



Bay State Wind Offshore Wind Farm Combined PSO Reports – 2018/2019 Geophysical Survey Plan

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Appendix B	Protected Species Observer Report (TerraSond Report)
Appendix C	Geophysical Site Survey Protected Species Observation Report (EGS Report)

Acronyms and Abbreviations

Bay State Wind	Bay State Wind LLC
BOEM	Bureau of Ocean Energy Management
EGS	EGS International Ltd.
EZ	exclusion zone
Fugro	Fugro Marine Geoservices, Inc.
HRG	high-resolution geophysical
IHA	Incidental Harassment Authorization
kHz	kilohertz
Lease Area	Renewable Energy Lease Area OCS-A 0500
m	meter
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
OSS	offshore substation
PAM	Passive Acoustic Monitoring
Project	Bay State Wind Offshore Wind Farm Project
Project Area	Commercial Lease OCS-A 500 Area and the Export Cable Corridor
PSO	Protected Species Observer
RB	reticle binoculars
RPS	RPS Group
SES	Smultea Environmental Sciences, LLC
UE	unaided eye
WTG	wind turbine generator

1. Introduction

The following report provides an overview of the protected species observer (PSO) mitigation and monitoring efforts conducted aboard the R/V *Westerly* (performed by Fugro Marine GeoServices, Inc. [Fugro] with PSOs from Smultea Environmental Sciences, LLC [SES]), the M/V *Gerry Bordelon* (performed by TerraSond with PSOs from RPS Group [RPS]), and the M/V *Neptune* (performed by EGS International Ltd. [EGS] with PSOs provided by EPI Group [EPI]) from May 2018 to March 2019 during geophysical survey efforts for Bay State Wind LLC (Bay State Wind). All information provided in this report is derived from the three technical PSO reports which are found in Appendix A, B, and C respectively. The Fugro report was authored by SES; the TerraSond Report was authored by RPS; and the EGS report was authored by EPI.

2. Survey

2.1 Background

Geophysical survey efforts were performed to support the development of the Bay State Wind Offshore Wind Farm Project (Project) located in the Bureau of Ocean Energy Management (BOEM)-designated Renewable Energy Lease Area OCS-A 0500 (Lease Area). For these purposes, the Project Area includes both the offshore Lease Area and the Export Cable Corridor (Figure 1) surveyed during the three geophysical survey effort phases. Protected species monitoring was conducted throughout all survey operations, in accordance with standards set forth by BOEM and the National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NOAA Fisheries). Additionally, protected species monitoring was performed in compliance with the Geophysical Survey Plan Approval Conditions for Lease Outer Continental Shelf OCS-A 0500 and the Incidental Harassment Authorization (IHA). The IHA, issued by NOAA Fisheries on July 24, 2018, authorized the potential level B takes for 8,534 marine mammals from 13 species. No level A exposures were authorized. Species in the IHA authorization include seven dolphin species, five whale species, two seal species, and the harbor porpoise. The species authorized for Level B take are as follows:

Dolphins:

- bottlenose dolphin (*Tursiops truncatus*);
- Atlantic white-sided dolphin (*Lagenorhynchus acutus*);
- short-beaked common dolphin (*Delphinus delphis*);
- Atlantic spotted dolphin (*Stenella frontalis*);
- Risso's dolphins (*Grampus griseus*); and
- long-finned pilot whale (*Globicephala melas*);

Whales:

- sperm whale (*Physeter macrocephalus*);
- humpback whale (*Megaptera novaeangliae*);
- fin whale (*Balaenoptera physalus*); and
- minke whale (*Balaenoptera acutorostrata*); and

Seals:

- harbor seal (*Phoca vitulina*);
- gray seal (*Halichoerus grypus*); and
- harbor porpoise (*Phocoena phocoena*).

A general overview of the geophysical survey area can be found in Figure 1. Survey overview information, including total durations of survey efforts in days and hours and durations of PSO efforts from all three geophysical survey efforts is provided in Table 1. Table 2 lists a summary of survey efforts by vessel. Survey efforts on board M/V Neptune were conducted over a comparatively much longer duration, 270 days, as opposed to 55 and 51 days on board the R/V Westerly and M/V Gerry Bordelon, respectively. M/V Gerry Bordelon and M/V Neptune are both larger vessels containing sleeping and living quarters for crew and therefore run 24-hour offshore operations, whereas the R/V Westerly is a smaller nearshore vessel which berths at a marina nightly. Both offshore vessels conducted 24-hour PSO or Passive Acoustic Monitoring (PAM) operations. Discussed further in Section 2.1.1., survey efforts on board R/V Westerly did not require use of a PAM system.

Table 1 Summary of Combined Survey Efforts

Total Number of Survey Days	Total Survey Hours	Total PSO hours	Total PAM hours
376	3,239	4,611	1,349

Table 2 Summary of Survey Efforts by Vessel

Vessel	Number of Survey Days	Hours of Survey Operations	Hours of PSO Operations	Hours of PAM Operations
R/V Westerly	55	349	466	N/A
M/V Gerry Bordelon	51	457	758	191
M/V Neptune	270	2,433	3,387	1,158

2.1.1 R/V Westerly Survey

The geophysical survey conducted on R/V Westerly was responsible for the shallow water area between the potential landfall locations of the Export Cable Corridor in Somerset, Massachusetts area (Figure 2), as well as filling in data gaps along the previously surveyed Export Cable Corridor to Somerset, Massachusetts (Figure 3). These two areas of geophysical survey performed by the R/V Westerly are, in this report, referred to as Area A (Figure 2). Additionally, R/V Westerly was responsible for survey of the Export Cable Corridor out to the 3-nautical mile limit, referred to here as Area B (Figure 3).

Geophysical survey operations were performed by Fugro, and protected species observations, monitoring, and mitigation were conducted by SES under contract with Fugro. Protected species included marine mammals, sea turtles, and Atlantic sturgeon.

The PSO responsibilities included monitoring and implementing mitigation measures in order to diminish the possibility of potential adverse impacts to protected species. PSO monitoring onboard the R/V Westerly was only necessary during daylight periods, while the vessel was operating.

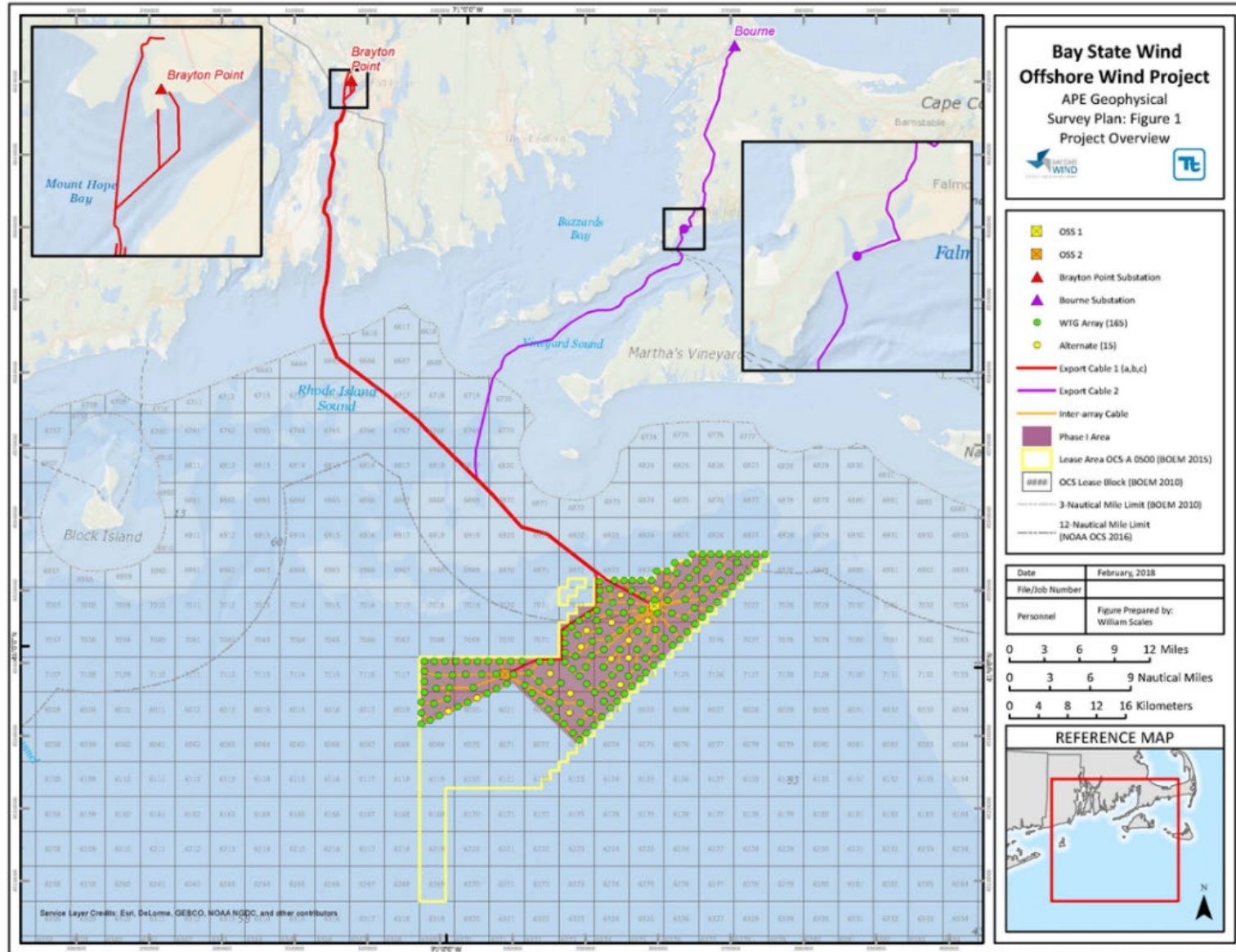


Figure 1 Geophysical Survey Area Overview



Figure 2 R/V Westerly Survey Area A

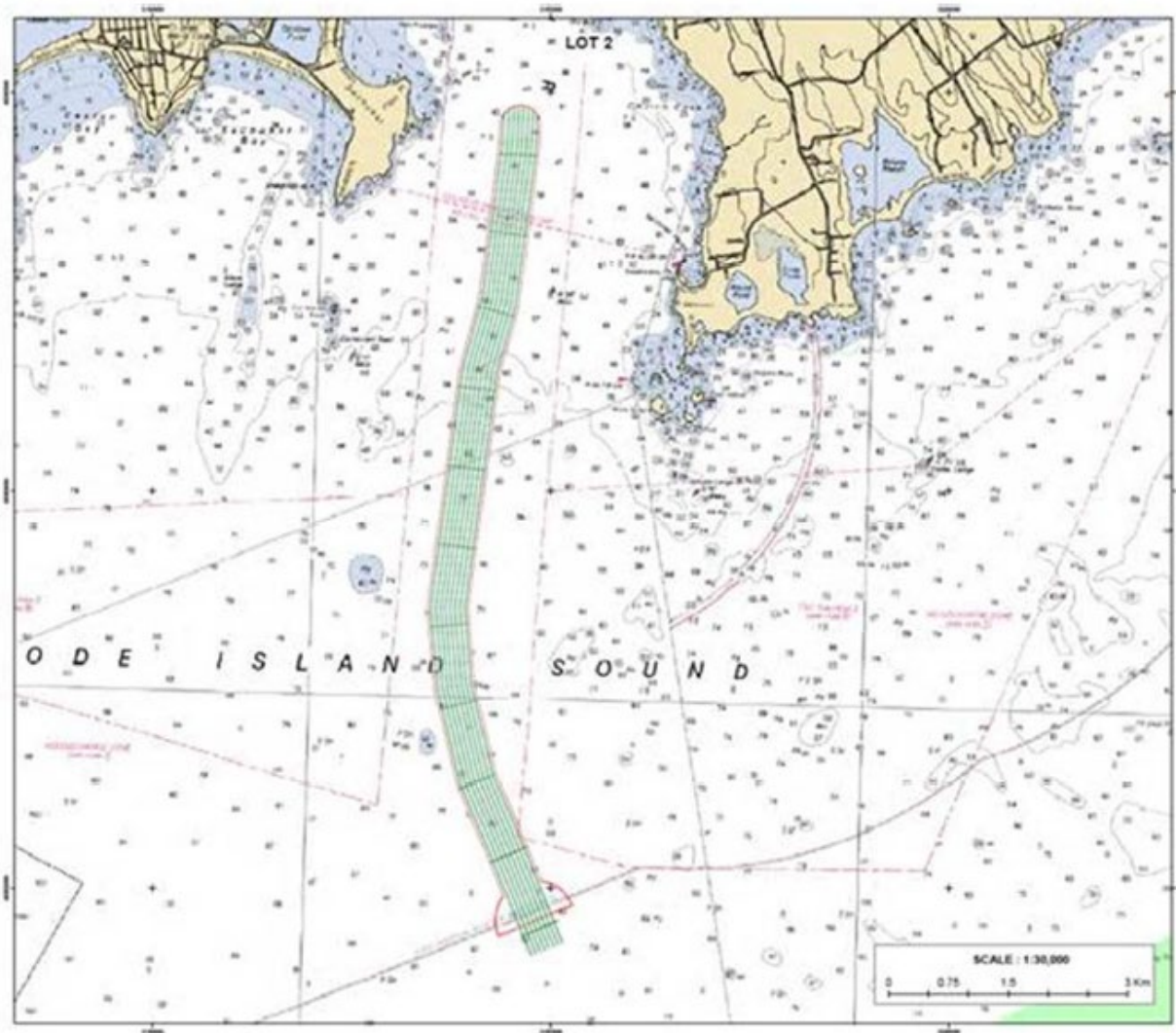


Figure 3 R/V Westerly Survey Area B

Mitigation measures on board the R/V Westerly, as listed in the PSO report provided by Fugro found in Appendix A, included:

- A 60-minute (min) “clearing” period of the 500-meter (m) exclusion zone (EZ) for North Atlantic right whales (*Eubalaena glacialis*) and the 200-m EZ (all other marine mammals and sea turtles) prior to activation of survey equipment regulated by the Lease (i.e., producing sounds <200 kilohertz [kHz]);
- Ramp-up and shutdown protocols for high-resolution geophysical (HRG) equipment operating below 200 kHz (note, however, that ramp up was not physically/operationally feasible with any of the equipment used nearshore);
- Vessel strike avoidance protocols;
- North Atlantic right whale separation distance (500 m) and seasonal operating procedures; and
- Documentation of any injured or dead protected species observed during the survey as described herein and in the BOEM Lease OCS-A 0500.

Methods utilized by PSOs on board the R/V Westerly consisted of visual monitoring before, during, and after the use of any geophysical survey equipment. Additionally, monitoring occurred when survey equipment was inactive to ensure compliance with BOEM specifications. PSO visual monitoring occurred using unaided eye (UE) with the occasional use of Fujinon™ 7 × 50 reticle binoculars (RB). Use of RB was primarily for confirmation of species identity, distance to sighting, and group composition/size and behavior. Viewing constraints associated with the use of RB is the narrower field of view when compared to UE; however, benefits of the RB are the greater magnification available to allow more distance sightings and accurate species identification, and, the ability to locate animals using the built in reticle system. PSO monitoring occurred on the back deck of R/V Westerly, focusing forward with a 180° arc while underway, but observing a full 360° area while the vessel was on station due to geophysical survey operations. Additionally, regular scanning in a sweeping pattern occurred astern of the vessel while underway.

One visual PSO stationed on the R/V Westerly monitored for protected species prior to, during, and after use of all geophysical equipment. All PSOs on board the M/V Westerly were NOAA Fisheries, BOEM, and Bay State Wind approved. Visual PSO data was recording using *Mysticetus*, a software system designed to increase efficiency of data collection. *Mysticetus* displays the real time data on computer monitors, allowing a simplified solution for identifying location/distance of protected species sightings to mitigation distances/zones. Shift times, photographic protocols, and camera models are not specified.

This survey did not include the use of PAM nor did it operate at night, thus this report did not contain the NOAA Fisheries reporting requirement to compare visual observations to PAM detections and operations or an assessment of the effectiveness of night vision equipment, as none were used. NOAA Fisheries also requires a description of the effectiveness of the various mitigation techniques utilized and an interpretation of the results and effectiveness of all monitoring tasks. This report contains a brief summary of visual monitoring effort by sea state in Appendix A, Section 4.1.2.

2.1.2 M/V Gerry Bordelon Survey

Geophysical survey operations on board the M/V Gerry Bordelon, conducted by Terrasond, completed data acquisition along the export and inter-array cable corridors, at the wind turbine generator (WTG) foundation and installation areas, and at the offshore substation (OSS) foundations and installation areas. RPS, contracted by Terrasond, provided four PSOs and two PAM Operators, responsible for monitoring as well as implementing mitigation protocols. Mitigation protocols, according to the PSO report provided by Terrasond, found in Appendix B, included:

- establishment of EZs around energy sources with operating frequencies below 200 kHz:
 - 500-m EZ for North Atlantic right whales;
 - 135-m EZ for all marine mammal species for which no Level B potential exposure allowances were permitted in the Project IHA;
 - 100-m EZ was implemented for Endangered Species Act-listed animals;
 - 75-m EZ was used for harbor porpoise;
 - 50-m EZ was implemented for sea turtles; and
 - 5-m EZ was used for all other marine mammal species with Level B potential exposure allowances in the Project IHA;

- search periods of 60 minutes conducted visually (daytime) or visually and acoustically (all periods of reduced visibility, including night) prior to the initiation of the sound sources from silence;
- delays to the initiation of the sound sources if marine mammals or sea turtles were detected inside their respective exclusion zones during the search period prior to the initiation of the source;
- shut-down of the active source upon detection of marine mammals or sea turtles inside their respective exclusion zones while a sound source with an operating frequency below 200 kHz was active and a subsequent search period of the exclusion zones; and
- once the sound source had been shut down for a protected species detection, operations would not resume until a specific time had passed following the last detection of the animal(s) or once the animal had exited the EZ: 15 minutes for small delphinid cetaceans and for pinnipeds, 30 minutes for non-delphinid cetaceans, 30 minutes for North Atlantic right whales, and 60 minutes for sea turtles.

Six experienced PSOs conducted monitoring and mitigation procedures on board the M/V Gerry Bordelon throughout the duration of the geophysical survey efforts. All PSOs on board the M/V Gerry Bordelon were NOAA Fisheries-approved and also held certifications from a BOEM PSO course. PSOs on board performed the majority of their monitoring duties on the bridge wings of the vessel, approximately eight meters above the surface of the water, with exceptions during severe weather and transits when monitoring was conducted from the bridge.

Monitoring duties were conducted by observing a 360° view of the vessel and acoustic sources. Monitoring included observing for blows, fins, splashes, disturbances of the sea surface, large flocks of feeding sea birds, and other indications of the possibility of protected species in the vicinity. PSO monitoring occurred using 7x50 RB in addition to two mounted 25x50 Big-eye binoculars and Nikon and Cannon DSLR cameras. One PSO was always on duty during daylight operations, and two PSOs during nighttime operations and periods of reduced visibility, regardless of survey operations activity. These assisting tools were utilized during daylight observation operations. Nighttime PSO operations utilized infrared LED handheld spotlights, as well as night vision goggles with head mounts and thermal clip-ons. PSO watches were scheduled at varying lengths throughout the day, with no watches exceeding four consecutive hours, and all followed by at least two hours of scheduled break time.

At the time of any sighting, PSOs' first step was to identify the range between the animal and the vessel/acoustic source, using RB, UE, and known distances to relate the animal to. PSOs would then identify the species, if possible, in order to determine mitigation measures to implement, if necessary. Photographs were taken when possible and photos were reviewed during observations breaks to confirm report information. Additional information was recorded, in accordance with IHA and Geophysical Survey Plan Approval Conditions, in the detection datasheet.

The use of a PAM was implemented on board M/V Gerry Bordelon during all times of survey operations, but primarily used to supplement visual monitoring efforts during times of darkness or low visibility. Passive Acoustic Monitoring activities were conducted by trained PAM Operators, having completed a BOEM accepted PSO training course and an RPS in-house PAM training course. Passive Acoustic Monitoring shifts lasted no longer than four consecutive hours with at least one hour of break in between watches. Passive Acoustic Monitoring occurred using Sennheiser headphones for aural monitoring, and *Pamguard* software for visual monitoring. *Pamguard* allowed for viewing of the spectrogram modules as well as click

detector modules, and also for location detection on the map module. *Pamguard* also allowed for the recording of high and low frequencies.

The effectiveness of the monitoring and mitigation measures that occurred during the PSO efforts on board M/V Gerry Bordelon can be found in Appendix B, Section 5.2.

2.1.3 M/V Neptune Survey

Geophysical survey efforts onboard the M/V Neptune Survey were conducted by EGS. Survey areas (Figure 4) according to the PSO report provided by EGS (Appendix C) are as follows:

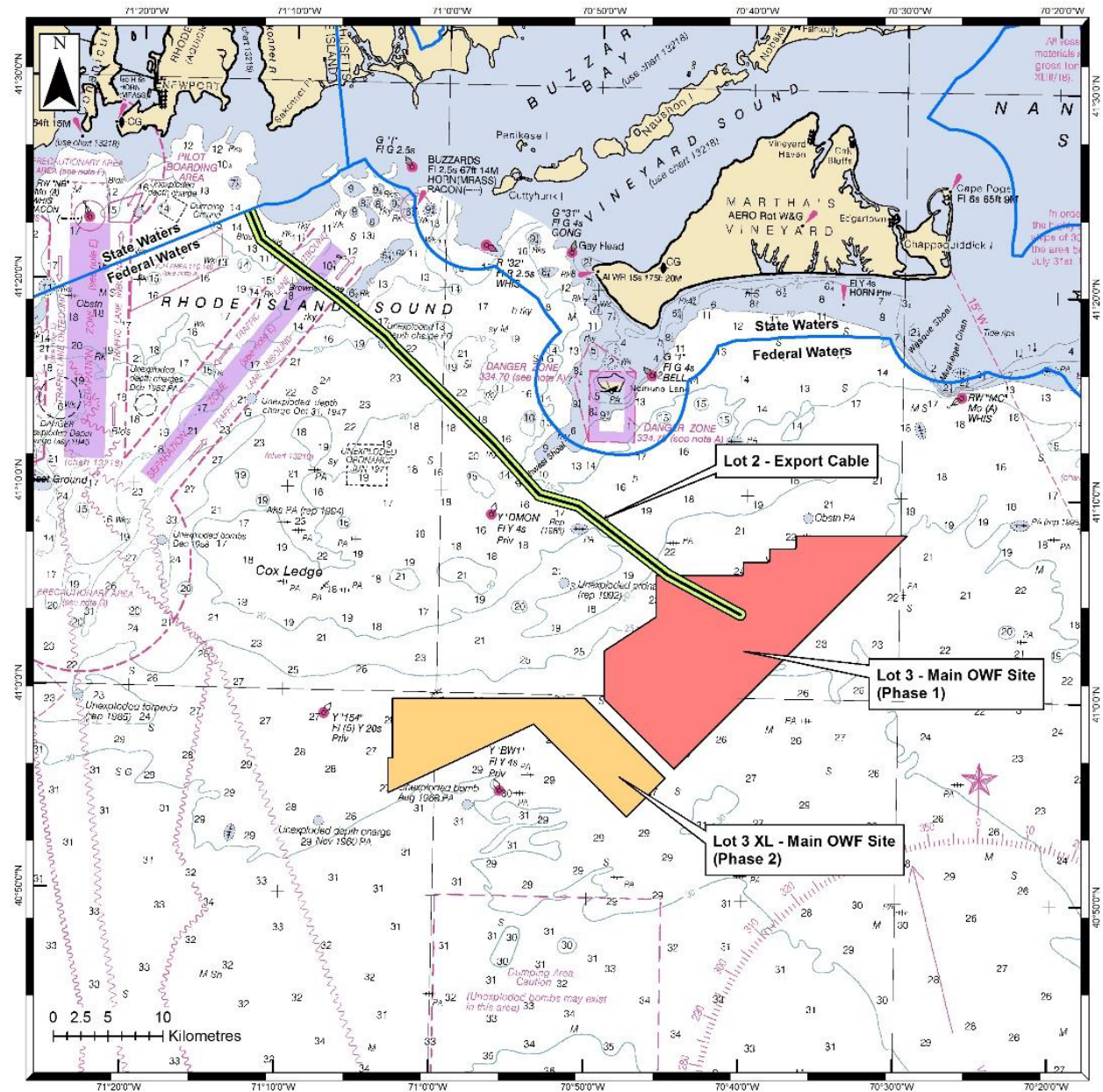


Figure 4 M/V Neptune Survey Area

- Lot 2: Geophysical survey of the offshore Export Cable Corridor, extending up to the 3-nautical mile State Outward Boundary/Federal State Boundary, providing supplementary information to previous survey data;
- Lot 3 XL (Phase 2 Area): Geophysical survey of the inter-array and OSS/WTG locations of an optional additional area to the south-west of the main Lot 3 area including the OSS-Link Cable connecting the two OSSs; and
- Lot 3 (Phase 1 Area): Geophysical survey of the Inter-Array and OSS/WTG locations of the main Lot 3 area.

Geophysical survey efforts consisted of use of sound sources including multi-beam echosounder, satellite vessel positioning system, Ultra-short-baseline positioning system, Side Scan Sonar, Gradiometer (Magnetometer), Sub-bottom Profiler, and Ultra-High Resolution Seismic (S-UHRS) system. Due to the use of these systems, EGS contracted EPI for protected species observations throughout the duration of the geophysical survey operations. EPI utilized four PSOs and two PAM technicians on board the M/V Neptune at all times, for marine mammal and protected species monitoring and mitigation. Visual monitoring occurred 24-hours a day and PSOs rotated shifts at 2- to 4-hour intervals. All PSOs on board the M/V Neptune were experienced and had received approval from NOAA Fisheries and BOEM for their provided credentials prior to the beginning of the survey efforts. PSO and PAM technician responsibilities are as follows, according to the PSO report provided by EGS, found in Appendix C:

- **Monitoring:** The PSO recorded numbers, behavior, and locations of marine mammals (and other protected species) both during, and in the absence of, geophysical operations. Documenting animal reactions to the vessel and geophysical survey (when applicable). Documenting environmental parameters that may affect the ability to sight marine mammals and other protected species.
- **Mitigation:** Detecting marine mammals (and other protected species) within, or about to enter, the applicable EZ and initiate immediate shut down during geophysical operations. Using visual monitoring and PAM to estimate the number of marine mammals (and protected species) potentially exposed to geophysical sound sources at the specified estimated received levels.

Mitigation protocols on board the M/V Neptune consisted of the following, according to the PSO report provided by EGS (Appendix C):

- a 30 minute pre-watch in which no marine mammal or protected species is seen within its EZ, must be conducted prior to the activation of any HRG survey equipment;
- should a marine mammal or protected species be observed within its respective EZ during this pre-watch period, the start of operations must be delayed by:
 - 15 minutes for small odontocetes; and
 - 30 minutes for all other species;
- once the EZs have been clear for the relevant time periods, the lead PSO can give the all clear to the survey team to commence operations;
- once survey has commenced, should a marine mammal or protected species enter its related EZ, the lead PSO must request an immediate shut-down of all survey equipment. Operations may not re-commence until the lead PSO has confirmed that the EZ has been clear for a minimum of:
 - 15 minutes for small odontocetes; and

- 30 minutes for all other species; and
- at night or during periods where PAM is being used to support visual monitoring, PAM alone cannot be used to give the all clear to commence operations:
 - it can however be used to inform the PSOs that there are marine mammals vocalizing, potentially within the 500m EZ;
 - furthermore, should a North Atlantic right whale be detected with PAM, shut-down of all survey equipment below 200kHz may be requested by the PAM, whether or not the sound source can be localized; and
 - should a detection of sufficient volume be detected with PAM, shut-down may be requested following marine mammal presence by the PSOs.

Protected Species Observers conducted their visual monitoring on the bow and forward decks, the raised platform outside the bridge, and associated wings of the M/V Neptune whenever possible. During severe weather conditions, PSO visual monitoring was conducted inside the bridge. PSOs scanned a 360° area in a sweeping pattern using UE and, during daylight hours, Bushnell Marine 7 x 50 reticule binoculars and Zeis 10 x 42 non-reticulated binoculars. Two PSOs were always on watch during hours of darkness. During vessel transits, PSOs focused in a forward facing 180° arc. During hours of darkness, in addition to UE PSOs utilized Armasite PVS 7-night vision device binoculars and FLIR Ocean Scout Marine Thermal Handheld Scopes. Advantages and disadvantages of these specific night vision devices are summarized in the EGS Report (see Appendix G within Appendix C).

M/V Neptune was equipped with a PAM, which was utilized approximately 10-14 hours per day, dependent on the number of hours of darkness, based on the time of the year. Passive Acoustic Monitoring was also utilized during daylight hours with reduced visibility. Passive Acoustic Monitoring was conducted using *MSeis Night Hawk III* for documentation of vocalizations as well as analysis. Passive Acoustic Monitoring on board the M/V Neptune also utilized *Pamguard* to monitor, detect, and classify vocalizing marine mammals. Advantages and disadvantages of the specific PAM utilized are found in Appendix D.

2.2 BOEM Reporting Requirements

All three technical PSO reports submitted by Fugro, Terrasond, and EGS were written in accordance with requirements set forth by BOEM Lease OCS-A 0500.

Specific BOEM requirements regarding the record of observations of protected species sightings are as follows (BOEM 2015):

1. Vessel name.
2. Observer's names and affiliations.
3. Date.
4. Time and latitude/longitude when daily visual survey began.
5. Time and latitude/longitude when daily visual survey ended.
6. Average environmental conditions during visual surveys:
 - a. Wind speed and direction;
 - b. Sea state (glassy, slight, choppy, rough, or Beaufort scale);
 - c. Swell (low, medium, high, or swell height in meters); and
 - d. Overall visibility (poor, moderate, good).

7. Species (or identification to lowest possible taxonomic level).
8. Certainty of identification (sure, most likely, best guess).
9. Total number of animals.
10. Number of juveniles.
11. Description (as many distinguishing features as possible of each individual seen, including length, shape, color and pattern, scars or marks, shape and size of dorsal fin, shape of head, and blow characteristics).
12. Direction of animal's travel relative to the vessel (preferably accompanied by a drawing).
13. Behavior (as explicit and detailed as possible, noting any observed changes in behavior).
14. Activity of vessel when sighting occurred.

3. Results

This section of the report discusses the results of PSO and PAM observations completed by each of the three geophysical surveys that were conducted in support of the Project.

3.1 Marine Mammal Detections

A total of 496 marine mammal detections occurred throughout the duration of geophysical survey efforts conducted on all three vessels. A summary of all detections throughout the duration of geophysical survey efforts is summarized in Table 3. Table 4 shows number of detections by vessel.

Table 3 Summary of Marine Mammal Detections from All Surveys Combined

Species	Number of detections	Estimated Number of Individual Animals
Whales		
Humpback Whale	14	19
Fin Whale	20	24
Sperm Whale	1	1
Melon-headed Whale	1	1
Minke Whale	24	25
Unidentifiable Whale	81	86
Dolphins		
Bottlenose Dolphin	1	3
Risso's Dolphin	1	1
Common Dolphins	227	2280
Unidentifiable Dolphin	90	389
Pinnipeds		
Harbor Seal	10	11
Gray Seal	13	17
Unidentifiable Seal	10	13
Porpoises		
Harbor Porpoise	1	1
Sea turtles		
Loggerhead Sea Turtle	1	1
Unidentified Sea Turtle	1	1

Table 4 Summary of Marine Mammal Detections from All Surveys

Species	Number of Detections on Board		
	R/V Westerly	M/V Gerry Bordelon	M/V Neptune
Whales			
Humpback Whale		2	12
Fin Whale			20
Sperm Whale			1
Melon-headed Whale			1
Minke Whale		1	23
Unidentifiable Whale	1	2	78
Dolphins			
Bottlenose Dolphin			1
Risso's Dolphin			1
Common Dolphins		60	167
Unidentifiable Dolphin		9	81
Pinnipeds			
Harbor Seal		1	9
Gray Seal	1		12
Unidentifiable Seal		1	9
Porpoises			
Harbor Porpoise			1
Sea turtles			
Loggerhead Sea Turtle			1
Unidentified Sea Turtle			1

3.1.1 Marine Mammal Detections from R/V Westerly

Two marine mammal detections occurred on board the R/V Westerly (Figure 5): the sighting of one gray seal and the sighting of an unidentifiable whale carcass. Both sightings were visually observed, and descriptions can be found in Table 5. Upon the sighting of the unidentifiable whale carcass, necessary parties were informed and a report of the incident was completed, per NOAA Fisheries/BOEM reporting procedures.

Table 5 Summary of Detections on board R/V Westerly, found in Appendix A

Sighting Time	Species	Sgt Dist (m)	Optics Type	Behavior Change	Bft	Best Count	Mitigation Request	Mitigation Response
2018-06-07 14:46:45.9 EDT	Unidentified Whale (dead, portion of vertebrae)	300	Naked Eye	NA	4	1	Shutdown	Shutdown
2018-07-12 13:38:50.0 EDT	Gray Seal	5	Naked Eye	None	3	1	Shutdown	Shutdown



Figure 5 Marine Mammal Detections from R/V Westerly

3.1.2 Marine Mammal Detections from M/V Gerry Bordelon

A total of 76 marine mammal sightings were observed from the M/V Gerry Bordelon during geophysical survey operations (Figure 6). Out of these 76 marine mammal sightings an estimated 182 potential Level B exposures occurred. All 182 incidents occurred during common dolphin detections. Four marine mammal species were identified as being sighted, with two of the sighting's species remaining unidentified. The reasoning for the inability to identify the two remaining species is either the brevity of the sighting, the visual conditions, or the distance of the sighted animal from the M/V Gerry Bordelon. Of the 76 sightings, a total of 60 were common dolphins. Of the 76 marine mammal sightings, only 27 sightings required mitigation measures to be taken. A total of 98 marine mammal detections, both visual and acoustic, occurred throughout survey operations on board the M/V Gerry Bordelon. A summary of the detections, both visual and acoustic, made during the M/V Gerry Bordelon survey can be found in Table 6.

Table 6 Summary of Detections on board M/V Gerry Bordelon, found in Appendix B

Monitoring Method	No. of detections made	Monitoring effort (HH:MM)	Monitoring Effort (Decimal)	Detection rate (Dets/hour effort)
Visual monitoring	67	758:21	758.35	0.088
Acoustic monitoring	31	190:46:00	190.77	0.162

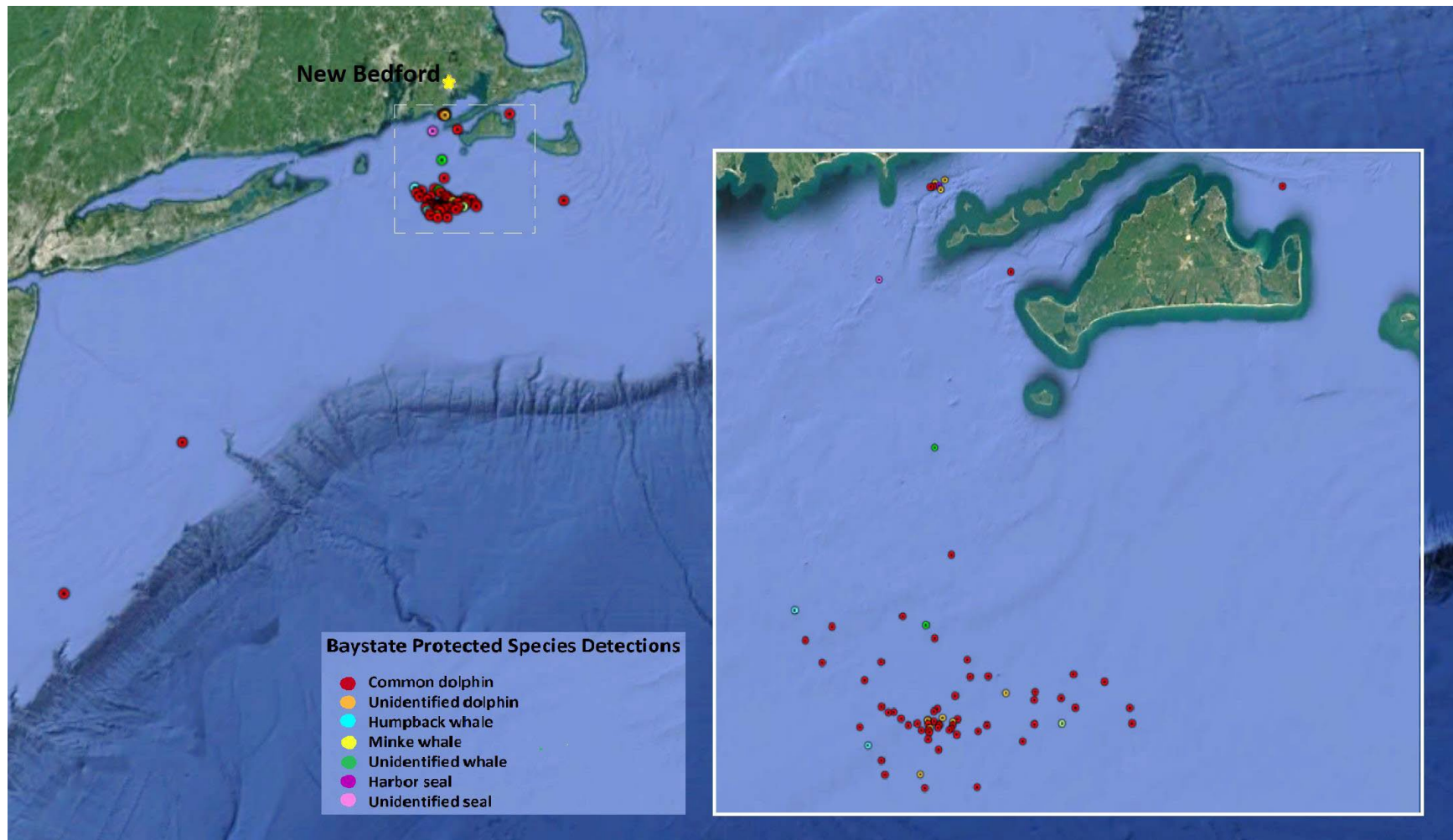


Figure 6 Marine Mammal Detections from M/V Gerry Bordelon

3.1.3 Marine Mammal Detections from M/V Neptune

Four hundred and eighteen marine mammal sightings occurred on board the M/V Neptune (Figure 7 through Figure 11). Of these 418 sightings, only 22 sighting events required mitigation measures. Throughout all of the marine mammal detections, no marine mammal takes occurred. The majority of sightings on board the M/V Neptune were common dolphin and unidentifiable sightings. Additionally, a comparably significant amount of unidentifiable whale sightings occurred as well. A total of 487 marine mammal detections occurred throughout survey operations on board the M/V Neptune. A summary of detections, visual, infrared camera, and acoustic, is found in Table 7.

Table 7 Summary of Detections on board M/V Neptune, found in Appendix C

Species	No. of Visual Detections	No. of Infrared Camera Detections	No. of PAM Detections	Total
Bottlenose Dolphin	1	-	-	1
Fin Whale	20	-	-	20
Grey Seal	12	-	-	12
Harbor Porpoise	1	-	-	1
Harbor Seal	9	-	-	9
Humpback Whale	12	-	-	12
Loggerhead Sea Turtle	1	-	-	1
Melon-headed Whale	1	-	-	1
Minke Whale	22	-	-	22
Risso's Dolphins	1	-	-	1
Common Dolphin	166	1	57	224
Sperm Whale	1	-	-	1
Unidentified Dolphin or Porpoise	27	1	65	93
Unidentified Seal	9	-	-	9
Unidentified Sea Turtle	1	-	-	1
Unidentified Whale	63	-	16	79
Total	347	2	138	487

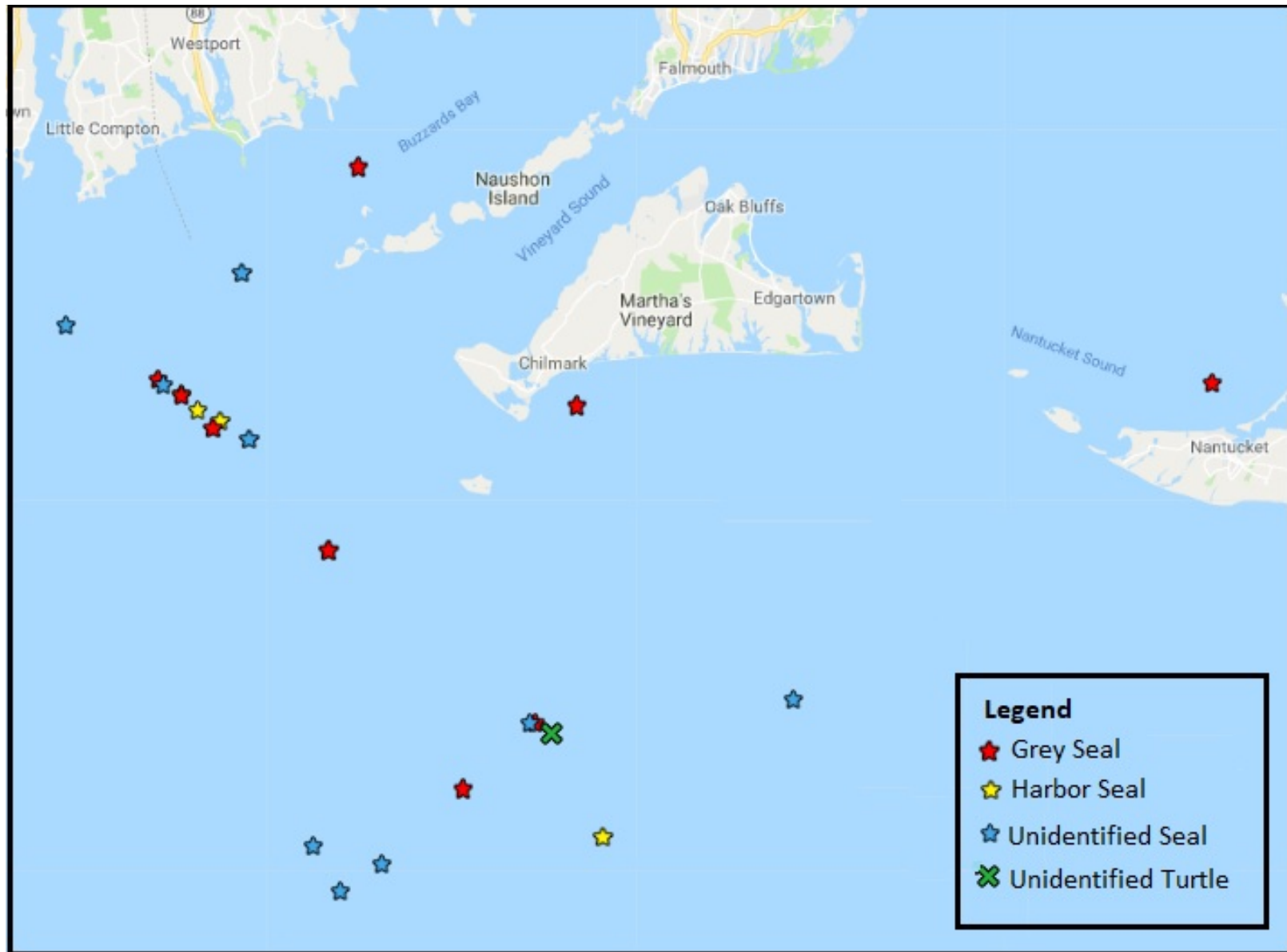


Figure 7 Marine Mammal Detections from M/V Neptune (pinniped and sea turtles using visual monitoring methods)

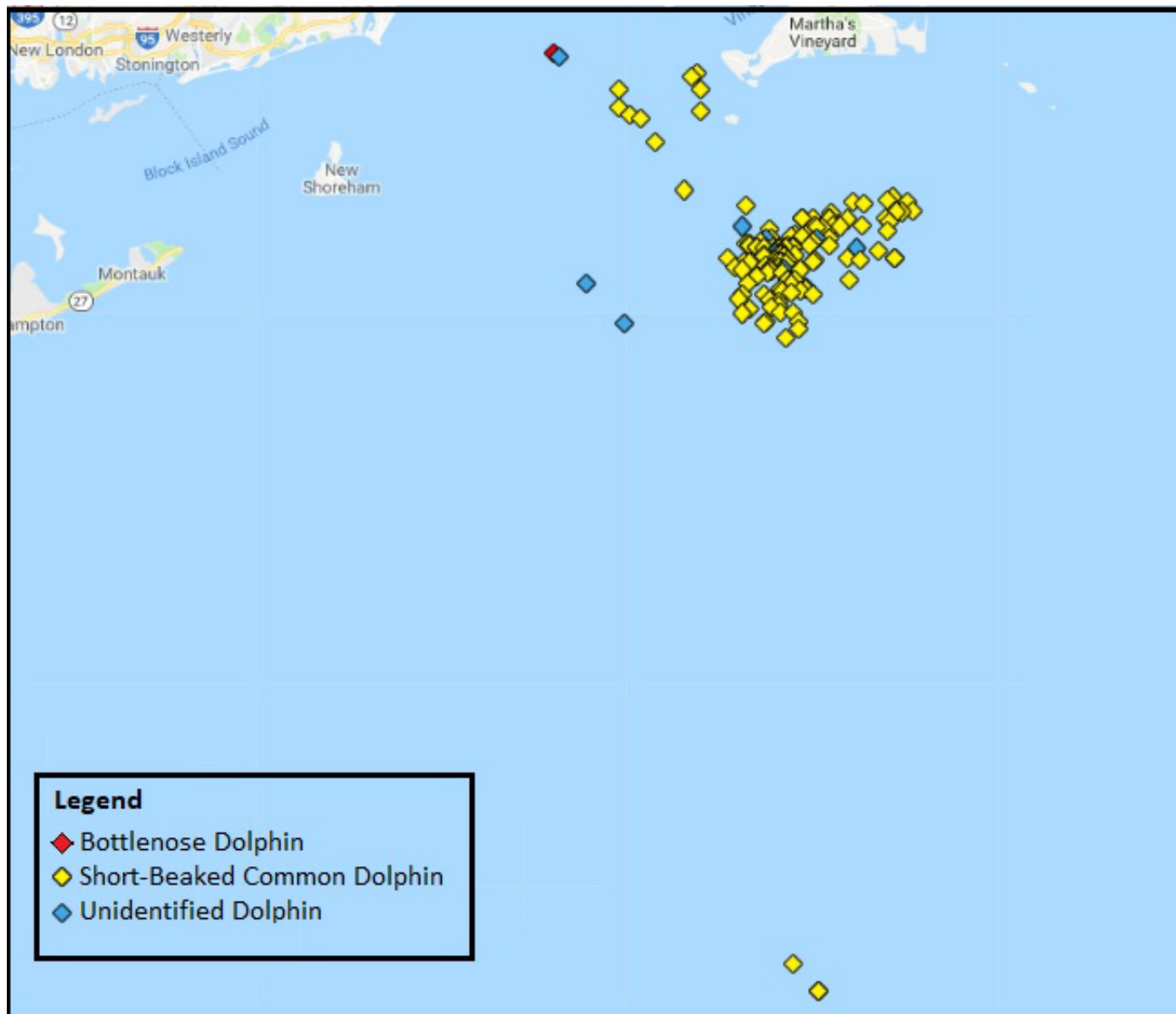


Figure 8 Marine Mammal Detections from M/V Neptune (dolphins using visual monitoring methods)

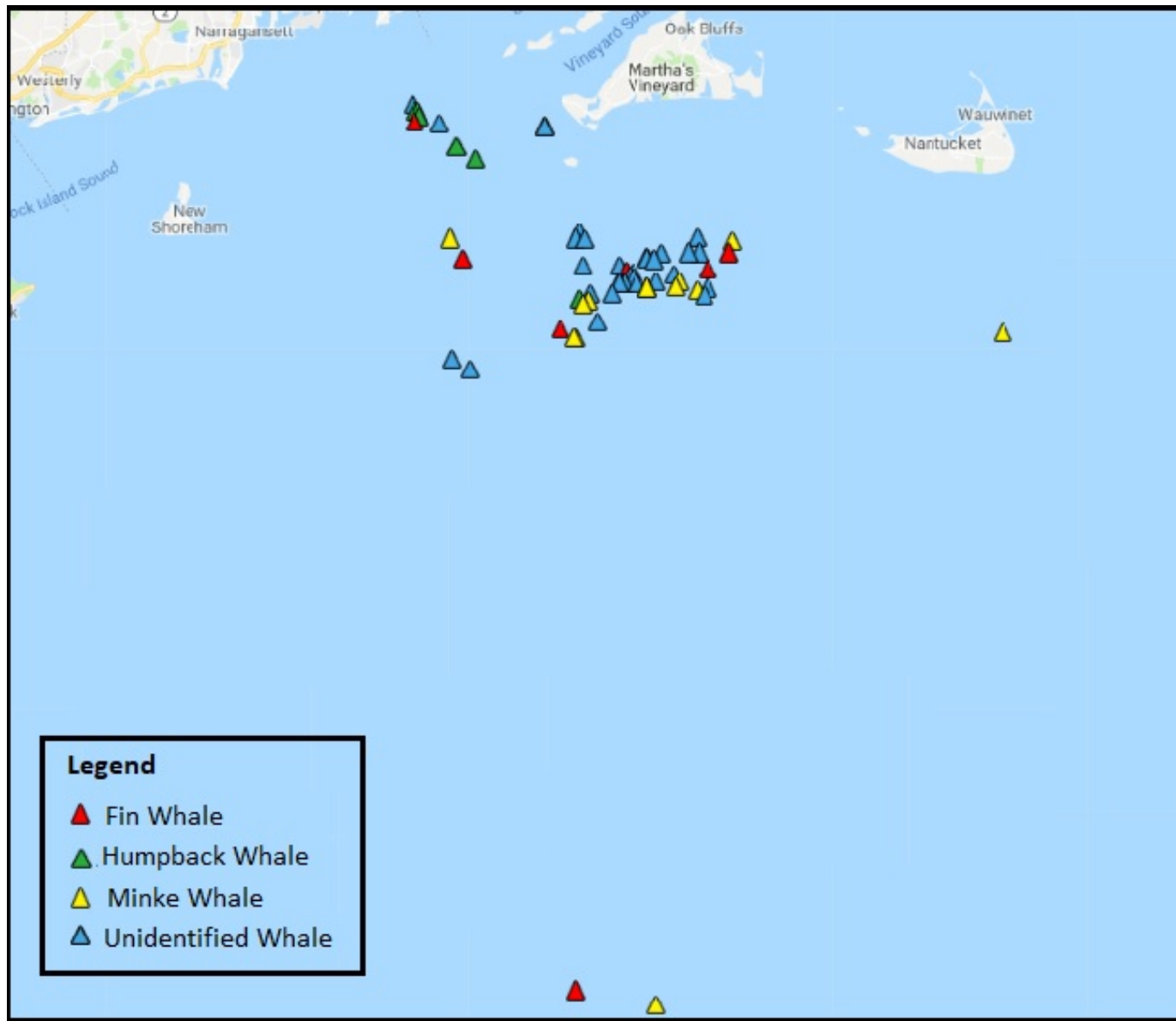


Figure 9 Marine Mammal Detections from M/V Neptune (whales using visual monitoring methods)

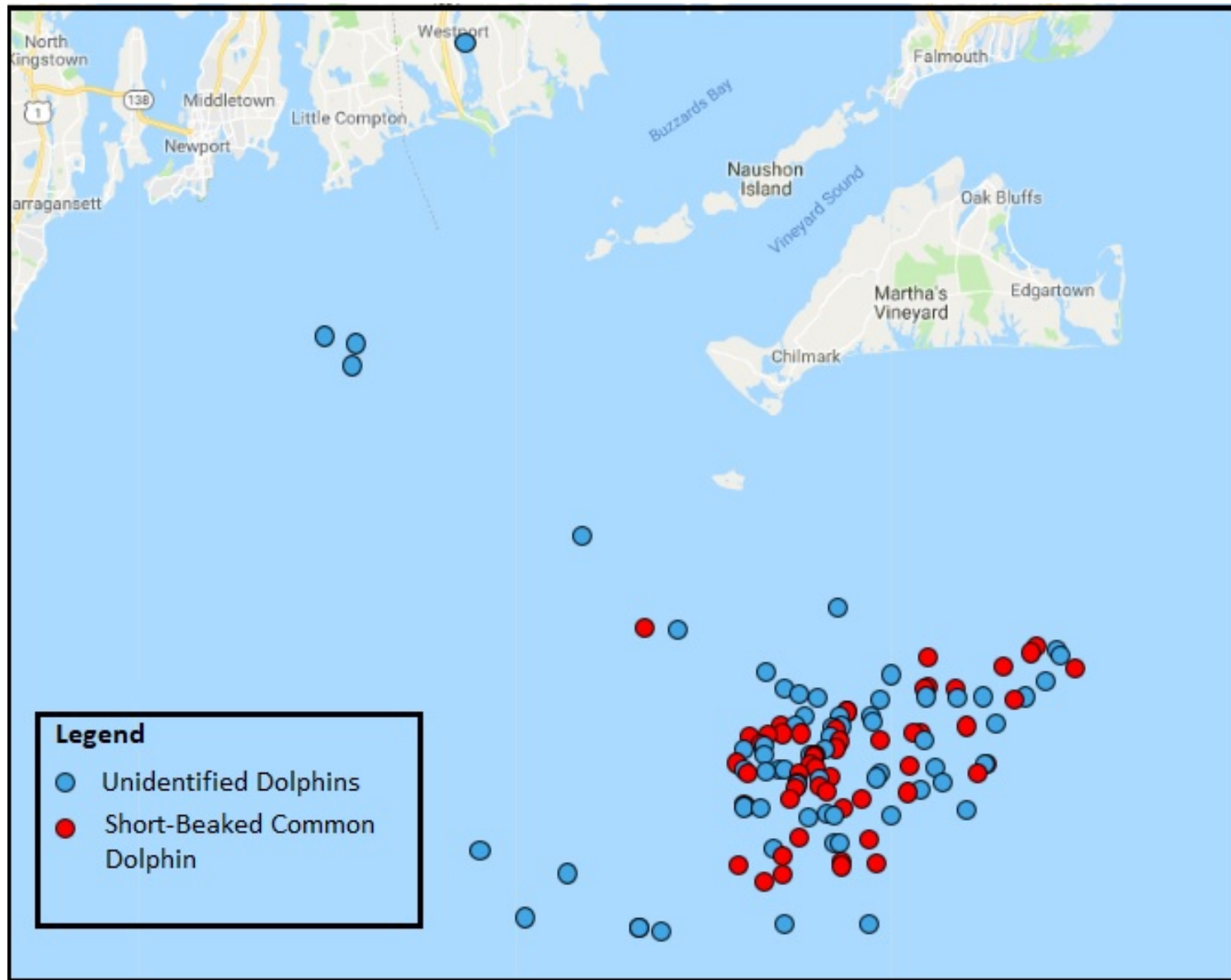


Figure 10 Marine Mammal Detections from M/V Neptune (dolphins using PAM methods)

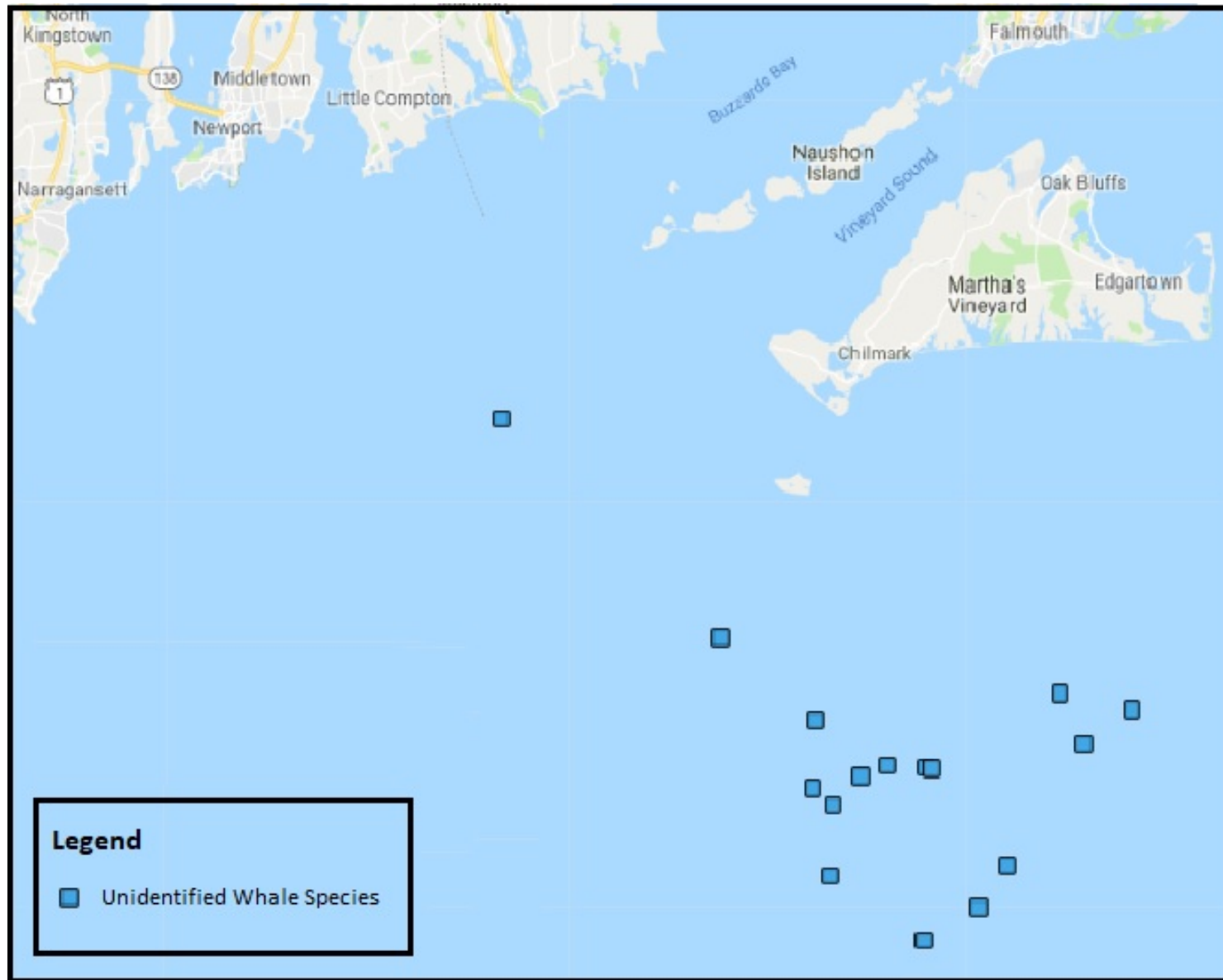


Figure 11 Marine Mammal Detections from M/V Neptune (whales using PAM methods)

3.2 Mitigations Actions Implemented

A total of 51 mitigation measures were implemented throughout the duration of geophysical survey efforts on board all three vessels. A summary of mitigation measures implemented on board all three vessels during geophysical survey efforts is included in Table 8. The majority of detections did not require mitigation measures to be implemented.

Table 8 Summary of Mitigation Actions Implemented from All Surveys

Type of Mitigation Measure	Number of Mitigation Measures on Board		
	R/V Westerly	M/V Gerry Bordelon	M/V Neptune
Delay	0	3	4
Shutdown	2	24	18
Total	2	27	22

4. Literature Cited

BOEM (Bureau of Ocean Energy Management). 2015. Commercial Lease of Submerged Lands for Renewable Energy *Development on the Outer Continental Shelf*. Available online: <https://www.boem.gov/Lease-OCS-A-0500/>. Accessed July 3, 2019.

Appendix A

Protected Species Observer Final Technical Report for Bay Shore Wind Export Cable Landfall Areas, Lots 1 & 2, Somerset and Falmouth, MA, 2018 (Fugro Report)

Appendix B

Protected Species Observer Report (TerraSond Report)

Appendix C

Geophysical Site Survey Protected Species Observation Report (EGS Report)