	315 v		Unidentified turtle species	Sure	Firing (SBP, Sparker, USBL)	Away from ship	1	1	Small shelled sea turtle, carapace ~12 in	Unknown	Swimming slowly under the surface	None	Shutdown
21	RV Ocean Researcher	Dave Reynolds, Lee Slater	09/07/2017	14:00	14:24	38°53.63N 74°20.52W	38°57.08N 74°22.41W	NW	3 o	g		10	20	14:23 - 14:24	38°57.08N 74°22.41W	30	340 v		Unidentified turtle species	Sure	Firing (SBP, Sparker, USBL)	Parallel to opposite direction of ship	1	0	Light coloured shell, medium sized turtle, never surfaced	Unknown	Swimming slowly under the surface	None	Shutdown
22	RV Ocean Researcher	Rory O'Connell	09/07/2017	23:54	00:10	38°57.27N 74°20.52W	38°57.87N 74°19.72W	S	3 o	g		0	30	23:54 - 23:55	38°57.27N 74°20.52W	30	270 v		Unidentified turtle species	Sure	Firing (SBP, Sparker, USBL)	Away from ship	1	0	Light coloured shell, medium sized turtle, never surfaced	Unknown	Swimming at the surface, breathed once	None	Shutdown
23	RV Ocean Researcher	Lee Slater, Rory O'Connell	10/07/2017	13:25	14:00	39°02.81N 74°21.81W	39°01.67N 74°20.51W	SW	3 o	g		20	20	13:22 - 13:25	39°02.81N 74°21.81W	20	240 v		Loggerhead turtle	Sure	Firing (SBP, Sparker, USBL)	Away from ship	1	0	Head	Unknown	Swimming slowly at the surface	None	Shutdown
24	RV Ocean Researcher	Dave Reynolds	12/07/2017	13:00	14:00	36°56.84N 75°51.59W	36°57.32N 76°01.48W	SW	4 o	g		10	10	13:30 - 13:35	36°56.75N 75°57.21W	1500	250 v		Common bottlenose dolphin	Sure	Not firing	Parallel to opposite direction of ship	10	0	Gray, medium sized dolphin, falcate dorsal	Unknown	Swimming slowly	None	None
25	RV Ocean Researcher	Dave Reynolds	12/07/2017	13:00	14:00	36°56.84N 75°51.59W	36°57.32N 76°01.48W	SW	4 o	g		10	10	13:41 - 13:50	36°57.04N 75°59.59W	2500	315 v		Common bottlenose dolphin	Sure	Not firing	Crossing perpendicular ahead of ship	1	0	Gray, medium sized dolphin, falcate dorsal	Unknown	Swimming slowly	None	None
26	RV Ocean Researcher	Sam Tufano, Lee Slater, Dave Reynolds, Heidi Ingram	12/07/2017	15:00	16:00	37°00.35N 76°13.81W	36°54.94N 76°20.43W	SW	4 o	g		10	10	15:19 - 15:31	37°00.05N 76°17.87W	50	150 v		Common bottlenose dolphin	Sure	Not firing	Variable direction	3	1	Dolphin with short beak, gray body	Unknown	Swimming slowly	None	None
27	RV Ocean Researcher	Dave Reynolds	15/07/2017	10:00	12:00	36°52.03N 76°19.20W	36°58.99N 76°09.02W	Variable	1 o	g		60	10	10:58 - 11:02	36°58.29N 76°20.00W	1000	0 v		Common bottlenose dolphin	Sure	Not firing	Crossing perpendicular ahead of ship	6	1	Dolphin with short beak, gray body, clear views	Unknown	Swimming slowly	None	None
28	RV Ocean Researcher	Dave Reynolds	15/07/2017	11:00	12:00	36°58.29N 76°20.00W	36°58.99N 76°09.02W	Variable	1 o	g		60	10	11:45 - 11:48	36°58.99N 76°09.02W	1500	330 v		Common bottlenose dolphin	Sure	Not firing	Parallel to opposite direction of ship	3	0	Gray, medium sized dolphin, falcate dorsal	Unknown	Swimming slowly	None	None
29	RV Ocean Researcher	Heidi Ingram, Dave Reynolds	15/07/2017	12:00	13:00	36°58.99N 76°09.02W	36°56.16N 75°55.00W	S	3 o	g		10	30	12:00 - 12:08	36°58.11N 76°05.62W	1500	135 v		Common bottlenose dolphin	Sure	Not firing	Parallel to opposite direction of ship	10	0	Gray, medium sized dolphin, falcate dorsal	Unknown	Swimming slowly, milling, feeding	None	None
30	RV Ocean Researcher	Heidi Ingram, Dave Reynolds	15/07/2017	12:00	13:00	36°58.99N 76°09.02W	36°56.16N 75°55.00W	S	3 o	g		10	30	12:29 - 12:35	36°56.87N 76°00.01W	200	135 v		Common bottlenose dolphin	Sure	Not firing	Variable direction	5	0	Gray, medium sized dolphin, falcate dorsal	Unknown	Swimming slowly, milling	None	None
31	RV Ocean Researcher	Heidi Ingram, Dave Reynolds	15/07/2017	12:00	13:00	36°58.99N 76°09.02W	36°56.16N 75°55.00W	S	3 o	g		10	30	12:41 - 12:48	36°56.39N 75°56.19W	1000	90 v		Common bottlenose dolphin	Sure	Not firing	Parallel to opposite direction of ship	15	0	Gray, medium sized dolphin, falcate dorsal	Unknown	Swimming	None	None
32	RV Ocean Researcher	Lee Slater, Sam Tufano	15/07/2017	15:00	16:00	37°07.60N 75°30.53W	37°15.45N 75°30.53W	S	3 o	g		50	0	15:1															

Table A 1 Summary of protected species observations during the Ocean Wind Offshore Wind Farm survey (ctd.)

ID #	Vessel Name	Observer's Name	Date	Start of Watch (UTC)	End of Watch (UTC)	Survey Start Position	Survey End Position	Wind Direction (compass)	Beaufort Force	Swell (o=low [ $<2m$ ]; m=medium [ $2-4m$ ]; l=large [ $>4m$ ])	Visibility (p=poor [ $<1km$ ]; m=moderate [ $1-5km$ ]; g=good [ $>5km$ ])	Cloud Cover (%)	Glare (%)	Time of Encounter (UTC)	Encounter Position	Distance to Animal from Source	Bearing to Animal	Detection Method (visual [v]; acoustic [a]; both [b])	Species or Species Group	Species ID Certainty	Sound Source Activity	Animal's Direction of Travel (vessel-relative)	Total # observed	# juveniles (visual sightings only)	Animal Description	Animal sex	Animal Behavior	Behavioral Reaction Observed	Mitigation Action Taken
38	RV Ocean Researcher	Kerri Sanders	17/07/2017	00:00	00:34	39°09.28N 74°11.08W	39°07.82N 74°13.01W	SW	3	o	g	30	20	00:34	39°07.82N 74°13.01W	50	300	v	Unidentified turtle species	Sure	Firing (SBP, Sparker, USBL)	Variable direction	1	0	Dark smooth carapace, approx 70cm length, encrusted with barnacles	Unknown	Surfaced to breath, logging	None	Shutdown
39	RV Ocean Researcher	Dave Reynolds, Lee Slater	17/07/2017	13:00	14:00	39°05.28N 74°13.62W	39°05.37N 74°13.83W	E	1	o	g	80	30	13:17 - 13:19	39°06.30N 74°12.29W	150	90	v	Loggerhead turtle	Sure	Firing (SBP, Sparker, USBL)	Parallel to opposite direction of ship	1	0	Light brown, square head, ridge along the center	Unknown	Slow swimming before diving out of sight	None	Shutdown
40	RV Ocean Researcher	Kerri Sanders	17/07/2017	19:00	19:13	39°07.57N 74°12.42W	39°07.00N 74°13.17W	SE	3	o	g	90	0	19:13	39°07.00N 74°13.17W	100	270	v	Unidentified turtle species	Sure	Firing (SBP, Sparker, USBL)	Away from ship	1	0	Light brown shell	Unknown	One breath before diving out of sight	None	Shutdown
41	RV Ocean Researcher	Sam Tufano	18/07/2017	17:21	17:47	38°56.76N 74°19.42W	38°56.26N 74°19.10W	S	2	o	g	20	20	17:21 - 17:22	38°56.76N 74°19.42W	50	280	v	Unidentified turtle species	Sure	Soft start (SBP, Sparker, USBL)	Towards ship	1	0	Large, brown carapace	Unknown	Swimming under the surface before diving	None	Shutdown
42	RV Ocean Researcher	Sam Tufano	18/07/2017	17:21	17:47	38°56.76N 74°19.42W	38°56.26N 74°19.10W	S	2	o	g	20	20	17:45 - 17:47	38°56.26N 74°19.10W	150	270	v	Loggerhead turtle	Sure	Not firing	Parallel to opposite direction of ship	1	0	Light brown, square head, ridge along the center	Unknown	Logging on surface	None	Delay
43	RV Ocean Researcher	Tom Scott-Heagerty	20/07/2017	03:35	03:37	39°08.33N 74°21.33W	39°08.73N 74°21.29W	SW	3	o	p	30	0	03:37	39°08.73N 74°21.29W	30	270	v	Unidentified turtle species	Sure	Reduced (SBP, Sparker, USBL)	Parallel to opposite direction of ship	1	0	Medium-sized, dark shell	Unknown	Logging on surface	None	Shutdown
44	RV Ocean Researcher	Heidi Ingram, Dave Reynolds, Lee Slater	20/07/2017	15:18	15:20	39°07.10N 74°17.68W	39°07.15N 74°17.66W	W	2	o	g	0	30	15:19 - 15:20	39°07.15N 74°17.66W	150	290	v	Loggerhead turtle	Sure	Reduced (SBP, Sparker, USBL)	Towards ship	1	0	Light brown/orange, square head, large carapace with barnacles	Unknown	Slowly traveling on the surface	None	Shutdown
45	RV Ocean Researcher	Heidi Ingram	21/07/2017	10:00	11:00	38°48.48N 74°48.77W	38°46.45N 74°56.63W	SW	3	o	m	50	0	10:43 - 10:51	38°47.52N 74°55.62W	1500	150	v	Unidentified dolphin species	Sure	Not firing	Variable direction	10	0	Medium sized gray dolphin	Unknown	Feeding	None	None
46	RV Ocean Researcher	Heidi Ingram, Dave Reynolds	21/07/2017	11:00	12:00	38°46.45N 74°56.63W	38°45.85N 74°45.55W	SW	3	o	g	30	10	11:40 - 11:49	38°45.84N 74°47.66W	600	130/325	v	Common bottlenose dolphin	Most likely	Not firing	Parallel to opposite direction of ship	15	0	Gray, medium sized dolphin, falcate dorsal	Unknown	Traveling, leaping, milling	None	None
47	RV Ocean Researcher	Lee Slater	21/07/2017	12:00	13:00	38°45.85N 74°33.10W	38°47.05N 74°33.10W	SW	3	o	g	10	10	12:53 - 12:57	38°46.70N 74°33.78W	700	290	v	Common bottlenose dolphin	Sure	Not firing	Parallel to opposite direction of ship	6	0	Gray, medium sized dolphin, falcate dorsal	Unknown	Slow traveling	None	None
48	RV Ocean Researcher	Lee Slater, Dave Reynolds	21/07/2017	13:00	14:00	38°47.05N 74°32.82W	38°55.05N 74°32.82W	SW	2	o	g	10	20	13:28 - 13:44	38°52.72N 74°31.91W	500	310	v	Common bottlenose dolphin	Sure	Not firing	Variable direction	20	1	Gray, medium sized dolphin, falcate dorsal	Unknown	Tail-slapping, wake riding, traveling	None	None
49	RV Ocean Researcher	Tom Scott-Heagerty, Kerri Sanders	22/07/2017	02:00	02:52	39°06.46N 74°21.12W	39°04.07N 74°24.21W	SW	4	o	p	60	0	02:52	39°04.07N 74°24.21W	50	10	v	Loggerhead turtle	Sure	Firing (SBP, Sparker, USBL)	Parallel to same direction of ship	1	0	Light brown, square head, ridge along the center	Unknown	Surface to breath, logging	None	Shutdown
50	RV Ocean Researcher	Sam Tufano	22/07/2017	19:00	20:00	38°47.51N 74°27.36W	38°37.18N 74°30.65W	Variable	1	o	g	60	10	19:45 - 19:47	38°40.11N 74°24.28W	50	150	v	Unidentified dolphin species	Sure	Not firing	Towards ship	1	0	Large, light brown/green carapace	Unknown	Slow swimming	None	None
51	RV Ocean Researcher	Heidi Ingram	23/07/2017	10:00	11:00	36°56.92N 75°51.43W	36°57.29N 76°01.02W	W	4	o	g	50	0	10:48	36°56.97N 75°59.89N	20	283	v	Unidentified dolphin species	Sure	Not firing	Towards ship	3	0	Large gray dolphins	Unknown	Traveling fast	None	None
52	RV Ocean Researcher	Lee Slater	23/07/2017	11:00	12:00	36°57.29N 76°01.02W	36°59.89N 76°12.03W	W	4	o	g	70	10	11:06 - 11:10	36°57.71N 76°03.25W	750	210	v	Common bottlenose dolphin	Most likely	Not firing	Away from ship	10	1	Medium sized gray dolphin, falcate dorsal	Unknown	Traveling	None	None
53	RV Ocean Researcher	Dave Reynolds	23/07/2017	12:00	13:00	36°59.89N 76°12.03W	36°54.78N 76°20.34W	W	5	o	g	50	20	12:22 - 12:27	36°59.16N 76°18.88W	150	225	v	Common bottlenose dolphin	Most likely	Not firing	Variable direction	10	0	Medium sized gray dolphin, falcate dorsal	Unknown	Milling, avoiding vessel	None	None
54	RV Ocean Researcher	Heidi Ingram, Dave Reynolds, Lee Slater	23/07/2017	12:00	13:00	36°59.89N 76°12.03W	36°54.78N 76°20.34W	W	5	o	g	50	20	12:40 - 12:44	36°56.70N 76°20.27W	100	180	v	Common bottlenose dolphin	Most likely	Not firing	Variable direction	6	0	Medium sized gray dolphin, falcate dorsal	Unknown	Milling, avoiding vessel	None	None
55	RV Ocean Researcher	Heidi Ingram, Dave Reynolds, Lee Slater	23/07/2017	12:00	13:00	36°59.89N 76°12.03W	36°54.78N 76°20.34W	W	5	o	g	50	20	12:49 - 13:01	36°54.78N 76°20.34W	500	180	v	Common bottlenose dolphin	Most likely	Not firing	Parallel to opposite direction of ship	2	0	Medium sized gray dolphin, falcate dorsal	Unknown	Traveling	None	None
56	RV Ocean Researcher	James Currie, Kerri Sanders	24/07/2017	10:00	11:00	36°51.92N 76°19.00W	36°58.74N 76°19.45W	SW	2	o	g	30	0	10:42 - 10:43	36°56.25N 76°20.35W	100	70	v	Unidentified dolphin species	Sure	Not firing	Variable direction	2	1	Large gray dolphins	Unknown	Feeding, surfaced for breath and dove	None	None
57	RV Ocean Researcher	Dave Reynolds	24/07/2017	11:00	11:50	36°58.74N 76°19.45W	36°59.14N 76°10.22W	SE	3	o	g	30	10	11:27 - 11:28	37°00.70N 76°13.98W	5	135	v	Unidentified dolphin species	Sure	Not firing	Crossing perpendicular ahead of ship	2	0	Large gray dolphins	Unknown	Single surface	None	None
58	RV Ocean Researcher	Maeve Roberts, Lori Cabrera, Grace De Leon, Dave Reynolds	24/07/2017	11:50	13:00	36°59.14N 76°10.22W	36°56.60N 75°58.23W	S	5	o	g	60	0	12:45 - 12:55	36°56.94N 76°00.60W	100	350	v	Unidentified dolphin species	Sure	Not firing	Crossing perpendicular ahead of ship	7	0	Large gray dolphins	Unknown	Traveling	None	None
59	RV Ocean Researcher	Jordan Boliver	24/07/2017	19:37	20:32	37°40.86N 75°07.17W	37°47.73N 75°00.86W	E	2	o	g	70	10	19:51 - 19:52	37°42.92N 75°05.33W	50	90	v	Green turtle	Most likely	Not firing	Parallel to opposite direction of ship	1	0	Light brown, medium sized	Unknown	Logging on surface	None	None
60	RV Ocean Researcher	Dave Reynolds	24/07/2017	19:37	20:32	37°40.86N 75°07.17W	37°47.73N 75°00.86W	E	2	o	g	70	10	20:29 - 20:32	37°47.72N 75°00.86W	150	45	v	Unidentified turtle species	Sure	Not firing	Stationary	1	0	Medium sized, light brown	Unknown	Logging on surface before diving	None	None
61	RV Ocean Researcher	Grace De Leon	26/07/2017	14:00	14:55	39°15.58N 74°19.45W	39°13.47N 74°16.82W	NE	4	o	g	80	10	14:53 - 14:55	39°13.47N 74°16.82W	30	90	v	Green turtle	Most likely	Firing (SBP, Sparker, USBL)	Away from ship	1	0	Medium sized, greenish brown	Unknown	Traveling	None	Shutdown
62	RV Ocean Researcher	Lori Cabrera	28/07/2017	11:27	12:00	39°01.61N 74°14.11W	39°01.69N 74°14.12W	SW	2	o	g	40	10	11:27 - 11:28	39°01.61N 74°14.11W	200	90	v	Unidentified turtle species	Most likely	Not firing	Parallel to opposite direction of ship	1	0	Medium sized, brown	Unknown	Traveling	None	None
63	RV Ocean Researcher	Sofia Juarez	28/07/2017	21:00	22:00	39°12.10N 74°20.80W	39°14.43N 74°18.38W	N	2	o	g	100	0	21:55 - 21:56	39°14.75N 74°17.28W	600	270	v	Unidentified dolphin species	Sure	Not firing	Parallel to same direction of ship	3	0	Medium, gray dolphins	Unknown	Traveling	None	None
64	RV Ocean Researcher	Sofia Juarez	28/07/2017	22:00	23:02	39°14.43N 74°18.38W	39°14.75N 74°17.28W	NW	2	o	g	100	0	22:07 - 22:13	39°14.75N 74°17.28W	200	300	v	Green turtle	Sure	Not firing	Parallel to opposite direction of ship	1	0	Large size and brown	Unknown	Floating	None	None
65	RV Ocean Researcher	Dave Reynolds, Lori Cabrera	31/07/2017	03:17	04:00	39°14.07N 74°13.58W	39°12.98N 74°11.88W	NE	2	o	p	0	0	03:34 - 04:10	39°13.54N 74°12.98W	Unknown	Unknown	a	Unidentified dolphin species	Most likely	Not firing	Unknown	Unknown	Unknown	No description given	Unknown	Unknown	None	Delay
66	RV Ocean Researcher	Lori Cabrera, Captain	01/08/2017	08:00	09:00	40°12.30N 72°36.79W	40°18.96N 72°26.90W	E	2	o	p	0	0	08:41 - 08:46	40°13.20N 71°51.96W	300	20	v	Unidentified dolphin species	Sure	Not firing	Towards ship	7	0	Large gray dolphins	Unknown	Wake and bow riding then heading away from vessel	None	None
66	RV Ocean Researcher	Kerri Sanders	01/08/2017	14:46	16:00	40°59.05N 71°34.30W	40°08.97N 71°23.10W	E	2	o	g	0	10	14:46 - 14:47	40°59.05N 71°34.30W	700	45	v	Fin Whale	Sure	Not firing	Away from ship	1	0	Large distinct lower dorsal fin, thick tail stock	Unknown	Surfacing	None	None

## **APPENDIX B    MITIGATION ACTION SUMMARY**

**Table B 1 Summary of mitigation actions implemented during the Ocean Wind Offshore Wind Farm survey**

Date	Species	Type of detection	Number of Individuals	Closest Distance to Source (m)	Time Within EZ (UTC)	Mitigation Implemented	Time equipment stopped (UTC)	Time equipment ramped up/started (UTC)
02/07/2017	Unidentified turtle species	Visual	1	75	14:12 - 14:14	Delay	NA	15:24
02/07/2017	Unidentified turtle species	Visual	1	50	16:39 - 16:41	Shutdown	16:39	17:40
03/07/2017	Loggerhead turtle	Visual	1	20	16:35 - 16:37	Shutdown	16:35	17:39
04/07/2017	Loggerhead turtle	Visual	1	5	13:10 - 13:16	Shutdown	13:11	14:16
04/07/2017	Unidentified turtle species	Visual	1	20	16:22 - 16:24	Shutdown	16:22	17:25
05/07/2017	Unidentified turtle species	Visual	1	20	02:45 - 02:47	Shutdown	02:47	04:09
05/07/2017	Unidentified turtle species	Visual	1	100	17:03 - 17:05	Shutdown	17:03	18:58
05/07/2017	Unidentified turtle species	Visual	1	150	17:56	Delay	NA	18:58
07/07/2017	Unidentified turtle species	Visual	1	30	13:08 - 13:09	Shutdown	13:09	14:09
09/07/2017	Unidentified turtle species	Visual	1	10	14:23 - 14:24	Shutdown	14:24	15:24
09/07/2017	Unidentified turtle species	Visual	1	5	23:54 - 23:55	Shutdown	23:54	00:57
10/07/2017	Loggerhead turtle	Visual	1	10	13:22 - 13:25	Shutdown	13:25	14:27
16/07/2017	Unidentified turtle species	Visual	1	10	15:24 - 15:26	Shutdown	15:24	18:37
16/07/2017	Loggerhead turtle	Visual	1	10	16:22 - 16:24	Delay	NA	18:37
16/07/2017	Unidentified turtle species	Visual	1	150	20:40	Shutdown	20:40	21:47
17/07/2017	Unidentified turtle species	Visual	1	50	00:34	Shutdown	00:34	01:38
17/07/2017	Loggerhead turtle	Visual	1	125	13:17 - 13:19	Shutdown	13:18	14:26
17/07/2017	Unidentified turtle species	Visual	1	50	19:13	Shutdown	19:13	20:25
18/07/2017	Unidentified turtle species	Visual	1	50	17:21 - 17:22	Shutdown	17:21	18:49
18/07/2017	Loggerhead turtle	Visual	1	150	17:43 - 17:47	Delay	NA	18:49
20/07/2017	Unidentified turtle species	Visual	1	20	03:37	Shutdown	03:37	04:38
20/07/2017	Loggerhead turtle	Visual	1	125	15:19 - 15:20	Shutdown	15:20	16:21
22/07/2017	Loggerhead turtle	Visual	1	10	02:52 - 02:54	Shutdown	02:52	03:53
26/07/2017	Green turtle	Visual	1	80	14:53	Shutdown	14:54	15:54
31/07/2017	Unidentified dolphin species	Acoustic	Unknown	Unknown <sup>1</sup>	03:34 - 04:10 <sup>1</sup>	Delay	NA	05:22

<sup>1</sup> As it was not possible to determine the distance of the dolphins, there was a precautionary 60 minute delay to the start of operations from the last time of detection