AFTER-ACTION MITIGATION REPORT FOR THE SHOCK TRIAL OF USS MESA VERDE (LPD 19)

December 2008

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1.0 Introduction

The Navy prepared a Final Environmental Impact Statement (EIS)/Overseas EIS on the Shock Trial of USS MESA VERDE (LPD 19) and published a notice of its availability in the *Federal Register* on 30 May 2008 (73 Federal Register [FR] 105 [31115]). In support of section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA), the Navy also submitted a request to the National Marine Fisheries Service (NMFS) for an "incidental take authorization". In support of the incidental take submittal, the NMFS published a proposed rule in the *Federal Register* on 11 April 2008 (73 FR 71 [19789–19795]) specifying protective measures and reporting requirements for the shock trial. The final rule, signed by NMFS on 18 July 2008, became effective upon its submission to the *Federal Register* for publication on 24 July 2008 (73 FR 143 [43130-43138]). The NMFS issued its Letter of Authorization (LOA) for the shock trial on 22 July 2008 (NMFS, 2008a). The Navy published its Record of Decision for the shock trial in the *Federal Register* on 28 July 2008 (73 FR 145 [43727-43730]). This report is presented to fulfill the requirements conditional to the LOA and Biological Opinion (BO) (NMFS, 2008b) under the Endangered Species Act for the shock trial of USS MESA VERDE (LPD 19), a new amphibious transport dock SAN ANTONIO Class ship. The Navy is submitting this report to the Director of NMFS' Office of Protected Resources, the NMFS' Southeast Region, and the Chief of NMFS' Endangered Species Division - Office of Protected Resources.

Section 2366, Title 10, United States Code (10 USC §2366) requires realistic survivability testing of a covered weapon system to ensure that the vulnerability of the system, under combat conditions, is known. The Navy executed the shock trial for the SAN ANTONIO Class ships to meet its obligation to perform realistic survivability testing. The Navy conducted a full ship shock trial during an eight-week period in the summer of 2008 utilizing USS MESA VERDE (LPD 19) as the test ship. The shock trial of USS MESA VERDE consisted of three underwater detonations of a nominal[1] 10,000 pound (lb) charge at a minimum rate of one detonation per week.

A full ship shock trial consists of a series of underwater detonations that propagate a shock wave through the ship's hull under deliberate and controlled conditions. The effects of the shock wave on the ship's hull, equipment, and personnel safety features are then evaluated. The purpose of the shock trial is to generate data that the Navy would use to assess the survivability of SAN ANTONIO Class ships. This data will be used by the Navy to validate or improve the survivability of the SAN ANTONIO Class, thereby reducing the risk of injury to the crew, and damage to or loss of a ship. An entire manned ship must undergo an at-sea full ship shock trial to obtain survivability data that are not obtainable through computer modeling and component testing on machines or surrogates. Navy ship design, crew training, and survivability lessons learned during previous shock trials, and total ship survivability trials, have proven their value by increasing a ship's ability to survive battle damage.

[1] ± 50 lbs

The following information is provided within this report:

- A daily log of the shock trial including descriptions of protective measures employed by the Navy;
- Identification of manpower needed to implement the aerial and shipboard surveillance efforts;
- Calculation of the time required on station to complete the shock trial and pre- and post-monitoring activities;
- Summary of the results, including the effectiveness of the protective measures plan and marine animal observations (i.e., sighted marine animals and sea turtles, behavioral observations);
- Adjustments/changes to the protective measures plan implemented during the shock trial; and
- Recommendations or descriptions of any constraints on the shock trial, if any.

This report provides the necessary information and analyses, and thus fulfills the requirements set forth in the Final EIS, Final Rule, LOA, and BO. The report is organized by section as follows:

- Section 2 provides details on the mitigation and monitoring requirements. This section describes the components of the protective measures efforts for pre- and post-detonation monitoring identified within the shock trial's Marine Mammal and Sea Turtle Protective Measures Plan.

- Section 3 includes data on the location and hours of aerial and shipboard surveillance used during the shock trial and observations of marine animals. This section also includes a summary of the results, including details of the marine animal observations (i.e., sighted marine animals and sea turtles, behavioral observations) for each detonation.

- Section 4 identifies the manpower implemented for the aerial and shipboard surveillance efforts. This section also includes an estimated calculation of the time required on station to complete each shock trial detonation.
- Section 5 includes lessons learned and adjustments/changes to the protective measures plan. Recommendations to improve the shock trial plan are also included in this section.

- Section 6 provides a conclusion of the shock trial events. There were no observed injuries or mortalities to marine mammals and sea turtles during the shock trial detonations. In addition, there were no indications of any impacts to any marine animals throughout the shock trial.

2.0 Mitigation

A detailed Marine Mammal and Sea Turtle Protective Measures Plan (Section 5.0 of the Final EIS; Navy, 2008) was developed to reduce the impact of the shock trial on these animals. The Protective Measures (Mitigation) Plan was modeled after similar mitigation and monitoring efforts successfully used during the shock trial of USS WINSTON S. CHURCHILL (WSC) conducted in 2001 off the coast of northern Florida (Navy, 2001).

2.1 Mitigation Plan Summary

The Mitigation Plan included shipboard and aerial surveillance components, as depicted in Figure 2-1. The Mitigation Plan established procedures for selecting the primary and secondary test sites within the test area where marine mammal and sea turtle populations were the lowest, based on the results of aerial surveys conducted prior to the detonation. This would ensure that the test site selected posed the least possible risk to the marine environment. Procedures for pre-detonation monitoring by shipboard and aerial surveillance were included to evaluate the test site and the Safety Range on the day of each detonation. Pre-detonation monitoring would verify that the Safety Range is free of visually detectable marine mammals, sea turtles, large *Sargassum* rafts, debris lines, large schools of fish, flocks of seabirds, and/or concentrations of jellyfish (possible indicators of sea turtle presence).

A Safety Range radius of 3.5 nautical miles (nmi) around the detonation point was calculated and determined to cover the estimated ranges for mortality and injury to a marine mammal or sea turtle associated with the detonation of a 10,000 lb explosive. The maximum range calculated for mortality (onset of severe lung injury) was 1.02 nmi with the maximum range for injury (onset of permanent threshold shift) at 3.5 nmi. These ranges were considered conservative and accounted for worst-case depth effects. The Mitigation Plan included detailed post-detonation monitoring to determine the effectiveness of the mitigation efforts. A ship-based Marine Animal Response Team (MART) and aerial observers would monitor the test site and surrounding waters for injured or dead animals after each detonation.

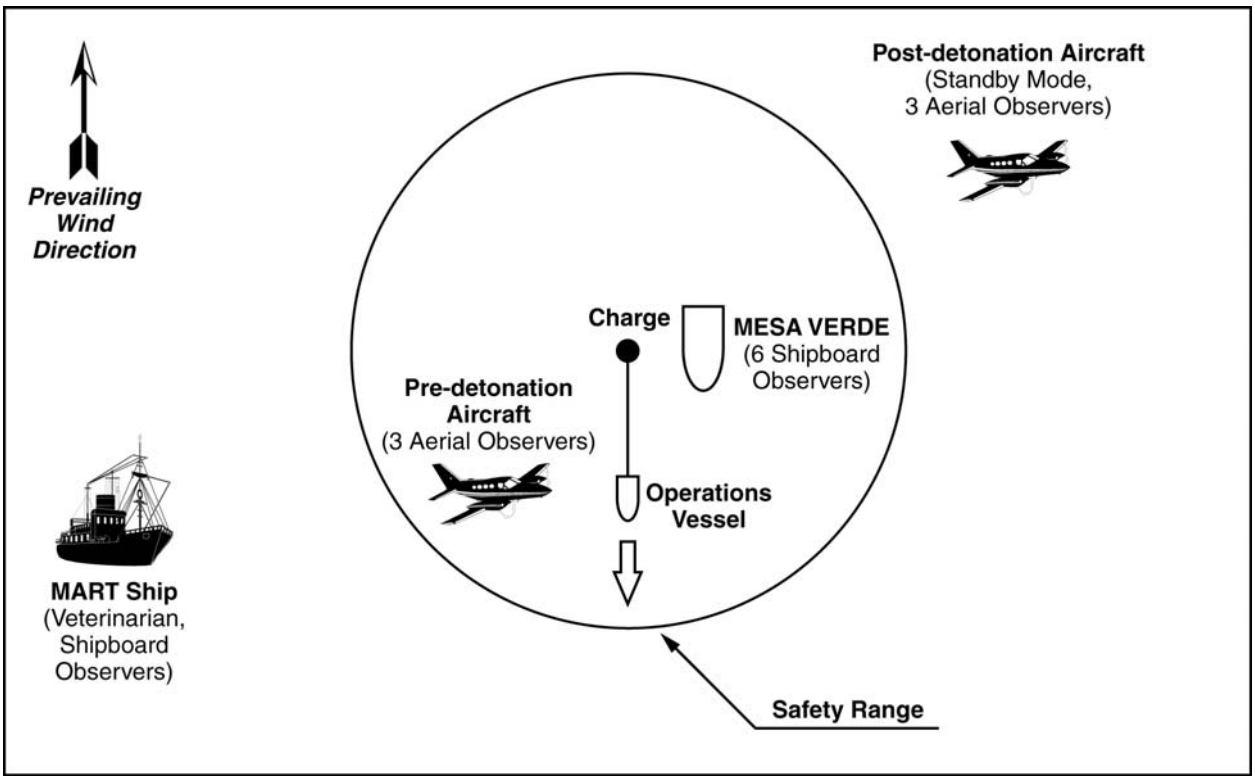

Figure 2-1. Mitigation Plan Components

Weather that supports the ability to sight small marine life (e.g., sea turtles) is required to mitigate the test site effectively. Wind, visibility, and surface conditions of the ocean are the most critical factors affecting mitigation operations. Higher winds typically increase wave height and create "white cap" conditions, both of which limit an observer's ability to locate surfacing marine mammals and sea turtles. Visibility is also a critical factor for aerial observation capabilities and safety-of-flight issues. To maximize detection of marine mammals and sea turtles, the Mitigation Plan required mitigation efforts to be conducted in Beaufort sea states no greater than 3 (Table 2-1). A minimum ceiling of 1,000 feet and visibility of 3 nmi was required to support mitigation and safety-of-flight concerns.

Table 2-1. Beaufort Sea State Descriptions

Beaufort Sea State	Description
1	Flat calm, no waves or ripples, wind speed 3 knots or less
2	Small wavelets, few if any whitecaps, wind speed of 4 to 6 knots
3	Whitecaps on 0-33% of surface; 1 to 2 ft waves, wind speed of 7 to 10 knots
4	Whitecaps on 33-50% of surface; 2 to 3 ft waves, wind speed of 11 to 16 knots
5	Whitecaps on greater than 50% of surface; greater than 3 ft waves, wind speed of 17 to 21 knots

Go/No Go Criteria

The Lead Scientist had the authority to declare the range fouled and recommend a "hold" or "abort" until surveillance monitoring indicated that the Safety Range was, and should remain, clear of detectable marine animals prior to the detonation. The shock trial countdown schedule included a series of operational checks, with the final two at three minutes and 90 seconds prior to detonation.

Detonation would be postponed if there were:

1. Any visual detections of marine mammals or sea turtles within the Safety Range (3.5 nmi radius). The "hold" or "abort" would continue until the marine animal that caused the postponement is positively reacquired outside of the Safety Range, either due to the animal swimming out of the Safety Range or due to the Safety Range moving to beyond the animal's last verified location.

2. Observations of large *Sargassum* rafts, debris lines, or large concentrations of jellyfish within the Safety Range. The "hold" or "abort" would continue until the *Sargassum* rafts, debris lines or jellyfish that caused the postponement are confirmed to be outside the Safety Range, due to either current movement or the Safety Range moving away from the last verified location.

3. Observations of flocks of seabirds or large schools of fish near the ocean surface within 1 nmi of the detonation point. The "hold" or "abort" would continue until the seabirds or fish are confirmed to be more than 1 nmi from the detonation point, either due to the fish or birds moving out of the Safety Range or the Safety Range moving away from their last verified location.

2.2 Mitigation and Monitoring Components

The Mitigation Plan included three components: (1) pre-detonation aerial surveys; (2) pre-detonation shipboard monitoring from USS MESA VERDE and the MART ship; and (3) post-detonation aerial and shipboard monitoring. The aerial and shipboard monitoring teams identified and located marine mammals, sea turtles, and large *Sargassum* rafts observed at the ocean surface. The Lead Scientist and Protective Measures Coordinator used a marine animal tracking and sighting (MATS) program onboard USS MESA VERDE to track all marine animals spotted by the shipboard and aerial teams during each shot day. The MATS program allowed immediate plotting of an animal's position relative to the detonation point and depicted the 3.5 nmi Safety Range as concentric circles around the moving detonation point (USS MESA VERDE). The MATS program used a real-time global positioning system (GPS) feed to identify the location of USS MESA VERDE and applied an algorithm to factor Gulf Stream current data, speed, and direction to predict possible movements of animals sighted near the detonation point. This capability was particularly beneficial in depicting floating *Sargassum* mats and species like sea turtles that are passively mobile within the Gulf

Stream. The Protective Measures Coordinator entered the species, location, swim direction, and time of sighting of every animal or group of animals detected into the MATS program. The MATS program then predicted where the animal(s) would most likely resurface and assisted in re-identifying sightings outside of the Safety Range.

2.2.1 Pre-Detonation Aerial Surveys/Monitoring

The aerial observation team consisted of three observers and a pilot familiar with flying marine animal aerial surveys. The aircraft flown was an M337 Skymaster, a twin-engine aircraft holding four personnel: a pilot, a co-pilot, and two marine biologists as observers. The aircraft can fly up to 9½ hours due to its extended range tanks. The aircraft was equipped with three GPS displays with the ability to download National Electrical Manufacturers Association (NEMA) data directly to a laptop computer. Additional equipment included an all-weather, full instrument equipment marine band radio; a Next-generation Radar (NEXRAD) weather satellite with real-time download; and a weather stormscope. The right window of the aircraft can be rolled open to accommodate photography by the observers. The aircraft was equipped with an open ocean four to six man life raft with full emergency supplies and an emergency life vest for each crew member. A second aircraft of similar configuration and crew of pilots and observers was available on each shot day to relieve the primary aircraft when the primary aircraft needed to refuel.

In consideration of safety-of-flight issues, only one observation aircraft was allowed in the airspace over the test site at any one time. Each aerial observer was required to be experienced in marine animal surveying and familiar with species that occur in the area. Each aircraft had a data recorder responsible for relaying the sighting coordinates, species, number of animals, and the direction and speed of the animals to the Lead Scientist and Protective Measures Coordinator onboard USS MESA VERDE. The Protective Measures Coordinator entered this information into the MATS program, and the Lead Scientist relayed this information, as appropriate, to the Shock Trial Director or Environmental Director.

The Mitigation Plan required the use of standard line transect survey methods, as developed by NMFS, for all aerial surveys and shipboard monitoring. All surveys were flown at a minimum altitude of 750 feet and a speed of 110 knots. The pre-detonation aerial survey efforts allowed for the selection of primary and secondary test sites, each 10 x 15 nmi in size. Pre-detonation monitoring on the day of the test was conducted in the primary test site and secondary test site, if necessary. Observed marine animals were identified to species or the lowest possible taxonomic level and their relative positions recorded. Detonations were to occur no earlier than three hours after sunrise and no later than three hours prior to sunset to ensure adequate daylight for pre- and post-detonation monitoring.

2.2.2 Pre-Detonation Shipboard Monitoring

Shipboard monitoring was staged from USS MESA VERDE and the MART ship. The Lead Scientist, Protective Measures Coordinator, and Environmental Director were located on the bridge of USS MESA VERDE. Seven marine animal observers experienced in shipboard surveys and familiar with the marine life of the area were located on the bridge wings of USS MESA VERDE. Four sets of 25X power binoculars (Bigeyes) on USS MESA VERDE allowed observers to sight surfacing marine animals from as far as 5 nmi. Four observers monitored the test site with the ship-mounted 25X power or with hand-held binoculars, while two additional observers monitored the area with hand-held binoculars. The extra observer allowed for the rotation of observers through each of the six observation stations every 15 minutes, with a rest station every 1.5 hours. The frequent rotations and the rest station reduced observer fatigue. Sightings were relayed to the Lead Scientist by radio and entered into the MATS program to review the species location within the Safety Range. The species, number of animals sighted, swim direction, and distance from USS MESA VERDE would be recorded. The Lead Scientist ensured that the Shock Trial Director and Environmental Director were aware of all animals in or approaching the detonation point.

The MART ship provided preliminary visual evaluation of the primary test site, particularly first thing in the morning prior to the arrival of the aerial survey team and USS MESA VERDE. Observers onboard the MART ship assessed the primary test site for suitability, and relayed this information to the Lead Scientist and Shock Trial Director to review conditions and move to the secondary test site, if necessary. The observers on the MART ship continued to survey the test site throughout the shot day.

2.2.3 Post-Detonation Aerial and Shipboard Monitoring

Post-detonation monitoring commenced immediately following each detonation and was designed to determine the effectiveness of pre-detonation mitigation by reporting any sightings of marine mammals or sea turtles. After each detonation, the aerial monitoring team resumed surveys in the detonation area and continued for at least three hours on shot day. The Mitigation Plan outlined for aerial monitoring to occur for a minimum of three hours at and down-current from the detonation site for each of the two days immediately following the first two detonations and up to seven days after the third detonation.

The aerial monitoring team worked in tandem with the MART observers. The Mitigation Plan called for the MART ship to remain in the area during post-detonation monitoring to allow sufficient time for a dead animal to submerge and resurface due to a buildup of decomposition gases. The MART ship regularly repositioned itself down-current from the detonation site. If any animals were observed in the general area during the post-detonation, the location, number, species, and behavior were recorded.

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3.0 Mitigation Implementation and Results

The environmental window for the shock trial was 21 July to 20 September 2008. All assets were in place for mitigation activities by 21 July 2008. The test area identified in the Final EIS for the shock trial was within the Charleston/Jacksonville operating area and located 70.82 nmi east of Jacksonville, Florida at its westernmost boundary and 110 nmi at its easternmost boundary (Navy, 2008). Within the test area, primary and secondary test sites were selected based on their relatively low densities of marine mammals and sea turtles observed during pre-detonation surveys. The primary and secondary sites for the shock trial were located approximately 95.58 to 104.28 nmi east of Jacksonville, Florida within the test area. These test sites were located in the eastern half of the Gulf Stream, with northerly currents averaging 2 to 4 knots.

This section provides a daily log of the surveillance efforts in support of the shock trial and describes the mitigation efforts undertaken for each detonation.

3.1 Site Selection

Beginning in April 2008, the Lead Scientist began analyzing sea surface temperature data for the test area. The Advanced Very High Resolution Radiometry (AVHRR) satellite data provided by Rutgers and Johns Hopkins University Web sites were extremely useful in determining where in the test area the most uniformly warm water could be found. The Lead Scientist compared the AVHRR images for 25 July to 30 August from the years 2000 to 2007. These images were compared with the 2001 AVHRR images for the WSC shock trial dates to compare how the WSC survey results might assist in finding the ideal location for USS MESA VERDE's shock trial. The Lead Scientist reviewed the AVHRR images to identify the largest swath of consistently warmer water, as far from mixing zones as possible. The ideal location would be a site located away from all thermal fronts, in the deepest water, and over the least varied bathymetry.

Because of the test area's offshore location, several additional Web sites were consulted on a daily basis from late July to mid-September to ascertain the characteristics of the Gulf Stream and determine offshore sea conditions. Essentially, real-time National Oceanographic and Atmospheric Administration (NOAA) data buoy information was used, triangulating between buoys nearest the test area. Such triangulations were also used in processing various weather forecasts throughout the shock trial event. The Web sites referred to were:

Weather Data
http://www.ndbc.noaa.gov/station_page.php?station=41012
http://www.ndbc.noaa.gov/station_page.php?station=41009
http://www.ndbc.noaa.gov/station_page.php?station=41010
http://forecast.weather.gov/shmrn.php?mz=amz470
http://forecast.weather.gov/shmrn.php?mz=amz570&syn=amz500
http://www.ndbc.noaa.gov/data/Forecasts/FZNT23.KNHC.html

Gulf Stream Data
http://marine.rutgers.edu/mrs/sat_data/?product=sst&region=floridacoast&nothumbs=0
http://fermi.jhuapl.edu/avhrr/avhrr/gs/averages/07aug/index.html

The Lead Scientist participated in aerial survey efforts conducted on 23 July 2008. Aerial sightings reported for 23 July 2008 and 25-27 July 2008 were reviewed by the Lead Scientist to determine potential locations for the test site. Based on bathymetry, preliminary aerial surveys results, and negotiations with COMSUBFOR, the Lead Scientist limited the practical operations area to the southern part of the test area where marine mammal and sea turtle densities were at the lowest (below latitude 30°00'N) (see Figure 3-1). COMSUBFOR, who is responsible for planning submarine training exercises, requested the shock trial reduce their operations area in support of submarine training exercise requirements. The extensive pre-planning and aerial surveys gave the Lead Scientist the information to successfully focus site selections to the southern portion of the shock trial area thereby satisfying both the shock trial and COMSUBFOR requirements.

3.2 Aerial Surveys and Sightings

Aerial surveys of the operations area were required prior to selecting site locations and prior to each shot. In support of the shock trial, aerial surveys commenced on 23 July 2008 and concluded on 18 September 2008. A total of approximately 150 hours of aerial surveys were flown in support of the shock trial event (July through September 2008). Table 3-1 summarizes the daily aerial survey efforts, sea state conditions, and general marine animal sightings for the shock trial. Survey coverage related to each shot is included in Sections 3.3, 3.4, and 3.5.

Sightings of marine animals reported from the aerial and shipboard surveillance for the duration of the shock trial event are detailed in Figure 3-1. Marine animals identified to species included pilot whales, sperm whales, Risso's dolphins, bottlenose dolphins, *Stenella* sp.[2], loggerhead sea turtles, and green sea turtles. Some sightings could not be positively identified to the species level. Appendix A provides a complete list of all aerial marine animal and large *Sargassum* sightings during the shock trial period.

[2] *Stenella* sp. in the area (Atlantic spotted dolphin, pantropical spotted dolphin, striped dolphin, or spinner dolphin) are similar in appearance and difficult to identify to the species level.

Table 3-1. Daily Aerial Survey Effort, Sea State Conditions, and Sightings

Date	Summary of Effort	Beaufort Sea State (Beau SS)	Summary of Sightings
23 Jul	Survey of entire test area	Beau SS 2	Sea turtles, dolphins
24 Jul	No flight	n/a	n/a
25 Jul	Survey of southern operations area	Beau SS 2	Sea turtles, dolphins
26 Jul	Survey of southern operations area, focusing on primary and secondary test sites	Beau SS 2	Sea turtles, dolphins
27 Jul	Survey of southern operations area, focusing on primary and secondary test sites	Beau SS 3-4	Sea turtles, dolphins
28 Jul	Shot one postponed until early August	n/a	n/a
11 Aug	Survey of southern operations area	Beau SS 3-4	Sea turtles, dolphins, sperm whale
12 Aug	Survey of southern operations area	Beau SS 3	Sea turtles
13 – 14 Aug	No flights due to high winds and sea states	n/a	n/a
15 Aug	Survey of primary & secondary test sites	Beau SS 4	Sea turtles, dolphins
16 Aug	Survey in support of successful Shot One	Beau SS 2-3	Sea turtles, dolphins, pilot whales
17 Aug	Post-detonation survey	Beau SS 1-2	Dolphins
18 Aug	Post-detonation survey	Beau SS 2	Dolphins
19 - 23 Aug	No flights due to Tropical Storm Fey	n/a	n/a
24 Aug	Survey of southern operations area	Beau SS 2	Sea turtles, dolphin
25 Aug	Survey of primary and secondary test sites	Beau 2	Sea turtles
26 Aug	Survey in support of successful Shot Two	Beau SS 2-3	Sea turtles, dolphins
27 Aug	Post-detonation survey	Beau SS 3	n/a
28 Aug	Post-detonation survey	Beau SS 4	Dolphins, sea turtle
29 – 31 Aug	No flights due to Hurricane Hanna	n/a	n/a
1 – 5 Sep	No flights due to Hurricane Ike	n/a	n/a
6 Sep	Survey of southern operations area	Beau SS 3 (high)	No sightings
7 Sep	Survey of primary and secondary test sites	Beau SS 2	Sea turtle
8 Sep	Survey of primary and secondary test sites	Beau SS 4	Sea turtles, dolphins
9 - 10 Sep	No flights due to weather conditions (high winds and sea states)	n/a	n/a
11 Sep	Survey of primary and secondary test sites	Beau SS 4	Sea turtle
12 Sep	Survey of primary and secondary test sites	Beau SS 3	No sightings
13 Sep	Survey in support of successful Shot Three	Beau SS 1-2	No sightings
14 Sep	Post-detonation survey	Beau SS 1-2	Pilot whales, dolphins
15 Sep	Post-detonation survey	Beau SS 4	Dolphins
16 Sep	Post-detonation survey	Beau SS 3	Sea turtle
17 Sep	Post-detonation survey	Beau SS 2	Dolphins
18 Sep	Post-detonation survey	Beau SS 5	No sightings
19 – 20 Sep	No flights due to weather conditions (high winds and sea states)	n/a	n/a

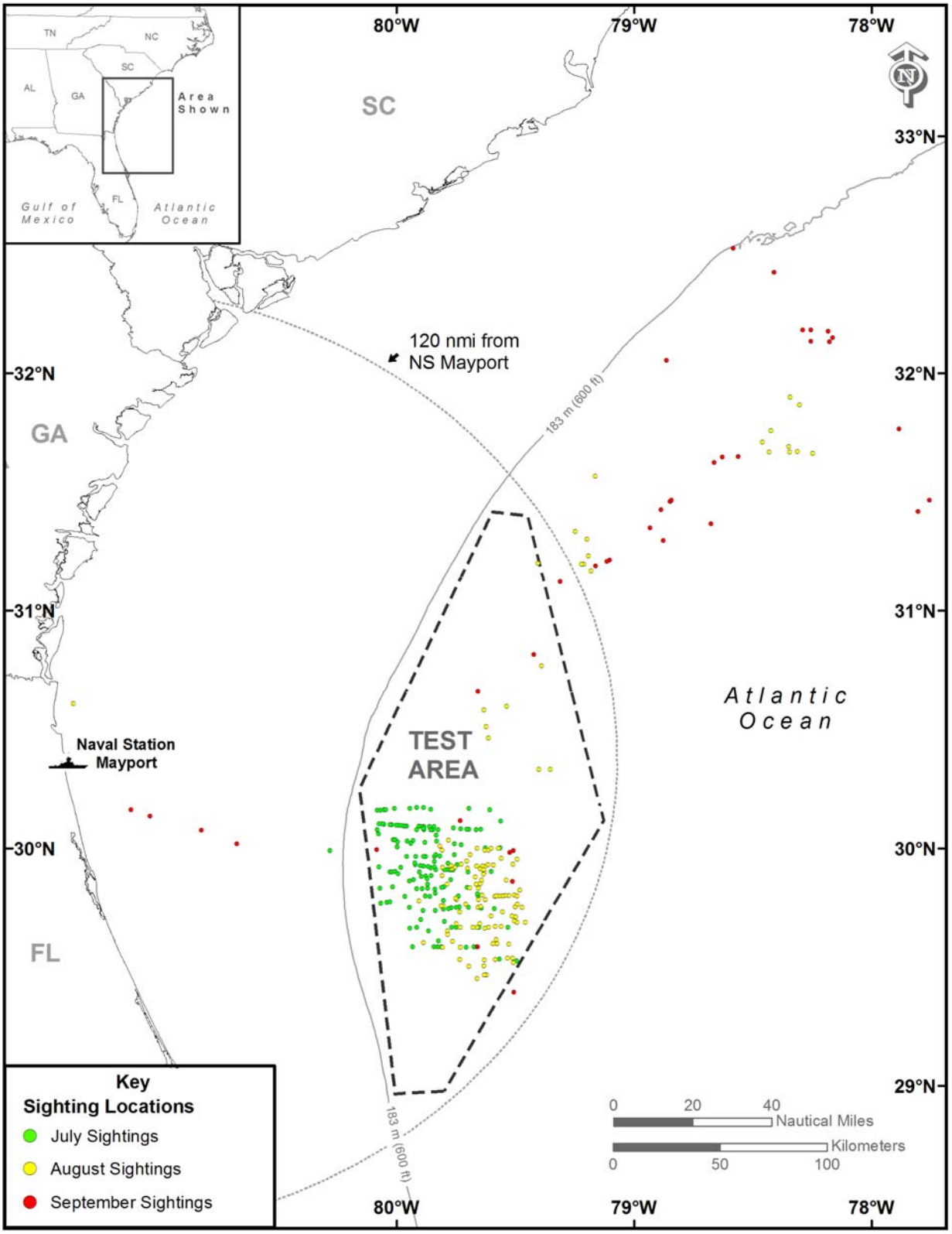

Figure 3-1. Aerial Survey Sightings of Marine Mammals and Sea Turtles for Entire Shock Trial Event (July to September 2008)

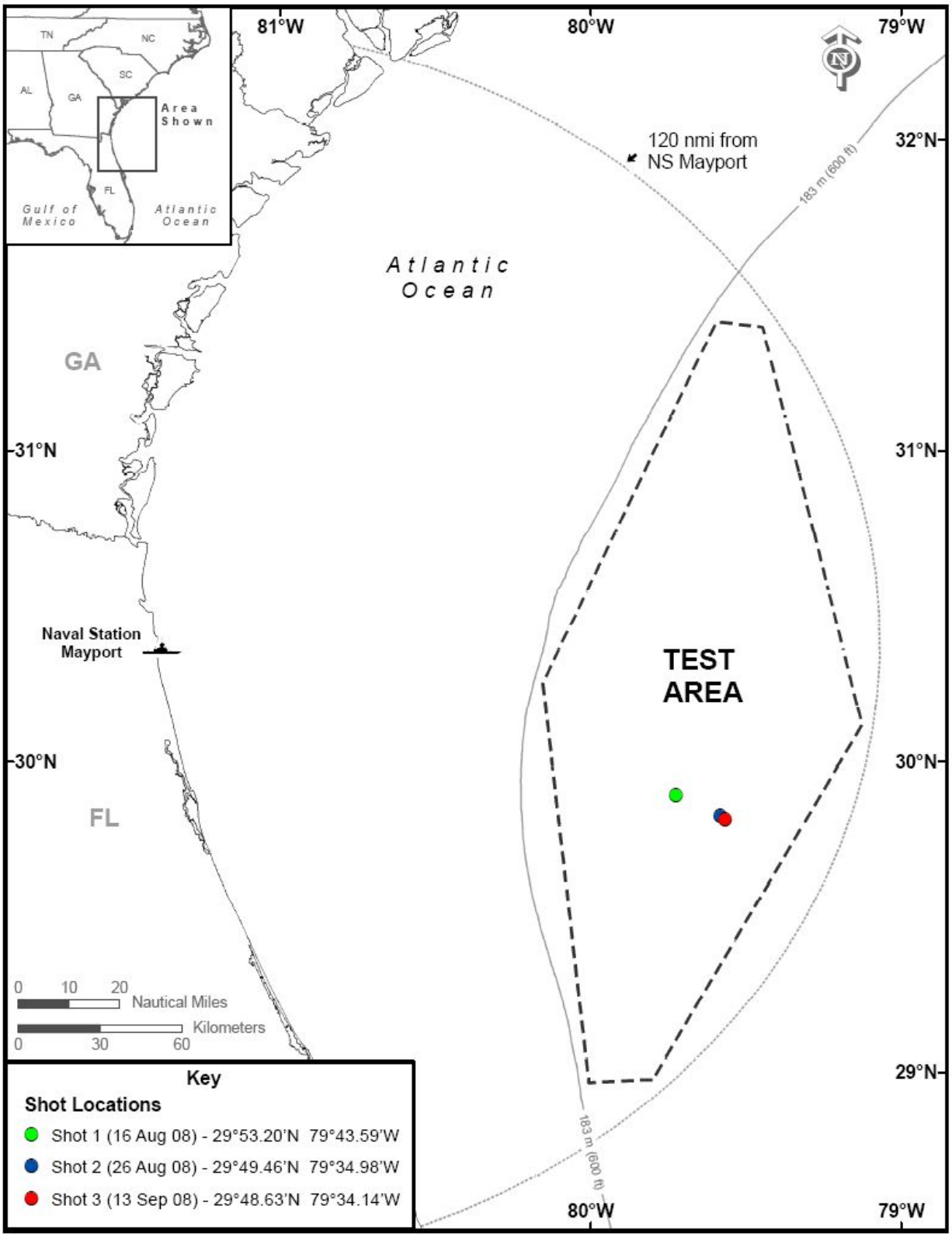

Figure 3-2. Locations of Shock Trial Detonations within Test Area

3.3 Shot One (16 August 2008)

Earlier aerial survey efforts conducted in July 2008 (23 July and 25-27 July) supported the selection of a test site in the southern portion of the operations area. Technical issues with USS MESA VERDE postponed the planned first shot from 28 July 2008 to mid-August 2008. On 11 August 2008, a broad scale aerial survey was completed over much of the southern operations area under acceptable conditions. Pre-detonation monitoring continued on 12 and 15 August 2008. The results from these aerial surveys indicated a reduction in the abundance of sea turtles in the test area relative to the earlier aerial surveys conducted in July 2008, with only a few marine mammal sightings (Table 3-2). Based on good weather conditions and the aerial survey results, a rendezvous point for USS MESA VERDE and the explosives vessel was selected within the primary test site. The MART ship was underway at 1600 on 15 August 2008 and arrived on station at 0600 on 16 August 2008 to monitor environmental conditions.

Table 3-2. Pre-detonation Aerial Survey Sightings for Shot One (11-12 and 15 August 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
8/11/2008	942	29.99268723	-79.62861633	Unidentified sea turtle	1	
8/11/2008	943	29.99344063	-79.61275482	Unidentified sea turtle	1	
8/11/2008	952	29.92523956	-79.62908173	Loggerhead sea turtle	1	
8/11/2008	952	29.92553329	-79.6390686	Loggerhead sea turtle	1	
8/11/2008	953	29.92652512	-79.66278839	Loggerhead sea turtle	1	
8/11/2008	1009	29.86665916	-79.6413269	Loggerhead sea turtle	1	
8/11/2008	1015	29.80379677	-79.50502777	Loggerhead sea turtle	1	
8/11/2008	1016	29.80278397	-79.52709198	Loggerhead sea turtle	1	
8/11/2008	1016	29.80161858	-79.54254913	Loggerhead sea turtle	1	
8/11/2008	1017	29.80054855	-79.55476379	Loggerhead sea turtle	1	
8/11/2008	1017	29.79967117	-79.56689453	Loggerhead sea turtle	2	
8/11/2008	1018	29.79901886	-79.58677673	Loggerhead sea turtle	1	
8/11/2008	1028	29.77874374	-79.90685272	Bottlenose dolphin	2	
8/11/2008	1041	29.68852615	-79.49229431	Loggerhead sea turtle	1	
8/11/2008	1044	29.67151642	-79.55981445	Loggerhead sea turtle	1	
8/11/2008	1046	29.66723633	-79.61425781	Unidentified sea turtle	1	
8/11/2008	1058	29.60315704	-79.88606262	Loggerhead sea turtle	1	
8/11/2008	1105	29.59988976	-79.59372711	Loggerhead sea turtle	1	
8/11/2008	1106	29.5993576	-79.57772827	Loggerhead sea turtle	2	
8/11/2008	1107	29.59767723	-79.52751923	Loggerhead sea turtle	1	
8/11/2008	1110	29.53829384	-79.51229095	Loggerhead sea turtle	1	
8/11/2008	1111	29.53756905	-79.53325653	Unidentified sea turtle	1	
8/11/2008	1113	29.53303146	-79.5851593	Loggerhead sea turtle	1	

* Decimal degrees

Table 3-2 (cont.). Pre-detonation Aerial Survey Sightings for Shot One (11-12 and 15 August 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
8/11/2008	1114	29.53101349	-79.63021088	Loggerhead sea turtle	1	
8/12/2008	0851	30.00086594	-79.66062164	Loggerhead sea turtle	1	
8/12/2008	0853	30.00054169	-79.60218811	Loggerhead sea turtle	1	
8/12/2008	0853	30.00028801	-79.57117462	Loggerhead sea turtle	1	
8/15/2008	0853	29.91601563	-79.70171356	Unidentified sea turtle	1	
8/12/2008	0856	29.95556641	-79.49282074	Loggerhead sea turtle	1	
8/12/2008	0858	29.93427277	-79.51040649	Loggerhead sea turtle	1	
8/12/2008	0900	29.92960548	-79.59316254	Loggerhead sea turtle	1	
8/12/2008	0901	29.9317379	-79.61595917	Loggerhead sea turtle	1	
8/12/2008	0922	29.86600685	-79.53897095	Loggerhead sea turtle	1	
8/15/2008	0902	29.88513184	-79.80910492	Loggerhead sea turtle	1	
8/15/2008	0909	29.85214043	-79.64811707	Unidentified sea turtle	1	
8/15/2008	0914	29.82519913	-79.48202515	Loggerhead sea turtle	1	
8/15/2008	0933	29.78483391	-79.62734222	Loggerhead sea turtle	1	
8/15/2008	0940	29.7528801	-79.47105408	Loggerhead sea turtle	1	
8/15/2008	0947	29.75203133	-79.6577301	Loggerhead sea turtle	1	
8/15/2008	1000	29.7149086	-79.60231018	Loggerhead sea turtle	1	
8/15/2008	1006	29.68897247	-79.4592514	Loggerhead sea turtle	1	
8/15/2008	1028	29.66361046	-79.62787628	Unidentified sea turtle	1	
8/15/2008	1044	29.83413506	-79.69141388	Unidentified sea turtle	1	
8/15/2008	1116	29.92062569	-79.80599213	Loggerhead sea turtle	1	
8/15/2008	1207	30.61081123	-81.3615799	Bottlenose dolphin	5	Inshore
8/15/2008	0933	29.78483391	-79.62734222	Loggerhead sea turtle	1	

* Decimal degrees

Weather conditions on 16 August 2008 were favorable for environmental observations, with Beaufort sea state conditions of 2, almost no whitecaps, and a current speed of 2.3 knots. Shipboard observers onboard the MART ship went on watch at 0700. The primary survey aircraft launched at 0800 and started conducting broad scale surveys of the primary test site at 0900. Shipboard observers onboard USS MESA VERDE started watch at 0920. Radio communications were a challenge as the primary survey aircraft was unable to report sightings directly to the Lead Scientist onboard USS MESA VERDE using marine very high frequency (VHF) radio. Instead, the aircraft reported sightings to the MART ship using aviation VHF radio, and the Captain of the MART ship relayed these sightings to the Lead Scientist on the MESA VERDE.

The MART reported a sighting of seven pilot whales at 0834 within the test site. At 0925, the primary survey aircraft reacquired the pilot whales having traveled in a northeasterly direction within the primary test site. Four pilot whales were reported by the MART at 1120 heading in an east-northeast direction, and were believed to be from

the original morning sightings. Safety issues during the charge arming procedure caused a delay in starting the countdown until shortly after 1100. At 1212, the primary survey aircraft reported a sighting of five pilot whales traveling at a moderate speed bearing northeast. The Lead Scientist and Protective Measures Coordinator continually tracked and monitored these pilot whale sightings to determine if they would be traveling into the detonation area. After reviewing the whales' location, the Lead Scientist noted that this was likely the same group as reported earlier. At 1216, the MART sighted a different group of pilot whales traveling at moderate to fast speed bearing south-southwest towards the eastern edge of the primary test site.

At 1245, the northerly flow of the Gulf Stream current compounded by the safety delay caused the explosives vessel to drift a few nautical miles north of the primary test site. At this point, the primary survey aircraft had flown surveys over the entire primary test site. Given the slow speed of the explosives vessel and requirement for it to enter 3.5 nmi into the primary test site for the detonation, the primary survey aircraft was repositioned to the northern edge above the primary test site to survey from 29^{o}51'N to 29^{o}58'N (29.85 and 29.96667 decimal degrees) bound by 079^{o}38'W to 079^{o}47'W (-79.63333 to -79.78333 decimal degrees). One dolphin was sighted adjacent to USS MESA VERDE's bow at 1317 traveling at moderate speed while the ship was enroute to the detonation point. An unidentified marine mammal sighting was reported at 1337. Sightings of large groups of dolphins (27 dolphins total) were reported by the MART and the primary survey aircraft between 1340 and 1350 traveling south approximately 1.5 to 4 nmi, respectively, outside the Safety Range.

The primary survey aircraft conducted two complete surveys of the detonation point and its encompassing Safety Range prior to detonation. At 1452, aerial survey efforts reported four marine mammals within the Safety Range causing a "hold" in the detonation countdown to occur. The Lead Scientist requested that the aerial survey team reacquire the animals and report their coordinates. At 1509, the aircraft observers relocated the animals, updated the sighting record as 24 dolphins, and provided the sighting coordinates. The information was entered into the MATS and the Lead Scientist confirmed the dolphins were clear of the Safety Range, declaring the Safety Range as "green". At 1515, a successful detonation occurred at 29°53.2'N, 079°43.5'W (29.88667, -79.725 decimal degrees) (Figure 3-2). All sightings from both aerial and shipboard surveillance teams reported to the Lead Scientist during the shot day are provided in Table 3-3.

Table 3-3. Sightings Log for Shot One (16 August 2008)

Time	Source	Latitude*	Longitude*	Species	No. of Animals	Note
0834	MART	30.76333	-79.78167	Pilot whale	7	Bearing northeast
0925	Aerial	30.79783	-79.73788	Pilot whale	7	Bearing northeast
1120	MART	30.88333	-79.67583	Pilot whale	4	Bearing northeast
1317	USS MESA VERDE	29.97317	-79.6895	*Stenella* sp.^ or bottlenose dolphin	1	Next to bow, moderate speed
1337	USS MESA VERDE	29.94667	-79.70583	Unidentified marine mammal	1	Moderate speed
1350	Aerial	30.91833	-79.75167	Unidentified dolphin	27	Bearing south, fast speed
1452	Aerial	30.91833	-79.77	Unidentified marine mammal	4	Bearing southeast, moderate speed
1509	Aerial	30.9437	-79.77647	Unidentified dolphin	24	Bearing south, moderate speed

* Decimal degrees
^ *Stenella* sp. in the area (Atlantic spotted dolphin, pantropical spotted dolphin, striped dolphin, or spinner dolphin) are similar in appearance and difficult to identify to the species level

The shipboard observation team on USS MESA VERDE resumed watch at 1524, remaining on station until 1630, with no sightings reported. The primary survey aircraft team resumed surveys over the detonation site at 1524; several Risso's dolphins were sighted swimming in the area. The secondary aircraft team arrived on-station at 1610 and resumed post-detonation surveys of the area. The secondary survey aircraft team concluded its survey efforts at 1823 with several sightings of sea turtles. A list of post-detonation marine animal sightings for Shot One is provided in Table 3-4.

The MART ship transited to the detonation site and commenced searching for marine animals. The MART remained in the area for 1 hour, and then began drifting with the Gulf Stream to remain with the water in which the detonation occurred.

The survey aircraft surveyed the detonation site and areas down-current on 17 and 18 August 2008. Post-detonation surveys and monitoring by the survey aircraft and the MART did not observe any marine mammal or sea turtle mortalities or injuries. A list of post-detonation marine animal sightings for Shot One is provided in Table 3-4; aerial sightings for all shots are included in Appendix A. The MART remained drifting with the Gulf Stream for two days after the detonation, and then returned to port. The post-detonation sighting from the MART is provided in Table 3-5. All MART sightings and the general survey region traveled by the MART ship related to Shot One are included in Figure 3-2; sighting data from the MART for all shots are in Appendix B.

Table 3-4. Post-detonation Aerial Sightings for Shot One (16-18 August 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals
8/16/2008	1535	29.99367	-79.80904	Risso's dolphin	6
8/16/2008	1542	30.00995	-79.81776	Risso's dolphin	5
8/16/2008	1542	30.00995	-79.81776	Unidentified marine mammal	1
8/16/2008	1800	30.095	-79.795	Loggerhead sea turtle	1
8/16/2008	1801	30.095	-79.81167	Loggerhead sea turtle	2
8/16/2008	1802	30.095	-79.82333	Loggerhead sea turtle	1
8/16/2008	1810	29.97667	-79.66167	Loggerhead sea turtle	1
8/16/2008	1812	29.965	-79.725	Loggerhead sea turtle	2
8/16/2008	1815	29.96	-79.825	Loggerhead sea turtle	1
8/17/2008	0920	30.03515	-79.78214	Bottlenose dolphin	1
8/17/2008	0943	29.93349	-79.7276	Unidentified dolphin	2
8/17/2008	0950	30.58371	-79.63234	Unidentified dolphin	8
8/17/2008	0949	29.90010	-79.62988	Loggerhead sea turtle	1
8/17/2008	1000	29.83330	-79.65517	Unidentified sea turtle	1
8/17/2008	1200	30.60007	-79.53678	Loggerhead sea turtle	1
8/17/2008	1250	30.51376	-79.62232	Loggerhead sea turtle	1
8/18/2008	0949	31.16648	-79.18125	Unidentified dolphin	7
8/18/2008	0952	31.19682	-79.21213	Bottlenose dolphin	2
8/18/2008	0952	31.19586	-79.22170	Bottlenose dolphin	1
8/18/2008	0957	31.19959	-79.40575	Bottlenose dolphin	3
8/18/2008	1021	31.30093	-79.19805	Bottlenose dolphin	6
8/18/2008	1025	31.33457	-79.24775	Bottlenose dolphin	1
8/18/2008	1005	31.23142	-79.19289	Unidentified dolphin	4
8/18/2008	1115	31.56694	-79.16446	Unidentified dolphin	3

* Decimal degrees

Table 3-5. Post-detonation MART Sightings for Shot One (17-18 August 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
8/17/2008	0847	30.465	-79.61367	Unidentified marine mammal	1	Black dorsal fin, ~ 6-8 ft (possible *Kogia* sp.)

* Decimal degrees

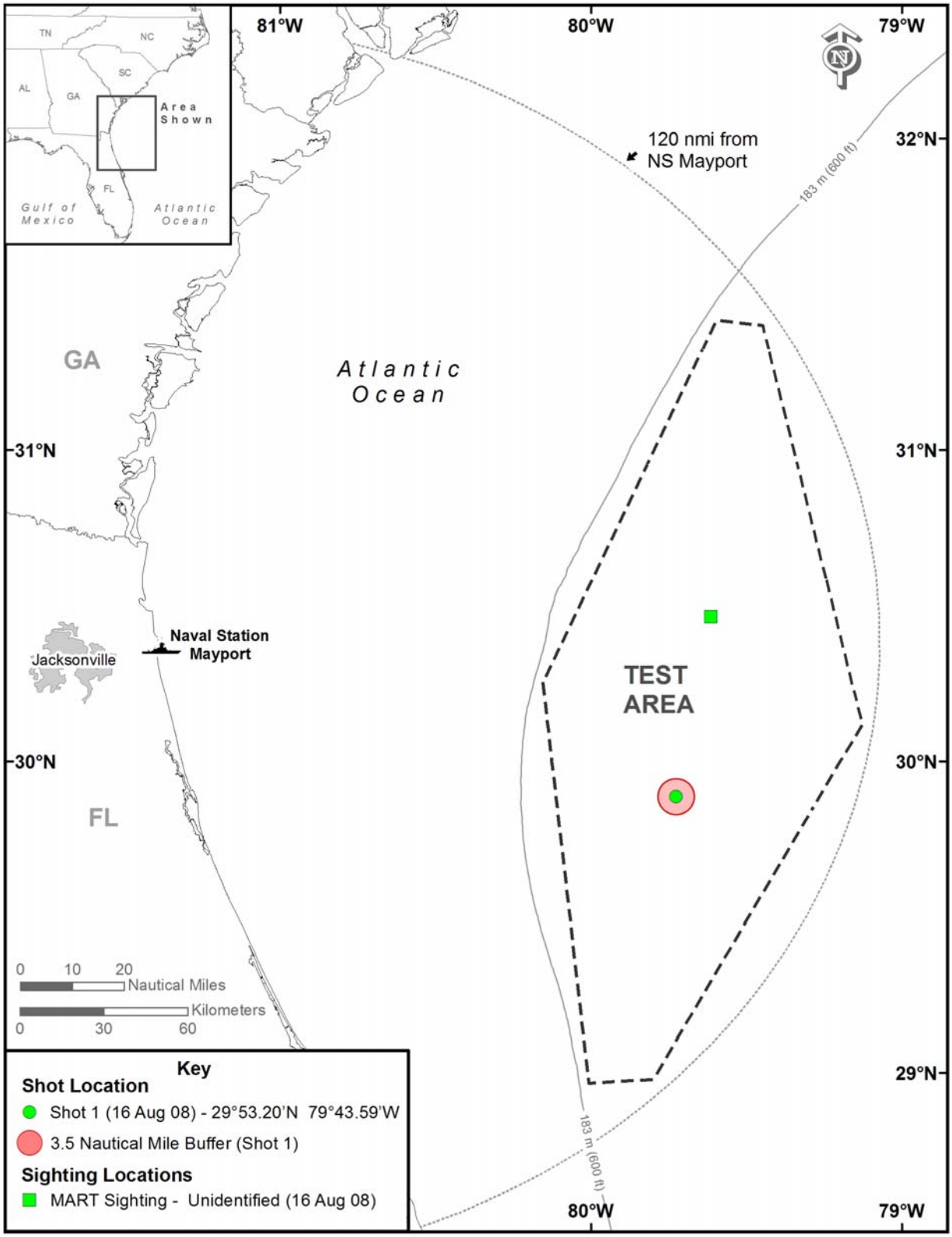

Figure 3-3. MART Survey Area and Sightings for Shot One (17-18 August 2008)

3.4 Shot Two (26 August 2008)

A broad scale aerial survey was completed over much of the southern operations test area under excellent conditions on 24 August 2008 with a narrower aerial survey over the potential test sites on 25 August 2008. The results from both surveys indicated a reduction in the abundance of sea turtles in the test site relative to previous surveys (Table 3-6). Based on good weather conditions and the aerial survey results, a rendezvous point was selected in the southern portion of the test site. The MART ship was underway at 1800 on 25 August 2008, arrived on site at 0600 on 26 August 2008 to monitor environmental conditions, and began survey transects at 0701 hours.

Table 3-6. Pre-detonation Aerial Survey Sightings for Shot Two (24-25 August 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals
8/24/2008	1131	29.84879	-79.66487	Loggerhead sea turtle	1
8/24/2008	1135	29.85026	-79.78789	Loggerhead sea turtle	1
8/24/2008	1206	29.65281	-79.78627	Unidentified sea turtle	1
8/24/2008	1224	29.58361	-79.73167	Unidentified sea turtle	1
8/24/2008	1239	29.51816	-79.50895	Unidentified sea turtle	1
8/24/2008	1247	29.45099	-79.66060	Unidentified dolphin	1
8/24/2008	1309	29.53291	-79.73354	Unidentified sea turtle	1
8/24/2008	1314	29.58406	-79.80605	Unidentified sea turtle	1
8/24/2008	1329	29.63759	-79.78467	Unidentified sea turtle	1
8/25/2008	932	29.46691	-79.62122	Loggerhead sea turtle	1
8/25/2008	932	29.46672	-79.63134	Green sea turtle	1
8/25/2008	939	29.50412	-79.69575	Loggerhead sea turtle	1
8/25/2008	941	29.50495	-79.63271	Loggerhead sea turtle	1
8/25/2008	1007	29.61716	-79.58050	Loggerhead sea turtle	1
8/25/2008	1014	29.67099	-79.58530	Unidentified sea turtle	1
8/25/2008	1016	29.66793	-79.66086	Loggerhead sea turtle	1
8/25/2008	1017	29.66781	-79.67883	Green sea turtle	1
8/25/2008	1018	29.66805	-79.73186	Unidentified sea turtle	1
8/25/2008	1035	29.76628	-79.70867	*Sargassum*	Large patches
8/25/2008	1037	29.78953	-79.75060	Loggerhead sea turtle	1
8/25/2008	1059	29.91401	-79.64732	Loggerhead sea turtle	1
8/25/2008	1100	29.91123	-79.63515	Green sea turtle	1

* Decimal degrees

On 26 August 2008, weather conditions were favorable for environmental observations, with Beaufort sea state conditions of 2 and almost no whitecaps. Swells were present that caused an extensive delay in arming the charge. Shipboard observers on USS MESA VERDE began informal observations at 0830 while waiting for swells to subside and for the charge to be armed. Half-watch (rotation of half the observers on watch) by shipboard observers occurred during lunch (1100 to 1200) as the charge was still unarmed. A full shipboard watch commenced at 1200, and continued until detonation at 1701. The primary survey aircraft started broad scale surveys at 1158. A communications test confirmed good radio communications between the aircraft and MART ship with the Lead Scientist onboard USS MESA VERDE.

At 1236, the MART ship commenced survey transects heading in a westerly direction from a position of 29º39'N (29.65 decimal degrees) and 079º32'W (-79.53333 decimal degrees). Though detailed aerial and shipboard surveying commenced at 1200, the charge was not armed until 1535. Multiple marine animal sightings were reported during the three and a half hour survey effort prior to arming the charge, though none resulted in animals being present or reacquired in the Safety Range during the detonation. The last animals observed prior to detonation were five to seven dolphins at 1556, heading south at a moderate speed away from the test area. All sightings from both aerial and shipboard surveillance teams reported to the Lead Scientist are provided in Table 3-7.

Table 3-7. Sightings Log for Shot Two (26 August 2008)

Time	Source	Latitude*	Longitude*	Species	No. of Animals	Comment
1210	Aerial	29.78431	-79.65593	Unidentified dolphin	4	Moderate speed
1229	Aerial	29.68291	-79.65032	Unidentified sea turtle	2	
1246	Aerial	29.60792	-79.76470	Unidentified sea turtle	1	Estimated location
1329	Aerial	29.89239	-79.63449	Unidentified sea turtle	1	
1353	Aerial	29.75368	-79.49975	*Sargassum*	Six patches	50x30 ft
1452	USS MESA VERDE	29.95833	-79.56033	*Stenella* sp.^	4	Moderate speed
1530	Aerial	29.75668	-79.64518	Unidentified sea turtle	1	
1556	Aerial	29.73337	-79.55434	Unidentified dolphin	5-7	South heading and moderate speed

* Decimal degrees
^ *Stenella* sp. in the area (Atlantic spotted dolphin, pantropical spotted dolphin, striped dolphin, or spinner dolphin) are similar in appearance and difficult to identify to the species level

At 1653, the aerial surveillance team began flying transects over the Safety Range from 29º46'N (29.76667 decimal degrees) working in a northern direction. No animals were observed during these transects. The survey aircraft conducted two complete surveys of the detonation point and its encompassing Safety Range prior to detonation. At 1658 and 1700, the Protective Measures Coordinator provided current sighting data to the Lead Scientist, who confirmed that all previously observed animals were clear of the

Safety Range, declaring the Safety Range as “green”. At 1701, a successful detonation occurred at 29°49.46’N, 079°34.98’W (29.82433, -79.583 decimal degrees) (Figure 3-2).

Immediately following the detonation, the MART ship transited to the detonation site and commenced searching for marine animals. The MART ship remained in the detonation area, and began drifting with the Gulf Stream to remain with the detonation water. Observations continued until dusk; no sightings from the MART ship were reported. The shipboard observation team on USS MESA VERDE resumed watch at 1708, remaining on station until 1800, with no sightings reported. Aerial surveys moved to review the test area after the detonation until 1930 when the setting sun cast long shadows over the water making aerial observations indiscernible. This survey area was centered 10 nmi north of and 5 nmi south of the detonation site. No marine animals were sighted.

The aircraft surveyed the detonation site and areas down-current on 27 and 28 August 2008. Post-detonation surveys and monitoring by the aircraft and the MART did not find any marine mammal or sea turtle mortalities or injuries. A list of marine animal post-detonation aerial sightings is provided in Table 3-8.

Table 3-8. Post-detonation Aerial Sightings for Shot Two (27-28 August 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals
8/27/2008	1550	30.33362	-79.40052	*Sargassum*	Big, patchy
8/27/2008	1551	30.33367	-79.35350	*Sargassum*	Patchy
8/28/2008	1545	31.86744	-78.30322	Bottlenose dolphin	13
8/28/2008	1634	31.66881	-78.43123	Bottlenose dolphin	1
8/28/2008	1533	31.90016	-78.34363	Risso’s dolphin	7
8/28/2008	1626	31.69062	-78.35022	Unidentified dolphin	5
8/28/2008	1637	31.67070	-78.31343	Unidentified dolphin	5
8/28/2008	1639	31.66202	-78.24818	Unidentified dolphin	1
8/28/2008	1636	31.66819	-78.34473	Loggerhead sea turtle	1

* decimal degrees

The MART ship remained drifting with the Gulf Stream for two days after the detonation. All MART sightings related to Shot Two are included in Figure 3-4 and in Table 3-9.

Table 3-9. Post-detonation MART Sightings for Shot Two (27-28 August 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
8/27/2008	1411	30.76983	-79.389	Pilot whales	5-7	At least 3 calves in 20-25 animals of mixed species group
8/28/2008	0844	31.711	-78.46083	*Stenella* sp.^	2	
8/28/2008	1400	31.7585	-78.42333	*Stenella* sp.^	5-7	Bow riding, with calf
8/28/2008	1415	31.74333	-78.455	*Stenella* sp.^	5-7	Bow, wake riding

* decimal degrees

^ *Stenella* sp. in the area (Atlantic spotted dolphin, pantropical spotted dolphin, striped dolphin, or spinner dolphin) are similar in appearance and difficult to identify to the species level

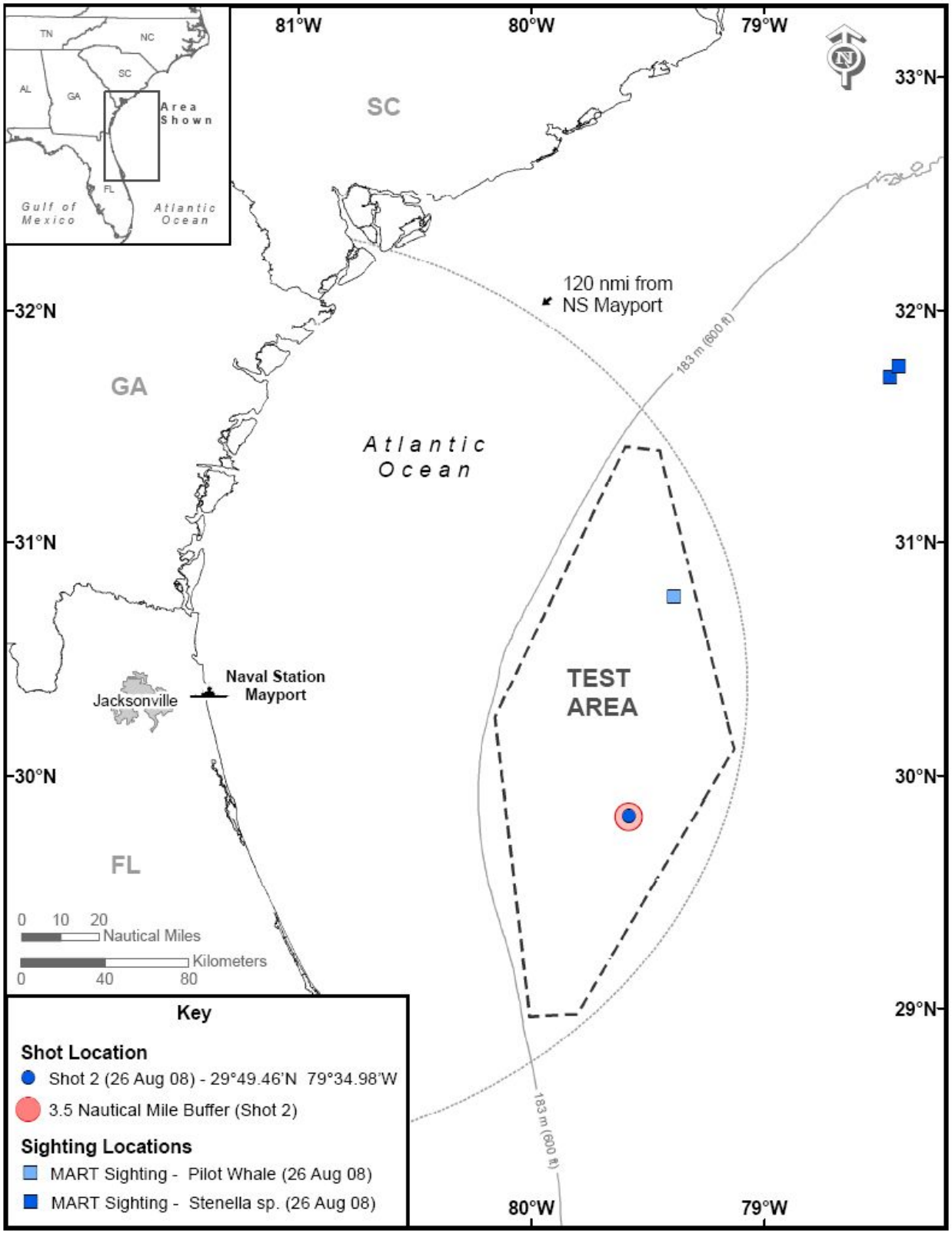

Figure 3-4. MART Survey Area and Sightings for Shot Two (27-28 August 2008)

3.5 Shot Three (13 Sept 2008)

After Shot Two's post-detonation monitoring, aerial surveys were postponed due to poor weather conditions. Hurricane Hanna kept flights on the ground from 29-31 August 2008, closely followed by poor weather conditions due to Hurricane Ike (1-5 September 2008). Aerial surveys of the southern operations area were resumed 6-8 September 2008 under high sea state conditions (Beaufort sea state of 3-4 generally). Sightings included several sea turtles and dolphins. Poor weather conditions postponed flights from 9-10 September 2008 due to high winds and sea states. A broad scale aerial survey was completed over the primary and secondary test sites under fair survey conditions (Beaufort sea state 3) on 11 September 2008. No marine animal sightings were reported from the 11 September 2008 survey. Overall survey results indicated a reduction in the abundance of sea turtles in the test site relative to previous surveys (Table 3-10). Based on good weather conditions and pre-detonation surveys, a rendezvous point for USS MESA VERDE and the explosives vessel was selected. The MART ship was underway at 1200 on 11 September 2008 and arrived on site at 0700 on 12 September 2008 to monitor environmental conditions.

Observed weather conditions for 12 September 2008 were Beaufort sea state 2-3 with minimal white caps. Shipboard observers on USS MESA VERDE were on station at 0830. The survey aircraft was on station at 0917. Swells were present in the test area, which made it difficult to arm the charge. Shipboard observers began observations at 0900 while waiting for swells to subside and for the charge to be armed. At 1100, the Shock Trial Director postponed the detonation one day due to the inability to safely arm the charge under the large swell conditions. The survey aircraft continued to survey the area to provide pre-detonation sightings. No marine animal sightings were reported in the area.

Table 3-10. Pre-detonation Aerial Survey Sightings for Shot Three (6-8 September and 11-12 September 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals
9/7/2008	1245	29.58562	-79.65965	Unidentified sea turtle	1
9/7/2008	1329	29.39371	-79.50564	*Sargassum*	Large
9/8/2008	1122	30.02065	-80.67287	Bottlenose dolphin	10
9/8/2008	1134	30.16334	-81.11819	Green sea turtle	30
9/8/2008	1126	30.07684	-80.82198	Unidentified sea turtle	1
9/8/2008	1132	30.13732	-81.03765	Unidentified sea turtle	1
9/11/2008	1001	29.86201	-79.51196	*Sargassum*	Big patches

* decimal degrees

Weather conditions the following day (13 September 2008) were favorable for environmental observations, with Beaufort sea state conditions of 2-3 with almost no whitecaps. The charge was armed and deployed without incident. Earliest detonation time was estimated to be 1300. Shipboard observers were on station at 0812. The survey aircraft was on station by 0900. Throughout the morning, the survey aircraft reported no marine animal sightings within the primary test site. Shipboard observers on USS MESA VERDE also reported no sightings. Aerial monitoring around the Safety Range commenced at 1201. No marine animal sightings by aerial or shipboard observers were reported prior to detonation. At 1305, a successful detonation occurred at 29°48.68'N, 079°34.13'W (29.81133, -79.56883 decimal degrees) (Figure 3-2). The shipboard observation team resumed watch at 1315, remaining on station until 1430 with no sightings for the day.

The MART ship continued surveys while drifting with the Gulf Stream after the detonation. The planned post-detonation surveys for seven days following the last shot were cut short due to weather. Post-detonation monitoring by the aerial team occurred for five days (13-18 September 2008) (Table 3-11), with four days of post-detonation monitoring from the MART ship (13-17 September 2008) (Table 3-12). On the last two days of post-detonation monitoring, 20 to 30 knot winds and seas of 8 to 10 ft in waters across the region were observed from the detonation sites north to North Carolina. Due to the degrading weather conditions, environmental surveys were abbreviated for safety of the survey crews. The MART concluded its four days of post-detonation surveys located 150 nmi off the coast of South Carolina, after tracking a drift buoy into a secondary current veering east of the Gulf Stream. The aerial team attempted to conduct flight operations on 18 September 2008 over the detonation sites; however, Beaufort sea state 5 conditions, as well as thunderstorms, made abbreviation of the survey necessary. The post-detonation aerial surveys were halted due to weather on 18 September 2008.

Post-detonation aerial surveys and monitoring by the MART from 14-18 September 2008 did not observe any marine mammal and sea turtle injuries or mortalities. All MART sightings and the general survey region traveled by the MART ship related to Shot Three are included in Figure 3-5. Sightings data of several marine mammals and sea turtles from the MART in areas down-current from the detonation sites during post-detonation surveys are provided in Table 3-12. All MART sightings for the duration of the shock trial event are listed in Appendix B.

Table 3-11. Post-detonation Aerial Sightings for Shot Three (14-18 September 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
9/14/2008	1056	29.99555	-80.08458	Bottlenose dolphin	1	
9/14/2008	1141	29.99166	-79.50766	Pilot whale	25	
9/14/2008	1246	30.66278	-79.65811	Bottlenose dolphin	26	
9/14/2008	1324	30.81751	-79.42195	Unidentified dolphin	3	
9/15/2008	1158	32.05457	-78.86449	Bottlenose dolphin	24	
9/15/2008	1243	32.13414	-78.25479	Bottlenose dolphin	50	Two pods
9/15/2008	1249	32.13408	-78.17673	Unidentified dolphin	10	
9/15/2008	1250	32.15049	-78.16459	Unidentified dolphin	5	
9/15/2008	1251	32.17765	-78.18254	Unidentified dolphin	10	
9/15/2008	1254	32.18260	-78.25491	Unidentified dolphin	8	
9/15/2008	1255	32.18333	-78.28989	Risso's dolphin	5	
9/15/2008	1404	32.42577	-78.41057	Unidentified dolphin	1	
9/15/2008	1427	32.52710	-78.58193	Unidentified dolphin	6	
9/16/2008	1049	31.41710	-77.80506	*Sargassum*	Large	
9/16/2008	1107	31.46653	-77.75577	*Sargassum*	Large	
9/16/2008	1324	31.76682	-77.88461	Unidentified sea turtle	1	
9/17/2008	1055	30.11713	-79.73139	Bottlenose dolphin	15	
9/17/2008	1132	31.12367	-79.31189	Bottlenose dolphin	25	Two groups
9/17/2008	1136	31.18862	-79.16172	Bottlenose dolphin	15	Two groups
9/17/2008	1138	31.21291	-79.10247	Bottlenose dolphin	10	Two groups
9/17/2008	1138	31.20828	-79.11410	Unidentified dolphin	6	
9/17/2008	1145	31.29634	-78.87678	Unidentified dolphin	25	
9/17/2008	1152	31.36669	-78.67648	Unidentified dolphin	8	

* Decimal degrees

Table 3-12. Post-detonation MART Sightings for Shot Three (14-18 September 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
9/15/2008	0717	31.394	-78.9315	Bottlenose dolphin	20-25	From 0717-0826; with calf
9/15/2008	0911	31.42617	-78.88667	Bottlenose dolphin	1	Two sightings of animal
9/15/2008	0954	31.46083	-78.8485	Unidentified dolphin	1	
9/15/2008	1000	31.46084	-78.84283	Bottlenose dolphin	17-20	Widely dispersed, ~7 along ship, ~10 animals ½ nmi behind
9/15/2008	1541	31.62533	-78.66317	Bottlenose dolphin	5	Porpoising, rode wake
9/15/2008	1633	31.64317	-78.62933	Bottlenose dolphin	2	Off bow, heading E/W
9/15/2008	1717	31.65	-78.56167	Unidentified dolphin	12	Fast swim speed, porpoising

* Decimal degrees

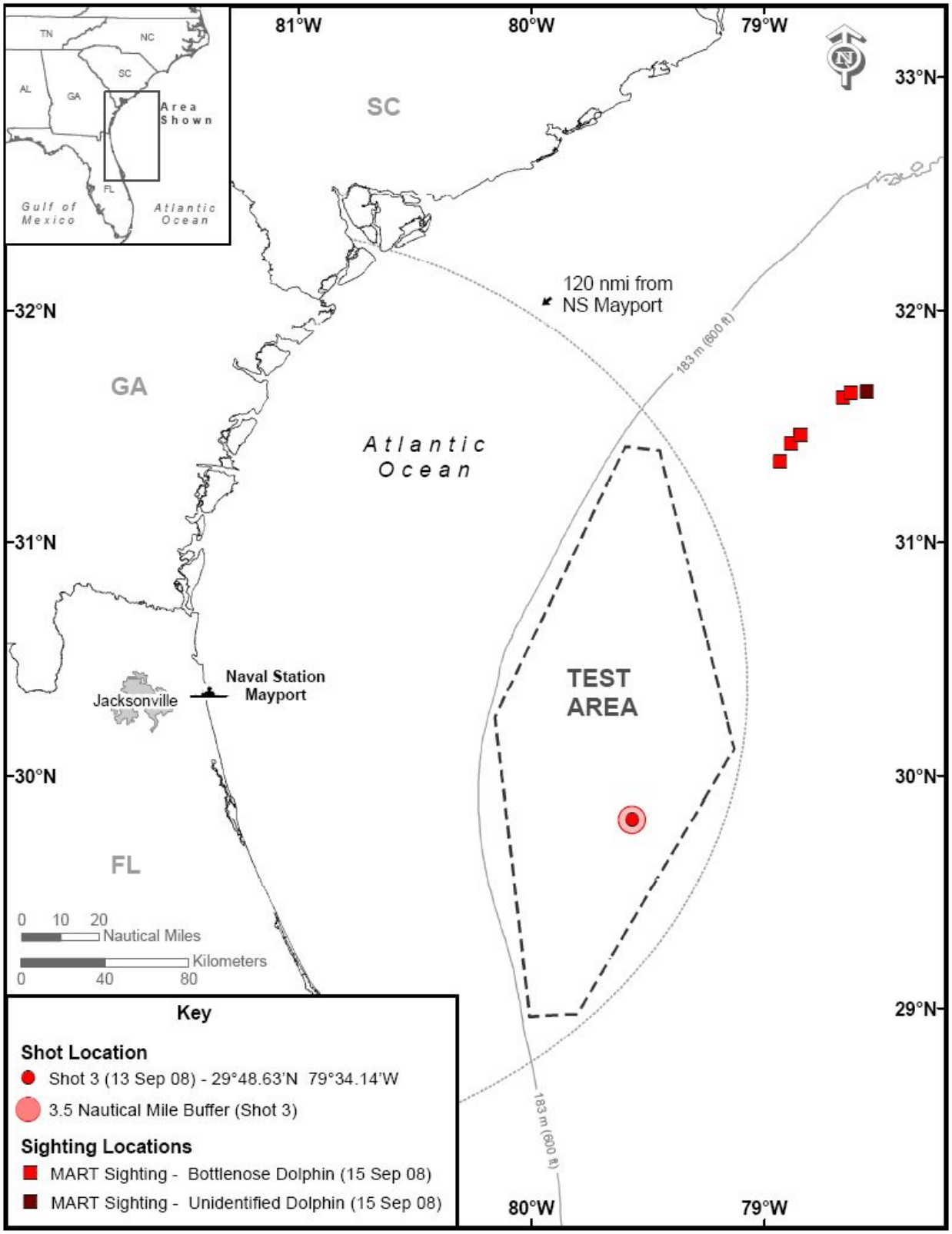

Figure 3-5. MART Survey Area and Sightings for Shot Three (14-18 September 2008)

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4.0 Manpower

The Mitigation Plan included three components: (1) pre-detonation aerial surveys; (2) monitoring from USS MESA VERDE, the MART ship and aerial crew the day of a planned detonation; and (3) post-detonation aerial and shipboard monitoring. The aerial and shipboard monitoring teams identified and located marine mammals, sea turtles, and large *Sargassum* rafts observed at the ocean surface. This section details the manpower associated with the aerial and shipboard surveillance supporting mitigation efforts for the shock trial.

4.1 Aerial Component

The aerial observation team consisted of three observers and a pilot familiar with flying marine mammal/sea turtle aerial surveys. A second aircraft of similar configuration and crew was available on each shot day to relieve the primary aircraft when the primary aircraft needed to refuel. Table 4-1 lists the aerial team members for the shock trial.

The aerial observation team flew a total of 146.7 hours in support of the shock trial. For Shot One (23 July to 18 August 2008), a total of 58.6 hours were flown. Shot One aerial observations encompassed the entire test area, focusing efforts on the southern operations area. Approximately 220 individual observations of marine mammals, sea turtles, and *Sargassum* were made by the aerial observers. For Shot Two (24 to 28 August 2008), a total of 30.8 hours were flown. Shot Two flights were confined to the southern operations area. The aerial observers recorded a total of approximately 70 marine animals and *Sargassum* rafts. For Shot Three (11 to 18 September 2008), the final detonation, a total of 47.5 hours were flown. Pre-detonation monitoring flights were over the southern operations area, whereas post-detonation monitoring covered the detonation site and waters north of the test area following the Gulf Stream and the MART ship. A total of approximately 321 marine animals and *Sargassum* rafts were observed.

4.2 Shipboard Components

Shipboard monitoring was staged from USS MESA VERDE and the MART ship. The Lead Scientist, Protective Measures Coordinator, and Environmental Director were located on the bridge of USS MESA VERDE with the Shock Trial Director. On USS MESA VERDE, seven observers experienced in shipboard surveys and familiar with the marine life of the area were located on the bridge wings with 25X power (Bigeyes) or hand-held binoculars. The shipboard observation team on USS MESA VERDE spent approximately 30 hours per observer in support of the shock trial, with an average of 10 hours per observer for each shot. Only three sightings of marine animals were observed from USS MESA VERDE – one during Shot One, and two during Shot Two. No marine animal sightings were reported for Shot Three.

The MART ship consisted of two observers using hand-held binoculars experienced in shipboard surveys and familiar with the marine life of the area. The MART observation team spent approximately 150 hours conducting shipboard surveys in support of the

shock trial. In addition to the shipboard observers, the marine animal veterinarian and sea turtle expert were located on the MART and participated in surveillance efforts. Table 4-1 lists protective measures team members stationed on USS MERDE and the MART ship for the shock trial.

Table 4-1. Protective Measures Team Members

Name	Affiliation	Role/Responsibility
Chris Slay	Coastwise Consulting	Lead Scientist
Dawn Schroeder	NAVSEA 04RE	Environmental Director
Steve Schroeder	NAVSEA 05E	Environmental Director (Alternate)
Jennifer Salerno	Booz Allen Hamilton	Protective Measures Coordinator
Jennifer Scarborough	Booz Allen Hamilton	Protective Measures Coordinator (Alternate)
Dr. Mike Walsh	Coastwise Consulting	MART Veterinarian
Jesse Agee	Coastwise Consulting	MESA VERDE Observer
Bill Brooks Jr.	Coastwise Consulting	MESA VERDE Observer
Megan McOsker	Coastwise Consulting	MESA VERDE Observer
Eric Westerman	Coastwise Consulting	MESA VERDE Observer
Charles Maley	Coastwise Consulting	MART Sea Turtle Expert
Rachel Sayre	Coastwise Consulting	MART Observer
Terrance Todd	Coastwise Consulting	MESA VERDE Observer / MART Sea Turtle Expert
Rafael Olivieri	Booz Allen Hamilton	MESA VERDE Observer
Patti Haase	Coastwise Consulting	MESA VERDE Observer
Gib Frye	Coastwise Consulting	MESA VERDE Observer
Jen Gratze	Coastwise Consulting	MART Observer
Chuck Oravetz	Coastwise Consulting	MESA VERDE Observer
Mike Vigus	Environmental Aviation	Aerial Pilot
Dr. Gerry Pinto	Environmental Aviation	Aerial Observer
Corey Accardo	Environmental Aviation	Aerial Observer
Katie Jackson	Environmental Aviation	Aerial Observer
Janna Lee	Environmental Aviation	Aerial Observer
Robert Murphy	Environmental Aviation	Aerial Pilot
Ryan Hagan	Environmental Aviation	Aerial Pilot
Bob Romanelli	Environmental Aviation	Aerial Pilot

5.0 Postponements and Recommendations

This section describes technical, weather-related, and mitigation-related postponements or delays experienced during the shock trial. This section also provides recommendations for planning purposes of future detonation events.

5.1 Postponements

The shock trial experienced several technical and weather-related delays. At the onset of the shock trial, USS MESA VERDE encountered mechanical issues that required maintenance postponing the shock trial for 14 days. Weather related delays were also observed. Tropical Storm Fey caused a four-day delay to the shock trial schedule. Hurricanes Hanna and Ike both created poor weather conditions (i.e., high wind speeds, Beaufort sea states greater than 4) that were unsuitable to safely conduct the shock trial. Hurricane Hanna resulted in a three-day delay, whereas there was a five-day delay related to Hurricane Ike. For the hurricanes, postponements were unavoidable as Naval Station Mayport sortied all ships to avoid damage related to the storms.

During Shot One (16 August 2008), a dolphin sighting created a "hold" during the shock trial countdown, delaying the detonation by 17 minutes until the dolphins were re-acquired by aerial surveillance and confirmed clear of the Safety Range. No other delays due to marine animal sightings occurred for Shots Two or Three.

5.2 Recommendations – Planning Component

- Shock Trial Director should meet with the Ordnance Operator and Lead Scientist to review potential test sites and rendezvous points prior to each shot.
- Include Lead Scientist in development of the mitigation plan at project kick-off.
- Include site visits to the ship by the mitigation team to ensure development of a mitigation plan specific to the individual ship and program needs.
- Invite NMFS permit representative to participate in the shock trial event.

5.3 Recommendations – Aerial Component

- Lead Scientist should coordinate all aerial survey efforts, with detailed briefings conducted prior to each detonation and after each survey.
- All communication protocols, including back-up protocols, should be clearly defined prior to the start of the test period.
- Aerial monitoring on post-detonation days after Shot Three should focus on water down-current from the detonation site, particularly for tests done in high current areas such as the Gulf Stream. Water in which the detonation takes place is traveling at 2-3 knots and long gone from the test area within a day. Extension of the aerial component will assist in the shipboard surveillance for the MART on

the surface. (Aerial monitoring after Shots One and Two focused on water down-current with the flight operations working in tandem with the MART ship, therefore this recommended change is not applicable for Shots One and Two.)

5.4 Recommendations – Shipboard Component

- Lead Scientist must have reliable satellite communication capabilities so that communication with the MART ship and aerial operations are possible at any time.

- Aerial and shipboard monitoring components should participate in rehearsals so communications testing can occur prior to the first detonation. Rehearsals may indicate a need for a dedicated marine-band VHF radio antenna affixed to the test ship to allow communications from the MART ship and surveillance aircraft directly to the Lead Scientist on the bridge. Rehearsal will also aid in the fine-tuning of the shot day schedule of events. For example, time to clear observers from the weather decks, secure Bigeyes, and locations to brace for the detonation may be adjusted.

- Additional batteries should to be available for hand-held radios and computer tracking equipment.

- Individuals on the shipboard mitigation team should remain the same for the duration of the shock trial, where possible, to allow for team building and process improvement throughout the shock trial event.

- Ensure Environmental Director responsibilities as a liaison between mitigation team and shock trial team are executed to allow for seamless exchange of information and project implementation.

6.0 Conclusion

The Mitigation Component of the shock trial was successful. All elements of mitigation were implemented as planned and detailed in the EIS and USS MESA VERDE Shock Trial Plan except for Shot Three post-detonation monitoring. Aerial and shipboard surveys were called off short of the seven day requirement due to safety reasons and poor weather conditions. The NMFS and NOAA General Counsel were notified of impending weather conditions and were agreeable to the deviation in monitoring.[3]

The LOA issued by NMFS in July 2008 limited the incidental take of marine mammals to no more than one mortality or serious injury, two takings by Level A harassment (injuries), and 282 takings by Level B harassment (through temporary threshold shift). In addition, the LOA specified that incidental taking by serious injury or mortality of threatened or endangered marine mammal species was prohibited. The BO issued by NMFS in July 2008 anticipated an incidental take via injury of up to 36 sea turtles and up to 1,727 turtles are likely to be harassed as a result of behavioral responses to being exposed to underwater detonations.

No mortalities or injuries to marine mammals or sea turtles were detected during the shock trial event or during post-mitigation monitoring. In addition, no marine mammal or sea turtle stranding has been attributed to the shock trial.

[3] Email correspondence dated 19 September 2008 from Shock Trial Lead Scientist Chris Slay (Coastwise Consulting) to Ken Hollingshead (NOAA) and Deborah Ben-David (NOAA General Counsel) summarizing the 16 September 2008 teleconference to inform NMFS/NOAA of deteriorating weather conditions requiring post-detonation monitoring after Shot Three to be halted prior to the seven days outlined in the Final EIS. During the teleconference, NMFS concurred with the assessment based on the safety risk to the monitoring crew.

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7.0 References

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National Marine Fisheries Service (NMFS), 2008a. Letter of Authorization. 22 July 2008.

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Appendix A

AERIAL SIGHTINGS

Note: Data from the aerial surveillance teams were recorded using GPS computer tracking systems. Times may not correspond exactly with shot day observation records and may show a difference of a few minutes. Shot day sightings were recorded on the bridge of USS MESA VERDE based on the time radioed to the Lead Scientist.

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Table A-1: Aerial Sightings for Entire Shock Trial (July – September 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
7/23/2008	1031	30.17333	-79.915	Loggerhead sea turtle	1	
7/23/2008	1031	30.17333	-79.88667	Loggerhead sea turtle	4	
7/23/2008	1036	30.16833	-79.695	Loggerhead sea turtle	1	
7/23/2008	1038	30.16333	-79.60833	Loggerhead sea turtle	1	
7/23/2008	1040	30.115	-79.56183	Loggerhead sea turtle	1	
7/23/2008	1043	30.08167	-79.645	Loggerhead sea turtle	2	
7/23/2008	1044	30.08	-79.665	Loggerhead sea turtle	2	
7/23/2008	1045	30.08167	-79.695	Loggerhead sea turtle	1	
7/23/2008	1045	30.08167	-79.705	Loggerhead sea turtle	2	
7/23/2008	1046	30.08333	-79.73	Loggerhead sea turtle	1	
7/23/2008	1047	30.08667	-79.76	Loggerhead sea turtle	1	
7/23/2008	1049	30.08	-79.825	Loggerhead sea turtle	1	
7/23/2008	1050	30.08	-79.84667	Loggerhead sea turtle	1	
7/23/2008	1050	30.08	-79.85667	Loggerhead sea turtle	1	
7/23/2008	1051	30.07833	-79.885	Loggerhead sea turtle	4	
7/23/2008	1052	30.08	-79.915	Loggerhead sea turtle	2	
7/23/2008	1105	30.02	-79.75667	Loggerhead sea turtle	1	
7/23/2008	1106	30.01667	-79.72833	Loggerhead sea turtle	1	
7/23/2008	1110	30.00333	-79.56333	Loggerhead sea turtle	1	
7/23/2008	1118	29.90333	-79.60167	Loggerhead sea turtle	2	
7/23/2008	1121	29.90167	-79.7	Loggerhead sea turtle	1	
7/23/2008	1123	29.90833	-79.76333	Loggerhead sea turtle	1	
7/23/2008	1123	29.90833	-79.77333	Loggerhead sea turtle	2	
7/23/2008	1123	29.91	-79.78667	Loggerhead sea turtle	1	
7/23/2008	1124	29.91167	-79.79833	Loggerhead sea turtle	2	
7/23/2008	1125	29.91833	-79.85667	Loggerhead sea turtle	2	
7/23/2008	1129	29.92	-79.98167	Loggerhead sea turtle	1	
7/23/2008	1139	29.83167	-79.87	Loggerhead sea turtle	2	
7/23/2008	1141	29.83833	-79.80167	Loggerhead sea turtle	1	
7/23/2008	1143	29.83667	-79.70333	Loggerhead sea turtle	1	
7/23/2008	1154	29.74667	-79.58833	Unidentified sea turtle	1	
7/23/2008	1155	29.74833	-79.64333	Loggerhead sea turtle	1	
7/23/2008	1157	29.75167	-79.69833	Loggerhead sea turtle	2	
7/23/2008	1158	29.75333	-79.73667	Loggerhead sea turtle	1	
7/23/2008	1158	29.75167	-79.75	Loggerhead sea turtle	2	
7/23/2008	1159	29.75	-79.77	Unidentified sea turtle	1	
7/23/2008	1159	29.74667	-79.78167	Unidentified sea turtle	1	

* Decimal degrees

Table A-1 (cont.): Aerial Sightings for Entire Shock Trial (July – September 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
7/23/2008	1200	29.745	-79.80333	Loggerhead sea turtle	1	
7/23/2008	1204	29.75167	-79.94667	Bottlenose dolphin	2	
7/23/2008	1214	29.665	-79.94333	Bottlenose dolphin	40	Heading south
7/23/2008	1217	29.66833	-79.915	Loggerhead sea turtle	1	
7/23/2008	1221	29.66833	-79.76833	Loggerhead sea turtle	1	
7/23/2008	1222	29.66833	-79.74833	Loggerhead sea turtle	1	
7/23/2008	1224	29.66833	-79.65333	Loggerhead sea turtle	1	
7/23/2008	1227	29.66833	-79.53167	Loggerhead sea turtle	1	
7/23/2008	1230	29.52667	-79.495	Bottlenose dolphin	4	
7/23/2008	1236	29.58667	-79.66167	Loggerhead sea turtle	2	
7/23/2008	1236	29.58667	-79.675	Loggerhead sea turtle	1	
7/23/2008	1237	29.58333	-79.70667	Loggerhead sea turtle	1	
7/23/2008	1240	29.585	-79.81167	Loggerhead sea turtle	1	
7/23/2008	1240	29.585	-79.82833	Loggerhead sea turtle	1	
7/23/2008	1244	29.585	-79.84333	Unidentified dolphin	2	Heading south
7/23/2008	1244	29.58667	-79.93333	Unidentified dolphin	15	Heading south
7/23/2008	1257	29.81167	-79.83667	Loggerhead sea turtle	1	
7/23/2008	1257	29.82833	-79.83833	Loggerhead sea turtle	1	
7/23/2008	1305	29.88167	-79.89667	Unidentified sea turtle	1	
7/23/2008	1306	29.88333	-79.87667	Unidentified dolphin	15	Heading south
7/23/2008	1306	29.88333	-79.87667	Loggerhead sea turtle	1	Heading south
7/23/2008	1306	29.88667	-79.855	Loggerhead sea turtle	2	
7/23/2008	1307	29.91	-79.835	Loggerhead sea turtle	2	
7/23/2008	1308	29.92167	-79.84167	Loggerhead sea turtle	2	
7/23/2008	1309	29.925	-79.86833	Loggerhead sea turtle	1	
7/23/2008	1309	29.92667	-79.88667	Loggerhead sea turtle	1	
7/23/2008	1310	29.92833	-79.9	Loggerhead sea turtle	1	
7/23/2008	1310	29.93167	-79.92167	Loggerhead sea turtle	2	
7/23/2008	1320	29.99167	-80.28167	Unidentified dolphin	40	Heading north
7/25/2008	1055	30.16167	-80.08167	Loggerhead sea turtle	1	
7/25/2008	1055	30.16167	-80.06833	Loggerhead sea turtle	1	
7/25/2008	1055	30.16333	-80.05333	Bottlenose dolphin	3	Heading south
7/25/2008	1055	30.16333	-80.045	Loggerhead sea turtle	1	
7/25/2008	1056	30.16833	-80.00833	Loggerhead sea turtle	1	
7/25/2008	1058	30.16833	-79.945	Loggerhead sea turtle	2	
7/25/2008	1101	30.165	-79.85667	Loggerhead sea turtle	1	
7/25/2008	1109	30.09333	-79.84333	Loggerhead sea turtle	1	

* Decimal degrees

Table A-1 (cont.): Aerial Sightings for Entire Shock Trial (July – September 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
7/25/2008	1109	30.09333	-79.86167	Loggerhead sea turtle	1	
7/25/2008	1110	30.09167	-79.885	Loggerhead sea turtle	1	
7/25/2008	1110	30.09167	-79.895	Loggerhead sea turtle	1	
7/25/2008	1110	30.095	-79.90667	Loggerhead sea turtle	2	
7/25/2008	1112	30.095	-79.95833	Loggerhead sea turtle	4	
7/25/2008	1112	30.095	-79.96667	Loggerhead sea turtle	3	
7/25/2008	1112	30.09667	-79.97667	Loggerhead sea turtle	1	
7/25/2008	1112	30.09833	-79.99	Bottlenose dolphin	2	Heading south
7/25/2008	1113	30.09833	-80.00167	Loggerhead sea turtle	1	
7/25/2008	1114	30.1	-80.02	Loggerhead sea turtle	3	
7/25/2008	1114	30.1	-80.02833	Loggerhead sea turtle	1	
7/25/2008	1114	30.10167	-80.05333	Loggerhead sea turtle	2	
7/25/2008	1115	30.10333	-80.06167	Loggerhead sea turtle	1	
7/25/2008	1115	30.10333	-80.075	Loggerhead sea turtle	1	
7/25/2008	1116	30.07833	-80.08167	Loggerhead sea turtle	1	
7/25/2008	1117	30.06167	-80.07667	Loggerhead sea turtle	2	
7/25/2008	1119	30.03667	-80.015	Loggerhead sea turtle	1	
7/25/2008	1119	30.03667	-80.005	Loggerhead sea turtle	2	
7/25/2008	1121	30.03333	-79.93	Unidentified dolphin	2	Heading south
7/25/2008	1123	30.03167	-79.95667	Loggerhead sea turtle	1	
7/25/2008	1124	30.03167	-79.83167	Loggerhead sea turtle	2	
7/25/2008	1128	29.97333	-79.75667	Unidentified dolphin	12	Heading E/SE
7/25/2008	1132	29.96833	-79.81833	Loggerhead sea turtle	2	
7/25/2008	1133	29.96667	-79.84167	Loggerhead sea turtle	2	
7/25/2008	1134	29.96667	-79.87667	Loggerhead sea turtle	1	
7/25/2008	1134	29.96667	-79.88667	Loggerhead sea turtle	1	
7/25/2008	1135	29.96667	-79.92	Loggerhead sea turtle	1	
7/25/2008	1136	29.96667	-79.95833	Loggerhead sea turtle	1	
7/25/2008	1140	29.92333	-80.075	Unidentified sea turtle	1	
7/25/2008	1142	29.90167	-80.02833	Loggerhead sea turtle	1	
7/25/2008	1143	29.90167	-80.01833	Loggerhead sea turtle	1	
7/25/2008	1146	29.90167	-79.905	Unidentified dolphin	15	
7/25/2008	1154	29.83667	-79.81	Loggerhead sea turtle	1	
7/25/2008	1156	29.83	-79.89167	Loggerhead sea turtle	1	
7/25/2008	1157	29.83	-79.915	Bottlenose dolphin	30	Heading south
7/25/2008	1201	29.83333	-80.07	Loggerhead sea turtle	1	

* Decimal degrees

Table A-1 (cont.): Aerial Sightings for Entire Shock Trial (July – September 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
7/25/2008	1203	29.77	-80.06667	Loggerhead sea turtle	2	
7/25/2008	1204	29.77333	-80.04167	Loggerhead sea turtle	1	
7/25/2008	1204	29.775	-80.02833	Loggerhead sea turtle	1	
7/25/2008	1210	29.78167	-79.80333	Loggerhead sea turtle	1	
7/25/2008	1216	29.69333	-79.79833	Loggerhead sea turtle	1	
7/25/2008	1218	29.7	-79.89833	Loggerhead sea turtle	1	
7/25/2008	1236	29.90333	-80.005	Loggerhead sea turtle	1	
7/25/2008	1242	29.97333	-79.835	Loggerhead sea turtle	2	
7/25/2008	1247	30.00667	-79.99833	Unidentified dolphin	4	Heading west
7/25/2008	1247	30.00667	-79.99833	Loggerhead sea turtle	2	
7/25/2008	1248	30.02667	-79.99667	Unidentified dolphin	10	Heading west
7/25/2008	1253	30.05667	-79.83333	Loggerhead sea turtle	1	
7/25/2008	1255	30.085	-79.88667	Loggerhead sea turtle	1	
7/26/2008	1021	29.8681	-79.92863	Loggerhead sea turtle	1	
7/26/2008	1024	29.85	-79.86918	Bottlenose dolphin	2	Heading SE
7/26/2008	1026	29.87262	-79.8722	Bottlenose dolphin	26	Heading SE
7/26/2008	1042	29.80138	-79.6573	Loggerhead sea turtle	1	
7/26/2008	1049	29.8009	-79.87837	Bottlenose dolphin	20	Heading SE
7/26/2008	1051	29.7986	-79.96607	Loggerhead sea turtle	1	
7/26/2008	1059	29.73937	-79.8363	Bottlenose dolphin	6	Heading south
7/26/2008	1144	29.5336	-79.56837	Loggerhead sea turtle	1	
7/26/2008	1234	29.83783	-80.01755	Bottlenose dolphin	30	Heading south
7/27/2008	0918	30.0213	-79.93973	Loggerhead sea turtle	1	
7/27/2008	0918	30.02622	-79.88025	Loggerhead sea turtle	1	
7/27/2008	0925	30.00362	-79.62638	Loggerhead sea turtle	1	
7/27/2008	0939	29.9315	-79.74485	Loggerhead sea turtle	1	
7/27/2008	0940	29.93775	-79.78323	Loggerhead sea turtle	1	
7/27/2008	0941	29.61142	-79.82463	Loggerhead sea turtle	1	
7/27/2008	0941	29.94475	-79.8402	Unidentified sea turtle	1	
7/27/2008	0944	29.93923	-79.92347	Loggerhead sea turtle	1	
7/27/2008	0948	29.89375	-79.99378	Bottlenose dolphin	2	Heading west
7/27/2008	0950	29.86295	-79.9463	Loggerhead sea turtle	1	
7/27/2008	0955	29.86973	-79.77202	Bottlenose dolphin	7	Heading south
7/27/2008	1008	29.8094	-79.6584	Unidentified sea turtle	1	
7/27/2008	1015	29.79975	-79.74017	Unidentified sea turtle	1	
7/27/2008	1018	29.79813	-79.86063	Loggerhead sea turtle	1	
7/27/2008	1028	29.7397	-79.88872	Loggerhead sea turtle	1	

* Decimal degrees

Table A-1 (cont.): Aerial Sightings for Entire Shock Trial (July – September 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
7/27/2008	1054	29.6524	-79.86528	Bottlenose dolphin	2	Heading north
8/11/2008	942	29.99269	-79.62862	Unidentified sea turtle	1	
8/11/2008	943	29.99344	-79.61275	Unidentified sea turtle	1	
8/11/2008	952	29.92524	-79.62908	Loggerhead sea turtle	1	
8/11/2008	952	29.92553	-79.63907	Loggerhead sea turtle	1	
8/11/2008	953	29.92653	-79.66279	Loggerhead sea turtle	1	
8/11/2008	1009	29.86666	-79.6413	Loggerhead sea turtle	1	
8/11/2008	1015	29.80380	-79.50503	Loggerhead sea turtle	1	
8/11/2008	1016	29.80279	-79.52709	Loggerhead sea turtle	1	
8/11/2008	1016	29.80162	-79.54255	Loggerhead sea turtle	1	
8/11/2008	1017	29.80055	-79.55476	Loggerhead sea turtle	1	
8/11/2008	1017	29.79967	-79.56689	Loggerhead sea turtle	2	
8/11/2008	1018	29.79902	-79.58678	Loggerhead sea turtle	1	
8/11/2008	1028	29.77874	-79.90685	Bottlenose dolphin	2	
8/11/2008	1041	29.68853	-79.49229	Loggerhead sea turtle	1	
8/11/2008	1044	29.67152	-79.55981	Loggerhead sea turtle	1	
8/11/2008	1046	29.66724	-79.61426	Unidentified sea turtle	1	
8/11/2008	1058	29.60316	-79.88606	Loggerhead sea turtle	1	
8/11/2008	1105	29.59989	-79.59373	Loggerhead sea turtle	1	
8/11/2008	1106	29.59936	-79.57773	Loggerhead sea turtle	2	
8/11/2008	1107	29.59768	-79.52752	Loggerhead sea turtle	1	
8/11/2008	1110	29.53830	-79.51229	Loggerhead sea turtle	1	
8/11/2008	1111	29.53757	-79.53326	Unidentified sea turtle	1	
8/11/2008	1113	29.53303	-79.58516	Loggerhead sea turtle	1	
8/11/2008	1114	29.53101	-79.63021	Loggerhead sea turtle	1	
8/12/2008	0851	30.00087	-79.66062	Loggerhead sea turtle	1	
8/12/2008	0853	30.00054	-79.60219	Loggerhead sea turtle	1	
8/12/2008	0853	30.00029	-79.57117	Loggerhead sea turtle	1	
8/15/2008	0853	29.91602	-79.70171	Unidentified sea turtle	1	
8/12/2008	0856	29.95557	-79.49282	Loggerhead sea turtle	1	
8/12/2008	0858	29.93428	-79.51041	Loggerhead sea turtle	1	
8/12/2008	0900	29.92961	-79.59316	Loggerhead sea turtle	1	
8/12/2008	0901	29.93174	-79.61596	Loggerhead sea turtle	1	
8/12/2008	0922	29.86601	-79.53897	Loggerhead sea turtle	1	
8/12/2008	1137	29.80046	-79.58115	Bottlenose dolphin	4	
8/15/2008	0902	29.88513	-79.80910	Loggerhead sea turtle	1	

* Decimal degrees

Table A-1 (cont.): Aerial Sightings for Entire Shock Trial (July – September 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
8/15/2008	0909	29.85214	-79.64812	Unidentified sea turtle	1	
8/15/2008	0914	29.8252	-79.48203	Loggerhead sea turtle	1	
8/15/2008	0933	29.78483	-79.62734	Loggerhead sea turtle	1	
8/15/2008	0940	29.75288	-79.47105	Loggerhead sea turtle	1	
8/15/2008	0947	29.75203	-79.65773	Loggerhead sea turtle	1	
8/15/2008	1000	29.71491	-79.60231	Loggerhead sea turtle	1	
8/15/2008	1006	29.68897	-79.45925	Loggerhead sea turtle	1	
8/15/2008	1028	29.66361	-79.62788	Unidentified sea turtle	1	
8/15/2008	1044	29.83414	-79.69141	Unidentified sea turtle	1	
8/15/2008	1116	29.92063	-79.80599	Loggerhead sea turtle	1	
8/15/2008	1207	30.61081	-81.36158	Bottlenose dolphin	5	Inshore
8/16/2008	0925	29.78428	-79.74678	Pilot whale	2	
8/16/2008	0950	29.73251	-79.73396	Unidentified marine mammal	3	Swam to the west
8/16/2008	1212	29.8798	-79.66930	Pilot whale	5	Same group
8/16/2008	1216	29.75739	-79.81157	Pilot whale	5	Different group
8/16/2008	1250	29.75735	-79.80301	Loggerhead sea turtle	1	
8/16/2008	1306	29.80424	-79.63958	Risso's dolphin	24	
8/16/2008	1354	29.92044	-79.75584	Risso's dolphin	25	
8/16/2008	1449	29.91506	-79.76912	Risso's dolphin	4	
8/16/2008	1502	29.92774	-79.76995	Risso's dolphin	20	
8/16/2008	1535	29.99367	-79.80904	Risso's dolphin	6	1 nmi north of plane
8/16/2008	1542	30.00995	-79.81776	Risso's dolphin	5	
8/16/2008	1542	30.00995	-79.81776	Unidentified marine mammal	1	Large animal
8/16/2008	1800	30.095	-79.795	Loggerhead sea turtle	1	
8/16/2008	1801	30.095	-79.81167	Loggerhead sea turtle	2	
8/16/2008	1802	30.095	-79.82333	Loggerhead sea turtle	1	
8/16/2008	1810	29.97667	-79.66167	Loggerhead sea turtle	1	
8/16/2008	1812	29.965	-79.725	Loggerhead sea turtle	2	
8/16/2008	1815	29.96	-79.825	Loggerhead sea turtle	1	
8/17/2008	0920	30.03515	-79.78214	Bottlenose dolphin	1	
8/17/2008	0943	29.93349	-79.72752	Unidentified dolphin	2	
8/17/2008	0950	30.58371	-79.63234	Unidentified dolphin	8	
8/17/2008	0949	29.9001	-79.62988	Loggerhead sea turtle	1	
8/17/2008	1000	29.8333	-79.65517	Unidentified sea turtle		
8/17/2008	1200	30.60007	-79.53679	Loggerhead sea turtle	1	
8/17/2008	1250	30.51375	-79.62232	Loggerhead sea turtle	1	
8/18/2008	0949	31.16647	-79.18125	Unidentified dolphin	7	

* Decimal degrees

Table A-1 (cont.): Aerial Sightings for Entire Shock Trial (July – September 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
8/18/2008	0952	31.19682	-79.21213	Bottlenose dolphin	2	
8/18/2008	0952	31.19587	-79.22170	Bottlenose dolphin	1	
8/18/2008	0957	31.19959	-79.40575	Bottlenose dolphin	3	
8/18/2008	1021	31.30093	-79.19805	Bottlenose dolphin	6	
8/18/2008	1025	31.33457	-79.24775	Bottlenose dolphin	1	
8/18/2008	1005	31.23142	-79.19289	Unidentified dolphin	4	
8/18/2008	1115	31.56694	-79.16446	Unidentified dolphin	3	
8/24/2008	1131	29.84879	-79.66487	Loggerhead sea turtle	1	
8/24/2008	1135	29.85026	-79.7879	Loggerhead sea turtle	1	
8/24/2008	1206	29.65281	-79.78627	Unidentified sea turtle	1	
8/24/2008	1224	29.58361	-79.73167	Unidentified sea turtle	1	
8/24/2008	1239	29.51816	-79.50895	Unidentified sea turtle	1	
8/24/2008	1247	29.4510	-79.66061	Unidentified dolphin	1	
8/24/2008	1309	29.53292	-79.73354	Unidentified sea turtle	1	
8/24/2008	1314	29.58406	-79.80605	Unidentified sea turtle	1	
8/24/2008	1329	29.63759	-79.78467	Unidentified sea turtle	1	
8/25/2008	0932	29.46692	-79.62122	Loggerhead sea turtle	1	
8/25/2008	0932	29.46672	-79.63134	Green sea turtle	1	
8/25/2008	0939	29.50412	-79.69575	Loggerhead sea turtle	1	
8/25/2008	0941	29.50495	-79.63271	Loggerhead sea turtle	1	
8/25/2008	1007	29.61717	-79.5805	Loggerhead sea turtle	1	
8/25/2008	1014	29.6710	-79.58530	Unidentified sea turtle	1	
8/25/2008	1016	29.66794	-79.66086	Loggerhead sea turtle	1	
8/25/2008	1017	29.66781	-79.67883	Green sea turtle	1	
8/25/2008	1018	29.66806	-79.73186	Unidentified sea turtle	1	
8/25/2008	1035	29.76629	-79.70869	*Sargassum*	Large patches	
8/25/2008	1037	29.78953	-79.7506	Loggerhead sea turtle	1	
8/25/2008	1059	29.91401	-79.64732	Loggerhead sea turtle	1	
8/25/2008	1100	29.91123	-79.63515	Green sea turtle	1	
8/26/2008	1211	29.78431	-79.65593	Unidentified dolphin	4	
8/26/2008	1222	29.71633	-79.51428	*Sargassum*	Large patch	Both sides of plane
8/26/2008	1228	29.68291	-79.65032	Unidentified sea turtle	2	
8/26/2008	1231	29.68306	-79.74857	*Sargassum*	2 large lines	Both sides of plane
8/26/2008	1246	29.60791	-79.7647	Unidentified sea turtle	1	
8/26/2008	1309	29.69573	-79.50468	*Sargassum*	Large patches	Both sides of plane
8/26/2008	1326	29.89239	-79.63449	Unidentified sea turtle	1	
8/26/2008	1347	29.75368	-79.49975	*Sargassum*	Large patches	Both sides of plane

* Decimal degrees

Table A-1 (cont.): Aerial Sightings for Entire Shock Trial (July – September 2008)

Date	Time	Latitude*	Longitude*	*Species*	No. of Animals	Note
8/26/2008	1417	29.71198	-79.49950	*Sargassum*	Large patches	
8/26/2008	1529	29.75667	-79.64518	Unidentified sea turtle	1	
8/26/2008	1546	29.73337	-79.55434	Unidentified dolphin	6	
8/26/2008	1556	29.76560	-79.49064	*Sargassum*	Large patches	Large patches
8/26/2008	1608	29.79989	-79.49362	*Sargassum*	Large patches	Both sides of plane
8/27/2008	1150	30.33362	-79.40052	*Sargassum*	Big patches	
8/27/2008	1151	30.33367	-79.35350	*Sargassum*	Patchy	
8/28/2008	1133	31.90016	-78.34363	Risso's dolphin	7	
8/28/2008	1145	31.86744	-78.30322	Bottlenose dolphin	13	
8/28/2008	1226	31.69062	-78.35022	Unidentified dolphin	5	
8/28/2008	1234	31.66882	-78.43123	Bottlenose dolphin	1	
8/28/2008	1236	31.66819	-78.34473	Loggerhead sea turtle	1	
8/28/2008	1237	31.67070	-78.31343	Unidentified dolphin	5	
8/28/2008	1239	31.66202	-78.24817	Unidentified dolphin	1	
9/7/2008	1245	29.58562	-79.65965	Unidentified sea turtle	1	
9/7/2008	1329	29.39371	-79.50564	*Sargassum*	Large	
9/8/2008	1122	30.02065	-80.67287	Bottlenose dolphin	10	
9/8/2008	1134	30.16334	-81.11819	Green sea turtle	30	Two groups
9/8/2008	1126	30.07684	-80.82198	Unidentified sea turtle	1	
9/8/2008	1132	30.13732	-81.03765	Unidentified sea turtle	1	
9/11/2008	1001	29.86201	-79.51196	*Sargassum*	Big patches	
9/14/2008	1056	29.99555	-80.08458	Bottlenose dolphin	1	
9/14/2008	1141	29.99166	-79.50766	Pilot whales	25	
9/14/2008	1246	30.66278	-79.65812	Bottlenose dolphin	26	
9/14/2008	1324	30.81751	-79.42195	Unidentified dolphin	3	
9/15/2008	1158	32.05457	-78.86449	Bottlenose dolphin	24	
9/15/2008	1243	32.13414	-78.25479	Bottlenose dolphin	50	Two large pods
9/15/2008	1249	32.13408	-78.17673	Unidentified dolphin	10	
9/15/2008	1250	32.15049	-78.16459	Unidentified dolphin	5	
9/15/2008	1251	32.17765	-78.18254	Unidentified dolphin	10	
9/15/2008	1254	32.18260	-78.25491	Unidentified dolphin	8	
9/15/2008	1255	32.18333	-78.28989	Risso's dolphin	5	
9/15/2008	1404	32.42577	-78.41057	Unidentified dolphin	1	
9/15/2008	1427	32.52710	-78.58193	Unidentified dolphin	6	
9/16/2008	1049	31.4171	-77.80505	*Sargassum*	Large	

* Decimal degrees

Table A-1 (cont.): Aerial Sightings for Entire Shock Trial (July – September 2008)

Date	Time	Latitude*	Longitude*	*Species*	No. of Animals	Note
9/16/2008	1107	31.46653	-77.75578	*Sargassum*	Large	
9/16/2008	1324	31.76682	-77.88461	Unidentified sea turtle		
9/17/2008	1055	30.11713	-79.73139	Bottlenose dolphin	15	
9/17/2008	1132	31.12367	-79.31189	Bottlenose dolphin	25	Two groups
9/17/2008	1136	31.18862	-79.16172	Bottlenose dolphin	15	Two groups
9/17/2008	1138	31.21291	-79.10247	Bottlenose dolphin	10	Two groups
9/17/2008	1138	31.20828	-79.11411	Unidentified dolphin	6	
9/17/2008	1145	31.29634	-78.87678	Unidentified dolphin	25	
9/17/2008	1152	31.3667	-78.67648	Unidentified dolphin	8	

* Decimal degrees

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Appendix B

MARINE ANIMAL RESPONSE TEAM (MART) SIGHTINGS

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Table B-1: Marine Animal Response Team (MART) Sightings for Entire Shock Trial (August – September 2008)

Date	Time	Latitude*	Longitude*	Species	No. of Animals	Note
8/16/2008	0834	29.76333	-79.78167	Pilot whale	3-4	
8/16/2008	0922	29.78667	-79.75	Pilot whale	4	Off bow, with a calf
8/16/2008	0929	29.79	-79.74167	Pilot whale	3	Different group
8/16/2008	0934	29.79667	-79.73883	Pilot whale	1	New adult behind ship
8/16/2008	1118	29.83833	-79.74	Pilot whale	3-4	Traveling 7.1 knots
8/16/2008	1211	29.865	-79.77883	Pilot whale	5	Moderate to fast speed, with a calf
8/16/2008	1328	29.805	-79.64667	Risso's dolphin	2-25	Tail slapping, spyhopping
8/16/2008	1345	29.8	-79.64333	Risso's dolphin	2-25	Same as earlier sighting
8/17/2008	0847	30.465	-79.61367	Unidentified marine mammal	1	Black dorsal fin, ~ 6-8 ft (possible *Kogia* sp.)
8/26/2008	0913	29.79333	-79.66167	*Sargassum*	10x10 ft	
8/26/2008	0923	29.773	-79.6665	*Sargassum*	30x10 ft	
8/26/2008	1355	29.783	-79.61817	*Sargassum*		Line running N/S with debris
8/26/2008	1425	29.78117	-79.515	*Sargassum*	50x50 ft	
8/26/2008	1611	29.766	-79.506	*Sargassum* rafts	15x15 ft	Part of a line of *Sargassum* running N/S
8/27/2008	1411	30.76983	-79.389	Pilot whale	5-7	Heading NW, at stern within 50 ft; at least 3 calves in 20-25 animals of mixed species group
8/28/2008	0844	31.711	-78.46083	*Stenella* sp.^	2	
8/28/2008	1400	31.7585	-78.42333	*Stenella* sp.^	5-7	Bow riding, with calf
8/28/2008	1415	31.74333	-78.455	*Stenella* sp.^	5-7	Bow, wake riding
9/15/2008	0717	31.3149	-78.93317	Bottlenose dolphin	20-25	At buoy; sighting from 0717-0826 with calf
9/15/2008	0911	31.42617	-78.88667	Bottlenose dolphin	1	Two sightings of animal
9/15/2008	0954	31.46083	-78.8485	Unidentified dolphin	1	
9/15/2008	1000	31.46483	-78.84283	Bottlenose dolphin	17-20	Widely dispersed, ~7 along ship, with ~10 animals ½ nmi away
9/15/2008	1541	31.62533	-78.66317	Bottlenose dolphin	5	Porpoising, rode wake
9/15/2008	1633	31.6465	-78.62933	Bottlenose dolphin	2	Off bow, heading E/W under bow
9/15/2008	1717	31.65	-78.56167	Unidentified dolphin	12	Fast swim speed; porpoising

* decimal degrees

^ *Stenella* sp. in the area (Atlantic spotted dolphin, pantropical spotted dolphin, striped dolphin, or spinner dolphin) are similar in appearance and difficult to identify to the species level