Request for the Taking of Marine Mammals Incidental to the Operation of Northeast Gateway® Deepwater Port and Algonquin Pipeline Lateral

Prepared by:

Excelerate Energy, L.P.
1450 Lake Robbins Drive, Suite 200
The Woodlands, TX 77380

and

Tetra Tech, Inc.
160 Federal Street
Boston, MA 02110

June 2014

TABLE OF CONTENTS

1.0 DESCRIPTION OF THE ACTIVITY 5
- 1.1 Introduction 5
- 1.2 Northeast Gateway Deepwater Port and Algonquin Pipeline Lateral 6
- 1.3 NEG Port and Algonquin Pipeline Lateral Operation and Maintenance Activities 7
  - 1.3.1 NEG Port 7
    - 1.3.1.1 NEG Port Operations 7
    - 1.3.1.2 NEG Port Maintenance and Repair 8
  - 1.3.2 Algonquin Pipeline Lateral O&M Activities 9
    - 1.3.2.1 Routine O&M Activities 9
    - 1.3.2.2 Unplanned Pipeline Repair Activities 9
- 1.4 NEG Port and Algonquin Pipeline Lateral Activities Resulting in the Potential Incidental Taking of Marine Mammals 10
  - 1.4.1 Hydroacoustic Analysis 10
  - 1.4.2 Regulatory Criteria 10
  - 1.4.3 Field Surveys 13
  - 1.4.4 Hydroacoustic Modeling 14
    - 1.4.4.1 NEG Port Operations 14
    - 1.4.4.2 NEG Port Maintenance and Repair 15
  - 1.4.5 Algonquin Pipeline Lateral O&M Activities 17

2.0 DATES, DURATION AND LOCATION OF NEG PORT AND ALGONQUIN PIPELINE LATERAL OPERATIONS 19
- 2.1 Operation Dates and Duration 19
- 2.2 Specific Geographic Region 19

3.0 MARINE MAMMAL SPECIES AND NUMBERS 22

4.0 AFFECTED SPECIES STATUS AND DISTRIBUTION 22
- 4.1 Toothed Whales (Odontonceti) 23
- 4.2 Baleen Whales (Mysticeti) 27
- 4.3 Earless Seals (Phocidae) 32

5.0 TYPE OF INCIDENTAL TAKE REQUESTED 33
- 5.1 NEG Port 33
  - 5.1.1 NEG Port Operations 33
  - 5.1.2 NEG Port Maintenance 34
- 5.2 Algonquin Pipeline Lateral O&M Activities 34

6.0 NUMBERS OF MARINE MAMMAL THAT MIGHT BE TAKEN 35
- 6.1 Basis for Estimating Numbers of Marine Mammals that Might be “Taken by Harassment” 35
  - 6.1.1 NEG Port 36
    - 6.1.1.1 NEG Port Operations 36
    - 6.1.1.2 NEG Port Maintenance 37
  - 6.1.2 Algonquin Pipeline Lateral O&M Activities 37
- 6.2 Estimate of Numbers of Marine Mammals that Might be “Taken by Harassment” 37
  - 6.2.1 Estimate of Potential NEG Port Operational Takes by Harassment 37
  - 6.2.2 Estimate of Potential NEG Port Maintenance and Repair Takes by Harassment 40

TABLE OF CONTENTS – Continued

6.2.3 Estimate of Potential Algonquin Pipeline Lateral Takes by Harassment 41

7.0 EFFECTS TO MARINE MAMMAL SPECIES OR STOCKS 41

8.0 MINIMIZATION OF ADVERSE EFFECTS TO SUBSISTENCE USES 42

9.0 EFFECTS TO MARINE MAMMALS FROM LOSS OR MODIFICATION OF HABITAT AND THE LIKELIHOOD OF RESTORATION 42
9.1 NEG Port Operations 42
9.2 NEG Port Maintenance 44
9.3 Unanticipated Algonquin Pipeline Lateral Maintenance and Repair 45

10.0 THE EFFECTS OF HABITAT LOSS OR MODIFICATION ON MARINE MAMMALS 45

11.0 MEANS OF AFFECTING THE LEAST PRACTICABLE IMPACT UPON EFFECTED SPECIES OR STOCKS 46

12.0 THE EFFECTS OF NEG PORT ACTIVITIES ON SPECIES OR STOCK OF MARINE MAMMALS AVAILABLE FOR ARCTIC SUBSISTENCE USES 47

13.0 MONITORING AND REPORTING 47

14.0 RESEARCH 49

15.0 LIST OF PREPARERS 50

16.0 REFERENCES 51

FIGURES

Figure 2-1 Northeast Gateway Energy Bridge Deepwater Port Project Site Location Map 21

TABLE

Table 1-1. Summary of NOAA Fisheries Cause and Effect Noise Criteria 11
Table 1-2. Interim PTS and TTS Criteria and Functional Hearing Range for Maine Mammals 12
Table 1-3. Summary Interim NOAA Fisheries Criteria for Sea Turtles 13
Table 1-4. Chronological Timeline 13
Table 1-5. Resultant underwater sound pressure levels and distance to threshold levels during NEG Port Operation 15
Table 1-6. Resultant underwater sound pressure levels and distance to threshold levels during NEG Port Maintenance and Repair 16
Table 1-7 Resultant underwater sound pressure levels and distance to threshold levels during Algonquin Pipeline Lateral Maintenance and Repair 18
Table 3-1 Marine Mammals Known to Occur in the Marine Waters of Massachusetts Bay 22
Table 6-1 Marine Mammal Density and Estimated Level B Harassment Take Numbers for Maximum NEG Port Capacity 39

TABLE OF CONTENTS – Continued

Table 6-2 Marine Mammal Density and Estimated Level B Harassment Take Numbers for Reduced Operations at NEG Port 40
Table 6-3 Marine Mammal Density and Estimated Level B Harassment Take Numbers for NEG Port Maintenance and Repair 40
Table 6-4 Marine Mammal Density and Estimated Level B Harassment Take Numbers for Algonquin Pipeline Lateral Maintenance and Repair 41

APPENDICES

Appendix A Marine Mammal Detection, Monitoring, and Response Plan for Operation of the Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral

Appendix B Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral Massachusetts Bay Area Hydroacoustic Surveys during Construction, Operations and Transit June 2011

Appendix C Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral Sound Pressure Level Propagation Calculation Methodologies Northeast Gateway Energy Bridge, LP

Appendix D Northeast Gateway Construction Marine Mammal Sightings and Take Summary Report

Appendix E Northeast Gateway Operations Marine Mammal Sighting and Take Summary Report 2008

Appendix F Northeast Gateway Operations Marine Mammal Sighting and Take Summary Report 2009

Appendix G Northeast Gateway Operations Marine Mammal Sighting and Take Summary Report 2010

Appendix H Northeast Gateway Operations Marine Mammal Sighting and Take Summary Report 2011

Appendix I Northeast Gateway Operations Marine Mammal Sighting and Take Summary Report 2012

Appendix J Northeast Gateway Operations Marine Mammal Sighting and Take Summary Report 2013

Appendix K Prevention, Monitoring and Mitigation Plan

ACRONYMS AND ABBREVIATIONS

ABs	auto-detection buoys
Algonquin	Algonquin Gas Transmission, LLC
AMAR	Autonomous Marine Recording
BO	Biological Opinion
BRP	Cornell University's Bioacoustics Research Program
Certificate	Certificate of Public Convenience and Necessity
CETAP	Cetacean and Turtles Assessment Program
CFR	Code of Federal Regulations
CSAP	Cetacean and Seabird Assessment Program
CWA	Clean Water Act
dB	Decibel
dBL	decibel linear
DOT	U.S. Department of Transportation
DP	Dynamically Positioned
EBRV	Energy Bridge™ Regasification Vessel
EEH	Equal Energy Hypothesis
EFD	Energy Flux Density
EIA	Environmental Impact Assessment
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
Excelerate®	Excelerate Energy, LP
FERC	Federal Energy Regulatory Commission
Final EIS/EIR	Final Environmental Impact Statement/Environmental Impact Report
gpm	gallons per minute
HF	high frequency
Hz	Hertz
IHA	Incidental Harassment Authorization
IMO	International Maritime Organization
ITS	Incidental Take Statement
IWC	International Whaling Commission
kHz	kilohertz
LF	low frequency
LNG	liquefied natural gas
LOA	Letter of Authorization
MARAD	Maritime Administration
MARU	Marine Autonomous Recording Unit
MBO	Manomet Bird Observatory
mgd	million gallons per day
ML	mid frequency
MMDMRP	Marine Mammal Detection, Monitoring, and Response Plan
MMPA	Marine Mammal Protection Act
MP	Milepost
NARWC	North Atlantic Right Whale Consortium
NCCOS	National Centers for Coastal Ocean Science
NEFSC	Northeast Fisheries Science Center

NEG Port or Port	Northeast Gateway® Deepwater Port
NCG	Noise Criteria Group
NIST	National Institute of Standards and Technologies
Northeast Gateway	Northeast Gateway Energy Bridge, L.P.
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Service
O&M	Operations and Maintenance
PCCS	Provincetown Center for Coastal Studies
Pipeline Lateral	Algonquin's 16.1 mile natural gas pipeline
PLEM	Pipeline End Manifold
PMMP	Prevention, Monitoring and Mitigation Program
Project	Northeast Gateway® Deepwater Port and Algonquin Pipeline Lateral
PTS	Permanent Threshold Shift
RAM	Range Dependent Acoustic Model
ROV	Remotely Operated Vehicle
RMS	root mean square
SBNMS	Stellwagen Bank National Marine Sanctuary
SEL	Sound Exposure Level
SEL_{CUM}	Cumulative Sound Exposure Level
SPL	Sound Pressure Level
SPUE	Species per Unit Effort
STL	Submerged Turret Loading
Tetra Tech	Tetra Tech, Inc.
TSS	Traffic Separation Scheme
TTS	Temporary Threshold Shift
USCG	U.S. Coast Guard
VGP	Vessel General Permit
WHOI	Woods Hole Oceanographic Institution
WWF	World Wildlife Fund
ZOI	Zone of Influence
μPA	micro-Pascal

1.0 DESCRIPTION OF THE ACTIVITY

1.1 Introduction

On May 7, 2007, the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NOAA Fisheries) issued to Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway®) and Algonquin Gas Transmission, L.L.C. (Algonquin) an Incidental Harassment Authorization (IHA) pursuant to Section 101(a)(5) of the Marine Mammal Protection Act (MMPA) and 50 Code of Federal Regulations (CFR) § 216 Subpart I to allow for the incidental harassment of small numbers of marine mammals resulting from the construction and operation of the Northeast Gateway Deepwater Port (NEG Port or Port) and the Algonquin Pipeline Lateral (Pipeline Lateral). The regulations set forth in Section 101(a)(5) of the MMPA and 50 CFR § 216 Subpart I allows for the incidental taking of marine mammals by a specific activity if the activity is found to have a negligible impact on the species or stock(s) of marine mammals and will not result in immitigable adverse impact on the availability of the marine mammal species or stock(s) for certain subsistence uses. Per this regulation, Level B take for incidental harassment was granted to Northeast Gateway and Algonquin for the North Atlantic right whale (*Eubalaena glacialis*), humpback whale (*Megaptera novaeangliae*), fin whale (*Balaenoptera physalus*), minke whale (*Balaenoptera acutorostrata*), pilot whale (*Globicephala* spp.), Atlantic white-sided dolphin (*Lagenorhynchus acutus*), common dolphin (*Delphinus delphis*), harbor porpoise (*Phocoena phocoena*), harbor seal (*Phocac vitulina*), and gray seal (*Halichoerus grypus*). This authorization was amended on November 30, 2007 and has been subsequently renewed on May 15, 2008, August 28, 2009, August 27, 2010 and October 6, 2011. Monitoring data indicates that there has not been any takes by harassment since the port started to operate in 2007, and only a single take by incidental harassment of either a seal or dolphin (species was not identifiable) was reported on February 5, 2009 by the EBRV Explorer while thrusters were engaged.

In support of continued Port operations, on January 18, 2013 Northeast Gateway petitioned NOAA Fisheries for the renewal of its October 6, 2011 IHA. Unlike the previous IHAs, which only covered incidental harassment during standard operations of the deepwater port, the 2013 IHA application from NEG requests take coverage during standard operations as well as during planned and unplanned maintenance and repair. This revised application modifies the January 2013 application to account for the five-year requirement for monitoring marine mammal activity using marine autonomous recording units (MARUs) expiring, and the removal of the array by Neptune LNG Deepwater Port, which had operational control of the array during that time. NOAA Fisheries requested that NEG Port re-submit a revised IHA renewal application for the 2014-2015 operational year with a revised marine mammal monitoring program to mitigate potential impacts to marine mammals. Section 13 contains the description of the monitoring program in lieu of the MARUs and the proposed conditions triggering reinstallation of the MARUs. In addition, ,new acoustic modeling techniques, as well as new operational acoustic data, have been applied to revised the projected take numbers. As described more fully in Section 6.2, the changes in estimated takes from the 2013 application are minimal and consistent with the prior IHA application submittal.

Per the recommendation of the NOAA Fisheries, Northeast Gateway and Algonquin have prepared this request for the taking by harassment, of small numbers of marine mammals in Massachusetts Bay, to be valid for a period of one year from the date of authorization. Northeast Gateway has based this request on take calculations conducted for the NEG Port operational activities, as was provided by the October 6, 2011 IHA. NEG Port maintenance and repair activities have been calculated based on site-specific acoustic data collected during Port construction. In addition, Algonquin has calculated potential take for

maintenance and repair activities for the Pipeline Lateral based on the same site-specific acoustic data. The following sections further describe the NEG Port and Algonquin Pipeline Lateral and the operational and repair/maintenance activities that could result in the potential take, by Level B harassment, of marine mammals under the MMPA. This is consistent with the direction of NOAA Fisheries provided on February 23, 2011 via personal communication with Shane Guan.

On June 13, 2005, Northeast Gateway submitted an application to the U.S. Coast Guard (USCG) and the Maritime Administration (MARAD) seeking a federal license under the Deepwater Port Act to own, construct, and operate a deepwater port for the import and regasification of LNG in Massachusetts Bay, off the coast of Massachusetts. The Northeast Gateway application was assigned Docket Number USCG-2005-22219. Simultaneous with this filing, Algonquin, now a subsidiary of Spectra Energy Corp, filed a Natural Gas Act Section 7(c) application with the Federal Energy Regulatory Commission (FERC) for a Certificate of Public Convenience and Necessity (Certificate) for the Pipeline Lateral that would connect the NEG Port with the existing HubLine natural gas pipeline for transmission throughout New England (FERC Docket Number CP05-383-000).

The USCG, in coordination with the FERC, published a Final Environmental Impact Statement/Environmental Impact Report (final EIS/EIR) for the proposed NEG Port and Algonquin Pipeline Lateral on October 27, 2006. This document provides detailed information on the NEG Port and Pipeline Lateral, operations methods, and analysis of potential impacts on marine mammals as well as other environmental resources. On May 14, 2007, MARAD issued a license to Northeast Gateway to own, construct, and operate a deepwater port. The FERC issued its Certificate to Algonquin on March 16, 2007. Construction of the NEG Port and Algonquin Pipeline Lateral was completed in December 2007, and the Port was commissioned for operation by the USCG in February 2008.

In 2006 and 2007 the EIS/EIR analysis was performed based on the best available information and anticipated operating parameters of the new technologies associated with the Port. However, actual experience operating these new technologies at the Port to date has revealed conditions and requirements that were not fully anticipated at the time of the NEPA analysis and permitting, namely safety, security, maintenance, repair and commissioning activities at the Port, standard operating requirements of EBRVs, as well as downstream pipeline and regional demand conditions.

Per Annex A, Conditions 2 and 11, Northeast Gateway notified the USCG on November 15, 2009, that it would prepare an Environmental Impact Assessment (EIA) to analyze the potential environmental consequences of its proposed change in operations of the Port in advance of submitting a formal request for a modification to the conditions of its various authorizations, approvals, and permits. The USCG issued the EIA on December 10, 2012. The EIA provided a comprehensive environmental analysis of the operational changes and resulting emissions and water use at the Port from what was studied in the final EIS/EIR. Potential impacts on marine mammals were further detailed in the NEG Port EIA, including maintenance and repair activities.

1.2 Northeast Gateway Deepwater Port and Algonquin Pipeline Lateral

The NEG Port is located in Massachusetts Bay and consists of a submerged buoy system to dock specially designed liquid natural gas (LNG) carriers approximately 13 miles (21 kilometers) offshore of Massachusetts in federal waters approximately 270 to 290 feet (82 to 88 meters) in depth. This facility delivers regasified LNG to onshore markets via the Algonquin Pipeline Lateral. The Pipeline Lateral

consists of a 16.1-mile (25.8-kilometer) long, 24-inch (61-centimeter) outside diameter natural gas pipeline which interconnects the Port to an offshore natural gas pipeline known as the HubLine[1].

The NEG Port consists of two subsea Submerged Turret Loading™ (STL[2]) buoys, each with a flexible riser assembly and a manifold connecting the riser assembly, via an 18-inch diameter subsea Flowline, to the Pipeline Lateral. Northeast Gateway utilizes vessels from its current fleet of specially designed Energy Bridge™ Regasification Vessels (EBRVs®[3]), each capable of transporting approximately 2.9 billion cubic feet (82 million cubic meters) of natural gas condensed to 4.9 million cubic feet (138,000 cubic meters) of LNG. Northeast Gateway has recently added two vessels to its fleet that have a cargo capacity of approximately 151,000 cubic meters of LNG. The mooring system installed at the NEG Port is designed to handle each class of vessel. The EBRVs will dock to the STL buoys, which will serve as both the single-point mooring system for the vessels and the delivery conduit for natural gas. Each of the STL buoys is secured to the seafloor using a series of suction anchors and a combination of chain/cable anchor lines.

1.3 NEG Port and Algonquin Pipeline Lateral Operation and Maintenance Activities

The following sections detail the operation and maintenance (O&M) activities at the NEG Port, including maintenance and repair activities which were not expressly included in prior IHA applications.

1.3.1 NEG Port

This section describes the operation and maintenance (O&M) activities that are required for the NEG Port. NEG Port O&M activities will be completed in accordance with the Classification Society Rules (American Bureau of Shipping). NEG Port Flowlines' O&M activities will be performed in accordance with U.S. Department of Transportation (DOT) regulations (49 CFR Part 192).

1.3.1.1 NEG Port Operations

During NEG Port operations, EBRVs servicing the NEG Port shall utilize the International Maritime Organization (IMO)-approved Boston Traffic Separation Scheme (TSS) on their approach to and departure from the NEG Port at the earliest practicable point of transit. EBRVs shall maintain speeds of 12 knots or less while in the TSS unless transiting the Off Race Point Seasonal Management Area between the dates of March 1 and April 30, the Great South Channel Seasonal Management Area between the dates of April 1 and July 31, or when there have been active right whale sightings[4], active acoustic[5] detections, or both, in the vicinity of the transiting EBRV in the TSS or at the NEG Port whereby the vessels must slow their speeds to 10 knots or less. Appendix A contains the revised Marine Mammal

[1] HubLine is an existing 30-inch-diameter interstate natural gas pipeline that was constructed by Algonquin in 2002/2003. HubLine starts at its connection with the Maritimes & Northeast Pipeline, L.L.C. Phase III Pipeline in Salem Harbor, Massachusetts and runs offshore to the south to the Algonquin "I" System Pipeline in Weymouth, Massachusetts.

[2] STL is a trademark of Advanced Production & Loading AS.

[3] EBRV is a trademark of Northeast Gateway, L.P.

[4] Active right whale sightings are all right whale sightings broadcast by the Mandatory Ship Reporting or Sighting Advisory System.

[5] Active acoustic detections are confirmed right whale vocalizations detected by a TSS auto-detection buoy (AB) within 24 hours of each scheduled data review period (e.g., every 30 minutes or every 12 hours, as detailed in subsequent text). Multiple confirmed acoustic detections at a single AB will extend the duration of minimum mandated LNGRV response to 24 hours from the last confirmed detection (within the reception area of the detecting AB). Confirmed acoustic detections at multiple ABs within the same 24-hour period will extend the area of minimum mandated LNGRV response to encompass the reception areas of all detecting ABs.

Detection, Monitoring, and Response Plan for Operation of the Northeast Gateway Energy Bridge Deepwater Port and Algonquin Pipeline Lateral, which describes in detail the NOAA-approved measures required for EBRVs transiting in the TSS or within the NEG Port area.

As an EBRV makes its final approach to the NEG Port, vessel speed will gradually be reduced to 3 knots at 1.86 miles (2.99 kilometers) out to less than 1 knot at a distance of 1,640 feet (500 meters) from the NEG Port. When an EBRV arrives at the NEG Port, it will retrieve one of the two permanently anchored submerged STL buoys. It will make final connection to the buoy through a series of engine and bow thruster actions. The EBRV will require the use of thrusters for dynamic positioning during docking procedure. Typically, the docking procedure is completed over a 10- to 30-minute period, with the thrusters activated as necessary for short periods (bursts in seconds), not a continuous sound source. Once connected to the buoy, the EBRV will make ready to begin vaporizing the LNG into its natural gas state using the onboard regasification system. As the LNG is regasified, natural gas will be transferred at pipeline pressures off the EBRV through the STL buoy and flexible riser via a steel flowline leading to the connecting Algonquin Pipeline Lateral. When the LNG vessel is on the buoy, wind and current effects on the vessel will be allowed to "weathervane" on the single-point mooring system; therefore, thrusters will not be used to maintain a stationary position.

It is estimated that at maximum operational levels, the NEG Port could receive approximately 65 cargo deliveries per year. During this time period thrusters will be engaged in use for docking at the NEG Port approximately 10 to 30 minutes for each vessel arrival and departure. However, 65 cargo deliveries per year represents the maximum capacity of the Port. While it is Northeast Gateway's objective is to utilize the Port to the maximum extent permitted, market demand fluctuations determine actual deliveries at the Port on an annual basis.

1.3.1.2 NEG Port Maintenance and Repair

The specified design life of the NEG Port is about 40 years, with the exception of the anchors, mooring chain/rope, and riser/umbilical assemblies, which are based on a maintenance-free design life of 20 years. The buoy pick-up system components are considered consumable and are inspected following each buoy connection, and replaced (from inside the STL compartment during the normal cargo discharge period) as deemed necessary. The underwater components of the NEG Port are inspected once yearly in accordance with Classification Society Rules (American Bureau of Shipping) using either divers or remotely operated vehicles (ROV) to inspect and record the condition of the various STL system components. These activities are conducted using the NEG Port's normal support vessel (125-foot [38 meter], 99 gross ton, 2,700 horsepower, aluminum mono-hull vessel), and to the extent possible coincide with planned weekly visits to the NEG Port. Helicopters will not be used for marker line maintenance inspections.

In addition to these routine activities, there may be instances whereby unanticipated events at the NEG Port necessitate emergency maintenance and/or repair activities. While the extent and number of such maintenance and repair activities at the NEG Port over its expected 25 year life cannot be accurately estimated, it is reasonable to assume that a worst-case maintenance and/or repair scenario would result in similar types of activities and require the use of similar support vessels and equipment as used for construction. There may also be certain unanticipated circumstances that require the presence of an EBRV at the NEG Port to support these maintenance and repair activities (e.g., maintenance and repair on the STL Buoy, vessel commissioning, and any onboard equipment malfunction or failure occurring while a vessel is present for cargo delivery). Potential noise effects would be associated with underwater acoustic harassment of marine mammals and sea turtles from the use of thrusters during mooring and unmooring as described for NEG Port operations. Mitigation and monitoring strategies are already in

place to mitigate for such effects when EBRVs are transiting within the designated TSS, transiting to the Broad Sound Anchorage area, maneuvering within the Port's Area to be Avoided, transiting between Port Buoys, and/or while actively engaging in the use of thrusters. Therefore, acoustic impacts associated with unanticipated EBRV-supported maintenance and/or repair activities at the Port under the Proposed Action would be the same as those described for NEG Port operations. Additionally, as published in the Federal Register (Vol. 76, No. 113), the NOAA Fisheries determined that the evaluation of a 14-day maintenance period was appropriate for evaluating the potential take associated with a maintenance and repair at the Neptune Port Facility. Due to the fact that both the NEG and Neptune Ports are very similar in their potential need and type of maintenance and repair of port facilities, we have applied the same average duration of 14 days to complete NEG Port maintenance and repair activities.

1.3.2 Algonquin Pipeline Lateral O&M Activities

This section describes the O&M activities that are required for the Algonquin Pipeline Lateral. The Algonquin Pipeline Lateral O&M activities will be performed in accordance with U.S. DOT regulations (49 CFR Part 192). The O&M activities associated with the Algonquin Pipeline Lateral can be subdivided into two categories, Routine O&M Activities and Unplanned Repair Work. Routine operation of the Algonquin Pipeline Lateral will not result in the potential take, by Level B harassment, of marine mammals under the MMPA. While the 0.7 and 0.51-mile (1.13 and 0.82- kilometer) Flowlines are part of the NEG Port, because of their similar functions and requirements, for the purposes of this application and subsequent authorization, they will be considered as part of the Algonquin Pipeline Lateral activities.

1.3.2.1 Routine O&M Activities

The planned activities required for the O&M of the Algonquin Pipeline Lateral and Flowlines over a 1-year period are limited. Similar to the inspection of the NEG Port underwater components, the only planned O&M activity is the annual inspection of the cathodic protection monitors by a ROV. The monitors are located at the ends of the Algonquin Pipeline Lateral and the adjacent Flowlines. Each inspection activity will take approximately 3 days and will utilize a ROV launched from a vessel of opportunity. The most likely vessel will be similar to the NEG Port's normal support vessel referenced in section 1.3.1.2. This vessel is self-positioning and requires no anchors or use of thrusters. No forms of take by the operation of this vessel are likely or anticipated. The requested take authorization would apply to Algonquin Pipeline Lateral activities described regardless of the individual actor (e.g., vessel owner, operator, contractor, etc.) provided that the conditions of the take authorization are met. The vessel will mobilize from Salem, Massachusetts and will inspect the monitors in the vicinity of the NEG Port and at the point where the Algonquin Pipeline Lateral interconnects with Algonquin's HubLine. These activities will be performed during daylight hours and during periods of good weather.

1.3.2.2 Unplanned Pipeline Repair Activities

Unplanned O&M activities may be required from time to time at a location along the Algonquin Pipeline Lateral or along one of the Flowlines should the line become damaged or malfunction. Repair activities requiring limited excavation to access the pipeline or cathodic protection maintenance are authorized by the FERC certificate.

Should repair work be required, it is likely a dive vessel would be the main vessel used to support the repair work. The type of diving spread and the corresponding vessel needed to support the spread would be dictated by the type of repair work required and the water depth at the work location. In addition, the type of vessel used may vary depending upon availability. The duration of an unplanned activity would also vary depending upon the repair work involved (e.g., repairing or replacing a section of the pipeline,

connection, or valve) but can generally be assumed to take less than 40 work days to complete based on industry experience with underwater pipeline repairs.

A diving spread required to execute an unplanned activity might necessitate several vessels. Most likely the dive vessel would support a saturation diving spread and be moored at the work location using four anchors. This vessel would transit to and from the location in accordance with the conditions stated in the Marine Mammal Detection, Monitoring, and Response Plan (MMDMRP) for Operation, Maintenance and Repair of the Northeast Gateway Energy Bridge Deepwater Port and Algonquin Pipeline Lateral (see Appendix A) and would likely be accompanied by an attendant tug to assist with anchor placement. Once secured at the work location, the dive vessel would remain on site through the completion of the work, weather permitting. A crew/supply boat would be utilized to intermittently provide labor and supply transfers. Once or twice during the work, a tug may be required to bring a material barge to and from the location. While unlikely, there is a small possibility that a second dive vessel would be required to support the main dive vessel, depending upon the work activity. The second dive vessel would be on-site for a shorter work duration. As discussed in more detail in section 13.0 and in Appendix A, the crews would be provided with project-specific training on the requirements for monitoring and reacting to the sighting of marine mammals and/or sea turtles. These vessels would be supported from an onshore base located between Quincy, Massachusetts and Gloucester, Massachusetts.

The selection of a dive vessel will be driven by the technical requirements of the work. In addition, the degree of urgency required to address the work and the availability of vessels will also enter into the decision process for securing a dive vessel. It may be that a four-point moored dive vessel is either not available or doesn't meet the technical capabilities required by the work. It then becomes possible that a dynamically positioned (DP) dive vessel may have to be utilized. The use of a DP dive vessel removes the need for an attendant tug to support the vessel since no anchors will be deployed. However, potential impacts related to noise are increased when a DP dive vessel is used. The noise generated by a DP dive vessel varies, and results from the use of the thrusters which run at various levels to maintain the vessel's position during the work depending upon currents, winds, waves and other forces acting on the vessel at the time of the work.

1.4 NEG Port and Algonquin Pipeline Lateral Activities Resulting in the Potential Incidental Taking of Marine Mammals

1.4.1 Hydroacoustic Analysis

This hydroacoustic analysis presented is an extension of the acoustic modeling work conducted for Excelerate in 2008 and 2009. The current analysis uses the same overall approach, however the acoustic propagation model methodology and source level definitions for the vessels and operations of the original report have been updated using best available information, and regulatory thresholds revised to include new exposure criteria and a cumulative acoustic exposure metric. The updated acoustic propagation model algorithms account for the variation of the bathymetry, geoacoustic properties of the sea bottom, and seasonal variations of the sound speed profile in the water column. The February sound speed profile was applied as it is representative of the worst case seasonal propagation bound (longest propagation distance) to determine the acoustic footprint during the winter heating season.

1.4.2 Regulatory Criteria

Under the 1994 Amendments to the MMPA, Level A harassment is statutorily defined as any act of pursuit, torment or annoyance that has the potential to injure a marine mammal or marine mammal stock in the wild. The NOAA Fisheries defines the zone of injury as the range of received levels from

180 linear decibels (dBL) referenced to 1 microPascal (μPa) root mean square (RMS) (180 dBL re 1μPa), for marine mammals. The MMPA defines Level B harassment as any act of pursuit, torment or annoyance that has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering. NOAA Fisheries defines Level B harassment are 160 dB re 1μPa from an impulsive noise source averaged over the duration of the signal, and 120 dB re 1μPa from a continuous noise source or an intermittent non-pulsed source. Table 1-1 summarizes the NOAA Fisheries cause and effect threshold criteria levels.

Table 1-1. Summary of NOAA Fisheries Cause and Effect Noise Criteria

Criterion	Type	Threshold
Level A Harassment	Absolute	180 dB_{rms}
Level B Harassment	Impulse	160$dB_{rms\ 90\%}$
Level B Harassment	Continuous	120dB_{rms}

Reference: Federal Register: January 11, 2005 (Volume 70, Number 7)

The NOAA Fisheries acoustic criteria were purposely developed to be protective of all marine species from high sound pressure levels. However, the sound pressure levels are calculated from unweighted acoustic signals, so they do not account for the different hearing abilities of animals at different frequencies. Also, the NOAA Fisheries (2005) states that such criteria have the disadvantage of not accounting for important attributes of exposure such as duration, sound frequency, or rate of repetition.

To address the stated limitations of the NOAA Marine Mammal Guidelines, the Noise Criteria Group (NCG) was established by support of NOAA Fisheries in 2005 to summarize research on marine mammal hearing with respect to their behavioral and physiological responses to anthropogenic noise. The group's findings were published in 2007 (Southall et al. 2007). It was determined that high exposure levels from underwater sound sources can cause hearing impairment. This can take the form of a temporary loss in hearing sensitivity, known as a Temporary Threshold Shift (TTS), or a permanent loss of hearing sensitivity known as a Permanent Threshold Shift (PTS). For transient and continuous sounds, it was concluded that the potential for injury is not just related to the level of the underwater sound and the hearing bandwidth of the animal, but is also influenced by the duration of exposure.

In December of 2013, NOAA Fisheries released the Draft Guidance for Assessing the Effect of Anthropogenic Sound on Marine Mammals which predominantly incorporated many of the key findings of the NCG. The proposed threshold criteria were established based on both zero-to-peak (peak) sound pressure levels (SPLs) of acoustic waves, and total (i.e., cumulative) sound exposure level (SEL). If an animal is exposed to sound that exceeds either the peak SPL or cumulative SEL (SEL_{cum}) criterion, the assumption is that the received sound exposure causes injury. To evaluate cumulative sound exposure, sound modeling may either be evaluated throughout the event duration and account for the fleeing movement of the marine animals, or as one-hour impact on stationary receivers. For the purposes of this report, the one-hour calculation approach was taken, while ignoring the mobility of the source and receivers which would tend to overstate impacts.

Frequency weighting provides a sound level referenced to an animal's hearing ability either for individual species or classes of species, and therefore a measure of the potential of the sound to cause an effect. The measure that is obtained represents the perceived level of the sound for that animal. In the Draft Guidance document, in addition to the four function marine mammal hearing groups identified by the NCG, NOAA Fisheries added a separate category for phocid pinnipeds which are distinguished from otariid pinnipeds,

leading to a total of five hearing groups. Table 1-2 presents the interim proposed PTS and TTS criteria for marine mammals as proposed by NOAA Fisheries (2013).

Table 1-2. Interim PTS and TTS Criteria and Functional Hearing Range for Maine Mammals

Functional Hearing Group	PTS Onset Impulsive	PTS Onset Non-Impulsive	TTS Onset Impulsive	TTS Onset Non-Impulsive	Functional Hearing Range
Low-frequency (LF) cetaceans	187 dB SEL_{cum}	198 dB SEL_{cum}	172 dB SEL_{cum}	178 dB SEL_{cum}	7 Hz to 30 kHz
Mid-frequency (MF) cetaceans (dolphins, toothed whales, beaked whales, bottlenose whales)	187 dB SEL_{cum}	198 dB SEL_{cum}	172 dB SEL_{cum}	178 dB SEL_{cum}	150 Hz to 160 kHz
High-frequency (HF) cetaceans (true porpoises, Kogia, river dolphins, cephalorhynchid, Lagenorhynchus cruciger and L. australis)	161 dB SEL_{cum}	180 dB SEL_{cum}	146 dB SEL_{cum}	160 dB SEL_{cum}	200 Hz to 180 kHz
Phocid pinnipeds (true seals)	192 dB SEL_{cum}	197 dB SEL_{cum}	177 dB SEL_{cum}	183 dB SEL_{cum}	75 Hz to 100 kHz
Otariid pinnipeds (sea lions and fur seals)	215 dB SEL_{cum}	220 dB SEL_{cum}	200 dB SEL_{cum}	206 dB SEL_{cum}	100 Hz to 40 kHz

Reference: National Oceanic and Atmospheric Administration and U.S. Department of Commerce. 2013. Draft Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammals: Acoustic Threshold Levels for Onset of Permanent and Temporary Threshold Shifts. In: National Oceanic and Atmospheric Administration, U.S.D.o.C. (ed.).

The hearing capabilities of sea turtle are poorly known and there is little information available on the effects of noise on sea turtles. Some studies have demonstrated that sea turtles have fairly limited capacity to detect sound, although all results are based on a limited number of individuals and must be interpreted cautiously. Limited research has shown that upper limit of the hearing range of sea turtles is generally in range 1,000 to 1,200 Hertz (Tech Environmental 2006 and Martin et al 2012). BOEM states the hearing sensitivity of most sea turtles appears to be best at frequencies between about 200 Hz and 700 Hz (BOEM 2013).

McCauley et al. (2000) serves as the best available information on the levels of underwater noise that may produce a startle, avoidance, and/or other behavioral or physiological response in sea turtles. McCauley noted that decibel levels of 166 dB RMS re 1µPa were required before any behavioral reaction (e.g., increased swimming speed) was observed, and decibel levels above 175 dB RMS re 1µPa elicited avoidance behavior of sea turtles. This study used impulsive sources of noise (e.g., air gun arrays) to ascertain the underwater noise levels that produce behavioral modifications in sea turtles.

Based on this and the best available information (BOEM, 2012), NOAA Fisheries believes any sea turtles exposed to underwater noise greater than 166 dB RMS re 1µPa may experience behavioral disturbance/modification (e.g., movements away from insonified area) . A threshold of 207 dB RMS re 1 1µPa is believed to cause hearing injury in Sea Turtle. Since that threshold is above all known source levels for the project, it is not evaluated. Table 1-3 summarizes the present NOAA Fisheries interim guidelines on underwater noise level which have the potential to cause injury or behavioral modification of sea turtles.

Table 1-3. Summary Interim NOAA Fisheries Criteria for Sea Turtles

Functional Hearing Group	Interim Criteria for Injury	Interim Criteria for Behavioral Modification	Functional Hearing Range
Sea turtles	207 dB re 1 μPa RMS	166 dB re 1 μPa RMS	Up to 1.2 kHz (est.)

1.4.3 Field Surveys

Northeast Gateway contracted with Tetra Tech, Inc. (Tetra Tech) to perform field investigations to document underwater noise levels emitted during the construction of the NEG Port and Algonquin Pipeline Lateral and during the operation of NEG Port facilities (namely the operation of EBRVs). Tetra Tech conducted five offshore hydroacoustic field programs: one in 2005 and one in 2006 at the Gulf Gateway Deepwater Port located approximately 116 miles off the coast of Louisiana in the Gulf of Mexico; and three in 2007 at the NEG Port and Algonquin Pipeline Lateral (or Project) area (see Table 1-4). The 2005 measurements were completed to determine underwater noise levels during EBRV onboard regasification and vessel movements. The data from the 2005 field program was used to support the modeling and analysis of potential acoustic affects of EBRV operations in Massachusetts Bay during the NEG Port permitting and licensing process. The data collected in 2006 was also associated with EBRV operation activities and were collected for the purpose of verifying the measurement completed in 2005 as well as to further document sound levels during additional operational and EBRV activities such as EBRV coupling and decoupling from the buoy system, transit and the use of stern and bow thrusters required for dynamic positioning. The 2007 measurements were collected during NEG Port and Algonquin Pipeline Lateral construction to obtain site-specific underwater sound-level data associated with various construction activities that were previously modeled in support of permitting and licensing.

Table 1-4. Chronological Timeline

03/20-24/05	Gulf of Mexico Deployment	Operation
08/03-04/06	Gulf of Mexico Deployment	Operation
06/27/07	Massachusetts Bay Deployment 1	Construction – Pipe lay
08/01/07	Massachusetts Bay Deployment 2	Construction - Plowing
08/27/07	Massachusetts Bay Deployment 3	Construction - Backfilling

A detailed report describing both the 2006 and 2007 operation and construction noise measurement events and associated results have been included as Appendix B. For the purposes of understanding the noise source characteristics of operations at the NEG Port, measurements taken to capture operational noise (docking, undocking, regasification, and EBRV thruster use) during the 2006 Gulf of Mexico field event were undertaken. Measurements taken during EBRV transit were normalized to a distance of 328 feet (100 meters) to serve as a basis for modeling sound propagation at the NEG Port site in Massachusetts Bay.

In addition, the 2008 operational noise events which were captured on the MARU are described in the Cornell Bioacoustics Reports and provide a good indication received sound levels during and operational and construction event. These data were referred to for further model validation purposes. Activities that could result in the incidental take of marine mammals are limited to the generation by vessels of underwater noise that has the potential to cause Level B harassment as defined by the MMPA. The

following sections describe those activities that could result in Level B harassment as they relate to NEG Port and Algonquin O&M activities.

1.4.4 Hydroacoustic Modeling

The updated acoustic modeling was completed with the widely-used Range Dependent Acoustic Model (RAM) which is based on the U.S. Navy's Standard Split-Step Fourier Parabolic Equation. This modeling analysis method considers range and depth along with a geo-referenced dataset to automatically retrieve the time of year information, bathymetry, and geoacoustic properties (e.g. hard rock, sand, mud) along propagation transects radiating from the sound source. Transects are run along compass points (every 5° from 0 to 360°) to determine received sound levels at a given location. These values are then summed across frequencies to provide broadband received levels at the MMPA Level A and B harassment criteria as described in Tables 1-1 and 1-2.

1.4.4.1 NEG Port Operations

The representative area ensonified to the MMPA Level B threshold for each Project activity was used to estimate take. Sound propagation calculations for operational activities were then completed at two positions in Massachusetts Bay to determine site-specific distances to the 120/160/180 dB isopleths:

- Operations Position 1 - Port (EBRV Operations): 70° 36.261' W and 42° 23.790' N
- Operations Position 2 – Boston TSS (EBRV Transit): 70° 17.621' W and 42° 17.539' N

At each of these locations sound propagation calculations were performed to determine the noise footprint of the operation activity at each of the specified locations. Appendix C provides figures that graphically describe the areas of insonification for each scenario and a description of the acoustic modeling methodologies. Table 1-5 provides a summary of the resultant underwater sound pressure levels and distance to the 120/160 dB isopleths by activity type and identified position. As identified in Table 1-5, none of the modeled activities were found to reach the 160 dB isopleths at any appreciable distance from the sources evaluated and the use of EBRV onboard equipment during regasification will only result in slightly elevated low level noise above ambient, but only for relatively short distances. It is important to note, that the results presented in Table 1-5, do not include existing acoustic underwater ambient conditions which may effectively mask project sounds at sufficient distances. To further understand how NEG Port activities may result in underwater noise that could harass marine mammals, Northeast Gateway has engaged representatives from Cornell University's Bioacoustics Research Program (BRP) and the Woods Hole Oceanographic Institution (WHOI) as the consultants for collecting and analyzing the acoustic data throughout the project area (see sections 13.0 and 14.0). Sound levels recorded by MARUs within frequency bands for marine mammals have been reported to include whales, other biotic and abiotic sound sources and ambient noise occurring at the time (BRP 2011).

Table 1-5. Resultant underwater sound pressure levels and distance to threshold levels during NEG Port Operation

	Estimated Distance (meters) from source at which Sound Pressure Level falls below 160 dBL	Estimated Distance (meters) from source at which Sound Pressure Level falls below 120 dBL
Typical EBRV docking procedure with support vessel Position 1: Port	< 10	3,500 to 5,400
Typical EBRV docking procedure with support vessels (2 - EBRVs on station co-colocated) Position 1: Port	<12	6,300 to 10,600
EBRV Regasification Position 1: Port	n/a	<300
EBRV transiting the TSS 10 knot	<0.1	1,600 to 1,700

The resulting distances to the 120/160 dB isopleths have been projected to determine the maximum distance at which Level B harassment may potentiall occur. Impulsive pressure levels produced by thrusters during maneuvering to and from the Port drop quickly below the 160 dB isopleth. Distances to the 120 dB isopleth extend from 3,500 to 10,600 meters depending on direction and the number of EBRVs present. Current mitigation and monitoring requirements to avoid and/or minimize harassment of marine mammals and sea turtles, as required by the NEG Port's MARAD/USCG License and NOAA Fisheries Biological Opinion (BO), and as assumed in previous IHAs and described in section 11.0, presently exceed the modeled distances.

1.4.4.2 NEG Port Maintenance and Repair

As stated in section 1.3.1.2, routine inspections of NEG Port mooring components occur after each buoy connection from the Port's normal support vessel. Inspections of other Port facility components such as the STL Buoy, flexible riser, mooring system, pipeline end manifold (PLEM) are conducted annually by a ROV and/or diver launched from a vessel of opportunity.

In addition to these routine activities, there may be instances whereby unanticipated events at the NEG Port necessitate emergency maintenance and/or repair activities. While the extent and number of such maintenance and repair activities at the NEG Port over its expected 25 year life cannot be accurately estimated, it is reasonable to assume that a worst-case maintenance and/or repair scenario would result in similar types of activities and require the use of similar support vessels and equipment as used for construction.

Modeling analysis conducted in support of the final EIS/EIR concluded that the only underwater noise of critical concern during NEG Port construction would be from vessel noises such as turning screws, engine noise, noise of operating machinery, and thruster use. To confirm these modeled results and better understand the noise footprint associated with construction activities at the NEG Port, field measurements were taken of various construction activities during the 2007 NEG Port and Algonquin Pipeline Lateral Construction period (see Table 1-4). Measurements were taken and normalized as described in section 1.4.1.1 to establish the "loudest" potential construction measurement event. One position within Massachusetts Bay was then used to determine site-specific distances to the 120/160/180 dB isopleths for NEG Port maintenance and repair activities:

- Maintenance and Repair Position 1. Port: 70° 36.261' W 42° 23.789' N

As described for NEG Port operations, sound propagation calculations were performed to determine the noise footprint during future maintenance and repair activity. The calculations took into consideration aspects of water depth, sea state, bathymetry, and seabed composition, and specifically evaluated sound energy in the range that encompasses the auditory frequencies of marine mammals and at which sound propagates beyond the immediate vicinity of the source. These results were then summed across frequencies to provide the broadband received levels at receptor locations. Table 1-6 provides a summary of the resultant underwater sound pressure levels and distance to the 120/160 dB isopleths for NEG Port maintenance and repair. As identified in Table 1-6, modeled activities for barge and tug were found to not reach the 160 dB isopleths at any appreciable distance from the sources evaluated. As with NEG Port operations, it is important to note that the results presented in Table 1-6, do not include existing acoustic underwater ambient conditions which may effectively mask project sounds at sufficient distances. Elevated underwater sound levels within Massachusetts Bay due to this existing vessel traffic and other Bay activities may effectively mask sound generated during Port maintenance and repair activities. Sound levels recorded by MARUs within frequency bands for marine mammals have been reported to include whales, other biotic and abiotic sound sources and ambient noise that could be occurring at the time (BRP 2011).

Table 1-6. Resultant underwater sound pressure levels and distance to threshold levels during NEG Port Maintenance and Repair

	Estimated Distance (meters) from source at which Sound Pressure Level falls below 160 dBL	Estimated Distance (meters) from source at which Sound Pressure Level falls below 120 dBL
NEG Port: Maintenance and Repair		
Major Construction Event - Tug / Barge Position 1: Port	<20	8,300 to 24,900
Minor Construction Event – Dive Support Vessel Position 1: Port	<5	2,400 to 3,400

The resulting distances to the 120/160 dB isopleths have been conservatively estimated to determine the maximum distance at which Level B harassment may occur. While the latest modeling data shows an increase in distance out to the 120 dB isopleth, current mitigation and monitoring requirements to avoid and/or minimize harassment of marine mammals and sea turtles, as required by the NEG Port's MARAD/USCG License and NOAA Fisheries BO, and as described in section 11, exceed the modeled distances. These requirements successfully supported construction activities and remain applicable and appropriate for any future maintenance and repair activities.

There may also be certain circumstances that require the presence of an EBRV at the NEG Port to support maintenance and repair activities (e.g., maintenance and repair on the STL Buoy, vessel commissioning, and any onboard equipment malfunction or failure occurring while a vessel is present for cargo delivery). As stated previously, the potential noise effects would only be associated with underwater acoustic harassment of marine mammals and sea turtles from the use of thrusters during mooring and unmooring. Mitigation and monitoring strategies are already in place to mitigate for such effects when EBRVs are transiting within the designated TSS, transiting to the Broad Sound Anchorage area, maneuvering within the Port's Area to be Avoided, transiting between Port Buoys, and/or while actively engaging in the use

of thrusters. Therefore, acoustic impacts associated with EBRV-supported maintenance and/or repair activities at the Port under the Proposed Action would be the same as those described for Port operations.

1.4.5 Algonquin Pipeline Lateral O&M Activities

As stated in section 1.3.2.1, routine inspections of the Algonquin Pipeline Lateral are conducted annually by a ROV launched from a vessel of opportunity. Planned O&M activity is the annual inspection of the cathodic protection monitors by a ROV. The monitors are located at the ends of the Algonquin Pipeline Lateral and the adjacent Flowlines. Each inspection activity will take approximately 3 days and will utilize a ROV launched from a vessel of opportunity. The most likely vessel will be similar to the NEG Port's normal support vessel referenced in section 1.3.1.2.

In addition to these routine activities, there may be instances whereby unanticipated events at the NEG Port and Algonquin Pipeline Lateral necessitate emergency maintenance and/or repair activities. While the extent and number of such maintenance and repair activities at the Port over its expected 25 year life cannot be accurately estimated, it is reasonable to assume that a worst-case maintenance and/or repair scenario would result in similar types of activities and require the use of similar support vessels and equipment as used for construction.

Modeling analysis conducted in support of the final EIS/EIR concluded that the only underwater noise of critical concern during NEG Port and Algonquin Pipeline Lateral construction would be from vessel noises such as turning screws, engine noise, noise of operating machinery, and thruster use. As with construction noise at the NEG Port, to confirm modeled results and better understand the noise footprint associated with construction activities along the Algonquin Pipeline Lateral, field measurements were taken of various construction activities during the 2007 NEG Port and Algonquin Pipeline Lateral Construction period (see Table 1-4). Again, as detailed in section 1.4.1.1., measurements were taken and normalized to establish the "loudest" potential construction measurement event. Two positions within Massachusetts Bay were then used to determine site-specific distances to the 120/160/180 dB isopleths:

- Maintenance and Repair Position 2. PLEM: 70° 46.755' W and 42° 28.764' N
- Maintenance and Repair Position 3. Mid-Pipeline: 70° 40.842' W and 42° 31.328' N

As described for NEG Port operations and maintenance and repair, at each location sound propagation calculations were performed to determine the noise footprint of the vessel activity at each of the specified locations. The calculations took into consideration the same aspects and evaluations as described in sections 1.4.1.1 and 1.4.1.2. Results were then summed across frequencies to provide the broadband received levels at receptor locations. Appendix C provides a summary of the propagation calculation methodologies employed and figures depicting the area of insonification. Table 1-7 provides a summary of the resultant underwater sound pressure levels and distance to the 120/160 dB isopleths by activity type and identified position. As identified in Table 1-7, none of the modeled activities were found to reach the 160 dB isopleths at any appreciable distance from the sources evaluated. As with NEG Port operations and maintenance and repair, it is important to note that the results presented in Table 1-7, do not include existing acoustic underwater ambient conditions which may effectively mask project sounds at sufficient distances. Elevated underwater sound levels within Massachusetts Bay due to this existing vessel traffic and other Bay activities may effectively mask sound generated during Port and Pipeline activities. Sound levels recorded by MARUs within frequency bands for marine mammals have been reported to include whales, other biotic and abiotic sound sources and ambient noise that could be occurring at the time (BRP 2011).

Table 1-7 Resultant underwater sound pressure levels and distance to threshold levels during Algonquin Pipeline Lateral Maintenance and Repair

	Estimated Distance (meters) from source at which Sound Pressure Level falls below 160 dBL	Estimated Distance (meters) from source at which Sound Pressure Level falls below 120 dBL
Pipeline Lateral: Construction		
Major Construction Event - Tug / Barge Position 2: PLEM	<20	3,800 to 24,700
Minor Construction Event – Dive Support Vessel Position 2: PLEM	<5	2,150 to 4,200
Major Construction Event at PLEM - Tug / Barge Position 3: MidPipeline	<20	12,400 to 25,000
Major Construction Event at PLEM - Dive Support Vessel Position 3: MidPipeline	<5	2,200 to 3,200

The resulting distances to the 120/160 dB isopleths have been conservatively estimated to determine the maximum distance at which Level B harassment may occur. Impulsive pressure levels produced by thrusters during maneuvering of construction vessels drop quickly below the 160 dB isopleth. While the latest modeling data shows an increase in distance out to the 120 dB isopleth, current mitigation and monitoring requirements to avoid and/or minimize harassment of marine mammals and sea turtles, as required by the NEG Port's MARAD/USCG License and NOAA Fisheries BO, and as described in section 11, exceed the modeled distances. These requirements successfully supported construction activities and remain applicable and appropriate for any future Algonquin Pipeline Lateral maintenance and repair activities.

In order to determine the area of impact for the 2013 NOAA draft guidelines, the SELcum and Zero-to-Peak metrics were reviewed. Given that the source levels for the operations are stated at below the absolute peak level criteria, no further evaluation is needed. To calculate the SELcum not only is the source level considered, but the duration as well. One assumption made when using the SELcum metric is the equal energy hypothesis (EEH), where it is assumed that sounds of equal SELcum produce the equal risk for hearing loss (i.e., if the SELcum of two sources are similar, a sound from a lower level source with a longer exposure duration may have similar risks to a shorter duration exposure from a higher level source). As has been shown to be the case with humans and terrestrial mammals (Henderson et al. 1991), the EEH does not always hold true within marine mammals due the inherent complexity of predicting threshold shifts (Kastak et al. 2007; Mooney et al. 2009a; Mooney et al. 2009b; Finneran et al. 11 2010a; Finneran et al. 2010b; Finneran and Schlundt 2010). Based on animal movement and avoidance, a 1-hour accumulation period was used to calculate the "SEL threshold distance". This "SEL threshold distance" is calculated by determining the distance from the source at which an animal would have to remain stationary for 1 hour in order to accumulate sound to the designated threshold. While marine life may move closer and farther from the source, which in some cases is also mobile, this distance is considered a reasonable and very conservative approximation.

It was determined that the 120 dB isopleth is more conservative than the new NOAA draft guidelines. The result of using a one hour threshold results in an effective threshold less than the given threshold with the

resultant area of insonification encompassing a smaller area than currently depicted by the 120 dB isopleth.

2.0 DATES, DURATION AND LOCATION OF NEG PORT AND ALGONQUIN PIPELINE LATERAL OPERATIONS

2.1 Operation Dates and Duration

The NEG Port completed commissioning activities on February 27, 2008, enabling the facility to receive natural gas and to begin its operations. The NEG Port is expected to receive LNG cargo deliveries for the design life of the facility of about 40 years. To date, the following port calls by EBRVs have occurred at the NEG Port:

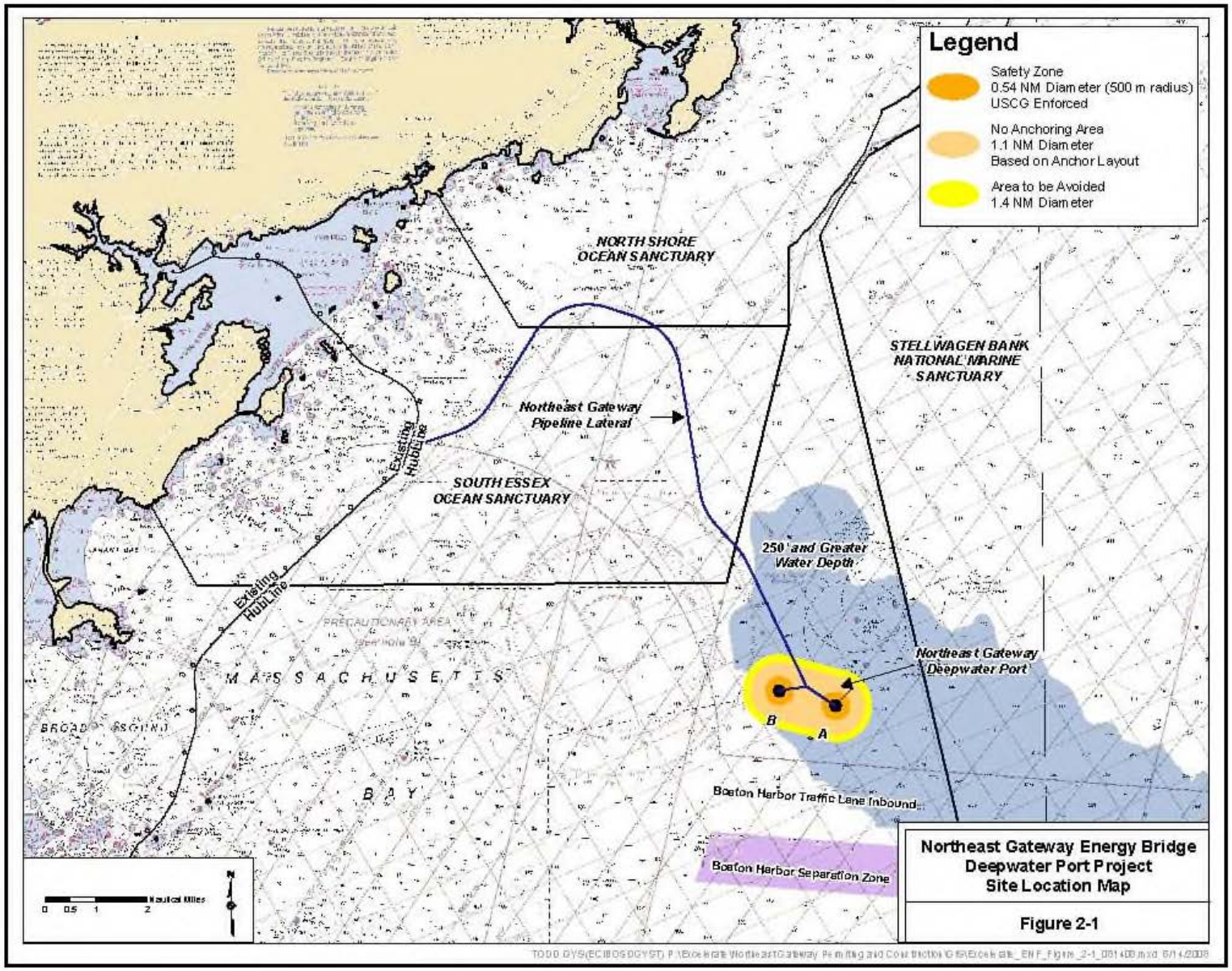
- February 2008 – EBRV Excelerate
- May 2008 – EBRV Excellence
- January 2009 – EBRV Explorer (Hydrate Blockage repair)
- November 2009 – EBRV Excellence
- December 2009 – EBRV Express
- December 2009 – EBRV Excellence
- January 2010 – EBRV Excelerate
- January 2010 – EBRV Explorer
- February 2010 – EBRV Express
- February 2010 – EBRV Excelerate
- February 2010 – EBRV Exquisite

Regional demand and pipeline constraints play an important role in Northeast Gateway's ability to deliver natural gas at the total volume and rate described in the final EIS/EIR for the Port and reflected in the MARAD Record of Decision and License. While it is Northeast Gateway's objective is to utilize the Port to the maximum extent permitted, market demand fluctuations determine actual deliveries at the Port on an annual basis. Northeast Gateway has estimated that, based on foreseeable market conditions for the 2014-2015 winter heating season, EBRVs will deliver cargo approximately four times.

2.2 Specific Geographic Region

The NEG Port is located at 42º 23' 38.46" N/70º 35' 31.02" W for Buoy A and 42º 23' 56.40 N/70º 37' 0.36" W for Buoy B in Massachusetts Bay. The Algonquin Pipeline Lateral begins near milepost (MP) 8 on the existing HubLine pipeline in waters approximately 3 miles (4.8 kilometers) to the east of Marblehead Neck in Marblehead, Massachusetts. From the HubLine connection (MP 0.0), the Algonquin Pipeline Lateral route extends northeast, crossing the outer reaches of the territorial waters of the Town of Marblehead, the City of Salem, the City of Beverly, and the Town of Manchester-by-the-Sea for approximately 6.3 miles (10.1 kilometers). At MP 6.3, the Algonquin Pipeline Lateral route curves to the east and southeast, exiting Manchester-by-the-Sea territorial waters and entering waters regulated by the Commonwealth of Massachusetts. The Algonquin Pipeline Lateral route continues to the south/southeast

for approximately 6.2 miles (10 kilometers) to MP 12.5, where it exits state waters and enters federal waters. The Algonquin Pipeline Lateral route then extends to the south for another approximately 3.5 miles (5.7 kilometers), terminating at the NEG Port. The NEG Port and Algonquin Pipeline Lateral are depicted in Figure 2-1.


Legend
Safety Zone
0.54 NM Diameter (500 m radius)
USCG Enforced
No Anchoring Area
1.1 NM Diameter
Based on Anchor Layout
Area to be Avoided
1.4 NM Diameter
NORTH SHORE OCEAN SANCTUARY
STELLWAGEN BANK NATIONAL MARINE SANCTUARY
Northeast Gateway Pipeline Lateral
Existing Hub Line
SOUTH ESSEX OCEAN SANCTUARY
250' and Greater Water Depth
Existing Hub Line
PRECAUTIONARY AREA
MASSACHUSETTS
BAY
Northeast Gateway Deepwater Port
B
A
Boston Harbor Traffic Lane Inbound
Boston Harbor Separation Zone
Nautical Miles
0 0.5 1 2
N
Northeast Gateway Energy Bridge
Deepwater Port Project
Site Location Map
Figure 2-1

3.0 MARINE MAMMAL SPECIES AND NUMBERS

Marine mammals known to traverse or occasionally visit the waters within the area of the NEG Port and Algonquin Pipeline Lateral include both threatened or endangered species protected under the Endangered Species Act (ESA), as well as those species that are not threatened or endangered. Marine mammals both protected under the MMPA as amended in 1994 and those that are listed as threatened or endangered under the Endangered Species Act are discussed in detail in sections 3.2.4 and 3.3 of the USCG final EIS/EIR and section 4.2.2.4 of the USCG EIA issued for this project. As shown in Table 3-1, 20 marine mammal species have the possible or confirmed occurrences within the marine waters of Massachusetts Bay.

Table 3-1 Marine Mammals Known to Occur in the Marine Waters of Massachusetts Bay

Common Name	Scientific Name	NOAA Fisheries Status	Time of Year in Massachusetts Bay
Toothed Whales (Odontoceti)			
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Non-strategic	Year round
Bottlenose dolphin	*Tursiops truncates*	Non-strategic	Late summer, early fall
Short-beaked common dolphin	*Delphinus delphis*	Non-strategic	Fall and winter
Harbor porpoise	*Phocoena phocoena*	Strategic	Year round (Sept-April peak)
Killer whale	*Orcinus orca*	Non-strategic	July-Sept
Long-finned pilot whale	*Globicephala malaena*	Non-strategic	Year round (Sept-April peak)
Risso's dolphin	*Grampus griseus*	Non-strategic	Spring, summer, autumn
Striped dolphin	*Stenella coeruleoalba*	Non-strategic	Year round
White-beaked dolphin	*Lagenorhynchus albirostris*	Non-strategic	April-Nov
Sperm whale	*Physeter macrocephalus*	Endangered	Pelagic
Baleen Whales (Mysticeti)			
Minke whale	*Balaenoptera acutorostrata*	Non-strategic	April-Oct
Blue whale	*Balaenoptera musculus*	Endangered	Aug-Oct
Fin whale	*Balaenoptera physalus*	Endangered	April-Oct
Humpback whale	*Megaptera novaeangliae*	Endangered	April-Oct
North Atlantic right whale	*Eubalaena glacialis*	Endangered	Jan-Jul (year round)
Sei whale	*Balaenoptera borealis*	Endangered	May-Jun
Earless Seals (Phocidae)			
Gray seals	*Halichoerus grypus*	Non-strategic	Year round
Harbor seals	*Phoca vitulina*	Non-strategic	Late Sept-early May
Hooded seals	*Cystophora cristata*	Non-strategic	Jan-May
Harp seal	*Phoca groenlandica*	Non-strategic	Jan-May

4.0 AFFECTED SPECIES STATUS AND DISTRIBUTION

The status, distribution, and seasonal distribution of affected species or stocks that may be affected by the operation of the NEG Port and Algonquin Pipeline Lateral are discussed in detail in sections 3.2.4 and 3.3 of the USCG final EIS/EIR issued for this NEG Port and Algonquin Pipeline Lateral, and in Table 3-1.

In general, Risso's dolphins, striped dolphins, sperm whales, hooded seals, and harp seals range outside the NEG Port area, usually in more pelagic waters. Additionally, the sei whale, also a more pelagic and northern species, generally ranges outside the NEG Port area. On October 6, 2011, NOAA Fisheries

issued an IHA to Northeast Gateway which authorizes the incidental harassment of species more commonly found in the shelf waters of Massachusetts Bay and that could potentially be encountered in the NEG Port area. These species include the gray seal, harbor seal, harbor porpoise, Atlantic white-sided dolphin, short-beaked common dolphin, bottlenose dolphin, long-finned pilot whale, killer whale, minke whale, North Atlantic right whale, humpback whale, and fin whale. These species, with the exception of the short-beaked common dolphin, bottlenose dolphin and killer whale, are the only ones observed during intensive right whale surveys (2001 to 2005) in nearby Cape Cod by the Provincetown Center for Coastal Studies. The short-beaked common dolphin, bottlenose dolphin and killer whale were also not observed during NEG Port and Algonquin Pipeline Lateral construction activities during the months of May through November 2007 (see Appendix D), or during operational activities in the 2008 and 2009 operational periods (see Appendix E and F). Additionally, the bottlenose dolphin and killer whale were not observed during operational activities during the 2010 through 2011 operational period (see Appendix G and H). However, given their potential for occurrence in the vicinity of the NEG Port and Algonquin Pipeline Lateral area, and the sighting of short-beaked common dolphin during the 2010 operational period (see Appendix G), Northeast Gateway and Algonquin request harassment authorization for all 13 species under this application. A general summary of each of these species is provided in the following sections.

4.1 Toothed Whales (Odontonceti)

Long-finned pilot whale (*Globicephala melas*) – Non-Strategic

The long-finned pilot whale is more generally found along the edge of the continental shelf (a depth of 330 to 3,300 feet [100 to 1,000 meters]), choosing areas of high relief or submerged banks in cold or temperate shoreline waters. This species is split between two subspecies: the Northern and Southern subspecies. The Southern subspecies is circumpolar with northern limits of Brazil and South Africa. The Northern subspecies, which could be encountered during operation of the NEG Port, ranges from North Carolina to Greenland (Reeves et al. 2002; Wilson and Ruff 1999). In the western North Atlantic, long-finned pilot whales are pelagic, occurring in especially high densities in winter and spring over the continental slope, then moving inshore and onto the shelf in summer and autumn following squid and mackerel populations (Reeves et al. 2002). They frequently travel into the central and northern Georges Bank, Great South Channel, and Gulf of Maine areas during the summer and early fall (May and October) (NOAA 1993). The best population estimate for long-finned pilot whales is 12,619 individuals (Waring et al. 2011).

They feed preferentially on squid but will eat fish (e.g., herring) and invertebrates (e.g., octopus, cuttlefish) if squid are not available. They also ingest shrimp (particularly younger whales) and various other fish species occasionally. These whales probably take most of their prey at depths of 600 to 1,650 feet (200 to 500 meters), although they can forage deeper if necessary (Reeves et al. 2002). As a very social species, long-finned pilot whales travel in pods of roughly 20 individuals while following prey. These small pods are thought to be formed around adult females and their offspring. Behaviors of long-finned pilot whales range from quiet rafting or milling on the surface, to purposeful diving, to bouts of playfulness.

The long-finned pilot whales are subject to bycatch during gillnet fishing, pelagic trawling, longline fishing, and purse seine fishing. Approximately 215 pilot whales were killed or seriously injured each year by human activities during 1997 to 2001. Strandings involving hundreds of individuals are not unusual and demonstrate that these large schools have a high degree of social cohesion (Reeves et al. 2002). The species is not listed as “strategic” by NOAA Fisheries because the 2003-2007 estimated

average annual human-related mortality does not exceed the potential biological removal for this species. However, issues with an inability to distinguish between species of long-finned and short-finned pilot whales, and the fact that abundance estimates and associated potential biological removal are not available, it is possible that mortality for both stocks of this species could exceed the potential biological removal (Waring et al. 2010).

Harbor porpoise (*Phocoena phocoena*) – Strategic

The harbor porpoise inhabits shallow, coastal waters, often found in bays, estuaries, and harbors. In the western Atlantic, they are found from Cape Hatteras north to Greenland. They are common visitors to Massachusetts Bay during September through April. During the spring, they are found from the Bay of Fundy to south of Cape Cod. They concentrate in southwestern Gulf of Maine, Great South Channel, Jeffreys Ledge, and coastal Maine during the mid-spring months. After April, they migrate north towards the Gulf of Maine and Bay of Fundy. They generally eat small schooling fish such as mackerel, herring, and cod, as well as worms, squid, and sand eel (ACSonline 2004; NOAA 1993). According to the species stock report, the population estimate for the Gulf of Maine/Bay of Fundy harbor porpoise is 89,054 individuals (Waring et al. 2012; Waring et al. 2011).

The most common threat to the harbor porpoise is from incidental mortality from fishing activities, especially from bottom-set gillnets. It has been demonstrated that the porpoise echolocation system is capable of detecting net fibers, but they must not have the "system activated" or else they fail to recognize the nets (Reeves et al. 2002). Roughly 365 harbor porpoises are killed by human-related activities each year. In 1999, a Take Reduction Plan to reduce harbor porpoise bycatch in U.S. Atlantic gillnets was implemented. The plan that pertains to the Gulf of Maine focuses on sink gillnets and other gillnets that can catch groundfish in New England waters. The ruling implements time and area closures, some of which are complete closures, as well as requiring pingers on multispecies gillnets. In 2001, the harbor porpoise was removed from the candidate species list for the Endangered Species Act of 1973; a review of the biological status of the stock indicated that a classification of "Threatened" was not warranted (Waring et al. 2009). However, this species has been listed as "strategic" because average annual human-related mortality and injury exceeds the potential biological removal (Waring et al. 2010).

Atlantic white-sided dolphin (*Lagenorhynchus acutus*) – Non-Strategic

The Atlantic white-sided dolphin is typically found at a depth of 330 feet (100 meters) in the cool temperate and subpolar waters of the North Atlantic, generally along the continental shelf between the Gulf Stream and the Labrador current to as far south as North Carolina (Bulloch 1993; Reeves et al. 2002).

NOAA Fisheries recognizes the potential for three stocks of the Atlantic white-sided dolphin in the western North Atlantic: a Gulf of Maine stock, a Gulf of St. Lawrence stock, and a Labrador Sea stock (Waring et al. 2009). The Gulf of Maine stock occupies regions of both the Gulf of Maine (usually in the southwestern portion) and Georges Bank throughout the entire year. High-use areas for this species are widely located either side of the 328-foot (100 meters) isobath along the northern edge of Georges Bank, and north from the Great South Channel to Stellwagen Bank, Jeffreys Ledge, Platts Bank, and Cashes Ledge. In spring, high-use areas existed in the Great South Channel, northern Georges Bank, the steeply sloping edge of Davis Bank and Cape Cod, southern Stellwagen Bank, and the waters between Jeffreys Ledge and Platts Bank. In summer, high-use areas tend to shift and expand toward the east and northeast along most of the northern edge of Georges Bank between the 164- and 656-foot (50- and 200-meter) isobaths and northward from the Great South Channel along the slopes of Davis Bank and Cape Cod. In winter, high sightings occur at the northern tip of Stellwagen Bank and Tillies Basin (NOAA 2008).

This species is highly social and is commonly seen feeding with fin whales. They feed on a variety of fish such as herring, hake, smelt, capelin, and cod, as well as squid (NOAA 1993). A recent estimate placed the population of Atlantic white-sided dolphins off the U.S. east coast at approximately 23,390 individuals (Waring et al. 2012; Waring et al. 2011).

The biggest human-induced threat to the Atlantic white-sided dolphin is bycatch, because they are occasionally caught in fishing gillnets and trawling equipment. An estimated average of 328 dolphins each year were killed by fishery-related activities during 2003 to 2007 (Waring et al. 2010). Average annual fishery-related mortality and serious injury does not exceed the potential biological removal for this species; therefore, NOAA Fisheries considers this species as "non-strategic" (Waring et al. 2010).

Killer whale (*Orcinus orca*) – Non-Strategic

The black-and-white killer whale is the largest member of the dolphin family, roughly 22 to 30 feet (6.7 to 9.1 meters) long and nearly 9,000 pounds (4,080 kilograms). This species is found in all of the world's oceans with highest densities in the high latitudes (Wilson and Ruff 1999). Killer whales do not maintain a regular migration route because they generally migrate towards viable food sources, which are likely to be schools of bluefin tuna. Killer whale presence in the waters off the east coast of the United States is considered uncommon (Katona et al. 1988; Waring et al. 2004). When encountered, they are seen in the southwestern Gulf of Maine from mid-July to September. Killer whales have been found to overwinter in the Gulf of Maine and were seen on Jeffreys Ledge between the Isles of Shoals and Stellwagen Bank (NOAA 1993). They feed on a variety of fish, including tuna, herring, and mackerel, and have also been known to attack seals, seabirds, and other cetaceans such as large baleen and sperm whales (NOAA 1993; Blaylock et al. 1995). According to the species stock report, the population estimate for the western North Atlantic stock of killer whales is unknown (Baylock et al. 1995).

The killer whale is not endangered, although whaling or live-capture operations have depleted some regional populations. They are threatened by pollution, heavy ship traffic, and possibly reduced prey abundance. There have been no observed mortalities or serious injuries by NOAA Fisheries Sea Samplers in the pelagic drift gillnet, pelagic longline, pelagic pair trawl, New England multispecies sink gillnet, mid-Atlantic coastal sink gillnet, or the North Atlantic bottom trawl fisheries (Blaylock et al. 1995). Recent evidence has also indicated that they are subject to biomagnification of toxic substances (ACSonline 2004). Average annual fishery-related mortality and serious injury does not exceed the potential biological removal for this species; therefore, NOAA Fisheries considers this species as "non-strategic" (Blaylock et al. 1995).

Although this species is one of the most widely distributed small cetacean species in the world, they are not commonly seen in the vicinity of the NEG Port and Algonquin Pipeline Lateral in Massachusetts Bay (NOAA 2008). No confirmed sightings of this species have occurred during construction and/or operation of the NEG Port and Algonquin Pipeline Lateral (Northeast Gateway 2007; Northeast Gateway 2008; Northeast Gateway 2009; Northeast Gateway 2010; Northeast Gateway 2011).

Short-beaked common dolphin (*Delphinus delphis*) – Non-Strategic

Short-beaked common dolphins can be found either along the 200- to 2,000-meter (650- to 6,500-foot) isobaths over the continental shelf and in pelagic waters of the Atlantic and Pacific Oceans. They are present in the western Atlantic from Newfoundland to Florida. The short-beaked common dolphin is especially common along shelf edges and in areas with sharp bottom relief such as seamounts and escarpments (Reeves et al. 2002). They show a strong affinity for areas with warm, saline surface waters. Off the coast of the eastern United States, they are particularly abundant in continental slope waters from

Georges Bank southward to about 35 degrees north (Reeves et al. 2002) and usually inhabit tropical, subtropical, and warm-temperate waters (Waring et al. 2009).

The long-beaked dolphin is more common in coastal waters, where the short-beaked dolphin inhabits offshore waters. If they do come to the Massachusetts Bay area to feed, it is usually during the fall and winter (NOAA 1993). According to the species stock report, the best population estimate for the western North Atlantic common dolphin is approximately 120,743 individuals (Waring et al. 2011; Waring et al. 2009).

These dolphins typically gather in schools of hundreds of thousands, although the schools generally consist of smaller groups of 30 or fewer. They are eager bow riders and are active at the surface (Reeves et al. 2002). The short-beaked common dolphin feeds on small schooling fish and squid. They have been known to feed on fish escaping from fishermen's nets or fish that are discarded from boats (NOAA 1993).

The short-beaked common dolphin is also subject to bycatch. It has been caught in gillnets, pelagic trawls, and during longline fishery activities. During 2003 to 2007, an estimated average of approximately 160 dolphins were killed each year by human activities. Average annual fishery-related mortality and serious injury does not exceed the potential biological removal for this species; therefore, NOAA Fisheries considers this species as "non-strategic" (Waring et al. 2009).

Although this species is one of the most widely distributed small cetacean species in the world, they are not commonly seen in the vicinity of the NEG Port and Algonquin Pipeline Lateral in Massachusetts Bay (NOAA 2008). No confirmed sightings of this species have occurred during construction and/or operation of the NEG Port and Algonquin Pipeline Lateral during the operating periods between 2008 and 2011 operating periods. (Northeast Gateway 2007; Northeast Gateway 2008; Northeast Gateway 2009; Northeast Gateway 2010; Northeast Gateway 2011).

Bottlenose dolphin (*Tursiops truncatus*) – Non-Strategic

The bottlenose dolphin is a light- to slate-gray dolphin, roughly 8 to 12 feet (2.4 to 3.7 meters) long with a short, stubby beak. Because this species occupies a wide variety of habitats, it is regarded as possibly the most adaptable cetacean (Reeves et al. 2002). It occurs in oceans and peripheral seas at both tropical and temperate latitudes. In North America, bottlenose dolphins are found in surface waters with temperatures ranging from 50 to 90 °F (10 to 32 °C). These animals often move into or reside in bays, estuaries, and the lower reaches of rivers (Reeves et al. 2002).

The population of bottlenose dolphins in the North Atlantic consists of a complex mosaic of dolphin stocks (Waring et al. 2010). Evidence suggests that five coastal stocks of bottlenose dolphins exist: the Northern Migratory and Southern Migratory stocks, a South Carolina/Georgia Coastal stock, a Northern Florida Coastal stock and a Central Florida Coastal stock (Waring et al. 2010). The Northern Migratory Coastal stock is best understood, based on survey data, and individuals occur along the North Carolina coast and as far north as New York during the summer (Cetacean and Turtles Assessment Program [CETAP] 1982; Kenney 1990; Garrison 2003). During winter, bottlenose dolphins are rarely observed north of the North Carolina/Virginia border (Waring et al. 2010). The Southern Migratory Coastal stock is the most poorly understood due to overlap with the Northern Migratory Coastal and both the Northern and Southern North Carolina Estuarine System stocks; however, this stock generally ranges from North Carolina and Virginia during summer down to northern Florida during winter (Waring et al. 2010). The best population estimate for bottlenose dolphins is for the offshore stock, estimated at 81,588 individuals (Waring et al. 2011). Based on data collected in 2002, the population estimate for the Northern Migratory

Coastal stock is 9,604 individuals, while the Southern Migratory Coastal stock is estimated at 12,482 individuals (Waring et al. 2011).

Bottlenose dolphins feed on a large variety of organisms, depending on their habitat. The coastal, shallow population tends to feed on benthic fish and invertebrates, while deepwater populations consume pelagic or mesopelagic fish such as croakers, sea trout, mackerel, mullet, and squid (Reeves et al. 2002). Bottlenose dolphins appear to be active both during the day and night. Their activities are influenced by the seasons, time of day, tidal state, and physiological factors such as reproductive seasonality (Wells and Scott 2002).

The biggest threat to the population is bycatch because they are frequently caught in fishing gear, gillnets, purse seines, and shrimp trawls (Waring et al. 2009). They have also been adversely impacted by pollution, habitat alteration, boat collisions, human disturbance, and are subject to bioaccumulation of toxins. Scientists have found a strong correlation between dolphins with elevated levels of PCBs and illness, indicating certain pollutants may weaken their immune system (ACSonline 2004). NOAA Fisheries considers this species as "non-strategic"; however, average annual fishery-related mortality and serious injury between 2002 and 2006 has not been estimated, and it is therefore unknown whether or not total mortality and serious injury can be considered insignificant. (Waring et al. 2009).

Although this species is one of the most widely distributed small cetacean species in the world, they are not commonly seen in the vicinity of the NEG Port and Algonquin Pipeline Lateral in Massachusetts Bay (NOAA 2008). No confirmed sightings of this species have occurred during construction and/or operation of the NEG Port and Algonquin Pipeline Lateral (Northeast Gateway 2007; Northeast Gateway 2008; Northeast Gateway 2009; Northeast Gateway 2010; Northeast Gateway 2011).

Risso's dolphin (*Grampus griseus*) – Non-Strategic

Risso's dolphins are commonly found in the deeper waters of the U.S. east coast continental shelf edge and oceanic waters ranging from Cape Hateras to Georges Bank, mainly during spring, summer and autumn (CETAP 1982; Payne et al. 1984). There is currently no information on stock structure of this species for western North Atlantic; therefore, it is not possible to determine if separate stocks exist in the Gulf of Mexico and Atlantic Waring et al. 2010). The best estimate of abundance for the western North Atlantic stock of Risso's dolphins is 20,479 animals (Waring et al. 2011; Waring et al., 2010). There are insufficient data to determine the population trend for this stock.

The biggest threat to the population is bycatch because they have been caught in fishing gear such as drift gillnets, pelagic longline, pair trawls and mid-water trawls (Waring et al. 2010). NOAA Fisheries considers this species as "non-strategic"; however, average annual fishery-related mortality and serious injury between 2005 and 2009 was 18 dolphins (Waring et al. 2011).

Although this species is one of the most widely distributed small cetacean species in the world, they are not commonly seen in the vicinity of the NEG Port and Algonquin Pipeline Lateral in Massachusetts Bay (NOAA 2008). No confirmed sightings of this species have occurred during construction and/or operation of the NEG Port and Algonquin Pipeline Lateral (Northeast Gateway 2007; Northeast Gateway 2008; Northeast Gateway 2009; Northeast Gateway 2010; Northeast Gateway 2011).

4.2 Baleen Whales (Mysticeti)

North Atlantic right whale (*Eubalaena glacialis*) – Endangered

The North Atlantic right whale is a baleen whale and one of the most endangered large whale species in the world. The North Atlantic right whale has seen little to no recovery since it was listed as a protected

species. This is a drastic difference from the stock found in the Southern Hemisphere, which has increased at a rate of 7 to 8 percent (Knowlton and Kraus 2001).

From the 2003 United States Atlantic and Gulf of Mexico Marine Mammal Stock Assessments, there were only 291 North Atlantic right whales in existence, which is less than what was reported in the Northern Right Whale Recovery Plan written in 1991 (NOAA Fisheries 1991a; Waring et al. 2004). This is a tremendous difference from pre-exploitation numbers, which are thought to be around 1,000 individuals. When the right whale was finally protected in the 1930s, it is believed that the North Atlantic right whale population was roughly 100 individuals (Waring et al. 2004). In 2009, the Western North Atlantic population size was estimated to be at least 444 individuals (Waring et al. 2013).

There are six major habitats or congregation areas for western North Atlantic right whales: coastal waters of the southeastern United States, Great South Channel, Georges Bank/Gulf of Maine, Cape Cod and Massachusetts Bays, Bay of Fundy, and the Scotian Shelf (Waring et al. 2010). New England waters are a primary feeding habitat for the North Atlantic right whale. North Atlantic right whales inhabit the waters off New England throughout the year, but their presence is highest in the Massachusetts Bay area during the winter/spring months. In the spring, the highest abundance of right whales is located over the deeper waters (328- to 525-foot [100- to 160-meter] isobaths) on the northern edge of the Great South Channel and deep waters (328 to 984 feet, 100 to 300 meters) parallel to the 328-foot (100-meter) isobath of northern Georges Bank and Georges Basin. High abundance was also found in the shallowest waters (<98 feet [< 30 meters]) of Cape Cod Bay, over Platts Bank and around Cashes Ledge. In the summer months, right whales move almost entirely away from the coast to deep waters over basins in the central Gulf of Maine (Wilkinson Basin, Cashes Basin between the 525- and 656-foot [160- and 200-meter] isobaths) and north of Georges Bank (Rogers, Crowell, and Georges Basins). Highest abundance was found north of the 328-foot (100-meter) isobath at the Great South Channel and over the deep slope waters and basins along the northern edge of Georges Bank. The waters between Fippennies Ledge and Cashes Ledge are also estimated as high-use areas. In the fall months, right whales have been sighted infrequently in the Gulf of Maine, with highest densities over Jeffreys Ledge and over deeper waters near Cashes Ledge and Wilkinson Basin. In winter, Cape Cod Bay, Scantum Basin, Jeffreys Ledge, and Cashes Ledge are the main high-use areas (NOAA 2008).

The primary prey for North Atlantic right whales off the coast of Massachusetts are zooplankton (i.e., copepods) (Kelly 1995). Right whales are considered grazers as they swim slowly with their mouths open. They are the slowest swimming whales and can only reach speeds up to 10 miles (16 kilometers) per hour. They can dive at least 1,000 feet (300 meters) and stay submerged for typically 10 to 15 minutes, feeding on their prey below the surface (ACSonline 2004).

Most ship strikes are fatal to the North Atlantic right whales (Jensen and Silber 2004). Right whales have difficulty maneuvering around boats. North Atlantic right whales spend most of their time at the surface, feeding, resting, mating, and nursing, increasing their vulnerability to collisions. Mariners should assume that North Atlantic right whales will not move out of their way nor will they be easy to detect from the bow of a ship for they are dark in color and maintain a low profile while swimming (World Wildlife Fund [WWF] 2005).

Humpback whale (*Megaptera novaeangliae*) – Endangered

Humpback whales were commercially exploited by whalers throughout their whole range until they were protected in the North Atlantic in 1955 by the International Whaling Commission (IWC) ban. Before whaling activities, it was thought that the abundance of whales in the North Atlantic stock was in excess

of 15,000 (Nowak 2002). Today, less than 10 percent of the initial population exists (NOAA Fisheries 1991b). According to the species stock assessment report, the best estimate of abundance for the Gulf of Maine stock of humpback whales is 823 individuals (Waring et al. 2013).

The humpback whale is found in all of the world's oceans and it follows a normal migration route of feeding in the temperate and polar waters in the summer and mating and calving in tropical waters during the winter. Humpback whales inhabit waters mainly over the continental shelves; they stay along the edges and around some of the oceanic islands (NOAA Fisheries 1991b; NOAA 1993). There are 13 separate stocks of humpback whales worldwide (NOAA Fisheries 1991b). Through genetic analysis of the whales inhabiting the Gulf of Maine, it was determined that the Gulf of Maine has its own feeding stock. Most individuals arrive in early March to Massachusetts Bay from wintering grounds in eastern central Caribbean. The highest abundance for humpback whales is distributed primarily along a relatively narrow corridor following the 328-foot (100-meter) isobath across the southern Gulf of Maine from the northwestern slope of Georges Bank, south to the Great South Channel, and northward alongside Cape Cod to Stellwagen Bank and Jeffreys Ledge. The relative abundance of whales increases in the spring with the highest occurrence along the slope waters (between the 131- and 459-foot [40- and 140-meter] isobaths) off Cape Cod and Davis Bank, Stellwagen Basin, and Tillies Basin and between the 164- and 656-foot (50- and 200-meter) isobaths along the inner slope of Georges Bank. High abundance is also estimated for the waters around Platts Bank. In the summer months, abundance increases over the shallow waters (<164 feet, or <50 meter) of Stellwagen Bank, the waters (328 to 656 feet [100 to 200 meters]) between Platts Bank and Jeffreys Ledge, the steep slopes (between the 98- and 525-foot [30- and 160-meter] isobaths) of Phelps and Davis Bank north of the Great South Channel towards Cape Cod, and between the 164- and 328-foot (50- and 100-meter) isobath for almost the entire length of the steeply sloping northern edge of Georges Bank. This general distribution pattern has persisted in all seasons except winter, when humpbacks remained at high abundance in only a few locations, including Porpoise and Neddick Basins adjacent to Jeffreys Ledge, northern Stellwagen Bank and Tillies Basin, and the Great South Channel (NOAA 2008).

Humpback whales exhibit consistent fidelity to feeding areas within the northern hemisphere (Stevick et al. 2006), effectively creating six subpopulations that feed in six different areas during spring, summer and fall. These populations can be found in the Gulf of Maine, the Gulf of St. Lawrence, Newfoundland/Labrador, western Greenland, Iceland, and Norway (Waring et al. 2013). Humpback whales migrate from these feeding areas to the West Indies (including the Antilles, the Dominican Republic, the Virgin Islands and Puerto Rico) where they mate and calve their young (NOAA Fisheries 1991b; Waring et al. 2013). Little feeding is known to occur in their wintering grounds. Humpbacks feed over the continental shelf in the North Atlantic between New Jersey and Greenland, consuming roughly 95 percent small schooling fish and 5 percent zooplankton (i.e., krill), and they will migrate throughout their summer habitat to locate prey (Kenney and Winn 1986). They swim below the thermocline to pursue their prey, so even though the surface temperatures might be warm, they are frequently swimming in cold water (NOAA Fisheries 1991b).

Stellwagen Bank has been identified as an important nursery for humpback mothers with calves. Herring, sand lance, and capelin are the primary prey species for the Gulf of Maine stock but they also eat haddock, mackerel, small pollock, cod, and hake (NOAA Fisheries 1991b). Data found in the Northeast Gateway Environmental Impact Statement Baseline Evaluation show an increase in humpback whale sightings near the project area in 2002, with declining numbers seen since. There is no significant change in sightings between the periods 1995 to 1999 and 2000 to 2004 (Weinrich and Sardi 2005).

The biggest threats to humpback whales are gear entanglements and ship strikes. Approximately three humpback whales were killed each year by anthropogenic factors such as ship strikes and fishery-related incidents during 1997 to 2001. During one study of humpback whale carcasses, anthropogenic factors either contributed to or caused the death of 60 percent of the stranded whales (Wiley et al. 1995 as reported in Waring et al. 2010). Glass et al. (2008) reported that between 2002 and 2006, humpback whales belonging to the Gulf of Maine population were involved in 77 confirmed entanglements with fishery equipment and 9 confirmed ship strikes. Humpback whales that were entangled exhibited the highest number of serious injury events of the six species of whale studied by Glass et al. (2008). A whale mortality and serious injury study conducted by Nelson et al. (2007) reported that the minimum annual rate of anthropogenic mortality and serious injury to humpback whales occupying the Gulf of Maine was 4.2 individuals per year. During this study period, humpback whales were involved in 70 reported entanglements and 12 vessel strikes, and were the most common dead species reported. NOAA Fisheries records for 2006 through 2010 indicate 10 reports of mortalities as a result of collision with a vessel, and 29 serious injuries and mortalities attributed to entanglement (Waring et al. 2013). Another study found that humpbacks are also subject to bioaccumulation of toxins (Taruski et al. 1975 as reported in NOAA Fisheries 1991b). Increase in ambient noise levels has also had an impact on their utilization of habitats; humpback whales have demonstrated a short-term avoidance of areas with increased whale-watching activity (Corkeron 1995).

The species is listed as Endangered due to the depletion of its population from whaling (NOAA Fisheries 1991b). A recovery plan has been written and is currently in effect (NOAA Fisheries 1991b).

Fin whale (Balaenoptera physalus) – Endangered

The fin whale is found in all oceans of the world. Fin whales spend the winter in subtropical or offshore waters mating and calving and migrate into cooler temperate to polar waters for feeding during the spring, summer, and fall (Reeves et al. 1998). There has been some controversy regarding the number of fin whale stocks along the eastern coast of the United States. The IWC recognizes one western North Atlantic stock, consisting of whales, which inhabit the waters off New England, north to Nova Scotia, and the southeastern coast of Newfoundland (Donovan 1991 as reported in Waring et al. 2004); however, Breiwick (1993 as reported in Reeves et al. 1998) identified two stocks, one that remains off of Nova Scotia and New England and another that remains in Newfoundland waters. Fin whales are the most common large baleen whale species in the Gulf of Maine/Massachusetts Bay area. They have the largest standing stock and largest food requirements, thus having the largest impact on the ecosystem of any cetacean species (Hain et al. 1992 as reported in Waring et al. 2010). Fin whales are also the most observed cetacean species during whale-watching activities in the northeastern United States.

The waters off New England are an important feeding ground for the fin whale. They generally stay in deeper waters near the edge of the continental shelf (300 to 600 feet; 90 to 180 meters), but will migrate towards coastal areas if prey is available (NOAA 1993). They are known to herd prey such as sea lance, capelin, krill, herring, copepods, and squid for easier consumption (NOAA 1993; U.S. Environmental Protection Agency [EPA] 1993). Apparently, the favorite food of fin whales on Stellwagen Bank and in Massachusetts Bay has been sand lance (EPA 1993). According to the species stock assessment report, the best population estimate for the western North Atlantic stock of fin whales is 3,985 individuals (Waring et al. 2011). Even though some whales overwinter near Cape Cod, their abundance near Stellwagen Bank peaks between April and October. Off the eastern United States, they are generally found along the 100-meter (330-foot) isobaths, but will follow prey abundance and inhabit shallower water (Reeves et al. 1998).

Spatial patterns of habitat utilization by fin whales are very similar to those of humpback whales. NOAA indicates that spring and summer high-use areas follow the 328-foot (100-meter) isobath along the northern edge of Georges Bank (between the 164- and 656-foot, or 50- and 200-meter, isobaths), and northward from the Great South Channel (between the 164- and 525-foot [50- and 160-meter] isobaths). Waters around Cashes Ledge, Platts Bank, and Jeffreys Ledge are all high-use areas in the summer months. Stellwagen Bank is a high-use area for fin whales in all seasons, with highest abundance occurring over the southern Stellwagen Bank in the summer months. In addition to Stellwagen Bank, high abundance in winter was estimated for Jeffreys Ledge and the adjacent Porpoise Basin 328- to 656-foot (100- to 160-meter) isobaths, as well as Georges Basin and northern Georges Bank (NOAA 2008).

The biggest threats to fin whales are entanglements in gillnets and ship strikes. From 2003 to 2007, the minimum annual rate of mortality for the North Atlantic stock from anthropogenic causes was approximately 2.8 per year (Waring et al. 2010). Increase in ambient noise has also impacted fin whales, for whales in the Mediterranean have demonstrated at least two different avoidance strategies after being disturbed by tracking vessels (Jahoda et al. 2003). Fin whales are the most observed cetacean species during whale-watching activities in the northeastern United States. The species is listed as Endangered due to the depletion of its population from whaling (Reeves et al. 1998). A recovery plan has been written and is available from the NOAA Fisheries for review (Waring et al. 2010).

Minke whale (*Balaenoptera acutorostrata*) – Non-Strategic

Minke whales are the smallest and are among the most widely distributed of all the baleen whales. They occur in the North Atlantic and North Pacific, from tropical to polar waters. Currently, scientists recognize two subspecies of the so-called “common” minke whale: the North Atlantic minke and the North Pacific minke. Generally, they inhabit warmer waters during winter and travel north to colder regions in summer, with some animals migrating as far as the ice edge. They are frequently observed in coastal or shelf waters and in the Massachusetts area, have been recorded in the shallow waters of Stellwagen Bank and southern Jeffreys Ledge from April until October. NOAA indicates that the highest abundance for minke whale is strongly associated with regions between the 164- and 328-foot (50- and 100-meter) isobaths, but with a slightly stronger preference for the shallower waters along the slopes of Davis Bank, Phelps Bank, Great South Channel and Georges Shoals on Georges Bank. Minke whales can be sighted in the Stellwagen Bank National Marine Sanctuary (SBNMS) in all seasons, with highest abundance estimated for the shallow waters (approximately 131 feet [40 meters]) over southern Stellwagen Bank in the summer and fall months. Platts Bank, Cashes Ledge, Jeffreys Ledge, and the adjacent basins (Neddick, Porpoise and Scantium) also supported high relative abundance. Very low densities of minke whales remain throughout most of the southern Gulf of Maine in winter (NOAA 1993; Weinrich and Sardi 2005; Wilson and Ruff 1999). Minke whales off the eastern coast of the United States are considered to be part of the Canadian East Coast stock. The best population estimate for the Canadian East Coast stock of the Western North Atlantic is 8,978 individuals (Waring et al. 2011).

As is typical of the baleen whales, minke whales are usually seen either alone or in small groups, although large aggregations sometimes occur in feeding areas (Reeves et al. 2002). Minke populations are often segregated by sex, age, or reproductive condition. Known for their curiosity, minke whales often approach boats. They feed on schooling fish (i.e., herring, sand eel, capelin, cod, pollock, and mackerel), invertebrates (squid and copepods), and euphausiids. Minke whales basically feed below the surface of the water, and calves are usually not seen in adult feeding areas.

Minke whales are impacted by ship strikes and bycatch from bottom trawls, lobster trap/pot, gillnet and purse seine fisheries. The estimated United States total annual average human-caused mortality was 5.9

minke whales per year from 2005 through 2009 (Waring et al. 2011). In addition, hunting for Minke whales continues today, by Norway in the northeastern North Atlantic and by Japan in the North Pacific and Antarctic (Reeves et al. 2002). International trade in the species is currently banned. Average annual fishery-related mortality and serious injury does not exceed the potential biological removal for this species; therefore, NOAA Fisheries considers this species as "non-strategic" (Waring et al. 2011).

4.3 Earless Seals (Phocidae)

Harbor seal (*Phocac vitulina*) – Non-Strategic

Harbor seals are the most abundant seals in eastern United States waters and are commonly found in all nearshore waters of the Atlantic Ocean and adjoining seas above northern Florida; however, their "normal" range is probably only south to New Jersey. In the western North Atlantic, they inhabit the waters from the eastern Canadian Arctic and Greenland, south to southern New England and New York, and occasionally as far south as South Carolina. Some seals spend all year in eastern Canada and Maine, while others migrate to southern New England in late September and stay until late May (Marine Mammal Center 2002; NOAA 1993; Waring et al. 2010). According to the species stock report, the best population estimate for the western North Atlantic stock of harbor seals is 99,340 (Waring et al. 2010).

Harbor seals forage in a variety of marine habitats, including deep fjords, coastal lagoons and estuaries, and high-energy, rocky coastal areas. They may also forage at the mouths of freshwater rivers and streams, occasionally traveling several hundred miles upstream (Reeves et al. 2002). They haul out on sandy and pebble beaches, intertidal rocks and ledges, and sandbars, and occasionally on ice floes in bays near calving glaciers.

Except for the strong bond between mothers and pups, harbor seals are generally intolerant of close contact with other seals. Nonetheless, they are gregarious, especially during the molting season, which occurs between spring and autumn, depending on geographic location. They may haul out to molt at a tide bar, sandy or cobble beach, or exposed intertidal reef. During this haulout period, they spend most of their time sleeping, scratching, yawning, and scanning for potential predators such as humans, foxes, coyotes, bears, and raptors (Reeves et al. 2002). In late autumn and winter, harbor seals may be at sea continuously for several weeks or more, presumably feeding to recover body mass lost during the reproductive and molting seasons and to fatten up for the next breeding season (Reeves et al. 2002).

Harbor seals are opportunistic feeders feeding on squid and small schooling fish (i.e., herring, alewife, flounder, redfish, cod, yellowtail flounder, sand eel, and hake). They spend about 85 percent of the day diving, and much of the diving is presumed to be active foraging in the water column or on the seabed. They dive to depths of about 30 to 500 feet (10 to 150 meters), depending on location.

Historically, these seals have been hunted for several hundred to several thousand years. Harbor seals are still killed legally in Canada, Norway, and the United Kingdom to protect fish farms or local fisheries (Reeves et al. 2002). From 2003 to 2007, the average rate of mortality for the Western North Atlantic harbor seal stock from anthropogenic causes was approximately 467 per year (Waring et al. 2010). Average annual fishery-related mortality and serious injury does not exceed the potential biological removal for this species; therefore, NOAA Fisheries considers this species as "non-strategic" (Waring et al. 2010).

Gray seal (*Halichoerus grypus*) – Non-Strategic

Gray seals inhabit both sides of the North Atlantic in both the temperate and subarctic waters (Morris 2004). Scientists recognize three primary populations of this species, all in the northern Atlantic Ocean.

The gray seals that reside in Nantucket Sound are part of the eastern Canada stock, which can be found from northernmost Cape Chidley in Labrador to most recently Long Island Sound (Katona et al. 1993). Gray seals form colonies on rocky island or mainland beaches, though some seals give birth in sea caves or on sea ice, especially in the Baltic Sea. Gray seals prefer haulout and breeding sites that are surrounded by rough seas and riptides where boating is hazardous. Pupping colonies have been identified at Muskegat Island (Nantucket Sound), Monomoy National Wildlife Refuge, and in eastern Maine (Rough 1995). According to the species stock report, the population estimate for the western North Atlantic stock of gray seals is not available; however estimates have been made for certain population segments from different times. In May 2001, the Maine Coast was estimated at 1,731. For the Gulf of St Lawrence and Nova Scotia Eastern Shore during January 2004, the estimate was 52,500. Also in January of 2004, Sable Island population estimates ranged from 208,721 to 223,220 (Waring et al. 2010).

Gray seals are gregarious, gathering to breed, molt, and rest in groups of several hundred or more at island coasts and beaches or on land-fast ice and pack-ice floes. They are thought to be solitary when feeding and telemetry data indicates that some seals may forage seasonally in waters close to colonies, while others may migrate long distances from their breeding areas to feed in pelagic waters between the breeding and molting seasons (Reeves et al. 2002). Gray seals molt in late spring or early summer and may spend several weeks ashore during this time. When feeding, most seals remain within 45 miles (72 kilometers) of their haulout sites. They generally feed on fish (i.e., skates, alewife, sand eel, and herring) and invertebrates.

The biggest threats to gray seals are entanglements in gillnets or plastic debris (Waring et al. 2004). The total estimated human caused mortality from 2003 to 2007 to gray seals was approximately 1,160 per year (Waring et al. 2010). Average annual fishery-related mortality and serious injury does not exceed the potential biological removal for this species; therefore, NOAA Fisheries considers this species as “non-strategic” (Waring et al. 2010).

5.0 TYPE OF INCIDENTAL TAKE REQUESTED

Northeast Gateway and Algonquin request the taking of small numbers of marine mammals pursuant to section 101(a)(5) of the MMPA to authorize the potential non-lethal incidental takes by Level B harassment as defined in the MMPA of small numbers of marine mammals during the O&M of the NEG Port and Algonquin Pipeline Lateral. The request is based upon projected O&M activities for a period of 1 year commencing on October 5, 2012.

Northeast Gateway and Algonquin, in cooperation with the NOAA, the NOAA Fisheries, and the SBNMS, have developed comprehensive acoustic and visual monitoring and mitigation measures to minimize potential takes of marine mammals (see sections 11.0 and 13.0 and Appendix A). Given these measures, no take by serious injury or death is likely as a result of NEG Port and Algonquin Pipeline Lateral O&M activities.

5.1 NEG Port

5.1.1 NEG Port Operations

As detailed in section 1.4.1.1, the only NEG Port operational activities that would generate underwater noise with sounds exceeding the 120 dB threshold for Level B harassment are those stemming from the maneuvering of EBRVs during final docking and/or decoupling maneuvers No other forms of take are likely or anticipated. The requested take authorization would apply to NEG Port operational activities

described regardless of the individual actor (e.g., vessel owner, operator, contractor, etc.) provided that the conditions of the take authorization are met.

On October 6, 2011, NOAA Fisheries issued an IHA to Northeast Gateway Energy Bridge Deepwater Port to take by harassment small numbers of marine mammals incidental to operating a deepwater LNG facility in the Massachusetts Bay. Listed in the issued IHA, under condition 3 – Species Impacted and Level of Takes, are the following 14 species approved for take by Level B Harassment:

North Atlantic right whale (*Eubalaena glacialis*)
Humpback whale (*Megaptera novaeangliae*)
Fin whale (*Balaenoptera physalus*)
Sei whale (*Balaenoptera borealis*)
Minke whale (*B. acutorostrata*)
Pilot whale (*Globicephala* spp.)
Atlantic white-sided dolphin (*Lagenorhynchus acutus*)
Bottlenose dolphin (*Tursiops truncates*)
Common dolphin (*Delphinus delphis*)
Killer whale (*Orcinus orca*)
Risso's dolphin (*Grampus griseus*)
Harbor porpoise (*Phocoena phocoena*)
Harbor seal (*Phoca vitulina*)
Gray seal (*Halichoerus grypus*)

Per the recommendation of the NOAA Fisheries, Northeast Gateway is requesting the authorization for the incidental take by harassment, of small numbers of the same above listed species of marine mammals in Massachusetts Bay that is based on NEG Port operational activities, as was provided by the October 6, 2011 IHA, pursuant to Section 101 (a) (5) of the MMPA and in accordance with 50 CFR § 216 Subpart I.

5.1.2 NEG Port Maintenance

As detailed in section 1.4.1.2, the only NEG Port maintenance activities that would generate underwater noise with sounds exceeding the 120 dB threshold for Level B harassment are those stemming from vessel noises such as turning screws, engine noise, noise of operating machinery, and thruster use during maintenance and repair events. However, the associated noise levels for maintenance and repair would be localized and would not extend beyond the immediate area where construction activities were occurring.

Per the recommendation of the NOAA Fisheries, Northeast Gateway is requesting the authorization for the incidental take by harassment, of small numbers of the same listed species of marine mammals in Massachusetts Bay as described in section 5.1.1, pursuant to Section 101 (a) (5) of the MMPA and in accordance with 50 CFR § 216 Subpart I, in support of maintenance and repair activities.

5.2 Algonquin Pipeline Lateral O&M Activities

As detailed in section 1.4.2, routine inspections of the Algonquin Pipeline Lateral are conducted annually by a ROV launched from a vessel of opportunity. No forms of take are likely or anticipated from this ROV vessel. The only Algonquin Pipeline Lateral maintenance and repair activities that would generate underwater noise with sounds exceeding the 120 dB threshold for Level B harassment are those stemming from vessel noises such as turning screws, engine noise, noise of operating machinery, and thruster use during unplanned maintenance and repair events. However, the associated noise levels for maintenance

and repair would be localized and would not extend beyond the immediate area where construction activities were occurring.

The Algonquin Pipeline Lateral is located within the same general waters as the NEG Port and species are expected to be the same as those described for NEG Port activities. Therefore, per the recommendation of the NOAA Fisheries, Algonquin is requesting the authorization for the incidental take by harassment, of small numbers of the same listed species of marine mammals in Massachusetts Bay as described in section 5.1.1, pursuant to Section 101 (a) (5) of the MMPA and in accordance with 50 CFR § 216 Subpart I, in support of maintenance and repair activites.

6.0 NUMBERS OF MARINE MAMMAL THAT MIGHT BE TAKEN

Northeast Gateway and Algonquin seek authorization for potential "taking" of small numbers of marine mammals under the jurisdiction of the NOAA Fisheries in the proposed region of activity. Species for which authorization is sought include the gray seal, harbor seal, harbor porpoise, Atlantic white-sided dolphin, short-beaked common dolphin, bottlenose dolphin, Risso's dolphin, long-finned pilot whale, killer whale, minke whale, North Atlantic right whale, humpback whale, and fin whale. These 13 species, described in detail in section 4.0, have the highest likelihood of occurring, at least occasionally, in the NEG Port and Algonquin Pipeline Lateral area.

The only anticipated impacts to marine mammals are associated with noise are limited to the use of DP thrusters and short term construction and maintenance events which may result in short-term displacement of marine mammals and seaturles within ensonified zones during such events. The representative area ensonified to the MMPA Level B threshold for each Project activity was used to estimate take (see Appendix C). The O&M activities proposed by Northeast Gateway and Algonquin are not expected to take more than small numbers of marine mammals, or have more than a negligible effect on their populations based on the seasonal density and distribution of marine mammals, and the vulnerability of these animals to harassment from the frequency of noises.

6.1 Basis for Estimating Numbers of Marine Mammals that Might be "Taken by Harassment"

There are three kinds of noises recognized by NOAA Fisheries: continuous, intermittent, and pulse. No pulse noise activities, such as seismic, blasting, loud sonar, or pile driving, are associated with the operation and maintenance of the NEG Port and Algonquin Pipeline Lateral; thus, the 160/170 dB threshold value does not apply. The noise sources of potential concern are regasification/offloading (continuous) and dynamic positioning of vessels using thrusters (intermittent) during O&M activities. Both continuous and intermittent noise sources carry the 120 dB isopleth threshold.

Continuous sound sources associated with the operation of the NEG Port are not expected to exceed the 120 dB threshold for Level B harassment. However, the intermittent noise from thruster use associated with dynamic positioning of vessels during the docking with and/or decoupling of the EBRVs from NEG Port facilities may result in the occasional exceedance of the 120 dB threshold for intermittent noise sources. Consequently, EBRV bow thruster use has the potential for take by harassment for any marine mammal occurring within a zone of ensonification (>120 dB) emanating from the sound source. This area, known as the Zone of Influence (ZOI), has a variable maximum radius dependent on water depth and associated differences in transmission loss (see Appendix C).

Underwater noise of critical concern during NEG Port and Algonquin Pipeline Lateral construction would be from vessel noises such as turning screws, engine noise, noise of operating machinery, and thruster use. It is reasonable to assume that a worst-case maintenance and/or repair scenario would result in similar types of activities and require the use of similar support vessels and equipment as used for construction. Consequently, NEG Port and Algonquin Pipeline Lateral maintenance and repair vessel noise has the potential for take by harassment for any marine mammal occurring within a zone of ensonification emanating from the sound source.

The basis for the take estimate is the number of marine mammals that would be exposed to sound levels in excess of 120 dB. Typically this is determined by multiplying the ZOI by local marine mammal density estimates, and then correcting for seasonal use by marine mammals, seasonal duration of noise-generating activities, and estimated duration of individual activities when the maximum noise-generating activities are intermittent or occasional. In the absence of any part of this information, it becomes prudent to take a conservative approach to ensure the potential number of takes is not greatly underestimated.

Based on underwater sound pressure levels and distance to threshold levels during NEG Port and Algonquin Pipeline Lateral operation and maintenance (see Tables 1-5, 1-6 and 1-7), the worst-case scenarios have been used as the basis for take calculations. Additionally, Northeast Gateway has consistently used a single EBRV for calculating take, as this is the most likely scenario for operational activity at the NEG Port. Overlap between two EBRVs maneuvering at each buoy will occur only 10 percent of the time. EBRV thruster use will only be used intermittently during a 10 to 30 minute period during docking and undocking procedures and therefore the potential for simultaneous, intermittent use of directional thrusters by two EBRVs is not likely during normal operational activities. In the event that such a situation occurs, existing and NOAA Approved-approved mitigations and procedures (e.g., near real-time detections by ABs), coupled with marine mammal observation by designated EBRV lookouts from both vessels would help to avoid and/or minimize any potential harassment to marine mammals in the area.

6.1.1 NEG Port

6.1.1.1 NEG Port Operations

In the NOAA Fisheries October 6, 2011 IHA to Northeast Gateway, the ensonified area at the 120-dB radius was estimated to be 1.6 miles (2.6 kilometers) maximum from the sound source during dynamic positioning for the EBRV, making a maximum ZOI of 8.1 square miles (21.0 square kilometers). The latest calculations, based on empirical received sound pressure levels (see Appendix B and C), estimate the maximum distance of the 120-dB radius to be approximately 3.4 miles (5.4 kilometers). This represents a nominal 1.8 miles (2.9 kilometers) linear difference between modeled estimates originally evaluated in the final EIS/EIR and modeled results based on empirical received sound levels derived from actual field verified measurements taken during EBRV operational activities. However, the maximum ZOI of 20.8 square miles (53.9 square kilometers) for NEG Port operations is based on modeling results shown in Figures C1 through C4 in Appendix C. It should be noted that, to date, no MARU data has indicated any take by harassment during the operational lifetime of the array, and only a single take by incidental harassment of either a seal or dolphin (species was not identifiable) was reported on February 5, 2009 by the EBRV Explorer while thrusters were engaged. Furthermore, the mitigation measures currently in place and approved by NOAA Fisheries provide the means of effecting the least practicable adverse impact on marine mammal species or stocks and their habitat.

6.1.1.2 NEG Port Maintenance

Northeast Gateway has analyzed empirical received sound pressure levels collected during specific construction operations as described in section 1.4.1. The latest calculations, based on received sound pressure levels (see Appendix B and C), estimate the maximum distance of the 120-dB isopleth to be approximately 3.2 miles (5.2 kilometers). The maximum ZOI, based on modeling results shown in Figures C5 through C8 in Appendix C, is estimated to be approximately 18.8 square miles (48.6 square kilometers). Originally modeled sound pressure levels, as published in the Federal Register (Vol. 72, No. 48) on March 13, 2007, estimated the distance of the 120-dB radius to be approximately 2 miles (3.31 kilometers) with an associated ZOI of 34 square kilometers. In the case of certain circumstances that require the presence of an EBRV at the NEG Port to support maintenance and repair activities, the ZOI would be larger for EBRV positioning thruster use. In such cases, existing mitigation and estimates on take for EBRV operation are expected to be sufficient.

6.1.2 Algonquin Pipeline Lateral O&M Activities

Algonquin and Northeast Gateway have analyzed empirical received sound pressure levels collected during specific pipeline construction operations as described in section 1.4.2. The latest calculations, based on received sound pressure levels (see Appendix B and C), estimate the maximum distance of the 120-dB isoplpeth to be approximately 3.2 miles (5.2 kilometers). The maximum ZOI, based on modeling results shown in Figures C9 and C10 in Appendix C, is estimated to be approximately 18.8 square miles (48.6 square kilometers), consistent with NEG Port maintenance and repair activities as stated in section 6.1.1.2. As with NEG Port maintenance and repair activities, the originally modeled sound pressure levels, as published in the Federal Register (Vol. 72, No. 48) on March 13, 2007, estimated the distance of the 120-dB radius to be approximately 2 miles (3.31 kilometers) with an associated ZOI of 34 square kilometers.

6.2 Estimate of Numbers of Marine Mammals that Might be "Taken by Harassment"

On October 20, 2011, NOAA Fisheries also reauthorized the Northeast Gateway Incidental Take Statement (ITS) for the operational period of October 6, 2011 through October 5, 2012. This reauthorization of take was based upon the calculations provided for species in the notice of issuance of the IHA as published in the Federal Register (Vol. 76, No. 196) on October 20, 2011. For consistency, take estimates have been derived utilizing the same estimate methods as provide in the Federal Register (Vol. 76, No. 196) on October 20, 2011, utilizing empirical received sound pressure levels to determine the ensonified area at the 120-dB radius.

6.2.1 Estimate of Potential NEG Port Operational Takes by Harassment

To estimate take for NEG Port operations, estimates of the number of marine mammals that would be exposed to sound levels in excess of 120 dB are determined by multiplying the area of the EBRV's ZOI (53.9 square kilometers) by local marine mammal density estimates, and then multiplying by the estimated EBRV visits per year. In the case of data gaps, a conservative approach was used to ensure the potential number of takes is not underestimated.

NOAA Fisheries originally used data on cetacean distribution within Massachusetts Bay, such as those published by the National Centers for Coastal Ocean Science (NCCOS, 2006), to estimate potential takes of marine mammals species in the vicinity of project area. For consistency, these data sources, and NOAA Fisheries Methods for take calculation, have been used to update NEG Port take estimates based

on the most recent best available data. The NCCOS study used cetacean sightings from two sources: (1) The North Atlantic Right Whale Consortium (NARWC) sightings database held at the University of Rhode Island (Kenney, 2001); and (2) the Manomet Bird Observatory (MBO) database, held at the NOAA Fisheries, Northeast Fisheries Science Center (NEFSC). The NARWC data contained survey efforts and sightings data from ship and aerial surveys and opportunistic sources between 1970 and 2005. The main data contributors included: CETAP, Canadian Department of Fisheries and Oceans, Provincetown Center for Coastal Studies (PCCS), International Fund for Animal Welfare, NOAA's NEFSC, New England Aquarium, WHOI, and the University of Rhode Island. A total of 406,293 miles (653,725 kilometers) of survey track and 34,589 cetacean observations were provisionally selected for the NCCOS study in order to minimize bias from uneven allocation of survey effort in both time and space. The sightings-per-unit-effort (SPUE) was calculated for all cetacean species by month covering the southern Gulf of Maine study area, which also includes the project area (NCCOS, 2006).

The MBO's Cetacean and Seabird Assessment Program (CSAP) was contracted from 1980 to 1988 by NOAA Fisheries NEFSC to provide an assessment of the relative abundance and distribution of cetaceans, seabirds, and marine turtles in the shelf waters of the northeastern United States (MBO, 1987). The CSAP program was designed to be completely compatible with NOAA Fisheries NEFSC databases so that marine mammal data could be compared directly with fisheries data throughout the time series during which both types of information were gathered. A total of 8,383 miles (5,210 kilometers) of survey distance and 636 cetacean observations from the MBO data were included in the NCCOS analysis. Combined valid survey effort for the NCCOS studies included 913,840 miles (567,955 kilometers) of survey track for small cetaceans (dolphins and porpoises) and 1,060,226 miles (658,935 kilometers) for large cetaceans (whales) in the southern Gulf of Maine. The NCCOS study then combined these two data sets by extracting cetacean sighting records, updating database field names to match the NARWC database, creating geometry to represent survey tracklines and applying a set of data selection criteria designed to minimize uncertainty and bias in the data used.

Owing to the comprehensiveness and total coverage of the NCCOS cetacean distribution and abundance study, NOAA Fisheries has calculated the estimated take number of marine mammals based on the most recent NCCOS report published in December 2006 (see NEG Port IHA 2011, Federal Register [Vol. 76, No. 196]; Neptune LNG Letter of Authorization 2011, Federal Register [Vol. 76, No. 113]). For a detailed description and calculation of the cetacean abundance data and SPUE, please refer to the NCCOS study (NCCOS, 2006). These data show that the relative abundance of North Atlantic right, fin, humpback, minke, sei, and pilot whales, and Atlantic white-sided dolphins for all seasons, as calculated by SPUE in number of animals per square kilometer, is 0.0082, 0.0097, 0.0118, 0.0059, 0.0084, 0.0407, and 0.1314, respectively.

In calculating the area density of these species from these linear density data, NMFS used 0.5 mi (0.825 km) as the hypothetical strip width (W). This strip width is based on the distance of visibility used in the NARWC data that was part of the NCCOS (2006) study. However, those surveys used a strip transect instead of a line transect methodology. Therefore, in order to obtain a strip width, one must divide the visibility or transect value in half. Since the visibility value used in the NARWC data was 2.3 mi (3.7 km), it thus gives a strip width of 1.15 mi (1.85 km). The hypothetical strip width used in the analysis is less than half of that derived from the NARWC data, therefore, the analysis provided here is more protective in calculating marine mammal densities in the area. Based on this information, the area density (D) of these species in the project area can be obtained by the following formula:

$$D = SPUE/2W.$$

Based on this calculation method, the estimated take numbers per year for North Atlantic right, fin, humpback, minke, sei, pilot whales, and Atlantic white-sided dolphins by NEG Port maximum operations, which is an average of 65 visits for EBRVS to the Port area per year (or approximately 1.25 visits per week), with vessels' operating thrusters for dynamic positioning before offloading natural gas and before departing from the Port, can be obtained by the following formula:

Estimated Take = D x ZOI x (65)

The resulting take estimates per year for North Atlantic right, fin, humpback, minke, sei, pilot whales, and Atlantic white sided dolphins by the NEG Port facility operations, corrected for 50 percent more marine mammals that may be underwater, are presented in Table 6-1..

Table 6-1 Marine Mammal Density and Estimated Level B Harassment Take Numbers for Maximum NEG Port Capacity

Species	SPUE (No./ km²)	Density (SPUE/2W)	Requested Take Authorization (No.)	Percent Population (%)
North Atlantic Right Whale	0.0082	0.0033	**17**	3.896
Humpback Whale	0.0097	0.0039	**20**	0.176
Fin Whale	0.0118	0.0047	**25**	0.625
Minke Whale	0.0059	0.0024	**13**	0.139
Sei Whale	0.0084	0.0034	**18**	0.015
Pilot Whale	0.0407	0.0163	**86**	0.678
Atlantic White-sided Dolphin	0.1314	0.0526	**276**	1.181

Since it is very likely that individual animals could potentially be “taken” by harassment multiple times, these percentages are the upper boundary of the animal population that could be affected. Therefore, the actual number of individual animals being exposed or taken would be far less. NOAA Fisheries has already determined that there is no danger of injury, death, or hearing impairment from the exposure to these noise levels. In fact, during NEG Port operations to date, no MARU data has indicated any take by harassment, and only a single take by incidental harassment of either a seal or dolphin (species was not identifiable) was reported on February 5, 2009 by the EBRV Explorer while thrusters were engaged. In addition, 65 port visits per year represents the maximum capacity of the Port. While it is Northeast Gateway’s objective is to utilize the Port to the maximum extent permitted, market demand fluctuations determine actual deliveries at the Port on an annual basis. Northeast Gateway has estimated that, based on foreseeable market conditions for the 2014-2015 winter heating season, EBRVs will deliver cargo approximately four times. This represents approximately six percent of the Port’s maximum capacity. While Northeast Gateway is seeking authorization at full capacity to preserve Port operational flexibility, the actual take numbers during reduced operations would be significantly lower, and estimated utilizing the following formula:

Estimated Take = D x ZOI x (4)

During reduced operations, take estimates per year for North Atlantic right, fin, humpback, minke, sei, pilot whales, and Atlantic white sided dolphins by the NEG Port facility operations, corrected for 50 percent more marine mammals that may be underwater, are presented in Table 6-2 for comparison purposes.

Table 6-2 Marine Mammal Density and Estimated Level B Harassment Take Numbers for Reduced Operations at NEG Port

Species	SPUE (No./ km²)	Density (SPUE/2W)	Requested Take Authorization (No.)	Percent Population (%)
North Atlantic Right Whale	0.0082	0.0033	**1**	0.252
Humpback Whale	0.0097	0.0039	**1**	0.011
Fin Whale	0.0118	0.0047	**2**	0.040
Minke Whale	0.0059	0.0024	**1**	0.009
Sei Whale	0.0084	0.0034	**1**	0.001
Pilot Whale	0.0407	0.0163	**5**	0.042
Atlantic White-sided Dolphin	0.1314	0.0526	**17**	0.073

6.2.2 Estimate of Potential NEG Port Maintenance and Repair Takes by Harassment

For NEG Port maintenance/repair, the worst-case scenario, as presented in Table 1-4, has been used as the basis for calculating take using the 120-dB ZOI of approximately 18.8 square miles (48.6 square kilometers). As a conservative measure, and for the sake of consistency, the same data sources and take calculation methods used above for NEG Port operational activities have been used for maintenance and repair estimates. On June 13, 2011, NOAA Fisheries issued a Letter of Authorization (LOA) to Neptune LNG for the take of marine mammals during both operation and maintenance and repair of the Neptune Port facility. As published in the Federal Register (Vol. 76, No. 113), the NOAA Fisheries determined that the evaluation of a 14-day maintenance period was appropriate for evaluating the potential take associated with a maintenance and repair at the Neptune Port Facility. Due to the fact that both the NEG and Neptune Ports are very similar in their potential need for and type of major and minor maintenance and repair of port facilities, we have applied the same average duration of 14 days to calculate the take for NEG Port maintenance and repair activities.

Based on the same calculation method as described above for NEG Port operations (but using the 120-dB ZOI of approximately 18.8 square miles [48.6 square kilometers]), the estimated take numbers by Level B harassment on an annual basis for North Atlantic right, fin, humpback, minke, sei, and pilot whales, and Atlantic white-sided dolphins incidental to NEG Port maintenance and repair activities, corrected for 50 percent more marine mammals that may be underwater, are presented in Table 6-3.

Table 6-3 Marine Mammal Density and Estimated Level B Harassment Take Numbers for NEG Port Maintenance and Repair

Species	SPUE (No./ km²)	Density (SPUE/2W)	Requested Take Authorization (No.)	Percent Population (%)
North Atlantic Right Whale	0.0082	0.0033	**3**	0.754
Humpback Whale	0.0097	0.0039	**4**	0.034
Fin Whale	0.0118	0.0047	**5**	0.121
Minke Whale	0.0059	0.0024	**2**	0.027
Sei Whale	0.0084	0.0034	**3**	0.003
Pilot Whale	0.0407	0.0163	**17**	0.132
Atlantic White-sided Dolphin	0.1314	0.0526	**54**	0.229

These numbers are based on 14 days of repair and maintenance activities occurring annually. It is unlikely however, that this much repair and maintenance work would be required each year at the Port. In the case of certain circumstances that require the presence of an EBRV at the NEG Port to support maintenance

and repair activities, existing mitigation and estimates on take for EBRV operation are expected to be sufficient.

6.2.3 Estimate of Potential Algonquin Pipeline Lateral Takes by Harassment

For Algonquin Pipeline Lateral maintenance and repair activities, the worst-case scenario, as presented in Table 1-4, has been used as the basis for calculating take. As a conservative measure, and for the sake of consistency, the same data sources and take calculation methods used above for NEG Port O&M activities have been used for Algonquin Pipeline Lateral maintenance and repair estimates. Algonquin expects that no more than one repair will be required in any given year. If a DP rather than an anchored vessel is used to complete the repair, thruster use will occur at varying sound levels as necessary for the vessel to hold its position for up to 40 work days, as a worst-case estimate, with operations expected to be occurring up to 24 hours per day 7 days per week. Accordingly, during a repair of the Algonquin Pipeline Lateral, marine mammals could be exposed to sound levels above 120 dB for a maximum period of potential harassment of up to 40 days (up to 960 hours) over the course of one operating year.

Based on the same calculation method as described above for NEG Port operations (but using the 120-dB ZOI of approximately 18.8 square miles [48.6 square kilometers]), the estimated take numbers by Level B harassment on an annual basis for North Atlantic right, fin, humpback, minke, sei, and pilot whales, and Atlantic white-sided dolphins incidental to Algonquin Pipeline Lateral maintenance and repair activities, corrected for 50 percent more marine mammals that may be underwater, are presented in Table 6-4.

Table 6-4 Marine Mammal Density and Estimated Level B Harassment Take Numbers for Algonquin Pipeline Lateral Maintenance and Repair

Species	SPUE (No./ km²)	Density (SPUE/2W)	Requested Take Authorization (No.)	Percent Population (%)
North Atlantic Right Whale	0.0082	0.0033	**10**	1.804
Humpback Whale	0.0097	0.0039	**11**	0.082
Fin Whale	0.0118	0.0047	**14**	0.289
Minke Whale	0.0059	0.0024	**7**	0.064
Sei Whale	0.0084	0.0034	**10**	0.007
Pilot Whale	0.0407	0.0163	**47**	0.315
Atlantic White-sided Dolphin	0.1314	0.0526	**153**	0.549

These numbers are based on 40 days of repair and maintenance activities occurring annually. It is unlikely however, that this much repair and maintenance work would be required each year for the Algonquin Pipeline Lateral.

7.0 EFFECTS TO MARINE MAMMAL SPECIES OR STOCKS

Consideration of negligible impact is required for the NOAA Fisheries to authorize the incidental take of marine mammals. In 50 CFR § 216.103, the NOAA Fisheries defines negligible impact to be “an impact resulting from a specified activity that cannot be reasonably expected to, and is not reasonably likely to, adversely affect the species or stocks [of marine mammals] through effects on annual rates of recruitment or survival.” Based upon best available data regarding the marine mammal species (including density, status, and distribution) that are likely to occur in the NEG Port and Algonquin Pipeline Lateral area as well as in-field acoustic assessment surveys of NEG Port activities, Northeast Gateway and Algonquin conclude that exposure to marine mammal species and stocks due to NEG Port and Algonquin Pipeline

Lateral operations would result in short-term minimal effects and would not likely affect the overall annual recruitment or survival for the following reasons:

- As evidenced in section 1.4 and Appendices B and C, potential acoustic exposures from NEG Port and Algonquin Pipeline Lateral activities are within the non-injurious behavioral effects zone (Level B harassment);
- The potential for take as estimated in section 6.2 represent conservative estimates of harassment based upon worst-case operating and maintenance/repair scenarios without taking into consideration the effects of standard mitigation and monitoring measures; and
- The protective measures as described in sections 11.0 and 13.0 and Appendix A are designed to minimize the potential for interactions with and exposure to marine mammals.

8.0 MINIMIZATION OF ADVERSE EFFECTS TO SUBSISTENCE USES

There are no traditional subsistence hunting areas in the NEG Port or Algonquin Pipeline Lateral area.

9.0 EFFECTS TO MARINE MAMMALS FROM LOSS OR MODIFICATION OF HABITAT AND THE LIKELIHOOD OF RESTORATION

NEG Port and Algonquin Pipeline Lateral operations are not likely to change over the next year. On December 10, 2012, the USCG issued the NEG Port EIA regarding water usage levels at the Port. Effects to marine mammals form loss or modification of habitat, updated to include the requested water use scenario for the NEG Port, are discussed in the following sections.

9.1 NEG Port Operations

Operation of the NEG Port will not result in short-term effects; however, long-term effects on the marine environment, including alteration of the seafloor conditions, continued disturbance of the seafloor, regular withdrawal of sea water, and regular generation of underwater noise, will result from Port operations. Specifically, a small area (0.14 acre) along the Pipeline Lateral has been permanently altered (armored) at two cable crossings. In addition, the structures associated with the NEG Port (flowlines, mooring wire rope and chain, suction anchors, and pipeline end manifolds) occupy 4.8 acres of seafloor. An additional area of the seafloor of up to 43 acres (worst case scenario based on severe 100-year storm with EBRVs occupying both STL buoys) will be subject to disturbance due to chain sweep while the buoys are occupied.

EBRVs are currently authorized to withdraw an average of 4.97 million gallons per day (mgd) and 2.6 billion gallons per year of sea water for general ship operations during it cargo delivery activities at the NEG Port. However, on December 10, 2012, the MARAD and USCG issued a final EIA regarding Northeast Gateway's requested changes for water use including

- 11 billion gallons of total annual water use at the Port;
- Maximum daily intake volume of up to 56 million gallons per day (mgd) at a rate of 0.45 feet per second when an EBRV is not able to achieve the HRS mode of operation; and,
- Maximum daily change in discharge temperature of 12ºC (21.6ºF) from ambient from the vessel's main condenser cooling system.

Under the requested water-use scenario, the estimated annual loss of 3,000 kilograms of phytoplankton biomass per year (8.2 kilograms per day) will result in the estimated loss of about 300 kilograms per year

(0.8 kilograms per day) of zooplankton, and 30 kilograms per year (0.08 kilograms per day) of small planktivorous fish such as Atlantic herring. Loss of zooplankton biomass is about 1,500 kilograms per year (4.1 kilograms per day), resulting in loss of about 150 kilograms per year (0.4 kilograms per day) of planktivorous fish. The loss of zooplankton represents a direct impact to whales and the trophic transfer to planktivorous fish represents an indirect impact; however, these losses are minor relative to the total biomass of these trophic levels in Massachusetts Bay. Additionally, the estimated losses of ichthyoplankton are not significant given the very high natural mortality of ichthyoplankton.

The results of a prey consumption model based on the requested water-use scenario of 56 mgd have been presented in the USCG EIA. Estimates of daily consumption by a single whale range from 400 kilograms for a sei whale to 1 metric ton for a fin whale using a higher body weight estimate. Annual consumption estimates for a single whale range from 25 to 244 metric tons, and annual consumption estimates for the entire Massachusetts Bay or northeastern U.S. populations range upward to tens or hundreds of thousands of metric tons. Those rates dwarf any reasonable estimates of prey removals by NEG Port operations, which therefore must be considered as negligible.

Consideration has also been given to the long–term consequences of NEG Port operation on prey removal for whales and the downstream effects this removal could have on the distribution of prey items outside of the project area. As the Maine Coastal Current passes through the NEG Port area, prey items are carried downstream and distributed to known foraging grounds of whales in Massachusetts Bay and Cape Cod Bay and Stellwagen Bank. Even if the daily transport rates for the Maine Coastal Current vary by an order of magnitude above and below the average, the proportion of the flow withdrawn would still be a fraction of one percent at the lowest current flows. The interannual variability in abundance of each of the primary prey stocks for endangered whales in the region—large copepods, sand lance, and herring—are all much more than a few percent, therefore the short- and long-term impacts of removals would be undetectable against normal variability.

None of the prey-related distributional shifts analyzed in the USCG EIA resulted in any detectable change in mortality rates of whale stocks. In only one case has a potential impact of variability in prey resources on life-history parameters of a whale population in the western North Atlantic been identified. Greene et al. (2003) correlated patterns in the North Atlantic Oscillation Index, an index of slope water temperature for the Gulf of Maine region, a normalized index of *C. finmarchicus* abundance across the entire Gulf of Maine, and the numbers of calves born each year in the western North Atlantic right whale stock. The working hypothesis is that low copepod densities across most or all of the feeding range of the right whales, while not sufficiently low to increase mortality (i.e., cause starvation), may be insufficient to support increased feeding rates by adult females that are trying to recover blubber-lipid stores between calves (Greene et al. 2003; Greene and Pershing 2004; Kenney 2007). The effect would be to increase the resting time between calves and the inter-birth interval, as was observed during the 1990s (Kraus et al. 2001).

If background variability in prey abundance is orders of magnitude greater than changes that might potentially be caused by NEG Port operations, and if substantial variability in prey resources across the entire Gulf of Maine area causes only variation in calving intervals of one of the whale species, any small effect of NEG Port operations on whale distributions or demographics cannot possibly be detectable.

Approximately 4.8 acres of seafloor has been converted from soft substrate to the artificial hard substrate of the structures associated with the NEG Port. An additional area of up to 38 acres is subject to disturbance due to chain sweep while the buoys are occupied by the EBRVs. Given the relatively small

size of the NEG Port area that will be directly affected by Port operations (see section 1.2), Northeast Gateway does not anticipate that habitat loss will be significant. In addition, the possible removal benthic or planktonic species, resulting from the relatively minor EBRV water use requirements while at port, is unlikely to affect in a measurable way the food sources available to marine mammals. At the end of the useful life of the NEG Port (approximately 40 years), the Port facilities will be removed and or abandoned in place, in compliance with all applicable and appropriate regulations, guidelines, and technologies in place at that time to ensure habitat integrity.

9.2 NEG Port Maintenance

As stated in section 1.3.2, the NEG Port will require scheduled maintenance inspections using either divers or ROVs. The duration of these inspections are not anticipated to be more than two 8-hour working days. An EBRV will not be required to support these annual inspections. Air emissions would be limited to the diver/ROV support vessel. Emissions associated with these vessels have been previously calculated and evaluated in the Massachusetts Conformity Determination during the licensing of the Project (Section A.2, p. 18).

Water usage would be limited to the standard requirements of NEG's normal support vessel. As with all vessels operating in Massachusetts Bay, sea water uptake and discharge is required to support engine cooling, typically using a once-through system. The rate of seawater uptake varies with the ship's horsepower and activity and therefore will differ between vessels and activity type. For example, the Gateway Endeavor is a 90-foot vessel powered with a 1,200 horsepower diesel engine with a four-pump seawater cooling system. This system requires seawater intake of about 68 gallons per minute (gpm) while idling and up to about 150 gpm at full power. Use of full power is required generally for transit. A conservatively high estimate of vessel activity for the Gateway Endeavor would be operation at idle for 75 percent of the time and full power for 25 percent of the time. During the routine activities this would equate to approximately 42,480 gallons of seawater per 8-hour work day. When compared to the engine cooling requirements of an EBRV over an 8-hour period (approximately 18 million gallons), the Gateway Endeavour uses about 0.2 percent of the EBRV requirement. To put this water use into context, potential effects from the waters-use scenario of 56 mgd have been concluded to be orders of magnitude less than the natural fluctuations of Massachusetts Bay and Cape Cod Bay and not detectable. Water use by support vessels during routine port activities would not materially add to the overall impacts. Additionally, discharges associated with the Gateway Endeavor and/or other support/maintenance vessels that are 79 feet or greater in length, are now regulated under the Clean Water Act (CWA) and must receive and comply with the EPA Vessel General Permit (VGP). The permit incorporates the USCG mandatory ballast water management and exchange standards, and provides technology- and water quality-based effluent limits for other types of discharges, including deck runoff, bilge water, graywater, and other pollutants. It also establishes specific corrective actions, inspection and monitoring requirements, and recordkeeping and reporting requirements for each vessel.

Certain maintenance and repair activities may also require the presence of an EBRV at the Port. Such instances may include maintenance and repair on the STL Buoy, vessel commissioning, and any onboard equipment malfunction or failure occurring while a vessel is present for cargo delivery. Because the requested water-use scenario allows for daily water use of up to 56 mgd (see section 9.1) to support standard EBRV requirements when not operating in the HRS mode, vessels will be able to remain at the Port as necessary to support all such maintenance and repair scenarios. This minimizes the need for frequent transit to and from the Port and the use of thrusters to support mooring and unmooring activities,

thereby minimizing, proportionally, the potential for vessel strike and acoustic harassment of marine mammals and sea turtles from Port activities.

9.3 Unanticipated Algonquin Pipeline Lateral Maintenance and Repair

As stated in section 1.3.3, proper care and maintenance of the Algonquin Pipeline Lateral should minimize the likelihood of an unanticipated maintenance and/or repair event; however, unanticipated activities may occur from time to time if facility components become damaged or malfunction. Unanticipated repairs may range from relatively minor activities requiring minimal equipment and one or two diver/ROV support vessels to major activities requiring larger construction-type vessels similar to those used to support the construction and installation of the facility. Air emissions would be limited, ranging from a diver/ROV support vessel to construction-type vessles. Emissions associated with these vessels have been previously calculated and evaluated in the Massachusetts Conformity Determination during the licensing of the Project (Section A.2, p. 18).

Major repair activities, although unlikely, may include repairing or replacement of pipeline manifolds or a section of the Pipeline Lateral. This type of work would likely require the use of large specialty construction vessels such as those used during the construction and installation of the NEG Port and Algonquin Pipeline Lateral. The duration of a major unplanned activity would depend upon the type of repair work involved and would require careful planning and coordination.

Turbidity would likely be a potential effect of Algonquin Pipeline Lateral maintenance and repair activities on listed species. In addition, the possible removal benthic or planktonic species, resulting from relatively minor construction vessel water use requirements, as measured in comparison to EBRV water use, is unlikely to affect in a measurable way the food sources available to marine mammals. Discharges associated with maintenance and repair vessels that are 79 feet or greater in length, are now regulated under the CWA and must receive and comply with the EPA VGP. The permit incorporates the USCG mandatory ballast water management and exchange standards, and provides technology- and water quality-based effluent limits for other types of discharges, including deck runoff, bilge water, graywater, and other pollutants. It also establishes specific corrective actions, inspection and monitoring requirements, and recordkeeping and reporting requirements for each vessel.

At the end of its useful life (approximately 40 years), the Algonquin Pipeline Lateral will be removed and or abandoned in place, in compliance with all applicable and appropriate regulations, guidelines, and technologies in place at that time to ensure habitat integrity.

10.0 THE EFFECTS OF HABITAT LOSS OR MODIFICATION ON MARINE MAMMALS

As stated above, approximately 4.8 acres of seafloor has been converted from soft substrate to artificial hard substrate. The soft-bottom benthic community may be replaced with organisms associated with naturally occurring hard substrate, such as sponges, hydroids, bryozoans, and associated species. The benthic community in the up to 43 acres (worst case scenario based on severe 100-year storm with EBRVs occupying both STL buoys) of soft bottom that may be swept by the anchor chains while EBRVs are docked will have limited opportunity to recover, so this area will experience a long-term reduction in benthic productivity. In addition, disturbance from anchor chain movement would result in increased turbidity levels in the vicinity of the buoys that could affect prey species for marine mammals; however, as indicated in the final EIS/EIR, these impacts are expected to be short-term, indirect, and minor.

Daily removal of sea water from EBRV intakes will reduce the food resources available for planktivorous organisms. Massachusetts Bay circulation will not be altered, however, so plankton will be continuously transported into the NEG Port area. The removal of these species is minor and unlikely to affect in a measurable way the food sources available to marine mammals.

As discussed in section 9.2, planned maintenance activities at the NEG Port will result in sea water intakes and therefore removal of planktivorous organisms. The removal of these species is minor and unlikely to affect in a measurable way the food sources available to marine mammals.

Maintenance and repair activities for the Algonquin Pipeline Lateral, as discussed in section 9.3, will result in increased levels of turbidity which can interfere with the ability of whales to forage effectively by obscuring visual detection of or dispersing potential prey. Disturbance of the seafloor through jetting, laybarge anchoring, and other repair activities can also release contaminated sediments back into the water column, thus exposing marine organisms to contaminants that were previously attached to sediment particles. Although increased turbidity may cause displacement of whales or their prey, displacement will be temporary, and whales are likely to find suitable prey in surrounding areas. Additionally, any possible removal benthic or planktonic species, resulting from relatively minor construction vessel water use requirements, as measured in comparison to EBRV water use, is unlikely to affect in a measurable way the food sources available to marine mammals.

11.0 MEANS OF AFFECTING THE LEAST PRACTICABLE IMPACT UPON EFFECTED SPECIES OR STOCKS

Northeast Gateway and Algonquin have committed to a comprehensive set of mitigation measures during operation as well as on-going consultations with NOAA Fisheries. These measures include:

- Passive acoustics program
- Visual monitoring program
- Safety zones
- Reporting
- Vessel speed restrictions
- Ramp-up procedures

To date, these mitigation and monitoring activities have successfully safeguarded marine mammals and sea turtles, resulting in a total of only 1 take by acoustic harassment over the past 3 years of operation. This number is well within the yearly permitted number of level B harassment takes for operational activities listed in the current IHA (as issued on October 6, 2011) and ITS (as issued on October 20, 2011) of 5 right, 5 fin, and 15 humpback whales. With these mitigation in place, NEG Port and Algonquin Pipeline Lateral O&M activities will likely result in no change to underwater noise impacts from those evaluated and currently mitigated for per the requirements of Northeast Gateway's permits. However, to ensure the continued protection of marine mammals and sea turtles in the NEG Port and Algonquin Pipeline Lateral area during all maintenance and repair events, Northeast Gateway has provided a revised MMDMRP and a revised Prevention, Monitoring and Mitigation Program (PMMP) as Appendix A and K, respectively. The revised MMDMRP and PMMP adapt the approved strategies for minimizing and avoiding impacts to marine resources developed for construction to minimize/avoid impact during potential future maintenance and repair activities, including the use of DP vessels. Monitoring and reporting for these activities is discussed in further detail in section 13.0.

12.0 THE EFFECTS OF NEG PORT ACTIVITIES ON SPECIES OR STOCK OF MARINE MAMMALS AVAILABLE FOR ARCTIC SUBSISTENCE USES

Potential impacts to species or stocks of marine mammals will be limited to individuals of marine mammal species located of the Northeast Region of the United States, and will not affect Arctic marine mammals. Given that the NEG Port is not located in Arctic waters, the activities associated with the NEG Port will not have an adverse effect on the availability of marine mammals for subsistence uses allowable under the MMPA. It is Northeast Gateway's intent to apply for an IHA to be issued for NEG Port operational activities.

13.0 MONITORING AND REPORTING

Beginning in April 2007, Northeast Gateway monitored the noise environment in Massachusetts Bay in the vicinity of the NEG Port and Algonquin Pipeline Lateral using an array of 19 MARUs to collect data during the preconstruction and active construction phases of the NEG Port and Algonquin Pipeline Lateral. As a condition of the Deepwater Port License, the MARU array remained in place for a period of five years following the commissioning of the NEG Port. The five-year stipulated period of operation of the MARU array for the NEG Port expired in February 2013. This, coupled with the transfer of operational responsibility of the MARU array to Neptune LNG, who suspended operation of their Deepwater Port on June 26, 2013, which lead to the removal of the MARU array in July 2013.

The MARUs collected archived noise data and were not designed to provide real-time or near-real-time information about vocalizing whales. The acoustic data collected by the MARUs were analyzed by the Bioacoustics Research Program (BRP) at Cornell University to document the seasonal occurrences and overall distributions of whales (primarily fin, humpback, and right whales) within approximately 10 nautical miles of the NEG Port, and to measure and document the noise "budget" of Massachusetts Bay so as to eventually assist in determining whether an overall increase in noise in the Bay associated with the NEG Port and Algonquin Pipeline Lateral might be having a potentially negative impact on marine mammals. This analysis included periods of NEG Port deliveries and commissioning during the winter heating season and data still available by request to the BRP. Although the majority of the hydrophones were positioned outside the insonified area during operational events at the Port, received sound levels from the closest units provided a good indication of the acoustic footprint of the NEG Port during the winter season.

Continued monitoring utilizing the MARU array is no longer warranted for a number of reasons, including:

1. The MARU array system was designed for monitoring for the maximum operational scenario with the NEG Port receiving 65 cargo deliveries per year. Anticipated deliveries to the Port during the next year will be significantly smaller scale and though dependent on market rates, will likely confined to the winter heating season,

2. The purpose of the MARU data was principally intended to determine the daily occurrence of acoustically active fin whales, humpback whales, and right whales with nineteen MARUs deployed. A secondary purpose was to evaluate the extent to which operations sounds were evident throughout the region and the relative contribution of those sounds to the acoustic environment in the region. In that regards, the majority of the MARUs were positioned at separation distances too large to meet this secondary objective. In comparison, the revised hydroacoustic monitoring program is intended to provide empirical measurements of specific

operational and maintenance events and provide groundtruthing of the acoustic model algorithms employed. By targeting these specific events, and positioning sensors within the water column in proximity to the Port, the resultant dataset should provide a clearer picture of the actual acoustic footprint and extents of the Port.

3. The static recorders and realtime hydrophone arrays that will be employed in the updated hydroacoustic monitoring program are purposely designed specifically for empirical measurement and recording of underwater sound. With National Institute of Standards and Technologies (NIST) traceable calibration certificates for the entire measurement chain, the data will provide an absolute measurement that received sound levels ensuring the highest degree of accuracy presently possible for an offshore measurement program.

Nevertheless, at the request of NOAA Fisheries, NEG has developed a proposed field program to measure underwater sound during the initial EBRV delivery for the 2014 winter season in place of the MARUs. Moreover, NEG proposes additional long-term monitoring should anticipated deliveries exceed 5 shipments in a 30-day period or over 20 shipments in a six-month period. The overall intent of the proposed hydroacoustic monitoring program is to provide better information for both regulators and the general public regarding the acoustic footprint associated with operation of the NEG Port in Massachusetts Bay. The modeled underwater acoustic impacts presented in the IHA relied primarily on estimated source levels derived from the similar vessels and operations. This proposed monitoring plan will measure the actual sound levels that are introduced into the underwater environment, reducing uncertainty associated with source levels used as modeling inputs for the analysis presented in the IHA. Underwater noise monitoring will be conducted to obtain a representative acoustic signature of vessel transit, docking, maintenance, onboard regasification operational scenarios, and maintenance activities. The underwater noise monitoring program will include both a digital sound recording and real-time analysis of received sound pressure levels and has been specifically developed for the NEG Port and Energy EBRVs calling at the Port.

NEG will conduct the short-term hydroacoustic monitoring to document sound levels during the initial operational event for the 2014-2015 heating season. In addition, the short-term hydroacoustic monitoring will be utilized for any maintenance or repair activities with the potential to result in significant noise levels (i.e. DP thrusters) or for any delivery that may occur outside the identified winter heating season. Autonomous Marine Recording (AMAR) units will be deployed one day prior to the identified monitoring events and retrieved one day after these events, utilizing a vessel similar to that described for MARU deployment and retrieval. Information pertaining to forecasted delivery levels at or above the stated trigger will be provided to NEG in advance, giving adequate time for monitoring systems to be put in place prior to the first forecasted delivery event. The field monitoring program will be used to field verify actual distances to thresholds and these values will be compared to the impact distances predicted from modeling. The revised Hydroacoustic Monitoring Protocol has been included as part of Appendix A of this application.

Northeast Gateway shall continue to deploy 10 ABs within the TSS for the operational life of the NEG Port. A description of the ABs can be found in Appendix A of this application. The purpose of the ABs shall be to detect a calling North Atlantic right whale an average of 5 nautical miles from each AB (detection ranges will vary based on ambient underwater conditions). The AB system shall be the primary detection mechanism that alerts the EBRV Master and/or NEG Port and Algonquin Pipeline Lateral support vessel captains to the occurrence of right whales, heightens EBRV or NEG Port and Algonquin

support vessel awareness, and triggers necessary mitigation actions as described in the PMMP included as Appendix K of this application.

Northeast Gateway has engaged Tetra Tech as the consultants for developing, implementing, collecting, and analyzing the acoustic data; reporting; and providing oncall hydroacoustic monitoring services. Northeast Gateway continues to utilize Cornell University's BRP and the WHOI as the consultants for developing, implementing, collecting, and analyzing the acoustic data; reporting; and maintaining the AB acoustic monitoring system.

Further information detailing the deployment and operation of AMAR hydroacoustic monitoring program centered on the terminal site and the 10 ABs that are to be placed at approximately 5-mile intervals within the recently modified TSS can be found in the MMDMRP included as Appendix A of this application.

In summary, the accuracy of the acoustic model predictions for the Project is limited by the quality of the sound source data employed and the accuracy of predictive calculations. The proposed hydroacoustic monitoring program is designed to document sound levels in proximity to the NEG Port where the signatures are strongest, with data collected varying depths and distances enabling three-dimensional acoustic mapping and subsequent acoustic model benchmarking. The proposed hydroacoustic measurement program will be used to acoustically map port operations and will result in much higher accuracy for subsequent site specific modeling and sound propagation calculations. We are confident that the acoustic data collected during the initial EBRV delivery and subsequent maintenance events will provide all the necessary data for use in future acoustic modeling, impact assessment, and permitting efforts for the NEG Port. If however, further changes to the NEG Port occur that represent significant changes to operational conditions, or if the a an EBRV delivery is made outside the normal winter heating season, this will be regarded as an opportunity to conduct additional measurements providing further model validation to determine seasonal effects.

14.0 RESEARCH

Previous research for Northeast Gateway is associated with monitoring the noise environment in Massachusetts Bay in the vicinity of the NEG Port using an array of 19 MARUs that were deployed initially in April 2007 and have recently ended the five-year stipulated period of operation. Northeast Gateway will continue to monitor the noise environment in Massachusetts Bay in the vicinity of the NEG Port during the initial delivery of LNG to the NEG Port in 2014. As stated in Section 13, received sound levels from the closest MARU has provided an adequate indication of the acoustic footprint of the NEG Port during the winter season.

Because basic operations at the Port are not changing, and at the direction of NOAA Fisheries, the IHA Application was developed to closely follow the application approved by NOAA Fisheries on October 6, 2011. Cornell University's BRP and the WHOI worked closely with Northeast Gateway to develop and implement the original acoustic monitoring program. BRP and WHOI are also responsible for collecting and analyzing the acoustic data, reporting, and maintaining the acoustic monitoring system. BRPs 2009 Operational was submitted on February 8, 2011. The final reports from BRP for 2010 and 2011 are pending and will be provided to agencies.

Further information regarding the deployment and operation of the AMAR units and the 10 ABs is detailed in section 13 of this application and in the MMDMRP included as Appendix A of this application.

15.0 LIST OF PREPARERS

Timothy Feehan
Tetra Tech, Inc.
Environmental Scientist, Project Manager

Jennifer Daniels
Tetra Tech, Inc.
Environmental Scientist

Erik Kalapinski
Tetra Tech, Inc.
Acoustics Group Lead

16.0 REFERENCES

ACSonline (American Cetacean Society). 2004. "Cetacean Fact Pack." Site visited February 12, 2005. http://www.ACSonline.org/factpack/index.html

ASA. 2005. Galagan, C. and Isaji, T. Sediment Transport Study for Northeast Gateway Pipeline Lateral Project in Massachusetts Bay. Draft Report, October 2005. Applied Science Associates, Inc., Narragansett, RI. Project 05-178.

Blaylock, R.A., J.W. Hain, L.J. Hansen, D.L. Palka, and G.T. Waring. 1995. U.S. Atlantic and gulf of Mexico Marine Mammal Stock Assessments. NOAA Technical Memorandum NOAA Fisheries-SEFSC-363.

Bulloch, D.K. 1993. The Whale-Watcher's Handbook, A Field Guide to the Whales, Dolphins, and Porpoises of North America.

CETAP. 1982. A characterization of marine mammals and turtles in the mid- and north Atlantic areas of the U.S. outer continental shelf. Cetacean and Turtle Assessment Program, University of Rhode Island. Final Report #AA551-CT8-48 to the Bureau of Land Management, Washington, DC, 538 pp.

Cornell University Bioacoustics Research Program (BRP). 2011. Draft Marine Mammal Acoustic Monitoring and Analysis for the Operations of the Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral 01 January – 06 December 2009. Cornell University Bioacoustics Research Program Technical Report 09-09.

Corkeron, P.J. 1995. "Humpback whales (*Megaptera novaeangliae*) in Hervey Bay, Queensland behavior and responses to whale-watching vessels." Canadian Journal of Zoology 73(7): 1290-1299.

EPA (United States Environmental Protection Agency). 1993. Assessment of Potential Impact of the MWRA Outfall on Endangered Species. United States Environmental Protection Agency, Region I, Boston, Massachusetts. 205 pp.

Garrison, L.P. 2003. Estimated Bycatch of Marine Mammals and Turtles in the U.S. Atlantic Pelagic Longline Fleet During 2001-2002. NOAA Technical Memorandum NOAA FISHERIES-SEFSC-515: 52 p.

Glass, A.H., T.V.N Cole, M. Garron, R.L. Merrick, and R.M. Pace III. 2008. Mortality and serious injury determinations for baleen whale stocks along the United States eastern seaboard and adjacent Canadian Maritimes, 2002-2006. U.S. Department of Commerce, Northeast Fisheries Science Center Ref Doc. 08-04; 18 p. Available from: National Marine Fisheries Service, 166 Water Street, Woods Hole, MA 02543-1026.

Greene, C.H., and A.J. Pershing. 2004. Climate and the conservation biology of North Atlantic right whales: the right whale at the wrong time? Frontiers in Ecology and the Environment 2: 29-34.

Greene, C.H., A.J. Pershing, R.D. Kenney, and J.W. Jossi. 2003. Impact of climate variability on the recovery of endangered North Atlantic right whales. Oceanography 16(4): 98-103.

Jahoda M., C.L. Lafortuna, N. Biassoni, C. Almirante, A. Azzellino, S. Panigada, M. Zanardelli, G.N. Di Sciara. 2003. "Mediterranean fin whale's (*Balaenoptera physalus*) response to small vessels and biopsy sampling assessed through passive tracking and timing of respiration." Marine Mammal Science 19(1): 96-110.

Jensen, A.S. and G.K. Silber. 2004. Large Whale Ship Strike Database. U.S. Department of Commerce, NOAA Technical Memorandum. NOAA Fisheries-OPR-, 37 pp.

Katona, S.K., J. A. Beard, P. E. Girton, and F. Wenzel. 1988. Killer whales (*Orcinus oirca*) from the Bay of Fundy to the equator, including the Gulf of Mexico. Rit Fiskideild. 11:205- 224.

Katona, S.K., V.R. Rough, and D. Richardson. 1993. A Field Guide to the Whales and Seals from Cape Cod to Newfoundland. 4th Edition, revised. Smithsonian Institution Press, Washington, D.C.

Kelly, J.R. 1995. Water Column Monitoring in Massachusetts and Cape Cod Bays: Annual Report for 1994. MWRA Environmental Quality Dept. (ENQUAD) Technical Report Series No. 95-17. Massachusetts Water Resources Authority, Boston, Massachusetts.

Kenney, R.D. 2007. Right whales and climate change: Facing the prospect of a greenhouse future. Pp. 436-459 in: S.D. Kraus and R.M. Rolland (eds). The Urban Whale: North Atlantic Right Whales at the Crossroads. Cambridge, MA: Harvard University Press.

Kenney, R. D. 1990. Bottlenose dolphins off the northeastern United States. Pp. 369–396 in: S. Leatherwood and R. R. Reeves, eds. The Bottlenose Dolphin. Academic Press, San Diego, CA.

Kenney, R.D. and H.E. Winn. 1986. Cetacean high-use habitats of the northeast United States continental shelf. Fishery Bulletin 84(2): 345-357.

Knowlton A.R. and S.D. Kraus. 2001. "Mortality and serious injury of northern right whales (*Eubalaena glacialis*) in the western North Atlantic Ocean". Journal of Cetacean Research and Management, Special Issue 2:193-208.

Kraus, S.D., P.K. Hamilton, R.D. Kenney, A.R. Knowlton, and C.K. Slay. 2001. Reproductive parameters of the North Atlantic right whale. Journal of Cetacean Research and Management, Special Issue 2: 231-236.

Marine Mammal Center. 2002. "Harbor Seal." Site visited February 21, 2005. Accessed at: http://www.tmmc.org/learning/education/pinnipeds/harborseal.asp

Morris, P. 2004. "Gray seal (eastern Atlantic population) (Halichoerus grypus)". Site visited February 21, 2005. http://www.arkive.org/species/ARK/mammals/Halichoerus_grypus/more_info.html

NAI (Normandeau Associates Inc.) 2010. Seabrook Station 2009 Environmental Monitoring in the Hampton-Seabrook Area: A Characterization of Environmental Conditions. Prepared for Nextera Energy Seabrook LLC.

Nelson, M., M. Garron, R.L. Merrick, R.M. Pace and T.V.N. Cole. 2007. Mortality and serious injury determinations for large whale stocks along the United States Eastern Seaboard and Adjacent Canadian Maritimes, 2001-2005. U. S. Dep. Commer., Northeast Fish. Sci. Cent. Ref. Doc. 07-05. 18 pp.

Northeast Gateway. 2007. Northeast Gateway Marine Mammal Monitoring Weekly Reports.

Northeast Gateway. 2008. Northeast Gateway Marine Mammal Monitoring Weekly Reports.

Northeast Gateway. 2009. Northeast Gateway Marine Mammal Monitoring Weekly Reports.

Northeast Gateway. 2010. Northeast Gateway Marine Mammal Monitoring Weekly Reports.

NOAA Fisheries (National Oceanic and Atmospheric Administration, National Marine Fisheries Service). 1991a. Recovery Plan for the Northern Right Whale (*Eubalaena glacialis*). Prepared by the Right Whale Recovery Team for the National Marine Fisheries Service", Silver Spring, Maryland. 86 pp.

NOAA Fisheries. 1991b. Recovery Plan for the Humpback Whale (*Megaptera novaeangliae*). Prepared by the Humpback Whale Recovery Team for the National Marine Fisheries Service", Silver Spring, Maryland. 105 pp.

NOAA Fisheries. 2005. "How_when_and_what". Site visited February 11, 2005. http://www.NOAA Fisheries.noaa.gov/ pr/PR2/Conservation_and_Recovery_Program/msr/How,%20when%20and%20what.htm

NOAA (National Oceanic and Atmospheric Administration). 1993. *Stellwagen Bank Management Plan and Final Environmental Impact Statement*. http://stellwagen.noaa.gov/management/1993plan.html.

NOAA. 1999. "Small Takes of Marine Mammals Incidental to Specified Activities; Seismic Hazards Investigation in Southern California," Federal Register 64 (No 112).

NOAA. 2005. "Endangered Fish and Wildlife; Notice of Intent to Prepare an Environmental Impact Statement" Federal Register: January 11, 2005 (Volume 70, Number 7).

NOAA. 2006. "Small Takes of Marine Mammals Incidental to Specified Activities; Rim of the Pacific (RIMPAC) Antisubmarine Warfare (ASW) Exercise Training Events Within the Hawaiian Islands Operating Area (OpArea)," Federal Register 71 (No.78).

NOAA. 2008. Taking of Marine Mammals Incidental to Specified Activities; Operation of an LNG Facility in Massachusetts Bay. U.S. Department of Commerce, NOAA Document RIN 0648-XG25, Federal Register Document ID FR27MR08-27.

Nowak, R.M. 2002. Walker's Mammals of the World 6th edition. John Hopkins University Press, Baltimore, MD.

Reeves, R.R. G.K. Silber and P.M. Payne. 1998. "Draft recovery plan for the Fin Whale (Balaenoptera physalus) and Sei Whale (Balenoptera borealis)." Office of Protected Resources, National Marine Fisheries Service, Silver Spring, MD. 65pp.

Reeves, R.R., B.S. Stewart, P.J. Clapham, J.A. Powell. 2002. Guide to Marine Mammals of the World. National Audubon Society.

Richardson, W.J. et al. 1995. Marine Mammals and Noise.Academic Press, San Diego, California.

Rough, V. 1995. Gray Seals in Nantucket Sound, Massachusetts, Winter and Spring, 1994. Final Report to Marine Mammal Commission in Fulfillment of Contract T10155615.

Schulkin, M. and Mercer, J.A. 1985. "Colossus Revisited: A Review and Extension of the Marsh-Schulkin Shallow Water Transmission Loss Model," University of Washington Applied Physics Laborotory, APL-UW 8508.

Stevick, P.T., L. Pacheco de Godoy, M. McOsker, M.H. Engel, J. Allen. 2006. A note on the movement of a humpback whale from Abrolhos Bank, Brazil to South Georgia. J Cetacean Res Manage 8:297-300

Sumich, J.L. 1988. An Introduction to the Biology of Marine Life. 7th Edition. Dubuque, IA: Wm. C Brown Publishing.

Waring, G., E. Josephson, K. Maze-Foley, and P.E. Rosel (eds). 2013. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2012, 419 pages. Available at: www.nmfs.noaa.gov/pr/sars/pdf/ao2012.pdf.

Waring, G., E. Josephson, K. Maze-Foley, and P.E. Rosel (eds). 2011. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments - 2011, 330 pages. Available at: http://www.nmfs.noaa.gov/pr/pdfs/sars/ao2011.pdf.

Waring GT, Josephson E, Maze-Foley K, and Rosel PE, editors. 2010. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2009. NOAA Tech Memo NOAA Fisheries NE 213; 528 p.

Waring GT, Josephson E, Fairfield-Walsh CP, Maze-Foley K, editors. 2009. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments -- 2008. NOAA Tech Memo NOAA Fisheries NE 210; 440 p.

Waring, G.T., R.M. Pace, J.M. Quintal, C.P. Fairfield, and K. Maze-Foley, Editors. 2004. U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments—2003. NOAA Technical Memorandum NOAA Fisheries-NE-182.

Weinrich M. and K. Sardi. 2005. The Distribution of Baleen Whales in the Waters Surrounding the Northeast Gateway Proposed LNG Buoy Project: 1995-2004. The Whale Center of New England, Gloucester, Massachusetts.

Wells, R.S. and M.D. Scott. 2002. Bottlenose Dolphins Tursiops truncatus and T. aduncus. Pp. 122-128. In W.F. Perrin, B. Wursig, and J.G.M. Thewissen, eds. Encyclopedia of Marine Mammals. Academic Press, San Francisco, CA.

Wiley, D.N., R.A. Asmutis, T.D. Pitchford, and D.P. Gannon. 1995. "Stranding and mortality of humpback whales, *Megaptera novaeangliae*, in the mid-Atlantic and southeast United States, 1985-1992". Fishery Bulletin 93:196-205.

Wilson and Ruff. 1999. The Smithsonian Book of North American Mammals. Smithsonian Institution Press, Washington, DC.

WWF (World Wildlife Fund). 2005. "Green Turtle: Introduction". Site visited February 22, 2005.http://www.panda.org/about_wwf/what_we_do/species/showspecies.cfm?SID=32& LID=2&FH= E.

Appendix A

Marine Mammal Detection, Monitoring, and Response Plan for Operation of the Northeast Gateway Energy Bridge Deepwater Port and Algonquin Pipeline Lateral

DRAFT FINAL

Marine Mammal Detection, Monitoring, and Response Plan for Operation of the Northeast Gateway Deepwater Port and Pipeline Lateral

Submitted by

Northeast Gateway Energy Bridge, L.P.

Prepared By

Tetra Tech

TETRA TECH

160 Federal Street
Boston, MA 02110

June 2014

TABLE OF CONTENTS

1 Northeast Gateway Port Project Description 1

2 Introduction 1

2.1 NOAA Regulatory Oversight: Marine Mammals 3

3 Marine Mammal Detection, Monitoring, and Response Recommendations and Requirements 3

3.1 NEG Port and Pipeline Lateral General Marine Mammal Avoidance Requirements..... 4

3.2 NEG Port-specific Operational Requirements – Winter Season 2014 6

3.3 Planned and Unplanned/Emergency Maintenance and Repair Requirements 8

3.3.1 NEG Port 8

3.3.2 Pipeline Lateral 9

3.4 Acoustic Detection Operational and Maintenance Requirements to Reduce Vessel-whale Strikes 14

3.5 Injured/Dead Protected Species Reporting 14

4 Acoustic Monitoring Strategy 15

4.1 Acoustic Whale Detection and Response Plan 19

4.1.1 Right Whale Detection and Notifications 19

NEG Port Operations 19

NEG Port and Pipeline Lateral Planned and Unplanned/Emergency Repair and Maintenance Activities 22

4.1.2 NAVTEX Reporting 22

4.1.3 AIS Reporting of North Atlantic Right Whale Detections 23

4.1.4 Maintenance of the Auto-detect Buoy Systems 23

4.2 Hydroacoustic Monitoring Program during Initial EBRV Delivery 23

4.3 Extended Longterm Hydroacoustic Monitoring 25

4.4 Data Analysis and Reporting 25

List of Figures

Figure 1. Autonomous marine acoustic recorder (AMAR) specification and schematic 17

Figure 2. Auto-detection buoy (AB) schematic and picture of AB operating off the coast of New England 17

Figure 3. Locations of the Auto Detection Buoys and AMARs 29

List of Tables

Table 4.2-1 Marine Mammal Detection and Monitoring Reporting Requirements 27

ACRONYMNS AND ABBREVIATIONS

AB	Auto-detection Buoy
AIS	Automatic Identification System
AGT	Algonquin Gas Transmission, L.L.C.
AMAR	Autonomous Marine Recording Unit
ATBA	Area to be Avoided
BO	Biological Opinion
CCB-SMA	Cape Cod Bay Seasonal Management Area
Certificate	FERC Certificate of Public Convenience and Necessity
Cornell	Cornell University's Bioacoustics Research Program
CR	Construction representative
DEIS	Draft Environmental Impact Statement
DMA	Dynamic Management Areas
DP	Dynamic Positioning
EBRV	Energy Bridge Regasification Vessel
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FERC	Federal Energy Regulatory Commission
FMSC	USCG Federal Maritime Security Coordinator
GPS	Global Positioning System
GSC-SMA	Great South Channel Seasonal Management Area
GT	Gross Tons
HubLine	Algonquin's existing offshore natural gas pipeline system in Massachusetts Bay
IHA	Incidental Harassment Authorization
IMO	International Maritime Organization
ITS	Incidental Take Statement
LNG	Liquefied Natural Gas
LT	local time
MARAD	Department of Transportation - Maritime Administration
MARSEC	Maritime Security
MARU	Marine Autonomous Recording Units
MDA	Maritime Domain Security Awareness
MMDMRP	Marine Mammal Detection, Monitoring, and Response Plan
MMO	Marine Mammal Observer
MMPA	Marine Mammal Protection Act
MSR	Mandatory Ship Reporting
MSRA	Mandatory Ship Reporting Area
NAVTEX	Navigational Telex
NBDP	Narrow Band Direct Printing
NIST	National Institute of Standards and Technology
NEG Port	Northeast Gateway Deepwater Port
NER	Northeast Region
NOAA	National Oceanographic Atmospheric Administration
NOAA Fisheries	National Marine Fisheries Services

Northeast Gateway	Northeast Gateway Energy Bridge, L.L.C.
NERO	NOAA Fisheries Northeast Regional Office
NMSA	National Marine Sanctuary Act
NMSP	National Marine Sanctuary Program
ORP-SMA	Off Race Point Seasonal Management Area
Pipeline Lateral	Northeast Gateway's new 16.06–mile long, 24–inches diameter natural gas pipeline connecting the NEG Port to the existing Hubline
PMMP	Prevention, Monitoring and Mitigation Plan
PSV	Port Service Vessel
ROV	Remotely Operated Vehicle
SAS	Sighting Advisory System
SBNMS	Stellwagen Bank National Marine Sanctuary
Spectra	Spectra Energy Corporation
STL	Submerged Turret Loading™
TSS	Traffic Separation Scheme
USCG	United States Coast Guard
VTS	Vessel Traffic Services
WHOI	Woods Hole Oceanographic Institution
ZOI	Zone of Influence

1 Northeast Gateway Port Project Description

Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway) filed an application with the U.S. Department of Transportation, Maritimes Administration (MARAD) on June 13, 2005, for a license to construct, own, and operate the Northeast Gateway Deepwater Port (NEG Port), located approximately 13 miles southeast of Gloucester, MA. Concurrent with this filing, Algonquin Gas Transmission, L.L.C. (AGT), now a subsidiary of Spectra Energy Corporation (Spectra), filed a Natural Gas Act Section 7(c) application with the Federal Energy Regulatory Commission (FERC) for a Certificate of Public Convenience and Necessity (Certificate) for the Northeast Gateway Pipeline Lateral (Pipeline Lateral) that would connect the NEG Port with the existing HubLine natural gas pipeline for transmission throughout New England (FERC Docket Number CP05-383-000). The Maritime Administrator issued a License to own, construct, and operate a Deepwater Port to Northeast Gateway on May 14, 2007. The FERC issued its Certificate to AGT on March 16, 2007. Construction of the NEG Port and the Pipeline Lateral was completed in December 2007, and the NEG Port was commissioned for operation by the United States Coast Guard (USCG) in February 2008.

The NEG Port is located in Massachusetts Bay and consists of a submerged buoy system to moor specially designed liquefied natural gas (LNG) carriers approximately 13 miles (21 kilometer) offshore of Massachusetts in federal waters approximately 270 to 290 feet (82 to 88 meters) in depth. The facility delivers regasified LNG to onshore markets via new and existing pipeline facilities owned and operated by AGT. The Pipeline Lateral is a new 16.06–mile (25.8 kilometer) long, 24–inches (61–centimeters) diameter natural gas pipeline. It connects the NEG Port to AGT's existing offshore natural gas HubLine pipeline system (HubLine), located in Massachusetts Bay. Northeast Gateway's fleet of purpose-built Energy Bridge Regasification Vessels (EBRVs™) is based on the design of conventional LNG transport vessels fitted with patented on-board regasification equipment to deliver LNG to the NEG Port. Once at the NEG Port, the EBRVs regasify LNG back into its gaseous state and then transport the natural gas into the submerged Pipeline Lateral connected to the existing HubLine for delivery into the New England energy market.

2 Introduction

In accordance with Condition 12 of Annex A to the MARAD License, Northeast Gateway, in cooperation with MARAD, the United USCG, the National Oceanographic and Atmospheric Administration (NOAA), the Commonwealth of Massachusetts and other federal and state agencies, has established a program for preventing, monitoring, and mitigating environmental impacts (Prevention, Monitoring, and Mitigation Plan [PMMP]). As required, the PMMP is comprised of all federal, state, and local environmental permits, certificates, licenses and approved monitoring and mitigation plans obtained by Northeast Gateway and AGT to support the collective pre-construction, construction, post-construction, operation, repair and maintenance of the NEG Port and Pipeline Lateral. Integral to the PMMP, a Marine Mammal Detection, Monitoring, and Response Plan (MMDMRP) has been developed to support the requirements identified in the PMMP to minimize adverse impacts to marine mammals and sea turtles. The information presented in this MMDMRP serves as a guide to help Northeast Gateway, the EBRVs and the repair and maintenance personnel better understand the procedural requirements for marine mammal protection as identified in the MARAD License, the Endangered Species Act (ESA) Biological Opinion (BO), the Marine Mammal Protection Act (MMPA), Incidental Harassment Authorization (IHA), Incidental Take Statement (ITS) as amended, and the National Marine Sanctuary Act (NMSA) Section 304 (d) Recommendations. This MMDMRP has been specifically developed for the NEG Port, Pipeline Lateral and the vessels that will call on these facilities to support operation, repair, and maintenance.

This MMDMRP is organized under four major headings, beginning with a brief description of the project (Section 1.0); this introduction (Section 2.0), which describes the purpose of this MMDMRP and the NOAA National Marine Fisheries Service (NOAA Fisheries) regulatory oversight for the project relative to marine mammals; Section 3.0 which summarizes the requirements for marine mammal detection, monitoring and response requirements of MARAD and USCG License, the terms and conditions of the BO, IHA, and ITS as amended, as well as the NMSA Section 304 (d) Recommendations and describes the actions to be taken by Northeast Gateway and AGT to meet the identified requirements; and Section 4.0 details the acoustic monitoring strategy. A detailed Heightened Awareness Protocol has also been included as Appendix A to the MMDMRP to support the transit of EBRVs to and from the NEG Port. Appendix B contains the detailed marine mammal protocols to be followed during the repair and/or maintenance of the NEG Port and Pipeline Lateral. In addition, all crew members with navigation responsibilities on the EBRVs (including look-outs) and repair and maintenance support vessels will receive training on marine mammal sighting/reporting and vessel strike avoidance measures. This training module has been included as Appendix C.

This MMDMRP does not supersede any of the conditions of the Deepwater Port License or the NOAA authorizations listed above; rather, this MMDMRP is intended to provide further detail as to how these conditions are to be implemented during day-to-day operations of the NEG Port and Port/Pipeline repair and maintenance events. However, it is important to recognize that the safety of a vessel, its crew, and cargo must be maintained at all times. As such, the procedures outlined within the context of this MMDMRP shall be adhered to at all times, except under extraordinary circumstances when the safety of the vessel, crew and cargo are in doubt or the safety of life at sea is in question.

Under normal operating conditions the EBRVs and all support vessels servicing the NEG Port will comply with speed restrictions, routing measures and marine mammal and sea turtle standoff distances outlined in this MMDMRP as defined by the stricter of those included in the MARAD and USCG License; the terms and conditions of the BO, ITS, and IHA as amended; the NMSA Section 304 (d) Recommendations; the applicable parts of 50 CFR Parts 222, 223 and 224; and any other regulations or permit requirements that apply.

Emergency situations as determined by the Vessel Master and/or in coordination with the USCG or other agencies in authority may require rare instances of exceeding speed restrictions and/or variation in vessel course, and/or coming in closer proximity to protected and endangered species than noted here. Emergency situations involve the risk to life, property and the environment, and failure to respond appropriately could potentially worsen the consequences. Such emergency situations would include, but would not be limited to, maintaining vessel maneuverability, avoiding severe weather conditions, collision/grounding avoidance, vessel safety and security, rendering assistance (i.e., first response) to vessels and aircraft in distress, search and rescue, medical emergencies, fire/explosion, port security/piracy threats and spill prevention/response to the NEG Port itself or other vessels in the area. These actions would normally be coordinated with the USCG.

As an example, the Northeast Gateway support vessel(s) have defined roles and responsibilities in mitigating port security risks and response in coordination with the USCG per the USCG Federal Maritime Security Coordinator (FMSC) Assessment and Recommendations and incorporated into the Port Security Plan of the Operations Manual.

In such response to emergency situations, the EBRV and support vessels will, if possible, maintain an even higher level of vigilance en route to avoid vessel strikes or other potential adverse impact to marine mammals and/or sea turtles. In all cases where the vessel cannot execute the mitigation and monitoring requirements in this Operational MMDMRP due responding to an emergency, each such deviation shall be documented in the logbook of the vessel and, depending on investigation, legal and security restrictions, reported at the conclusion of the emergency situation to the NOAA Fisheries Northeast Regional Office (NERO) Ship Strike Coordinator and the NOAA staff at the Stellwagen Bank National Marine Sanctuary (SBNMS).

2.1 NOAA Regulatory Oversight: Marine Mammals

NOAA Fisheries has determined that serious injury or mortality of even a single individual of the critically-endangered North Atlantic right whale could jeopardize this species' continued existence. In addition, serious injury or mortality to other large whale species that frequent greater Massachusetts Bay waters, including North Atlantic fin, humpback, sei and blue whales, is also prohibited due to their endangered status. Therefore, federal actions that could lead to even a very small increased risk of serious injury or mortality must contain plans to mitigate the potential impact of those actions to these species. Specifically, federal agencies whose actions may affect endangered and/or threatened species must consult with NOAA Fisheries as specified under the implementing regulations for Section 7 of the ESA. Any harassment to any marine mammal species due to the licensed activity must also be permitted by NOAA Fisheries as specified under the MMPA. Under Section 304 (d) of the NMSA, federally licensed activities likely to adversely affect species within a National Marine Sanctuary are subject to consultation with NOAA's National Marine Sanctuary program (NMSP). Finally, NMSP regulations at 15 CFR Part 922 require that a permit be obtained for any activity conducted in a sanctuary that is otherwise prohibited (such as disturbing the seabed with anchors or moorings). As a result of consultation under NMSA, 13 specific recommendations were developed by NMSP for the NEG Port and submitted to the MARAD/USCG. As required by the National Marine Sanctuary Act (NMSA), the MARAD/USCG indicated their response to each of the NMSP recommendations, and those accepted were included in the project description as evaluated under the ESA as well as in Northeast Gateway and AGT's applications for IHA under the MMPA and the Northeast Gateway permit for deployments of passive acoustic array elements within the SBNMS. Mitigation/monitoring activities mandated as part of Northeast Gateway and AGT's construction, operation and repair/maintenance activities resulting from consultations, were also included in the Final Environmental Impact Statement (FEIS) issued for this project by the MARAD/USCG on October 27, 2006, the Record of Decision, issued by MARAD on February 7, 2007, the Project's License, issued by the MARAD/USCG on May 14, 2007, and the FERC Certificate for the Pipeline Lateral issued on March 16, 2007.

In support of continued Port operations, Northeast Gateway is petitioning NOAA Fisheries for the renewal of its IHA as issued on October 6, 2011 which expired on October 5, 2012. A renewal application was submitted to NOAA Fisheries on January 18, 2013. During subsequent review of the renewal application, the five-year requirement for monitoring marine mammal activity using marine autonomous recording units (MARUs) expired, and the array was removed by Neptune LNG Deepwater Port, who had operational control of the array during that time. NOAA Fisheries has requested that NEG Port re-submit the IHA renewal application for the 2014-2015 operational year with a revised marine mammal monitoring program to mitigate potential impacts to marine mammals.

3 Marine Mammal Detection, Monitoring, and Response Recommendations and Requirements

Both Northeast Gateway and AGT will be separately subject to the conditions of the project's BO, ITS and IHA as amended, and will be required to comply with all provisions that are applicable to each organization.

Northeast Gateway and AGT will cooperate fully with those administering the BO, ITS, and IHA to aid in ensuring such compliance. A summary of the obligations are set forth in the following sections.

3.1 NEG Port and Pipeline Lateral General Marine Mammal Avoidance Requirements

All NOAA consultations relevant to marine mammal species cited the importance of reducing the potential for vessel-whale strikes by EBRVs and associated support, repair, and maintenance vessels during the operational phase of the Project. As such, the MARAD License, the BO, ITS and IHA as amended, and NMSA Section 304 (d) Recommendations have established procedural requirements to ensure that operation, repair and/or maintenance of the NEG Port and Pipeline Lateral will not adversely affect marine mammals or sea turtles. The procedural requirements during the operation, repair and maintenance of the NEG Port and Pipeline Lateral consist of the following:

A. As appropriate, vessels shall utilize the newly-configured and International Maritime Organization (IMO)-approved Boston Traffic Separation Scheme (TSS) on their approach to and departure from the NEG Port and/or the repair/maintenance area at the earliest practicable point of transit[1] (subject to exceptional circumstances as defined in Section 1.0) in order to lower the risk of whale strikes. Upon entering the TSS the EBRV will go into "Heightened Awareness." The heightened awareness protocol is included as Appendix A of the MMDMRP.

B. Prior to entering areas where North Atlantic right whales are known to occur, including the Great South Channel Seasonal Management Area (GSC-SMA) and the SBNMS, vessel operators shall:

   (1) consult Navigational Telex (NAVTEX), NOAA Weather Radio, the NOAA Right Whale Sighting Advisory System (SAS) or other means to obtain information about current right whale sightings and Dynamic Management Areas (DMA) in effect; and

   (2) receive up-to-date information on acoustic detections of right whales from the passive network of near-real-time auto-detection buoys (ABs) prior to and during transit through the northern leg of the TSS.

C. In accordance with 50 CFR 224.103(c), all vessels associated with NEG Port and Pipeline Lateral activities shall not approach closer than 500 yards (460 meters) to a North Atlantic right whale and 100 yards (91 meters) to other whales to the extent physically feasible given navigational constraints. In addition, when approaching and departing the project area, vessels shall be operated so as to remain at least 1 kilometer away from any visually-detected North Atlantic right whales.

D. In response to active right whale sightings[2] and active acoustic detections[3], and taking into account exceptional circumstances, as defined in Section 1.0, EBRVs, repair and maintenance vessels shall take appropriate actions to minimize the risk of striking whales. Specifically vessels shall:

   (1) respond to active right whale sightings and/or DMAs reported on the Mandatory Ship Reporting (MSR) or SAS by concentrating monitoring efforts towards the area of most recent detection (see Heightened Awareness Protocol included as Appendix A) and reducing speed to 10 knots

[1] The most practical point at which EBRVs might enter the TSS will be in the Off Race Point area, but generally north of the point after the TSS angles to the west, northwest. Repair, maintenance, and/or other support vessels may depart from various local port areas (e.g., Salem and Charlestown, Massachusetts) and therefore not require entry into the TSS.

[2] Active right whale sightings are all right whale sightings broadcast by the MSR or SAS.

[3] Active acoustic detections are confirmed right whale vocalizations detected by a TSS AB within 24 hours of each scheduled data-review period (e.g., every 30 minutes or every 12 hours, as detailed in subsequent text). Multiple confirmed acoustic detections at a single AB will extend the duration of minimum mandated EBRV response to 24 hours from the last confirmed detection (within in the reception area of the detecting AB). Confirmed acoustic detections at multiple ABs within the same 24 hour time period will extend the area of minimum mandated EBRV response to encompass the reception areas of all detecting ABs.

or less if the vessel is within the boundaries of a DMA (50 CFR 224.105) or within the circular area centered on an area 8 nms (nm) in radius from a sighting location;

(2) respond to active acoustic detections by concentrating monitoring efforts towards the area of most recent detection (see Appendix A for EBRV-Specific Heightened Awareness Protocol and Appendix B for Maintenance-Specific Detection Protocols) and reducing speed to 10 knots or less within an area 5 nms in radius centered on the detecting Auto-detection buoy (AB); and,

(3) respond to additional sightings made by the designated look-outs (e.g., designated trained crew member, marine mammal observer [MMO]) within a 2-mile radius of the vessel by slowing the vessel to 10 knots or less and concentrating monitoring efforts towards the area of most recent sighting (see Appendix A for EBRV-Specific Heightened Awareness Protocol and Appendix B for Maintenance-Specific Detection Protocols).

To further ensure that marine mammals and sea turtles will not be adversely affected by the operation, repair and/or maintenance of the NEG Port and Pipeline Lateral, the MARAD License, the BO, ITS and IHA as amended, and NMSA Section 304 (d) Recommendations have also established specific speed restrictions that vessels must comply with when calling at the NEG Port. The specific speed restrictions required for all vessels (i.e., EBRVs and vessels associated with maintenance and repair) consist of the following:

A. Vessels shall reduce their maximum transit speed while in the TSS from 12 knots or less to 10 knots or less from March 1 to April 30 in all waters bounded by straight lines connecting the following points in the order stated below unless an emergency situation, as defined in Section 2.0, dictate the need for an alternate speed. This area shall hereafter be referred to as the Off Race Point Seasonal Management Area (ORP-SMA).

42°30' N 70°30' W	41°40' N 69°57' W
42°30' N 69°45' W	42°12' N 70°15' W
41°40' N 69°45' W	42°12' N 70°30' W
42°04.8' N 70°10' W	42°30' N 70°30' W

B. Vessels shall reduce their maximum transit speed while in the TSS to 10 knots or less unless an emergency situation, as defined in Section 2.0, dictate the need for an alternate speed from April 1 to July 31 in all waters bounded by straight lines connecting the following points in the order stated below. This area shall hereafter be referred to as the GSC-SMA.

42°30' N 69° 45' W	41°40' N 69°45' W
42°30' N 67°27' W	42°30' N 69°45' W
42°09' N 67°08.4' W	41°00' N 69°05' W

C. Vessels are not expected to transit the Cape Cod Bay or the Cape Cod Canal; however, in the event that transit through the Cape Cod Bay or the Cape Cod Canal is required, vessels shall reduce maximum transit speed to 10 knots or less (unless extraordinary conditions as defined in Section 2.0 dictate the need for an alternate speed) from January 1 to May 15 in all waters in Cape Cod Bay, extending to all shorelines of Cape Cod Bay, with a northern boundary of 42°12' N latitude and the Cape Cod Canal. This area shall hereafter be referred to as the Cape Cod Bay Seasonal Management Area (CCB-SMA).

D. All Vessels transiting to and from the project area shall report their activities to the mandatory reporting Section of the USCG to remain apprised of North Atlantic right whale movements within the area. All vessels entering and exiting the MSRA shall report their activities to WHALESNORTH. Vessel

operators shall contact the USCG by standard procedures promulgated through the Notice to Mariner system.

E. All Vessels greater than or equal to 300 gross tons (GT) shall maintain a speed of 10 knots or less, unless an emergency situation as defined in Section 2.0, require speeds greater than 10 knots.

F. All Vessels less than 300 GT traveling between the shore and the project area that are not generally restricted to 10 knots will contact the Mandatory Ship Reporting (MSR) system, the USCG, or the project site before leaving shore for reports of active DMAs and/or recent right whale sightings and, consistent with navigation safety, restrict speeds to 10 knots or less within 5 miles (8 kilometers) of any sighting location, when traveling in any of the seasonal management areas (SMAs) (as defined in item A and B above) or when traveling in any active dynamic management area (DMA)..

3.2 NEG Port-specific Operational Requirements – Winter Season 2014

The NEG Port Manager shall notify Tetra Tech, Inc. (Tetra Tech) when he receives the USCG required 96-hour notification of an arriving vessel from the Master of the EBRV (see Section 4.1.1 for further detail) corresponding to the first delivery of the 2014 winter season. By this notification Tetra Tech will be able to determine and the NEG Port Manager will confirm when an EBRV is within 24 hours of entering the TSS. This notification will signal Tetra Tech to mobilize equipment required for the hydroacoustic monitoring program planned, which will include measurements during EBRV movement and NEG Port operations occurring during initial delivery. In addition to the general marine mammal avoidance requirements identified in Section 3.1, vessels calling on the NEG Port must comply with the following additional requirements:

A. EBRVs shall travel at 10 knots maximum speed when transiting to/from the TSS or to/from the NEG Port/Pipeline Lateral area. For EBRVs, at 1.86 miles (3 kilometers) from the NEG Port, speed will be reduced to 3 knots and to less than 1 knot at 1,640 feet (500 meters) from the NEG buoys unless an emergency situation, as defined in Section 2.0, dictate the need for an alternate speed.

B. The Port Service Vessel (PSV)[4] and maintenance/repair vessels less than 300 GT traveling between the shore and the NEG Port area that are not generally restricted to 10 knots will comply with conditions identified in section 3.1 item F. Maintenance/repair vessels greater than 300 GT shall not exceed 10 knots (section 3.1 item E), unless an emergency situation as defined in Section 2.0, require speeds greater than 10 knots.

C. EBRVs shall maintain speeds of 12 knots or less while in the TSS until reaching the vicinity of the ABs (except during the seasons and areas defined under conditions defined in Section 3.1, when speed shall be limited to 10 knots or less) unless an emergency situation, as defined in Section 2.0, dictate the need for an alternate speed.

D. The EBRV Master shall receive reports as often as every 30 minutes regarding right whale call detections made by the ABs prior to and during transit through the portion of the TSS where the buoys are installed. Should detection occur, the following procedure shall be followed:

[4] Northeast Gateway utilizes a Port Service Vessel (PSV) that operates within the vicinity of the NEG Port for enhanced maritime domain security awareness (MDA), crewing, maintenance, transportation of port personnel, performance of surveys, and environmental studies. PSV activities are carefully coordinated and dedicated to those necessary while an EBRV is moored to the subsea buoy and cargo transfer operations are being performed. For MDA, the PSV will normally be present at least 70 percent of the time while an EBRV is moored at the NEG Port during Maritime Security (MARSEC) 1. If the PSV is performing others duties outside of domain awareness it can return to station at the NEG Port within one hour, which will require the vessel to travel at speeds greater than 10 knots in response to a heightened security or safety situations.

(1) In response to active right whale sightings or acoustic detections (as defined in footnotes 2 and 3) and taking into account an emergency situation that may exist as defined in Section 2.0, EBRVs shall take appropriate actions to minimize the risk of striking whales, including reducing speed to 10 knots or less and alerting the posted look-out to concentrate monitoring efforts towards the area of most recent detection (see Heightened Awareness Protocol included as Appendix A).

(2) EBRVs shall respond to active DMAs or right whale sightings reported on the MSR or SAS by alerting the look-out posted for marine mammal monitoring duties to concentrate monitoring efforts towards the area of most recent detection (see Heightened Awareness Protocol included as Appendix A) and by reducing speed to 10 knots or less if the vessel is within the DMA or within an 8 nm radius centered on the location of the sighting.

(3) EBRVs shall respond to active acoustic detections by concentrating monitoring efforts towards the area of most recent detection (see Heightened Awareness Protocol included as Appendix A) and reducing speed to 10 knots or less within a 5 nm radius centered on the detecting AB.

(4) EBRVs shall respond to visual observations made by the look-out within the 2-mile Zone of Influence (ZOI) around the ship by concentrating monitoring efforts towards the area of observation (see Heightened Awareness Protocol is included as Appendix A) and by reducing speed to 10 knots or less.

E. All individuals onboard the EBRVs responsible for the navigation duties and any other personnel that could be assigned to monitor for marine mammals and sea turtles shall receive training on marine mammal and turtle sighting/reporting and vessel strike avoidance measures. See Appendix C for a copy of the marine mammal and sea turtle training materials.

While an EBRV is navigating within the designated TSS, there are three people with look-out duties on or near the bridge of the ship including the Master, the Officer-of-the-Watch and the Helmsman-on-watch. In addition to the standard watch procedures, while the EBRV is transiting within the designated TSS, maneuvering within the Area to be Avoided (ATBA), and/or while actively engaging in the use of thrusters, an additional look-out shall be designated to exclusively and continuously monitor for marine mammals and sea turtles (see Heightened Awareness Protocol included as Appendix A).

All sightings of marine mammals and sea turtles by the designated look-out, individuals posted to navigational lookout duties and/or any other crew member while the EBRV is transiting within the TSS, maneuvering within the ATBA and/or when actively engaging in the use of thrusters, shall be immediately reported to the Officer-of-the-Watch who shall then alert the Master. The Master or Officer-of-the-Watch shall ensure the required reporting procedures as defined in Appendix A are followed and the designated marine mammal look-out records all pertinent information relevant to the sighting. The Master shall then be responsible for implementing the measures as described in this MMDMRP to ensure impacts to marine mammals and sea turtles are minimized.

Once the Submerged Turret Loading™ (STL) buoy is locked into place the vessel is no longer considered in Heightened Awareness status. However, when the EBRV prepares to depart from the NEG Port, the Master shall once again ensure the responsibilities as defined in this MMDMRP are carried out.

F. Visual sightings made by look-outs from the EBRVs will be recorded using a standard sighting log form (see Attachment 1 to the Heightened Awareness Protocol). Estimated locations will be reported for each individual and/or group of individuals categorized by species, when known, or by general classes

(i.e. one large whale, multiple large whales, 100+ dolphins etc.) when species or number is unknown. This data will be entered into a database and a summary of monthly sighting activity will be provided in the ITS/IHA reports to NOAA (see Section 4.2). Estimates of take and copies of these log sheets will also be included in ITS/IHA reports.

G. EBRVs that are approaching or departing from the NEG Port and are within the ATBA[5] surrounding the NEG Port, shall remain at least 1 kilometer away from any visually-detected North Atlantic right whale and at least 100 yards (91.4 meters) away from all other visually-detected whales unless an emergency situation, as defined in Section 2.0, require that the vessel stay its course. During EBRV maneuvering, the Vessel Master shall designate at least one look-out to be exclusively and continuously monitoring for the presence of marine mammals at all times while the EBRV is approaching or departing from the NEG Port as outlined in the Heightened Awareness Protocol included as Appendix A.

H. During NEG Port operations, in the event that a whale is visually observed within 1 kilometer of the NEG Port or a confirmed acoustic detection is reported on either of the two ABs closest to the NEG Port (western-most in the TSS array), departing EBRVs shall delay their departure from the NEG Port, unless an emergency situation, as defined in Section 2.0, require that departure is not delayed. This departure delay shall continue until either the observed whale has been visually (during daylight hours) confirmed as more than 1 kilometer from the NEG Port or 30 minutes have passed without another confirmed detection either acoustically within the acoustic detection range of the two ABs closest to the NEG Port, or visually within 1 kilometer from the NEG Port.

3.3 Planned[6] and Unplanned/Emergency[7] Maintenance and Repair Requirements

3.3.1 NEG Port

The specified design life of the NEG Port is about 40 years, with the exception of the anchors, mooring chain/rope and riser/umbilical assemblies, which are based on a maintenance-free design life of 20 years. The buoy pick-up system components are considered consumable and will be inspected following each buoy connection, and replaced (from inside the STL compartment during the normal cargo discharge period) as deemed necessary. Operational maintenance of underwater components of the NEG Port shall consist of yearly inspections in accordance with Classification Society Rules (American Bureau of Shipping) using either divers or remotely operated vehicles (ROV) to inspect and record the condition of the various STL system components. This planned annual maintenance and repair activity shall be restricted to the period environmentally preferred by NOAA between May 1 and November 30. These activities will be conducted using the NEG Port's normal support vessel, a 125-foot, 99 gross ton, 2,700 horsepower, aluminum mono-hull vessel or a vessel of similar design characteristics.

In order to accurately evaluate and effectively mitigate the potential noise impacts to marine mammals, the Northeast Gateway will conduct empirical source level measurements during maintenance/repair work if vessels dynamic positioning (DP) systems are to be employed and/or if significant underwater physical construction activities will be conducted. Vessels associated with repair and maintenance of underwater components, not considered consumable shall adhere to the restrictions and requirements as outlined in the

[5] The ATBA is a 1.4- nm diameter area around the NEG Port facility. This is the largest area of the port that will be marked on nautical charts that is enforceable by the USCG.

[6] Planned maintenance and repair work includes the routine inspections, maintenance and repair of the NEG Port and Pipeline Lateral components as identified in the Final Environmental Impact Statement (EIS), required under the MARAD License and in accordance with DOT regulations.

[7] Unplanned/Emergency maintenance and repair work includes all work outside of the routine inspections, maintenance and repair of the NEG Port and Pipeline Lateral components as identified in the Final EIS, required under the MARAD License and in accordance with DOT regulations). Such an unplanned repair or maintenance activity may be the result of a material or equipment failure and/or catastrophic or emergency event.

NOAA approved MMDMRP for Construction of the Northeast Gateway Energy Bridge™ Deepwater Port and Pipeline Lateral.

Northeast Gateway will provide the USCG, MARAD, NOAA Fisheries Headquarters Office of the Protected Resources (Shane Guan, 301-713-2289, shane.guan@noaa.gov), NOAA Fisheries Northeast Region Ship Strike Coordinator (Michael Asaro, 978-282-8469, 55 Great Republic Drive, Gloucester, MA 01930), and SBNMS (Leila Hatch, 781-545-8026, leila.hatch@noaa.gov) with a minimum of 30 days notice prior to any planned repair and/or maintenance activity. For any unplanned/emergency repair/maintenance activity, Northeast Gateway will notify the agencies as soon as practicable after it is determined that repair work must be conducted. Northeast Gateway will continue to keep the agencies apprised of repair work plans as further details (e.g., the time, location, and nature of the repair) become available. A final notification will be provided to agencies 72 hours prior to crews being deployed into the field.

During the maintenance and repair of NEG Port components, weekly status reports will be provided to NOAA and other pertinent agencies (USCG, MAARAD, NOAA Fisheries, SBNMS) using standardized reporting forms. The weekly reports will include data collected for each distinct marine mammal species observed in the repair/maintenance area during the period that maintenance and repair activities were taking place. The weekly reports shall include the following information:

A. Location (in longitude and latitude coordinates), time, and the nature of the maintenance and repair activities;

B. Indication of whether a DP system was operated, and if so, the number of thrusters being used and the time and duration of DP operation;

C. Marine mammals observed in the area (number, species, age group, and initial behavior);

D. The distance of observed marine mammals from the maintenance and repair activities;

E. Changes, if any, in marine mammal behaviors during the observation;

F. A description of any mitigation measures (power-down, shutdown, etc.) implemented;

G. Weather condition (Beaufort sea state, wind speed, wind direction, ambient temperature, precipitation, and percent cloud cover etc.);

H. Condition of the observation (visibility and glare); and

I. Details of passive acoustic detections and any action taken in response to those detections.

3.3.2 Pipeline Lateral

Vessels operating to support the maintenance and/or unplanned/emergency repair of the Pipeline Lateral shall adhere to the following speed restrictions and marine mammal monitoring requirements:

A. Pipeline maintenance/repair vessels less than 300 GT traveling between the shore and the maintenance/repair area that are not generally restricted to 10 knots will comply with conditions identified in section 3.1 item F. Maintenance/repair vessels greater than 300 GT shall not exceed 10 knots, unless an emergency situation as defined in Section 2.0, require speeds greater than 10 knots.

Planned maintenance and repair activities shall be restricted to the period environmentally preferred by NOAA between May 1 and November 30. The only planned activity is the annual inspection of the cathodic protection monitors by ROV. Cathodic protection monitors are located at the ends of the Pipeline Lateral and the adjacent flow lines. Each inspection activity will take approximately three days and will utilize a ROV launched from a

vessel of opportunity. The most likely vessel will be similar to the NEG Port's normal support vessel as described in section 3.2, footnote 4, and section 3.3.1, or a vessel of similar design characteristics. This vessel is self-positioning and requires no anchors or use of thrusters. The vessel will likely mobilize from Salem or Charleston, Massachusetts and will inspect the cathodic protection monitors in the vicinity of the NEG Port and at the point where the Pipeline Lateral interconnects with the HubLine. These activities will typically be performed during daylight hours and during periods of good weather. Helicopters will not be used to support maintenance and/or inspections.

Unplanned/emergency maintenance and repair activities shall be conducted utilizing anchor-moored dive vessel; however, while unlikely, the possibility that a DP dive vessel would be used cannot be ruled out, depending on the technical requirements of the work, the degree of urgency required to address the work, and the availability of vessels.

As described in Section 3.3.1, AGT will also provide the USCG, MARAD, NOAA Fisheries Headquarters Office of the Protected Resources (Shane Guan, 301-713-2289, shane.guan@noaa.gov), NOAA Fisheries Northeast Region Ship Strike Coordinator (Michael Asaro, 978-282-8469, 55 Great Republic Drive, Gloucester, MA 01930), and SBNMS (Leila Hatch, 781-545-8026, leila.hatch@noaa.gov) with a minimum of 30 days notice prior to any planned repair and/or maintenance activity. For any unplanned/emergency repair/maintenance activity, Northeast Gateway will notify the agencies as soon as practicable after it is determined that repair work must be conducted. AGT will continue to keep the agencies apprised of repair work plans as further details (e.g., the time, location, and nature of the repair) become available. A final notification will be provided to agencies 72 hours prior to crews being deployed into the field.

Marine monitoring and reporting during all planned and unplanned/emergency repair and maintenance activities will be conducted in accordance with the NEG Port and Pipeline Lateral repair and maintenance protocols provided in Appendix B. Both AGT and Northeast Gateway understand that noise generated from thrusters during dynamic positioning is the most likely source of a "take" to North Atlantic right whale, therefore the use of DP vessels and thrusters shall be minimized to the extent reasonably possible; however, should DP systems be used for maintenance and repair activities and/or activities will emit noise with a source level of re 139dB re 1 mircoPa @ 1 m, such operations shall be conducted in adherence to the general marine mammal avoidance requirements identified in Section 3.1, as well as the following additional requirements:

A. Two (2) qualified MMOs shall be assigned to each vessel that will use DP systems during maintenance and repair related activities. MMOs will operate individually in designated shifts to accommodate adequate rest schedules. Additional MMOs may be assigned to additional vessels if acoustic monitoring data indicates that sound levels exceed applicable impact criteria identified in the updated IHA at distances greater than the designated ZOI.

B All MMOs shall receive NOAA-approved marine mammal observer training and be approved in advance by NOAA after review of their resume. All MMOs shall have direct field experience on marine mammal/sea turtle vessels and/or aerial surveys in the Atlantic Ocean/Gulf of Mexico.

C. MMOs (one primary and one secondary) shall be responsible for visually locating marine mammals and sea turtles at the ocean's surface and, to the extent possible, identifying the species. The primary MMO shall act as the identification specialist and the secondary MMO will serve as data recorder and also assist with identification. Both MMOs shall have responsibility for monitoring for the presence of marine mammals and sea turtles. Specifically MMO's will:

    (1) Monitor at all hours of the day, scanning the ocean surface by eye for a minimum of 40 minutes every hour.

(2) Monitor the area where maintenance and repair work is conducted beginning at daybreak using 25x power binoculars and/or hand-held binoculars. Night vision devices must be provided as standard equipment for monitoring during low-light hours and at night.

(3) Conduct general 360° visual monitoring during any given watch period and target scanning by the observer shall occur when alerted of a whale presence.

(4) Alert the vessel superintendent or construction crew supervisor of visual detections within 2 miles (3.31 kilometers) immediately.

(5) Record all sightings on marine mammal field sighting logs. Specifically, all data shall be entered at the time of observation, notes of activities will be kept, and a daily report prepared and attached to the daily field sighting log form. The basic reporting requirements include the following:

- Beaufort sea state;
- Wind speed;
- Wind direction;
- Temperature;
- Precipitation;
- Glare;
- Percent cloud cover;
- Number of animals;
- Species;
- Position;
- Distance;
- Behavior;
- Direction of movement; and
- Apparent reaction to construction activity.

D. In the event that a whale is visually observed within the 2-mile (3.31-kilometers) ZOI of a DP vessel or other construction vessel that has shown to emit noise with source level in excess of 139 dB re I microPa @ 1 m, the MMO will notify the repair/maintenance construction crew to minimize the use of thrusters until the animal has moved away, unless there are divers in the water or an ROV is deployed.

E. DP vessel captains will focus on reducing thruster power to the maximum extent practicable, taking into account vessel and diver safety, during all repair and maintenance activities. Vessel captains will shut down thrusters whenever they are not needed.

F. In the event that a whale is visually observed within 0.5 mile (0.8 kilometers) of a repair or maintenance vessel, the vessel superintendent or on-deck supervisor shall be notified immediately. The vessel's crew shall be put on a heightened state of alert and the marine mammal shall be monitored constantly to determine if it is moving toward the repair or maintenance area.

G. Repair/maintenance vessel(s) must cease any movement and/or cease all activities that emit noises with source level of 139 dB re 1 μPa @ 1 m or higher when a right whale is sighted within or approaching at 500 yd (457 m) from the vessel. Repair and maintenance work may resume after the marine mammal is positively reconfirmed outside the established zones (500 yd [457 m]) or 30 minutes

have passed without a redetection. Any vessels transiting the maintenance area, such as barges or tugs, must also maintain these separation distances.

H. Repair/maintenance vessel(s) must cease any movement and/or cease all activities that emit noises with source level of 139 dB re 1 μPa @ 1 m or higher when a marine mammal other than a right whale is sighted within or approaching at 100 yd (91 m) from the vessel. Repair and maintenance work may resume after the marine mammal is positively reconfirmed outside the established zones (100 yd [91 m]) or 30 minutes have passed without a redetection Any vessels transiting the maintenance area, such as barges or tugs, must also maintain these separation distances.

H. All sightings of North Atlantic right whales shall be reported to the NOAA Fisheries as soon as possible. Sighting communications will be the responsibility of the environmental coordinator.

In addition to visual monitoring, if the repair/maintenance work is located outside of the detectible range of the 10 project area ABs, Northeast Gateway and Algonquin shall consult with NOAA (NMFS and SBNMS) to determine if the work to be conducted warrants the temporary installation of an additional AB(s) to help detect and provide early warnings for potential occurrence of right whales in the vicinity of the repair area (see section 4.1.1). The number of ABs installed around the activity site will be commensurate with the type and spatial extent of maintenance/repair work required, but must be sufficient to detect vocalizing right whales within the 120-dB impact zone. Source level data from the acoustic recording units deployed in the NEG Port and/or Pipeline Lateral maintenance and repair area will be provided to NOAA within a reasonable timeframe

To further ensure that marine mammals and/or sea turtles will not be adversely affected by the repair and/or maintenance activities, AGT and associated contractors will also comply with the following:

A. Operations involving excessively noisy equipment (source level exceeding 139 dB re 1μPa @ 1 m) will "ramp-up" sound sources, allowing whales a chance to leave the area before sounds reach maximum levels. In addition, Northeast Gateway, AGT, and other associated contractors will maintain equipment to manufacturers' specifications, including any sound-muffling devices or engine covers in order to minimize noise effects. Noisy construction equipment will only be used as needed and equipment shall be turned off when not in operation.

B. Any material that has the potential to entangle marine mammals and sea turtles (e.g., anchor lines, cables, rope or other construction debris) will only be deployed as needed and appropriate measures will be taken to minimize the chance of entanglement.

C. If necessary, knotless and non-floating lines will be used on repair/maintenance vessels. Repair/maintenance vessel anchors will have pennant lines (cables) supported by anchor buoys to enable the tugs to relocate anchors.

D. Any materials that have the potential to entangle marine mammals or sea turtles will be removed from the construction area immediately once they are no longer required to support repair/maintenance activities.

E. In the event that any material appears likely to entangle marine mammals or sea turtles, such material will be removed from the water immediately unless such action jeopardizes the safety of the vessel and crew as determined by the Captain of the vessel.

F. In the event that a marine mammal or sea turtle becomes entangled, the marine mammal coordinator and/or MMO will notify MARAD, USCG, NOAA Fisheries (if outside the SBNM), and NMSP and SBNMS staff (if inside the SBNMS) immediately so that a rescue effort may be initiated.

During the maintenance and repair of the Pipeline Laterals, weekly status reports will be provided to NOAA and other pertinent agencies (USCG, MAARAD, NOAA Fisheries, SBNMS) using standardized reporting forms. The weekly reports will include data collected for each distinct marine mammal species observed in the repair/maintenance area during the period that maintenance and repair activities were taking place. The weekly reports shall include the following information:

A. Location, time, and the nature of the maintenance and repair activities;

B. Indication of whether a DP system was operated, and if so, the number of thrusters being used and the time and duration of DP operation;

C. Marine mammals observed in the area (number, species, age group, and initial behavior);

D. The distance of observed marine mammals from the maintenance and repair activities;

E. Changes, if any, in marine mammal behaviors during the observation;

F. A description of any mitigation measures (power-down, shutdown, etc.) implemented;

G. Weather condition (Beaufort sea state, wind speed, wind direction, ambient temperature, precipitation, and percent cloud cover etc.);

H. Condition of the observation (visibility and glare); and

I. Details of passive acoustic detections and any action taken in response to those detections.

All maintenance/repair activities will be scheduled to occur between May 1 and November 30; however, in the event of unplanned/emergency repair work that cannot be scheduled during the preferred May through November work window, the following additional measures shall be followed for Pipeline Lateral maintenance and repair related activities between December and April:

A. Between December 1 and April 30, if on-board MMOs do not have at least 0.5-mile visibility, they shall call for a shutdown. At the time of shutdown, the use of thrusters must be minimized. If there are potential safety problems due to the shutdown, the captain will decide what operations can safely be shut down. It should be noted however, that dive operations typically use saturation divers. It can require up to 8 hours of decompression before the divers can come to the surface.

B. Prior to leaving the dock to begin transit, the barge will contact one of the MMOs on watch to receive an update of sightings within the visual observation area. If the MMO has observed a North Atlantic right whale within 30 minutes of the transit start, the vessel will hold for 30 minutes and again get a clearance to leave from the MMOs on board. MMOs will assess whale activity and visual observation ability at the time of the transit request to clear the barge for release.

C A half day training course will be provided by the current MMO provider to designated crew members assigned to the transit barges and other support vessels. These designated crew members will be required to keep watch on the bridge and immediately notify the navigator of any marine mammal sightings. All watch crew will sign into a bridge log book upon start and end of watch. Transit route, destination, sea conditions and any protected species sightings/mitigation actions during watch will be recorded in the log book. Any whale sightings within 1,000 m of the vessel will result in a high alert and slow speed of 4 knots or less and a sighting within 750 m will result in idle speed and/or ceasing all movement.

D The material barges and tugs used in repair and maintenance shall transit from the operations dock to the work sites during daylight hours when possible provided the safety of the vessels is not compromised. Should transit at night be required, the maximum speed of the tug will be 5 knots.

E Consistent with navigation safety, all repair vessels must maintain a speed of 10 knots or less during daylight hours. All vessels will operate at 5 knots or less at all times within 5 km of the repair area.

3.4 Acoustic Detection Operational and Maintenance Requirements to Reduce Vessel-whale Strikes

Vessels associated with maintaining the Autonomous Marine Recording (AMAR) units and the AB network operating as part of the mitigation/monitoring protocols under this MMDMRP shall adhere to the following speed restrictions and marine mammal monitoring requirements. These restrictions and requirements are also referred to in the SBNMS permit for this activity (permit number SBNMS-2007-002):

A. Vessels maintaining the AMAR units that are greater than 300 gross tons (GT) shall not exceed 10 knots.

B. Vessels maintaining the AMAR units that are less than 300 GT shall not exceed 15 knots at any time, but shall adhere to speeds of 10 knots or less in the following areas and seasons:

   (1) In the ORP-SMA between March 1 and April 30 as described in the Draft Environmental Impact Statement (DEIS) for the North Atlantic Right Whale Ship Strike Reduction Strategy and implemented in the BO for this project.

   (2) In the CCB-SMA between January 1 and May 15 as described in the DEIS for the North Atlantic Right Whale Ship Strike Reduction Strategy and implemented in the BO for this project.

C. In accordance with NOAA Regulation 50 CFR 224.103 (c), all vessels associated with NEG Port activities shall not approach closer than 500 yards (460 meters) to a North Atlantic right whale (see footnote 2).

D. During operations all vessels shall actively monitor for the presence of marine mammals to help avoid collisions. All vessel crew members shall receive training in marine mammal observation.

E. All vessels shall obtain the latest DMA or right whale sighting information via the NAVTEX, MSR, SAS, NOAA Weather Radio, or other available means prior to operations to determine if there are right whales present in the operational area.

3.5 Injured/Dead Protected Species Reporting

During all phases of the NEG Port and Pipeline Lateral operations, sightings of any injured or dead protected species (sea turtles and marine mammals) shall be reported immediately, regardless of whether the injury or death was caused by NEG Port activities. All planned and unplanned/emergency repair and maintenance activities will be suspended immediately (unless divers are in the water or an ROV is deployed) and the circumstances reported as specified below if a dead or injured right whale is found in the vicinity of the of the repair/maintenance area(s).

Sightings of injured or dead whales and sea turtles not associated with NEG Project activities can be reported to the USCG on VHF Channel 16, or to NOAA Fisheries Stranding and Entanglement Hotline: (978) 281-9351. In addition, if the injury or death was caused by a NEG Port or Pipeline Lateral vessel or Port/Pipeline-related equipment or material/activity (e.g., EBRV, support vessel, or repair/maintenance vessel, entanglement, buoy, etc.), Northeast Gateway and AGT shall notify the NOAA Fisheries Director at NERO: (978) 281-9300, the

Director of the Office of Protected Resources at NOAA Fisheries: (301) 713-2332), MARAD and the USCG immediately, and shall provide a full report to NOAA Fisheries at NERO and NOAA/NMSP/SBNMS. The reports to NOAA shall include the following information:

(1) the time, date and location (latitude/longitude) of the incident;
(2) the name and type of the vessel involved or other equipment/material that caused the injury or death;
(3) the vessel's speed during the incident, if applicable;
(4) a description of the incident;
(5) water depth;
(6) environmental conditions (e.g., wind speed and direction, sea state, cloud cover and visibility);
(7) the species identification or description of the animal, if possible; and
(8) the fate of the animal.

4 Acoustic Monitoring Strategy

As reflected in MARAD/USCG License, the BO, ITS and IHA as amended, and the NMSA Section 304 (d) Recommendations, the impacts from operation can be effectively monitored and mitigated utilizing passive acoustic detection technology. Previously, the Bioacoustics Research Program (BRP) at Cornell University collected hydroacoustic data, which included periods of deliveries and commissioning during the winter heating season, through the use of an array of Marine Autonomous Recording Units (MARUs) and Right Whale Auto-Detection Buoys (ABs). However, a revised hydroacoustic monitoring plan is being developed to specifically target sound monitoring generated during Energy Bridge Regasification Vessel (EBRV) movement, Port operation, and maintenance and repair events. Use of the BRP data for this purpose is somewhat limited due to the positioning of much of the array being outside the insonified area during certain operational events but some data (i.e. MARU #7) does provide initial indications of areas of insonification of prior operational and maintenance activities. Further measurements are essential to ground truth the models.

The overall intent of the proposed hydroacoustic monitoring program is to provide better information for both regulators and the general public regarding the acoustic footprint associated with operation of the NEG Port in Massachusetts Bay. The modeled underwater acoustic impacts presented in the IHA relied primarily on estimated source levels derived from the similar vessels and operations. This proposed monitoring plan will measure the actual sound levels that are introduced into the underwater environment, reducing uncertainty associated with source levels used as modeling inputs for the analysis presented in the IHA. Underwater noise monitoring will be conducted to obtain a representative acoustic signature of vessel transit, docking, maintenance, onboard regasification operational scenarios, and maintenance activities. The underwater monitoring program will include both a digital sound recording and real-time analysis of received sound pressure levels and has been specifically developed for the NEG Port and Energy EBRVs calling at the Port. This monitoring plan is expected to be a dynamic document that will evolve as the data collection and regulatory review process progresses.

Due to the limited number of expected future LNG deliveries, in lieu of the MARU array, Excelerate will conduct short-term hydroacoustic monitoring to document sound levels during operational events. The fieldwork program would be extended to a semi-permanent monitoring program similar in scope and design when forecasted NEG use will be more than 5 shipments in a 30-day period or over 20 shipments in a six-month period. In other words, § 6(d)(i) and (ii) requirements of the draft IHA permit that were the subject of the November 18, 2013 Federal Register will only take effect after there is a forecasted five or more shipments to NEG in a 30-day period, or over 20 shipments in a six-month period, and will remain in effect until the active

use is reduced below thresholds described. Information pertaining to forecasted delivery levels at or above the stated trigger will be provided in advance, giving adequate time for monitoring systems to be put in place prior to the first forecasted delivery event.

In addition, Northeast Gateway shall continue use of the 10 ABs (Figure 2) within the Separation Zone of the TSS for the operational life of the Project. The purpose of the ABs shall be to detect a calling North Atlantic right whale an average of 5 nm from each AB (detection ranges will vary based on ambient underwater conditions). The AB system shall be the primary detection mechanism that alerts the EBRV Master to the occurrence of right whales, heightens EBRV awareness, and triggers necessary mitigation actions as described in this MMDMRP.

Northeast Gateway has engaged representatives from Cornell and the Woods Hole Oceanographic Institution (WHOI) as the consultants for developing, implementing, collecting and analyzing the acoustic data, reporting, and maintaining the AB acoustic monitoring system.

The following sections detail the deployment and operation of AMARs centered on the terminal site and the 10 ABs (Figure 3)[8] that are to be placed at approximately 5-mile intervals within the recently modified TSS.

[8] The configurations of the MARU array and AB network presented in this plan were based upon the configurations developed and recommended by NOAA personnel. This plan represents a technological design based on scientific research. Impacts to MARUs and ABs from vessels transiting the TSS are not known. Modifications to the deployment schedules and configurations of the MARU array and AB network may be required to respond to any adverse impacts from these two activities.

Figure 1. Autonomous marine acoustic recorder (AMAR) specification and schematic

Inputs:

24-bit Analog-to-Digital Channels:

Number of 24 bit Analog Channels: 8
Two banks of four channels - each bank capable of independent sample rates
Sample Rates: 16, 32, 64, 48, 96 & 128 kHz (ksps)
Dynamic Range: 17 effective bits (104 dB)
Spectral noise floor at 128 ksps is better than -150 dB re FS
Software binary gain settings for each channel: 1 (0dB), 2 (6dB), 4 (12dB), 8(18dB), 16(24dB), 32(30dB), 64(36dB), 128(42dB)
Each channel independently AC or DC Coupled
Voltage: 0 to 5V single ended, +/- 2.5V (peak-to-peak)

High Speed 16-bit Analog-to-Digital Channel:

Sample Rates: 125, 250, 375, 687.5 & 916.667 kHz (ksps)
Dynamic Range: 14.5 effective bits
Each channel independently AC or DC Coupled
Voltage: 4.5V (peak-to-peak)

Low Speed Analog-to-Digital Channels:

Number of Low Speed Channels: 8
Sample Rate: 1 S/s
Dynamic Range: 10.5 bits
Voltage: +10V to -10V

Digital Inputs/Outputs:

Ten Digital Input/Output (DIO) lines (3 V)
Two 10/100 Ethernet
One USB 2.0 OTG
Two RS-232 serial channels
One RS-485 serial channel

Outputs:

Two 20 bit audio outputs (48 kHz bandwidth)
Intended to support optional headphone or acoustic projector
Software gain settings for audio outputs

Power:

DC power from battery pack (7 to 16 Vdc) or PoE
Three Standard Battery Packs Available (Short, Medium and Long Duration)
Extended duration possible through intelligent duty-cycling
Power consumption while recording 8 ch @ 16 kS/s: Approx 600 mW
Max Power in sleep mode: Approx. 50 mW

Memory & Recording:

Solid-state memory
Min Memory: 256 GBytes
Max Memory: 1792 GBytes
Recording Duration: Up to One Year
dependent on input channel configuration
dependent duty cycle settings
dependent on attached battery-pack(s)
Data input sampling configurations and duty cycling is programmable.
Acoustic Data downloaded as WAV formatted files
Non Acoustic Data downloaded as CSV files

Environmental:

Max Depth (Shallow AMAR): 250m
Max Depth (Deep AMAR): 2500m
Operating Temps: -5C to +50C
Storage Temps: -30C to 70C
Shock: 1 meter drop on to concrete and 3 meter drop into water
Vibration: transportation by air, truck or vessel

Physical:

Two Standard Depths: Shallow (250m) or Deep (2500m) (PVC and Aluminum Pressure Housings)
Three Standard Battery Durations: Short, Medium or Long

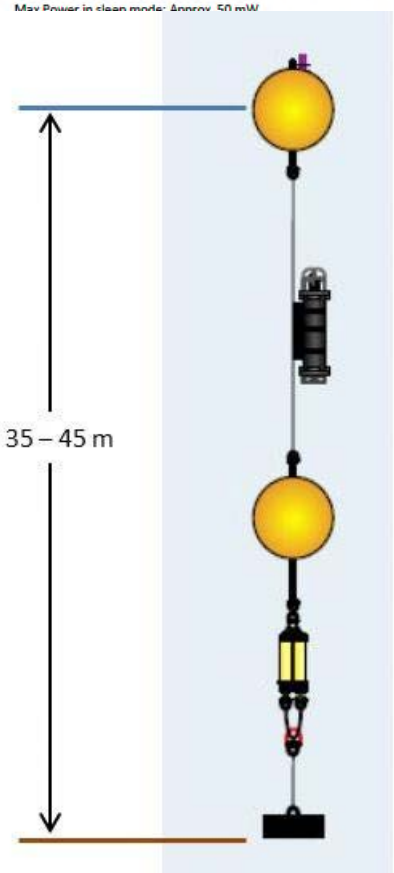
Approx Dimensions: (Medium Duration)
Diameter: 165 mm (6.5")
Max Length (Long Duration): 1321 mm (52")
Min Length (Short Duration): 406 mm (16")
Approx Mass: (Medium Duration—Shallow)
Mass in Air (Long Duration): 40 kg (88 lbs)
Mass in Air (Short Duration): 15 kg (33 lbs)

Hydrophone:

The AMAR can be used with hydrophones of varying sensitivities and frequency ranges upon request. A GeoSpectrum M8E hydrophone is typically provided with the AMAR.

Model M8E by GeoSpectrum Technologies Inc.
Omnidirectional:

Nominal sensitivity (1 kHz) : -160 dBV re 1 µPa
Frequency response: 1 Hz to 150 kHz



Flo-tec 18" low drag Buoy

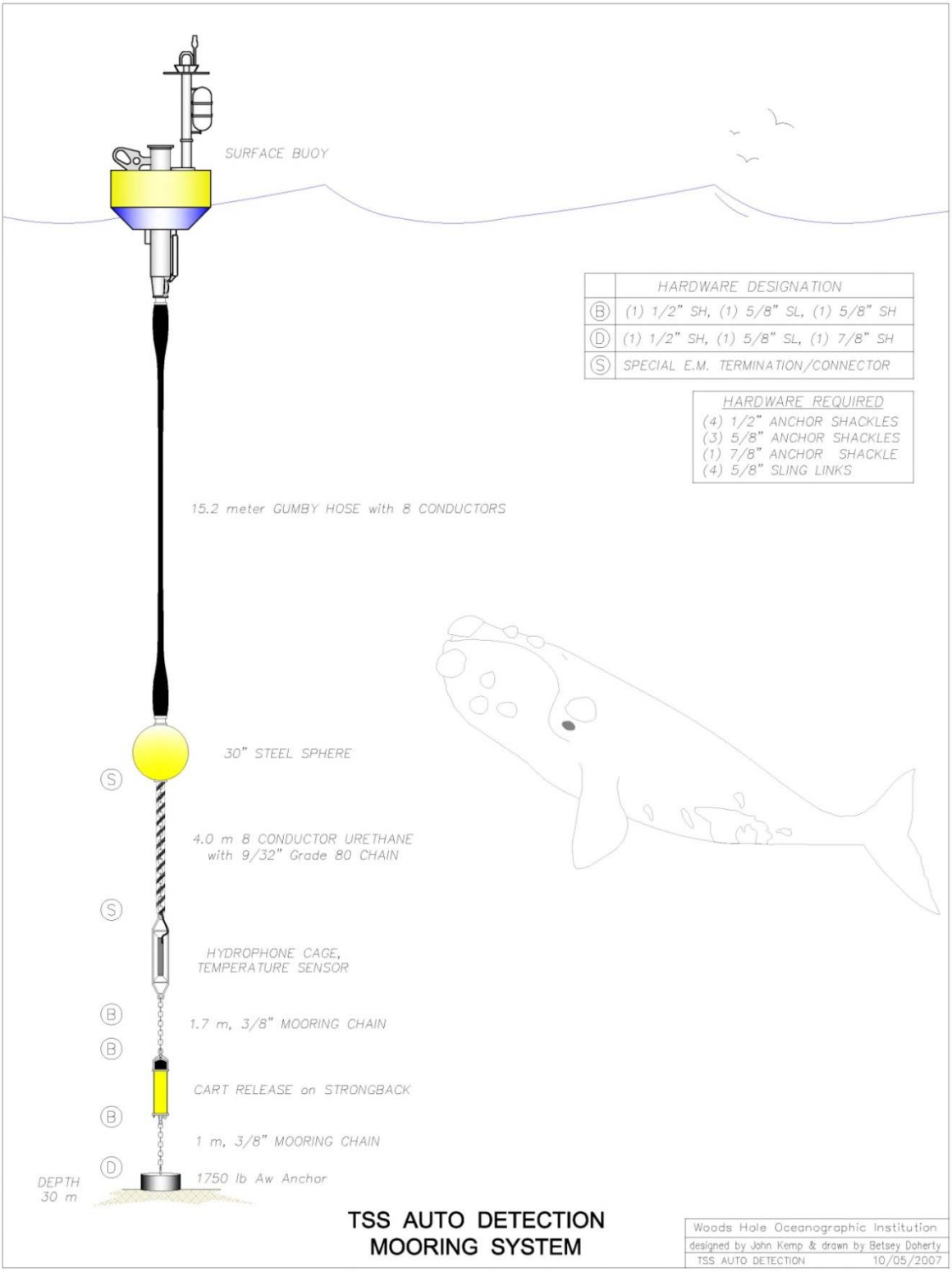
AMAR G3

Flo-tec 18" low drag Buoy

Benthos Model 875 Shallow Water Acoustic Release

Clump Weight

Figure 2. Auto-detection buoy (AB) schematic and picture of AB operating off the coast of New England



4.1 Acoustic Whale Detection and Response Plan

4.1.1 Right Whale Detection and Notifications

Ten (10) ABs manufactured by the WHOI and Cornell have been deployed within the TSS since 2007. The ABs have been placed approximately 5 nm from each other within the TSS northward as it approaches and then transits the SBNMS (Figure 3).

Each AB continuously screens the low-frequency acoustic environment (less than 1,000 Hertz) for right whale contact calls occurring within an approximately 5-nm radius from each buoy (the AB's detection range) and ranks detections on a scale from 1 to 10. Each AB transmits all detection data for detections of rank greater than or equal to 6 via Iridium satellite link to the Cornell server website every 20 minutes[9].

Protocols for evaluating and responding to AB right whale detections are described in the following sections.

NEG Port Operations

During NEG Port operations, the NEG Port Manager shall notify Cornell when he receives the USCG required 96-hour notification of an arriving vessel from the Master of the EBRV. By this notification Cornell shall be able to determine and the NEG Port Manager will confirm when an EBRV is within 24 hours of entering the TSS. Cornell will begin active monitoring for right whale detections 24 hours prior to the EBRV entering the TSS (referred to as the "monitoring-alert" condition).

There are two procedures for evaluating the AB data and posting the evaluation results, where posting refers to the protocol by which confirmed detections are communicated to an EBRV:

(1) Under a normal monitoring condition (no EBRV at the NEG Port, no EBRV in the TSS, no EBRV expected to enter TSS within 24 hours), Cornell staff with expertise in right whale call identification shall evaluate all available AB data and post detection results every 12 hours.

(2) Under a monitoring-alert condition (when the EBRV is within 24 hours of entering the TSS, is in the TSS or is in the NEG Port area) Cornell staff with expertise in right whale calls shall evaluate all available AB data and post detection results every 30 minutes[10]. During this monitoring-alert condition Cornell personnel with expertise in right whale calls shall be available full-time to confirm all detections.

Once a confirmed detection is made, Cornell shall immediately initiate a process to alert the Master of any EBRVs operating in the area. Until the Automatic Identification System (AIS) transmission is available for communicating confirmed whale detections, the time that Cornell establishes contact with the EBRV Master regarding the presence of a confirmed detection starts the 24 hour period in which that acoustic detection remains "active." Additional communications between Cornell and the EBRV Master regarding new confirmed detections (as often as every 30 minutes or every 12 hours under different monitoring conditions) shall either

[9] This 20-minute transmission schedule was determined by consideration of a combination of factors including the tendency of right whale calls to occur in clusters (leading to a sampling logic of listening for other calls rather than transmitting immediately upon detection of a possible call) and the amount of battery power required to complete a satellite transmission.

[10] The time required to complete the transmission of AB data is directly related to the size of the data package (i.e., large packages require more time than small ones.) Therefore, the exact length of time between the start of data transmission from an AB and evaluation of those AB data cannot be precisely specified. In order for Cornell staff to keep up with data evaluation from the same AB, the sum of transmission and evaluation times must be less than 20 minutes. Given the best available information at this time, we anticipate that data evaluation for a single AB data package transmitted every 20 minutes could be completed within 10 minutes after the start of data transmission. By this schedule, the longest delay time between the actual occurrence of a right whale call detected at an AB and the posting of a message that a calling right whale had been detected would be 30 minutes.

restart the 24 hour clock at an AB that has received multiple confirmed calls, or start additional 'clocks' associated with coincident detections at additional buoys.

Currently, EBRVs *Excellence*, *Excelerate*, *Explorer*, and *Express* are authorized to call upon the NEG Port. The contact info and notification content are:

Energy Bridge Regasification Vessels:

EBRV *Excalibur*:
Phone: + 870 320 542 110 (Bridge - CCR)
Phone: + 870 320 542 111 (Capt. Cabin)
Fax: + 870 320 542 112
Satcom C Telex: 420 542 110
Ocean region to be monitored: AORW (874 for Voice and 574 for Telex)
Call sign: ONCE
E-mail: master.excelerate@rmx2.rydex.co.uk - or - excellence@shipmanagement.exmar.be

EBRV *Excelerate*:
Phone: + 870 764 642 316 (Bridge - CCR)
Phone: + 870 764 642 317 (Capt. Cabin)
Fax: + 870 764 642 318
Satcom C Telex: 420 544 410
Ocean region to be monitored: AORW (874 for Voice and 574 for Telex)
Call sign: ONDY
E-mail: master.excelerate@rmx2.rydex.co.uk - or - excelerate@shipmanagement.exmar.be

EBRV *Excellence*:
Phone: + 870 764 337 789 (Bridge - CCR)
Phone: + 870 764 337 790 (Capt. Cabin)
Fax: + 870 764 337 791
Satcom C Telex: 420 543 411
Ocean region to be monitored: AORW (874 for Voice and 574 for Telex)
Call sign: ONBG
E-mail: master.excelerate@rmx2.rydex.co.uk - or - excellence@shipmanagement.exmar.be

EBRV *Excelsior*:
Phone: + 870 764 092 293 (Bridge - CCR)
Phone: + 870 764 092 294 (Capt. Cabin)
Fax: + 870 764 092 295
Satcom C Telex: 420 542 310
Ocean region to be monitored: AORW (874 for Voice and 574 for Telex)
Call sign: ONCD
E-mail: master.excelerate@rmx2.rydex.co.uk - or - excellence@shipmanagement.exmar.be

EBRV *Exemplar*:
Phone: + 870 765 052 518 (Bridge - CCR)
Phone: + 870 765 052 517 (Capt. Cabin)
Fax: + 870 765 052 519
Satcom C Telex: 420 555 310
Ocean region to be monitored: AORW (874 for Voice and 574 for Telex)
Call sign: ONFZ

E-mail: master.excelerate@rmx2.rydex.co.uk - or - excellence@shipmanagement.exmar.be

EBRV *Expedient*:
Phone: + 870 764 916 272 (Bridge - CCR)
Phone: + 870 764 916 271 (Capt. Cabin)
Fax: + 870 764 916 273
Satcom C Telex: 420 555 210
Ocean region to be monitored: AORW (874 for Voice and 574 for Telex)
Call sign: ONFY
E-mail: master.excelerate@rmx2.rydex.co.uk - or - excellence@shipmanagement.exmar.be

EBRV *Explorer*:
Phone: + 870 764 829 434 (Bridge - CCR)
Phone: + 870 764 829 435 (Capt. Cabin)
Fax: + 870 764 829 436
Satcom C Telex: 420 550 610
Ocean region to be monitored: AORW (874 for Voice and 574 for Telex)
Call sign: ONFL
E-mail: master.explorer@rmx2rydex.co.uk - or - explorer@shipmanagment.exmar.be

EBRV *Express*:
Phone: + 870 764 879 747 (Bridge - CCR)
Phone: + 870 764 879 748 (Capt. Cabin)
Fax: + 870 764 879 749
Satcom C Telex: 420 552 610
Ocean region to be monitored: AORW (874 for Voice and 574 for Telex)
Call sign: ONFL
E-mail: master.express@rmx2.rydex.co.uk - or - express@shipmanagement.exmar.be

EBRV *Exquisite*:
Phone: + 870 764 847 146 (Bridge - CCR)
Phone: + 870 764 847 147 (Capt. Cabin)
Fax: + 870 764 916 267
Satcom C Telex: 420 555 110
Ocean region to be monitored: AORW (874 for Voice and 574 for Telex)
Call sign: ONFX
E-mail: master.excelerate@rmx2.rydex.co.uk - or - excellence@shipmanagement.exmar.be

The Notification Content shall include:

- Time of detection – designated in local time (LT)
- Detection AB – designated by AB-ID# and LAT/LON coordinates
- Active detection time period – indicate start (as defined for pre-AIS communication methodology, above, and post-AIS communication methodology, below) and end times for 24-hour mandated response
- Special instructions – any pertinent information

In order to ensure the efficiency with which whale detection information is transmitted to EBRV Masters, additional notification methods may be developed in cooperation between NOAA, USCG, Cornell, and Northeast Gateway.

Presently, the default notification mechanism is that Cornell shall make telephone calls to the Master of any EBRV operating in the area. Information detailing the detection shall also be faxed to the NEG Port Manager (Fax #: +1 978 744 5973). Two alternative notification mechanisms, NAVTEX Reporting and AIS Reporting are being developed in cooperation with NOAA, USCG, Cornell, and Northeast Gateway to provide content information to the EBRVs.

The objective of these alternative notification methods is to ensure that whale detection information is transmitted in a manner that (1) allows it to be most efficiently integrated with additional information utilized by EBRV Masters and crew members, and (2) will facilitate broadening of the audience for detection notices to non-EBRV vessels in the area, following either voluntary reception and use of these messages by such additional vessels or determination by NOAA to propose the use of these messages in the agency's ship strike mitigation strategy (including associated evaluation of the impacts of such action, and additional governmental and public review and comment).

Since implementation of these two methods have not been fully developed by NOAA, USCG, Cornell, and NEG at this time, they are not included as part of this MMDMRP for Operation. Northeast Gateway shall continue to cooperate in the development activities for these two alternative notifications methods and when either method is tested and confirmed that the EBRVs can integrate the methods into their operating protocols, this MMDMRP shall be amended to describe how the alternative reporting systems shall be implemented and the EBRV crews shall be trained on their implementation. A brief general description of each of the proposed alternative reporting methodologies is provided below.

NEG Port and Pipeline Lateral Planned and Unplanned/Emergency Repair and Maintenance Activities

If the repair/maintenance work is located outside of the detectible range of the 10 project area ABs, Northeast Gateway and Algonquin shall consult with NOAA (NMFS and SBNMS) to determine if the work to be conducted warrants the temporary installation of an additional AB(s) to help detect and provide early warnings for potential occurrence of right whales in the vicinity of the repair area. Otherwise MMOs will be assigned to each vessel that will use DP systems during maintenance and repair related activities to visually observe for the presence of marine mammals.

Should acoustic monitoring be deemed necessary during an planned or unplanned/emergency repair and/or maintenance event, Cornell will begin active monitoring for right whale calls 24 hours prior to the start of activities. During this monitoring-alert condition, Cornell staff with expertise in right whale calls shall evaluate all available AB data and post detection results every 30 minutes until the repair/maintenance event is completed. MMOs will monitor and report in accordance with the NEG Port and Pipeline Lateral repair and maintenance protocols provided in Appendix B as well as the procedures outlined in section 3.3.2.

4.1.2 NAVTEX Reporting

NAVTEX is a standard Narrow Band Direct Printing (NBDP) system that assures a nearly 100% delivery of messages in all weather conditions. The NBDP system can be configured such that all detection messages can be prioritized. Therefore this notification procedure shall require receiver (vessel operator) acknowledgement or an audible alarm keeps repeating. Most vessels over 300 tons have NAVTEX. The IMO has designated NAVTEX as the primary means for transmitting coastal urgent marine safety information to ships worldwide. In the United States, NAVTEX is broadcast from USCG facilities in Cape Cod Massachusetts, Chesapeake Virginia, Savannah Georgia, Miami Florida, New Orleans Louisianna, San Juan Puerto Rico, Cambria California, Pt. Reyes California, Astoria Oregon, Kodiak Alaska, Honolulu Hawaii, and Guam. The USCG has been operating NAVTEX from Boston, Massachusetts since 1983.

4.1.3 AIS Reporting of North Atlantic Right Whale Detections

The AIS is currently being used by ship-to-ship, line-of-site communication and principally for identification and locating vessels for navigation safety and collision avoidance. AIS helps to resolve the difficulty of identifying ships when many ships are in one area or when ships are not in sight (e.g., in fog, at far distance) by providing a means for ships to exchange identification, position, course, speed, and other ship data with all other nearby ships and Vessel Traffic Services (VTS) stations. It works by integrating a standardized VHF transceiver system with an electronic navigation system, such as a LORAN-C or Global Positioning System (GPS) receiver, and other navigational sensors aboard a ship (e.g., gyrocompass, rate of turn indicator, speed log, etc.).

NOAA has suggested that the active whale detections be transmitted over the AIS to facilitate the efficiency with which these data are integrated with additional navigational information utilized by vessels fitted with AIS equipment. NEG shall work with representatives from Cornell and the University of New Hampshire to further investigate this new application for the AIS. Transmission of whale detection notifications over the AIS shall require authorization from the USCG and IMO.[11]

4.1.4 Maintenance of the Auto-detect Buoy Systems

AB units shall be refurbished and repaired every three to six months as necessary, and the schedule for such repairs shall be carefully orchestrated so as not to impact auto-detection coverage in the TSS. For example, units would be swapped out during periods when no Project vessels are in the area or expected to enter the area. Northeast Gateway shall be required to maintain this system for the life of the Project. Cornell shall provide regular reports to MARAD, USCG, and NOAA (both NOAA Fisheries and NMSP) that include information on the functioning and performance of this system (see Section 4.2).

4.2 Hydroacoustic Monitoring Program during Initial EBRV Delivery

The sound level verification program is planned to be implemented only once during the entire approach, unloading, and departure event for the first delivery shipment. However, if more extensive use of the NEG Port occur above use thresholds reflecting the original intent of NEG port operations, the monitoring program will be made more permanent and extended as necessary to meet monitoring and reporting requirements previously established or until the requisite data has been collected. Modeling is a supplement to measurements and a properly validated model will increase utility of the measurement results. In this particular Project area, local acoustic propagation characteristics have a minimal effect on determination of source level (SL); therefore, long-term continuous monitoring is not required to describe SLs during different seasons. Once the SL has been established for a given sound speed profile these data can be used to analyze sound propagation incorporating other seasonal effects.

The field recorded data will be used to verify acoustic modeling parameters and modeled sound level radii presented in the updated IHA. The recordings of acoustic measurements will also be used for future off-line evaluation and analysis and refinement of the site specific underwater sound attenuation rates under other seasonal conditions. Acoustic measurements will be collected during operation until the NEG Project is able to document a representative acoustic sample of all the major operating scenarios as described in the biological opinion (BO) issued by NOAA Fisheries pursuant to Section 7 of the Endangered Species Act (ESA) of 1973. To achieve this, the received sound levels will be measured at pre-determined distances to assess site-specific

[11] NOAA is facilitating the acquisition of this authorization. The USCG has reviewed the binary code proposed for transmission of whale detection notices to Northeast Gateway's EBRVs and has approved the use of AIS for this purpose. Transmissions became available for EBRV reception in July 2008; however, software development to decode and display the transmissions on EBRVs was not finalized until summer 2009. Fall-winter 2009/10 will be considered a pilot season for this new methodology using laptops separate from EBRV mainframe navigation systems. Until this development and testing phase are completed, received information on right whale detections will be reported to the transiting Excelerate Energy EBRVs using the default reporting procedures outlined in Section 3.1.1.

propagation characteristics and verify ranges to the NOAA Fisheries sound exposure thresholds. The operational scenarios that will be monitored include:

- **EBRV in Transit**: Measurements will be made of the EBRV approaching and departing the NEG port.
- **EBRV Maneuvering and Mooring**: Once the EBRV is within approximately 1 kilometer of the buoy, the EBRV will begin maneuvering to obtain proper positioning to allow for safe connection with the buoy. When the EBRV is connected, thrusters are disengaged.
- **Regasification:** The EBRV will regasify its LNG cargo while on station. As demonstrated during the Gulf Gateway underwater noise survey, sound levels for regasification are low when the EBRV is in heat recovery mode and there is no outfall noise at the NEG Port resulting in further reduction in noise generation as compared to Gulf Gateway.

In addition, measurements will be conducted during periodic maintenance events that have the potential to increase underwater sound levels, i.e. the use of thruster enabled vessels or significant underwater physical construction activities. During the proposed monitoring plan, background or ambient sound levels will also be established by analysis of recordings when no operations are present, and by relying on the previous BRP data set gathered over the last five years.

For the initial delivery, measurements will be made using a combination of equipment including a cabled real-time hydroacoustic analysis system and fixed autonomous recorder(s). By completing underwater noise measurements at an appropriate and relatively close distance to the NEG port, it is anticipated that only a limited set of such measurements would be needed to fulfill data collection goals. Fixed static recording units capable of recording the entire operational sequence will be deployed at approximate distances of 200 to 500 meters and 1 to 2 kilometers from the NEG Port along the specified transit route. These distances were selected to be outside the acoustic and geometric near field, but close enough to document sound levels and transmission loss effects for all but the quietest operational transient events (i.e. onboard regasification) while minimizing intrusion of nearby extraneous sources. The fixed recorder(s) will provide empirical data and recordings of the entire operational event to assess changes in the source and variations in its temporal and spectral characteristics over time. In addition, the data from the fixed recording unit will be used to correct for the variations in source level during the time periods when work-boat measurements were not being made. The static recording units will be deployed at least one (1) day prior to arrival and will remain in place for a minimum one (1) day after departure, utilizing a vessel similar to that described for previous MARU deployment and retrieval. Information pertaining to forecasted delivery levels at or above the stated trigger will be provided to NEG in advance, giving adequate time for monitoring systems to be put in place prior to the first forecasted delivery event. To that end, Tetra Tech will maintain two (2) Autonomous Multichannel Acoustic Recorder — Generation 3 (AMAR G3) on call for dedicated use on the Project.

Data from the autonomous recording unit would not be available for review until after the operational event has been completed and will be used to assess site specific transmission losses and provide further verification of the acoustic modeling methodology employed. The field monitoring program will be used to field verify actual distances to thresholds and these values will be compared to the impact distances from predictive modeling.

Events that may trigger additional data collection include any maintenance or repair activities with the potential to result in significant noise levels (i.e. DP thrusters) or for any delivery beyond the initial EBRV delivery that may occur outside the winter heating season.

For the cabled systems, the hydrophones will be deployed directly from a workboat (likely the same vessel used for static recorder deployment and retrieval) . This vessel will not be stationary but will be allowed to move throughout the monitored area to characterize sound fields, including in areas in immediate proximity to the EBRV. The ability to collect data easily at varying distances and directions relative to the EBRV will provide further information about duration and amplitude of source levels during different operational events. The hydrophones deployed from the work vessel will be suspended in the water column and secured to an anti-heave buoy, which will position the sensors at a constant distance below the surface of the water and the cables will be equipped with fairing to reduce cable strum. In addition, the line will be weighted at the lower end to best maintain a vertical profile during deployment. Prior to measurements being conducted, a sound velocity profile will be collected using a current-temperature-depth (CTD) sounder. It will be required that the vessel's engines, depth sounder, generator, and other equipment that may contaminate the sound signal will be shut down prior to each hydrophone deployment. The position of the vessel in relation to the NEG Port will be actively monitored by GPS and by use of a marine laser range finder. Tetra Tech will maintain three (3) Bruel & Kjaer model BK8104 or Reson model TC4040 broadband hydrophones and signal analyzers on call for dedicated use on the Project. Theses hydrophones are more sensitive than most other hydrophones, even at the extremes of its frequency range. With a dynamic range in excess of 100 dB, these hydrophones are among a few that are suitable for the measurement of noise with a highly sloped spectrum. These units are also equipped with waterproof connectors for signal input following conditioning directly to multichannel real time frequency analyzers capable of 1/3 octave and Fast Fourier Transform spectral analysis. The underwater sound levels will also be recorded with calibration tones recorded immediately prior to each measurement period, for reference purposes.

4.3 Extended Longterm Hydroacoustic Monitoring

The fieldwork program would be extended to a semi-permanent monitoring program similar in scope and design when forecasted NEG Port use will be more than 5 shipments in a 30-day period or over 20 shipments in a six-month period. This extended monitoring program would be expected to remain in effect until the active use is reduced below thresholds described. The deployed AMARs are available to remain in position for up to six months to cover potential shipments.

The extended monitoring period will provide insight in two key areas. The short-term measurement program will document specific EBRV deployments and benchmark existing sound models. With these data, models will be able to account the seasonal changes in the underwater soundscape. With the extended program, the measurements will document any variation in scheduled deliveries and limit the number of deployments and retreivals.

4.4 Data Analysis and Reporting

Following completion of the sound survey, measurement data and recordings will be immediately downloaded in the field for subsequent analysis at the Tetra Tech Boston office. Measurement data will be correlated to field log books and all necessary engineering calculations completed. Tetra Tech will report underwater sound levels in terms of RMS dB referenced to re 1 μPa. For each relevant time period, third octave spectra sound pressure level data will be evaluated for frequencies ranging from 10 Hertz (Hz) to 20 kilohertz (kHz). The results will be summarized in graphical form and include a summary of statistical sound levels and time histories. Specifically, items to be documented include:

- Map of monitoring locations and location of fixed static recorders;
- Position of hydrophones in the water column during testing;
- Weather, wave height (if applicable), current flow rates;

- Description, manufacturer and model number of equipment including hydrophone type, directionality, and nominal sensitivity;
- National Institute of Standards and Technology (NIST) calibration certifications and field calibration methods and results;
- Any unusual conditions that could have affected measured noise levels, including a description of any excessive extraneous noises;
- Time and date stamped time histories for all relevant datasets;
- SPL (dB re 1 µPa, RMS) for continuous sounds for each scenario;
- 1/3 frequency spectra of all relevant time periods including the arithmetic mean, which reflects the presence of high amplitude transients; the geometric mean; the median, L_{90} residual background, and maxima values and a table of significant highest tones;
- Peak SPL (dB re 1 µPa) or the largest absolute values of the instantaneous sound pressures for each scenario;
- Calculations of cumulative exposure over the duration of scenarios as a cumulative distribution function and the N percent exceedance level;
- The maximum averaging time and representative range of SPLs; and
- A summary of the nature and extent of the received sound levels during operational events and conclusions.

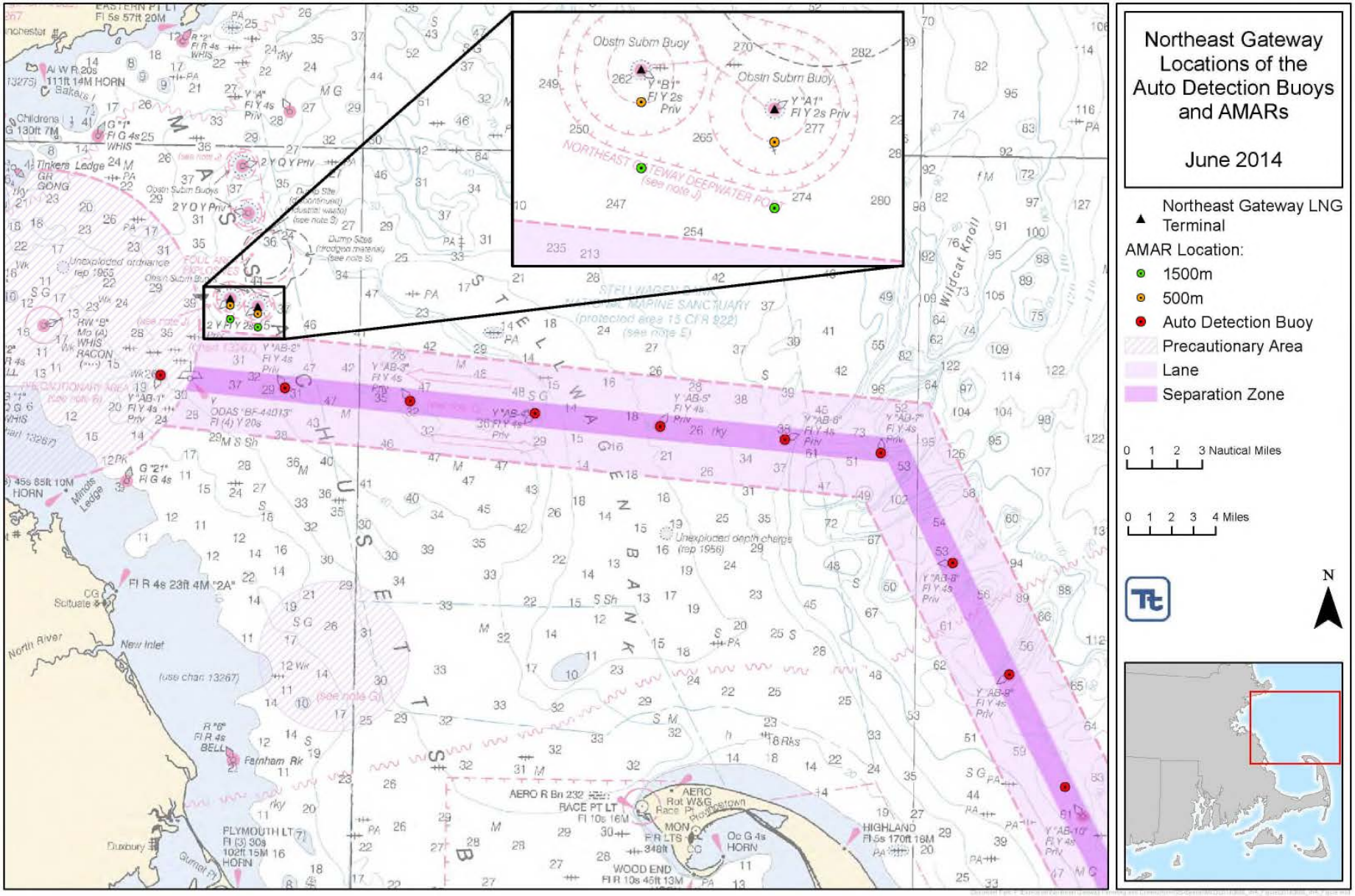
The operational reports will be provided upon the completion of the initial EBRV delivery or completion of any extended monitoring period Two separate deliverables will be associated with this field monitoring effort. A memo presenting preliminary results will be provided within 7 days of completion of the monitoring program, summarizing the results of testing for each operational monitoring event. A final technical report will be provided within 60 days after completion of the monitoring program. The report will provide full documentation of methods and monitoring protocols, summarize the data recorded during monitoring, estimate the number of listed marine mammals and sea turtles that may have been taken, and provide an interpretation of the results and effectiveness of all monitoring tasks. The attenuation of the noise over pre-selected transects will be used to further estimate the distance of the isopleths for the NOAA Fisheries mandated noise criteria.

Table 4.2-1 Marine Mammal Detection and Monitoring Reporting Requirements

Report Title	Scheduled delivery to NOAA	Summary of Contents
ITS/IHA Report	Monthly throughout operations	Tabulation of number of marine mammals visually detected within 2 miles of the EBRV or during NEG Port or Pipeline Lateral repair/maintenance activities; estimation of take per species/species class; raw sighting logs for month
Auto Detection Buoy Report	Every three months (beginning 9 months into operations)	Whale detections by TSS ABs, presence of EBRVs, and EBRV responses to notification
Hydroacoustic Monitoring Report	A memo presenting preliminary results will be provided within 7 days of completion of the monitoring program, summarizing the results of testing for each operational monitoring event. A final technical report will be provided within 60 days after completion of the monitoring program.	Underwater sound levels in terms of RMS dB referenced to re 1 µPa. For each relevant time period, third octave spectra sound pressure level data will be evaluated for frequencies ranging from 10 Hertz (Hz) to 20 kilohertz (kHz). The results will be summarized in graphical form and include a summary of statistical sound levels and time histories. Specifically, items to be documented include: • Map of monitoring locations; • Position of hydrophones in the water column during tests; • Weather, wave height (if applicable), current flow rates; • Description, manufacturer and model number of equipment including hydrophone type, directionality, and nominal sensitivity; • National Institute of Standards and Technology (NIST) calibration certifications and field calibration methods and results; • Any unusual conditions that could have affected measured noise levels, including a description of any excessive extraneous noises; • Time and date stamped time histories for all relevant datasets; • SPL (dB re 1 µPa, RMS) for continuous sounds for each scenario; • 1/3 frequency spectra of all relevant time periods including the arithmetic mean, which reflects the presence of high amplitude transients;

		the geometric mean; the median, L90 residual background, and maxima values and a table of significant highest tones; • Peak SPL (dB re 1 µPa) or the largest absolute values of the instantaneous sound pressures for each scenario; • Calculations of cumulative exposure over the duration of scenarios as a cumulative distribution function and the N percent exceedance level; • The maximum averaging time and representative range of SPLs; and • A summary of the nature and extent of the received sound levels during operational events and conclusions.
MMDMRP Summarization Report	Every five years	Overall review of the performance and effectiveness of the passive acoustic monitoring and mitigation systems within the areas of the AMAR and AB networks; including documentation, quantification and measurements of the contributors to ocean ambient noise.

Figure 3. Locations of the Auto Detection Buoys and AMARs



Appendix A: EBRV-specific Heightened Awareness Protocol

In accordance with Annex A of the Northeast Gateway MARAD License, the Revised NOAA Biological Opinion (issued November 30, 2007), Incidental Take Statement (issued November 30, 2007), the Revised Incidental Harassment Authorization (issued November 30, 2007), and the NMSP recommendations, Northeast Gateway must both acoustically and visually monitor for whale presence while transiting within the designate Boston TSS, while maneuvering within the confines of the NEG Port[12], and while EBRV vessels are actively engaging in the use of thrusters. While engaging in any of these activities, the EBRV crew will be placed on heightened awareness. The following document identifies the specific actions and reporting protocols for the EBRV crew to follow during heightened awareness events.

Heightened Awareness Protocols for Operating EBRVs

- Prior to entering and navigating the modified TSS the Master of the vessel will :
  - Consult NAVTEX, NOAA Weather Radio, the NOAA Right Whale SAS or other means to obtain current right whale sighting information as well as AB detection system;
  - Post a look-out who has successfully completed the required Marine Mammal and Sea Turtle Training Program, to visually monitor for the presence of marine mammals and/or sea turtles;
  - Place the vessel in the heightened awareness mode and ensure the protocols stated in this in appendix are initiated and implemented as presented;
  - Provide the USCG required 96-hour notification of an arriving EBRV to allow the NEG Port Manager to notify Tetra Tech of vessel arrival. This notification will signal Tetra Tech to mobilize equipment required for the hydroacoustic monitoring program planned, which will include measurements during EBRV movement and NEG Port operations occurring during initial delivery. The AB system shall be the primary detection mechanism that alerts the EBRV Master and/or NEG Port and Algonquin Pipeline Lateral support vessel captains to the occurrence of right whales, heightens EBRV or NEG Port and Algonquin support vessel awareness.
- While transiting the TSS, maneuvering within the ATBA, and/or while engaging in the use of thrusters, the vessel is considered operating under the requirement of this heightened awareness protocol
- The vessel look-out assigned to visually monitor for the presence of marine mammals and/or sea turtles will be equipped with the following:
  - Recent NAVTEX, NOAA Weather Radio, SAS and/or acoustic monitoring buoy detection data;
  - Binoculars to support observations;
  - Marine mammal detection guide sheets (see attachment 1); and
  - Sighting log (see attachment 2 and reporting requirements below).
- The look-out will concentrate his/her observation efforts within the 2-mile radius zone of influence (ZOI) from the maneuvering EBRV.
- If marine mammal detection was reported by NAVTEX, NOAA Weather Radio, SAS and/or an AB, the look-out will concentrate visual monitoring efforts towards the areas of the most recent detection.
- If the look-out (or any other member of the crew) visually detects a marine mammal within the 2-mile radius ZOI of a maneuvering EBRV, he/she will take the following actions:
  - The Officer-of-the-Watch will be notified immediately;

[12] The ATBA is a 1.4- nm diameter area around the NEG Port facility. This is the largest area of the port that will be marked on nautical charts that is enforceable by the USCG.

  - The sighting will be recorded in the sighting log by the designated marine mammal look-out (see attachment 2 and the reporting requirements below).
- If the Officer-of-the-Watch is notified by any crewmember of a marine mammal sighting, he/she will relay the sighting information to the Master immediately so that the appropriate action(s) can be taken to ensure impacts to the marine mammal(s) are successfully avoided and/or minimized.
- Once the STL buoy is locked into place the vessel is no longer considered in Heightened Awareness status. However, when the EBRV prepares to depart from the NEG Port, the crew will once again assume the responsibilities as defined in this Plan.

Heightened Awareness Reporting Protocols

- The look-out responsible for visual monitoring during any given watch period must keep a log of all marine mammal sightings. A sample sighting log sheet has been included as attachment 2. The basic reporting requirements include the following:
  - Date;
  - Time monitoring watch commenced/Time monitoring watch was suspended;
  - Name of look-out;
  - Vessel name;
  - Lookout position;
  - Weather and sea-state conditions;
  - Time of sighting;
  - Type of species sighted (categories will include: species [if known], unknown large whale, unknown small whale, unknown dolphin/porpoise, unknown seal, unknown sea turtle), as well as comment area for unusual or obvious behaviors;
  - Number of individuals sighted (record will include: exact number [if known], 5+, 10+, 50+, 100+);
  - Approximate location (latitude and longitude) at the time of the sighting;
  - General direction and distance of sighting from the vessel (distance should be recorded as within 50 yards, within 100 yards, within 500 yards, within 0.5 mile; within 1 mile, within 2 miles, greater than 2 miles);
  - Activity of the vessels at the time of sighting; and
  - Action taken by the observer.
- At the end of each monitoring watch the look-out will provide the log entries to the Officer-of-the-Watch.
- The Master will be responsible for providing the sighting log entries to the Port Manager.
- Northeast Gateway will provide a monthly IHA/ITS Report that includes copies of the sighting logs, a summary for the species sited for the month, and an estimate of Takes on a monthly basis to the following:

- **Michael Asaro**
  NOAA Fisheries NERO
  Ship Strike Coordinator
  55 Great Republic Drive
  Gloucester, MA 01930
  978-282-8469

- **Leila Hatch**
  Marine Ecologist
  NOS/NOAA
  Stellwagen Bank National Marine Sanctuary
  175 Edward Foster Road
  Scituate, MA 02066
  Leila.Hatch@noaa.gov
  (781) 545-8026 x203

- **Shane Guan**
  NOAA Fisheries Office of Protected Resources
  1315 East-West Highway
  SSMC-3 Suite 13756
  Silver Spring, MD 20910
  Shane.Guan@noaa.gov
  301-713-2289 x 137

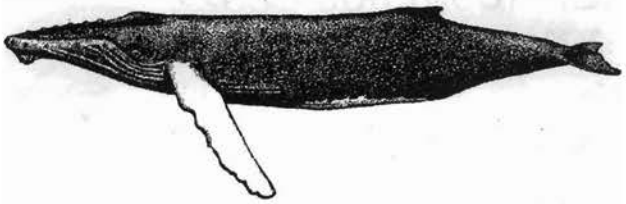
- **Yvette M. Fields**
  Director Office of Deepwater Ports and Offshore Activities
  U.S. Maritime Administration
  1200 New Jersey Avenue, SE, W21-309 (MAR-530)
  Washington, DC 20590
  Yvette.Fields@dot.gov
  (202) 366-0926

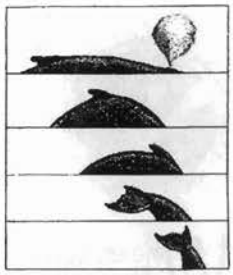
- **Roddy Bachman**
  Project Manager, Deepwater Ports Standards
  USCG Headquarters
  USCG Stop 7509,
  2703 Martin Luther King Jr. Ave SE,
  Washington DC 20593-0001
  Roddy.C.Bachman@uscg.mil
  (202) 372-1451

Attachment 1 – Marine Mammal Sighting Guide

Common Large Whales of the Atlantic

Humpback Whale (Size: Up to 55 feet in length)

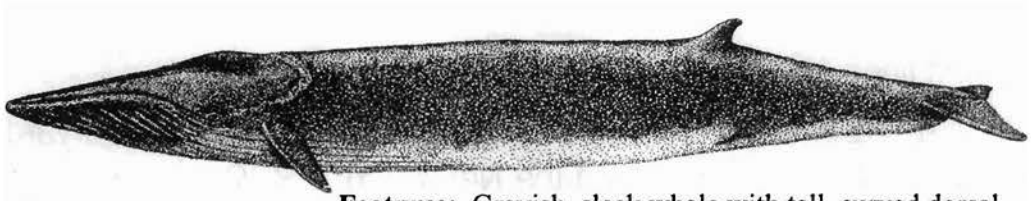


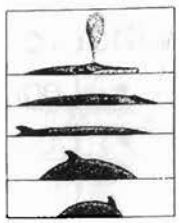


Features: Mostly black with long white flippers, bumps on head and distinctive, variably sized dorsal fin. Usually lifts the tail when diving. Distinctive black and white pattern underneath.

Range: During spring, summer and fall these whales are found most often around the sloping sides of the banks and ledges of the Gulf of Maine, Georges Bank and the continental shelf south to Cape Hatteras.
Food: Mostly small schooling fish like sandlance, herring, young mackerel, and krill.

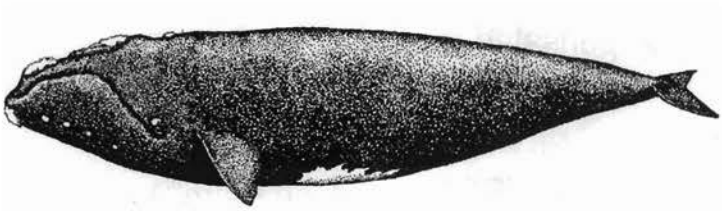
Finback Whale (Size: Up to 85 feet in length)



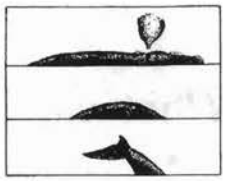


Features: Grayish, sleek whale with tall, curved dorsal fin. Head lighter on right side. Rarely lifts tail.
Range: Same areas as the Humpback whale, but not always at the same time.
Food: Same as Humpback whale.

North Atlantic Right Whale (very rare)* (Size: Up to 60 feet long)



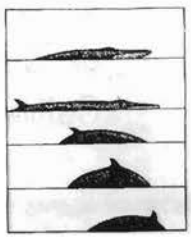
Features: Stocky, mostly black whale with no dorsal fin and rough white patches on head. Often lifts black, triangular tail high when diving.



Range: Winter/Spring in Cape Cod Bay & Great South Channel. Summer/Fall in Bay of Fundy & Roseway Basin. Winter off of Florida and Georgia coast (mostly females and calves).
Food: Small animal plankton, mostly copepods.

* With about 300 remaining, federal regulations establish a 500 yard buffer zone around this species. That zone can only be entered with special authorization through the Network or USCG to assist the Disentanglement Network.

Minke Whale (Size: Up to 35 feet in length)



Features: Sickle-shaped dorsal fin, white bands on flippers, with no visible breath (spout). Rarely lifts tail.
Range: Same as Humpback and Finback whales, but also found in closer to shore.
Food: Same as Humpback and Finback whales. Sometimes eats single discarded fish.

(Illustrations: Janet Biondi)

Attachment 2 – Marine Mammal Sighting Log

Northeast Gateway Deepwater Port Sighting Log
Boston, Massachusetts

LOOK OUT:	**DATE:**
LOOK OUT POSITION:	**OBSERVATION SHIFT (START/END):** /
VESSEL:	**TOTAL OBSERVATION HOURS:**

WEATHER AND WATER CONDITIONS:	**% Cloud Cover:**	**Sea State:**
	Clarity:	**Visibility:**

Sightings Logs

Time	Species	# Sighted	Approximate Location	General Direction / Closest Distance to Vessel	Vessel Activity	Action Taken by Observer
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: Behavior: _____	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: : Behavior: _____	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: : Behavior: _____	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: : Behavior: _____	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: : Behavior: _____	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: : Behavior: _____	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other: : Behavior: _____	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi ☐ >2 mi		

SIGNATURE OF LOOK OUT:	**SIGNATURE OF OFFICER OF THE WATCH:**

Northeast Gateway
Repair and Maintenance Sighting Logs

DATE:		PROJECT NUMBER:		PERMIT NUMBER
OBSERVERS:				
OBSERVER LOCATION:				
OBSERVER SHIFTS:		12:00-24:00		24:00-12:00

WEATHER CONDITIONS:	%CC:	Wind spd:	Wind dir:
WATER CONDTIONS:	Glare:	Clarity:	Color:
	Sea State:	Visibility:	Temp:
TOTAL OBSERVATION HOURS:			

Vessel		Vessel Type				Location		
Dynamic Positioning:	YES ☐	# Thrusters:		Lat(0:00)		Lat(12:00)		
	NO ☐	Time used:		Lon(0:00)		Lon(12:00)		
Exclusion Zone NARW				Other				

Daily Summary

Type	Species	Total number spotted	Number spotted outside exclusion zone	Number spotted inside exclusion zone	Behavior when inside exclusion zone	Action taken by observer	Action due to acoustic detection	Comments

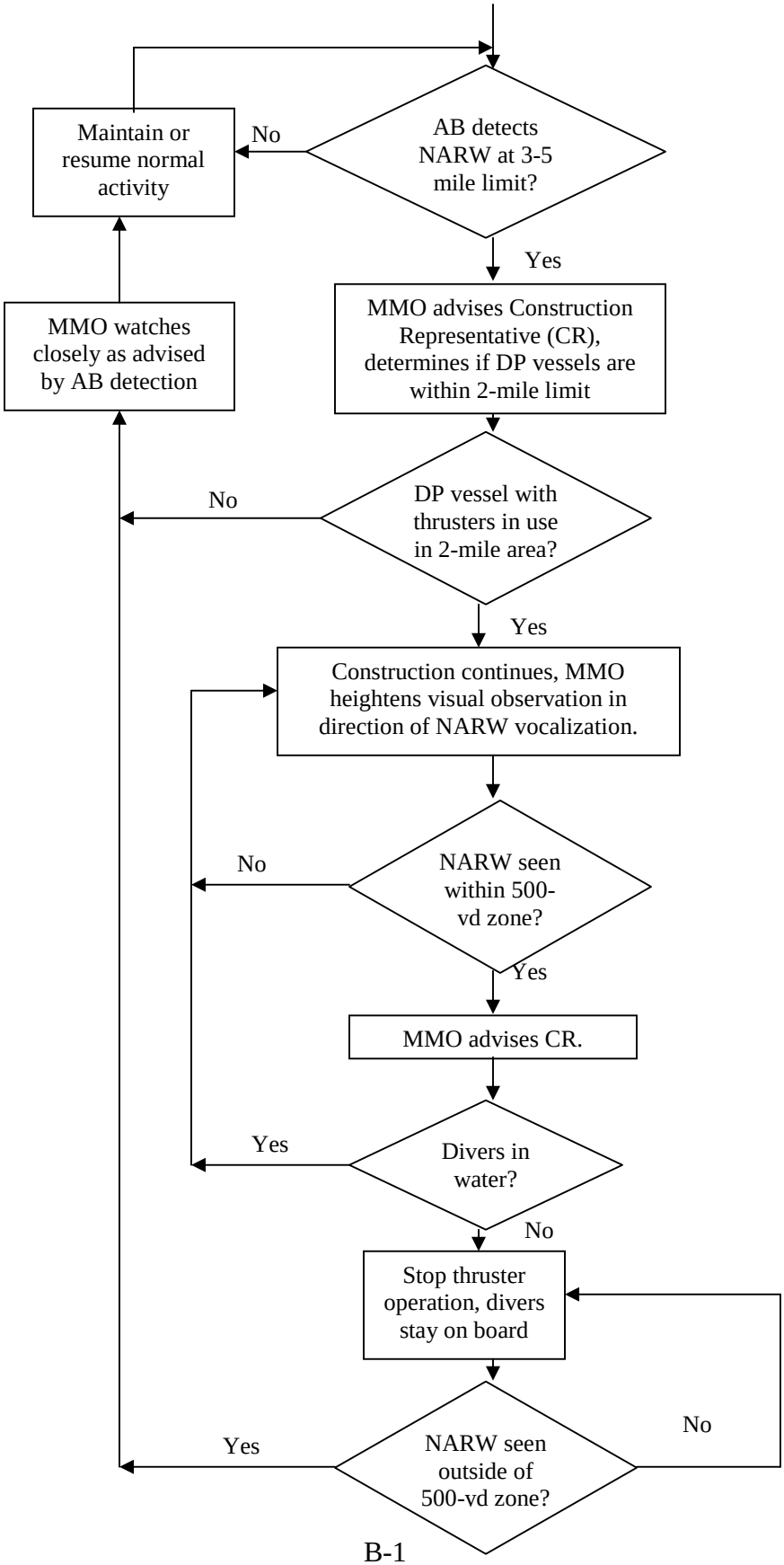
Sighting Logs

Time	Species	Adults	Juveniles	Closest distance to vessel (ft)	Activity	Time of Shutdown	Time of Start Up	Time last seen	Time of clip recording	AB Number (Buoy #)

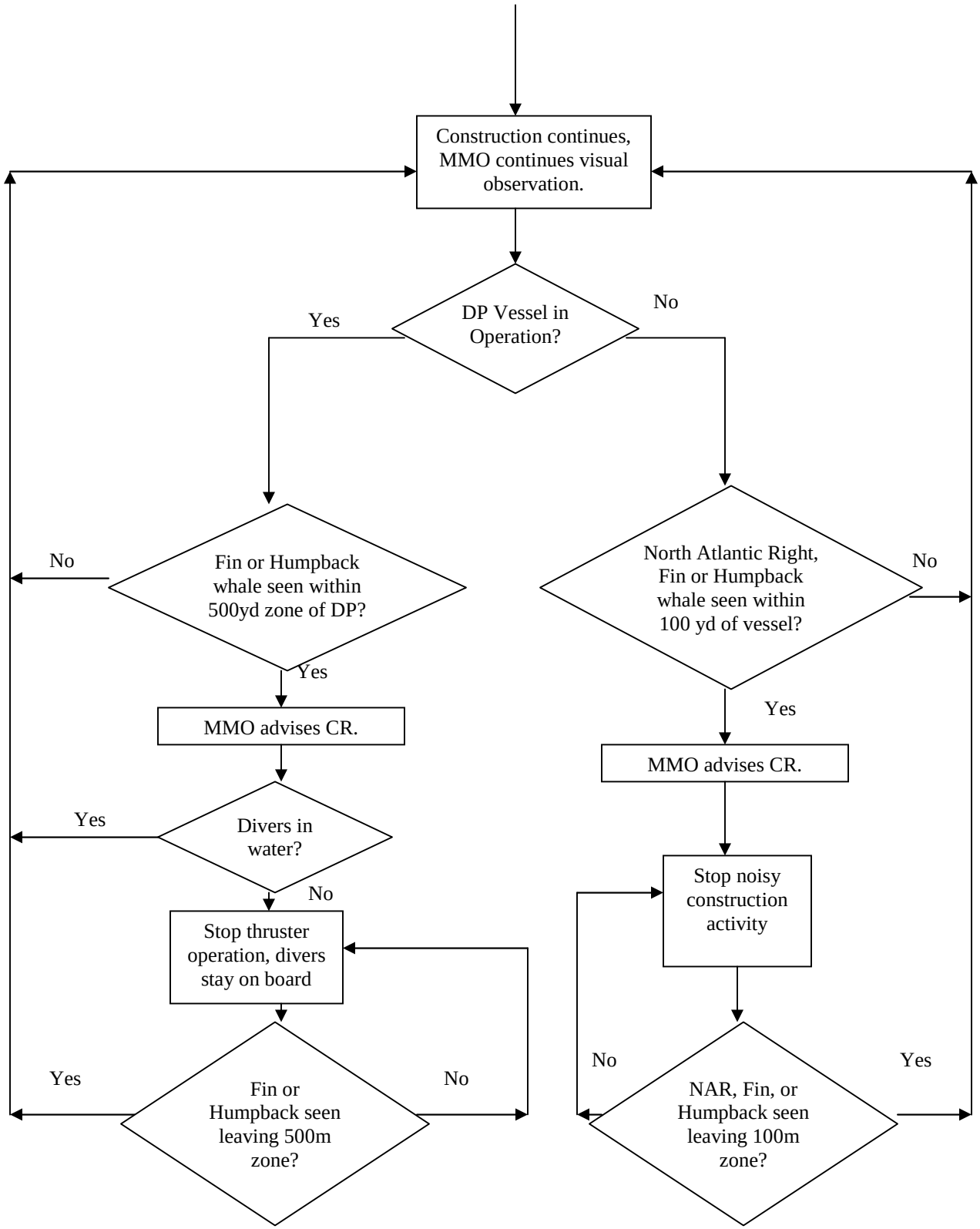
OBSERVER SIGNATURE:

Appendix B: Maintenance-specific Detection Protocols

NEG Port and Pipeline Lateral Protocol for Right Whale AB and Visual Detection and Response



NEG Port and Pipeline Lateral Protocol for All ESA-listed Whale Visual Detection and Response.



Appendix C: Marine Mammal and Sea Turtle Training Materials

Northeast Gateway

Northeast Gateway Deepwater Port and Pipeline Lateral Operations, Repair and Maintenance Marine Mammal and Sea Turtle Training Program

excelerate energy

Last Updated May 2014

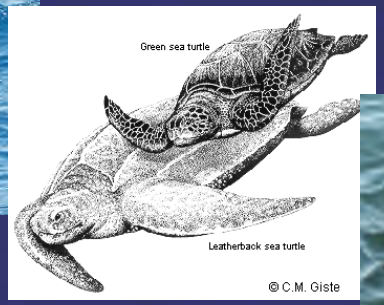
Northeast Gateway Marine Mammal and Sea Turtle Training Program

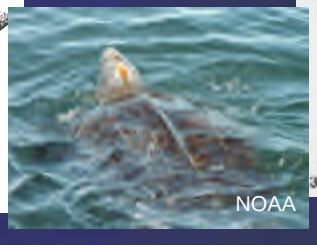
- Marine Mammal and Sea Turtle Information Sources
- Noise Monitoring
- Marine Mammal Vessel Strike Avoidance
- Marine Mammal Incidental Take and Harassment
- Reporting
- Marine Mammal and Sea Turtle Identification

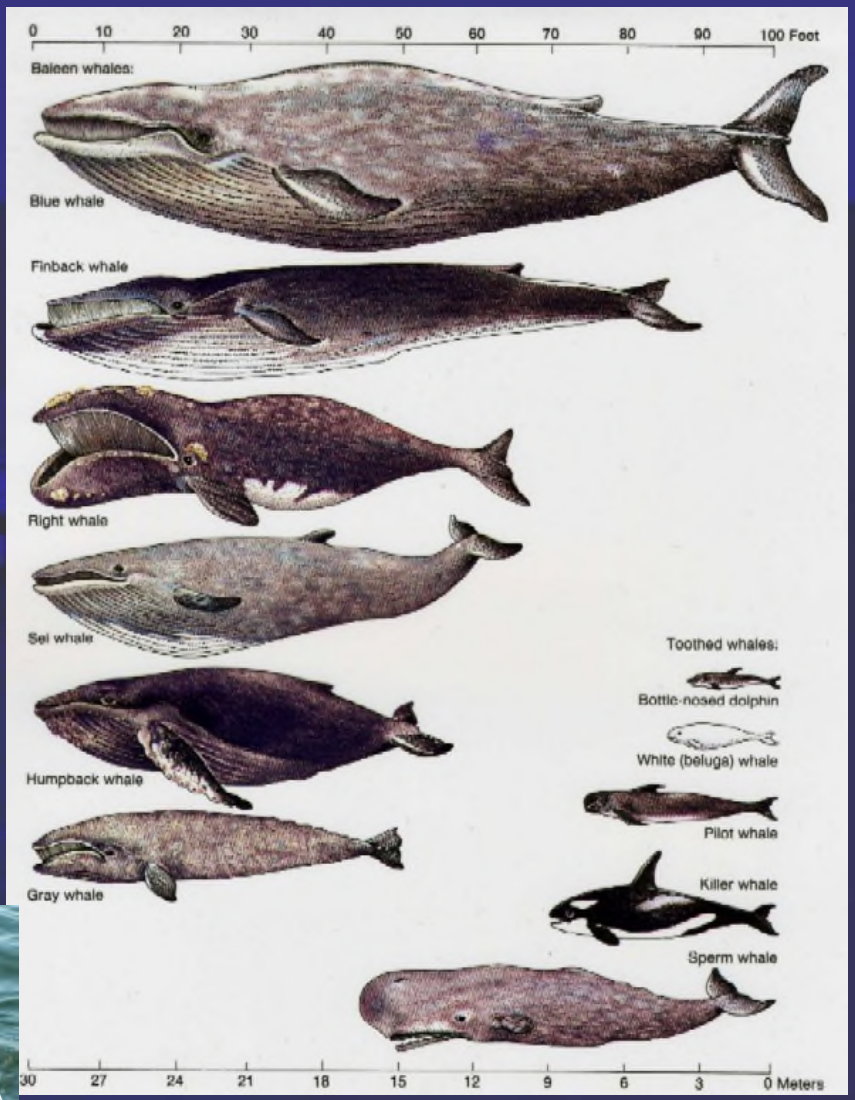
Northeast Gateway Marine Mammal and Sea Turtle Training Program

Marine Mammal and Sea Turtle Presence Training

- Marine mammal vessel strike avoidance procedures
- Federal laws and regulations for protected species (ship strike information, critical habitat, migratory routes and seasonal abundance)
- Recent sightings of protected species
- Identification of marine mammals and sea turtles







http://faculty.mccfl.edu

Northeast Gateway Marine Mammal and Sea Turtle Training Program

Training Requirements

All individuals onboard EBRVs, Repair and Maintenance Vessels, and NEG Port Personnel responsible for navigation and lookout duties will receive training for:

- Marine Mammal and Sea Turtle Presence
- Marine Mammal Vessel Strike Avoidance
- Marine Mammal and Sea Turtle Reporting

Marine Mammal and Sea Turtle Sightings Information

Sightings Data Sources

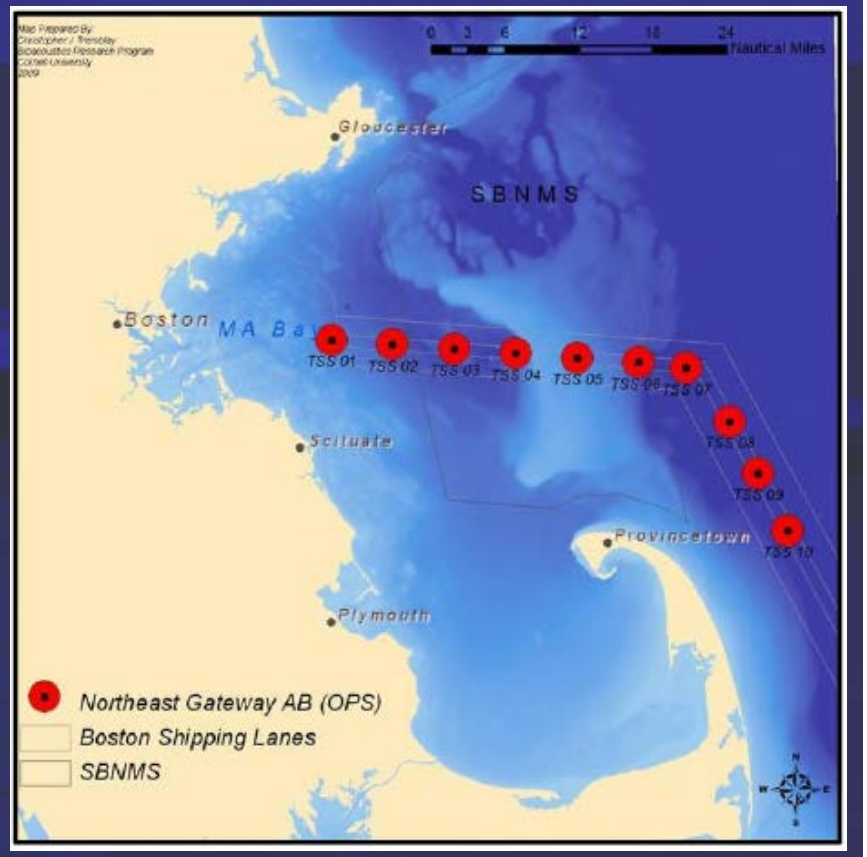
- Auto-Detection Buoy (AB) System
- NAVTEX
- NOAA Weather Radio
- NOAA Sightings Advisory System (SAS)

Noise Monitoring

Auto-Detection Array

- An array of 10 auto-detection buoys (AB)
- Operated in the northern leg of the Boston Traffic Separation Scheme (TSS)

Use of this system provides near-real-time passive acoustic monitoring of vocally active whales within the shipping lane.



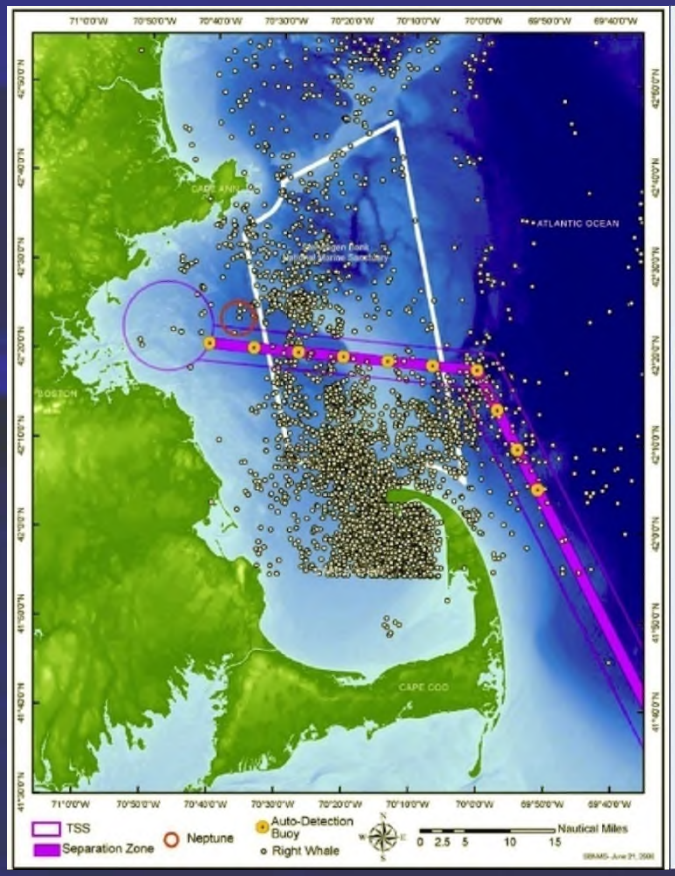
Noise Monitoring

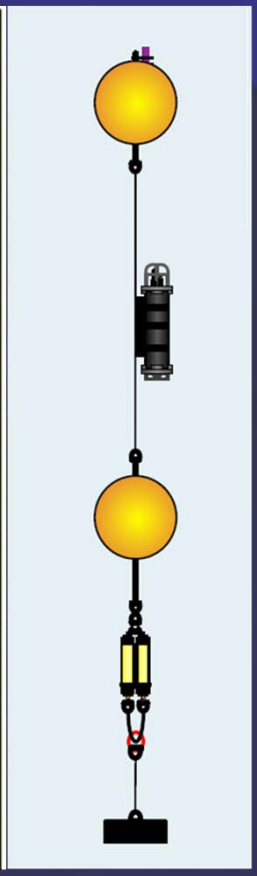
Autonomous Marine Recording (AMAR) Program

Short Term AMAR Program

- Implemented only once during the approach, unloading, and departure during the first delivery
- Deployed at approximate distances of 500 meters and 2 kilometers from the NEG Port

Program would be extended to a semi-permanent monitoring program forecasted NEG Port use will be more than 5 shipments in a 30-day period or over 20 shipments in a six-month period.



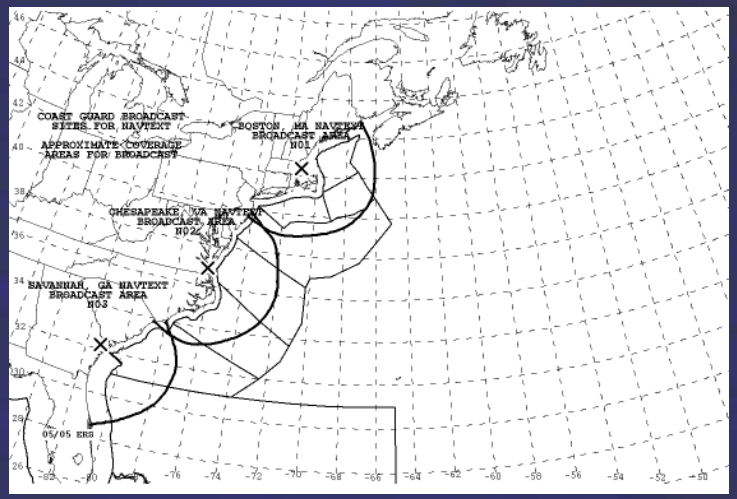


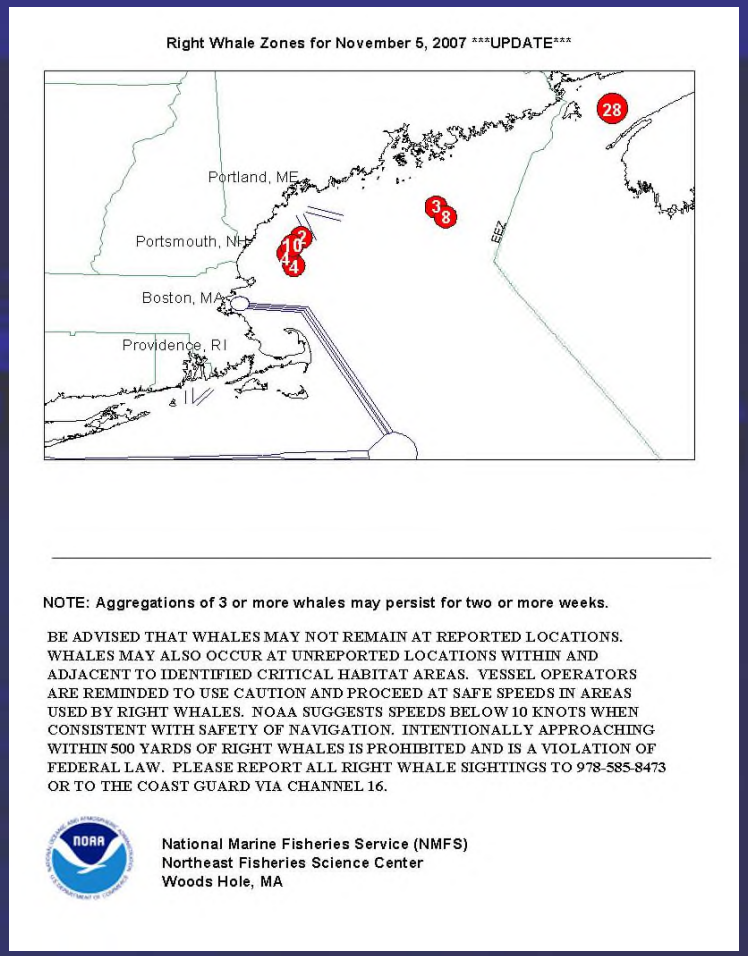
Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

All Vessels

All vessels consult right whale sightings information through NAVTEX, NOAA Weather Radio, NOAA Right Whale Sightings Advisory System ("SAS"; http://rwhalesightings.nefsc.noaa.gov), or other means, and get active detection from the auto-detection array.



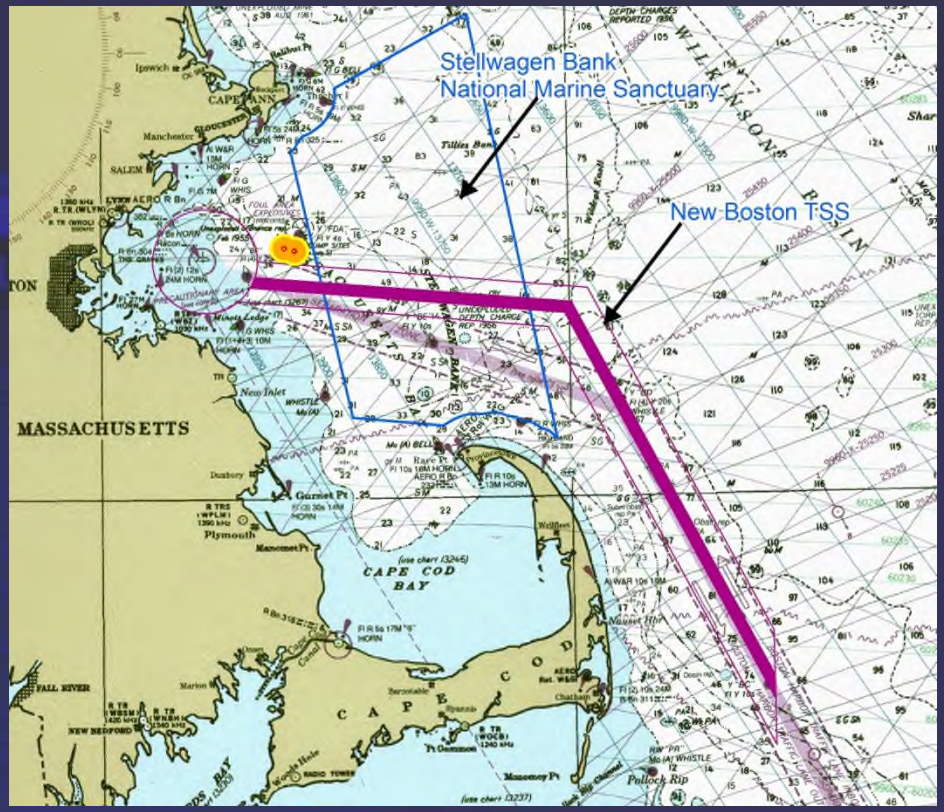


Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

All Vessels

- All vessels transiting to/from the Boston TSS or NEG Port shall use a maximum 10 knots vessel speed.
- In Boston TSS, all vessels shall go into a “heightened awareness” mode of operation.
- All vessels shall comply with Mandatory Ship Reporting System (MSRS).

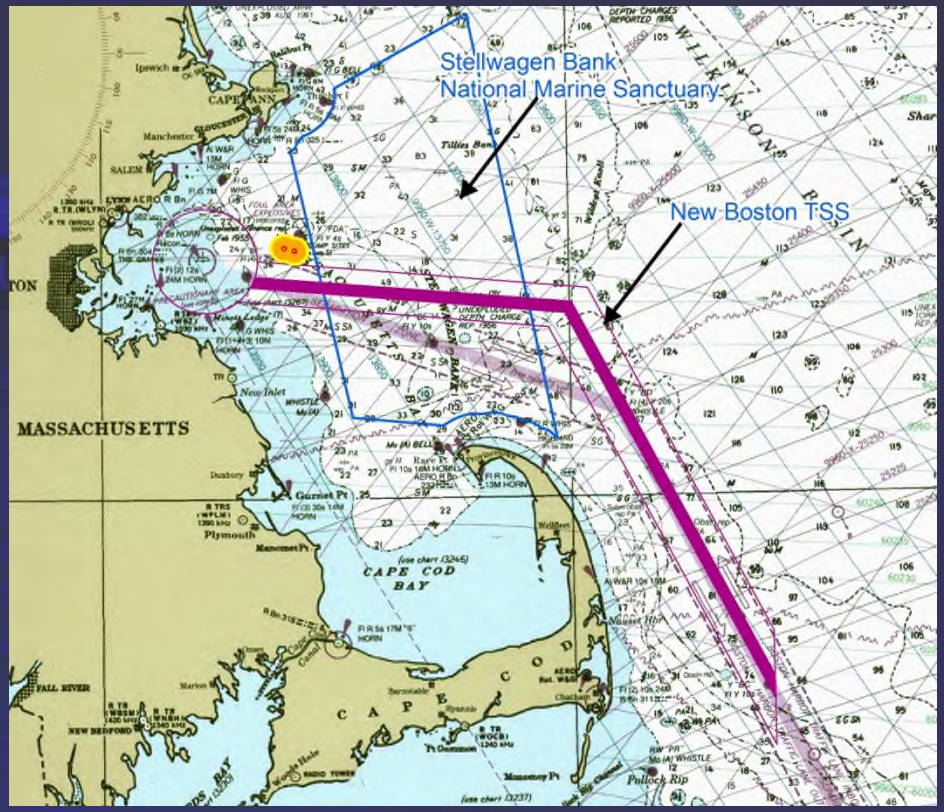


Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

All Vessels

- All vessels shall not approach closer than 500 yards to a right whale or 100 yards to any other whale.
- Vessels over 300 gross tons (GT) shall not exceed 10 knots, those under 300 GT shall not exceed 10 knots within 5 miles of any sighting location or while traveling through a dynamic management area (DMA).
- Vessels under 300 GT must contact the MSR, US Coast Guard (USCG) or Project site prior to leaving shore for reports of active DMAs or recent sightings.



Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

All Vessels

Vessel Heightened Awareness

- The Master of the vessel will post a trained look-out.
- Look-out will concentrate efforts within the 2-mile radius Zone of Influence (ZOI).
- If marine mammal sighted through the look-out will concentrate efforts toward the areas of the most recent detection.
- If a marine mammal is detected, the Officer-of-the-Watch is to be notified .
- When the STL buoy is locked in position, the vessel is no longer considered in Heightened Awareness status.

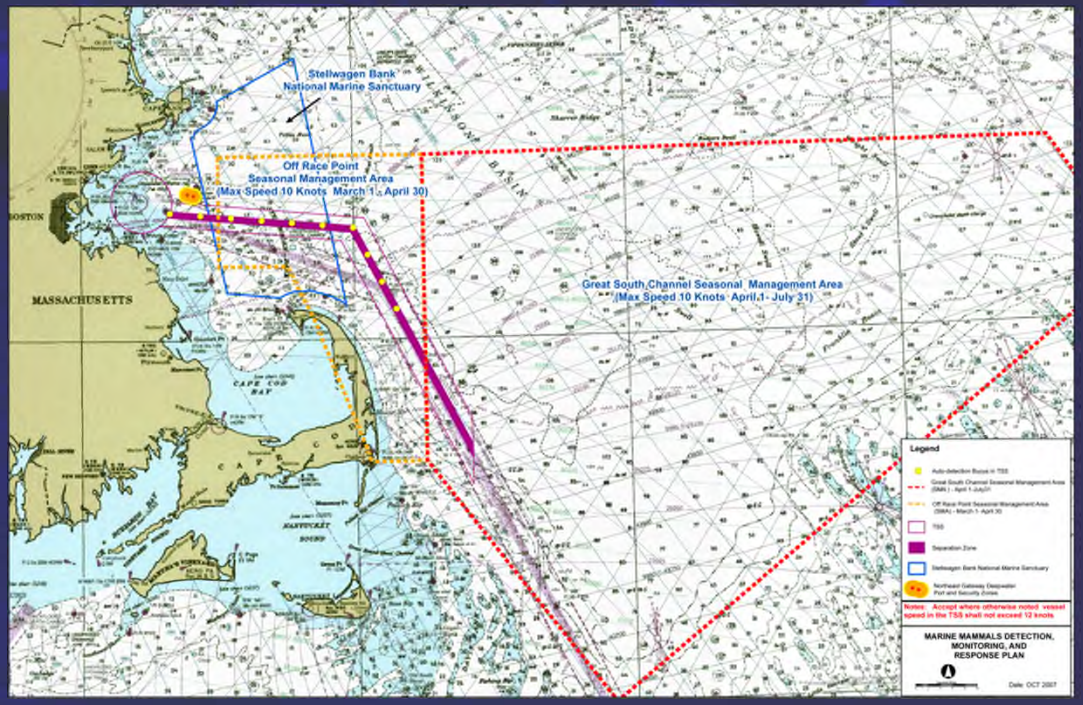
Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Vessel Speed Restrictions

Unless hydrographic, meteorological or traffic conditions dictate an alternative speed to maintain safety or maneuverability of the vessel:

- Within Boston TSS arriving/departing port:
  - 10 knot maximum when transiting to and from the Boston TSS or NEG Port, not to exceed 12 knots anywhere within the Boston TSS.
- Off Race Point SMA:
  - Maximum 10 knots March 1 through April 30.
- Great South Channel SMA:
  - Maximum 10 knots April 1 through July 31.



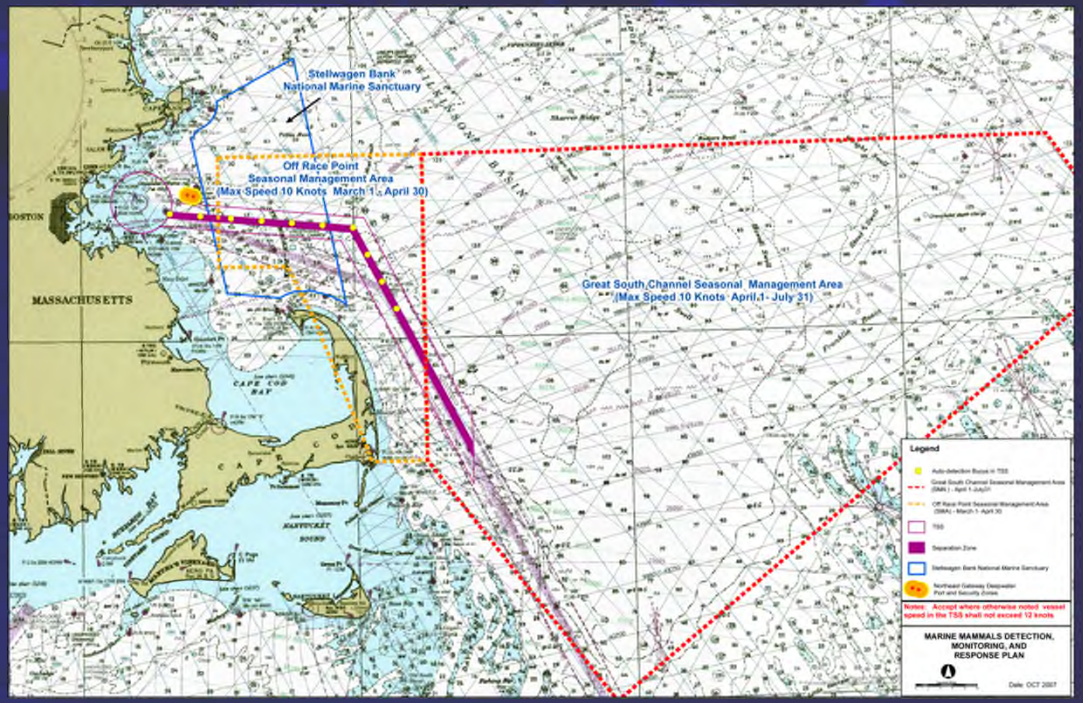
Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Vessel Speed Restrictions

Exceedance of speed restrictions, for any reason, require documentation of the reason, speed, area and time of the speed deviation. Contact both:

- **The NOAA Fisheries Northeast Regional Office (NERO) Ship Strike Supervisor:**
  Mary Colligan
  55 Great Republic Dr.
  Gloucester, MA 01930
  Mary.A.Colligan@noaa.gov
  (978) 281-9116
- **NMSP Regional Marine Bioacoustic Coordinator:**
  Leila Hatch
  175 Edward Foster Rd.
  Scituate, MA 02066
  Leila.Hatch@noaa.gov
  (781) 545-8026 x203

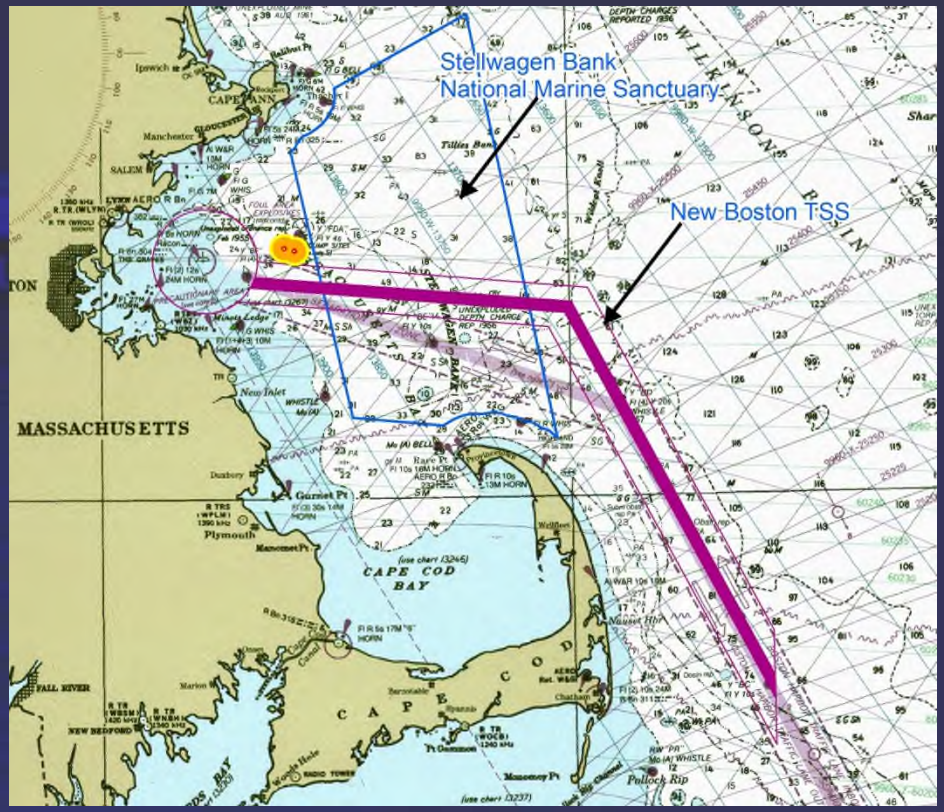


Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

EBRV Transit

- EBRVs must utilize the newly-configured and IMO-approved Boston TSS on approach and departure at the earliest practicable point of transit.
- EBRVs in transit to/from Boston TSS or NEG Port shall use the following speed restrictions:
  - 1.86 miles (3 km) from Port – 3 knots.
  - 1,640 ft. (500 m) from NEG Buoy – 1 knot.



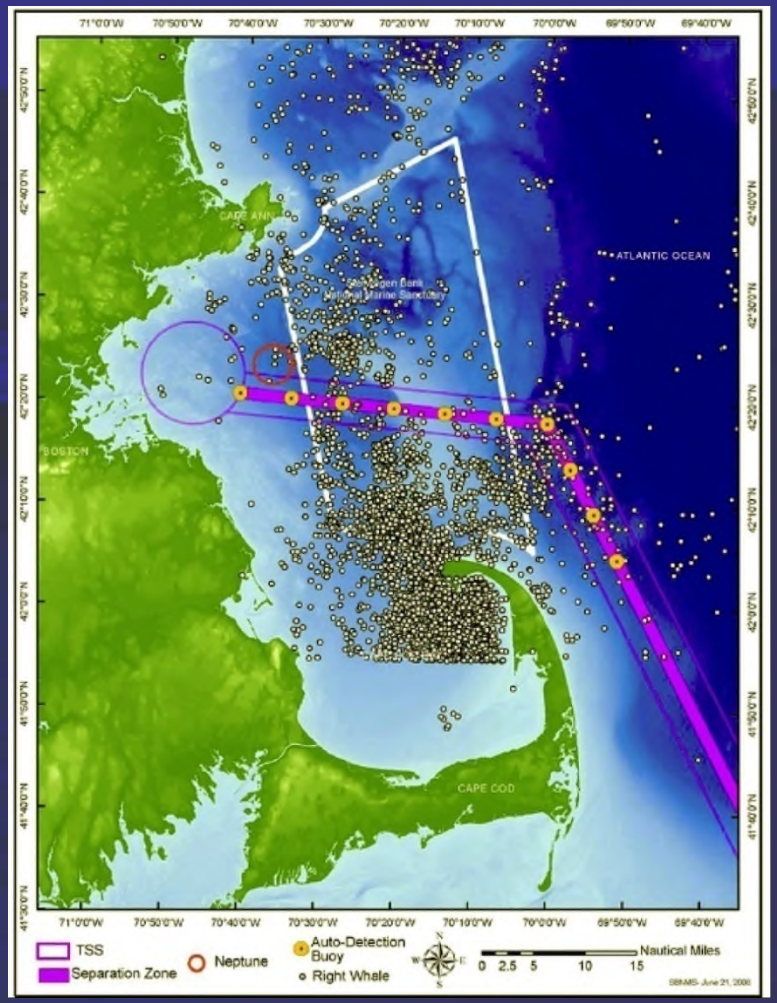
Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

EBRV Transit

Acoustic detection procedures:

- Cornell must be notified when an EBRV is within 24 hours of entering the TSS (arriving at or departing the port).
- Cornell will notify EBRV Masters via telephone call or fax when a positive acoustic detection is made.
- The notification content shall include the time of detection, detection AB, active detection time period and special instructions.
- NAVTEX Reporting and AIS Reporting, are being considered and may be developed in cooperation with NOAA, USCG, Cornell, and NEG to provide content information to the EBRVs.



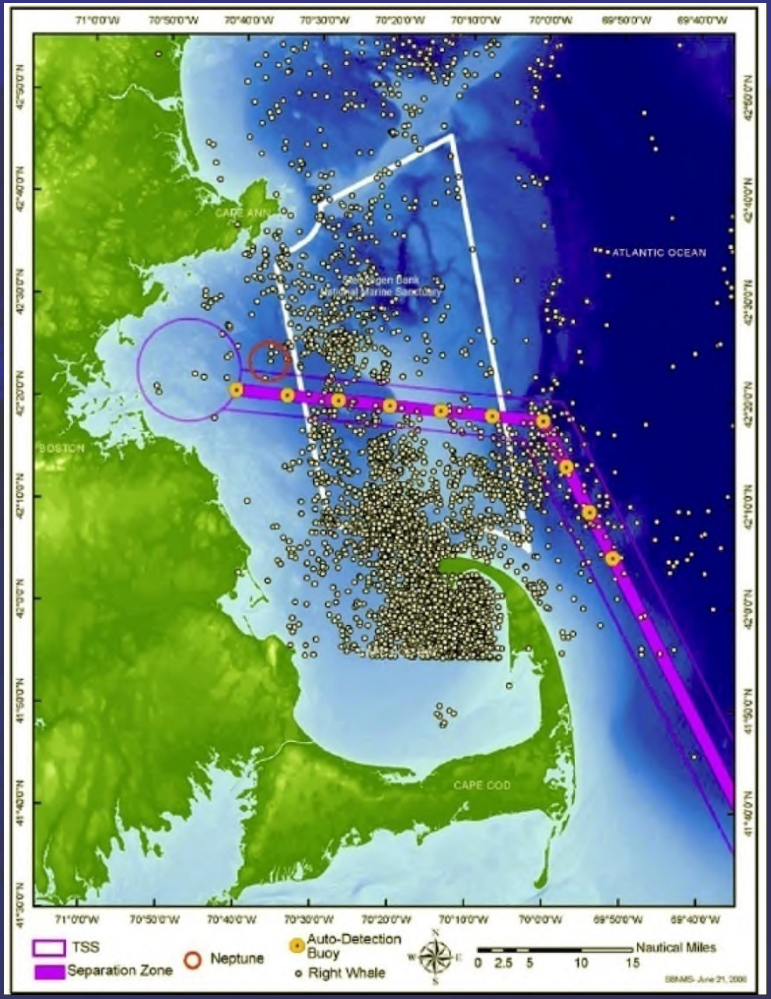
Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

EBRV Transit

For EBRVs, when whales are sighted:

- Notify Officer-of-the-Watch of the vessel.
- Reduce speed to 10 knots and concentrate look-out efforts towards the area of most recent sighting.
- Delay departure if the auto-detection system detects a whale within 1 km, until whale is greater than 1 km away or 30 minutes have passed since redetection.
- Approaching or departing vessels within the area to be avoided (ATBA) shall remain at least 1 km from right whales and 100 yards from other whales.



Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

- The use of DP thrusters shall be minimized to the extent reasonably possible.
- USCG, MARAD, NOAA (NOAA Fisheries and NMSP) must be notified 30 days prior to planned repair and/or maintenance
- Unplanned repair and/or maintenance requires notification of USCG, MARAD, NOAA (NOAA Fisheries and NMSP) as soon as practicable after determination that such work is needed
- Protected species observers (PSOs) and reporting will be conducted in accordance with NEG Port and Pipeline Lateral repair and maintenance protocols.

Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

- Vessel superintendant or crew supervisor to be notified immediately of whale detections within 2 miles.
- All sightings to be recorded on species sighting logs.
- For detections within 2 miles, use of direction thrusters is to be minimized until animal has moved away, unless divers or ROV are deployed.

Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

- For detections within 0.5 mile, crew shall go into a “heightened awareness” mode of operation.
- Vessel shall cease movement and all noise-emitting activities if right whale is sighted within 500 yards or any marine mammal or sea turtle is sighted within 100 yards. Work can resume when whale is confirmed to be out of the area or 30 minutes has passed without detection.

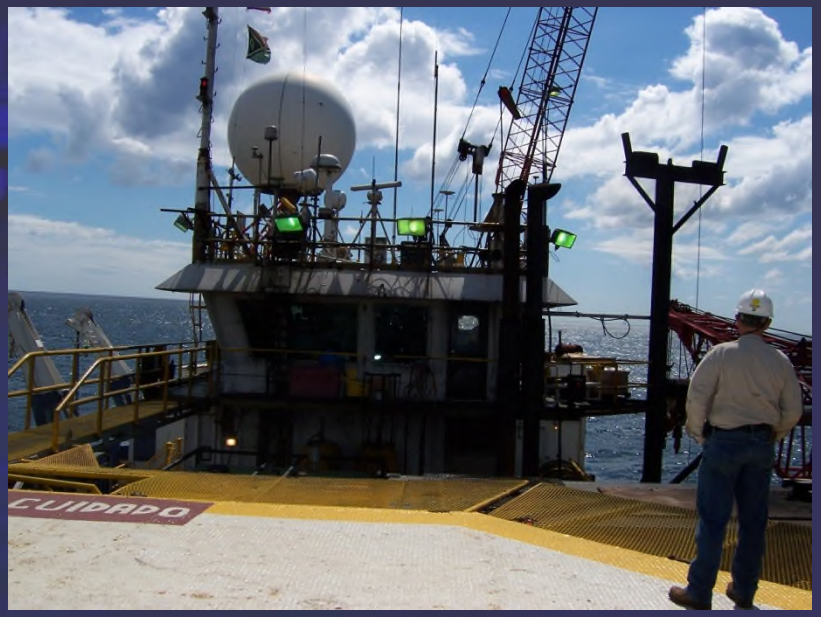
Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

If work is conducted outside the detectable range of the AB array:

- Operations involving noisy equipment shall “ramp-up” all sound-emitting equipment.
- Material with entanglement potential shall only be deployed as needed, using knotless floating line, and removed immediately after no longer required.
- Material will be removed if entanglement is immanent.
- USCG, MARAD, NOAA (NOAA Fisheries and NMSP) to be notified if entanglement occurs.



Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

All repair and maintenance activity shall be scheduled between May 1 and November 30. For anything between December and April the following additional conditions apply:

- Work shall shutdown and directional thrusters minimized if visibility drops below 0.5 mile.
- Transit barges must obtain sightings information from on-site vessels prior to transit start. Right whale sightings within 30 minutes of start shall hold the vessel for 30 minutes until cleared by the on-site PSO.

Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

All repair and maintenance activity shall be scheduled between May 1 and November 30. For anything between December and April the following additional conditions apply:

- Transit barge crews must receive half-day training and record all sightings.
- Sightings within 1,000, the transit barge shall go into high alert and reduce speed to 4 knots.
- Sightings within 750 meters require transit barge to idle and/or cease all movement.

Marine Mammal Vessel Strike Avoidance

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Maintenance and Repair

All repair and maintenance activity shall be scheduled between May 1 and November 30. For anything between December and April the following additional conditions apply:

- Transit barge requires a maximum vessel speed of 10 knots, reduced to 5 knots within 5 kilometers of the repair area.
- Transit barge movement shall occur during daylight hours when possible. Nighttime activity requires a maximum vessel speed of 5 knots.

Marine Mammal Vessel Strike Avoidance

NOAA General Ship Strike Avoidance Procedures

All Vessels

- Maintain a vigilant watch.
- For whales: maintain a distance of 100 yards or greater between the whale and vessel.
- For turtles: attempt to maintain a distance of 50 yards or greater between the turtle and vessel.

Marine Mammal Vessel Strike Avoidance

NOAA General Ship Strike Avoidance Procedures

All Vessels

- For small whales: maintain a parallel course to the animal and avoid abrupt changes in direction.
- 10 knots for mother/calf pairs or groups, maintaining a minimum distance of 100 yards whenever possible.
- When sighted, reduce speed and shift the engine to neutral. Do not engage the engines until animals are clear of the area.

Marine Mammal Vessel Strike Avoidance

Acoustic Seafloor Array Support Vessel Strike Avoidance Procedures

Acoustic Array Support Vessels

- Vessels over 300 GT shall not exceed 10 knots, those under 300 GT shall not exceed 15 knots.
- Comply with Off Race Point and Cape Cod Bay SMA Speed Restrictions.
- No Vessel Shall Approach a right whale closer then 500 yards or 100 yards to any other whale.
- All vessels shall post look-outs.
- All vessels shall obtain the latest right whale sighting information via the NAVTEX, MSR, SAS, NOAA Weather Radio, or other available means prior to operations.

Marine Mammal Vessel Strike Avoidance

North Atlantic Right Whale Requirements

All Vessels

- For sightings reported via MSR or SAS, reduce speed to 10 knots or less if within 8-nautical mile (9.2 miles) radius from the sighting.
- For sightings reported via acoustic detections, reduce speed to 10 knots or less if within 5-nautical mile (5.8 miles) radius from the sighting.
- Concentrate monitoring efforts in direction of most recent detection.
- For sightings reported via look-outs, reduce speed to 10 knots or less within 2-mile radius from the sighting.

Marine Mammal Vessel Strike Avoidance

Additional Recommendations for North Atlantic Right Whales

All Vessels

- No vessel is to approach closer than 500 yards to any right whale.
- Avoid transiting right whale habitat at night or during periods of low visibility.
- Mariners should route around known right whale locations or reduce speeds to 10 knots or less.

Marine Mammal Vessel Strike Avoidance

Additional Recommendations for North Atlantic Right Whales

All Vessels

- Information regarding avoiding ship strikes and specific information regarding right whale sighting locations: NOAA weather radio, USCG NAVTEX broadcasts, Notices to Mariners and US Coast Pilots.

Additional Recommendations for North Atlantic Right Whales

All Vessels

- Any right whale sightings should be reported to the NOAA Fisheries Sighting Advisory System at:

(978) 585-8473

Marine Mammal Incidental Take and Harassment

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Incidental Take and Harassment

- Harassment is defined as:

  Habitat conditions (received noise levels above the 120 dB threshold for continuous noise stated in the Marine Mammal Protection Act [MMPA]) temporarily impairing normal behavior patterns.

- Source of harassment:

  The only known associated with the operation of the NEG Port that is expected (with exceptions to be verified by acoustic monitoring) to result in received noise levels above the 120 dB threshold (other than propeller noise associated with transiting of the EBRVs) would be the use of the EBRV dynamic positioning thrusters while retrieving, maintaining position on and/or disengaging from the STL Buoy.

Marine Mammal Incidental Take and Harassment

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Incidental Take and Harassment

- Incidental take of species is exempt through the Incidental Take Statement (ITS) for a period of 1 year (Refer to the Prevention, Monitoring and Mitigation Plan [PMMP], Appendix G for the latest ITS)
- Incidental take during NEG Port operations are:
  - Any injury or death of a listed species caused by project activities
  - Use of dynamic positioning thrusters or other equipment producing sound levels above 120 dB when whales are within the 2-mile ZOI around the NEG Deepwater Port
- Species and Incidental Take Maximums (for take level B, Harassment only; take level A, Injury/Death, has no allotment for any species) are provided in the latest ITS located in the PMMP, Appendix G
- MARAD and NEG must notify NOAA Fisheries NERO when take level reaches 50 percent for any species

Marine Mammal Incidental Take and Harassment

Operation, Repair and Maintenance of the NEG Port and Pipeline Lateral

Incidental Take and Harassment

Under the ITS, the following reasonable and prudent measures must be followed:

- Implement a NOAA Fisheries approved program to monitor incidental harassment
- Cooperate with NOAA Fisheries to facilitate adaptive management, through proper reporting of project activities, marine mammals observations, and interactions with listed species.

Injured/Dead Protected Species Reporting

Injured or dead protected species must be reported, regardless of whether such injury or death is caused by port activities

- If not directly attributed to the NEG Port, report to:
  - USCG on VHF Channel 16
  - NOAA Fisheries Stranding and Entanglement Hotline at:

    (978) 281-9351
- If caused by NEG Port vessels or port-related equipment or material/activity, NOAA Fisheries NERO Endangered Species Coordinator must be notified within 24 hours (978-281-9208) of the observation, and report immediately to both:
  - MARAD, Mitch Hudson,1200 New Jersey Avenue, SE. Washington, DC 20590, Telephone: (202) 366-9373
  - USCG, Roddy C. Bachman, Deepwater Ports Project Manager, USCG Stop 7509, 2703 Martin Luther King Jr. Ave SE, Washington DC 20593-0001
    Telephone: (202) 372-1451

Injured/Dead Protected Species Reporting

Injured or dead protected species must be reported

If caused by NEG Port vessels or port-related equipment or material/activity, a full backup report must be provided to NOAA Fisheries NERO and NOAA/NMSP/SBNMS. The report is to include:

- Time, date and location of the incident
- Name and type of vessel, or other equipment/material causing the injury or death
- Vessel speed during the incident

If applicable, also include:

- Incident description
- Water depth
- Environmental Conditions (wind speed and direction, sea state, cloud cover, visibility)
- Species identification or description of the animal
- Fate of the animal involved

Species Reporting

Species Sighting Log

During operation, repair and maintenance, vessel look-out sighting information of marine mammals and/or sea turtles that occur within 2 miles of the vessel while in transit within the Boston TSS, maneuvering within the ATBA, and/or when actively engaging in the use of directional thrusters must be recorded and provided to MARAD, USCG and NOAA (both NOAA Fisheries and NMSP). The information gathered will be used by NEG in the required monthly ITS/IHA Report. During repair and maintenance events, a weekly status report shall be submitted to MARAD, USCG and NOAA (both NOAA Fisheries and NMSP).

Species Reporting

EBRV Species Sighting Log

Northeast Gateway Deepwater Port Sighting Log
Boston, Massachusetts

LOOK OUT:	**DATE:**
LOOK OUT POSITION:	**OBSERVATION SHIFT (START/END):** /
VESSEL:	**TOTAL OBSERVATION HOURS:**

WEATHER AND WATER CONDITIONS:	**% Cloud Cover:**	**Sea State:**
	Clarity:	**Visibility:**

Sightings Logs

Time	Species	# Sighted	Approximate Location	General Direction / Closest Distance to Vessel	Vessel Activity	Action Taken by Observer/Vessel
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		
	Known: _____ ☐ Large whale ☐ Small whale ☐ Dolphin/Porpoise ☐ Sea turtle ☐ Seal ☐ Other:	Known: _____ ☐ 5+ ☐ 10+ ☐ 50+ ☐ 100+	Lat: _____ Long: _____	Direction: _____ ☐ ≤50 yd ☐ ≤100 yd ☐ ≤500 yd ☐ ≤0.5 mi ☐ ≤1 mi ☐ ≤2 mi		

SIGNATURE OF LOOK OUT:	**SIGNATURE OF OFFICER OF THE WATCH:**

Species Reporting

Repair and Maintenance Vessel Species Sighting Log

Northeast Gateway
Repair and Maintenance Sighting Logs

DATE:		PROJECT NUMBER:		PERMIT NUMBER	
OBSERVERS:					
OBSERVER LOCATION:					
OBSERVER SHIFTS:		12:00-24:00		24:00-12:00	

WEATHER CONDITIONS:	%CC:	Wind spd:	Wind dir:
WATER CONDTIONS:	Glare:	Clarity:	Color:
	Sea State:	Visibility:	Temp:
TOTAL OBSERVATION HOURS:			

Vessel		Vessel Type				Location		
Dynamic Positioning:	YES ☐	# Thrusters:		Lat(0:00)		Lat(12:00)		
	NO ☐	Time used:		Lon(0:00)		Lon(12:00)		
Exclusion Zone NARW				Other				

Daily Summary

Type	Species	Total number spotted	Number spotted outside exclusion zone	Number spotted inside exclusion zone	Behavior when inside exclusion zone	Action taken by observer	Action due to acoustic detection	Comments

Sighting Logs

Time	Species	Adults	Juveniles	Closest distance to vessel (ft)	Activity	Time of Shutdown	Time of Start Up	Time last seen	Time of clip recording	AB Number (Buoy #)

OBSERVER SIGNATURE:

Species Reporting

Species Sighting Log

An ITS/IHA Monthly Report must be delivered by NEG to MARAD, USCG and NOAA (both NOAA Fisheries and NMSP) using the following contact information:

- **NOAA:** Michael Asaro, Ship Strike Coordinator, NOAA Fisheries NERO, 55 Great Republic Dr., Gloucester MA 01930, Michael.Asaro@noaa.gov, 978-282-8469
- **NMSP:** Leila Hatch, Regional Marine Bioacoustic Coordinator, NOS/NOAA, SBNMS, 175 Edward Foster Rd., Scituate MA 02066, Leila.Hatch@noaa.gov, (781) 545-8026 x203
- **MARAD:** Yvette Fields, Maritime Administrator, US Dept. of Transportation, MARAD, Office of Deepwater Ports and Offshore Activities, 1200 New Jersey Ave. SE, #W21-201, Washington DC 20590-0001, Yvette.Fields@dot.gov, (202) 366-0926
- **USCG:** Roddy Bachman, Project Manager, Deepwater Ports Standards, USCG Headquarters, USCG Stop 7509, 2703 Martin Luther King Jr. Ave SE, Washington DC 20593-0001, Roddy.C.Bachman@uscg.mil, (202) 372-1451

Species Reporting

Species Sighting Log

Repair and Maintenance weekly status reports must be delivered to:

- **NOAA:** Michael Asaro, Ship Strike Coordinator, NOAA Fisheries NERO, 55 Great Republic Dr., Gloucester MA 01930, Michael.Asaro@noaa.gov, 978-282-8469
- **NOAA:** Shane Guan, NOAA Fisheries Office of Protected Resources, 1315 East-West Highway, SSMC-3 Suite 13756, Silver Spring, MD 20910, Shane.Guan@noaa.gov, (301) 713-2289 x137
- **NMSP:** Leila Hatch, Regional Marine Bioacoustic Coordinator, NOS/NOAA, SBNMS, 175 Edward Foster Rd., Scituate MA 02066, Leila.Hatch@noaa.gov, (781) 545-8026 x203
- **MARAD:** Yvette Fields, Maritime Administrator, US Dept. of Transportation, MARAD, Office of Deepwater Ports and Offshore Activities, 1200 New Jersey Ave. SE, #W21-201, Washington DC 20590-0001, Yvette.Fields@dot.gov, (202) 366-0926
- **USCG:** Roddy Bachman, Project Manager, Deepwater Ports Standards, USCG Headquarters, USCG Stop 7509, 2703 Martin Luther King Jr. Ave SE, Washington DC 20593-0001, Roddy.C.Bachman@uscg.mil, (202) 372-1451

Additional Reporting

All reports are to be delivered to NEG and to designated representatives of the USCG and NOAA (both NOAA Fisheries and NMSP).

The following reports will be developed by Cornell:

- Quarterly Reports
  - AB Monitoring Report - Every three months during operations.
- Summary Report
  - MMDP Summarization Report.

Marine Mammal and Sea Turtle Identification

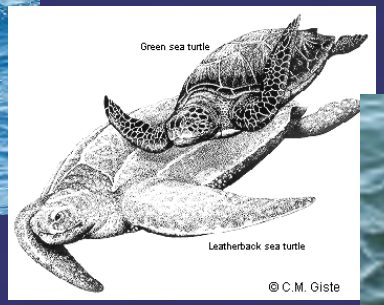
Marine Mammal and Sea Turtle Presence Training

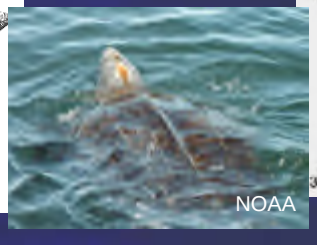
What are crews likely to see?

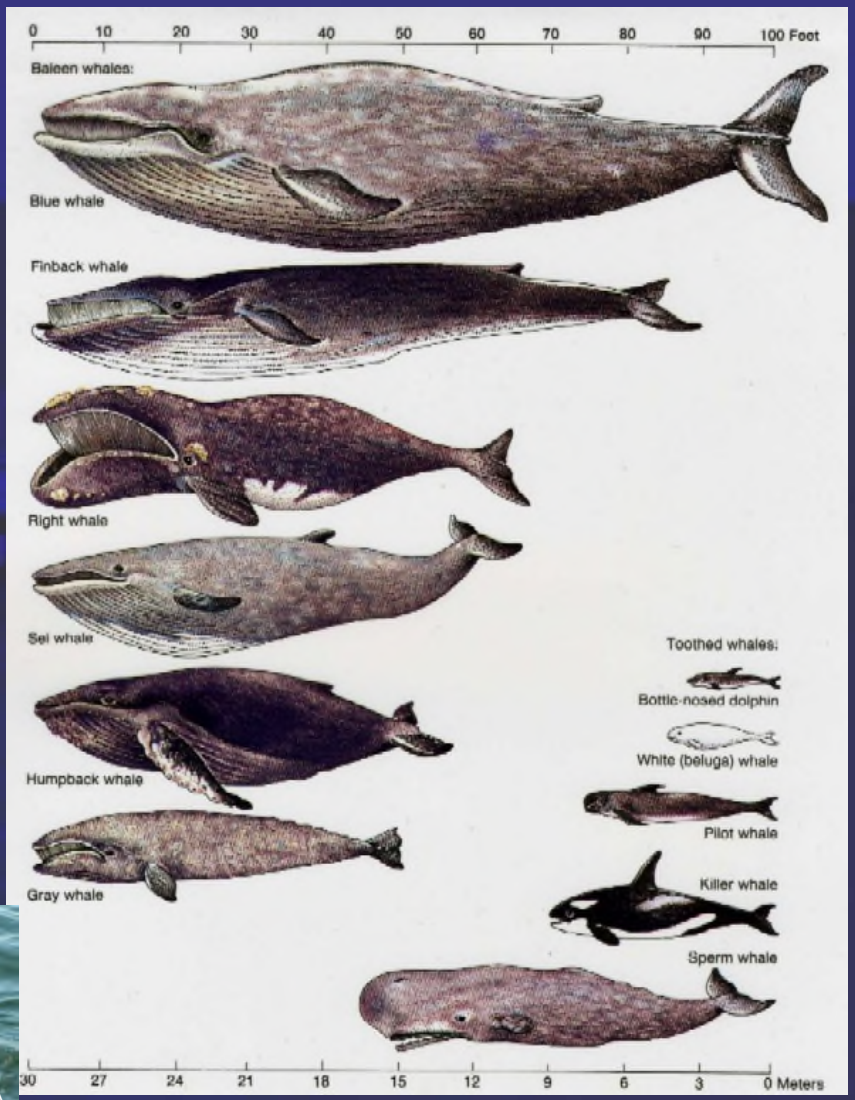
- Marine mammal descriptions
- Sea turtle descriptions

What do crews have to report?

- Crews will be provided with a guide book to help identify marine mammals and sea turtles.







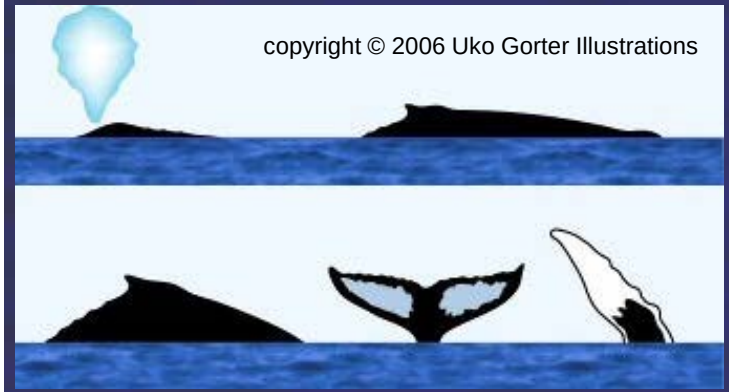
http://faculty.mccfl.edu

Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Large Whales)

Humpback Whale

- Common during summer months
- Ranges from Caribbean in winter to New England in summer
- Length: 40-50 ft.
- Weight: 25-40 tons

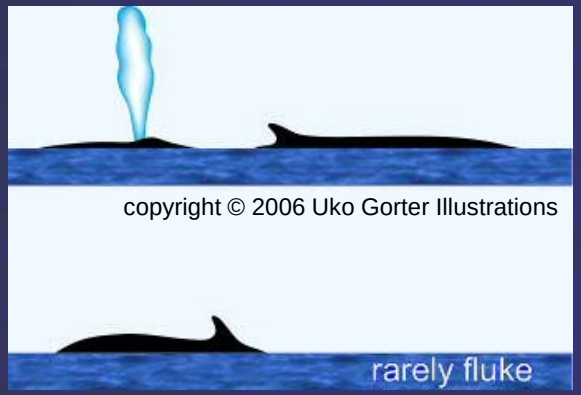


Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Large Whales)

Finback Whale

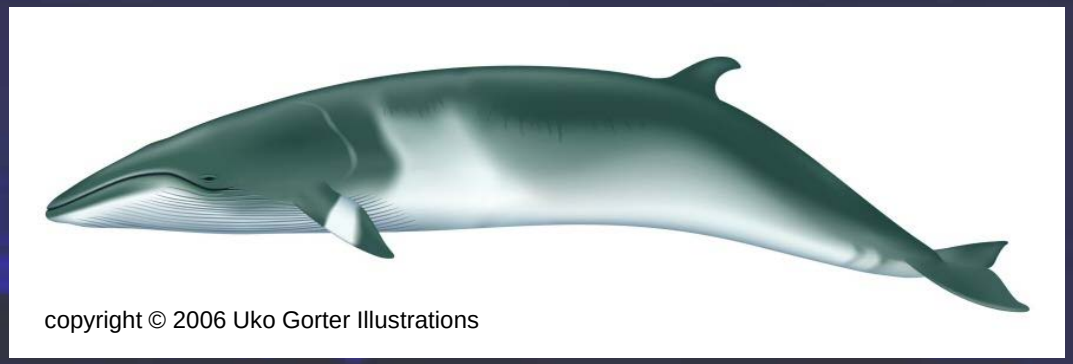
- Common during summer months
- Winter population location unknown
- Length: 45-70 ft.
- Weight: 40 tons



Marine Mammal Identification (Large Whales)

Minke Whale

- Common during summer months
- Winter population ranges from North Atlantic to Caribbean
- Length: 12-15 ft.
- Weight: 5-8 tons

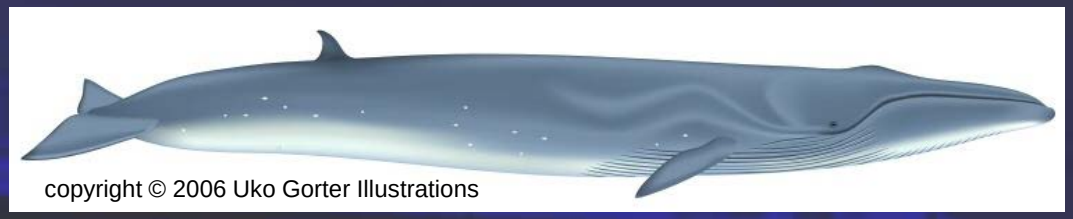


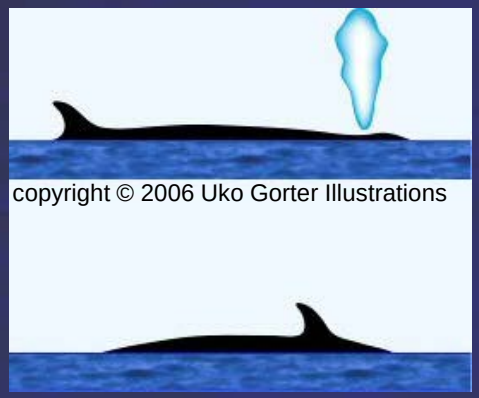
Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Large Whales)

Sei Whale

- Common during summer months
- Range from North Atlantic to Caribbean
- Length: 45-50 ft.
- Weight: 40-50 tons



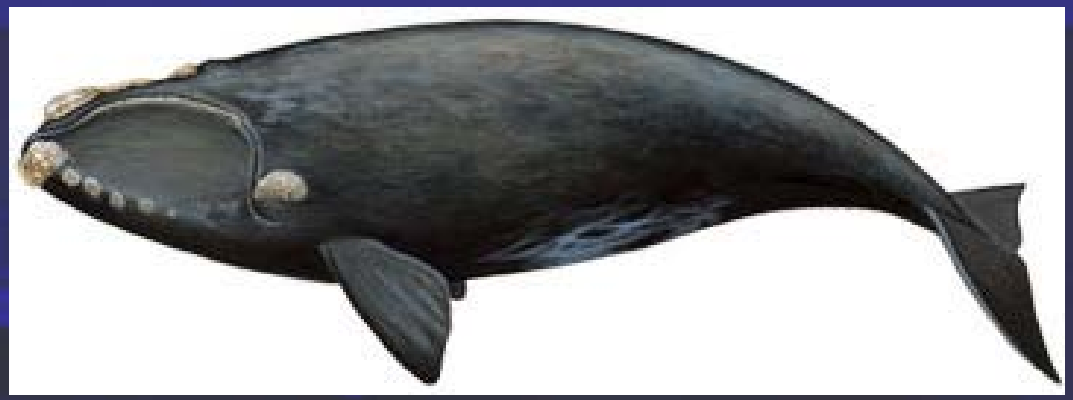


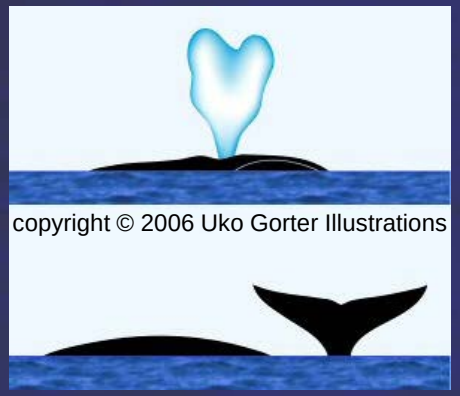
Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Large Whales)

North Atlantic Right Whale

- Common during summer months
- Winter population ranges from North Atlantic to Caribbean
- Length: 40-55 ft.
- Weight: 40-50 tons

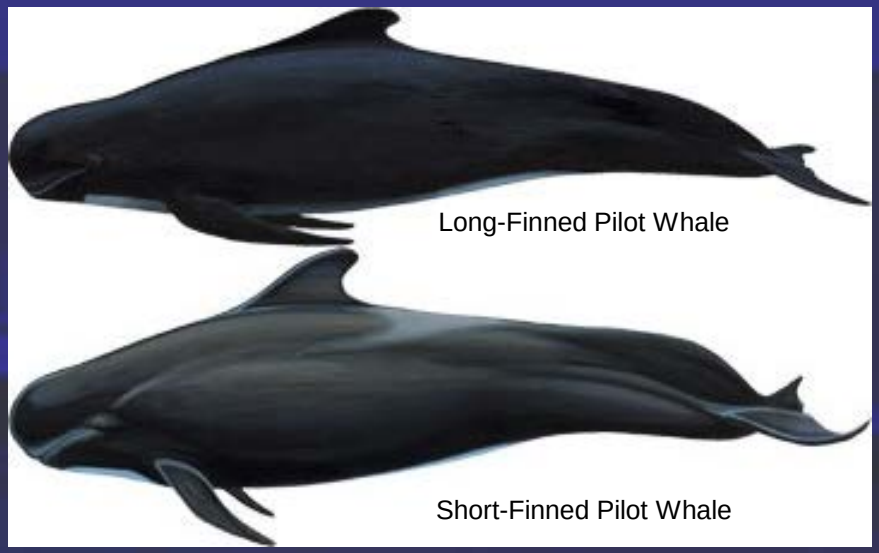




Marine Mammal Identification (Small Whale)

Long-Finned and Short-Finned Pilot Whale

- Common year round
- Long and Short-Finned populations overlap in Western Atlantic
- Length: 16-20 ft.
- Weight: 40-50 tons



Marine Mammal Identification (Dolphin)

Atlantic White-sided Dolphin

- Common year round
- Length: 5-8 ft.
- Weight: 300-600 lbs.

Marine Mammal Identification (Dolphin)

Common Dolphin

- Common year round
- Length: 7.5 - 8.5 ft.
- Weight: 300 lbs.

Marine Mammal Identification (Porpoise)

Harbor Porpoise

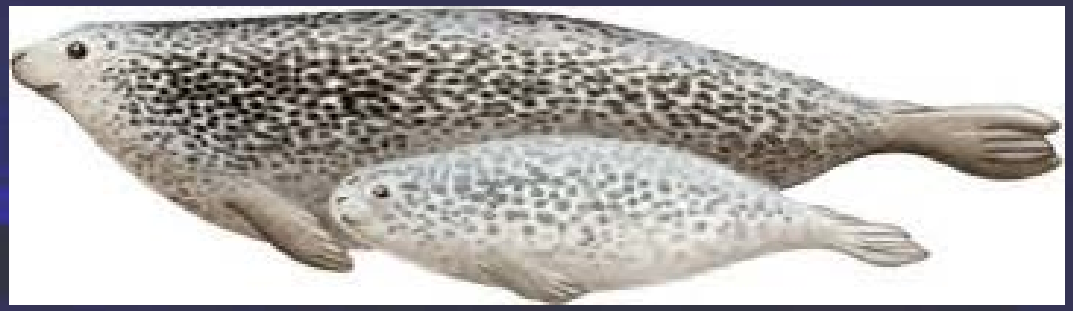
- Common year round
- Mostly coastal preferring shallow water
- Length: 6 ft.
- Weight: 200 lbs.

Marine Mammal and Sea Turtle Identification

Marine Mammal Identification (Seals)

Harbor Seal

- Common year round
- Ranges from Northeastern Canada to New Jersey
- Length: 5-6 ft.
- Weight: 200-350 lbs.



Marine Mammal Identification (Seals)

Gray Seal

- Common year round
- Ranges from Gulf of St. Lawrence to New England
- Length: 6.5-8 ft.
- Weight: 400-750 lbs.

Marine Mammal and Sea Turtle Identification

Sea Turtles

Green Sea Turtle

- Range: 30° N to 30° S latitude. Found from Texas to Massachusetts

Kemp's Ridley Sea Turtle

- Range: Ranges from Gulf of Mexico to Gulf of Maine

Leatherback Sea Turtle

- Ranges from Gulf of Mexico to Gulf of Maine

Loggerhead Sea Turtle

- Range: Newfoundland to Argentina

References and Further Information

Marine mammal and sea turtle species information, as well as rules and regulations can be found on the following websites:

http://www.nero.noaa.gov/shipstrike/doc/mtr.html
http://www.nmfs.noaa.gov/pr/species/mammals/
http://www.nmfs.noaa.gov/pr/species/turtles/
http://www.acsonline.org
http://www.whalecenter.org
http://www.coastalstudies.org/

Appendix B

Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral Massachusetts Bay Area Hydroacoustic Surveys during Construction, Operations and Transit

June 2011

Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral Massachusetts Bay Area

Hydroacoustic Surveys during Construction, Operations and Transit

June 2011

Submitted to

National Oceanic and Atmospheric Administration
National Marine Fisheries Service Office of Protected Resources Permits

Prepared by

Tetra Tech EC, Inc.
160 Federal Street | Boston, MA 02110

TABLE OF CONTENTS

1.0 INTRODUCTION 1-1

2.0 TERMINOLOGY 2-1

3.0 HYDROACOUSTIC MEASUREMENT OBJECTIVES 3-1

4.0 MEASUREMENT PROCEDURES 4-1

5.0 RESULTS –NORTHEAST GATEWAY CONSTRUCTION - MASSACHUSETTS BAY 5-1

5.1 June 27, 2007 Survey Result 5-3
5.1.1 Pipe-Lay 5-6
5.1.2 Ambient Measurements 5-7
5.1.3 Crew Boat 5-7
5.2 August 1, 2007 Survey Results 5-8
5.2.1 Plowing 5-10
5.2.2 Ambient Measurements 5-10
5.3 August 29, 2007 Survey Results 5-12
5.3.1 Backfilling 5-15
5.3.2 Ambient Measurements 5-16

6.0 RESULTS OF EBRV OPERATIONS – GULF OF MEXICO 6-1

6.1 EBRV Maneuvering 6-2
6.2 EBRV Transiting 6-2
6.3 EBRV Regasification 6-3

7.0 CONCLUSIONS 7-1

8.0 REFERENCES 8-3

FIGURES

Figure 1 Bruel & Kjaer (2009b) BK8104 Hydrophone typical frequency receiving characteristics and directivity pattern in water. 4-2
Figure 2 Bruel & Kjaer (2009a) BK4299 Hydrophone calibrator and typical frequency spectrum. Harmonics of the 251.2 Hz calibration tone can be seen 4-2
Figure 3 Support Vessel Deployed Monitoring Diagram 4-3

TABLES

Table 1 Chronological Timeline 1-2
Table 2 Sound Pressure Levels and Comparison to Relative Human Loudness Thresholds 2-2
Table 3 Summary of NOAA Fisheries Cause and Effect Noise Criteria (NOAA 2005) 2-4
Table 4 Major NEG Port and Pipeline Lateral Construction Vessels 5-1
Table 5 Prevailing Meteorological Conditions during Test Measurements 5-2
Table 6 Description of Monitoring Positions, Measurement Durations, and Results - June 27, 2007 5-4

Table 7 Description of Monitoring Positions, Measurement Durations, and Results - August 1, 2007 5-9
Table 8 Description of Monitoring Positions, Measurement Durations, and Results - August 29, 2007 5-13
Table 9 Description of Monitoring Positions, Measurement Durations, and Results August 3 & 4, 2006 6-1
Table 10 Prevailing Meteorological Conditions during Test Measurements 6-2

APPENDIX

Appendix A Hydroacoustic Survey during Construction June 27, 2007
Appendix B Hydroacoustic Survey during Construction August 1, 2007
Appendix C Hydroacoustic Survey during Construction August 27, 2007
Appendix D Hydroacoustic Survey during Gulf Gateway Operation August 3-4, 2006

ACRONYMS AND ABBREVIATIONS

Algonquin	Algonquin Gas Transmission, LLC
ANSI	American National Standards Institute
BRP	Bioacoustics Research Program, Cornell Lab of Ornithology
BO	Biological Opinion
dB	decibels
dBL	unweighted or linear decibels
DWPA	Deepwater Port Act of 1974
ESA	Endangered Species Act
EBRV	Energy Bridge Regasification Vessel
EFD	energy flux density
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
FERC	Federal Energy Regulatory Commission
FMPs	Fishery Management Plans
ft	foot
GPS	geographic positioning system
HAPC	Habitat Area of Particular Concern
Hz	hertz
IHA	Incidental Harassment Authorization
ITS	Incidental Take Statement
kHz	kilohertz
LNG	liquefied natural gas
Leq	equivalent continuous sound pressure level within a given time interval
Ln	statistical sound pressure level
L10	sound pressure level which is exceeded 10% of the time period
L50	sound pressure level which is exceeded 50% of the time period
L90	sound pressure level which is exceeded 90% of the time period
Lp	sound pressure level
m	meter
MARUs	Marine Autonomous Recording Units
MMPA	Marine Mammal Protection Act
MARAD	Maritime Administration
mph	miles per hour
min	minute
NIST	National Institute of Standard and Technology
NOAA Fisheries	National Marine Fisheries Service
NMSA	National Marine Sanctuary Act
NAD	North American Datum
NEG Port or Port	Northeast Gateway Deepwater Port
Northeast Gateway	Northeast Gateway Energy Bridge, L.P.
PTS	permanent threshold shift
PLEM	Pipeline End Manifold
PM	Post Meridian “after midday"
ROD	Record of Decision

ROV	remotely operated vehicle
re	reference
RMS	root-mean-square
R_0	horizontal reference distance
sec	second
SPL	sound pressure level
TTS	temporary threshold shift
Tetra Tech	Tetra Tech EC, Inc.
TSS	Traffic Separation Scheme
μPa	micro-Pascal
USCG	U.S. Coast Guard
USGS	U.S. Geological Survey

1.0 INTRODUCTION

On June 13, 2005, Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway) submitted an application to the U.S. Coast Guard (USCG) and Maritime Administration (MARAD) seeking a federal license under the Deepwater Port Act of 1974 (DWPA) to own, construct, and operate the Northeast Gateway Deepwater Port (NEG Port or Port) for the import and regasification of liquefied natural gas (LNG) in Massachusetts Bay, approximately 13 miles off of the coast of Massachusetts.

The USCG and MARAD were the lead federal agencies for the Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Port License application. The draft EIS/EIR, USCG Docket number USCG-2005-22219, was issued on May 19, 2006. Simultaneous with this filing, Algonquin Gas Transmission, LLC (Algonquin), a subsidiary of Spectra Energy Gas Transmission, filed a Natural Gas Act Section 7(c) application with the Federal Energy Regulatory Commission (FERC) for a Certificate of Public Convenience and Necessity for the Algonquin Pipeline Lateral (Pipeline Lateral) that would connect the Port with the existing HubLine natural gas pipeline for transmission throughout New England (FERC Docket Number CP05-383-000). The final EIS/EIR also included an analysis of the Pipeline Lateral.

The final EIS/EIR was issued on October 27, 2006 and a Record of Decision (ROD) was issued on February 7, 2007. The MARAD License was subsequently issued on May 14, 2007. Construction of the Port and the Pipeline Lateral was initiated in May 2007 and completed in December 2007, and the Port was commissioned for operation by the USCG in February 2008.

As a result of the extensive environmental review, permitting and licensing process, it was determined that construction of NEG Port and Pipeline Lateral as well as the operation of the Port and associated Energy Bridge Regasification Vessels (EBRV™) could result in the acoustic harassment of marine mammal species. As a result, per the requirements of the NEG Port's MARAD/USCG License, the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service (NOAA Fisheries) Biological Opinion (BO), Incidental Take Statement (ITS) and Incidental Harassment Authorization (IHA) as amended, and National Marine Sanctuary Act (NMSA) Section 304 (d) Recommendations, Northeast Gateway and Algonquin were required to monitor the noise environment in Massachusetts Bay in the vicinity of the NEG Port and Pipeline Lateral using an array of 19 Marine Autonomous Recording Units (MARUs). MARUs were deployed in April 2007 to collect preconstruction and active construction data and must remain in place to collect data on the operation of the Port for a period of 5 years (through the end of 2012). The overall intent of this system is to provide better information for both regulators and the general public regarding the acoustic footprint associated with both construction and the long-term operation of the NEG Port and Pipeline Lateral in Massachusetts Bay, as well as the distribution of vocalizing marine mammals during NEG Port operation. In addition to the 19 MARUs, Northeast Gateway was also required to deploy 10 Auto Detection Buoys (ABs) within the Separation Zone of the Boston Traffic Separation Scheme (TSS) for the operational life of the Port. The purpose of the ABs is to detect a calling North Atlantic right whale in near real-time to alert EBRVs of their presence during operational activities.

In addition to the deployment of the MARU array and TSS ABs, Tetra Tech, Inc. (Tetra Tech) was contracted by Northeast Gateway to perform field investigations to document underwater noise levels emitted during the construction of the NEG Port and Pipeline Lateral and during the operation of Port

facilities, namely the operation of EBRVs. Tetra Tech conducted five offshore hydroacoustic field programs: one in 2005 and one in 2006 at the Gulf Gateway Deepwater Port located approximately 116 miles off the coast of Louisiana in the Gulf of Mexico; and three in 2007 at the NEG Port and Pipeline Lateral Project area (see Table 1). The 2005 measurements were completed to determine underwater noise levels during EBRV onboard regasification and vessel movements. The data from the 2005 field program was used to support the modeling and analysis of potential acoustic affects of EBRV operations in Massachusetts Bay during the NEG Port permitting and licensing process, the results of which can be found in Section 4.2.4.3 of the Final EIS/EIR and are not discussed further in this report. The data collected in 2006 was also associated with EBRV operation activities and were collected for the purpose of verifying the measurement completed in 2005 as well as to further document sound levels during additional operational and EBRV activities such as EBRV coupling and decoupling from the buoy system, transit and the use of stern and bow thrusters required for dynamic positioning. The 2007 measurements were collected during NEG Port and Pipeline Lateral construction to obtain site-specific underwater sound level data associated with various construction activities that were previously modeled in support of permitting and licensing activities.

Table 1 Chronological Timeline

08/03-04/06	Gulf of Mexico Deployment	Operation
06/27/07	Massachusetts Bay Deployment 1	Construction
08/01/07	Massachusetts Bay Deployment 2	Construction
08/27/07	Massachusetts Bay Deployment 3	Construction

This Hydroacoustic Test Report provides an overview of each field investigation and associated results. Specifically, Section 2.0 provides an overview of basic acoustic terminology; Section 3.0 highlights the specific hydroacoustic measurement objectives associated with the field events; Section 4.0 describes the field measurement methodology; and Sections 4.0 and 5.0 provide the results of each measurement event and associated source level and acoustic frequency signatures for major construction and operation activities. This resulting dataset provides the technical information to characterize the potential acoustic impacts to species (e.g., marine mammals, turtles, and fish) and the surrounding environment associated with NEG Port activities within the immediate Port area as well as the greater Massachusetts Bay.

2.0 TERMINOLOGY

For purposes of document brevity, it is assumed the reader is familiar with basic acoustical terms, descriptors, and concepts that should help frame the discussion of acoustics in this technical report. The majority of the information in the following sections is to provide insight into data presented in time histories and spectral plots.

Statistical Levels

Statistical levels describe the temporal variation in sound levels. Underwater sound pressure levels may change from moment to moment; some are sharp impulses lasting one second or less, while others may rise and fall over much longer periods of time. Statistical levels provide a percentile time history of the time-varying sound levels. The statistical sound levels (L_n) provide the sound level exceeded for that percentage of time over the given measurement period. An L_{10} level is often referred to as the intrusive noise level and is the sound level that is exceeded for 10 percent of the time during a specified measurement period. The L_{90} level is the sound level that is exceeded for 90 percent of the time during the measurement time period, or the quietest 10 percent of a given time period. Often referred to as the residual sound level, L_{90} can be an indicator of the potential for acute perceptibility of a new sound source as it will not tend to include sound from transient events (such vessel watercraft passbys), unless they occurred for the entire measurement duration. Statistical levels can be specified as broadband "single number" values and also frequency dependant (i.e., in 1/3 octave bands).

Reference Levels

Sound levels are reported on a logarithmic scale expressed in units of decibels (dB) and are reported in terms of linear (or unweighted) decibels. Linear decibels are referred to as dBL in this report. A decibel is defined as the ratio between a measured value and a reference value of 1 micro-Pascal (μPa). A logarithmic scale is formed by taking 20 times the logarithm (base 10) of the ratio of two pressures: the measured sound pressure divided by a reference sound pressure. This reference sound for underwater sound pressure is 1 micro-Pascal (μPa); however, in-air sound uses a reference of 20 μPa. Due to the difference in acoustic impedance, a sound wave that has the same intensity in air and in water, will in water have a pressure that is 60 times larger than in air, with a displacement amplitude that will be 60 times less. Assuming pressure is maintained as a constant, the displacement amplitude in water will be 3580 times less than in air. To help demonstrate this relationship, Table 2 provides corresponding values of sound pressure in air and in water having the same intensities at a frequency of 1 kiloHertz (kHz) as it relates to human loudness. However, this somewhat simplistic comparison does not account for the frequency dependent hearing capabilities of various species (e.g., marine species) or individual hearing response mechanisms.

Table 2 Sound Pressure Levels and Comparison to Relative Human Loudness Thresholds

Pressure in Air re 20µPa/hz	Pressure in Water re 1µPa/hz	Relative Loudness (human perception of different reference sound pressure levels in air [Kinsler and Frey 1962])
0	62	Threshold of Hearing
58	120	Potentially Audible Depending on the Existing Acoustic Environment
120	182	Uncomfortably Loud
140	202	Threshold of Pain
160	222	Threshold of Direct Damage

Spectral Levels

Measured data are presented in 1/3 octave band center frequencies. The 1/3 octave band data may be useful in the analysis of potential impacts pertaining to species of concern to establish species-specific acoustic impact thresholds. For each relevant time period, 1/3 octave spectra of the single event sound pressure level were evaluated in the range of 10 Hz to 20 kHz. Higher attenuation rates occur at frequencies above 20 kHz and received sound levels at any appreciable separation distance are expected to be minimal. 1/3 octaves are a series of electronic filters used to separate sound into discrete frequency bands, making it possible to know how sound energy is distributed as a function of frequency. Corresponding broadband dBL sound levels, shown as the horizontal bar, sum the acoustic energy across all frequencies for that given statistical. These analyses quantitatively describe the frequency (Hz) dependent sound environment for specific events or activities.

Each octave band has a centre frequency that is double the centre frequency of the octave band preceding it. All reported results are presented in linear (unweighted) decibels referenced as 1 micropascal (abbreviated re 1 µPa). The term background noise refers to noise from natural sources (e.g., wind, tides) as well as noise from anthropogenic sources.

Principal contributors to the ambient environment include shipping traffic, wind and waves, precipitation, biological noise, and flow current and tidal current which can create turbulence. Shipping traffic typically dominates the ambient environment for frequencies between 100 and 2000 Hz. The sum of anthropogenic and natural noise depends on source levels and the propagation conditions including water depth, bottom conditions, proximity to shore and human activity. Local sea state and tidal current conditions that create underwater turbulence can also affect sound propagation and ambient conditions.

Turbulence can be caused by a combination of tidal current and direct hydrostatic movement of the hydrophone within the water column, and occurs predominantly below 100 Hz. Noise caused by water flow past the hydrophone (much like the wind rushing past a microphone), is evident in several of the spectral plots depending on localized conditions and is not unusual. In general, higher current velocities resulting in hydrostatic pressures produce increased flow noise around the hydrophone Vibrations of the mooring and cable strum are apparent in the measurement data when an isolated spike is present at approximately 20,000 Hz.

Unsettled weather conditions can substantially increase low frequency background levels even when the weather conditions occur at a significant distance away. Aside from anthropogenic and biological noise

source contributions, the principal source of underwater noise is surface agitation, which is dependent on localized conditions of sea state and wind speed and will vary both spatially and temporally. The ambient noise for frequencies above 1 kHz is due largely to waves, wind, and heavy precipitation, and not from human activity. To account for different ranges of interest, the spectral plots were divided and presented into three ranges, broadband containing all energy from 10 to 20,000 Hz, 100 to 2000 Hz and 2000 to 20,000 Hz. To the right side of the plots, the broadband energy is summed across these frequency ranges.

Time Histories

Time and date stamped time histories for all relevant datasets were compiled in 1-second L_{eq} intervals as a function of distance. The L_{eq}, or equivalent continuous sound pressure level (also referred to as the time-averaged level) is calculated by taking the square root of the average of the square of the pressure waveform over the duration of the measurement period. Exposure to this sound level over the measurement period would result in the same noise dose as being exposed to the actual (unsteady) sound levels. The L_{eq} is a very common quantity in sound engineering. .Samples as a subset were also taken with a user-selected time interval of 100 milliseconds to determine impulsivity if anticipated present,

$$L_{eq} = 10Log_{10}\left[\frac{\int_{T_1}^{T_2} p^2(t)dt}{p_0^2 T}\right]$$

where p is the sound pressure and the measurement duration (specific time period) $T=T_2-T_1$. Root-mean-square (RMS) is simply the square root of the mean of the square. This unit reflects the effective sound pressure taking into account both positive and negative pressures in a system. All data reported is in terms of RMS of the signal as defined by:

$$P_{RMS} = \sqrt{\frac{1}{T}\int_0^T P^2(t).dt}$$

The time averaging period for time histories is presented in 1-second intervals.

Spatial Effects

Measurements taken of underwater sound levels are conducted in both the acoustic and geometric far-field and near-field; however, samples were generally targeted for the acoustic and geometric far fields. The acoustic far-field is defined as the distance from a source of greater than the acoustic wavelength of the frequency of interest. Since the wavelength varies with frequency, the separation distance will vary with frequency with the lower frequencies having the longer wavelength, as measured in meters. The geometric far-field roughly begins at the distance from a source of sound which is greater than roughly four times the largest physical dimension of the area sound source(s). When in the geometric far-field, the sources have all essentially merged into one, so that measurements made even further away will be no different in terms of source contribution. The effects of source geometry and multiple sources operating concurrently, in the geometric far- field, are expected to be negligible.

Sound sources and activities often consist of a variety of individual source components, such as construction sites, or for sources of large physical dimensions, i.e. an EBRV. Sound sources in the

acoustic and geometric far-fields were generally collected at sufficient distances from the source such that the sound field and received sound levels were expected to decrease monotonously at a given rate of sound attenuation, with increased distance from the source to the measuring hydrophone. All measurement distances are reported horizontally from the source's acoustic center to the sea surface above the hydrophone to determine the average energy flux in a sound field.

Certain measurements were also completed in the near-field of a prototype EBRV during normal operations and regasification. In the acoustic and geometric near-fields, the sound field of a weaker, closer source can be louder than that of more distant, stronger sources of sound. Therefore, measurements made in the near-field can be used to effectively separate the various source levels of sound, but may not useful in predicting the sound levels and sound spectrum far from the source without further calculation.

Guideline for Lethal and/or Injurious Auditory Effects

Under the 1994 Amendments to the Marine Mammal Protection Act (MMPA), NOAA Fisheries defines the zone of injury as the range of received levels from 180 linear decibels (dBL) referenced to 1 microPascal (μPa) root mean square (RMS) (180 dBL re 1 μPa), for mysticetes and odontocetes, and 190 dBL re 1μPa for and pinnipeds. This ruling was made in relation to a permit for seismic surveys in offshore waters (NOAA 1995); the guidance was subsequently updated to include all odontocetes within the 180 dB re 1μPa sound exposure limit (NOAA 1999). This threshold considers instantaneous sound pressure levels at a given receiver location. NOAA Fisheries 180 dBL re 1 μPa guidelines are designed to protect all marine species from high sound pressure levels at any discrete frequency across the entire frequency spectrum. It is a very conservative criterion as it does not consider species-specific hearing capabilities.

The MMPA defines Level B harassment as any act of pursuit, torment, or annoyance that has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering. NOAA Fisheries defines the threshold level for Level B harassment at 160 dBL re 1μPa for impulsive sound, averaged over the duration of the signal. A summary of the NOAA Fisheries cause and effect noise criteria are summarized in Table 3.

Table 3 Summary of NOAA Fisheries Cause and Effect Noise Criteria (NOAA 2005)

	Criteria Level	Type
Level A Harassment	180 dBL re 1 μPa (RMS)	Absolute
Level B Harassment	160 re 1 μPa (RMS) 120 re 1 μPa (RMS)	Impulse Continuous

Regulatory criteria for marine mammals were revised by NOAA as part of a ruling on a permit application for a military sonar exercise (NOAA 2006). These criteria establish thresholds at which temporary or permanent hearing loss is expected for marine mammals. A temporary or reversible elevation in hearing threshold is termed a temporary threshold shift (TTS), while a permanent or unrecoverable reduction in hearing sensitivity is termed a permanent threshold shift (PTS). NOAA (2006) established a TTS of 195 dB re 1 μPa2-s and a PTS of 215 dB 1 μPa2-s for marine mammals based on the

typical values for the additional dB above TTS required to induce PTS in experiments with terrestrial mammals. The revised TTS and PTS thresholds are defined as an energy flux density (EFD), which is the acoustic energy passing though a particular point per-unit decibel; therefore, TTS and PTS are given in the units of dB re 1μPa2-s, the integration of RMS sound pressure over a one second duration. Being time energy based, the TTS and PTS thresholds take into account cumulative sound exposure.

NOAA is presently developing acoustic guidelines for assessing the effects of anthropogenic sound on marine mammal species under their jurisdiction. NOAA's draft acoustic guidelines are currently undergoing an internal review. The peer review will focus on scientific and technical studies that have been applied, as well as the manner that NOAA applies them in the guidelines. After peer review, NOAA will seek public comment. Once the peer review and public comments are addressed, NOAA will finalize and release the acoustic guidelines (NOAA 2011).

3.0 HYDROACOUSTIC MEASUREMENT OBJECTIVES

The goal of the hydroacoustic surveys was to obtain the representative underwater sound data to support the characterization of potential acoustic impacts to species (e.g., marine mammals, turtles, and fish) and the surrounding environment associated with NEG Port activities within immediate Port area as well as greater Massachusetts Bay.

The specific objectives of the hydroacoustic survey(s) were as follows:

1. Provide an acoustic frequency fingerprint of typical construction activities including plowing, backfill, and pipelay;

2. Provide an acoustic frequency fingerprint of typical operational activities, including EBRV maneuvering, coupling and decoupling from the buoy system including the use of bow and stern thruster, and regasification. Dynamic positioning is a system to automatically maintain a ship's position and heading by using its thrusters and propellers; and

3. Provide far-field measurement data that can be used to extrapolate and estimate sound fields, at multiple distances, for areas in shallow water coastal environments, incorporating site-specific conditions and environmental effects.

4.0 MEASUREMENT PROCEDURES

Tetra Tech executed underwater sound monitoring surveys to collect, analyze, and record underwater acoustic data to characterize underwater sound levels associated with various Port activities that have the potential to affect marine species (namely marine mammal, fish and sea turtles) in the surrounding environment. In order to quantify the underwater sound, three main measurement instrumentation components are required: (1) hydrophones and signal conditioning, (2) data acquisition and processing, digital recording, and a real-time display system, and (3) distance measurement and/or geographic positioning system (GPS).

During the 2006 operation field surveys performed in the Gulf of Mexico, measurements were made with hydrophones to characterize EBRV operational sound as a function of operating conditions during closed-loop regasification and offloading at the Gulf Gateway Deepwater Port. The sound generated by the EBRV is transmitted into the air directly from mechanical equipment located on or near the deck, and into the water primarily by energy transmitted through the EBRV hull. During EBRV maneuvering, sound is generated by the bow and stern thrusters. During field measurements all of the observation vessel's engines, depth sounder, generator, and other equipment that may contaminate the sound signal were shut down prior to hydrophone deployment. In addition, during operational testing of the onboard regasification process, the EBRV was moored to the Port and stationary so as to not contaminate the sound signal. Periods of thruster operation were also completed directly from the EBRV, during repositioning over the Pipeline End Manifold (PLEM).

Measurements were completed with Bruel & Kjaer (2009a) model BK8104 broadband hydrophones with a nominal sensitivity –205 dB re V/μPa± 1 dB and flat frequency response capable of absolute sound measurements over the frequency range 0.1Hz to 120 kHz. The BK8104 hydrophone is more sensitive than most other hydrophones, even at the extremes of its frequency range. With a dynamic range in excess of 90 dB, is suitable for the measurement of noise with a highly sloped spectrum, such as shallow water background noise. The hydrophones were equipped with extended length integrated water blocked cables and waterproof connectors for signal input following conditioning directly to real time frequency analyzers capable of 1/3 octave spectra analysis with data measured in the frequency range of 12 to 20 kilohertz (kHz).

The underwater sound level measurements were field calibrated with tones input immediately prior to each measurement period for reference purposes. On board calibration was completed with a Bruel & Kjaer model 4229 hydrophone calibrator. The calibrator works like a pistonphone and generates a pressure field in air at 251.2 Hz at a reference sound pressure level of 162 dBL re 1 μPa using a when fitted with a Bruel & Kjaer coupler UA 0547. The hydrophones can be calibrated in air as the pressure sensitivity is the same in air as in water, at this discrete frequency. 162 dBL re 1 μPa is equivalent to an in air sound pressure level of 136 dBL re 20 μPa, and such a high level ensures calibration even in very noisy environments, including work vessels. This in-situ method provides a field calibration to within 0.6 dBL (Bruel and Kjaer 2009a).

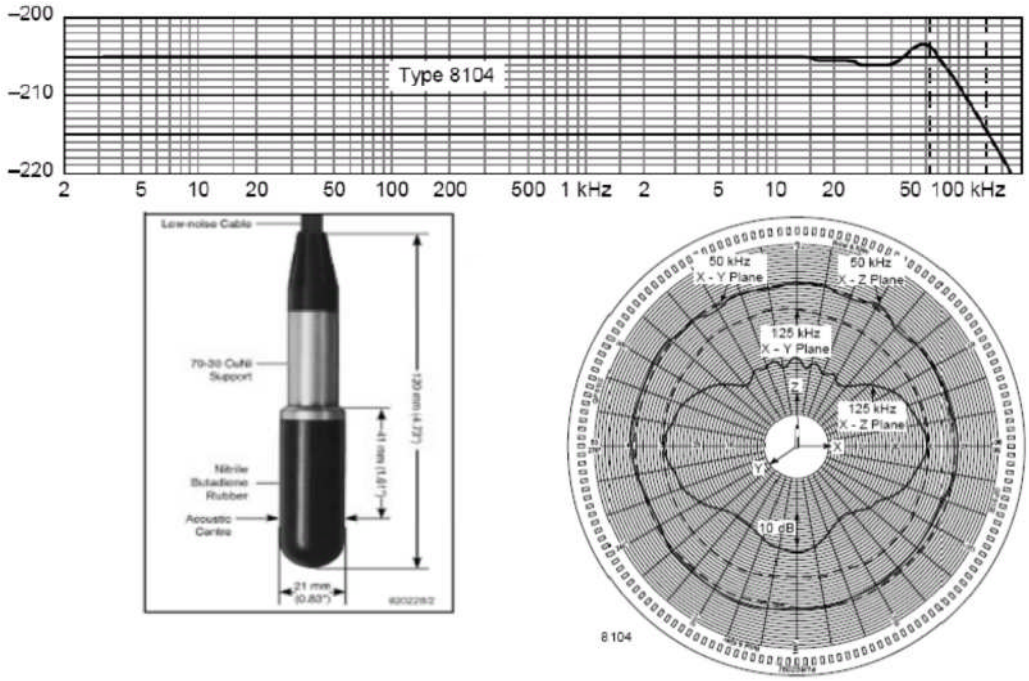


Figure 1 Bruel & Kjaer (2009b) BK8104 Hydrophone typical frequency receiving characteristics and directivity pattern in water.

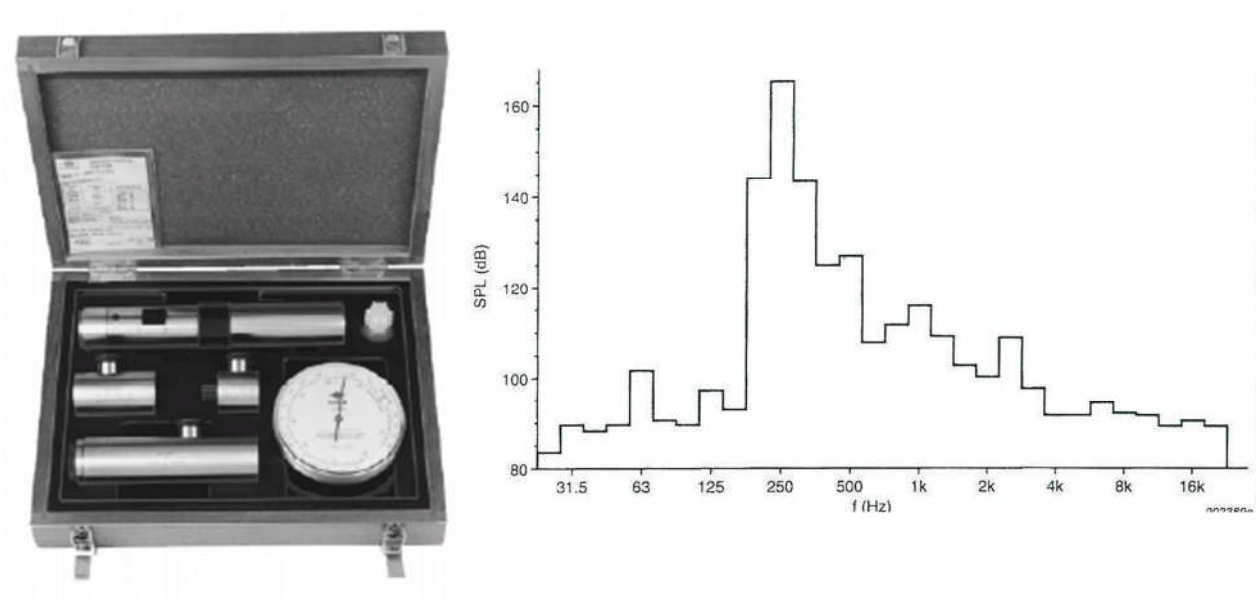


Figure 2 Bruel & Kjaer (2009a) BK4299 Hydrophone calibrator and typical frequency spectrum. Harmonics of the 251.2 Hz calibration tone can be seen .

During the 2006 field survey, to collect operational sound measurements, all measurement positions and distances from the EBRV relative to the observation vessel were determined using a laser range finder or onboard GPS. Measurements were completed at multiple distances in the acoustic far-field, and also directly from the EBRV deck to determine near-field underwater sound levels immediately adjacent to the EBRV hull. For all measurements, the hydrophone was deployed from either the EBRV or observation

vessel using a system of flotation devices and weights designed to decouple the hydrophone from the boat's movements. Specifically the hydrophone was suspended in the water column and secured to an anti-heave buoy, which positions the hydrophones at a set distance below the surface of the water, as a function of water depth. In addition, the line was weighted at the lower end to maintain a vertical profile.

To maximize the number of spot measurement locations and reduce the effects of hydrostatic pressures and resulting extraneous noise from a stationary fixed system due to current flow, the hydrophone was deployed such that it drifted away from the vessel of deployment. To assess spatial variations, measurements were completed at multiple distances.

Measurements were logged in 1-second intervals using the "Fast" time constants in order to provide a detailed time history and real-time reported broadband and linear 1/3-octave band RMS sound pressure levels on a dB scale. Typical measured sequences lasted for a period of 5 to 15 minutes, depending on current strength. The resultant sound levels were analyzed and compared to the ship logs of operations. Based on expected activities and sources, a dBL range of received sound levels at multiple reference horizontal distances were determined.

During the 2007 construction field surveys performed in Massachusetts Bay, measurements were made with similar hydrophone and analysis equipment following general methodologies as used during the Gulf of Mexico field surveys to characterize predominant construction activities associated with the NEG Port and Pipeline Lateral construction (namely pipe lay, plowing, backfilling, and the use of thrusters during dynamic positioning). The survey of baseline sound levels in the Massachusetts Bay in the vicinity of the NEG Port and Pipeline Lateral construction areas were also taken to establish background levels away from active work sites.

All measurements of construction activities were initiated from an observation vessel at a minimum distance as allowed by the construction managers to ensure safety. The observation vessel moved as necessary to new positions relative to the targeted construction activity over the entire duration of the measurement periods, using either a shipboard GPS unit or laser range finder.

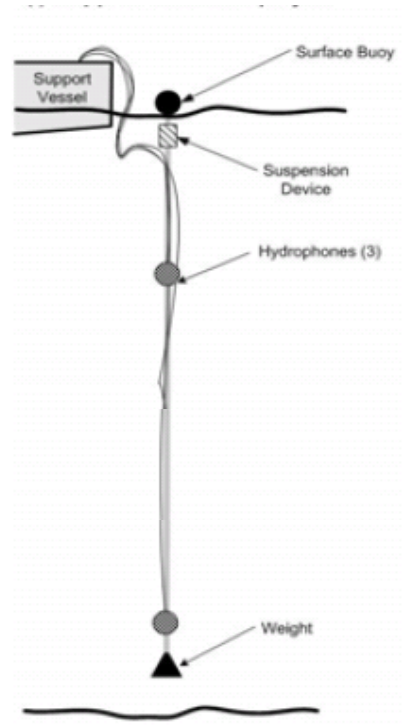


Figure 3 Support Vessel Deployed Monitoring Diagram.

As with the 2006 field survey, measurements were completed using a sprint/stop/measure procedure with typical measurement sequences lasting for a period of 5 to 15 minutes, depending on current strength. As stated previously the observation vessel's engines, depth sounder, generator, and other equipment that may contaminate the sound signal were shut down prior to hydrophone deployment. However, in several of the plots, electronic noise or possibly a depth finder from an area construction support vessel was evident at frequencies of, or greater than, 20 kHz.

5.0 RESULTS –NORTHEAST GATEWAY CONSTRUCTION - MASSACHUSETTS BAY

Construction of the NEG Port and Pipeline Lateral required the assembly of specialized construction contractors. Construction began in May 2007 and concluded in December 2007. For offshore construction, deepwater port construction equipment consisted of crane barges, anchor handling tug vessels, supply vessels, survey equipment and diving boats and crews. Dynamically positioned vessels were used to position the anchors, PLEM, and flow lines directly onto the seafloor.

Hydroacoustic measurements were completed off the coast of Massachusetts, focusing on the area of the NEG Port and along the Pipeline Lateral, with locations shown in Figure 1. During construction, the opportunity for measurements of construction sound sources and activities occurred during the following days:

1. Pipe lay (June 27, 2007),
2. Plowing (August 1, 2007),
3. Backfill (August 29, 2007)

The major construction vessels supporting the construction activities during the hydroacoustic measurement events and their associated specifications present are in Table 4. Noise output from these vessels varies slightly depending on individual vessel specifications. The composite underwater sound levels of the construction vessels used to support NEG Port and Pipeline construction are provided for given activities.

Table 4 Major NEG Port and Pipeline Lateral Construction Vessels

Vessel Name	Vessel Type	Length (m)	Total Engine Power (hp)	Present during Measurement
Lonestar Horizon	pipe laying barge	95.4	N/A (Barge – 8 anchors)	June 27, 2007
Atlantic Horizon	plow and backfill barge	128	N/A (Derrick Barge)	June 27, 2007 August 1, 2007 August 29, 2007
Texas Horizon	DP-2 construction vessel	103.9	Main engines: 7,400 Bow thrusters: 700 Stern thrusters: 800	August 29, 2007
Martha Eugenia	anchor handeling/towing vessel	59.4	7,000	June 27, 2007
Odyssea Giant	Anchor handeling/towing vessel	57.9	5,750	June 27, 2007 August 1, 2007 August 29, 2007
Smith Invader	ocean tug	29.6	4,200	June 27, 2007
Sun New York	motor vessel (ROV & survey support vessel)	65.1	Main engines: 5,520 Bow thrusters: 1,065 Stern thrusters: 300	June 27, 2007 August 1, 2007
Gulf Grace	crew boat	44	4,125	August 1, 2007

In addition, spot measurements were completed of background noise in Massachusetts Bay during the dates testing occurred, to record ambient normal noise levels at each location where construction was occurring or planned. Construction measurements included periodic use of tugs for positioning during anchoring and construction support activities within the designated work zones.

The prevailing meteorological conditions associated with each field event are detailed in Table 5.

Table 5 Prevailing Meteorological Conditions during Test Measurements

	June 27, 2007	**August 1, 2007**	**August 29, 2007**
Barometric pressure [hPa] [a/]	*1016.4-1017.4*	*1018.9-1021.0*	*1011.9-1013.4*
air temperature [°C] / [°F] [a/]	*19.4-23.1 / 66.9-73.6*	*18.3-18.8 / 64.9-65.8*	*21.1-21.9 / 70.0-71.4*
range of wind direction [a/]	*215-248*	*10-18*	*8-346*
prevailing wind direction [a/]	*SSW-WSW*	*NNE*	*NNW-NNE*
weather conditions [b/]	*Light fog*	*Hazy sun*	*Mostly clear-*
Seastate (ft) [b/]	2-3	2-3	1-2

[a/] Station 44013 (LLNR 420) - BOSTON 16 NM East of Boston, MA Boston Approach Lighted Buoy BF NOAA 44013. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, National Data Buoy Stennis Space Center, MS.
http://www.ndbc.noaa.gov/view_text_file.php?filename=44013h2007.txt.gz&dir=data/historical/stdmet/

[b/] Northeast Gateway Construction Vessel Weekly Log Books.

Time history and spectral plots for each construction activity measured are included in Appendices A through D and are reported in the chronological order that the measurements were taken.

5.1 June 27, 2007 Survey Result

On June 27, 2007 Tetra Tech performed field measurements to document data associated with pipelaying activities. Measurements also included the operation of a crew boat and ambient conditions at two locations. A summary of all measurement data from the June 27, 2007 survey event is provided in Table 6. This table evaluates the received sound levels in dBL in three ranges of frequencies (100 to 2,000 Hz, 2,000 Hz to 20 kHz, and broadband), where the principle energy is found (i.e. where sound energy peaks in the spectrum from 100 to 2,000 Hz), and a description of received sound level ranges as, indicated by statistical level, as a function of horizontal reference distance to source. Time history and spectral plots for each construction activity measured are included in Appendix A, and are reported in the chronological order that the measurements were taken. Appendix A, Figure A-1 presents a calibration tone frequency spectrum. A calibration tone was pre-recorded prior to each measurement period to ensure the validity of the resultant measurement data. In some instances, the calibration tone was imbedded directly into the measurement file and can be readily seen in the time history plots.

A detailed description of survey results is provided in the following sections.

Table 6 Description of Monitoring Positions, Measurement Durations, and Results - June 27, 2007

Figure	Activity or Reference Condition	Horizontal Reference Distance R_O (meters)	Frequency Range	L5 (dBL re 1µPa)	L10 (dBL re 1µPa)	L50 (dBL re 1µPa)	L90 (dBL re 1µPa)	Principle Energy (Hz)	Measurement Period		Measurement Duration (min: sec)
									Start Time	End Time	
A-1	Calibration	N/A	Broadband	162	162	162	162	251.2	10:07:06	10:07:36	00:00:29.7
			100 to 2000 Hz	162	162	162	162				
			2000 Hz to 20kHz	114	114	114	113				
A-2	Pipe-lay	606 to 772	Broadband	154	153	146	138	160	11:06:28	11:15:16	00:07:42.3
			100 to 2000 Hz	126	124	119	116				
			2000 Hz to 20kHz	145	145	108	105				
A-3	Pipe-lay	580 to 730	Broadband	153	145	145	137	160	11:24:49	11:32:25	00:06:45.3
			100 to 2000 Hz	124	118	118	113				
			2000 Hz to 20kHz	145	110	110	104				
A-4	Ambient at Plow	N/A	Broadband	151	149	143	135	100	12:25:03	12:40:15	00:12:58.9
			100 to 2000 Hz	123	122	113	106				
			2000 Hz to 20kHz	143	142	103	98				
A-5 / A-6	Crew	Passby	Broadband	152	150	145	139	160	12:54:59	12:57:20	00:02:06.4
			100 to 2000 Hz	128	126	121	115				
			2000 Hz to 20kHz	113	113	107	100				
A-7	Background	N/A	Broadband	157	155	149	141	160	13:29:09	13:44:19	00:13:11.0
			100 to 2000 Hz	118	116	111	108				

Figure	Activity or Reference Condition	Horizontal Reference Distance R_O (meters)	Frequency Range	L5 (dBL re 1µPa)	L10 (dBL re 1µPa)	L50 (dBL re 1µPa)	L90 (dBL re 1µPa)	Principle Energy (Hz)	Measurement Period		Measurement Duration (min: sec)
									Start Time	End Time	
			2000 Hz to 20kHz	147	146	117	102				
A-8	Pipe-lay	100 to 300	Broadband	155	153	145	136	200	14:11:00	14:17:20	00:05:41.8
			100 to 2000 Hz	147	145	138	133				
			2000 Hz to 20kHz	144	143	121	114				
A-9	Pipe-lay	500 to 600	Broadband	153	152	146	139	315	14:23:41	14:37:48	00:11:58.1
			100 to 2000 Hz	138	137	133	128				
			2000 Hz to 20kHz	143	142	123	113				

5.1.1 Pipe-Lay

Pipe laying construction activities occur in an assembly-line fashion on board the lay barge, and the pipe is installed by an S-Lay installation process. To assist the pipe in transitioning from the lay vessel to the seafloor, an adjustable structure called a "stinger" is attached to the stern of the barge. A combination of tension and stinger positioning ensures that the pipeline is not overstressed during the installation process.

The lay barge requires the use of an anchor handling tugs. The anchor handling tugs assist with anchor positioning and the movement of the barge as it installs the pipe. In addition to the anchor handling tugs, pipe laying activities are supported by a transportation/pipe haul barge (including two additional tug boats dedicated to the haul barges) to supply the pipe lay barge with line pipe as well as a supply vessel to ferry personnel, supplies, and fuel to and from the barge.

Pipe laying activities were performed by the lay barge *Lone Star Horizon*. During the June 27, 2007 pipe laying hydroacoustic measurement activities the *Lone Star Horizon* had the support of the anchor handling tug *Martha Eugenia* and the support vessel, M/V *Sun New York*. See Table 4 for vessel specifications. Appendix E includes the vessel log of activities performed on the day of survey activity.

The time history of a typical measurement of pipelay noise is presented in Appendix A, Figures A-2, A-3, A-8, and A-9. Measurements were taken at multiple distances from the pipelay barge, the *Lonestar Horizon* (606 to 772 meters, 580 to 730 meters, 100 to 300 meters, and 500 to 600 meters), which was conducting the installation. The spectral plot consists mainly of non-tonal noise at levels comparable to the mean estimated area ambient of approximately 120 dBL measured during pauses in work activities, with principle energy found at 250 Hz. Sound that could possibly be associated with the pipe laying activity would be described as relatively constant during the this first measurement period, or possibly masked by ambient entirely, with the exception of a short burst of sound at 11:11 am registering at 138 dBL, which may be associated with engine noise associated with the anchor handling tug, but this was not confirmed. Appendix A, Figure A-3 indicates high frequency components occurring for roughly 10 percent of the event are most likely attributable to electronic noise within the system or depth finders in use in the area which use >20kHz sound energy. Electronic noise is inherent noise from the hydrophone and electronic elements found within the sound level analyzer and signal conditioning was systematically found during a portion of the field measurement programs, but has no effect on reported sound levels in the 100 to 2,000 Hz range. Overall, time history shows that underwater levels remained relatively low at distances of 1,000 meters and greater, with principal energy found at 630 Hz. At these distances, the statistical sound levels approach the 120 dBL threshold, which was also representative of the upper extent of measured background noise during the date of testing. The data indicate that pipelay is a relatively low-level noise activity and there is little likelihood of the noise causing and adverse environmental effect at any appreciable distance, though certain sound frequency components may travel hundreds of meters.

Additional pipe laying measurements were made in the afternoon of June 27, 2007which included anchor pulling. Plots are presented in Appendix A, Figures A-8 and A-9. Figure A-8 with the closest transect at horizontal reference distance ranging from 100 to 300 meters and sound levels were found to range from 133 to 147 dBL in the 100 to 2,000 Hz frequency range, and are principally dominated by tug engine and anchor movements. As the observation vessel moved further away from the active work area, sound levels are seen to be decreasing with increased separation distance in the time history plot. The second measurement pipe lay measurement was made at a distance of 500 to 600 meters and included the M/V *Sun New York* on a maintenance run to the *Lone Star Horizon* as well as continued tug anchor movements

and ongoing pipe laying. Sound levels associated with this activity ranged from 128 to 138 dBL in the 100 to 2,000 Hz frequency range with principal energy centered at 315 Hz. The data indicate that the statistical sound levels were approximately 8 to 18 dBL above the 120 dBL threshold and area ambient noise levels present on the date of testing. Received sound levels were consistent with typical tug operations.

5.1.2 Ambient Measurements

Short term ambient measurements were completed at two locations. Appendix A, Figure A-4 shows time histories and spectral data collected in proximity to the plow locations. The *Atlantic Horizon* (the onsite plow and backfill barge) was onsite during this measurement activity, but no plowing or construction activities were occurring during the measurement period. A second ambient measurement was taken at a location removed from both plow and pipe lay sites. Time histories and spectral information is presented in Appendix A, Figure A-4 and A-7. For the majority of ambient measurement periods, the average statistical L_{eq} values were consistently at or below 125 dB, for frequencies in the 100 to 2,000 Hz range. Both ambient spectral plots show similar sloped spectrum, with a flat region and apparent increase in level for frequencies of 2,000 Hz and above which may indicate the high frequency electrical noise floor. This could not be avoided because even with signal conditioning, as the dynamic range was set for the frequency range for transients and tonal peaks with principal energy found in the 100 to 2000 Hz range. The measurements of ambient noise in the shallows indicates that the received sound levels in general range towards the upper bound of the deep water ambient noise levels presented by Wenz (1962) which is typical for coastal areas that are noisier, especially in areas that are close to active shipping lanes. Ambient measurements were targeted to periods when there is local movement of shipping was low. It should be noted however, that even when there is no apparent local movement, distant ships will contribute to received sound levels.

5.1.3 Crew Boat

On June 27, 2007 Tetra Tech measured received underwater sound levels of during the pass by of a crew boat (name of vessel is not known), as it entered the plow work site. The crew boat was a four engine watercraft. Time histories and spectral information is presented in Appendix A, Figure A-5 (approach) and A-6 (departing). Sound levels at the monitoring vessel generated received sound levels were 131 dBL at the closest estimated approach distance of 200 meters with sound levels increasing during approach and decreasing during departure. Residual L_{90} sound levels when the crew boat was not in view was 115 dBL, in the frequencies of 100 to 2,000 Hz. The principle sound energy during this measurement was centered at 160 Hz. The data indicate that the recorded sound levels reached approximately 10 to 15 dBL above ambient. Received sound levels were consistent with a four engine motor vessel, which are frequently traversing the waters of Massachusetts Bay.

5.2 August 1, 2007 Survey Results

On August 1, 2007 Tetra Tech performed field measurements to capture data associated with plowing activities and ambient conditions. A summary of all measurement data from the August 1, 2007 survey event is provided in Table 7. As stated previously, this table evaluates the received sound levels in dBL in three ranges of frequencies (100 to 2,000 Hz, 2,000 Hz to 20 kHz, and broadband), where the principle energy is found (i.e., peaks in the spectrum), and a description of received sound level ranges, as indicated by statistical levels, at a stated horizontal reference distance from the source or activity. Time history and spectral plots for each construction activity measured are included in Appendix B. A detailed description of survey results is provided in the following sections.

Table 7 Description of Monitoring Positions, Measurement Durations, and Results - August 1, 2007

	Activity or Reference Condition	Horizontal Reference Distance R_O (meters)	Frequency Range	L5 (dBL re 1µPa)	L10 (dBL re 1µPa)	L50 (dBL re 1µPa)	L90 (dBL re 1µPa)	Principle Energy (Hz)	Measurement Period		Measurement Duration (min: sec)
									Start Time	End Time	
B-1	Plow	330 to 600	Broadband	156	155	148	141	250	10:21:22	10:35:37	00:11:40.2
			100 to 2000 Hz	133	131	121	114				
			2000 Hz to 20kHz	148	147	119	108				
B-2	Plow	240 to 430	Broadband	158	157	150	143	630	11:03:28	11:18:40	00:12:23.2
			100 to 2000 Hz	134	133	129	125				
			2000 Hz to 20kHz	148	147	123	115				
B-3	Background at AB	N/A	Broadband	151	149	142	133	160	11:53:34	12:05:39	00:11:36.6
			100 to 2000 Hz	121	120	115	109				
			2000 Hz to 20kHz	110	106	103	102				
B-4	Background at AB	N/A	Broadband	152	149	140	131	315	12:08:40	12:18:38	00:09:57.5
			100 to 2000 Hz	121	120	117	113				
			2000 Hz to 20kHz	106	105	103	101				
B-5	Plow	440 to 550	Broadband	158	156	150	142	160	12:43:44	13:00:10	00:13:09.5
			100 to 2000 Hz	139	139	135	131				
			2000 Hz to 20kHz	123	123	116	116				
B-6	Background at Pipe-lay	N/A	Broadband	155	154	148	140	250	13:20:45	13:34:33	00:13:07.1
			100 to 2000 Hz	123	122	116	111				
			2000 Hz to 20kHz	109	108	103	101				

5.2.1 Plowing

Plowing activities associated with Pipeline Lateral construction was supported by the plow barge, the Lone Star Horizon, equipped with an eight-point anchoring system. Plowing activities also required the use of an anchor handling tug that supports the repositioning of the anchor spread, a towing vessel to move the plow and barge along the pipeline route, and a support vessel to assist in the deployment of an remotely operated vehicle (ROV) or diver to inspect the positioning of the plow over the pipeline, See Table 4 for vessel specifications.

Plowing activities consisted of towing the plow barge along the pipeline by pulling in the barge's bow anchor lines and releasing the stern anchor lines as the barge was pulled forward by a tug to a pre-determined distance ahead of the plow. As the towing vessel moved forward and the barge's anchor lines were released, the anchor handling tug moves into place to reposition the anchors ahead of the towing vessel to support the next haul of the plow. Towing speed during the event was variable, dependent on sediment type, depth of cut and rate of "in-fill" occurring behind the plow and prior to the pipeline settling in the ditch.

The time history of a typical measurement of plowing noise is presented in Appendix B, Figures B-1, B-2, and B-5. Appendix B, Figure B-1 shows sound levels ranging from 114 to 133 dBL in the frequency range of 100 to 2000 Hz. Sound levels are shown steadily increasing over the measurement period as the tug began an anchor movement and approached the observation vessel. Appendix B, Figure B-2 shows more steady received levels of 125 to 134 dBA at separation distances of 240 to 430 meters.

Measurements were made at separation distances of 440 to 550 meters of additional plowing activity as shown in Appendix B, Figure B-5. Sound levels during this event ranged from 131 to 139 dBL, in the frequency range of 100 to 2,000 Hz. As shown in Figure B-5, the spectra shape between the plow measurement data fluctuates between the measurement periods. During this measurement period, principle sound energy is centered at 160 Hz and extends to 630 Hz.

Overall the plowing work site was found to be a mixture of broadband noise, tonal machinery noise and short-term transient sounds associated with the ongoing construction activities, which may be due to impact of the plow with the seabed. As shown in the associated time histories, the underwater noise was at times highly variable, and may be partially dependent on the site-specific geology and soil conditions of the area that plowing was taking place, but more likely due to tug movements as it moved closer and further away from the measurement position. All plowing measurements included the contribution of support tugs during anchor handling, crew boat, and support vessel movements occurring within the construction zone. These data show that the recorded sound levels were a maximum 19 dBL over the 120 dBL threshold level which was also the upper extent of background noise measurement data collected on the date of testing. Received noise levels were consistent with normal plowing operations.

5.2.2 Ambient Measurements

Short term ambient measurements were completed at multiple locations within Massachusetts Bay including at Bioacoustics Research Program, Cornell Lab of Ornithology (BRP), Buoy AB-2. The ambient noise measurements were targeted for low noise periods when there were no identifiable sources of anthropogenic noise in plain sight. The mean broadband ambient noise levels ranged between 109 to 121 dBL during the first measurement period and 113 to 121 dBL during the second measurement period, in the frequency range of 100 to 2,000 Hz.

Ambient measurement time histories and spectral data, collected in proximity to the pipeline worksite (no work was underway), as shown in Appendix B, Figure B6 were from 111 to 123 dBL in the frequency range of 100 to 2,000 Hz. The sound energy and spectrum plots exhibited the typical pattern of a steeply sloped spectrum, characteristic of underwater ambient sound and found in all background data collected by Tetra Tech..

5.3 August 29, 2007 Survey Results

On August 29, 2007 Tetra Tech performed field measurements to capture data associated with backfilling activities including anchor movements. Ambient measurements were also documented at the BRP Buoy AB-2. A summary of the measurement data from the August 1, 2007 survey event including received sound levels (dBL) in the 100 to 2,000 Hz, 2,000 Hz to 20 kHz, and broadband frequency ranges is provided in Table 8.Time history and spectral plots for each construction activity and short-term background sound level measurement are included in Appendix C. A detailed description of survey results is provided in the following sections.

Table 8 Description of Monitoring Positions, Measurement Durations, and Results - August 29, 2007

	Activity or Reference Condition	Horizontal Reference Distance R_O (meters)	Frequency Range	L5 (dBL re 1µPa)	L10 (dBL re 1µPa)	L50 (dBL re 1µPa)	L90 (dBL re 1µPa)	Principle Energy (Hz)	Measurement Period		Recording Duration (min: sec)
									Start Time	End Time	
C-1	Backfill ing	1320 to 1410	Broadband	157	155	149	142	250	12:12:36	12:20:19	0:06:21.0
			100 to 2000 Hz	139	138	134	131				
			2000 Hz to 20kHz	126	123	120	117				
C-2	Backfilling	1420 to 1500	Broadband	159	156	150	142	250	12:20:52	12:30:19	0:07:46.3
			100 to 2000 Hz	134	133	128	123				
			2000 Hz to 20kHz	124	123	120	115				
C-3	Backfilling	1330 to 1690	Broadband	158	156	149	141	160	12:34:36	12:50:10	00:13:42.3
			100 to 2000 Hz	126	124	116	112				
			2000 Hz to 20kHz	120	118	110	103				
C-4	Backfill ing	990 to 1140	Broadband	157	155	149	141	125	13:01:17	13:12:33	00:11:15.8
			100 to 2000 Hz	116	115	111	108				
			2000 Hz to 20kHz	110	109	106	104				
C-5	Backfilling	1100 to 1410	Broadband	159	158	153	145	250	13:54:15	14:06:12	00:10:00.9
			100 to 2000 Hz	131	131	128	125				
			2000 Hz to 20kHz	112	112	110	109				
C-6	Backfilling	610 to 1050	Broadband	158	157	151	143	250	14:18:25	14:39:06	00:19:56.4
			100 to 2000 Hz	136	135	132	129				
			2000 Hz to 20kHz	121	120	116	113				
C-7	Ambient	N/A	Broadband	156	153	146	139	1250	16:00:08	16:04:40	00:03:41.5
			100 to 2000 Hz	116	113	109	105				

	Activity or Reference Condition	Horizontal Reference Distance R_O (meters)	Frequency Range	L5 (dBL re 1µPa)	L10 (dBL re 1µPa)	L50 (dBL re 1µPa)	L90 (dBL re 1µPa)	Principle Energy (Hz)	Measurement Period		Recording Duration (min: sec)
									Start Time	End Time	
			2000 Hz to 20kHz	106	105	103	101				
C-8	Ambient	N/A	Broadband	157	154	147	139	2500	16:05:12	16:17:00	00:09:53.0
			100 to 2000 Hz	117	115	110	106				
			2000 Hz to 20kHz	113	111	107	103				

5.3.1 Backfilling

Backfilling activities associated with the Pipeline Lateral construction are conducted using the same vessels and techniques as described for plowing (see section 5.2.1). Table 4 provides information on the backfill and the support vessel specifications.

Appendix C, Figures C-1 through C-6 present typical backfilling time histories and spectral plots; recorded at multiple distance ranges. As depicted in Appendix C, Figure C-1 and C-2, in addition to backfilling, the *Martha Eugenia* anchor handling tug was positioning and repositioning anchors within the active work area and the *Gulf Grace* crew boat departed from the work site. Sound levels in Appendix C, Figure C-1 range from 131 to 139 dBL at horizontal reference distances of 1,320 to 1,410 meters, in the frequencies of 100 to 2,000 Hz. Similar L_5 and L_{10} sound levels and spectrum shape are shown in Appendix C, Figure C-2 with levels of 123 to 134 dBL at distances of 1,420 to 1,550 meters. Lower L_{90} sound levels are an indication of higher variability in sound levels which is dependent on tug engine use. As shown in the time history plot, sound levels were also decreasing with increase separation distance between the observation vessel and work site.

Appendix C, Figure C-3 time history depicts a tug as it was moving away from the work site and the observation vessel at a range of 1,330 to 1,690 meters with sound levels decreasing with time from 126 dBL to 112 dBL with a short pulse to 140 dBL, in the frequency range of 100 to 2,000 Hz. It was unclear during testing, but has been hypothesized that the short duration pulses may have be attributable to an impact between equipment, the dropping of an anchor, or tug high engine use as it made a sudden directional change or similar high energy movement. Appendix C, Figure C-4 is representative of backfilling only, with no tug or anchor pulling activity at a distance of 990 to 1,140 meters. Sound levels during this measurement ranged from 116 to 108 dBL in the 100 to 2,000 Hz frequency range. These received sounds indicate that underwater sound generated by backfilling can be considered a low noise level activity, largely masked by ambient conditions at separation distances of 1,000 meters and greater, when tugs are not in use. Working tugs are generally amongst the loudest of the vessel sources present at an offshore construction site, especially during high-power operations (i.e., pushing/pulling). Appendix C, Figure C-5 and C-6 are measurements at the perimeter of the anchor spread, with tug engines engaged during anchor movements.

Additional measurements of backfilling were taken during the afternoon of August 29, 2007. During these events, as show in Appendix C, sound levels ranged from 131 to 125 dBL at a distance of 1,100 to 1,410 meters (Figure C-5) and 136 to 129 dBL at distances of 610 to 1,050 meters (Figure C-6). Data is reported within the frequencies of 100 to 2,000 Hz. Higher underwater sound measurement results during the second measurement period is attributable to the much shorter separation distances to the barge and tug anchor handling activities with underwater sound levels steadily decreasing during this 20-minute measurement period, as the observation vessel drifted away from the barge and tug. The tug engine and propulsion system is likely again the dominant sound source. Principal energy associated from all the backfilling measurement periods was seen at the discrete frequencies of 125, 160 and 250 Hz. The data indicate that the recorded sound levels were approximately 5 to 16 dBL, at given separation distances, above the 120 dBL threshold, which was also representive of the upper extent of ambient levels as measured on the date of testing. Received sound levels were consistent with typical tug, barge, and backfilling operations in an offshore shallow water environment.

5.3.2 Ambient Measurements

Short-term ambient measurements were completed at multiple locations including at the BRP Buoy AB-2, which was far removed from active construction sites. These data were collected for comparative purposes (BRP 2008; 2009; 2010). Appendix C, Figures C-7 and C-8 show the time histories and spectral plots. In Appendix C, Figure C-8, a recreational power boat was spotted and its presence is clearly evident in the time history plot. As shown in Appendix C, Figure C-8, the underwater sound levels increased slowly as the separation distance decreased, even though separation distances were large and overall sound levels remained relatively low. Ambient sound levels ranged from 105 to 117 dBL during the first measurement period and 106 to 117 dBL during the second with a small power boat visible in the distance. These levels are reported in the frequency range of 100 to 2,000 Hz. Resultant sound levels measured are similar to ambient measurements made in previous hydroacoustic surveys at the BRP AB-2 location.

6.0 RESULTS OF EBRV OPERATIONS – GULF OF MEXICO

The objective of the measurements collected at the Gulf Gateway Deepwater Port was to quantify the underwater noise levels generated by an EBRV as it participated in typical docking maneuvers, onboard closed loop regasification activities, and vessel transiting. Testing was completed in 2006 in the Gulf of Mexico with the support of EBRV *Excelsio*r, a (138 cubic meters [m^3] LNG tanker). A description of the vessel characteristics are summarized in Table 9. The test site was located at about 116 miles off the coast of Louisiana in the Gulf of Mexico at a water depth of approximately 80 meters. Reference calibration tones are presented in Appendix D, Figures D-1, D-6, and D-9. Weather conditions during testing are reported in Table 10.

Table 9 Description of Monitoring Positions, Measurement Durations, and Results August 3 & 4, 2006

Dimensions	Length O.A.	Apprx.	277 m
	Length B.P.		266 m
	Breadth, mid.		43.4 m
	Depth, mid.		26 m
	Designed draught, mid.		11.52 m
	Summer draught, mid.		12.32 m
	Scantling draught, mid.		12.32 m
Deadweight	At designed draught	Apprx.	31,545.6 MT
	At summer draught	Apprx.	77,287.2 MT
Maximum propulsion shaft power		26,478 kW at 88 RPM	
Thrusters (Controllable Pitch Propeller)		Bow thrusters:	
			Two (2) x 3550 kW
		Stern thrusters:	
			One (1) x 2026 kW
Service speed at designed draught and at maximum propulsion shaft power including 21% sea margin		Apprx.	19.1 knots

Table 10 Prevailing Meteorological Conditions during Test Measurements

	August 3, 2006	August 4, 2006
Barometric pressure [hPa] [a/]	*1014.8-1017.2*	*1015.0-1016.5*
air temperature [°C] / [°F] [a/]	*29.0-29.2 / 84.2-84.6*	*29.0 / 84.2*
range of wind direction [a/]	*93-119*	*89-149*
prevailing wind direction [a/]	*ESE*	*ENE-SSE*
weather conditions [b/]	*clear*	*clear*
Seastate (ft) [b/]	0.5-1	*1-2*

[a/] Station 42019 (LLNR 1205) - Freeport, TX 60 NM South of Freeport, TX. U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration, National Weather Service, National Data Buoy Stennis Space Center, MS. http://www.ndbc.noaa.gov/view_text_file.php?filename=42019h2006.txt.gz&dir=data/historical/stdmet/

[b/] Recorded at time of field activity.

6.1 EBRV Maneuvering

EBRVs are purpose-built LNG tankers that incorporate onboard equipment for the vaporization of LNG and delivery of high-pressure natural gas. EBRVs utilize a steam generating plant in the vessel for propulsion and overall vessel operations. EBRVs utilize a closed-loop warming system to vaporize the LNG without any use or discharge of local seawater.

Measurements of EBRV maneuvering were completed during a standard EBRV docking, which included periodic use of low level thrusters, as shown in Appendix D, Figure D-6. The docking sequence lasted approximately 5 minutes. Sound levels increased as the EBRV approached the Deepwater Port positioned, and connected. At the closest separation distance of 100 meters, sound levels ranged from 120 dBL on approach to 132 dBL upon connection, in the frequency range of 100 to 2,000 Hz. . The data indicate that the recorded sound levels were approximately 10 to 15 dBL above the 120 dBL threshold level, which was also representative of the upper extent of the measured background noise levels during the date of testing. Measurement data is consistent with the predicted source levels of 160 to 170 dBL from normal thruster operations during coupling/decoupling operations and EBRV maneuvering at the NEG Port as modeled in the 2006 Northeast Gateway Final EIS/EIR. Figure D-7 shows test measurement data of EBRV thrusters fully engaged over a prolonged time period. Although not a typical scenario during normal port operations, the time history and spectral plots are presented for comparative purposes.

6.2 EBRV Transiting

As stated in Table 8, the maximum transiting speed of an EBRV is approximately 19 knots; however when transiting to and from the NEG Port and TSS, EBRV vessel speeds are restricted to a no more than 10 knots due to seasonal and Port permit restrictions. As an EBRV makes its final approach to the NEG Port STL Buoys, vessel speed is gradually reduced. At about 1.86 miles out from the buoys vessel speeds will be close to 3 knots and less than 1 knot at a distance of about 1,640 feet from the NEG Port.

During the 2006 measurement event at the Gulf Gateway Deepwater Port, measurements of transiting EBRVs were completed to document the noise generated by EBRVs at velocities of 3 knots, 10 knots, and 13 knots with data presented in Appendix D, Figures D-2, D-3, and D-4, respectively.

During testing, the EBRV transited a straight line course. The EBRV maintained constant speed, fixed machinery conditions and minimum use of helm. The observation vessel remained at a fixed point, with closest traverse distance of 100 meters. At 13 knots, the maximum pass by sound level was measured at 132 dBL (100 to 2,000 Hz). At 10 knots, the measured maximum sound level was 134 dBL (100 to 2,000 Hz). The three knot pass by was logged at 125 dBL (100 to 2,000 Hz). These propulsion driven EBRV sound levels are consistent with apparent source levels of 160 to 170 dBL for operational and EBRV maneuvering conditions that was used to derive received sound pressure levels as reported in the 2006 Northeast Gateway Final EIS/EIR.

Every vessel has a unique frequency signature which changes with speed. Vessel propeller noise is prominent at frequencies below 1 kHz. However, cavitations caused by propellers increases underwater noise levels at reduced speeds, and are evident in the spectral plots occurring up to several kHz contributing to the tonal structure. At higher EBRV transit speeds, hydrodynamic flow noise over the hull causes turbulence, which can result in masking of the machinery tonal sounds present at lower speeds, as it becomes a dominant contributing factor.

6.3 EBRV Regasification

Acoustic nearfield measurements were completed at multiple locations off the side of the EBRV to determine variations in sound levels immediately adjacent to the hull of the vessel. Appendix D, Figures D-8, D-9, and D-10 present the tonal components and overall underwater sound levels with L_{50} sound levels between 120 and 130 in the 100 to 2,000 Hz frequency range, and these low level sounds are not expected to be readily detectable over distances extending beyond approximately 300 meters from the EBRV, dependant on site specific environmental and sea state conditions.. The L_{50} statistical sound is reported to help reduce extraneous sound from wave action against the hull of the ship. The 1/3 octave band levels are approximately evenly spaced, indicating a fairly stable sound level around the vessel, with wave action against the hull noted by field personnel, audible as a gurgling or splashing sounds.

Appendix D, Figure D-11 presents measurements made immediately above the PLEM from the deck of the EBRV. EBRV thrusters were periodically engaged for the sole purpose of maintaining the hydrophone measurement position immediately above the PLEM. Underwater noise levels ranged from 140 to 152 dBL (100 to 2,000 Hz), as recorded from a hydrophone located mid-ship while both bow and stern thrusters were activated for short periods, and are evident in the time history plot as the spikes in acoustic energy. . Thrusters are not typically engaged during normal regasification events.

7.0 CONCLUSIONS

Sound was collected during hydroacoustic field surveys of the prototype EBRV Excelsior, 212 miles offshore in the Gulf of Mexico. Measurements were completed during both vessel transiting and onboard regasification from an observation vessel in vicinity of the EBRV. Measurements were also completed during construction of the Northeast Gateway Port and Pipeline Lateral in Massachusetts Bay. The resulting empirical data set provides a good technical description of the sound levels and frequency signatures for use in estimating the expected received sound levels in similar offshore environments, sound propagation modeling and acoustic model calibrations. Data collected during the 2006 and 2007 surveys identified the following vessels and activities, associated with construction and operation, as sources of underwater sound generation:

Construction:

- Barges
- Tugs (pulling and pushing)
- Plow, backfill,and pipe-lay activities
- Construction support vessels

Operation:

- EBRV thrusters and propellers during a typical docking procedure
- Operations support vessels
- Onboard regasification
- EBRVs transiting at full and reduced speed

The received sound levels reported effectively describe NEG Port construction and operational activities. These vessels and activities also characterize the type of actions and equipment that would likely be employed to support ongoing EBRV operations at the NEG Port as well as those necessary to support a potential future minor and/or major maintenance and repair event. These data can therefore be used to support the determination of potential acoustic impacts to species (e.g., marine mammals, turtles, and fish). Specifically if used in conjunction with the applicable regulatory marine harassment criteria, the resultant measurement data can be used to serve as the basis to evaluate project noise at the actionable 120 and 180 dBL thresholds.

These measurement data may also be used to evaluate activities at other sites. To do so, Tetra Tech recommends the use of the L_5 or L_{10} statistical descriptors, encompassing the frequencies of 100 to 2,000 Hz. These statistical levels represent the loudest 5 percent and 10 percent of the measurement period, thereby providing a conservative basis as they are inclusive of the intrusive portion of the noise, while excluding extraneous noise that may systematically bias the dataset. Statistical levels reported, including the L_{90} (residual) and L_{50} (median), further describe the full range of expected sound levels over a given measurement period. Received sound levels reported at reference distance are routinely used in the

determination of compliance status with regulatory limits and in the review of behavioral response of marine life to new or increased levels of anthropogenic noise, when normalized to site-specific conditions including bathymetries, geoacoustical sediment profiles, seasonal presence and absence, and other environmental conditions.

8.0 REFERENCES

Bioacoustics Research Program, Cornell Lab of Ornithology (BRP). 2008. Technical Report 08-01, Marine Mammal Acoustic Monitoring and Analysis During Pre-Construction of the Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral, 2007.

BRP. 2009. Technical Report 08-04, Marine Mammal Acoustic Monitoring and Analysis During Construction of the Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral, 2007.

BRP. 2010. Technical Report 09-08, Marine Mammal Acoustic Monitoring and Analysis for the Operations of the Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral, 17 January - 31 December 2008.

Bruel and Kjaer. 2009a. Technical Specifications - Hydrophones - Types 8103, 8104, 8105 and 8106, October, 2006. Revision 12, May 21, 2009.

Bruel and Kjaer. 2009b. Product Data Hydrophones - Types 8103, 8104, 8105 and 8106, October, 2006. Revision 12, May 21, 2009.

Kinsler and Frey. 1962. Fundamentals of Acoustics, 2nd edition, John Wiley & Sons, 1962.

The National Oceanic and Atmospheric Administration (NOAA). 1995. "Small Takes of Marine Mammals Incidental to Specified Activities; Offshore Seismic Activities in Southern California," Federal Register 60 (No 200), 53753-5376

NOAA. 1999. "Small Takes of Marine Mammals Incidental to Specified Activities; Seismic Hazards Investigation in Southern California," Federal Register 64 (No 112).

NOAA.2005. “Endangered Fish and Wildlife; Notice of Intent to Prepare an Environmental Impact Statement” Federal Register: January 11, 2005 (Volume 70, Number 7).

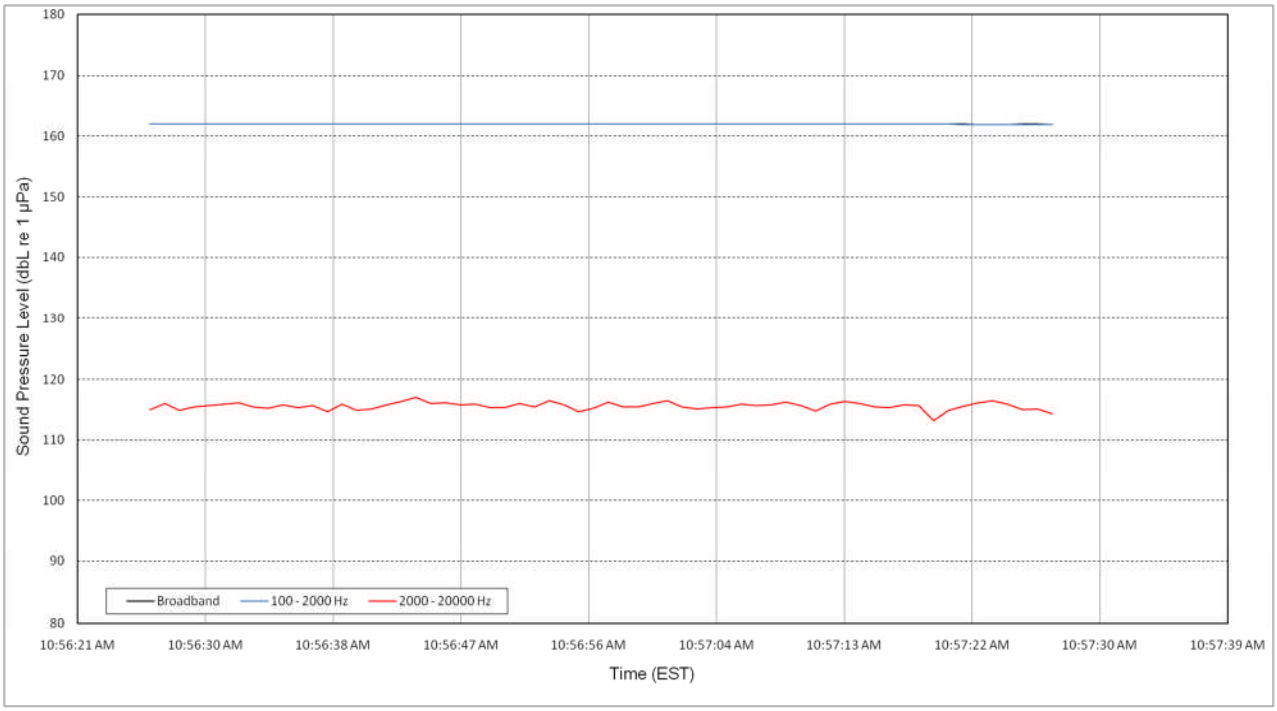
NOAA. 2006. "Small Takes of Marine Mammals Incidental to Specified Activities; Rim of the Pacific (RIMPAC) Antisubmarine Warfare (ASW) Exercise Training Events Within the Hawaiian Islands Operating Area (OpArea)," Federal Register 71 (No.78).

NOAA. 2011. NOAA's Marine Mammal Acoustic Guidelines. http://www.nmfs.noaa.gov/pr/acoustics/guidelines.htm accessed 05.14.2011.

Wenz, G. 1962. Acoustic ambient noise in the ocean; spectra and sources. Journal of theAcoustical Society of America, N34, pp 1936.

Appendix A
Hydroacoustic Survey during Construction
June 27, 2007

Figure A-1 Calibration Tone
June 27, 2007



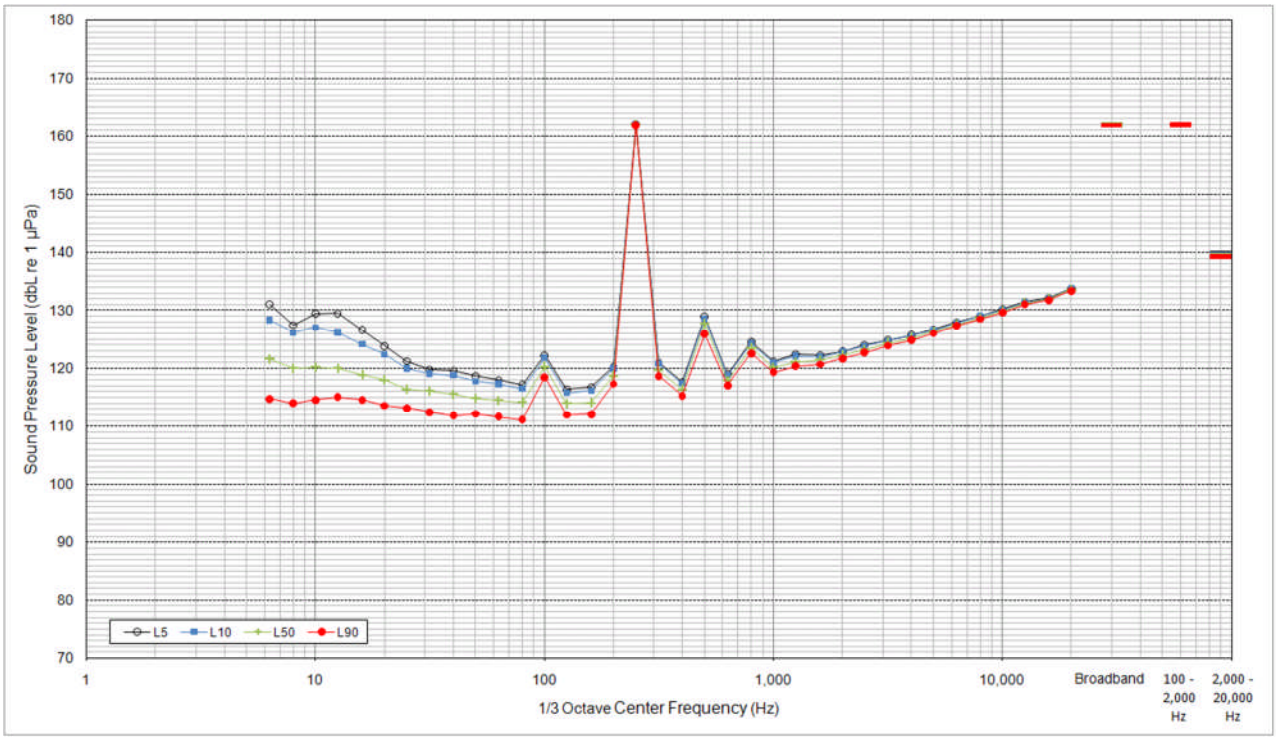
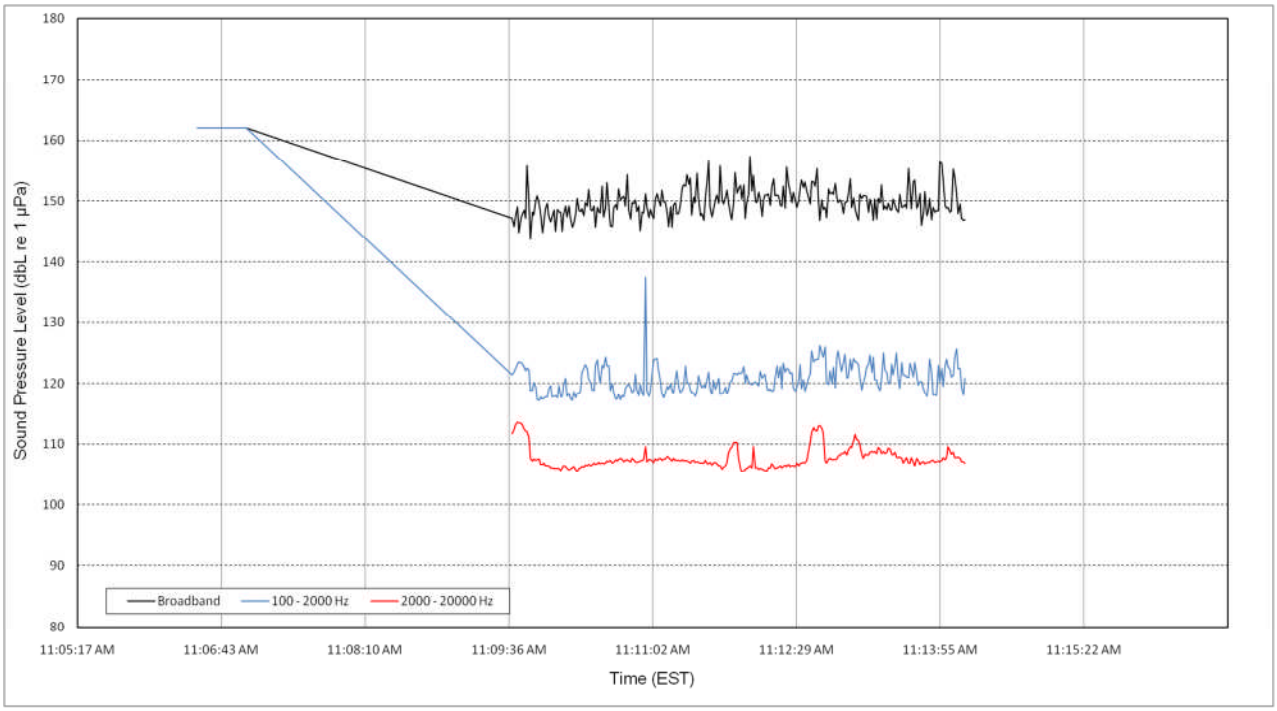


Figure A-2 Pipe-lay: Distance Range of 600 to 775 Meters
June 27, 2007



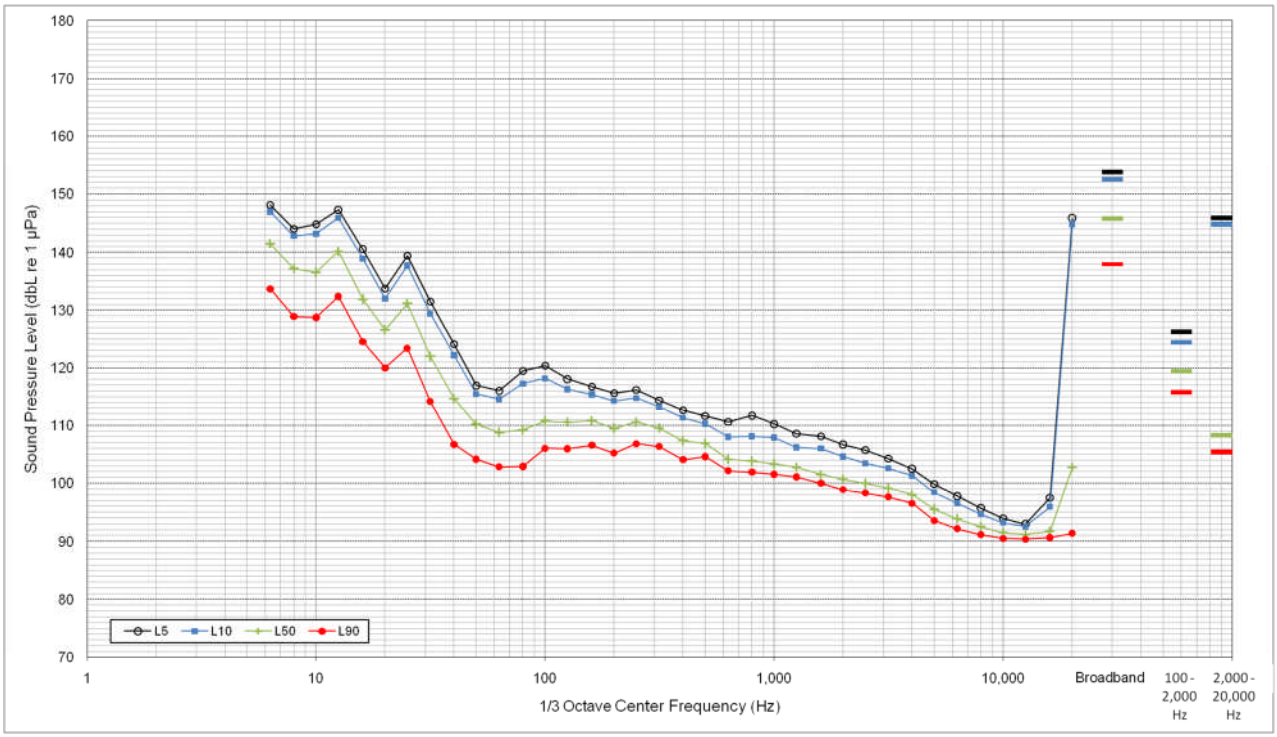
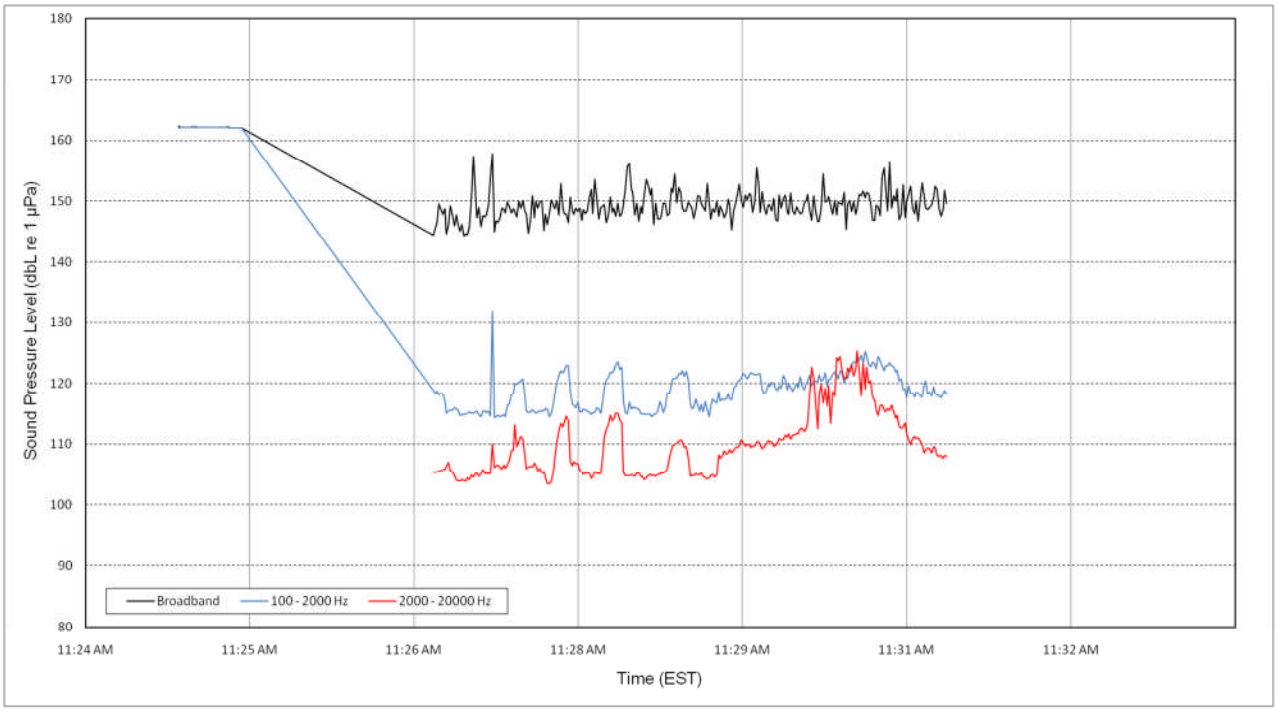


Figure A-3 Pipe-lay: Distance Range of 580 to 730 Meters
June 27, 2007



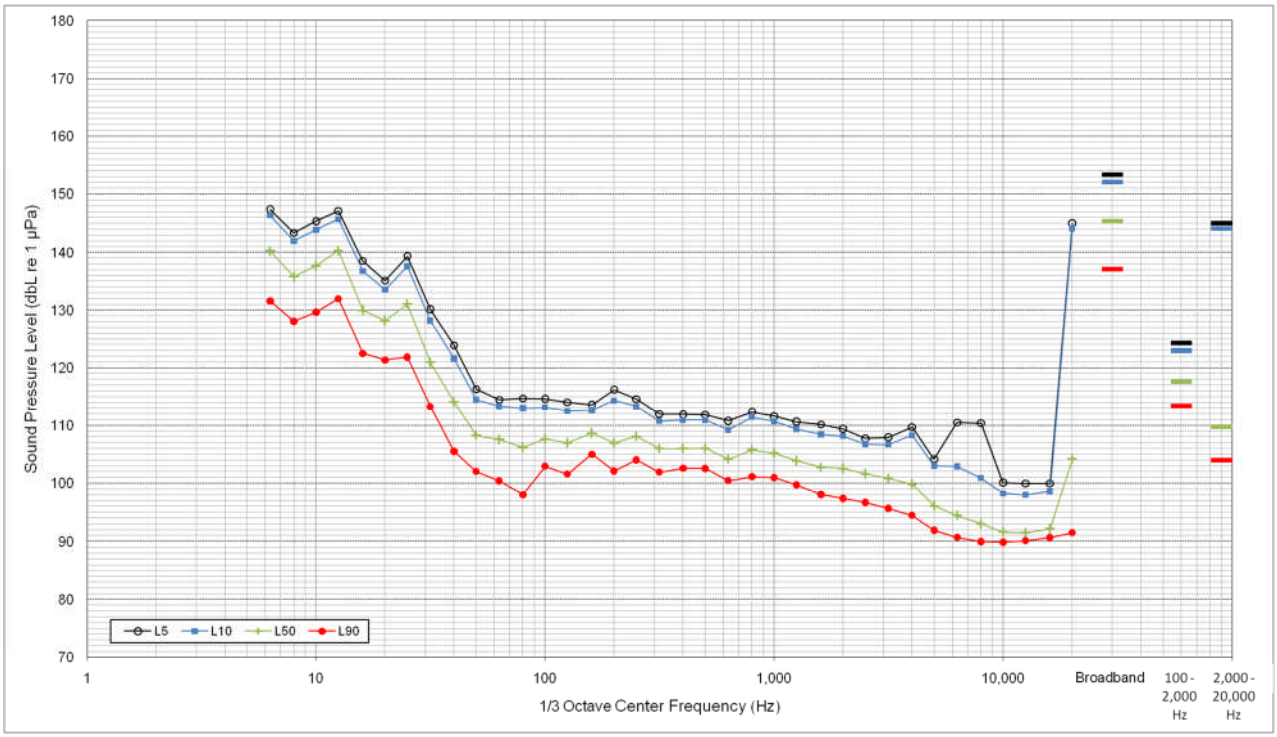
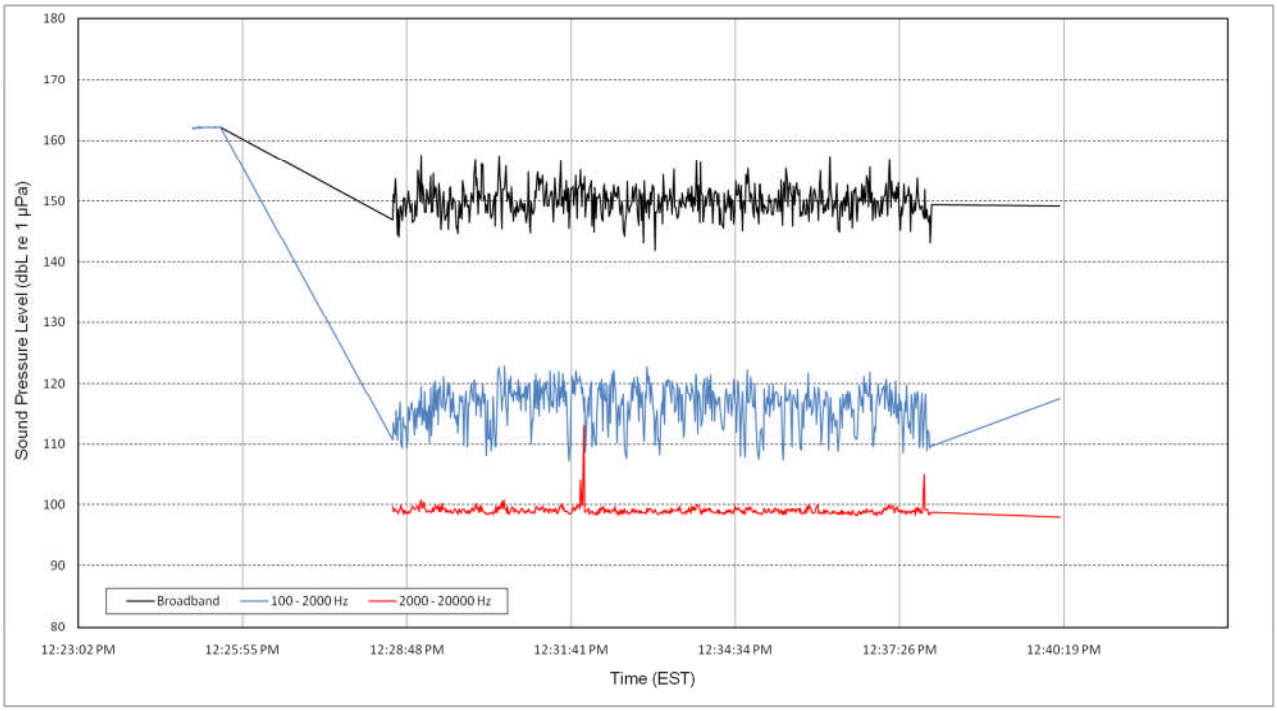


Figure A-4 Ambient Measurement
June 27, 2007



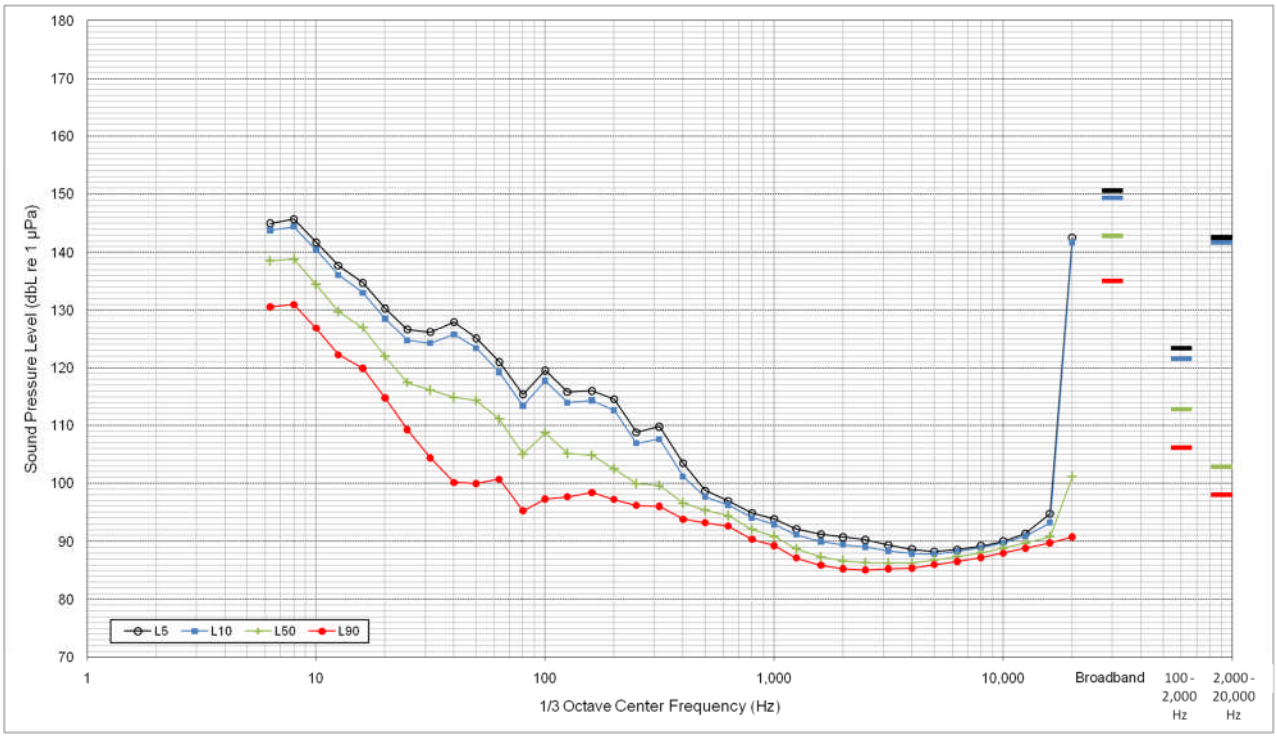
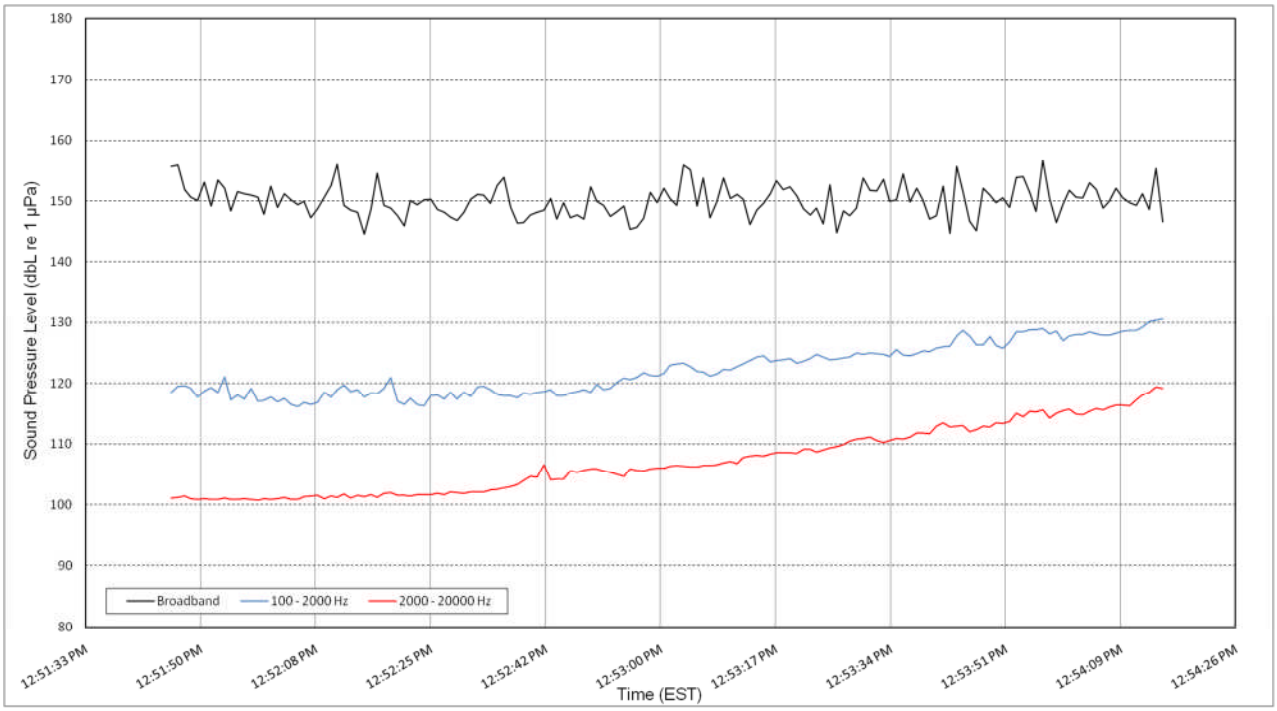


Figure A-5 Crew Boat in Transit
June 27, 2007



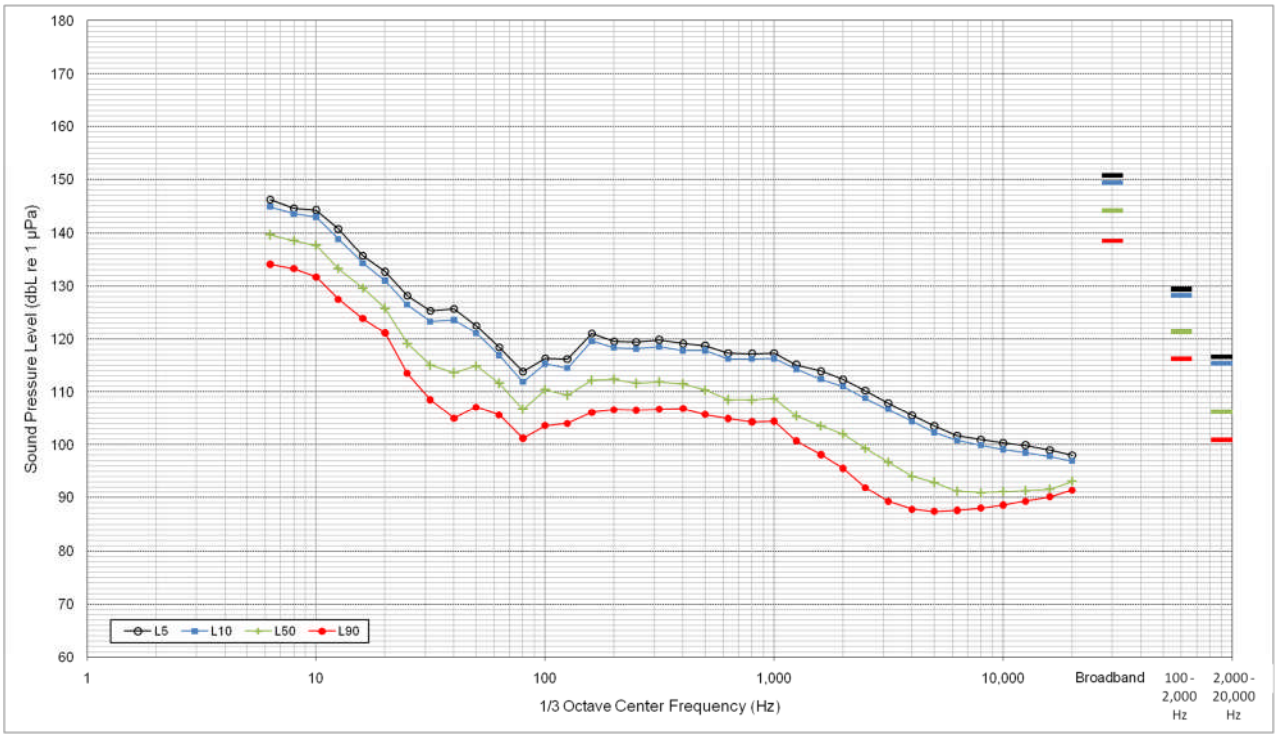
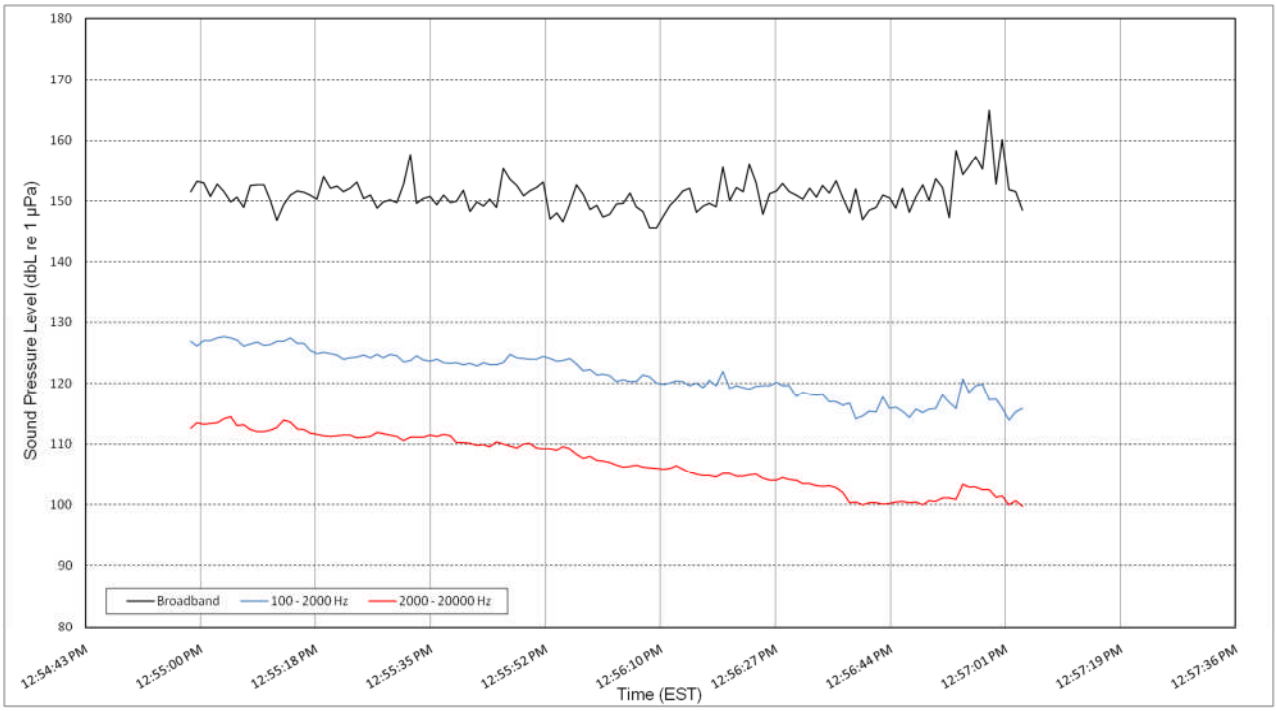


Figure A-6 Crew Boat in Transit
June 27, 2007



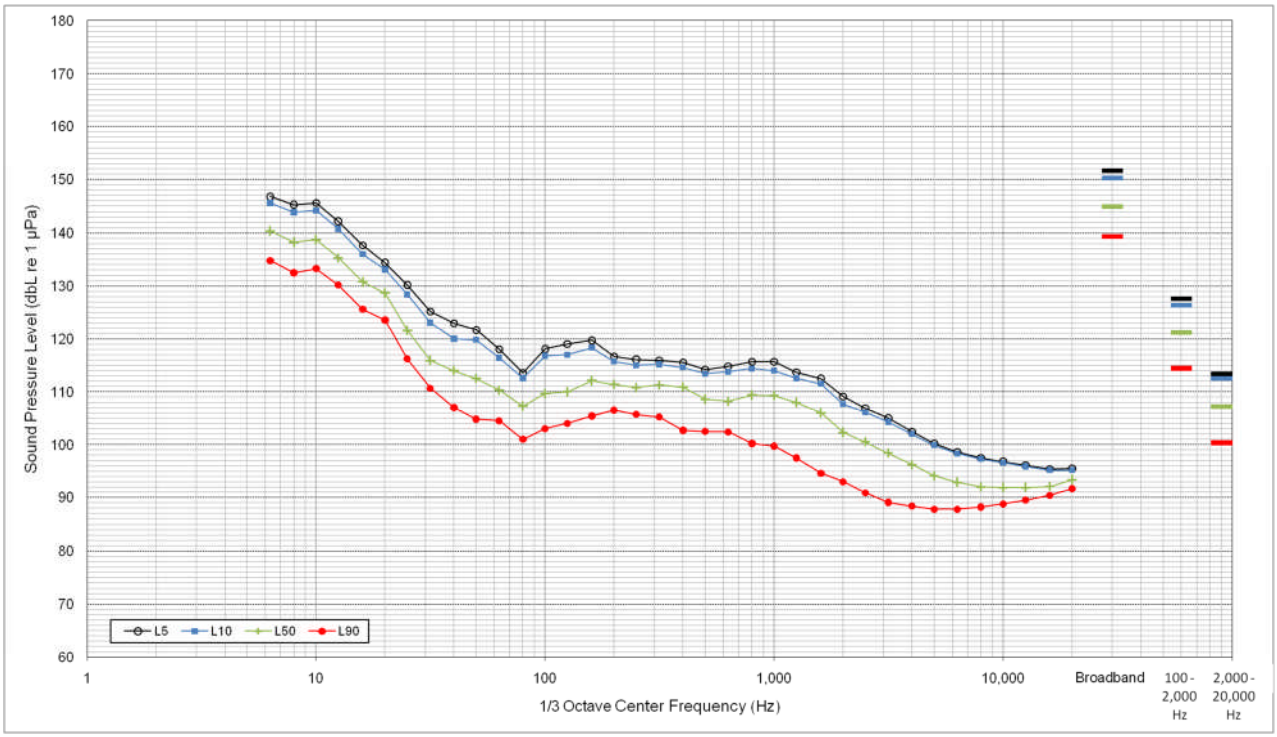
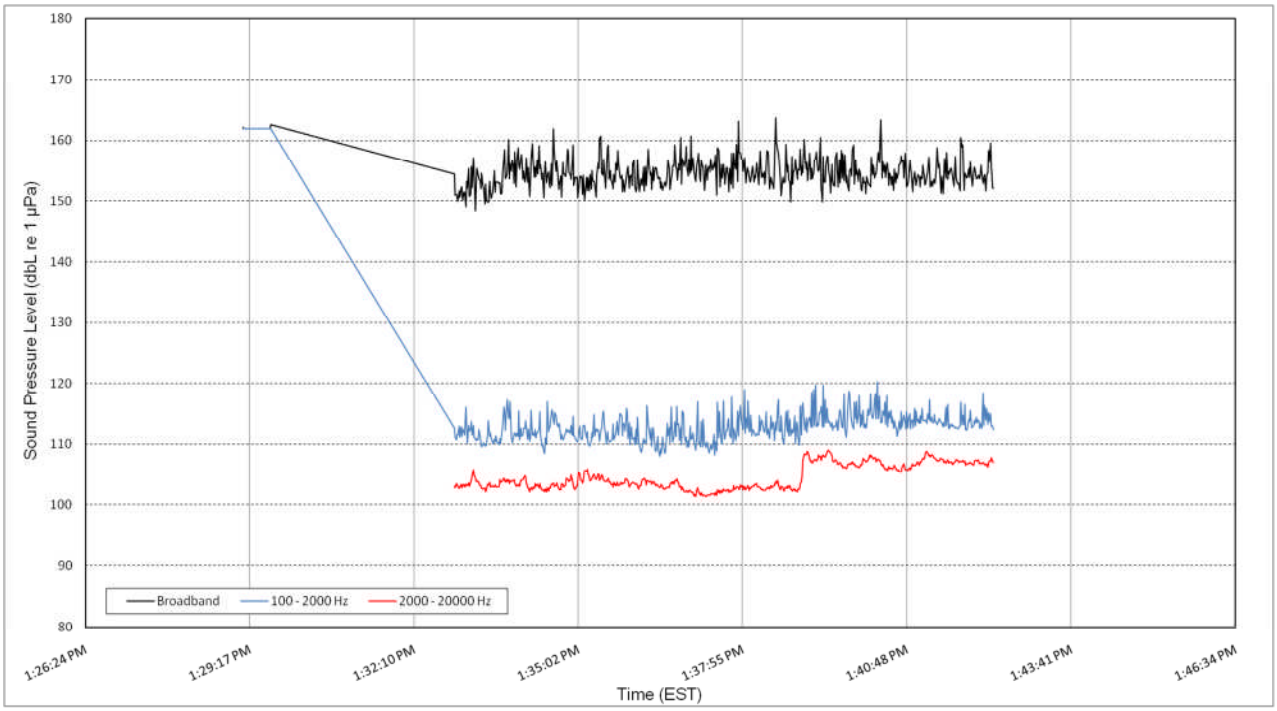


Figure A-7 Ambient Measurement
June 27, 2007



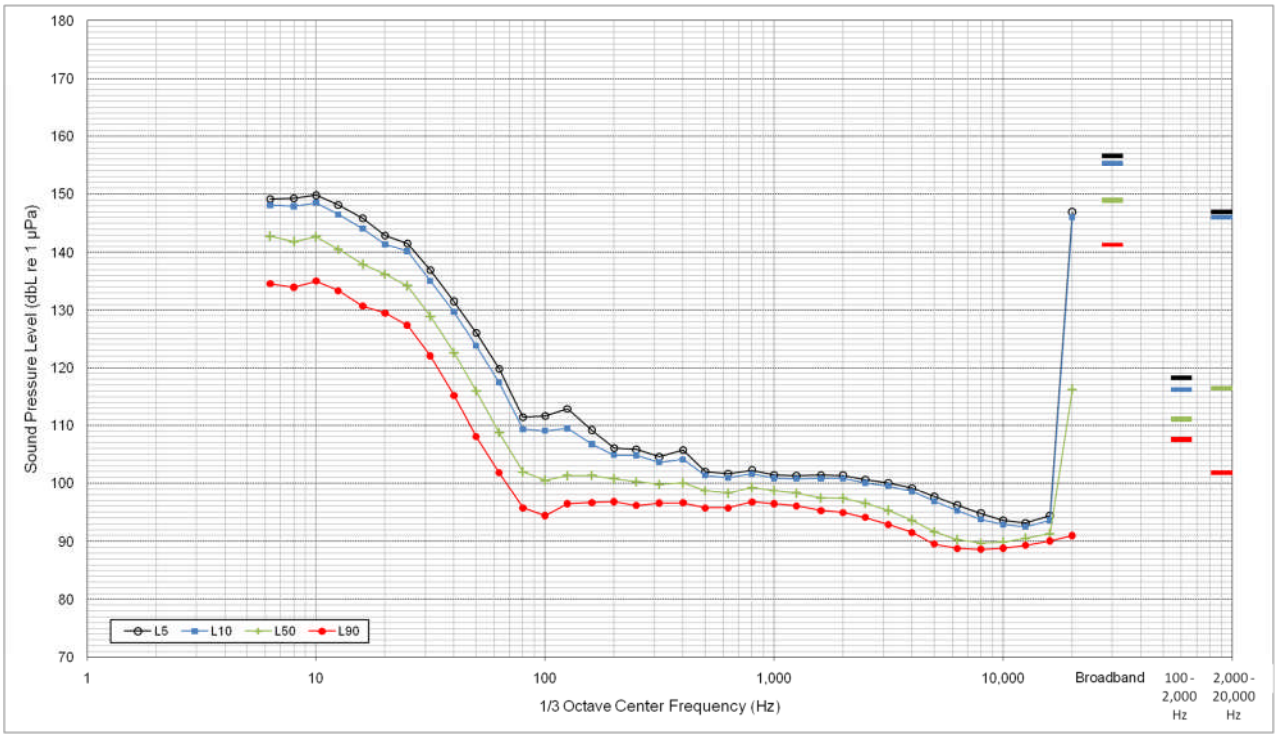
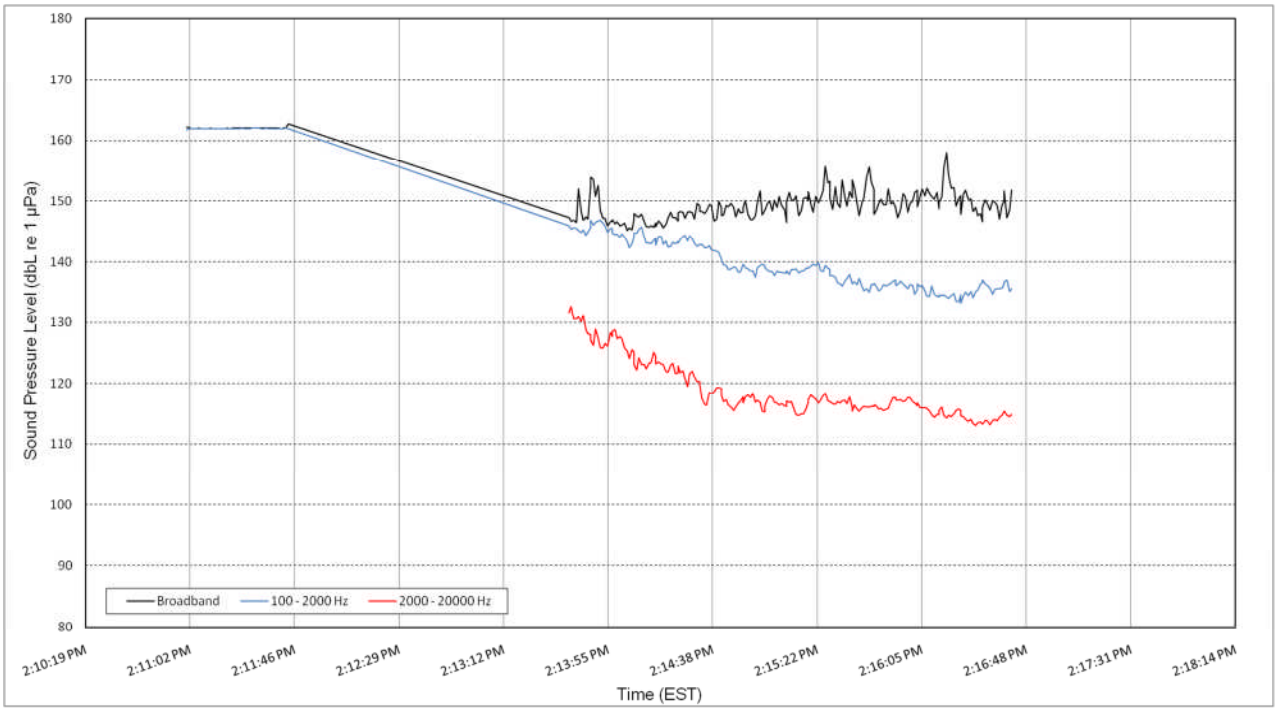


Figure A-8 Pipe-lay: Distance Range of 100 to 300 meters
June 27, 2007



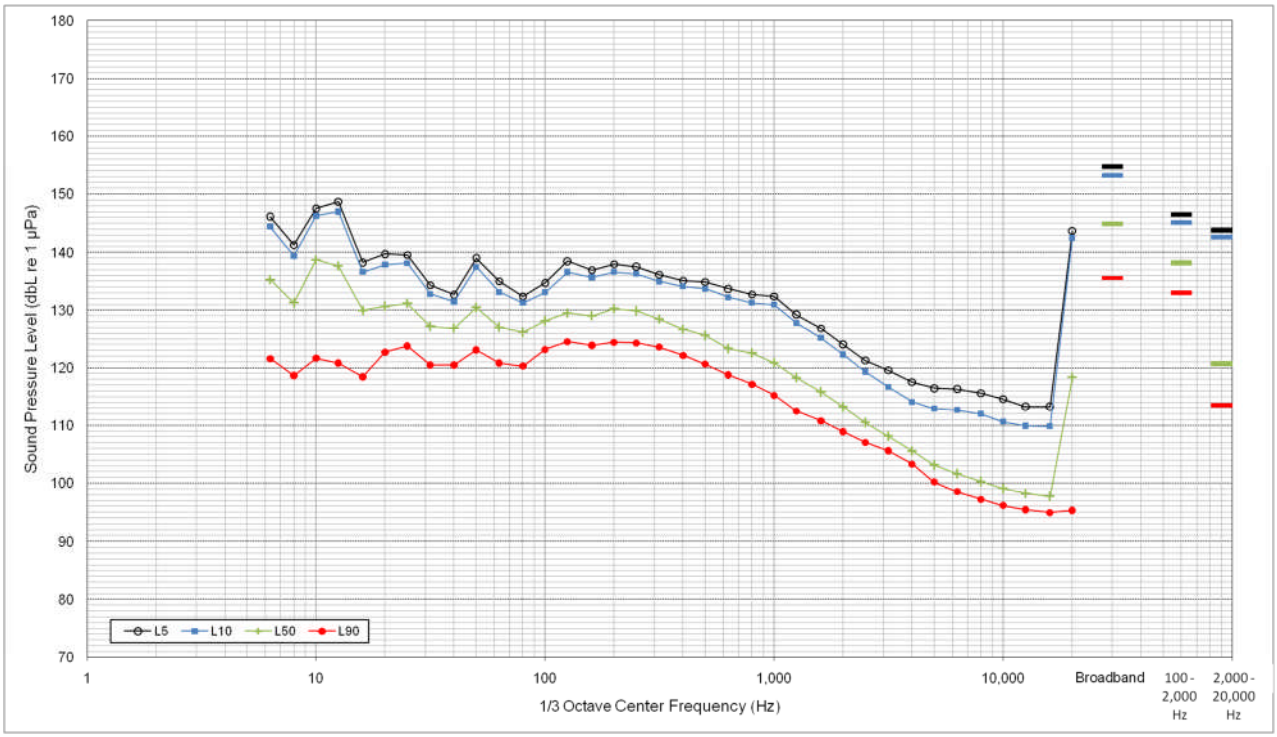
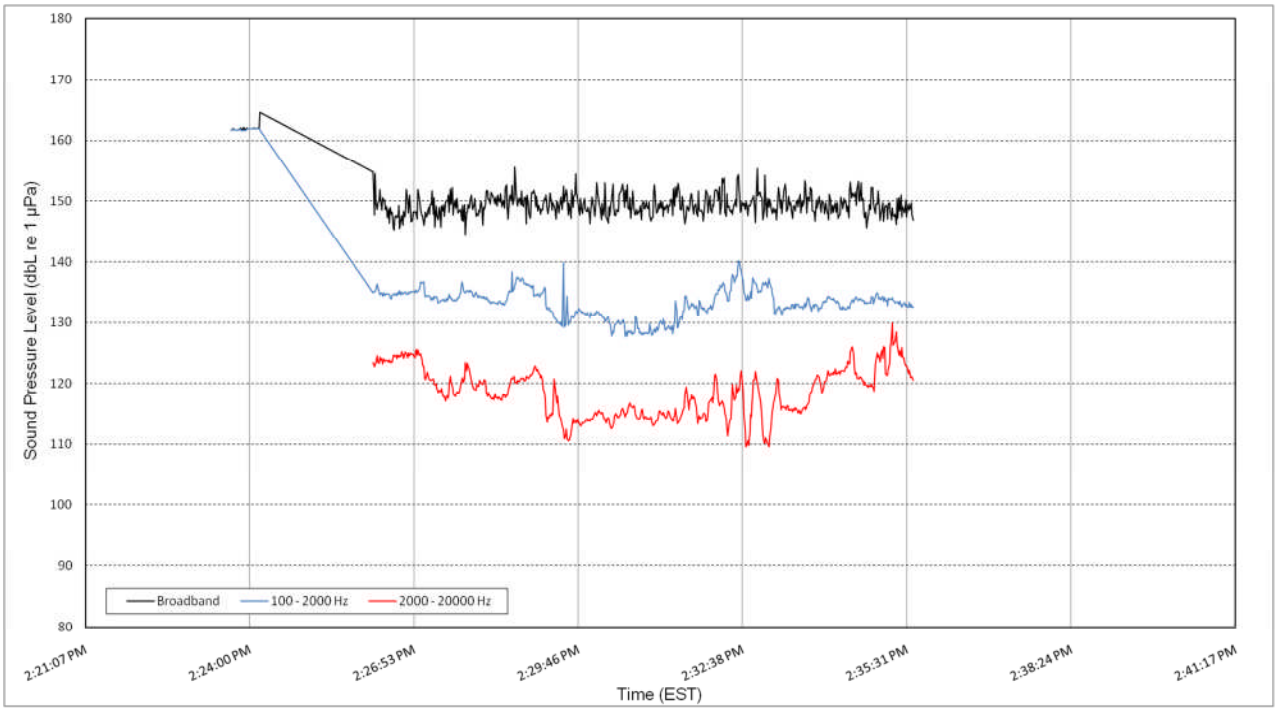
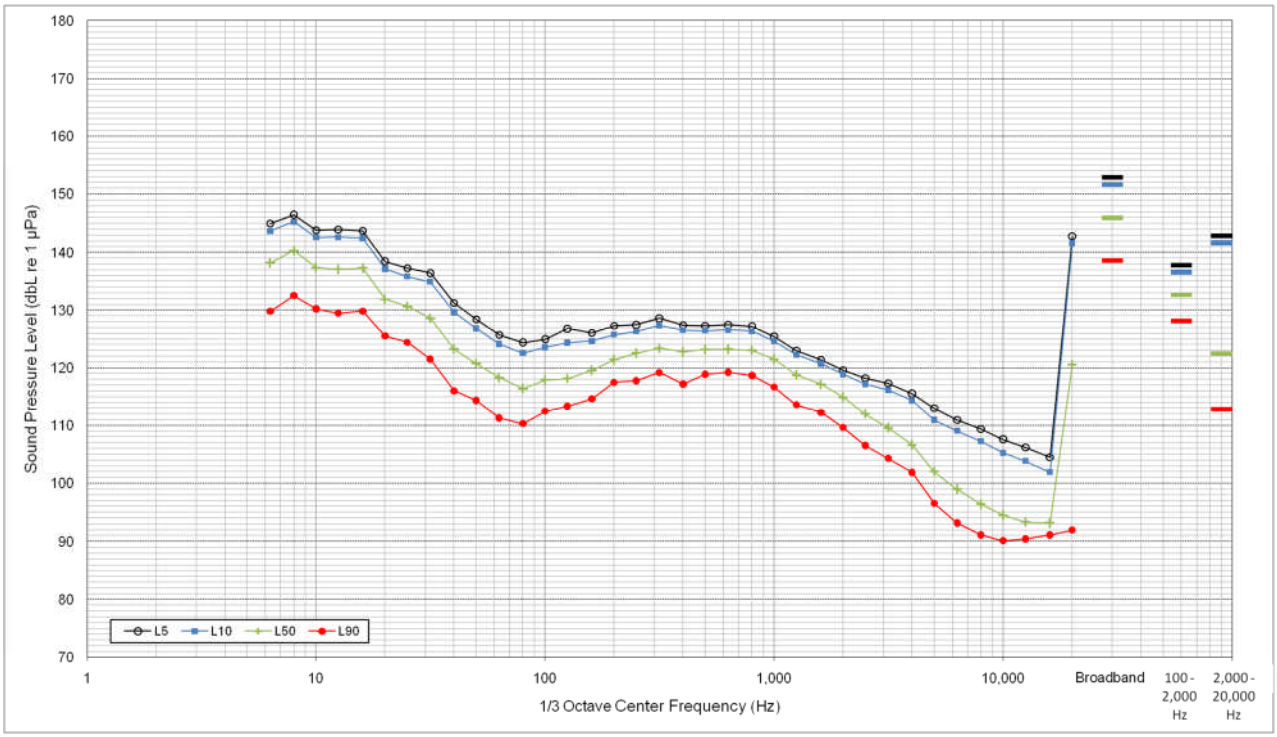


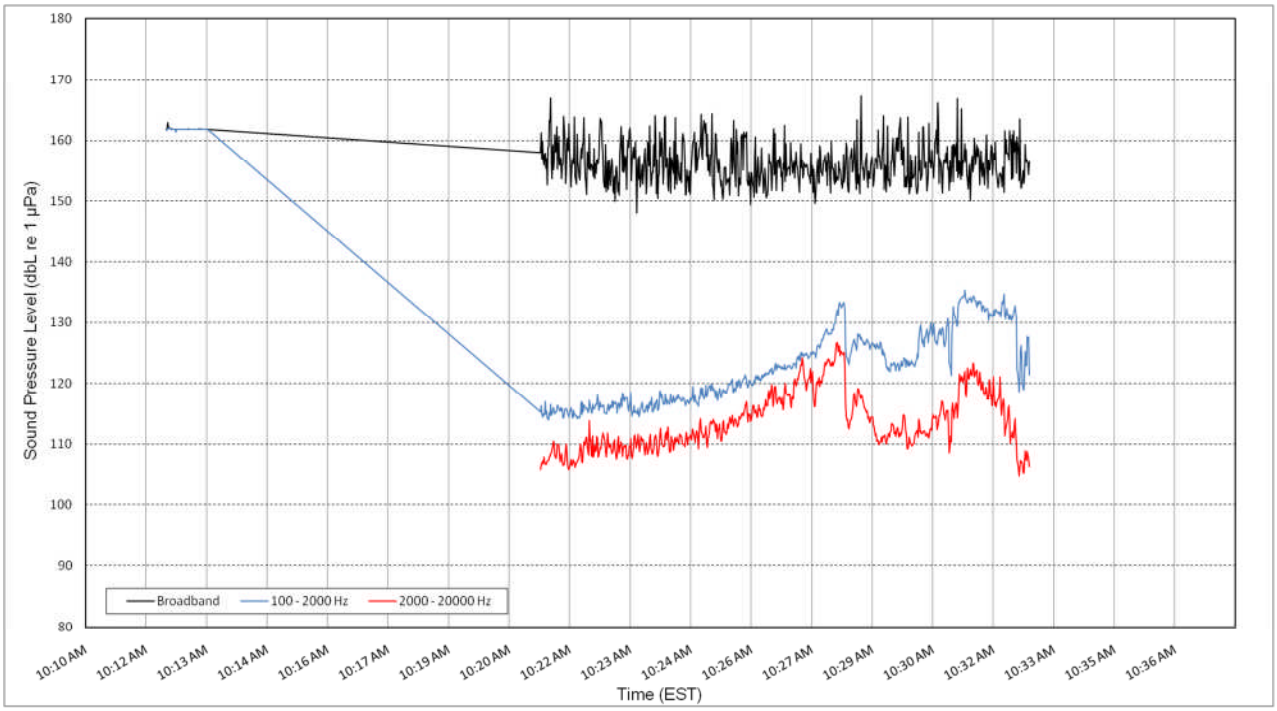
Figure A-9 Pipe-lay: Distance Range of at 500 to 600 meters
June 27, 2007





Appendix B
Hydroacoustic Survey during Construction
August 1, 2007

Figure B-1 Plow: Distance Range of 330 to 600 Meters
August 1, 2007



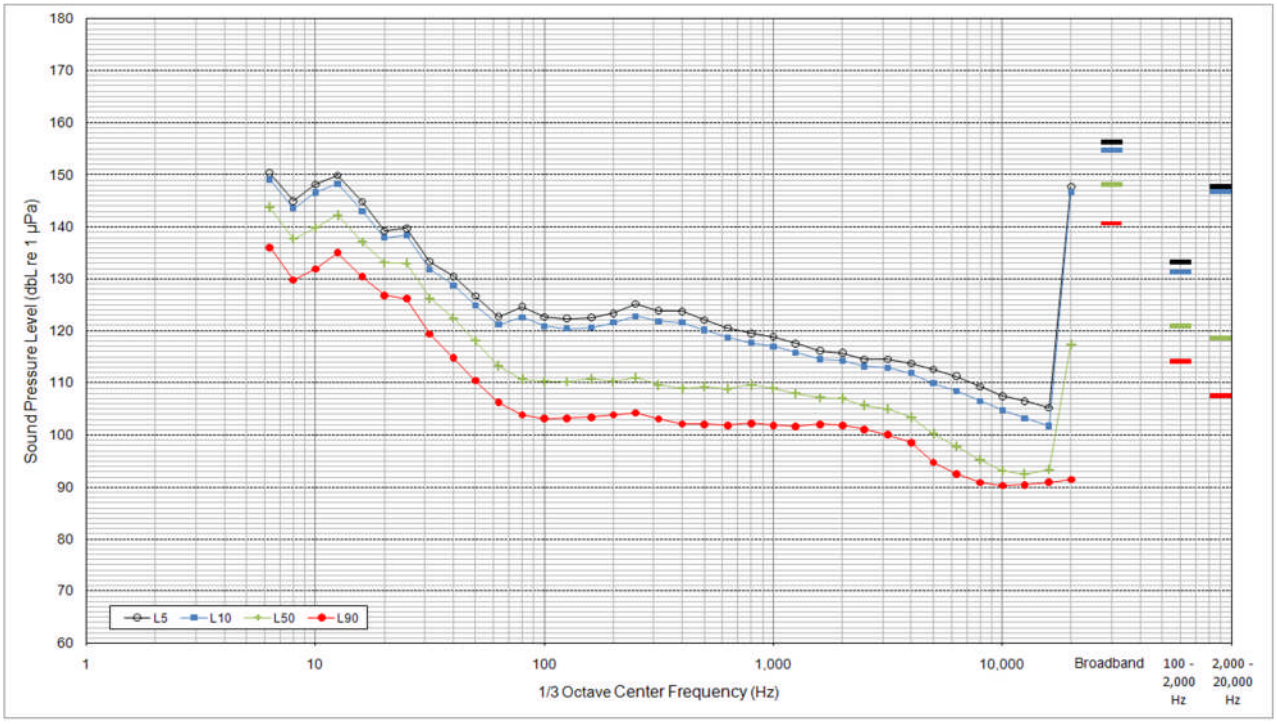
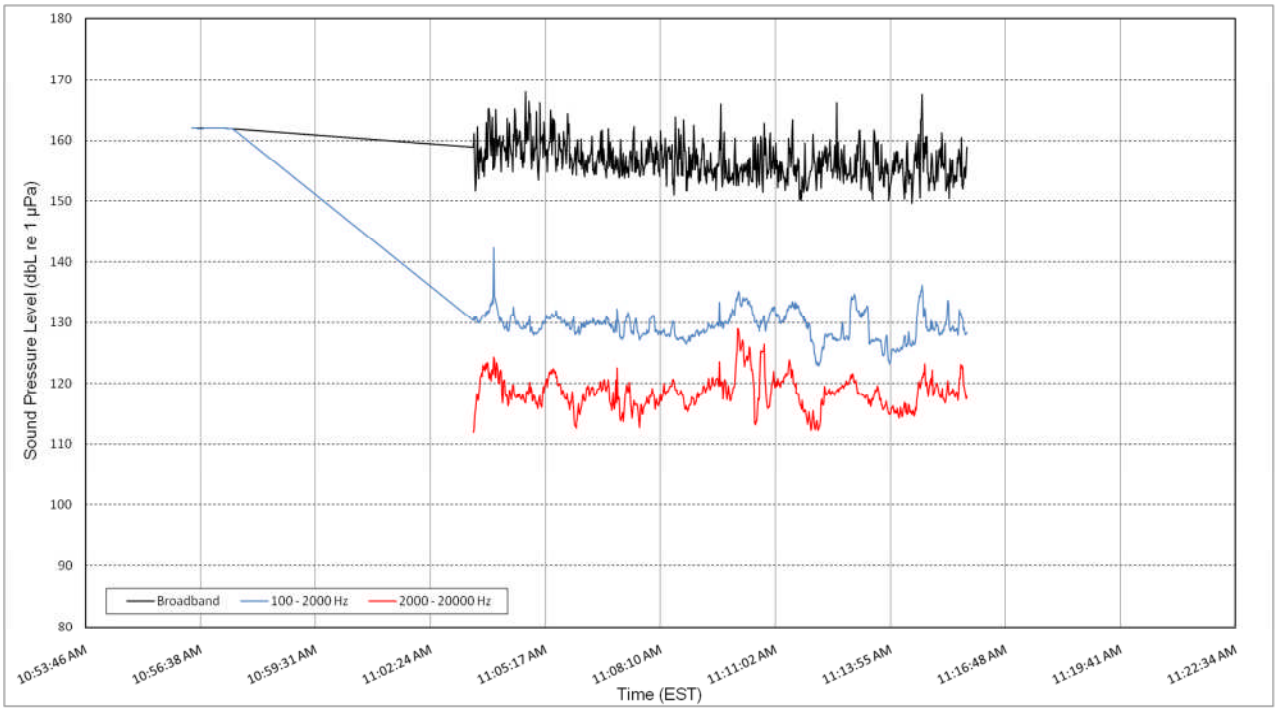


Figure B-2 Plow: Distance Range of 240 to 430 Meters
August 1, 2007



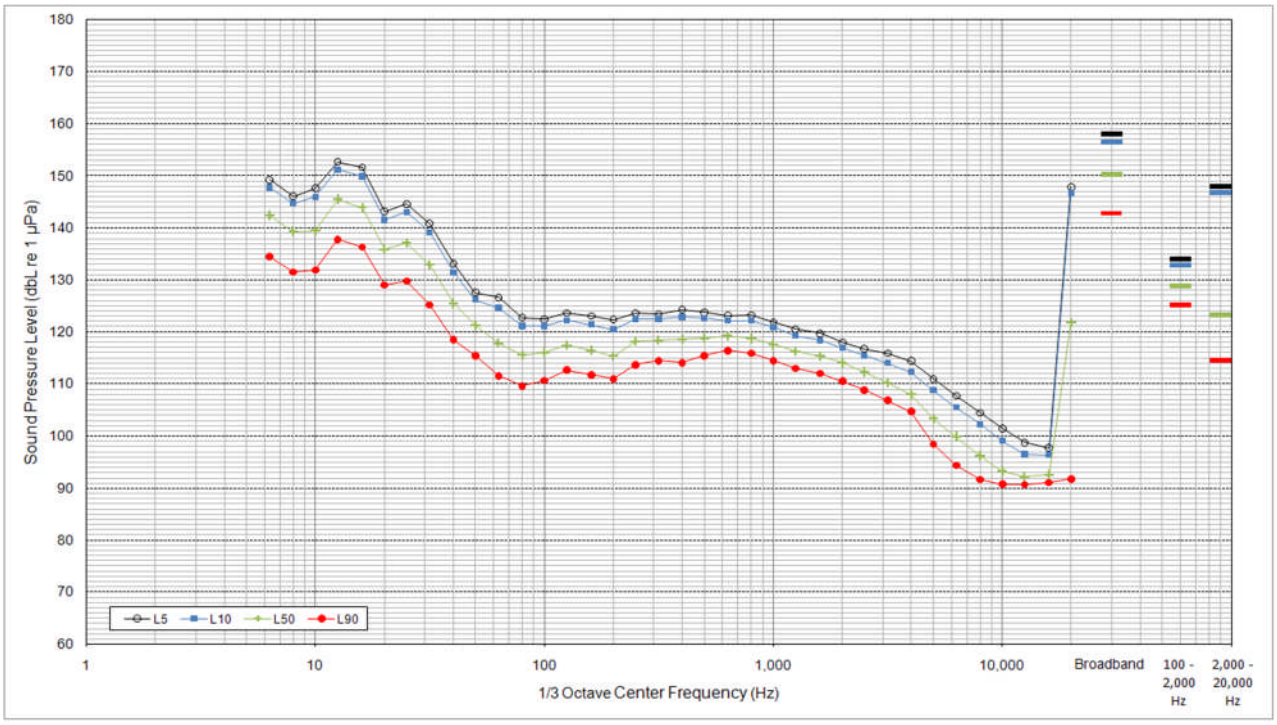
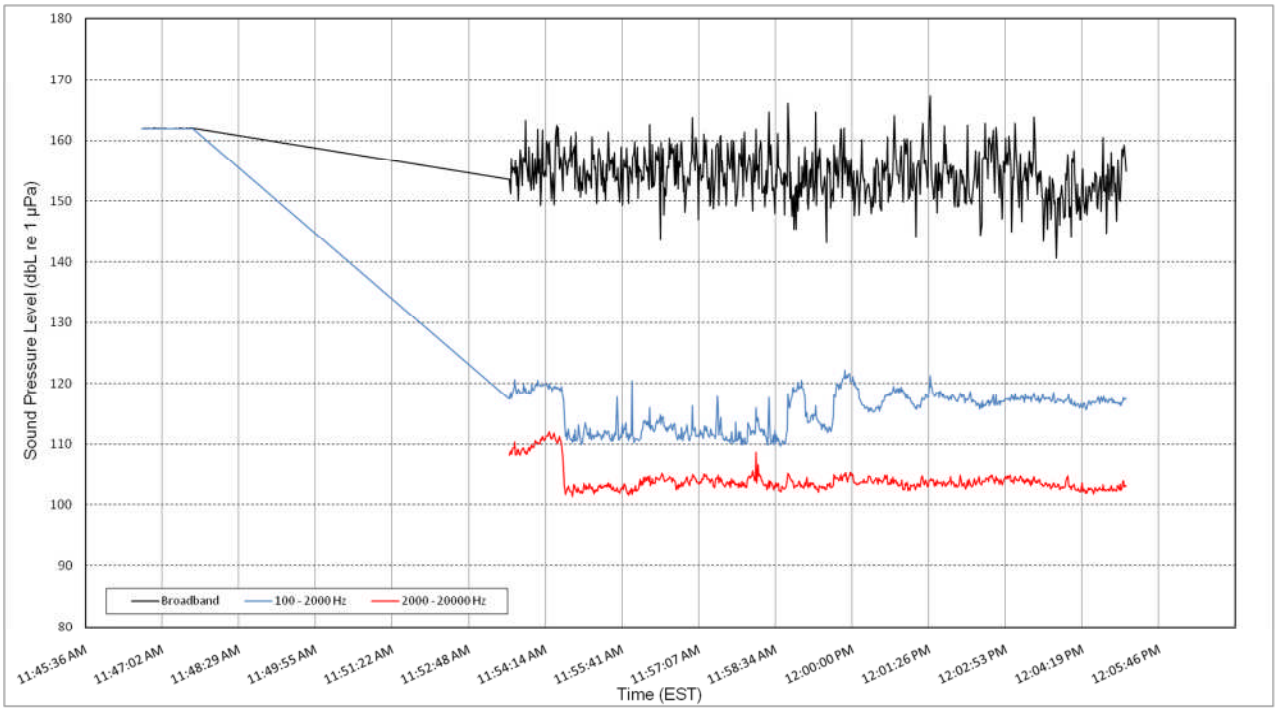


Figure B-3 Background at AB-2
August 1, 2007



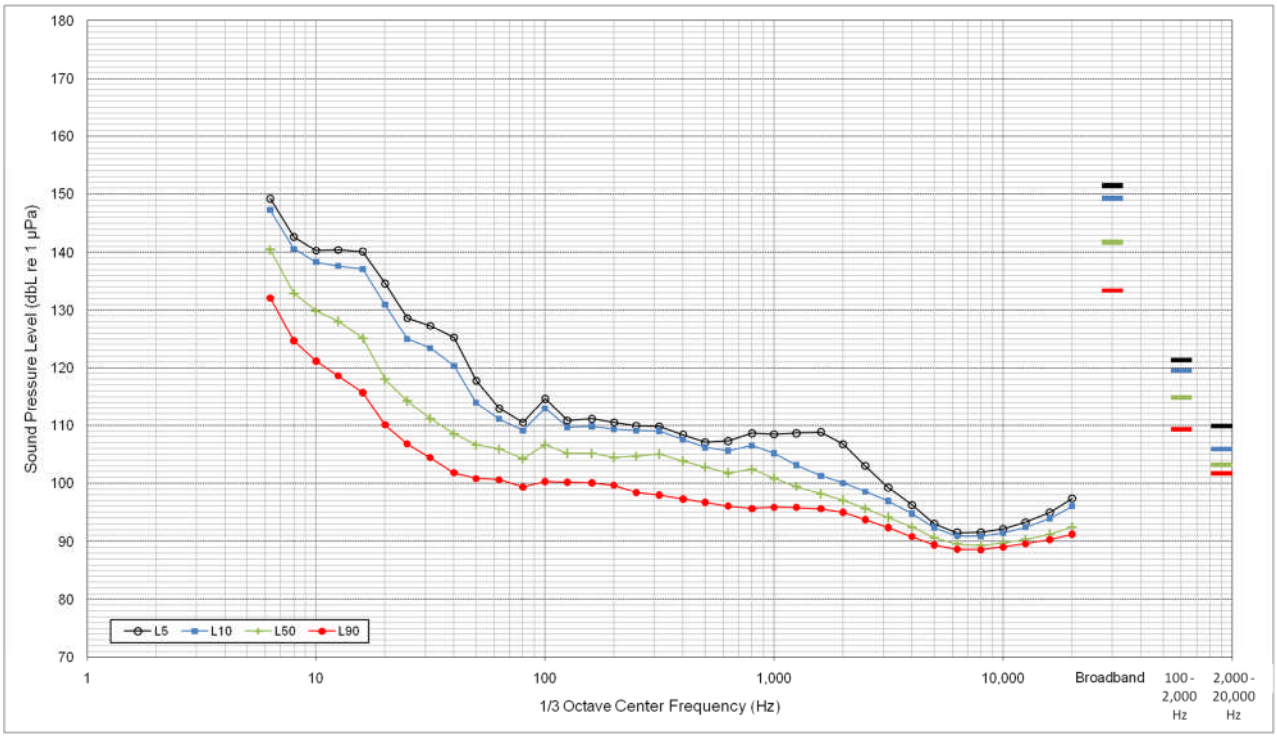
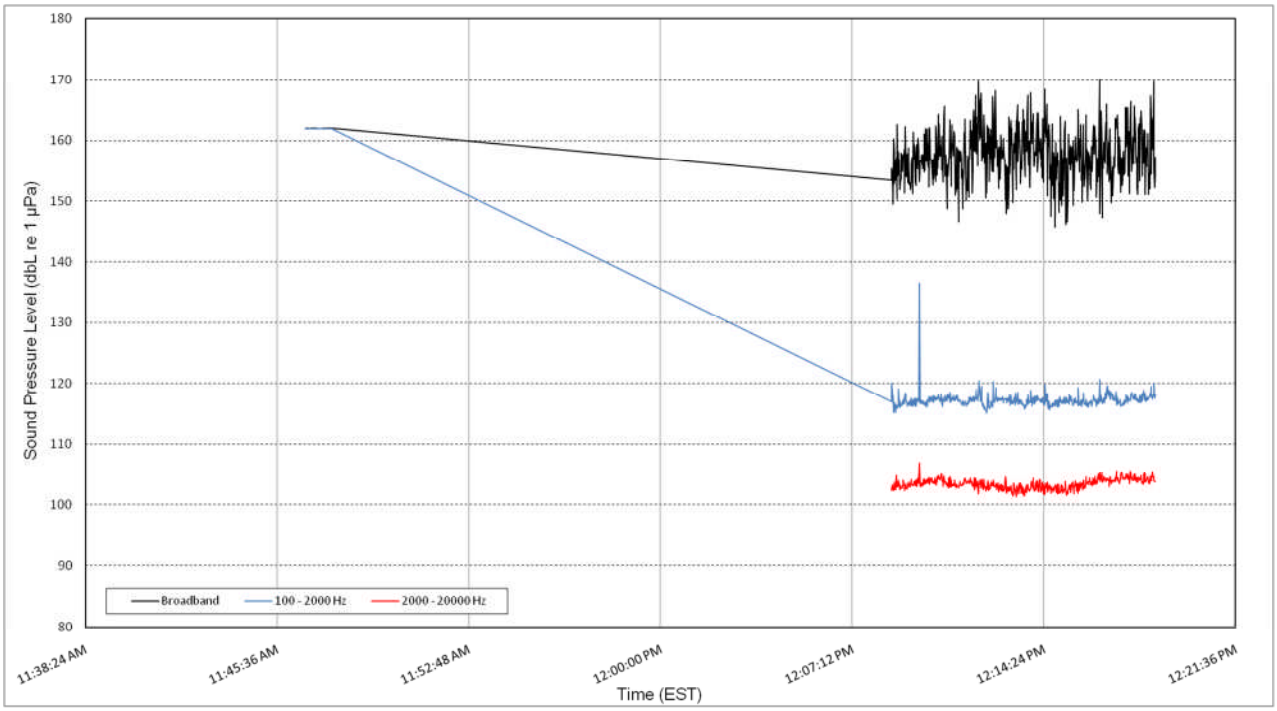


Figure B-4 Background at AB-2
August 1, 2007



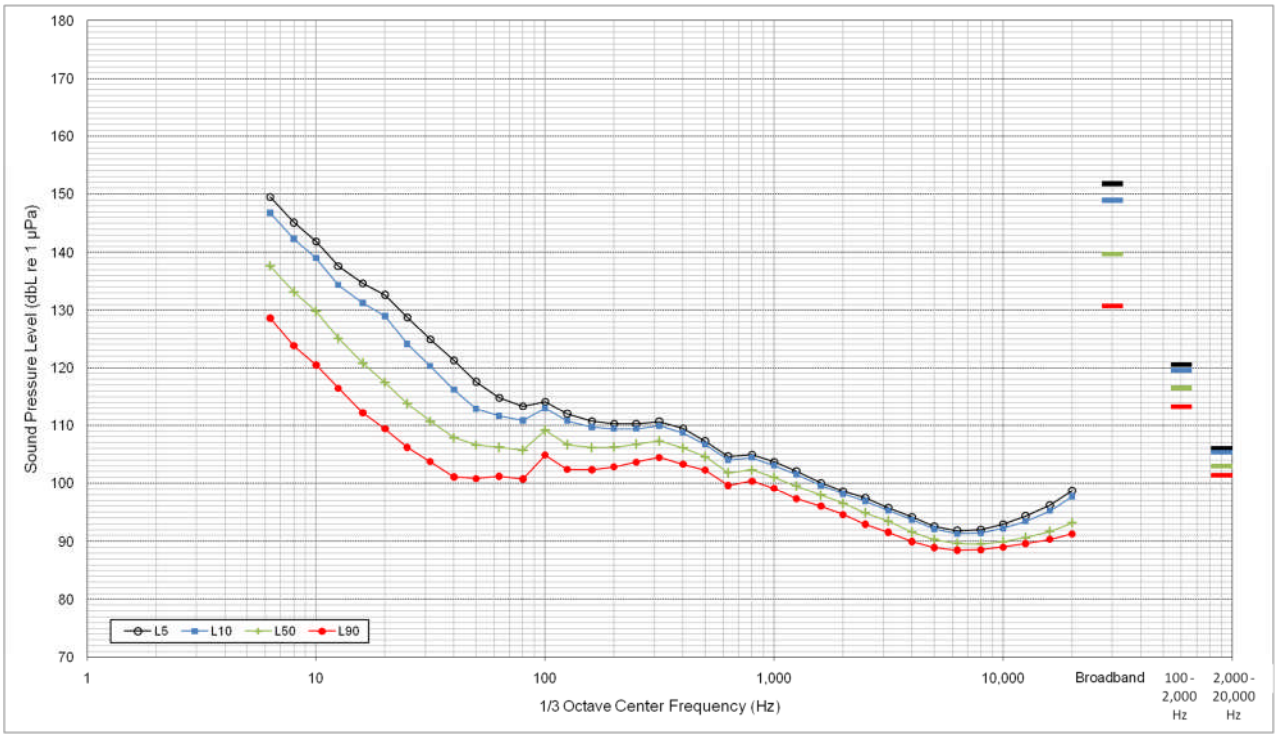
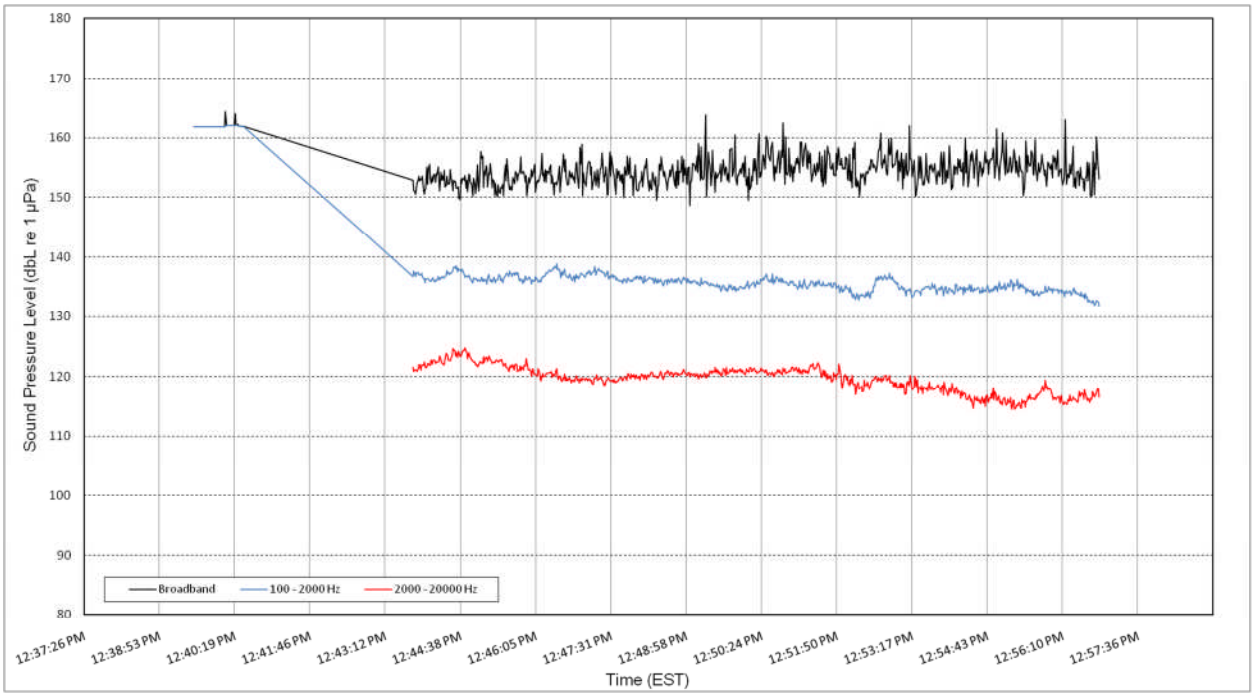


Figure B-5 Plow: Distance Range of 440 to 550 Meters
August 1, 2007



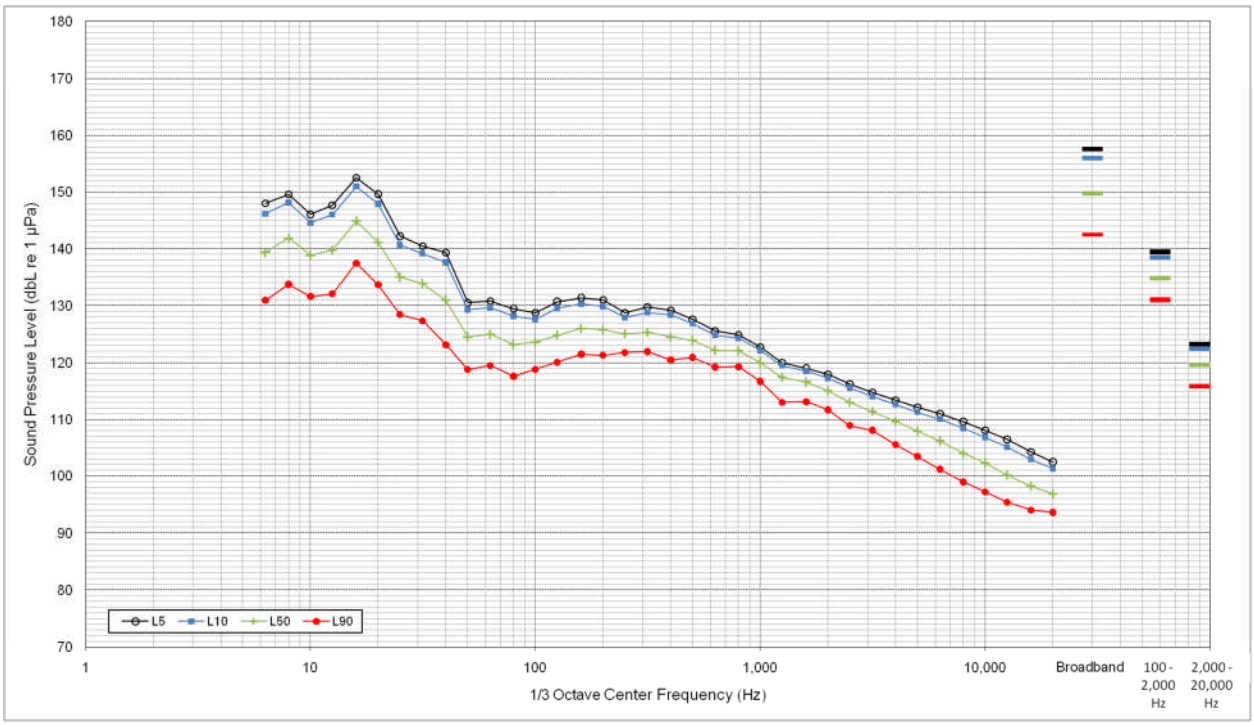
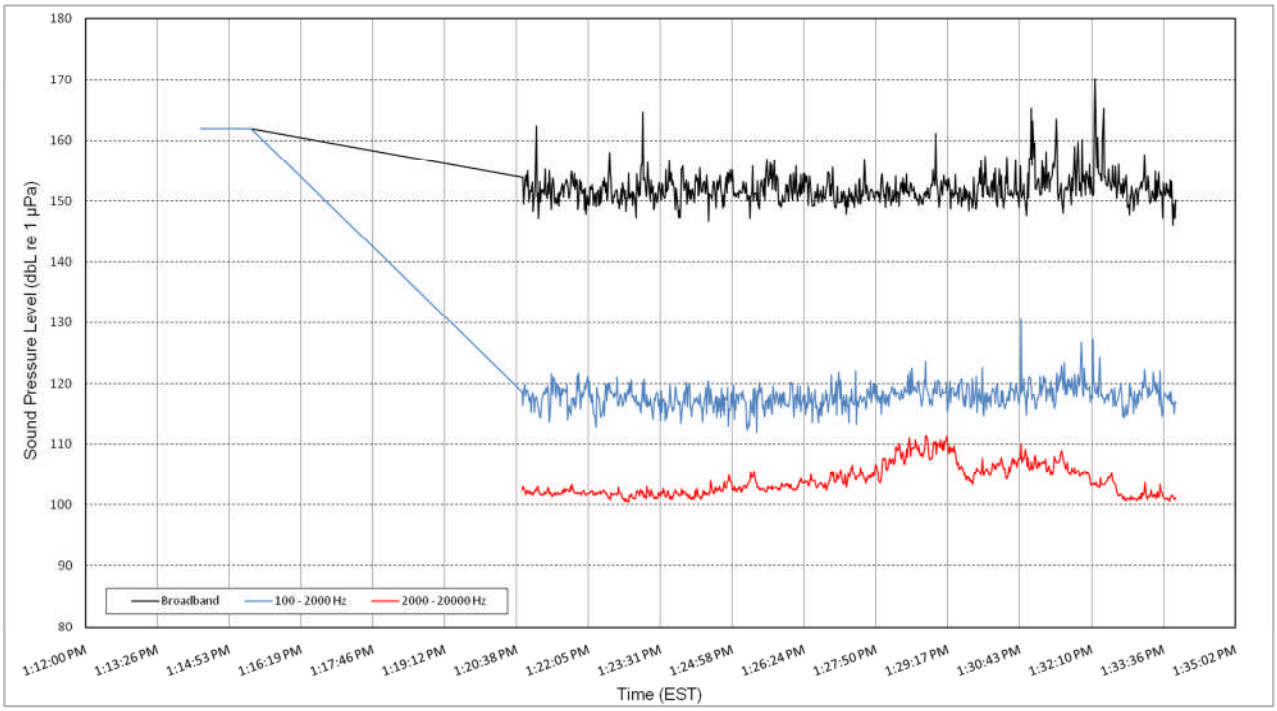
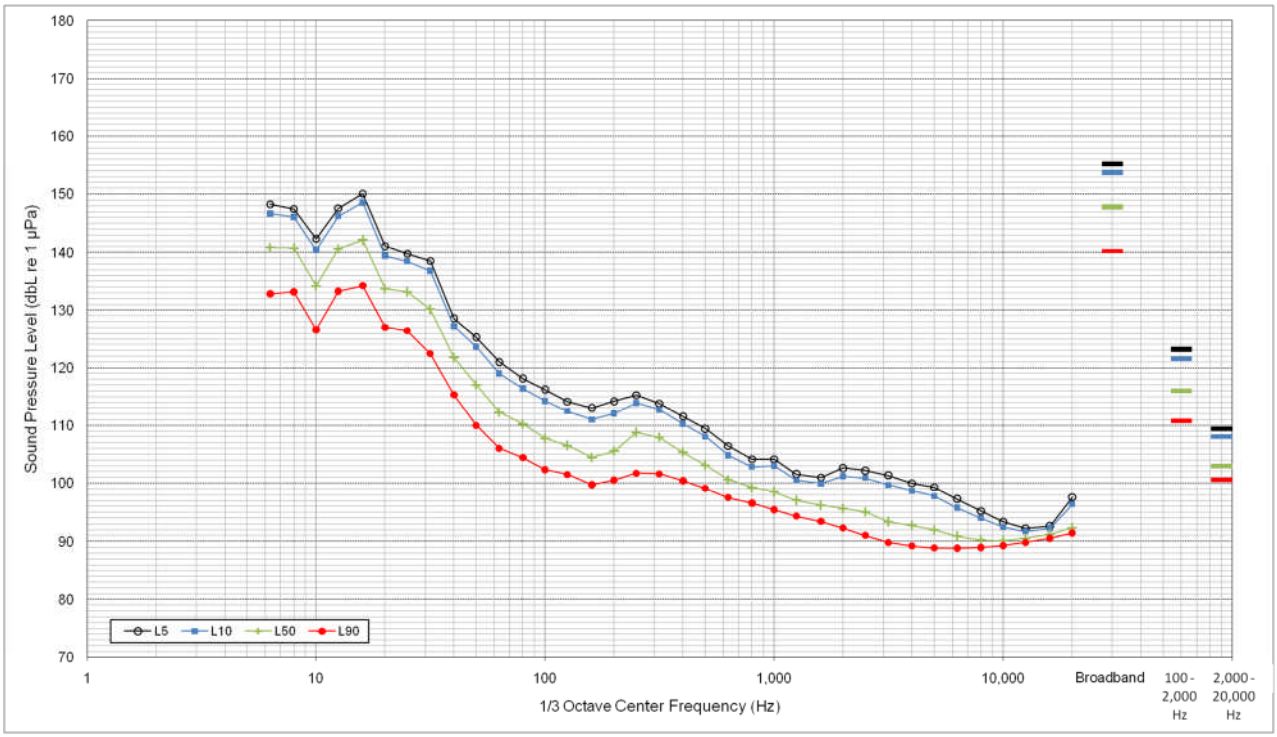


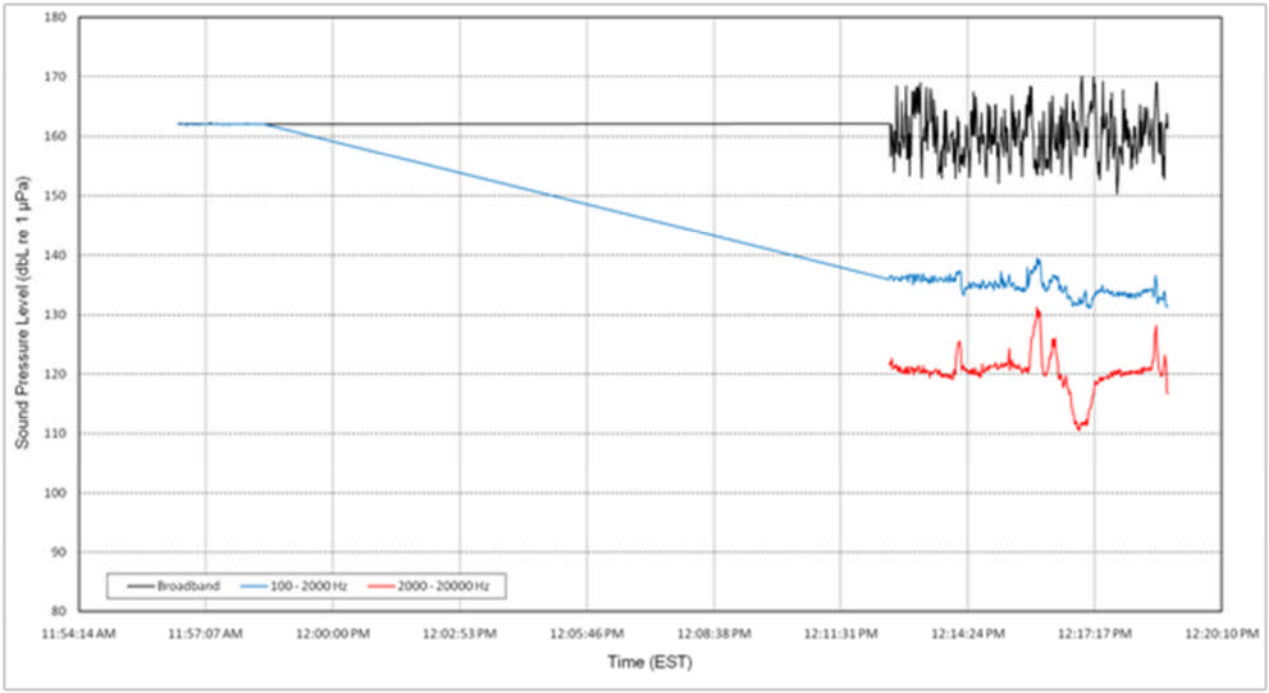
Figure B-6 Ambient Measurement
August 1, 2007





Appendix C
Hydroacoustic Survey during Construction
August 29, 2007

Figure C-1 Backfilling: Distance Range of 1320 to 1410 Meters
August 29, 2007



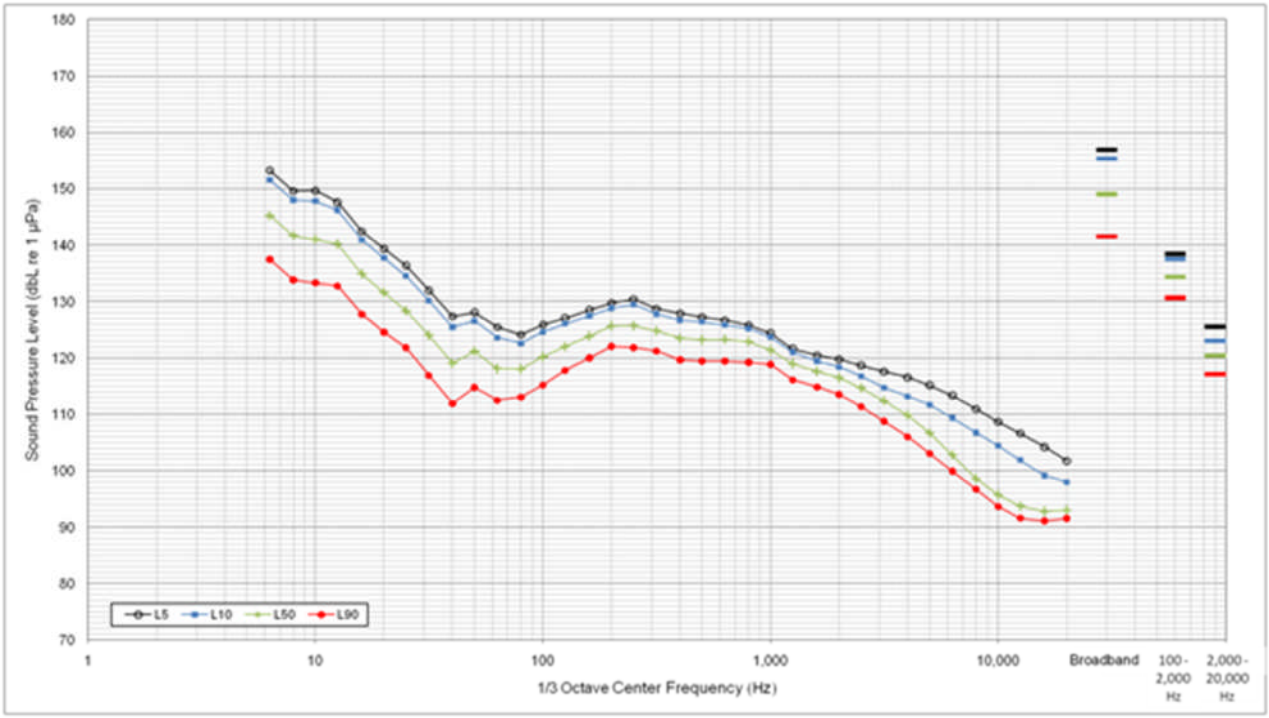
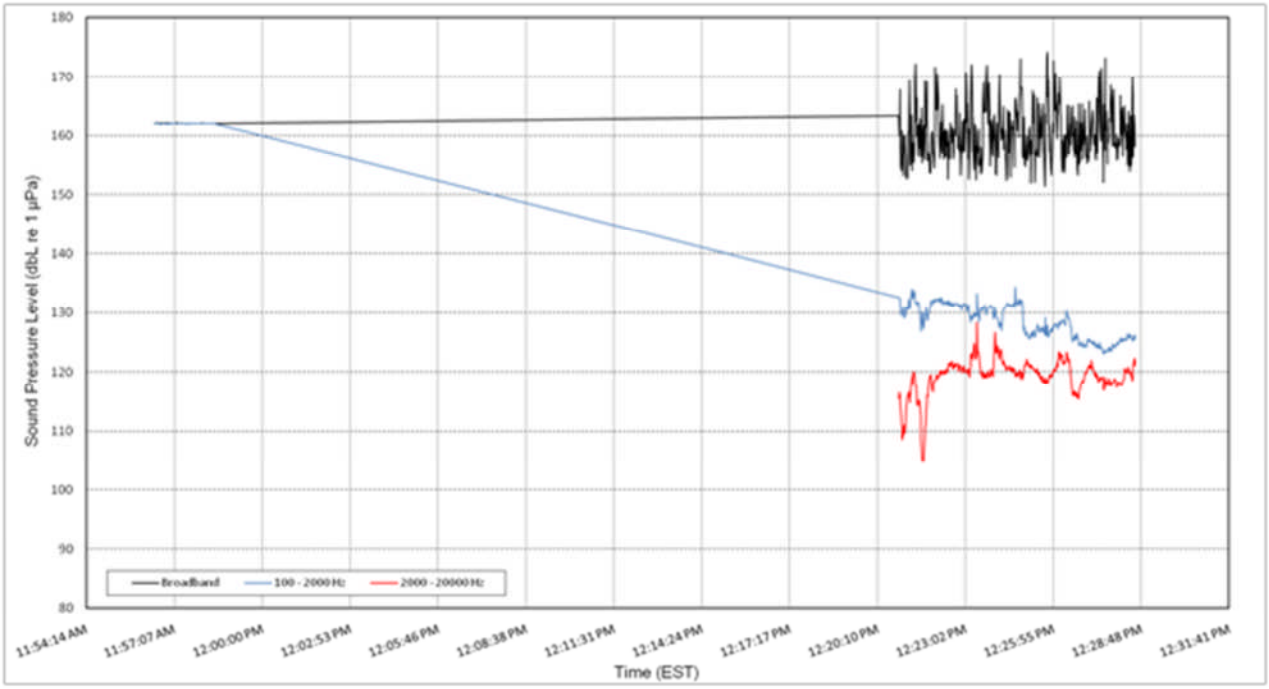


Figure C-2 Backfilling: Distance Range of 1420 to 1550 Meters
August 29, 2007



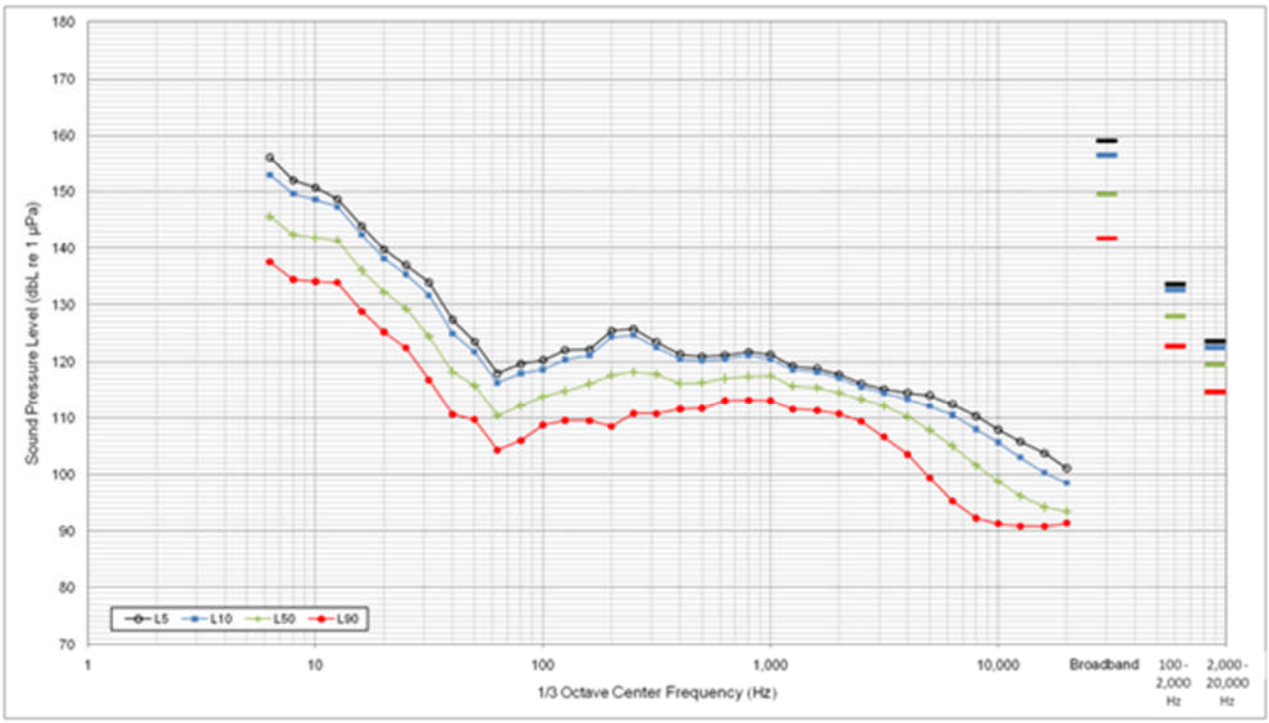
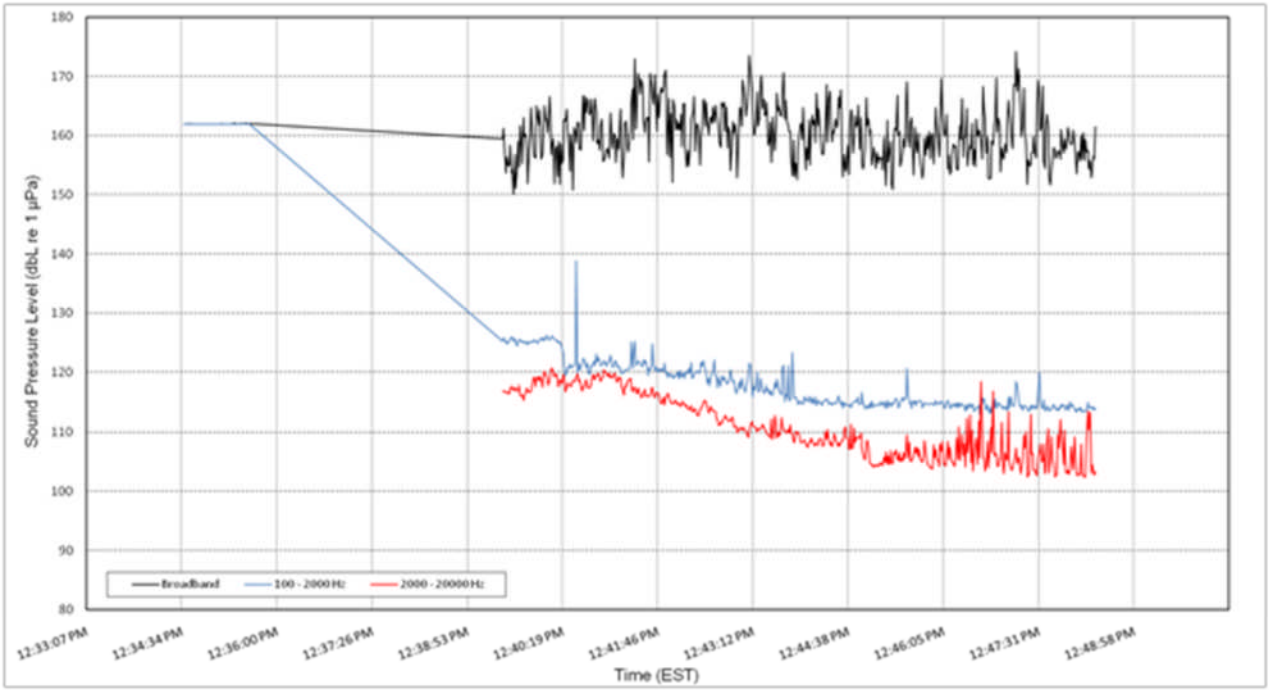


Figure C-3 Backfilling: Distance Range of 1330 to 1690 Meters
August 29, 2007



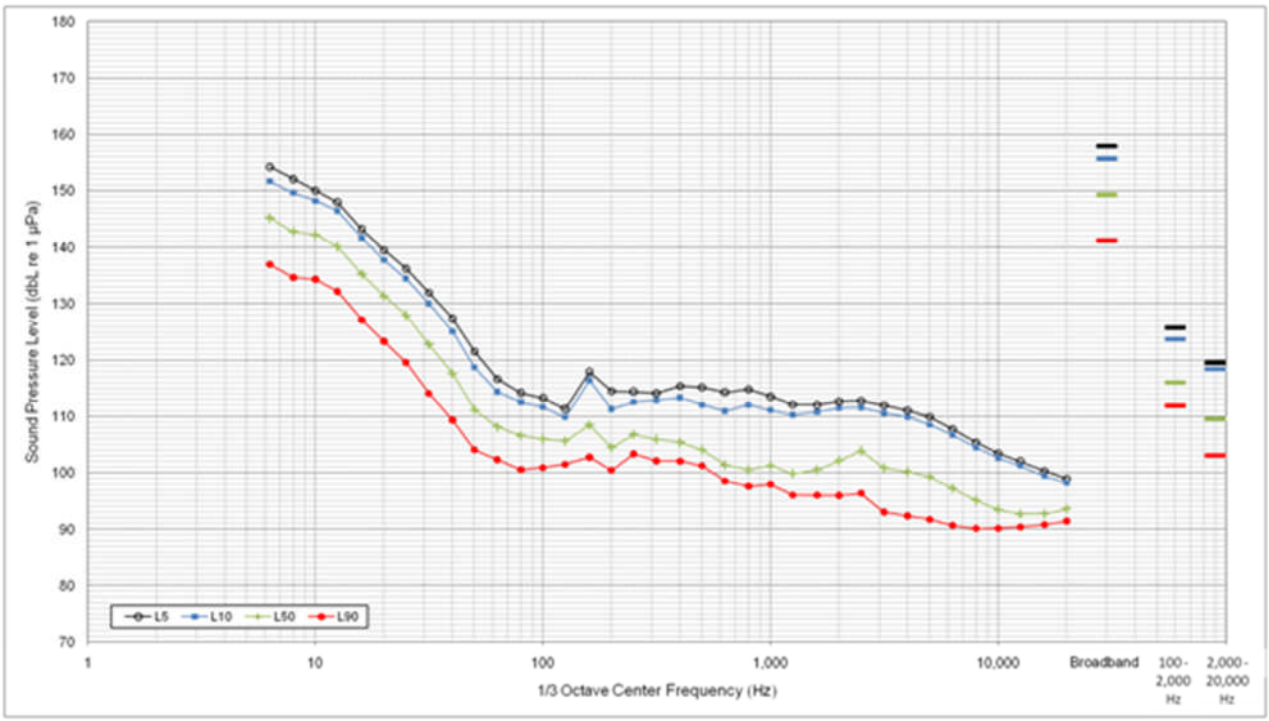
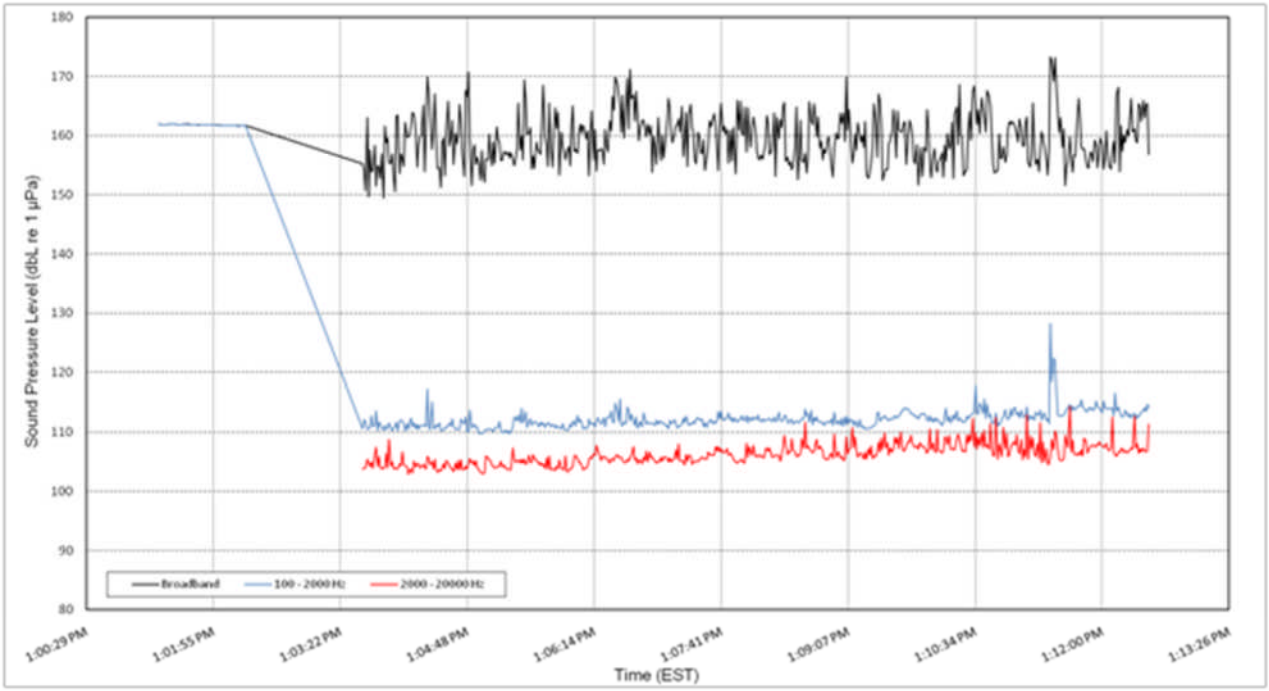


Figure C-4 Backfiling: Distance Range of 990 to 1140 Meters
August 29, 2007



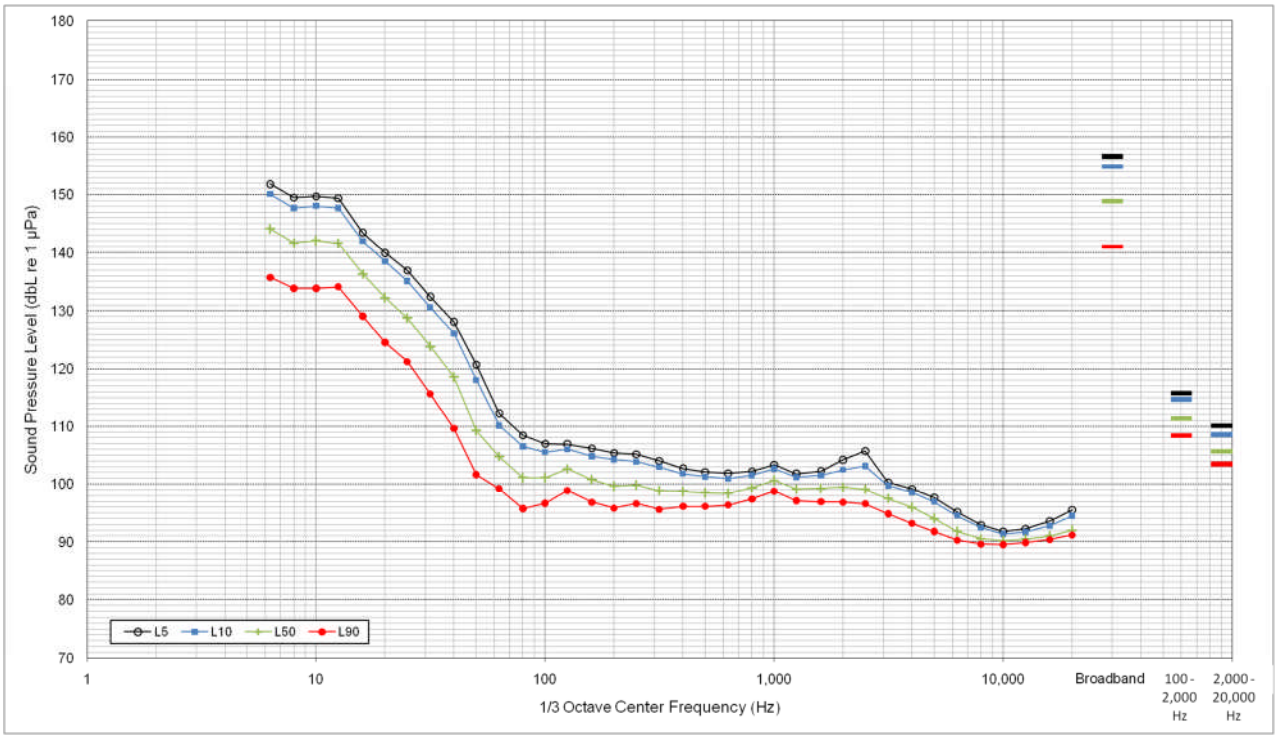
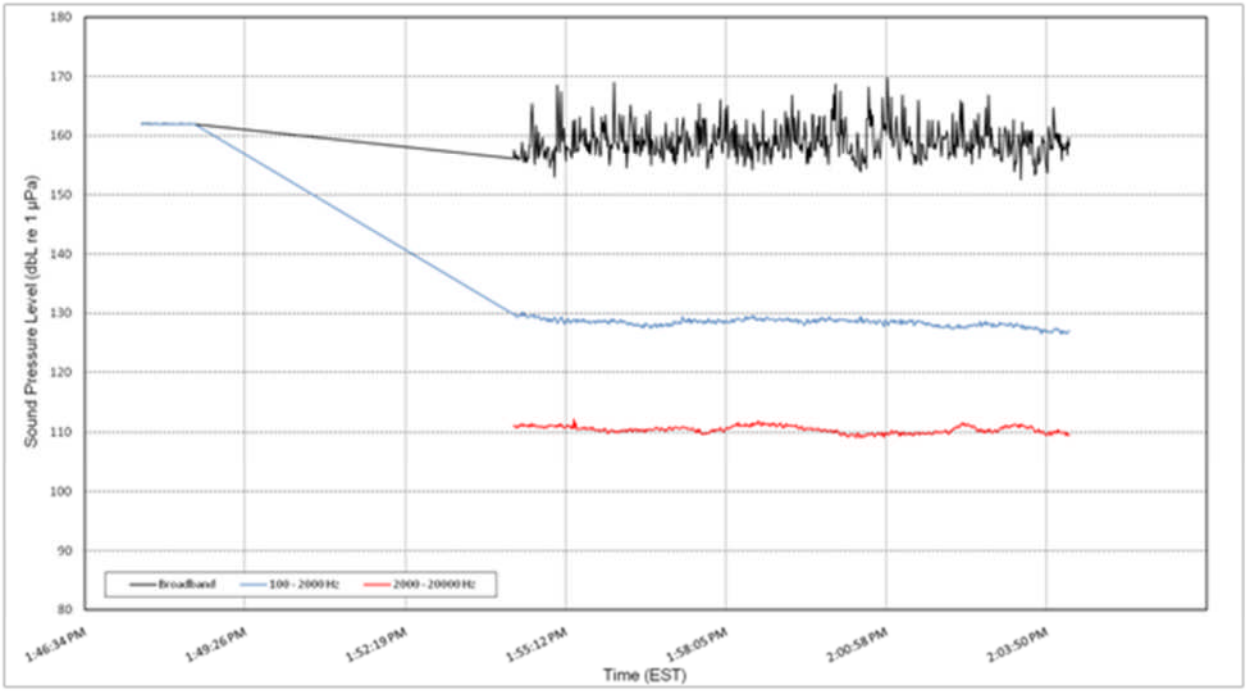


Figure C-5 Backfilling: Distance Range of 1100 to 1410 Meters
August 29, 2007



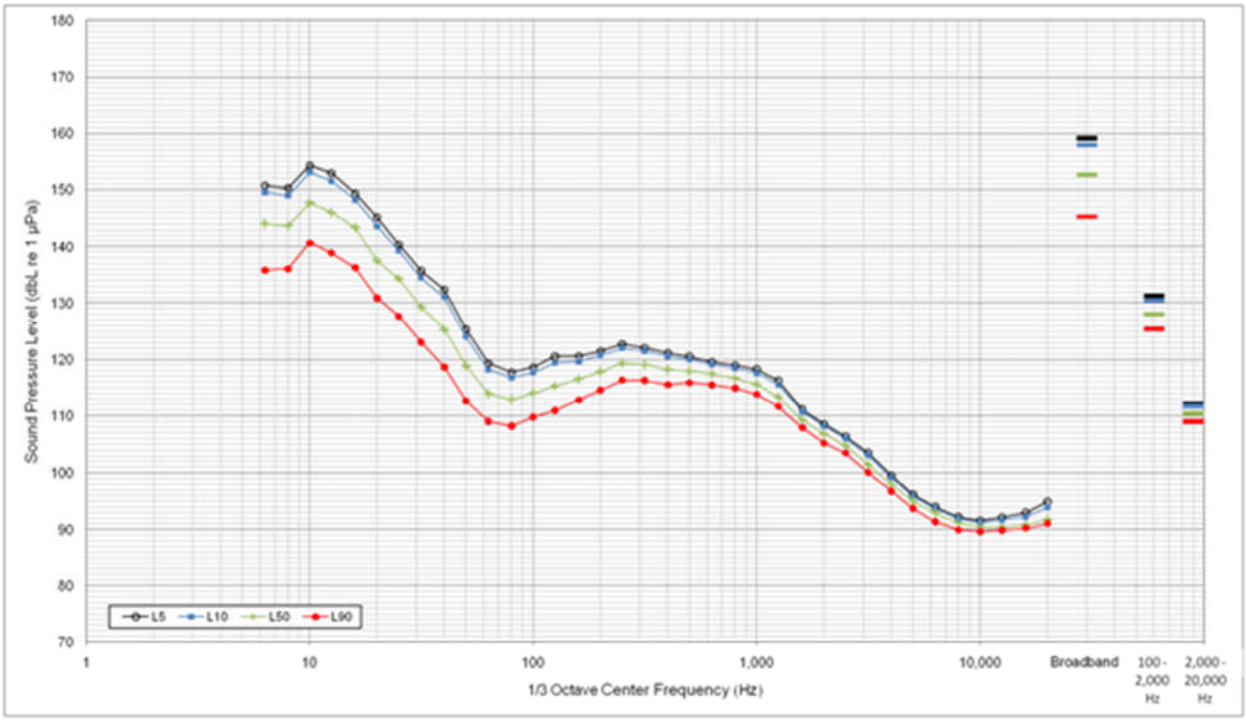
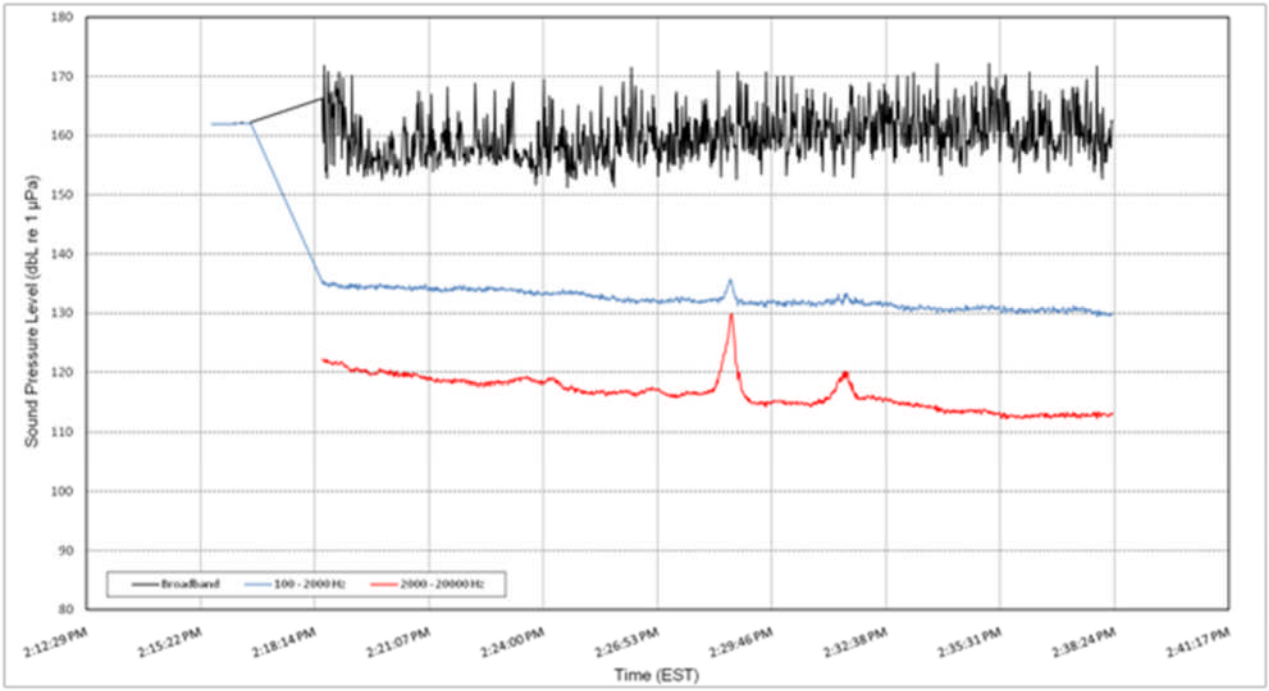


Figure C-6 Backfilling: Distance Range of 610 to 1050 Meters
August 29, 2007



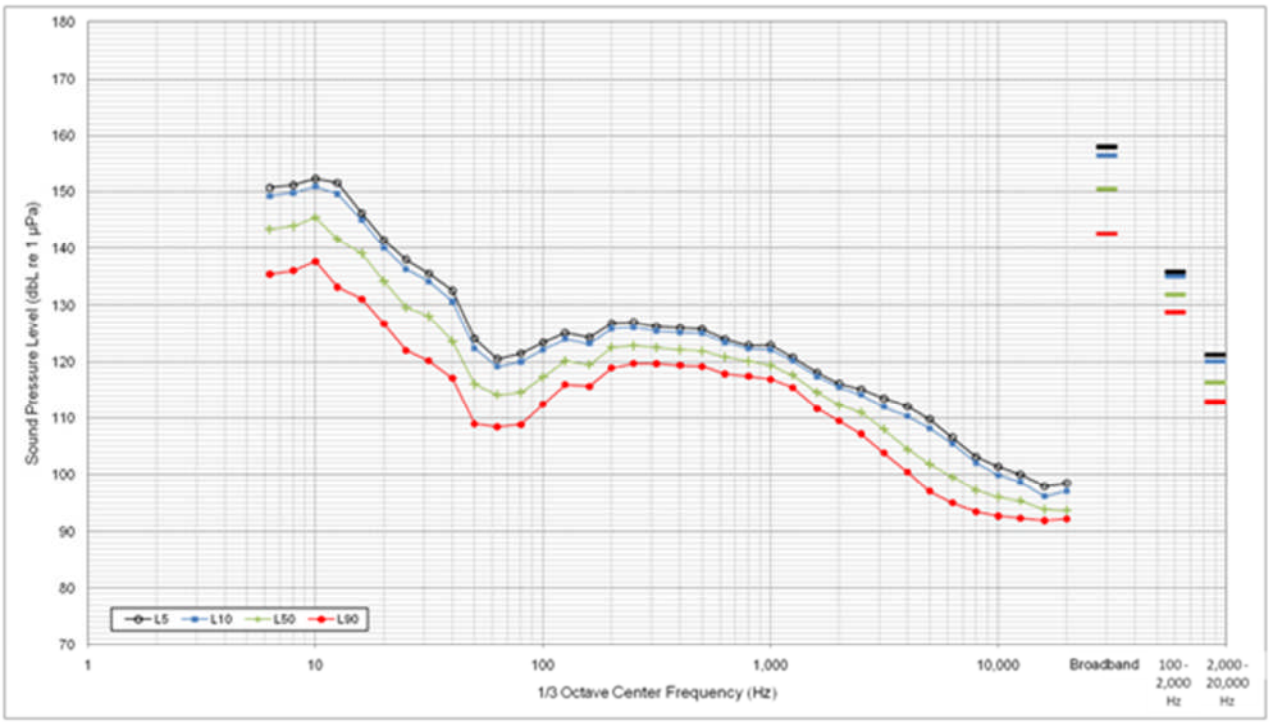
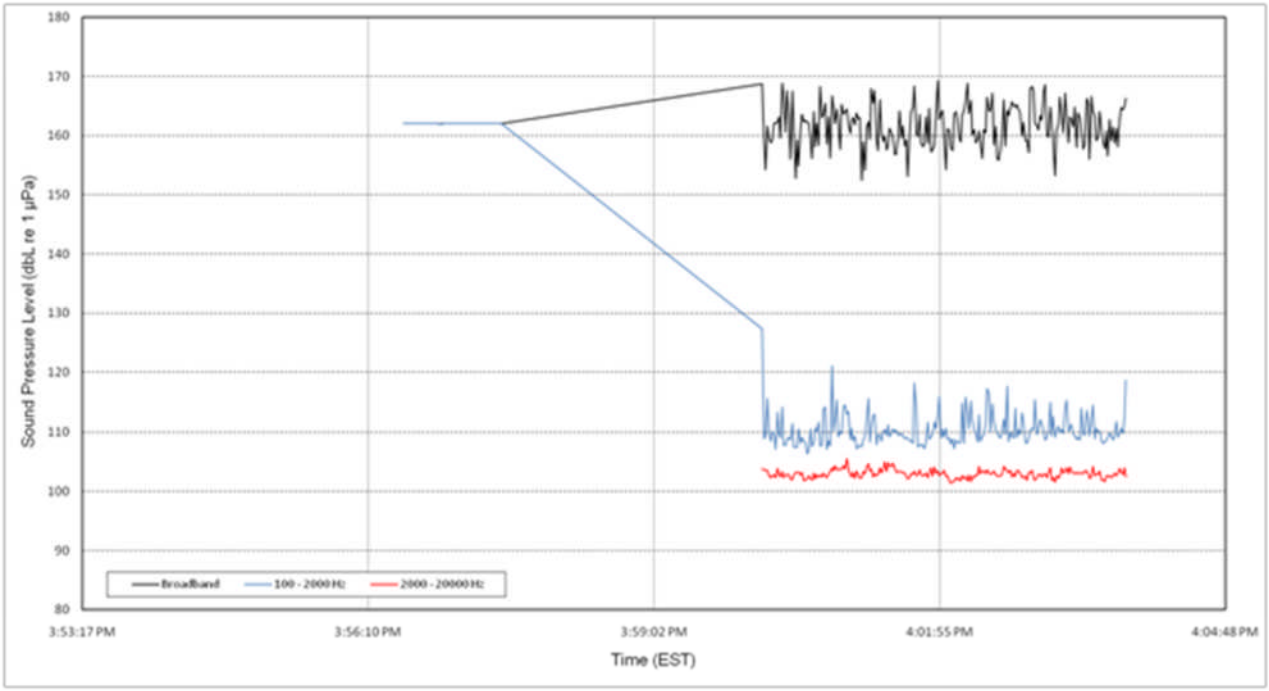


Figure C-7 Ambient Measurement
August 29, 2007



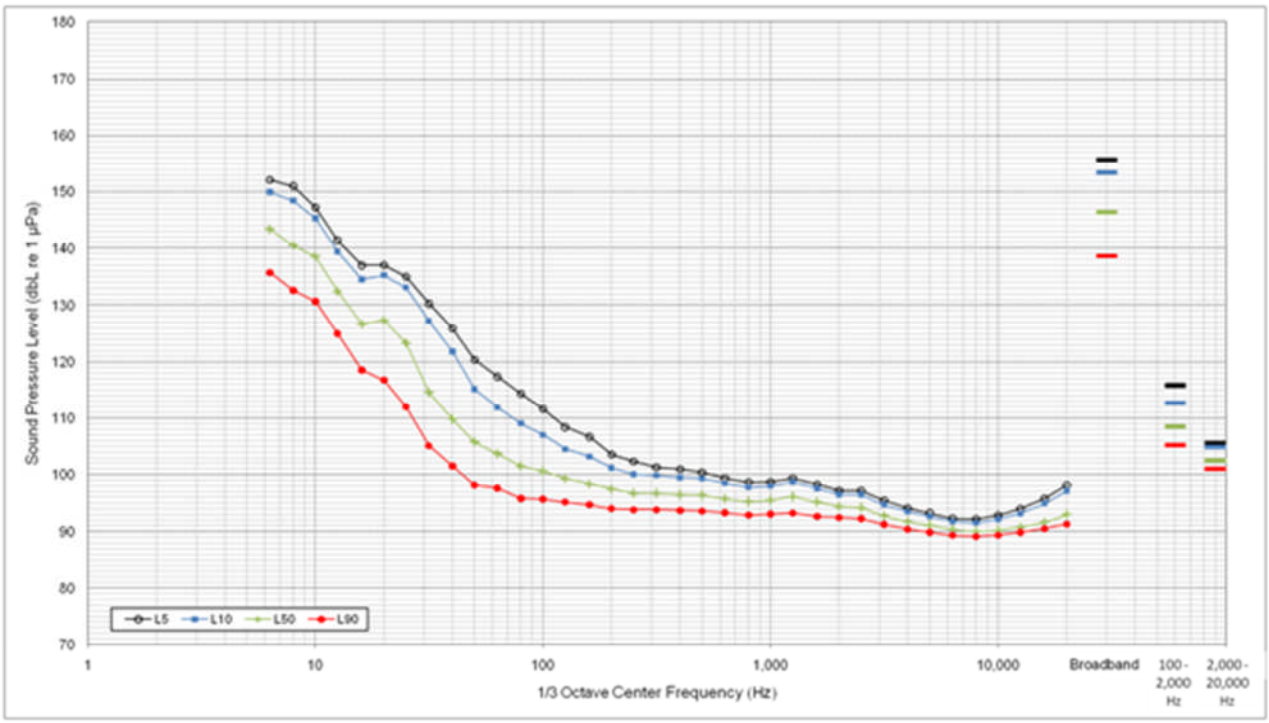
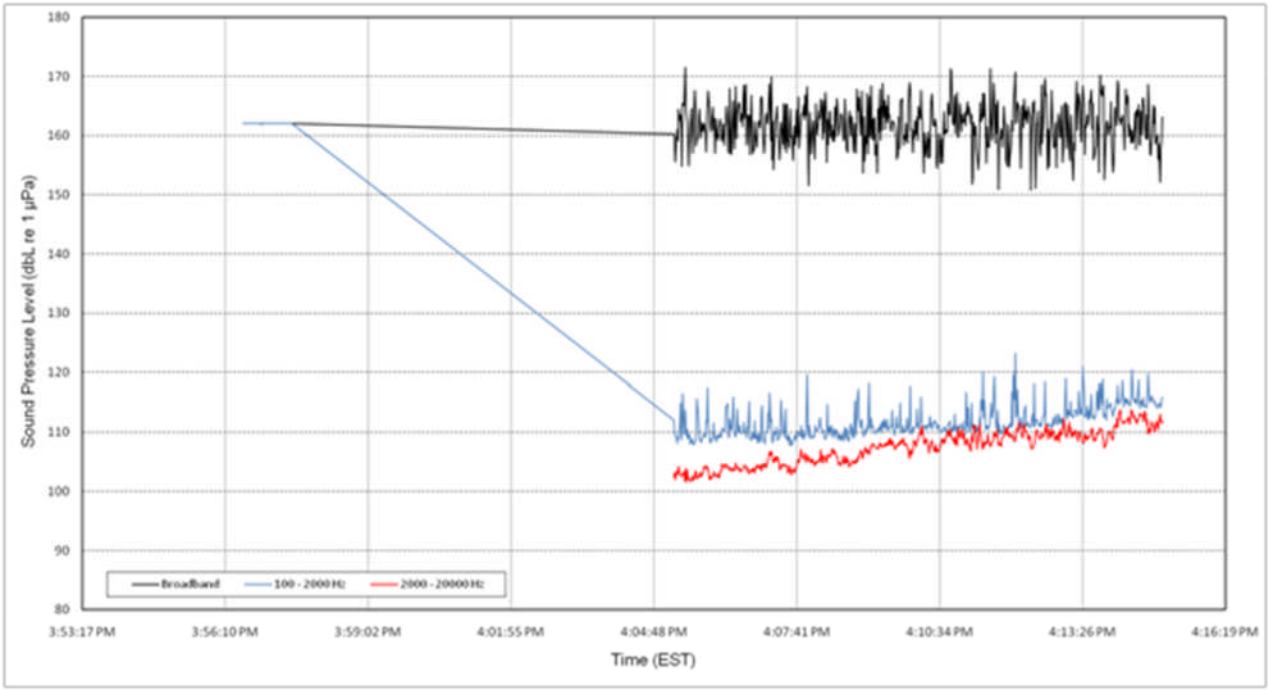
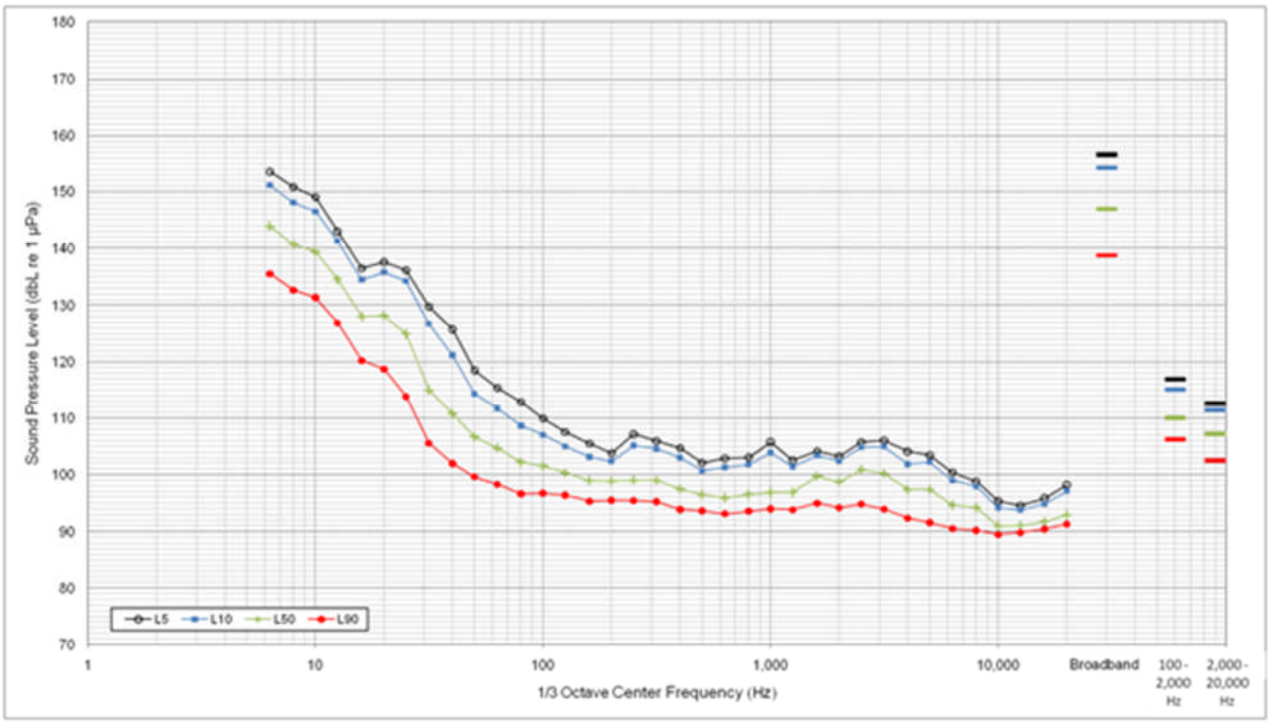


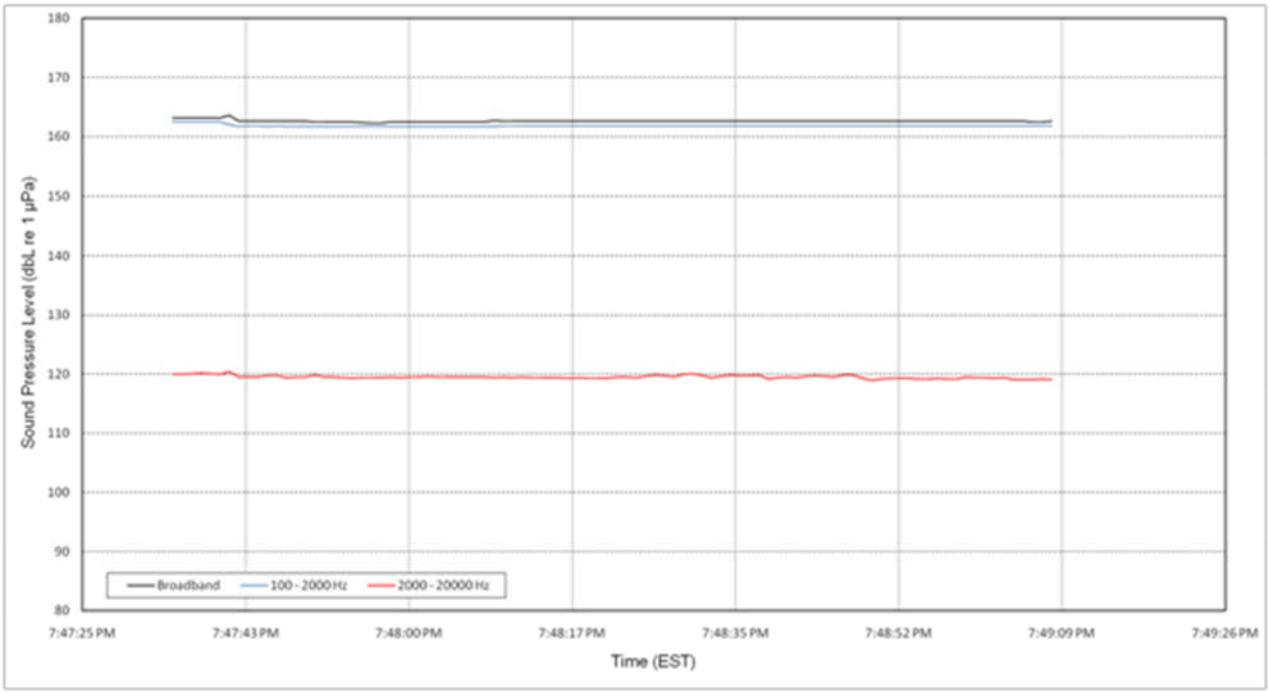
Figure C-8 Ambient Measurement
August 29, 2007





Appendix D
Hydroacoustic Survey during Gulf Gateway Operation
August 3-4, 2006

Figure D-1 Calibration Tone
August 3, 2006



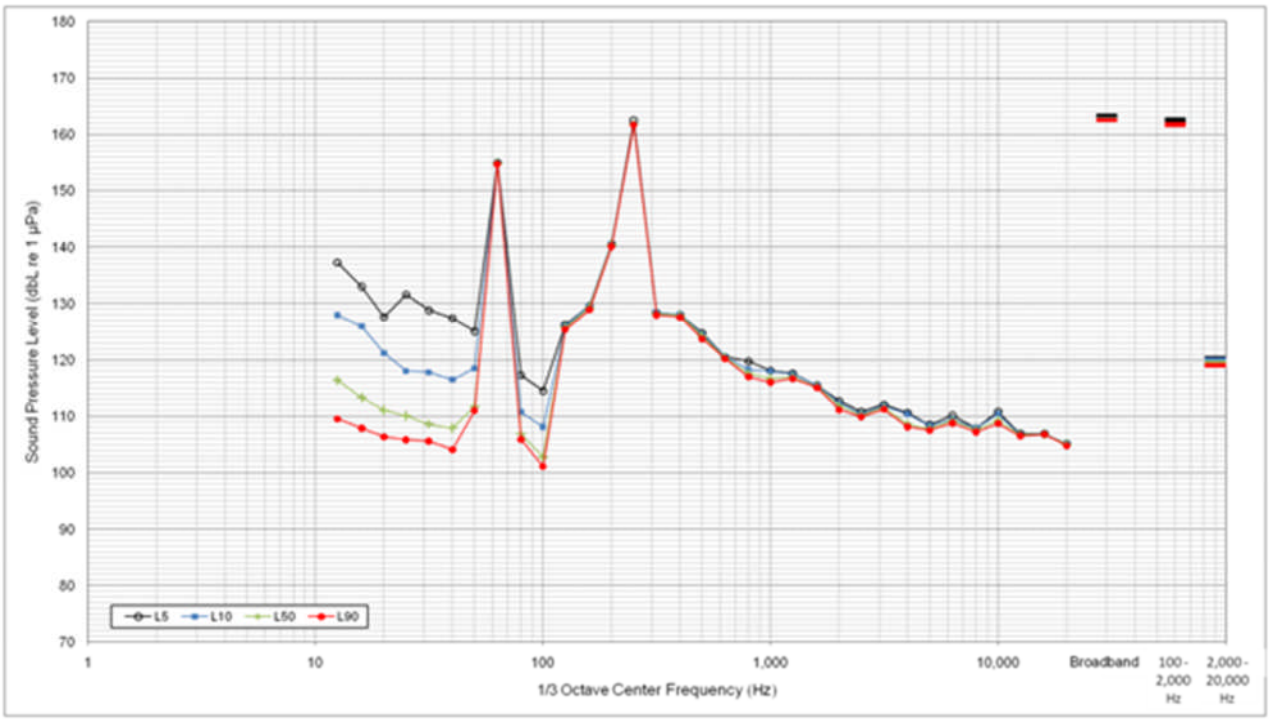
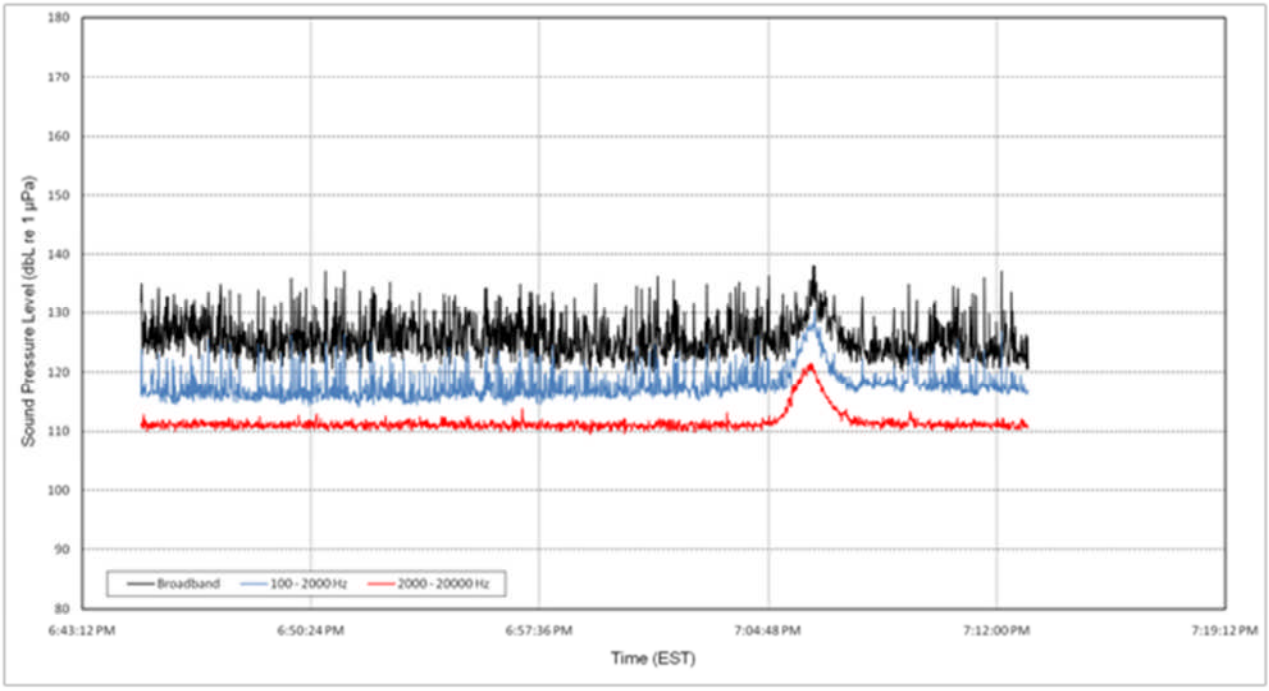


Figure D-2 EBRV Transit: 13 Knots at 100 Meters
August 3, 2006



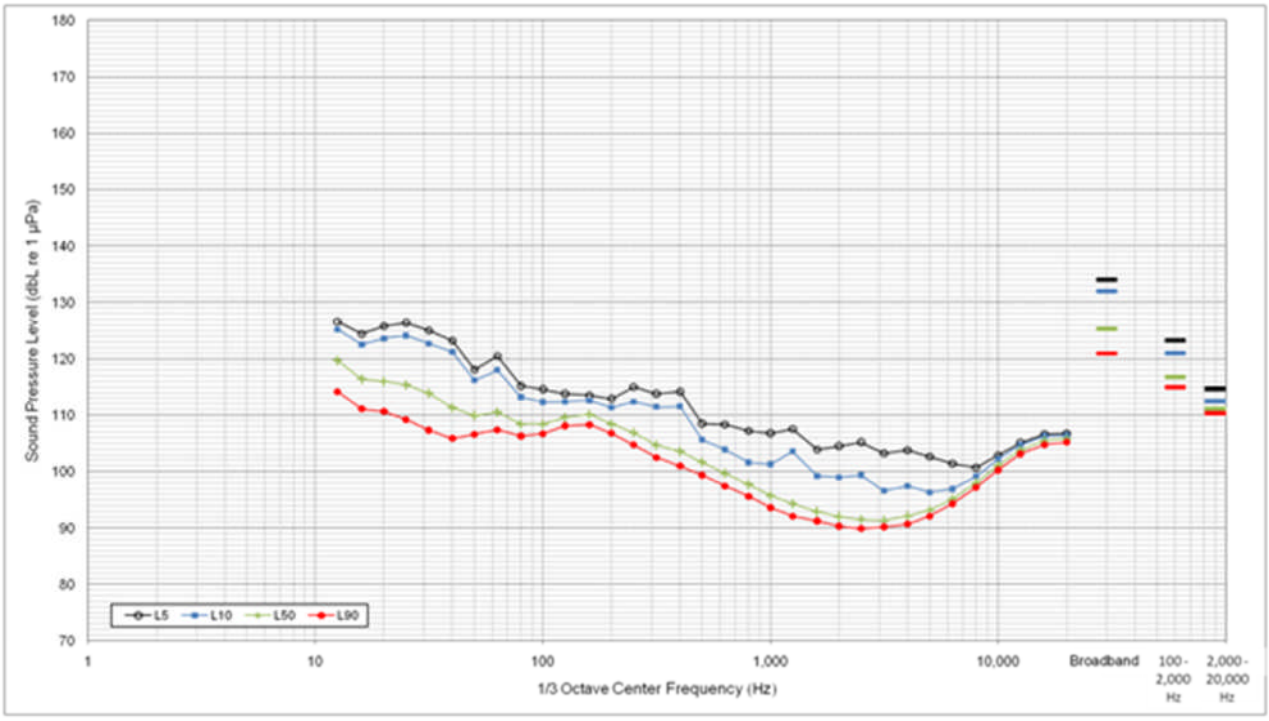
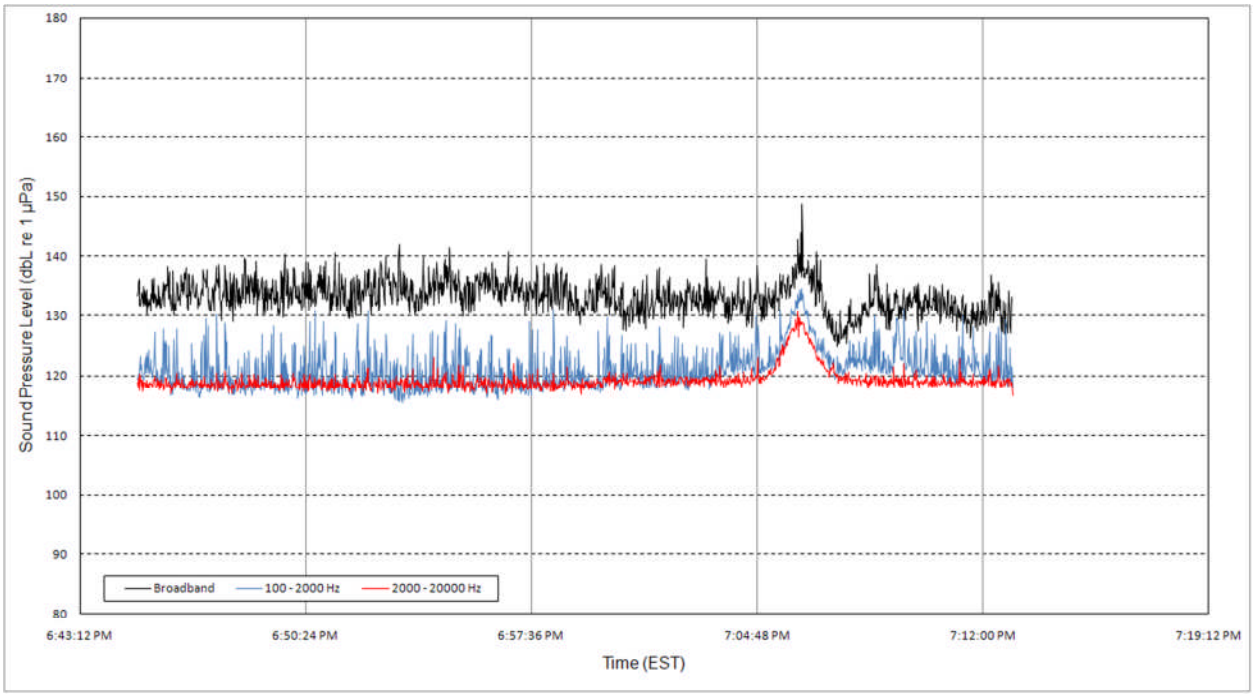


Figure D-3. EBRV in Transit: 10 Knots at 100 Meters
August 3, 2006



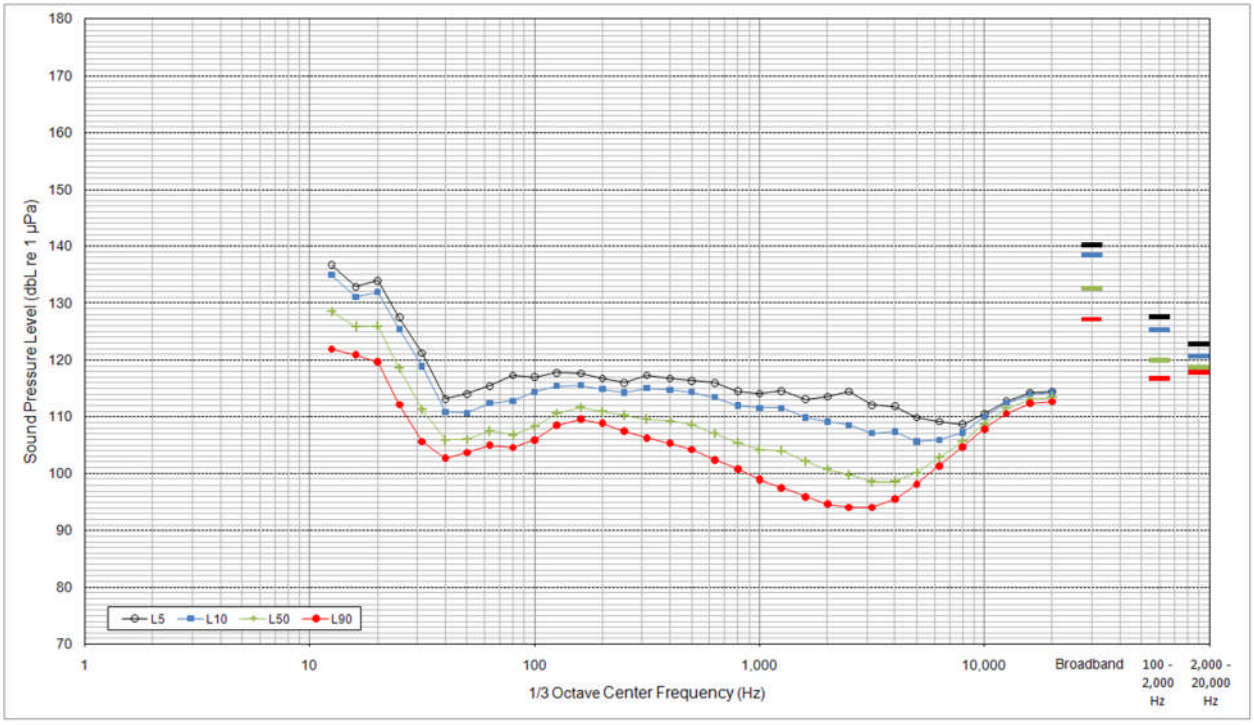
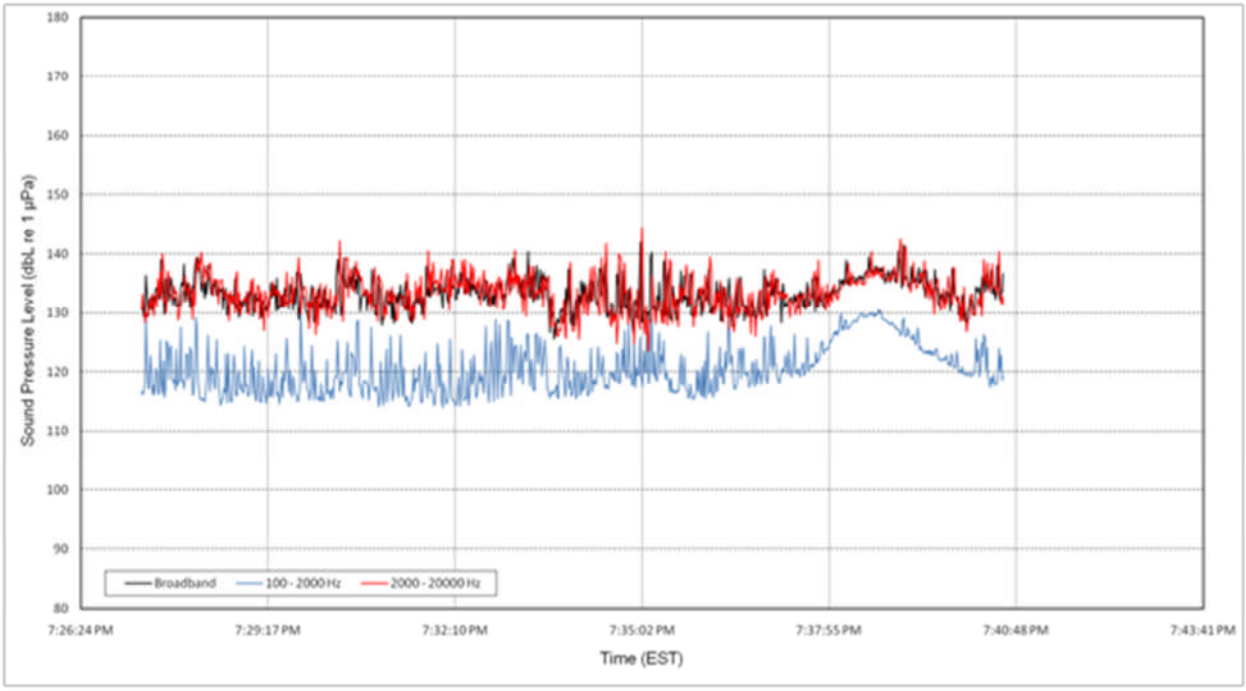


Figure D-4 EBRV in Transit: 3 Knots at 100 Meters
August 3, 2006



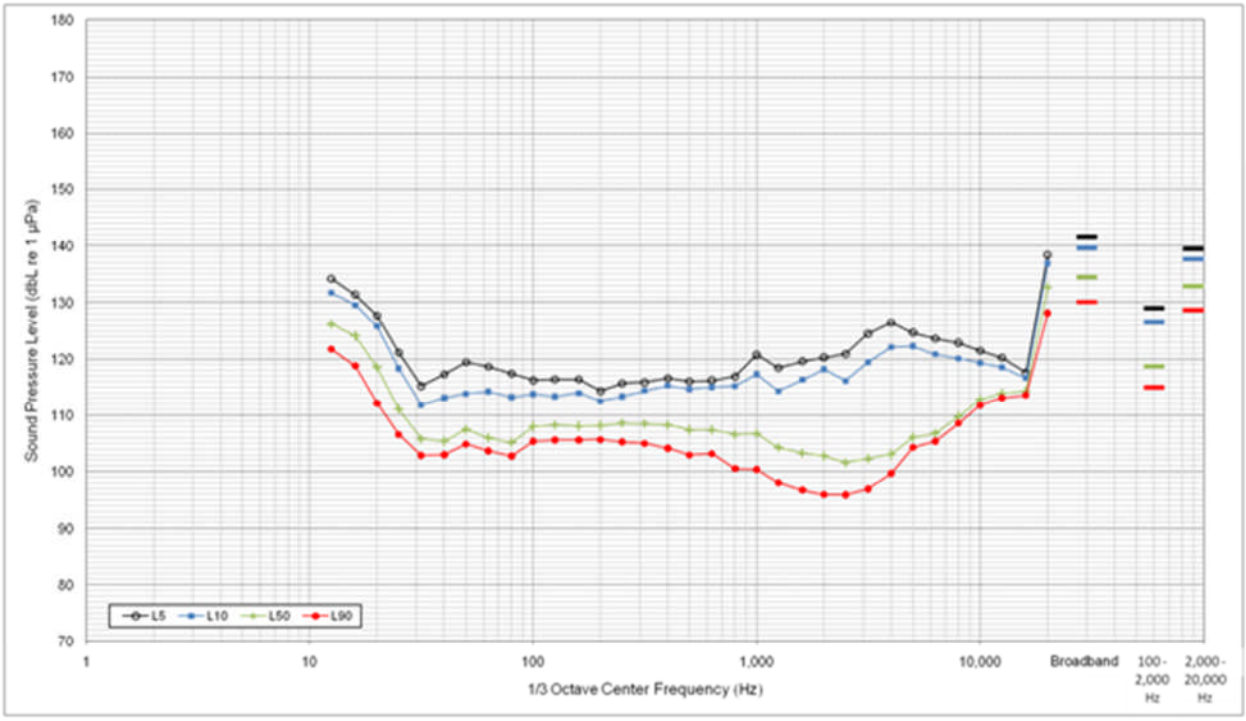
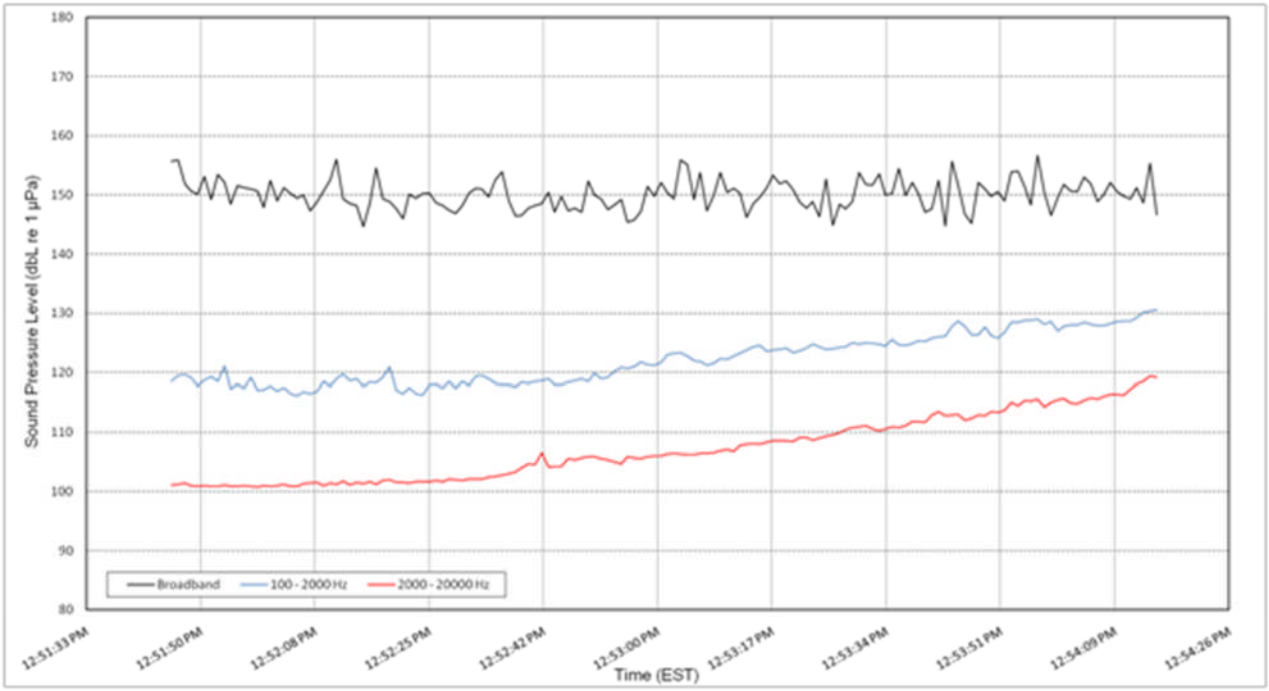


Figure D-5 EBRV Docking Sequence at 100 Meters
August 3, 2006



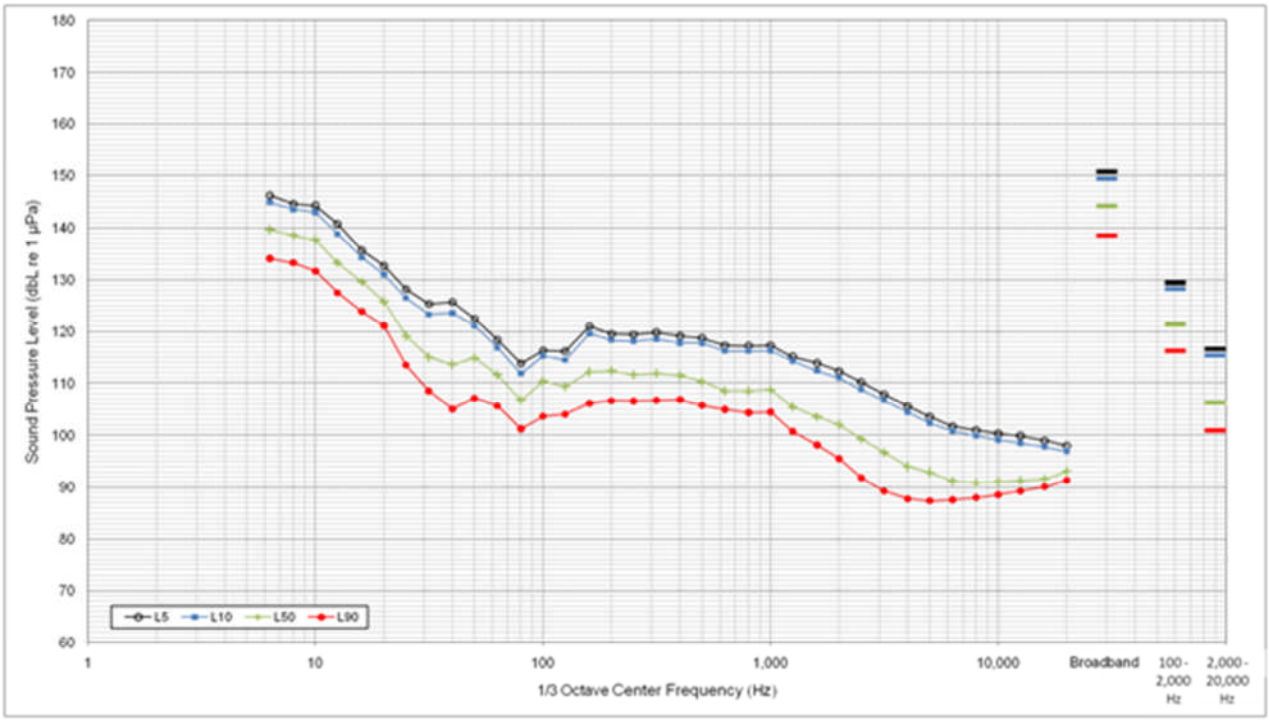
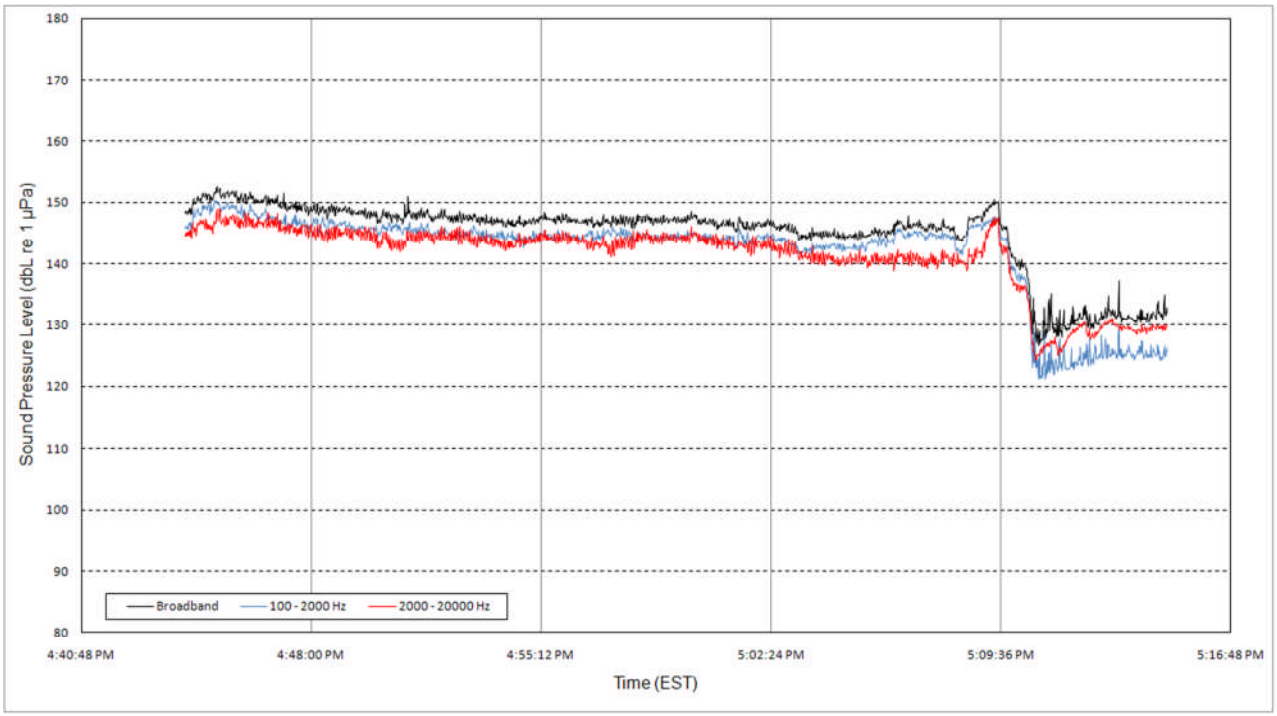


Figure D-6 EBRV High Thruster at 100 Meters
August 3, 2006



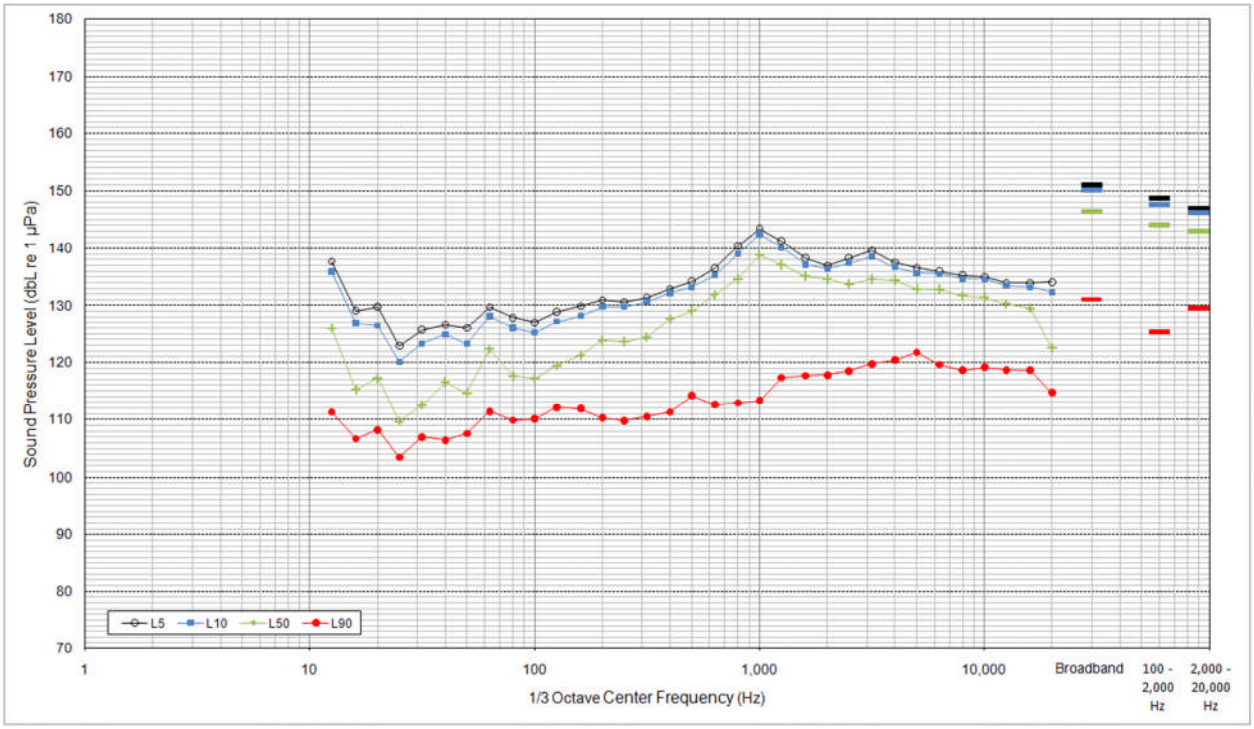
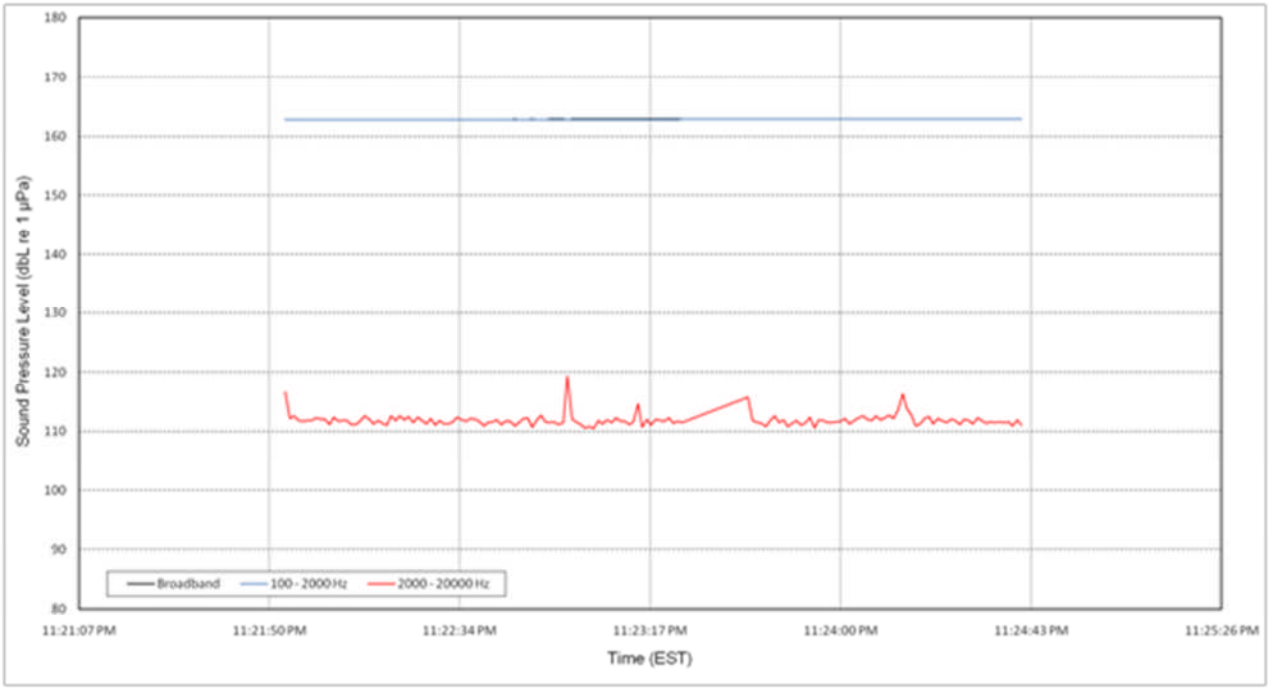


Figure D-7 Calibration Tone
August 3, 2006



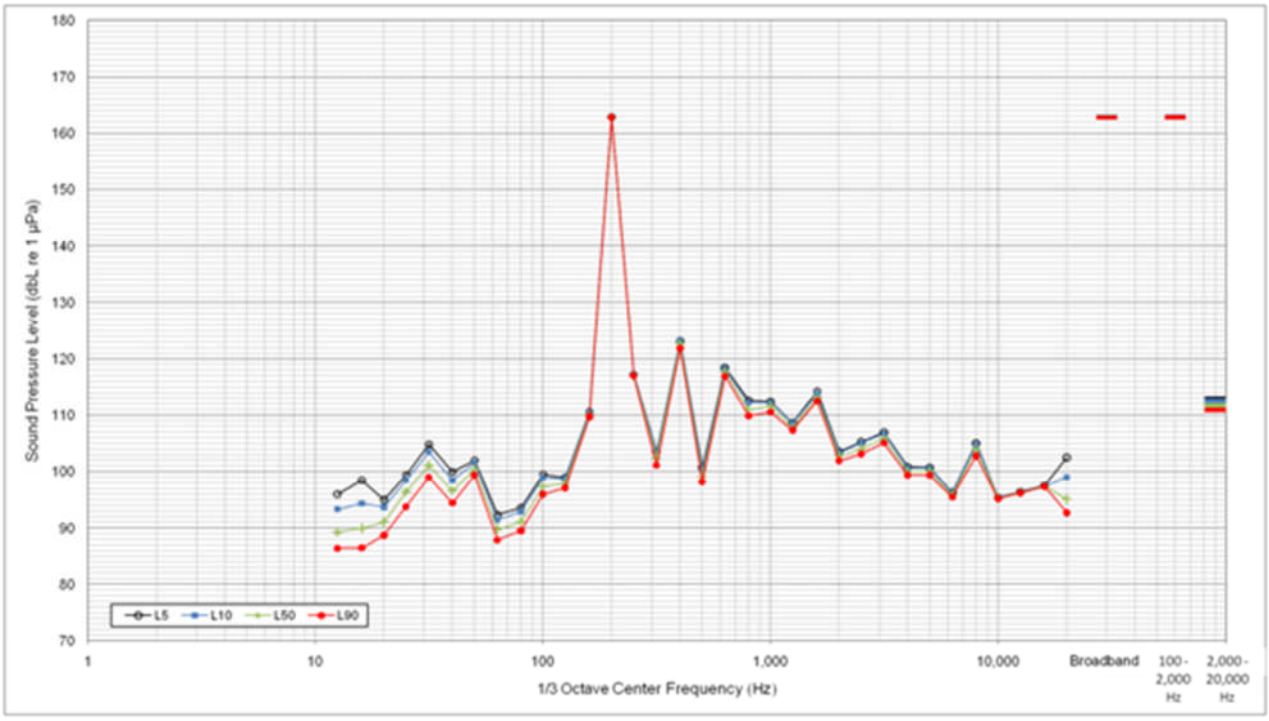
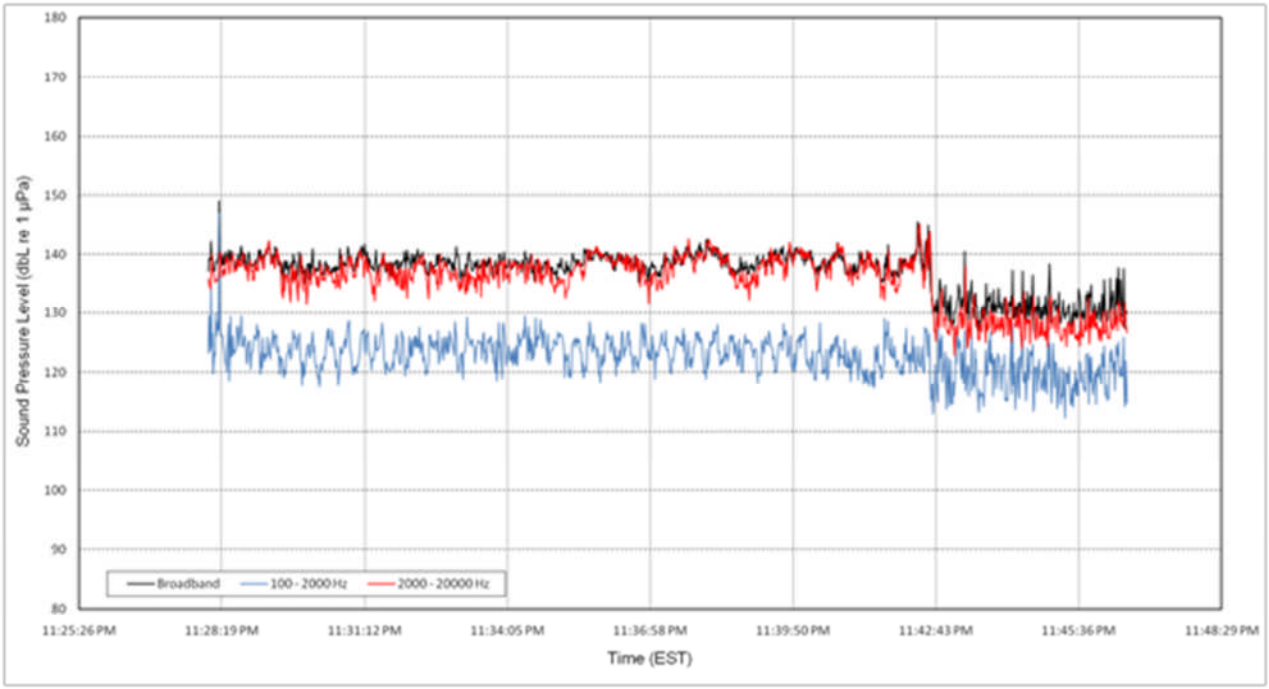


Figure D-8 EBRV Closed Loop Regassification: Nearfield
August 3, 2006



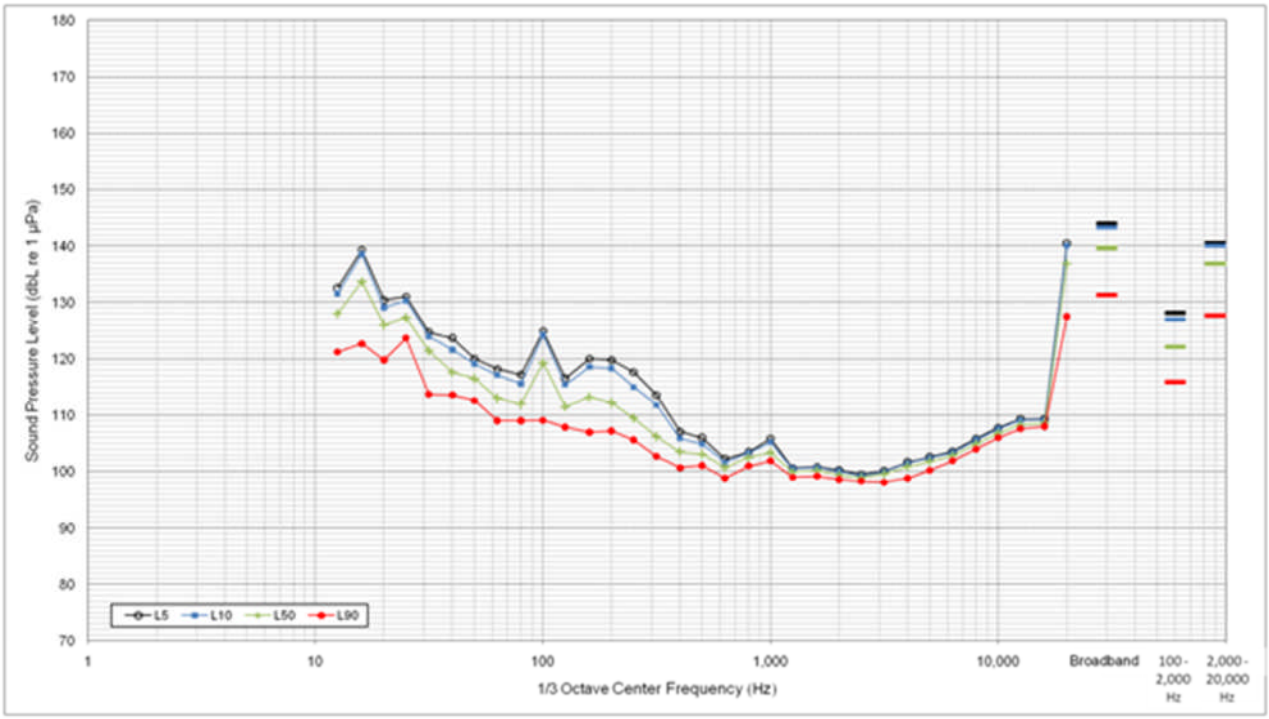
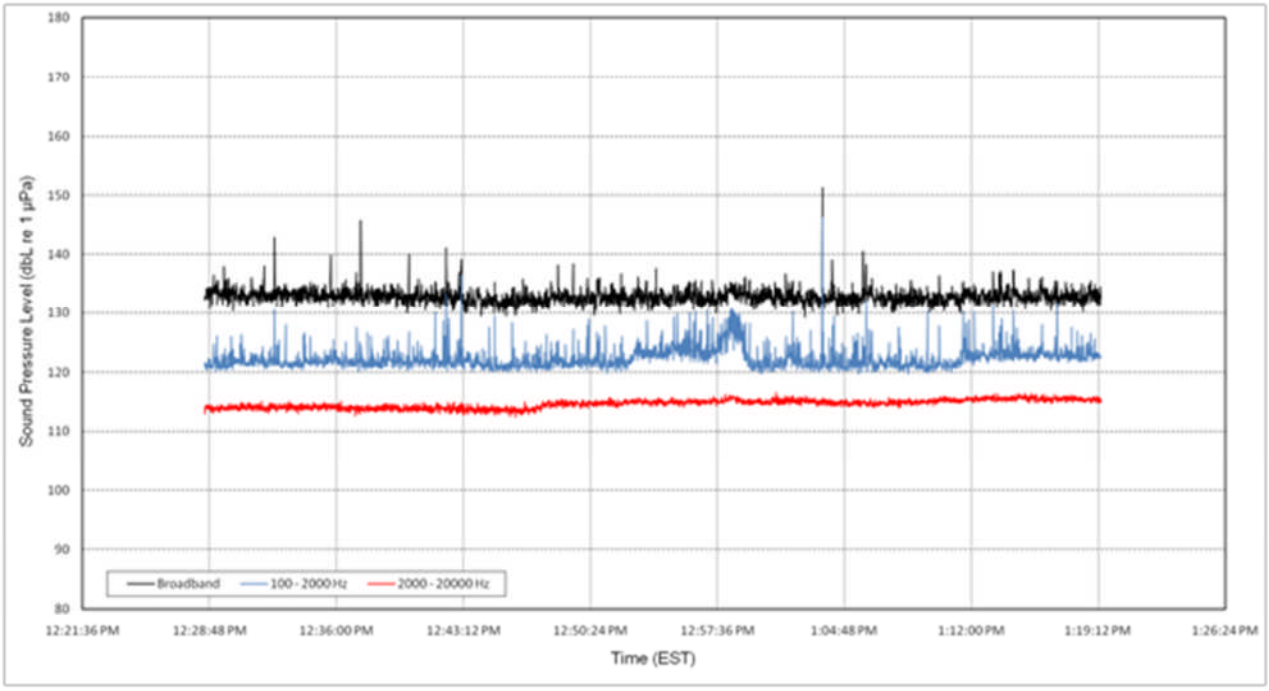


Figure D-9 EBRV Closed Loop Regassification: Nearfield
August 3, 2006



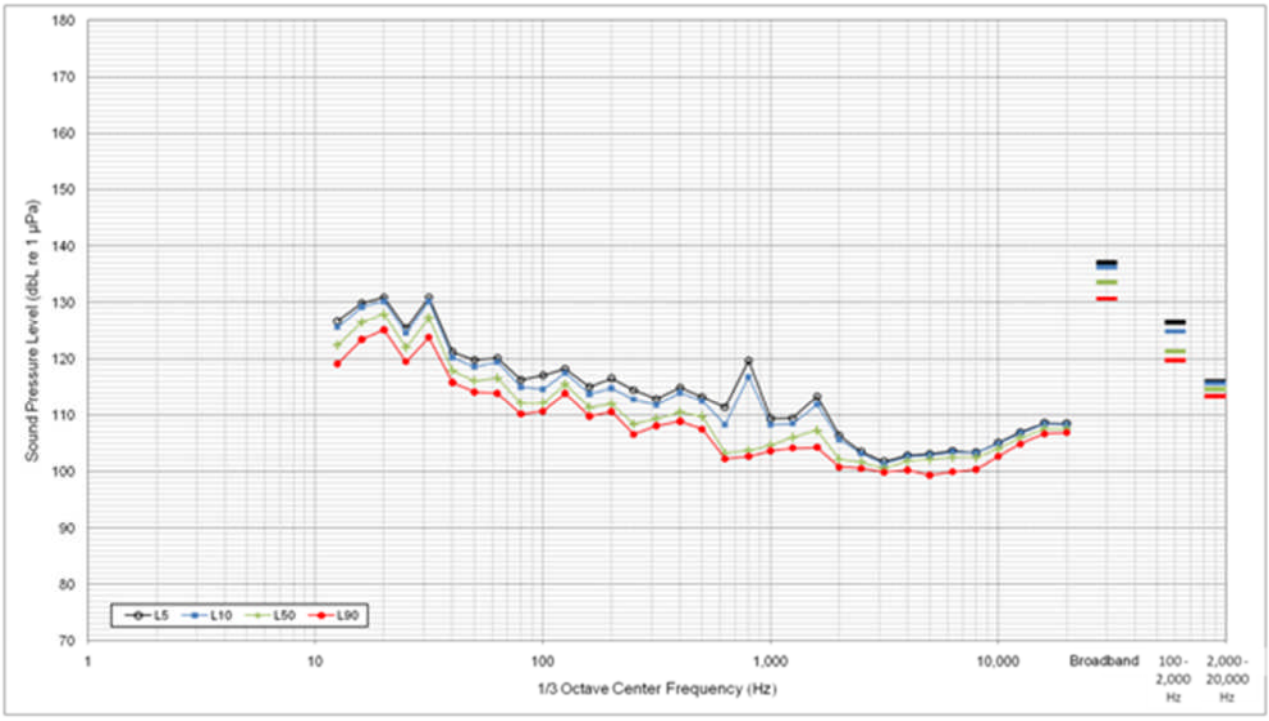
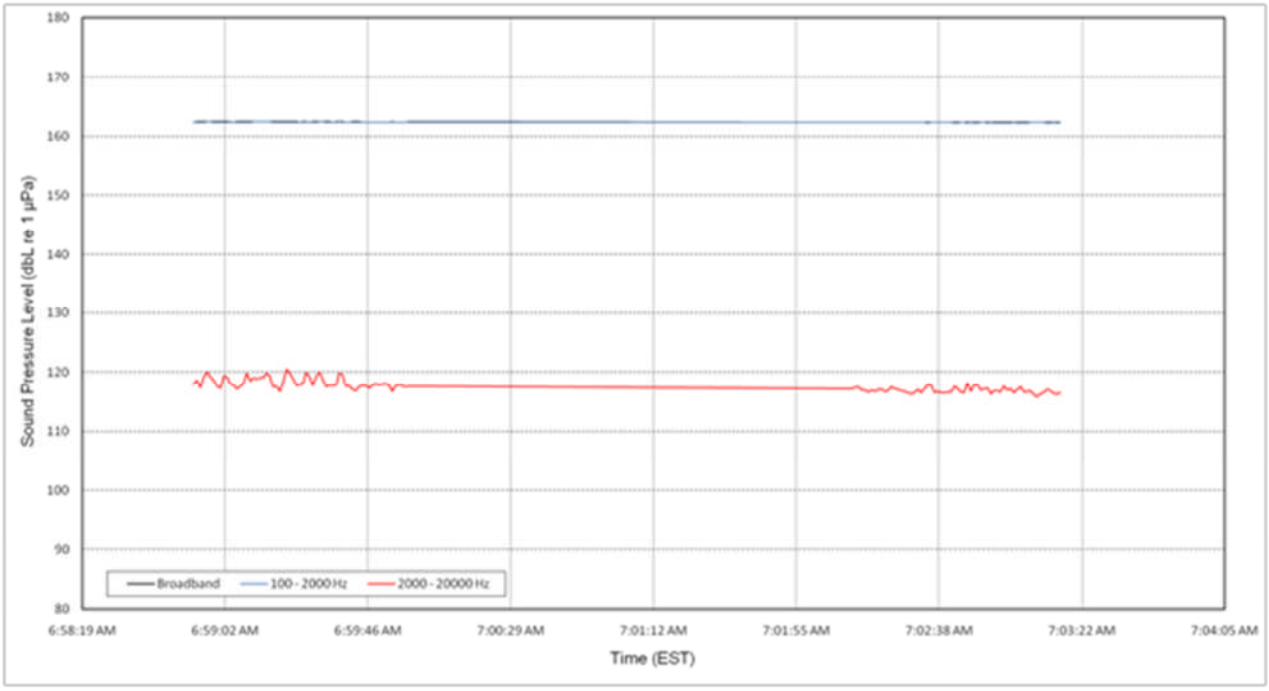


Figure D-10 Calibration Tone
August 4, 2006



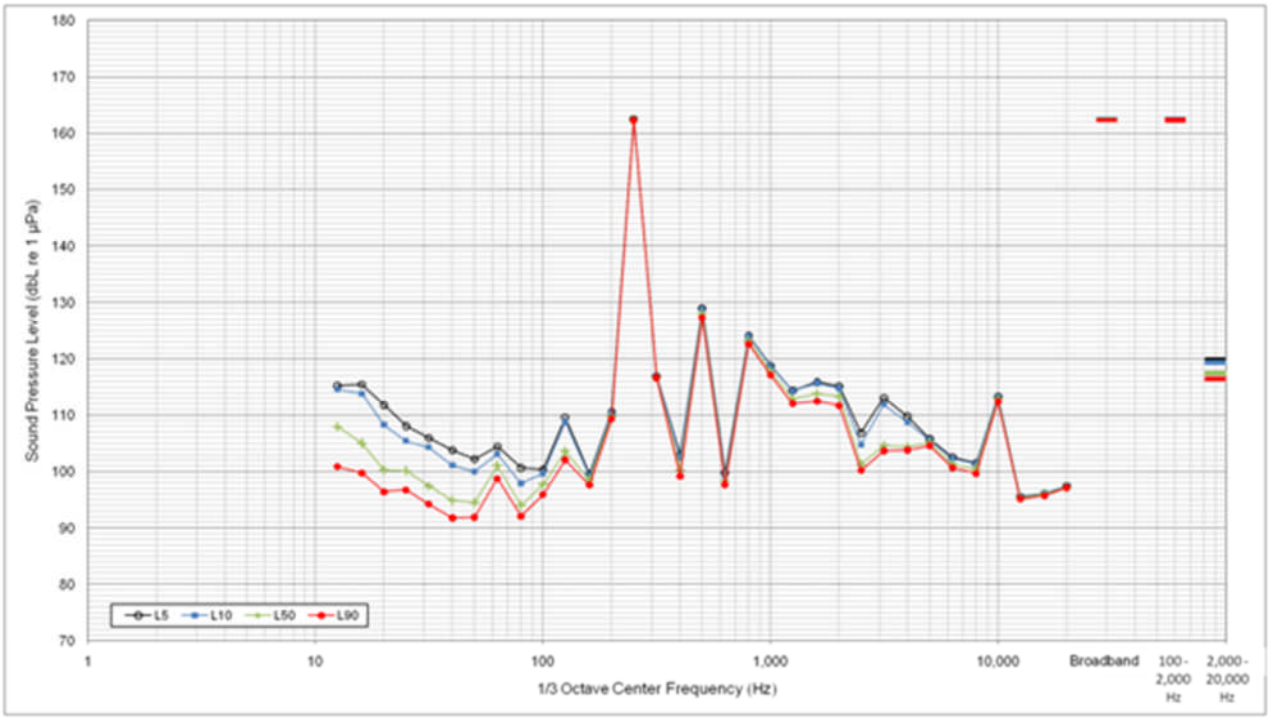
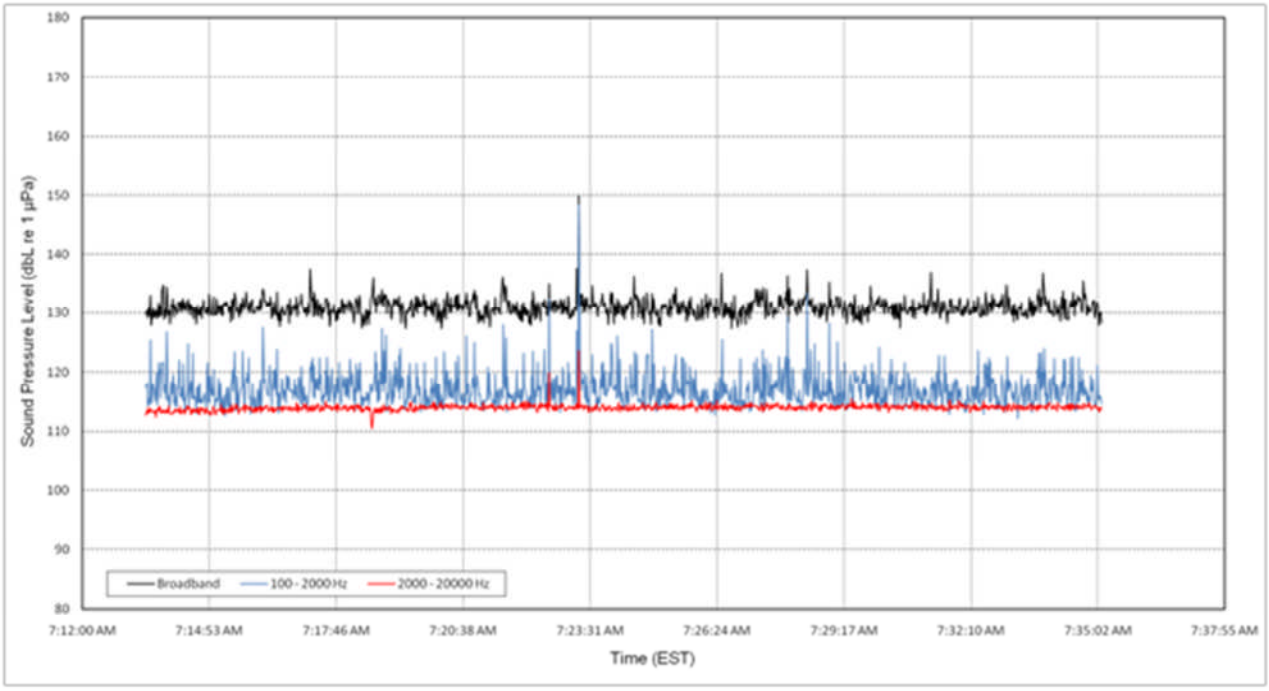


Figure D-11 EBRV Closed Loop Regassification: Nearfield
August 4, 2006



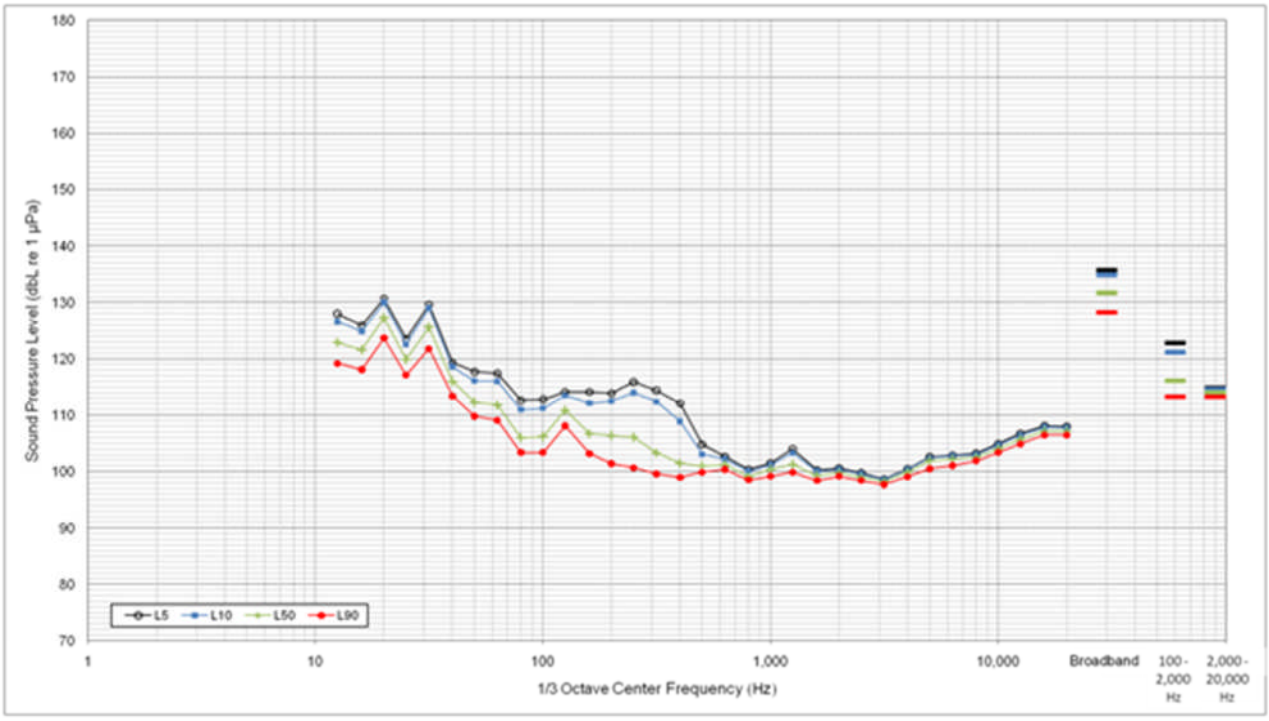
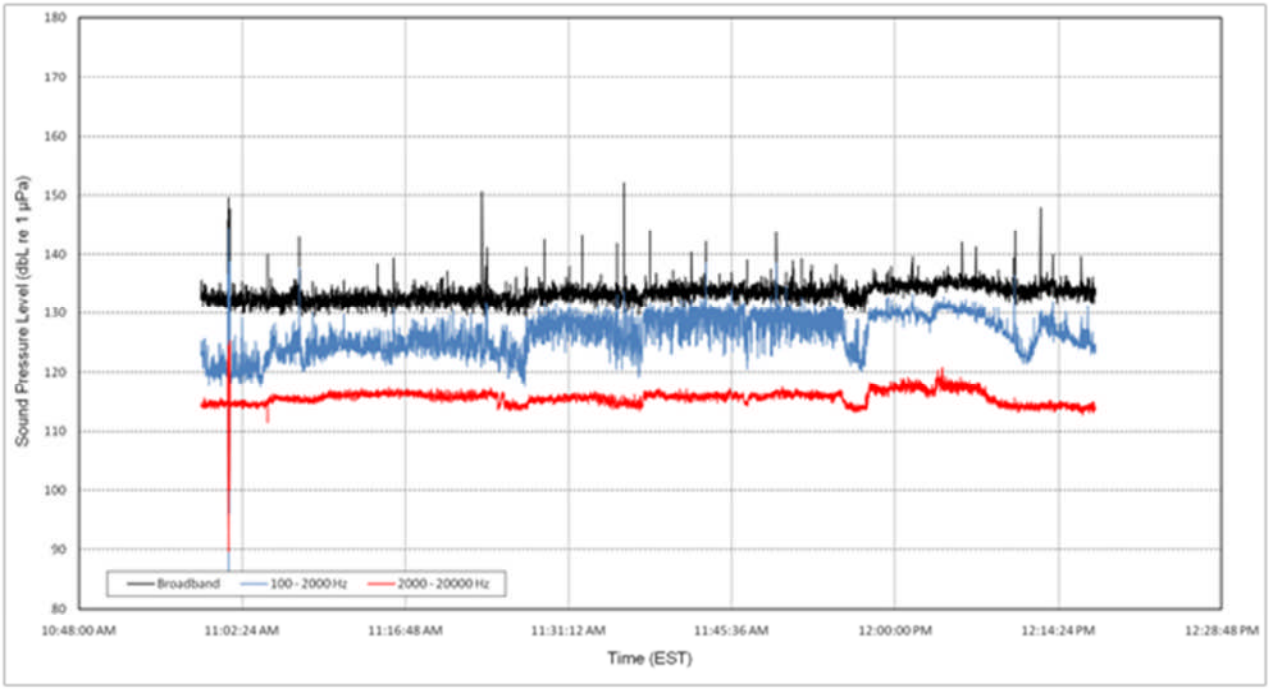
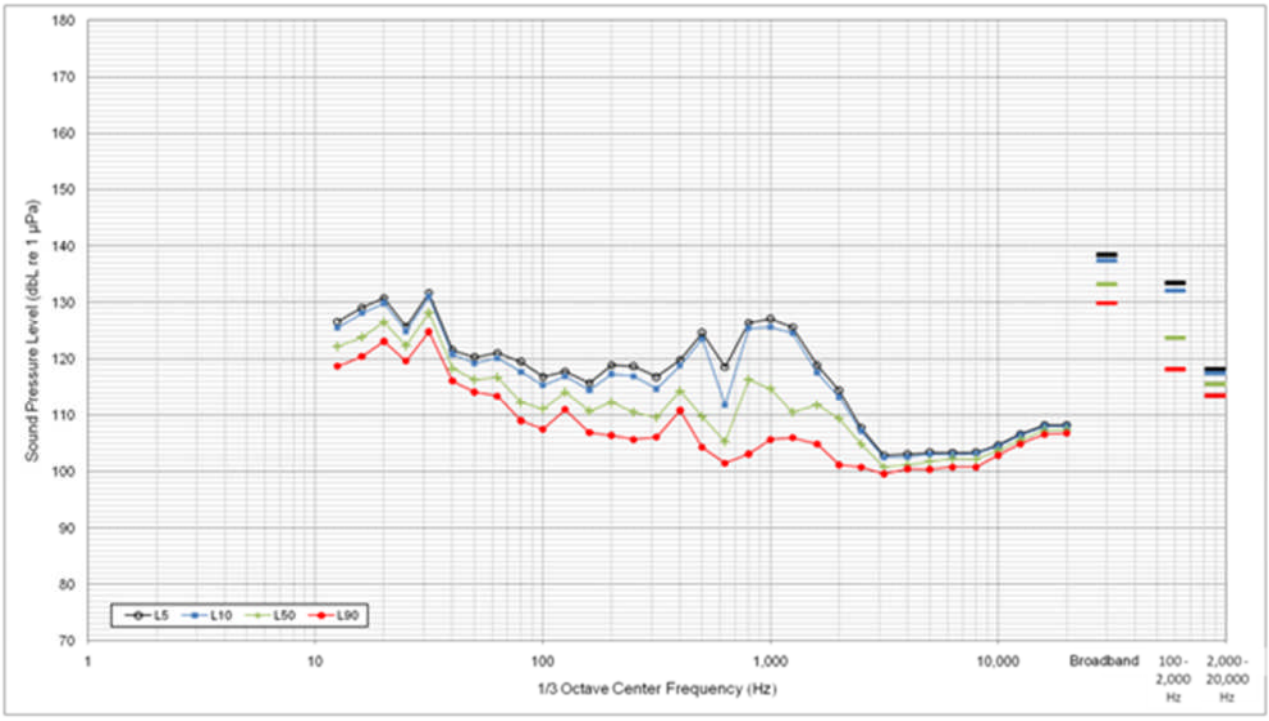


Figure D-12 EBRV Closed Loop Regassification: Over PLEM
August 4, 2006





Appendix C
Northeast Gateway Energy Bridge Deepwater Port and Pipeline Lateral Sound Pressure Level Propagation Calculation Methodologies
Northeast Gateway Energy Bridge, LP

1.0 ACOUSTIC MODELING METHODOLOGY

Acoustic modeling was conducted for primary-noise generating activities occurring during Project construction and operation. The following subsections describe the modeling program used, the modeling scenarios, and acoustic model input values.

1.0 Sound Propagation Model

Acoustic modeling was completed with the widely-used the Range Dependent Acoustic Model (GeoRAM) which is based on the U.S. Navy's Standard Split-Step Fourier Parabolic Equation (PE). Since the seafloor and its properties are variable based on location, it is necessary to use a range dependent model that is programmed to account for these variations along the propagation path. GeoRAM computes acoustic fields in 3-D by modeling transmission loss along evenly distributed radial traverses covering a 360 º swath from the source (so-called N×2-D modeling). This methodology consists of a set of algorithms that calculates transmission loss based on a number of factors including the distance between the source and receiver along with basic ocean parameters (e.g., depth, bathymetry, geoacoustic properties of sediment type, and the ocean's temperature-depth sound speed profile).

GeoRAM is an extremely efficient PE code that copes naturally with range-dependent environments and overcomes the principle limitation of the PE method; lack of accuracy for energy propagating at large angles to the horizontal (Duncan and Maggi, 2006). Use of the PE method allows for a one-way wave equation that can be solved by a range-marching technique with a proper starting field (i.e., near-field underwater sound pressure level). The forward propagating field is obtained at a given range from the field at a previous range after having also accounted for boundary conditions at the top and bottom of the domain, in other words the solution (i.e., the underwater received sound pressure level) is marched in range.

GeoRAM assumes that outgoing reflected and refracted sound energy dominates scattered sound energy and computes the solution for the outgoing (one-way) wave equation. At low frequencies, the contribution of scattered energy is very small compared to the outgoing sound field. An uncoupled azimuthal approximation is used to provide gridded 2-D TL values in range and depth with a geo-referenced dataset to automatically retrieve the bathymetry and acoustic environment parameters along each propagation transect radiating from the sound source.

The received sound field within each vertical radial plane is sampled at various ranges from the source with a fixed radial step size. At each sampling range along the surface, the sound field is sampled at various depths, with the step size between samples increasing with depth below the surface. The received sound level at a given location along a given transect is taken as the maximum value that occurs over all samples within the water column below. The TL values produced by the model are used to attenuate the spectral acoustic output levels of the sound source to generate received sound levels along a transect. These values are then summed across frequencies to provide broadband received levels at the MMPA level A and B harassment criteria as well as fishery and sea turtle interim guidelines.

1.1 Modeling Environment

The accuracy of underwater noise modeling results is largely dependent on the referenced sound source data and the accuracy of the intrinsically dynamic data inputs used to describe the medium between the path and receiver including sea surface conditions, water column, and sea bottom. The exact information required can never be obtained for all possible modeling situations, particularly for long-range acoustic modeling of temporally varying sound sources where uncertainties in model inputs increase at greater propagation distances from the source. In these instances, the reliance on a simplistic geometric spreading model such as the inverse power law may be inappropriate.

1.1.1 Acoustic Modeling Scenarios and Source Levels

The representative acoustic modeling scenarios were derived from any potential operational activities and maintenance activity that may require construction vessels. The subsections that follow provide more detailed information about the parameters used to model the noise sources associated with each scenario. Sound source levels vary from amongst vessels, and specific details on vessels is often unavailable. In order to calculate the source level, measurements of existing EBRV vessels were used to back calculate source levels. In addition, a literature review was conducted in order to identify source level measurements from comparable equipment performing similar activities. Proxy source levels for each of the modeling scenarios presented in this report were derived from literature, engineering guidelines, and underwater source measurements of similar equipment and activities as well as the field measurement programs that were completed during actual construction and operational events. Site specific source levels may vary and will be validated by Excelerate during future construction and operation of the Project.

The following five modeling scenarios were considered in the current study:

- Scenario 1: EBRV Docking Procedures with Support Vessel
- Scenario 2: EBRV Transiting the TSS
- Scenario 3: Maintenance and Repair Vessels at Port
- Scenario 4: Maintenance and Repair Vessels at PLEM
- Scenario 5: Maintenance and Repair Vessels at Mid Pipeline

The source level descriptions and source depth assumptions are key inputs to the acoustic propagation model. The source level is stated as a spectral level as a function of frequency – e.g. in one-third octave bands and summed as an overall broadband level. The level of an acoustic source is a measure of the acoustic output of that source. It is related to the radiant intensity and acoustic power of the source, but it is rarely described in these terms. By convention in the United States, underwater acoustic source levels are defined as the acoustic pressure at 1m distance from idealized point source, i.e. dB re 1 μPa at 1m by extrapolating back to a reference range of one meter from the source using a version of the simplified free field modeling (see Section 2.1). Most European nations have generally opted for a less error prone strategy of stating the level at the given measurement distance from the source, or a normalized distance for comparative purposes. Extrapolating back to 1 meter, as is done for many of the early US data to derive an apparent sound source level, is particularly prone to error due to the fact that the assumptions used in this derivation are not typically stated. However, since most of the data from proxy sources are derived in this way, this format has been maintained here, with the calculation of the apparent source normalized to the project site. Broadband source levels employed in the modeling calculations are summarized below:

- EBRV Main propeller at 10 kn: 170 dB re 1 μPa;
- EBRV thruster: 180 dB re 1 μPa;
- Two EBRV thrusters operating concurrently: 183 dB re 1 μPa;
- Tug and barge major maintenance and repair event thruster: 186 dB re 1 μPa;
- Diver support thruster enabled vessel during minor maintenance and repair event: 174 dB re 1 μPa;

1.1.2 Bathymetry

For geometrically shallow water, sound propagation is dominated by boundary effects. Bathymetry data represent the 3D nature of the subaqueous land surface and was obtained from the National Geophysical Data Center (NGDC) US Coastal Relief Model (NOAA Satellite and Information Service 2005); the horizontal resolution of this data set is 3 arc-seconds. NGDC's 3 arc-second U.S. Coastal Relief Model (CRM) provides the first comprehensive view of the U.S. coastal zone, integrating offshore bathymetry

with land topography into a seamless representation of the coast. The CRM spans the U.S. East and West Coasts, the northern coast of the Gulf of Mexico, Puerto Rico, and Hawaii, reaching out to, and in places even beyond, the continental slope. The Geophysical Data System (GEODAS) is an interactive database management system developed by the NGDC for use in the assimilation, storage and retrieval of geophysical data. GEODAS software manages several types of data including marine trackline geophysical data, hydrographic survey data, aeromagnetic survey data, and gridded bathymetry/topography.

The datasets, originally with a horizontal resolution of 20 m, were linearly interpolated on a regular grid. The bathymetric data was sampled by creating a fan of radials at a given angular spacing. This grid was then used to determine depth points along each modeling radial transect. The underwater acoustic modeling takes place over these radial planes in set increments depending on the acoustic wavelength and the sampled depth. These radial transects were used for modeling both the construction and operation of the Project, with each radial centered on the given Project sound source or activity. Figure 1 presents the bathymetries within the Project Area.

1.1.3 Sediment

Sediment type (e.g., hard rock, sand, mud) directly impacts the speed of sound as it is a part of the medium in which the sound propagates. The propagation efficiency of the seabed is far less than that of the water column because the intrinsic absorption of the bottom is typically about 1,000 times that in seawater. Because of variations in water depth and in ocean bottom properties, noise in shallow water can be highly variable from one location to another. Sediment information for the Project study area was obtained from site specific surveys.

The geoacoustic properties of these materials include compressional speed (cp), density (ρ), P-attenuation (αp), shear speed (cs) and S-attenuation (αs), and vary with depth (z). Bottom loss is a complex and only partly understood phenomenon. The table below presents order of magnitude acoustic parameters for common sediments and seafloor conditions, with the bottom type in the Project Area being predominantly sand.

Geoacoustic Parameters for Sediments[1]

Sediment Type	M (Φ)	N (%)	P (kgm^{-3})	c_r	c(m/s)	V(0°) (dB)	αs (dB/λ)	c_3 (m/s)	Ω_0 (cm^4)	h(cm)	δ {°}
Clay	9	80	1,200	0.98	1,470	-21.8	0.08	-	5×10^{-4}	0.5	1.2
Silty clay	8	75	1,300	0.99	1,485	-18.0	0.10	-	5×10^{-4}	0.5	1.5
Clayey silt	7	70	1,500	1.01	1,515	-13.8	0.15	125	5×10^{-4}	0.6	1.3
Sand-silt-clay	6	65	1,600	1.04	1,560	-12.1	0.20	290	5×10^{-4}	0.6	2
Sand-silt	5	60	1,700	1.07	1,605	-10.7	1.00	340	5×10^{-4}	0.7	2.5
Silty sand	4	55	1,800	1.10	1,650	-9.7	1.10	390	1×10^{-3}	0.7	3
Very fine sand	3	50	1,900	1.12	1,680	-8.9	1.00	410	2×10^{-3}	1.0	4
Fine sand	2	45	1,950	1.15	1,725	-8.3	0.80	430	3×10^{-3}	1.2	5
Coarse sand	1	40	2,000	1.20	1,800	-7.7	0.90	470	7×10^{-3}	1.8	6
Source: Hamilton 1976, Hamilton 1982, Hamilton and Bachman 1982, APL 1994.											

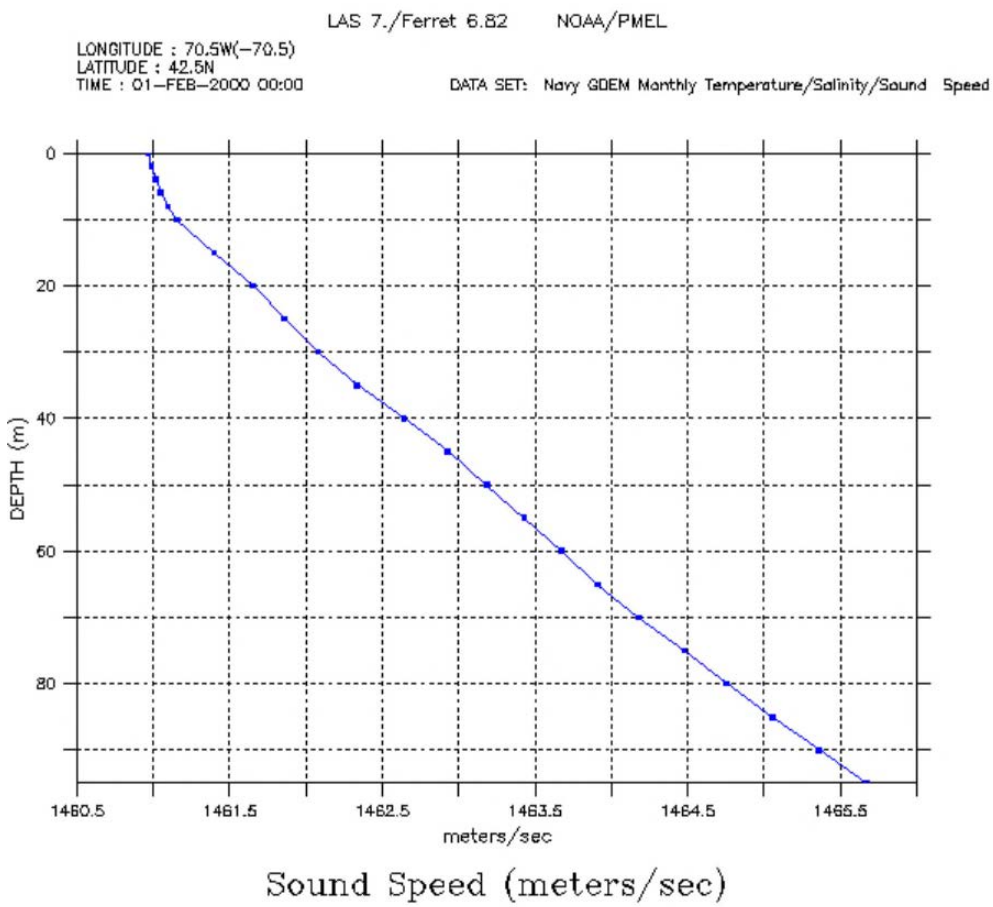
1.1.4 Seasonal Sound Speed Profiles

The speed of sound in sea water depends on the temperature T [°C], salinity S [ppt], and depth D [m] and can be characterized using sound speed profiles (SSPs). The SSP of an underwater environment has a

1 Hamilton, E.L. 'Compressional Waves in marine sediments', Geophysics, 37 620-646, 1982.
Hamilton, E.L. 'Geoacoustic modeling of the sea floor', Journal of the Acoustical Society of America, 68, 1313-1340, 1976.
Hamilton, E.L. and Bachman, R.T., 'Sound velocity and related properties of marine sediments', Journal of the Acoustical Society of America, 72, 1891-1904, 1982
APL, APL-UW High-Frequency Ocean Environmental Acoustic Models Handbook (APL-UW TR 9407). Seattle, WA: Applied Physics Laboratory, University of Washington, 1994.

significant effect on sound attenuation. Oftentimes, a homogeneous or mixed layer of constant velocity is present in the first few meters. It corresponds to the mixing of superficial water through surface agitation. There can also be other features such as a surface channel, which corresponds to sound velocity increasing from the surface down. This channel is often due to a shallow isothermal layer appearing in winter conditions, but can also be caused by water that is very cold at the surface. In a negative sound gradient, the sound speed decreases with depth, which results in sound refracting downwards which may result in increased bottom losses with distance from the source. In a positive sound gradient as predominantly present in the winter season, sound speed increases with depth and the sound is, therefore, refracted upwards, which can aid in long distance sound propagation. February was selected as the worst case SSP, and will result in conservative distances.

Figure 1 Average February Sound Speed Profile as a Function of Depth

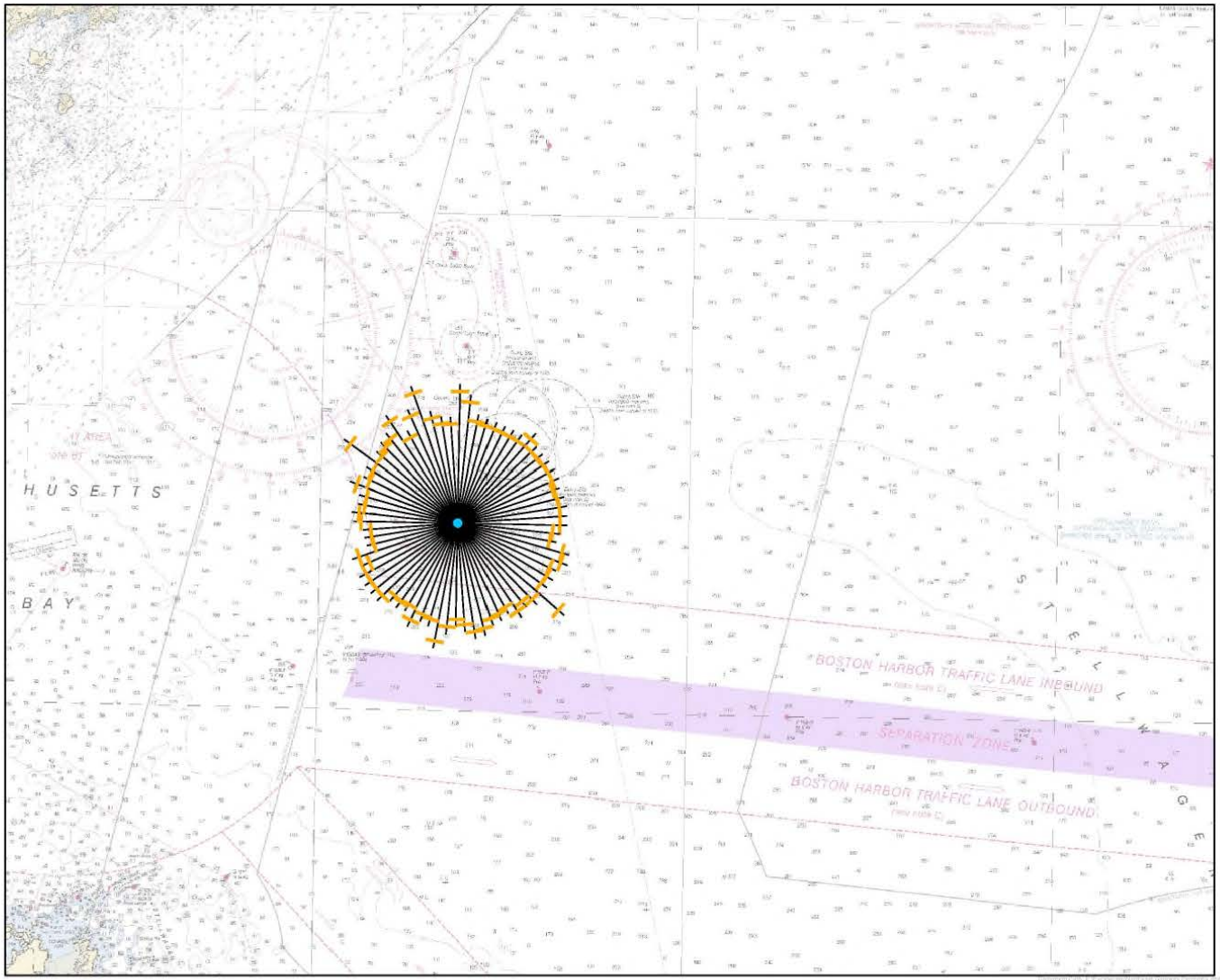


1.2 Modeling Results

While model results were computed in three spatial dimensions, sound levels were reduced to two-dimensional contours for presentation by taking the maximum sound level over all depths at each receiver location. This approach is conservative, as it makes no assumption as to the depth where an organism is present in the water column. Graphical diagrams depicting the results of the acoustic modeling are presented in Figures C-1 through C-10.

MODELING RESULTS

FIGURES

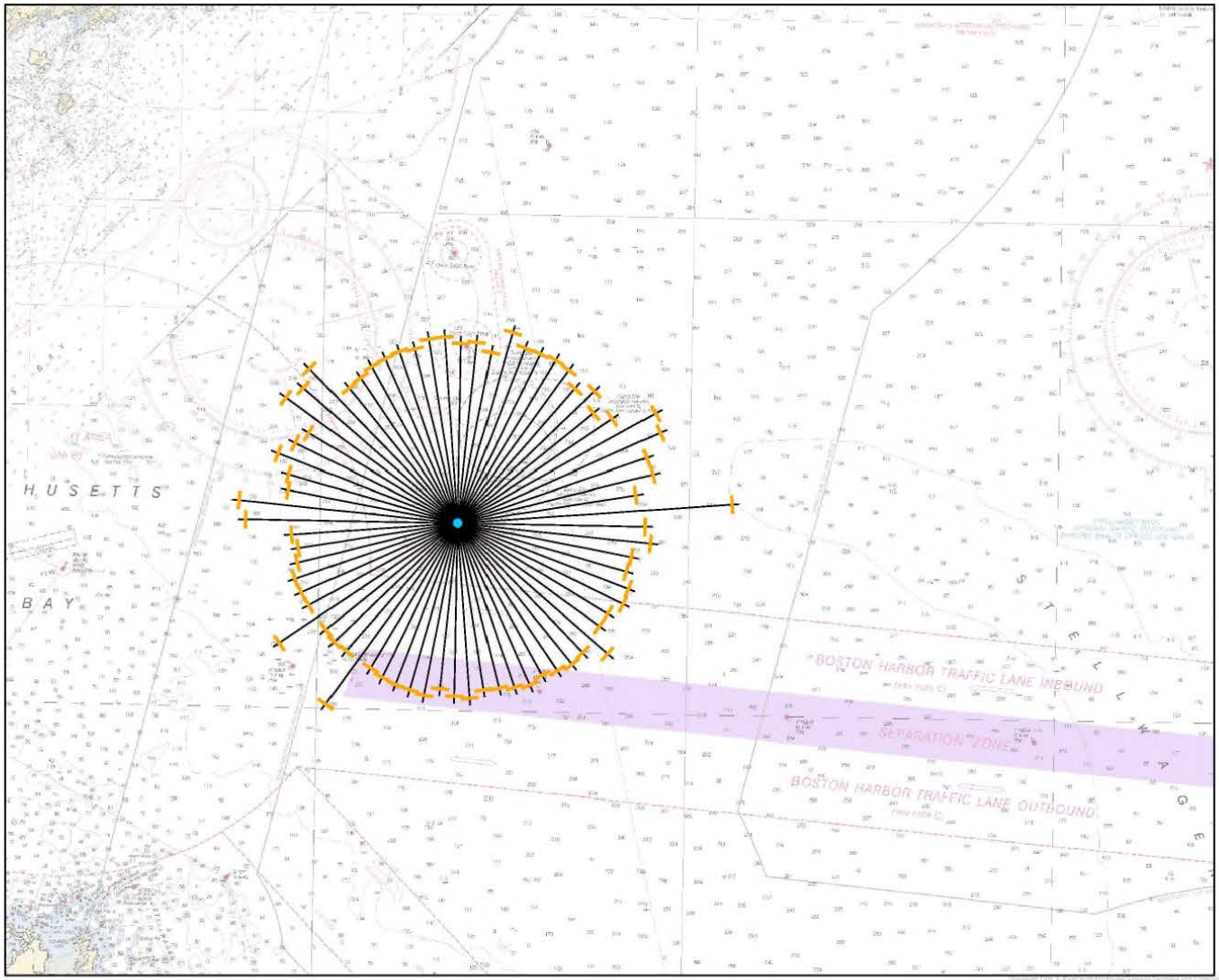


Northeast Gateway
Port Operations
Figure C-1
Received Sound Levels
during
EBRV Docking Procedure
with
Support Vessel
May 2014

Origin Location
120dB Extent

0 1 2 3 Nautical Miles

0 1 2 3 4 Miles

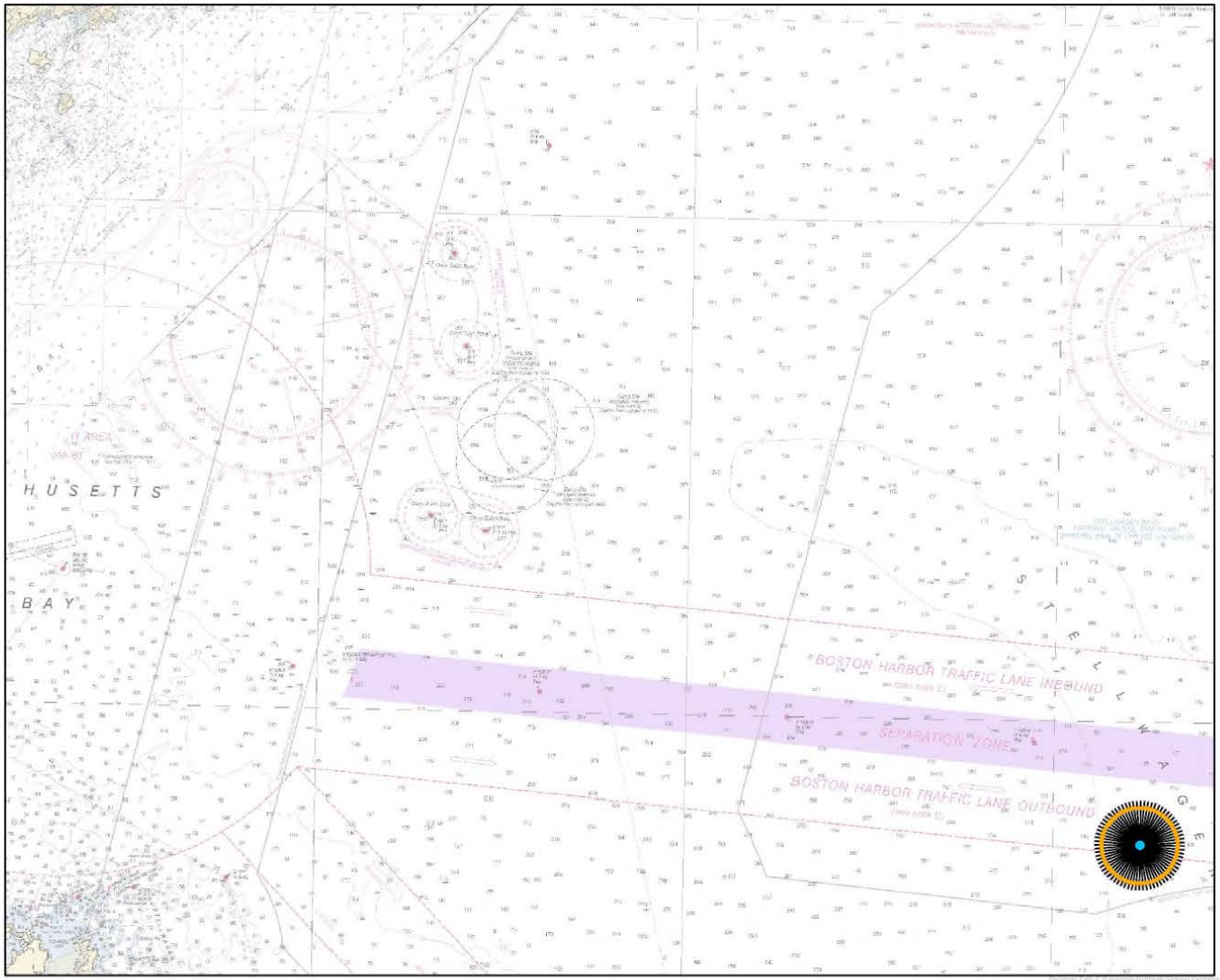


Northeast Gateway
Port Operations
Figure C-2
Received Sound Levels
during
EBRV Docking Procedure
with Support Vessels
(2 EBRVs on station)
May 2014

Origin Location
120dB Extent

0 1 2 3 Nautical Miles

0 1 2 3 4 Miles

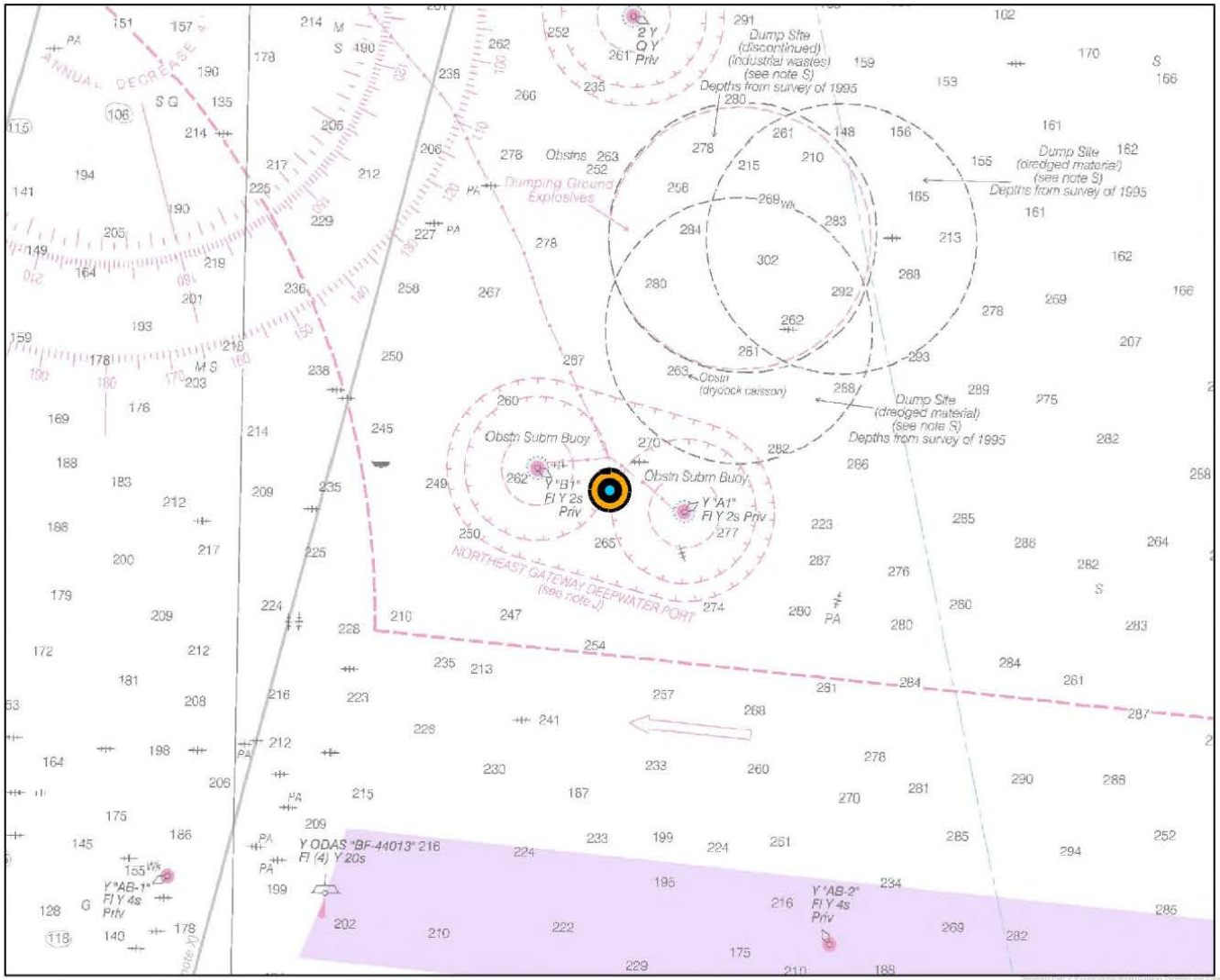


Northeast Gateway
Port Operations
Figure C-3
Received Sound Levels
during
EBRV Transiting the TSS
10 knot
May 2014

Origin Location
120dB Extent

0 1 2 3 Nautical Miles

0 1 2 3 4 Miles

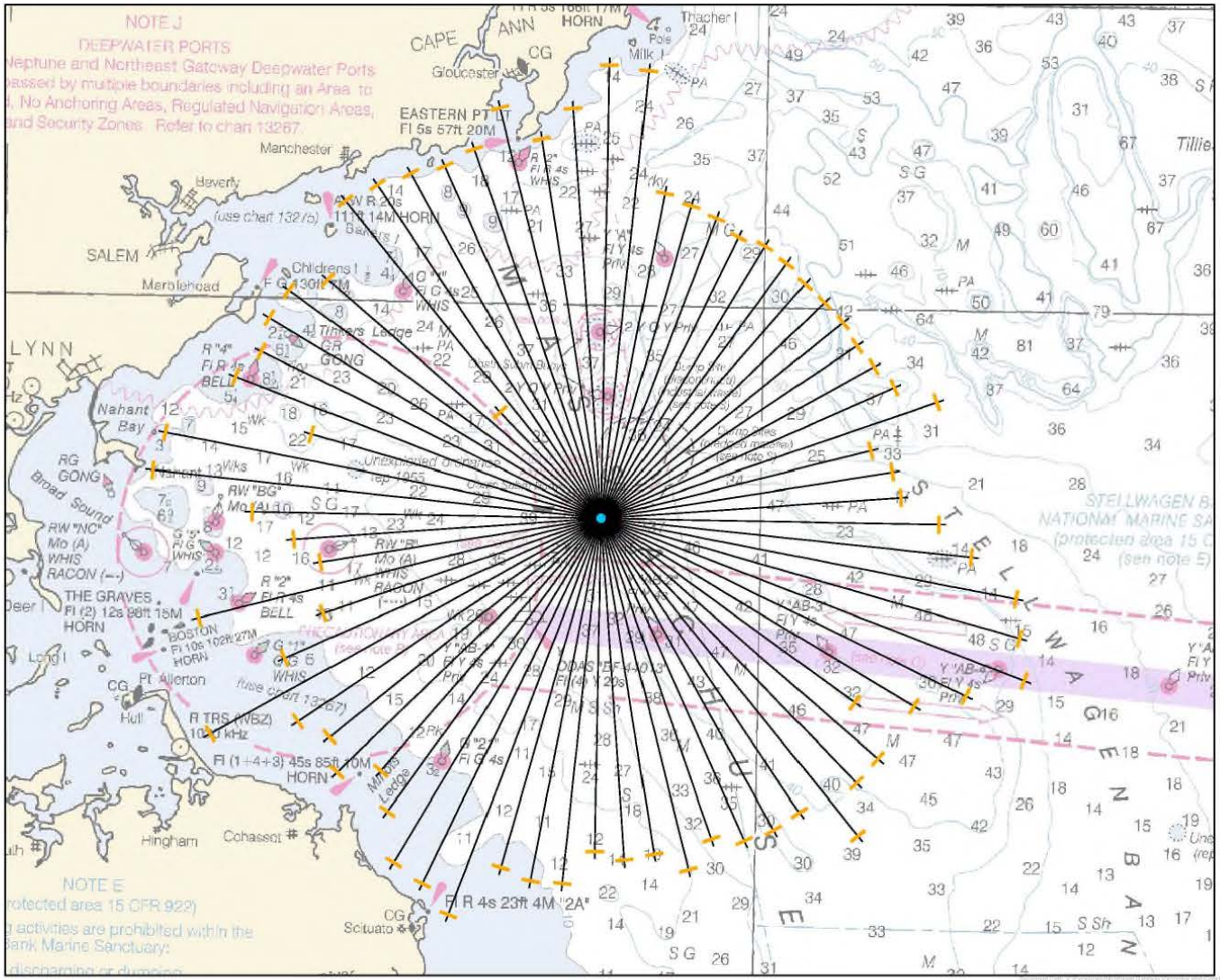


Northeast Gateway
Port Operations
Figure C-4
Received Sound Levels
during
EBRV
Regasification
May 2014

Origin Location
120dB Extent

0 2,000 4,000 6,000 8,000 Feet

0 500 1,000 1,500 2,000 Meters

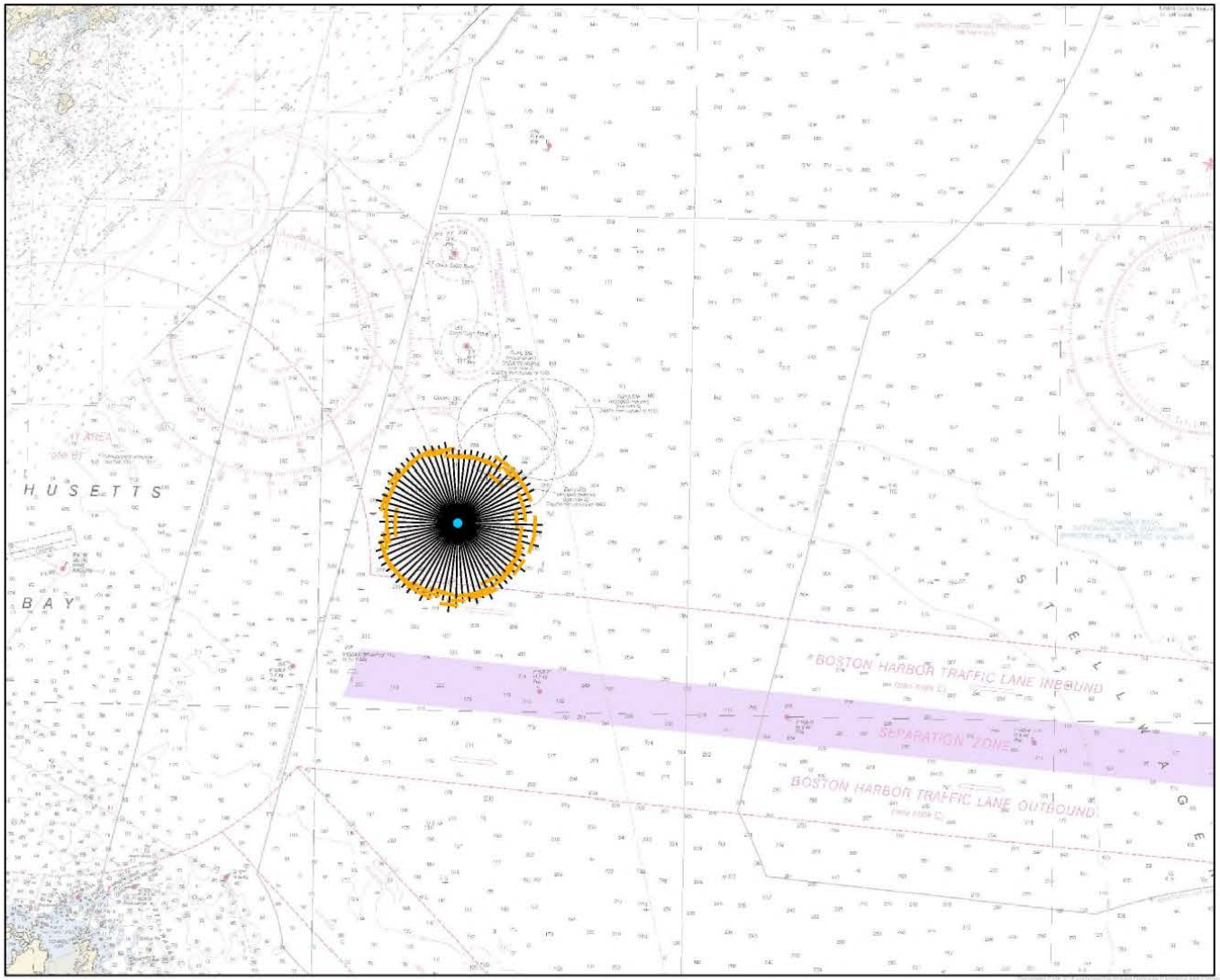


Northeast Gateway
Port Operations
Figure C-5
Received Sound Levels
during Major Construction
Event at Port
Tug and Barge Support
May 2014

Origin Location
120dB Extent

0 1 2 3 4 Nautical Miles

0 1 2 3 4 Miles

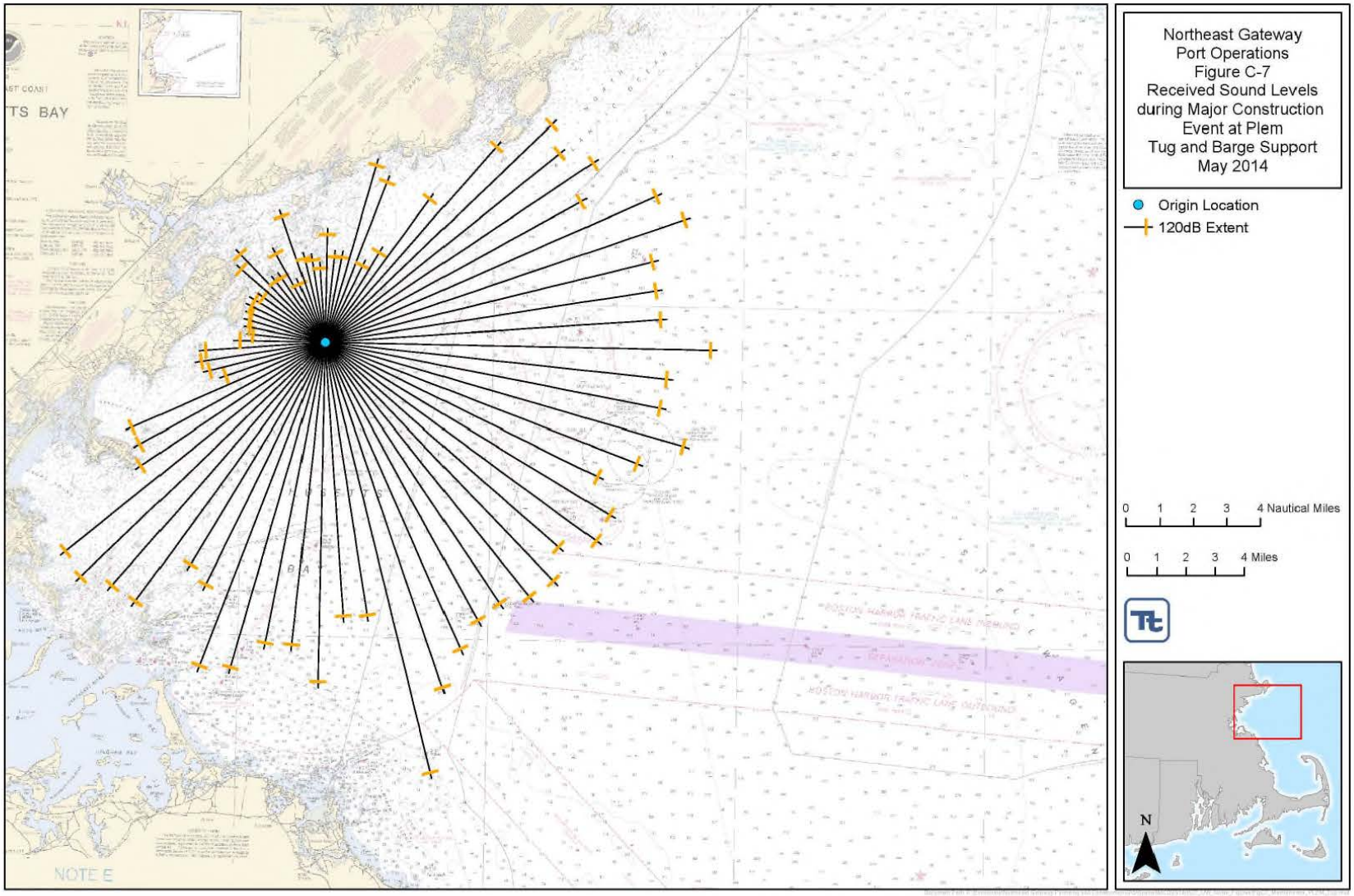


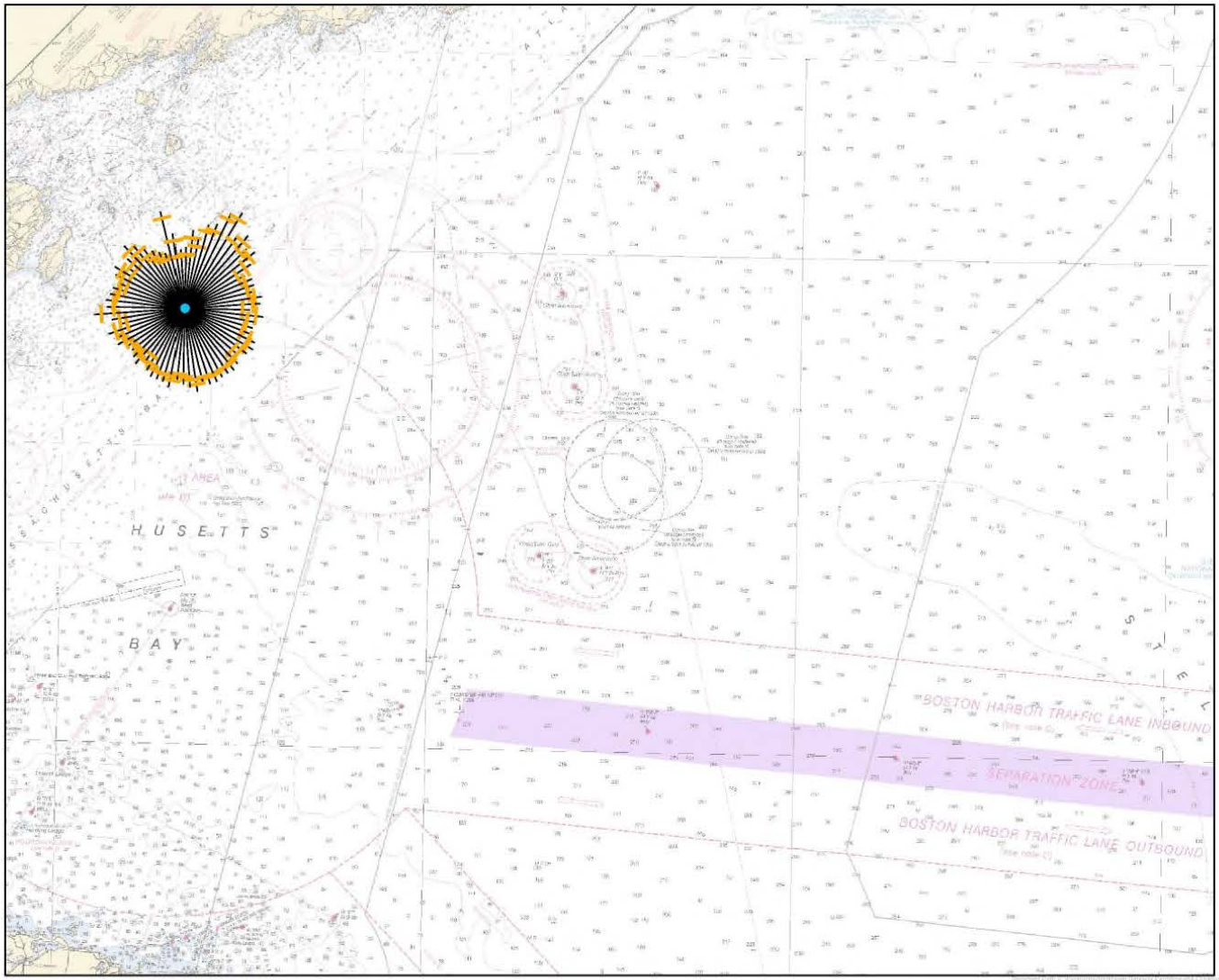
Northeast Gateway
Port Operations
Figure C-6
Received Sound Levels
during Minor Construction
Event at Port
Dive Vessel Support
May 2014

Origin Location
120dB Extent

0 1 2 3 Nautical Miles

0 1 2 3 4 Miles


Northeast Gateway
Port Operations
Figure C-7
Received Sound Levels
during Major Construction
Event at Plem
Tug and Barge Support
May 2014
Origin Location
120dB Extent
0 1 2 3 4 Nautical Miles
0 1 2 3 4 Miles
N
TTS BAY
NOTE E

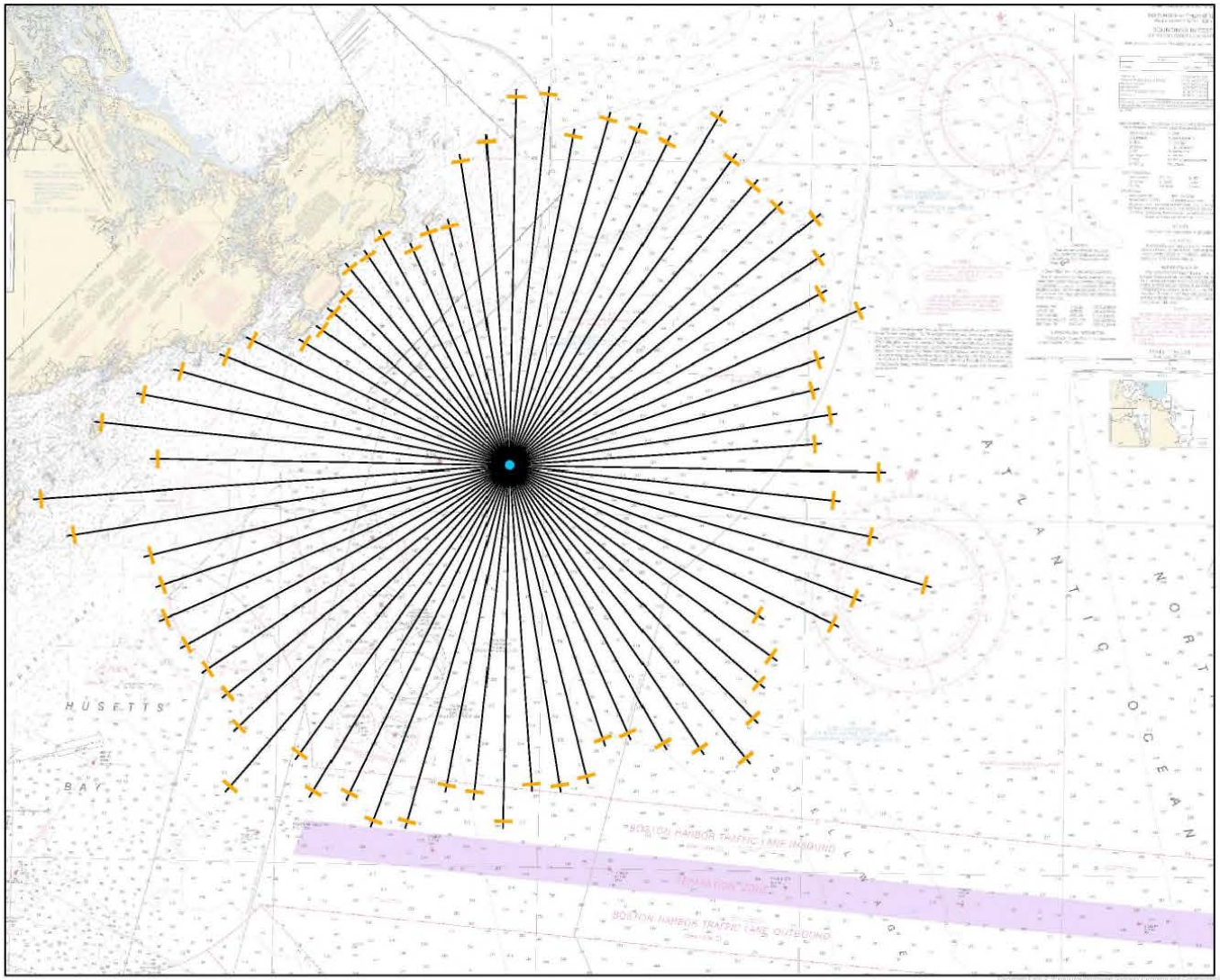


Northeast Gateway
Port Operations
Figure C-8
Received Sound Levels
during Minor Construction
Event at Plem
Dive Vessel Support
May 2014

Origin Location
120dB Extent

0 1 2 3 Nautical Miles

0 1 2 3 4 Miles

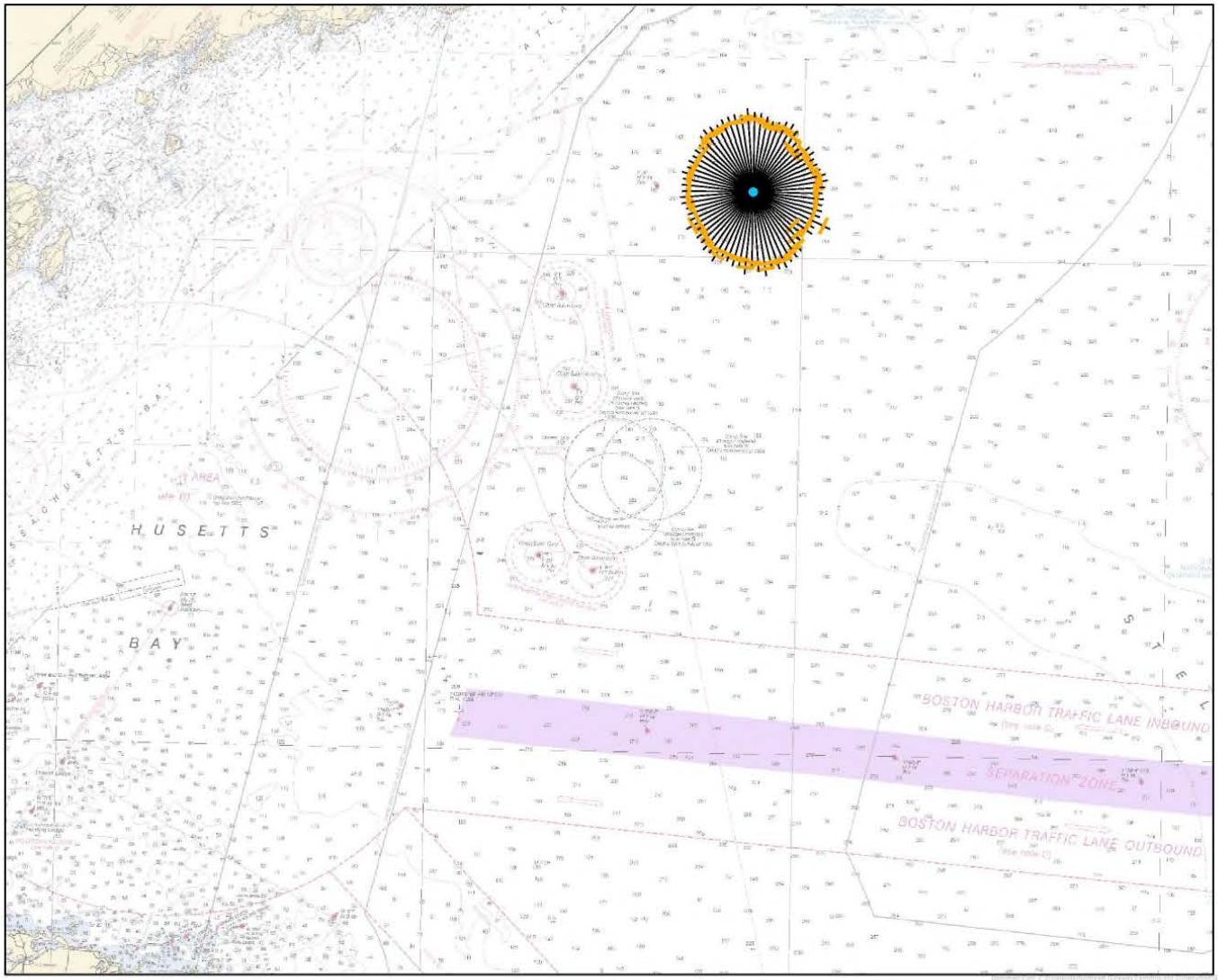


Northeast Gateway
Port Operations
Figure C-9
Received Sound Levels
during
Major Construction Event
at Mid Pipeline
Tug and Barge Support
May 2014

Origin Location
120dB Extent

0 1 2 3 Nautical Miles

0 1 2 3 4 Miles



Northeast Gateway
Port Operations
Figure C-10
Received Sound Levels
during
Minor Construction Event
at Mid Pipeline
Dive Vessel Support
May 2014

Origin Location
120dB Extent

0 1 2 3 Nautical Miles

0 1 2 3 4 Miles

Appendix D

Northeast Gateway Construction Marine Mammal Sightings and Take Summary Report

A summary of marine mammal sightings for the Northeast Gateway® Construction Project have been compiled for data collected between 26 May 2007 and 31 October 2007. There have been six vessels working on the project between this time period with a maximum of three vessels working during any one time period. There were 4 MMOs assigned to each construction vessel and observation was conducted 24 hours per day. Table 1 shows the total number of work days for each vessel and the total number of sightings per month as well as the sightings per observer day per month. Results are shown graphically in figure 1.

Table 1. Monthly sighting summary

Number of Observation Days per vessel (approx.)	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**
Lonestar (Anchored)	**4**	**29**	**0**	**0**	**0**	**0**
Atlantic (Anchored)	**0**	**24**	**31**	**31**	**30**	**31**
Jumbo Javelin (DP)	**0**	**0**	**9**	**27**	**0**	**0**
Agnes Candies (DP)	**0**	**0**	**0**	**19**	**11**	**6**
Island Vanguard (DP)	**0**	**0**	**0**	**13**		**0**
Texas (DP)	**0**	**0**	**0**	**6**	**30**	**30**
TOTAL OBSERVER DAYS	**4**	**53**	**40**	**96**	**74**	**67**
# (#) = Number of sighting per species (number of sightings per observer day)	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**
Humpback	4 (1)	5 (0.09)	10 (0.25)	54 (0.56)	117 (1.58)	42 (0.63)
Fin	0 (0)	2 (0.04)	7 (0.18)	22 (0.23)	27 (0.36)	8 (0.12)
Minke	0 (0)	1 (0.02)	11 (0.27)	6 (0.06)	10 (0.13)	0 (0)
UID Whale	0 (0)	0 (0)	5 (0.13)	27 (0.28)	9 (0.12)	3 (0.04)
AWS Dolphin	0 (0)	0 (0)	0 (0)	1 (0.01)	3 (0.04)	6 (0.09)
Seal (Harbor & Gray)	0 (0)	0 (0)	10 (0.25)	5 (0.05)	1 (0.01)	1 (0.01)
Other Marine Mammal *	1 (0.25)	0 (0)	3 (0.08)	1 (0.01)	0 (0)	0 (0)
Marine Turtle	0	0	0	1	0	0

Number of Observation Days per vessel (approx.)	May	Jun	Jul	Aug	Sep	Oct
Lonestar (Anchored)	4	29	0	0	0	0
Atlantic (Anchored)	0	24	31	31	30	31
Jumbo Javelin (DP)	0	0	9	27	0	0
Agnes Candies (DP)	0	0	0	19	11	6
Island Vanguard (DP)	0	0	0	13		0
Texas (DP)	0	0	0	6	30	30
TOTAL OBSERVER DAYS	4	53	40	96	74	67
# (#) = Number of sighting per species (number of sightings per observer day)	May	Jun	Jul	Aug	Sep	Oct
	(0)	(0)	(0)	(0.01)	(0)	(0)

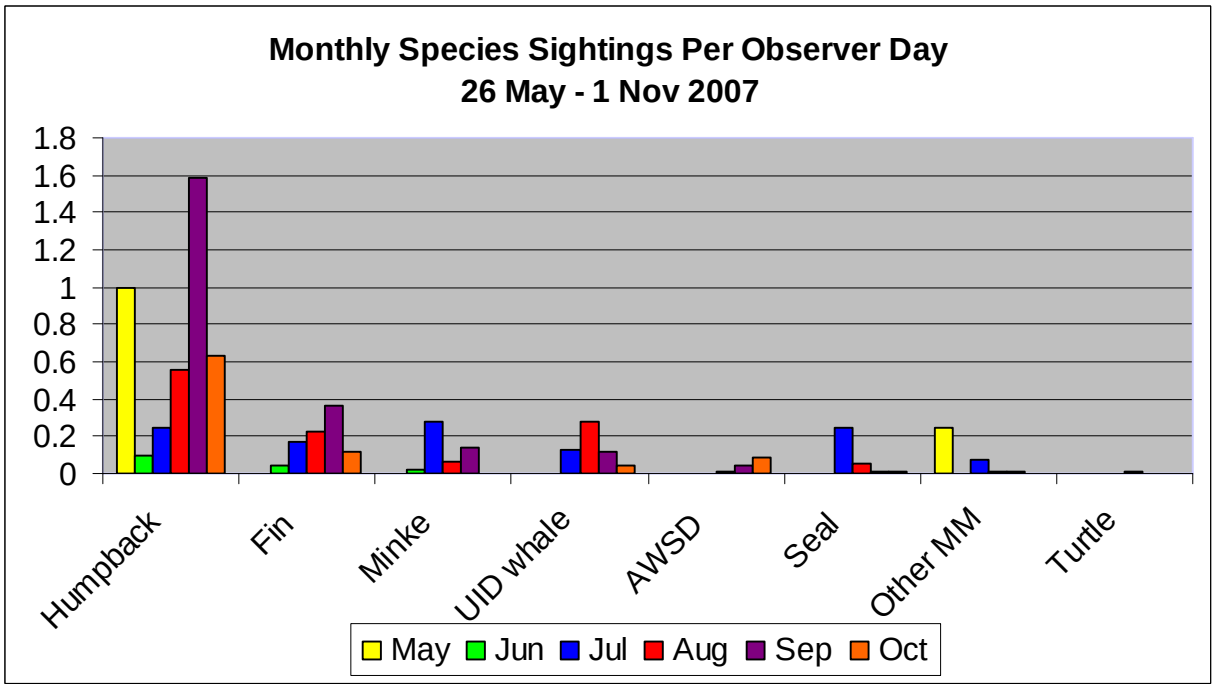


Figure 1. Monthly species sightings per observer day.

Distances were calculated for different categories defined by regulations and biological opinions. Only species defined in the IHA (Fin, Humpback, NARW) were used for these calculations and only those sighting records with a closest vessel distance of 2 miles (3500 yrds) or less. Sightings were summaries in 4 categories. The first category includes any sightings within the general marine mammal exclusion of 100yrds. The second category is any sightings recorded between the outer edge of the general marine

mammal exclusion zone and the outer edge of the NARW exclusion zone (101 – 500yrds). The third category is defined as the outer edge of the NARW exclusion zone to 0.5 miles from the vessel. One-half mile was used as a defining distance because it is mentioned in all regulatory documents as the presumed distance of sufficient visibility for marine mammal observers to detect and identify marine mammals within the project area. Table 2 lists the number of sightings and individuals for each distance category.

During visual observation it is likely that an animal is recorded multiple times, particularly when viewed from different vessels or locations within the project site. Upon examination of the sighting data for animals recorded within 2 miles (3500 yards) of the observer, we determined that sighting records within 30 minutes of one another and within the same general bearing and distance were duplicate records. Records within 500yrds of the vessel had very low (~1.5%) duplication, this duplication came mainly in the number of individuals and not in the number of sighting records. Record duplication increased with distance. We calculated the duplication percentage for all sightings of Fin and Humpback whales recorded at distances of greater than 500yrds from the vessel. We calculated a conservative estimate of duplication for each of the two whale species in the analysis. We estimated that 25% of all fin whale sightings were duplications and 40% of all humpback sightings were likely duplications. The actual duplication number is probably higher. We then calculated the same records for only DP vessels. (Table 3)

Table 2. Summary of distance data for all vessels (Data compiled through 321 Oct 07)

		0-100 yrds	101-500 yrds	501-880 yrds		0.5 miles or less	880-3500 yrds	Total affected area
All Vessels	Description of location	General Exclusion Zone	Exclusion zone to NARW Exclusion zone	NARW exclusion zone to 0.5 mile (corrected with % duplication)	Total for 0.5 miles or less	25% duplication in Fin sightings 40% duplication in HB sightings beyond 500 yrds	0.5 mile to 2 mile (% duplication)	Corrected Numbers from 0 - 2 miles
Fin	*Individuals*	2	12	7 (6)	21	20	35 (26)	46
	Sightings	2	9	6 (5)	17	16	24 (18)	34
Humpback	*Individuals*	30	23	47 (28)	100	81	111 (67)	148
	Sightings	21	16	23 (14)	60	51	52 (31)	82

Table 3. Summary of distance data for DP vessels only (Data compiled through 321 Oct 07)

		0-100 yrds	101-500 yrds	501-880 yrds		0.5 miles or less	880-3500 yrds	Total affected area
DP Vessels Only	Description of location	General Exclusion Zone	Exclusion zone to NARW Exclusion zone	NARW exclusion zone to 0.5 mile (corrected with % duplication)	Total of 0.5 miles or less	25% duplication in Fin sightings 40% duplication in HB sightings beyond 500 yrds	0.5 mile to 2 mile	Corrected Numbers from 0 - 2 miles
Fin	*Individuals*	0	8	4 (3)	12	11	31 (23)	34
	Sightings	0	6	4 (3)	10	9	20 (15)	24
Humpback	*Individuals*	11	17	27 (16)	55	44	71 (43)	87
	Sightings	11	12	12 (7)	35	30	30 (18)	48

Take assessment can be approached in a number of ways, but should only include the DP vessels that utilize thrusters for positioning. Using the 100-yrd and 500-yrd exclusion zones as the location for takes under the IHA:
We have not exceeded the allowance of right whales (0/3)

We have not exceeded the allowance of Fins (0/13)

We have not exceeded the allowance of Humpbacks (11/24)

If we use the assumption that 0.5 miles is the acceptable visual detection distance that can be applied for assessing takes and use only sighting records and not individuals due to probable high duplication in individual numbers
We have not exceeded the allowance for Right Whales (0/3)

We have not exceeded the allowance for Fins (11/13)

We have exceeded the allowance for Humpbacks (30/24)

In the worst case situation where we use 2.0 miles of influence and use the individual animal numbers:
We have not exceeded the allowance for Right Whales (0/3)

We have exceeded the allowance for Fins (34/13)

We have exceeded the allowance of Humpbacks (87/24)

Hopefully this helps out in sorting out the sighting records in relation to takes and other regulatory requirements. Please keep in mind that these numbers are rough and a number of assumptions have been made. There may be minor adjustments made in the final logs after careful review of individual sighting records and field notes. There is likely to be greater differences in the numbers of individuals than the number of sighting records due to duplication and this will increase with distance. Please let me know if you need further information.

Appendix E

Northeast Gateway Operations Marine Mammal Sightings and Take Summary Report 2008

Northeast Gateway® Deepwater Port Incidental Take Statement and Incidental Harassment Authorization Monitoring Report

Summary 2008

In accordance with Condition 12 Annex A of the Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway®) Maritime Administrator of the U.S. Maritime Administration (MARAD) License to Own, Construct, and Operate a Deepwater Port issued to Northeast Gateway® on May 14, 2007, and the National Oceanic and Atmospheric Administration (NOAA) Biological Opinion, Incidental Take Statement (ITS), and Incidental Harassment Authorization (IHA) as amended, Northeast Gateway® is required to monitor and recorded marine mammal and sea turtle sightings and incidences of take that take place while Energy Bridge Regasification Vessels (EBRVs™) are transiting to the Northeast Gateway® Deepwater Port (NEG Port or Port) within the designated Boston Traffic Separation Scheme (TSS), maneuvering within the Port's Area to be Avoided (ATBA), and/or while actively engaging in the use of thrusters. The following is a summary of all marine mammal and sea turtle sitings and potential incidents of take for the 2008 operating year.

Over the 2008 operating period, only two EBRVs™ called on the NEG Port including: the EBRV™ *Excelerate* in February, and the EBRV™ *Excellence* in May. During these events, all actions required under the NOAA-approved Marine Mammal Detection, Monitoring, and Response Plan for Operations of the NEG Port and Pipeline Lateral were implemented as required. Table 1 Summarizes marine mammal and sea turtle sightings and incidences of take that took place while the above listed EBRVs™ were transiting within the designated TSS, maneuvering within the Port's ATBA, and/or while actively engaging in the use of thrusters. As evidenced in Table 1, no incidents of take occurred during the 2008 operating period at the NEG Port.

Table 1: Marine Mammal and Sea Turtle Sightings and Take Summary - 2008

Date	Vessel Name	Observation Period (00:00)	Species[1]	# Sighted	Closest Distance From Vessel	Vessel Activity	# Take
2/23/08	Excelerate	10:43	Right Whale (*Eubalaena glacialis*)	2	≤ 1 mile	Transiting / No Thrusters	0
2/23/08	Excelerate	10:50	Pilot Whale (*Globicephala melas*)	1	≤ 1 mile	Transiting / No Thrusters	0
5/15/08	Excellence	15:30	Dolphin/Porpoise	1	≤ 100 yards	Transiting / No Thrusters	0
5/15/08	Excellence	17:00	Common Dolphin (*Delphinus delphis*)	10+	≤ 50 yards	Transiting / No Thrusters	0
5/15/08	Excellence	17:23	Seal	2	≤ 50 yards	Transiting / No Thrusters	0
5/15/08	Excellence	17:31	Small Whale	2	≤ 500 yards	Transiting / No Thrusters	0
5/15/08	Excellence	17:56	Dolphin/Porpoise	5+	≤ 100 yards	Transiting / No Thrusters	0
5/15/08	Excellence	18:20	Dolphin/Porpoise	10+	≤ 500 yards	Transiting / No Thrusters	0
5/15/08	Excellence	18:28	Finback Whale (*Balaenoptera physalus*)	1	≤ 500 yards	Transiting / No Thrusters	0
5/15/08	Excellence	18:43	Minke Whale (*Balaenoptera acutorostrata*)	2	≤ 500 yards	Transiting / No Thrusters	0
5/15/08	Excellence	19:02	Dolphin/Porpoise	5+	≤ 500 yards	Transiting / No Thrusters	0

Date	Vessel Name	Observation Period (00:00)	Species[1]	# Sighted	Closest Distance From Vessel	Vessel Activity	# Take
5/18/08	Excellence	12:40	Minke or Finback Whale (*Balaenoptera* sp.)	1	≤ 50yards	Moored to Buoy / No Thrusters	0
			Total Sighted:	**44+**		**Total # Takes:**	**0**

[1] Look-out personnel responsible for the monitoring for marine mammals have undergone NOAA-approved marine mammal identification training; however, these individuals do not have the long-term sighting expertise of NOAA-certified Marine Mammal Observers. Therefore the accuracy of the species identification is based solely on the look-out's best guess and a positive identification should not be assumed.

Appendix F

Northeast Gateway Operations Marine Mammal Sightings and Take Summary Report 2009

Northeast Gateway® Deepwater Port Incidental Take Statement and Incidental Harassment Authorization Monitoring Report

Summary 2009

In accordance with Condition 12 Annex A of the Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway®) Maritime Administrator of the U.S. Maritime Administration (MARAD) License to Own, Construct, and Operate a Deepwater Port issued to Northeast Gateway® on May 14, 2007, and the National Oceanic and Atmospheric Administration (NOAA) Biological Opinion, Incidental Take Statement (ITS), and Incidental Harassment Authorization (IHA) as amended, Northeast Gateway® is required to monitor and recorded marine mammal and sea turtle sightings and incidences of take that take place while Energy Bridge Regasification Vessels (EBRVs™) are transiting to the Northeast Gateway ®Deepwater Port (NEG Port or Port) within the designated Boston Traffic Separation Scheme (TSS), maneuvering within the Port's Area to be Avoided (ATBA), and/or while actively engaging in the use of thrusters. The following is a summary of all marine mammal and sea turtle sitings and potential incidents of take for the 2009 operating year.

Over the 2009 operating period, only three EBRVs™ called on the NEG Port including: the EBRV™ *Explorer* in January, February, March, April and May, the EBRV™ *Excellence* in November and December, and the EBRV™ *Express* in December. During these events, all actions required under the NOAA-approved Marine Mammal Detection, Monitoring, and Response Plan for Operations of the NEG Port and Pipeline Lateral were implemented as required. Table 1 Summarizes marine mammal and sea turtle sightings and incidences of take that took place while the above listed EBRVs™ were transiting within the designated TSS, maneuvering within the Port's ATBA, and/or while actively engaging in the use of thrusters. As evidenced in Table 1, a single take by incidental harassment of either a seal or dolphin (species was not identifiable) was reported on February 5, 2009 by the EBRV™ *Explorer*.

Table 1: Marine Mammal and Sea Turtle Sightings and Take Summary - 2009

Date	Vessel Name	Observation Period (00:00)	Species[1]	# Sighted	Closest Distance From Vessel	Vessel Activity	# Take
1/14/07	Explorer	15:30	Unidentifiable	Not Known	≤ 2 miles	Vessel Dropping Anchor	0
2/5/09	Explorer	14:51	Seal or Dolphin	1	≤ 2 miles	Thrusters Engaged	1
3/19/09	Explorer	14:15	Finback Whale	3	> 2 mi	Maneuvering within the ATBA	0
3/19/09	Explorer	14:35	Finback Whale	4	> 2 mi	Maneuvering within the ATBA	0
3/19/09	Explorer	15:15	Finback Whale	2	> 2 mi	Maneuvering within the ATBA	0
3/19/09	Explorer	15:35 - 16:00	Finback Whale	2	≤ 1mi	Maneuvering within Safety Zone	0
3/19/09	Explorer	15:35	Dolphin/Porpoise	4	≤ 1mi	Maneuvering within Safety Zone	0
3/19/09	Explorer	17:00	Dolphin/Porpoise	5	≤ 0.5mi	Connecting to Buoy A (no thruster use)	0

Date	Vessel Name	Observation Period (00:00)	Species[1]	# Sighted	Closest Distance From Vessel	Vessel Activity	# Take
3/19/09	Explorer	17:40	Finback Whale	3	≤ 1mi	Connecting to Buoy A (No thruster use)	0
4/10/09	Explorer	9:00	Pilot Whale	1	≤ 2mi	Heaving Up Anchor (No Thruster Use)	0
4/10/09	Explorer	9:15	Pilot Whale	1	≤ 1mi	Heaving Up Anchor (No Thruster Use)	0
4/10/09	Explorer	9:32	Pilot Whale	2	≤ 1mi	Heaving Up Anchor (No Thruster Use)	0
4/10/09	Explorer	10:55	Pilot Whale	1	≤ 0.5mi	Transiting towards NEG Port	0
4/10/09	Explorer	11:40	Unknown Large Whale	3	≤ 1mi	Transiting towards NEG Port	0
4/10/09	Explorer	11:52	Unknown Small Whale	2	≤ 2mi	Transiting towards NEG Port	0
4/10/09	Explorer	14:25	Unknown Large Whale	2	≤ 2mi	Transiting towards NEG Port	0
5/2/2009	Explorer	14:56	Unknown Small Whale	2	≤ 500yd	Transiting within the TSS	0
5/2/2009	Explorer	16:15	Humpback	1	≤ 1mi	Transiting within the TSS	0
11/7/2009	Excellence	13:30	Unknown Large Whale	1	2 miles	None	0
11/7/2009	Excellence	15:51	Unknown Large Whale	2	2 miles	None	0
12/31/09	Excelerate	07:00	Unidentifiable dolphin/porpoise	1	≤ 200yards	In Transit	0
			Total Sighted:	**42**		**Total # Takes:**	**1**

[1] Look-out personnel responsible for the monitoring for marine mammals have undergone NOAA-approved marine mammal identification training; however, these individuals do not have the long-term sighting expertise of NOAA-certified Marine Mammal Observers. Therefore the accuracy of the species identification is based solely on the look-out's best guess and a positive identification should not be assumed.

Appendix G

Northeast Gateway Operations Marine Mammal Sightings and Take Summary Report 2010

Northeast Gateway® Deepwater Port Incidental Take Statement and Incidental Harassment Authorization Monitoring Report

Summary 2010

In accordance with Condition 12 Annex A of the Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway) Maritime Administrator of the U.S. Maritime Administration (MARAD) License to Own, Construct, and Operate a Deepwater Port issued to Northeast Gateway on May 14, 2007, and the National Oceanic and Atmospheric Administration (NOAA) Biological Opinion, Incidental Take Statement (ITS), and Incidental Harassment Authorization (IHA) as amended, Northeast Gateway is required to monitor and recorded marine mammal and sea turtle sightings and incidences of take that take place while Energy Bridge Regasification Vessels (EBRVs™) are transiting to the Northeast Gateway Deepwater Port (NEG Port or Port) within the designated Boston Traffic Separation Scheme (TSS), maneuvering within the Port's Area to be Avoided (ATBA), and/or while actively engaging in the use of thrusters. The following is a summary of all marine mammal and sea turtle sitings and potential incidents of take for the 2010 operating year.

Over the 2010 operating period, only five EBRVs called on the NEG Port including: the EBRV™ *Excellence* in January, the EBRV *Excelerate* January and February, the EBRV *Explorer* in January through February, the EBRV *Express* in January through February, and the EBRV *Exquisite* in February through March. During these events, all actions required under the NOAA-approved Marine Mammal Detection, Monitoring, and Response Plan for Operations of the NEG Port and Pipeline Lateral were implemented as required. Table 1 Summarizes marine mammal and sea turtle sightings and incidences of take that took place while the above listed EBRVs were transiting within the designated TSS, maneuvering within the Port's ATBA, and/or while actively engaging in the use of thrusters. As evidenced in Table 1, no take by incidental harassment of any species was reported during the 2010 operating period.

Table 1: Marine Mammal and Sea Turtle Sightings and Take Summary - 2010

Date	Vessel Name	Observation Period (00:00)	Species[1]	# Sighted	Closest Distance From Vessel	Vessel Activity	# Take
1/31/10	Express	16:57	Seal	Not Known	≤ 50 yards	Vessel Picking up Forerunner	0
2/8/10	Excelerate	7:00	Right Whale	2	≤ 500 yards	Vessel Drifting	0
2/8/10	Excelerate	9:00	Right Whale	2	≤ 500 yards	Vessel Stopped	0
2/9/10	Excelerate	9:35	Unidentified Large Whale	2	> 2 miles	Vessel Stopped	0
2/13/10	Exquisite	11:12	Common Dolphin	5+	≤ 500 yards	Transiting TSS	0
2/13/10	Exquisite	11:50	Common Dolphin	5+	≤ 500 yards	Transiting TSS	0
2/13/10	Exquisite	12:57	Dolphin/Porpoise	5+	≤ 500 yards	Transiting TSS	0
2/13/10	Exquisite	14:30	Right Whale	3	≤ 1 mile	Transiting TSS	0
2/13/10	Exquisite	15:45	Small Whale	1	> 2 miles	Transiting TSS	0
2/13/10	Exquisite	15:55	Small Whale	5+	> 2 miles	Transiting TSS	0
2/13/10	Exquisite	16:06	Right Whale	3	≤ 1 mile	Transiting TSS	0
2/13/10	Exquisite	16:15	Large Whale	5+	≤ 2 miles	Transiting TSS	0

Date	Vessel Name	Observation Period (00:00)	Species[1]	# Sighted	Closest Distance From Vessel	Vessel Activity	# Take
2/13/10	Exquisite	16:20	Dolphin/Porpoise	5+	≤ 100 yards	Transiting TSS	0
2/13/10	Exquisite	16:38	Large Whale	1	≤ 0.5 mile	Transiting TSS	0
			Total Sighted:	**44**		**Total # Takes:**	**0**

[1] Look-out personnel responsible for the monitoring for marine mammals have undergone NOAA-approved marine mammal identification training; however, these individuals do not have the long-term sighting expertise of NOAA-certified Marine Mammal Observers. Therefore the accuracy of the species identification is based solely on the look-out's best guess and a positive identification should not be assumed.

Appendix H
Northeast Gateway Operations Marine Mammal Sightings and Take Summary Report 2011

TETRA TECH EC, INC.

February 29, 2012

Michael Asaro
NOAA NMFS Northeast Regional Office (NERO)
Ship Strike Coordinator
55 Great Republic Drive
Gloucester, MA 01930

RE: Northeast Gateway® Deepwater Port Incidental Take Statement and Incidental Harassment Authorization Monitoring Report – Summary 2011

Dear Mr. Asaro,

On behalf of Northeast Gateway®, L.P. (Northeast Gateway®) and accordance with Condition 12 Annex A of the Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway) Maritime Administrator of the U.S. Maritime Administration (MARAD) License to Own, Construct, and Operate a Deepwater Port issued to Northeast Gateway on May 14, 2007, and the National Oceanic and Atmospheric Administration (NOAA) Biological Opinion, Incidental Take Statement (ITS), and Incidental Harassment Authorization (IHA) as amended, Northeast Gateway is required to monitor and recorded marine mammal and sea turtle sightings and incidences of take that take place while Energy Bridge Regasification Vessels (EBRVs™) are transiting to the Northeast Gateway Deepwater Port (NEG Port or Port) within the designated Boston Traffic Separation Scheme (TSS), maneuvering within the Port's Area to be Avoided (ATBA), and/or while actively engaging in the use of thrusters.

For the 2011 operating year there were no activities at the NEG Port and therefore no incidents of take or harassment occurred as a result of Port operations.

Should you have any comments or concerns regarding the attached information please do not hesitate to contact me at 617-443-7526.

Sincerely,

Jennifer A. Daniels

Jennifer A. Daniels
Environmental Project Manager
Tetra Tech EC, Inc.

cc: Leila Hatch – Stellwagen Bank National Marine Sanctuary
Shane Guan – NOAA NMFS Office of Protected Resources
Yvette Fields – U.S. Department of Transportation, Maritime Administration
Linden Houston – U.S. Department of Transportation, Maritime Administration
M. A. Prescott – USCG Headquarters
Ernest W. Ladkani - Excelerate Energy, L.P.
Capt. Jeff Havlicek – Northeast Gateway®, L.P.
Christopher Clark – Cornell Laboratory of Ornithology
Chris Tremblay – Cornell Laboratory of Ornithology

160 Federal Street, 3rd Floor, Boston, MA 02110
Tel 617.443.7500 Fax 617.737.3480
www.tteci.com

Appendix I
Northeast Gateway Operations Marine Mammal Sightings and Take Summary Report 2012

April 2, 2013

Michael Asaro
NOAA NMFS Northeast Regional Office (NERO)
Ship Strike Coordinator
55 Great Republic Drive
Gloucester, MA 01930

RE: Northeast Gateway® Deepwater Port Incidental Take Statement and Incidental Harassment Authorization Monitoring Report – Summary 2012

Dear Mr. Asaro,

On behalf of Northeast Gateway®, L.P. (Northeast Gateway®) and accordance with Condition 12 Annex A of the Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway) Maritime Administrator of the U.S. Maritime Administration (MARAD) License to Own, Construct, and Operate a Deepwater Port issued to Northeast Gateway on May 14, 2007, and the National Oceanic and Atmospheric Administration (NOAA) Biological Opinion, Incidental Take Statement (ITS), and Incidental Harassment Authorization (IHA) as amended, Northeast Gateway is required to monitor and record marine mammal and sea turtle sightings and incidences of take that occur while Energy Bridge Regasification Vessels (EBRVs™) are transiting to the Northeast Gateway Deepwater Port (NEG Port or Port) within the designated Boston Traffic Separation Scheme (TSS), maneuvering within the Port's Area to be Avoided (ATBA), and/or while actively engaging in the use of thrusters.

For the 2012 operating year there were no activities at the NEG Port and therefore no incidents of take or harassment occurred as a result of Port operations.

Should you have any comments or concerns regarding the attached information please do not hesitate to contact me at 617-443-7526.

Sincerely,

Jennifer A. Daniels
Environmental Project Manager
Tetra Tech, Inc.

cc: Leila Hatch – Stellwagen Bank National Marine Sanctuary
Shane Guan – NOAA NMFS Office of Protected Resources
Yvette Fields – U.S. Department of Transportation, Maritime Administration
Linden Houston – U.S. Department of Transportation, Maritime Administration
M. A. Prescott – USCG Headquarters
Ernest W. Ladkani - Excelerate Energy, L.P.
Capt. Jeff Havlicek – Northeast Gateway®, L.P.
Christopher Clark – Cornell Laboratory of Ornithology
Chris Tremblay – Cornell Laboratory of Ornithology

Tetra Tech
160 Federal Street, 3rd Floor, Boston MA, 02110
Tel 617.443.7500 Fax 617.737.3480 www.tetratech.com

Appendix J
Northeast Gateway Operations Marine Mammal Sightings and Take Summary Report 2013

March 14, 2014

Michael Asaro
NOAA NMFS Northeast Regional Office (NERO)
Ship Strike Coordinator
55 Great Republic Drive
Gloucester, MA 01930

RE: Northeast Gateway® Deepwater Port Incidental Take Statement and Incidental Harassment Authorization Monitoring Report – Summary 2013

Dear Mr. Asaro,

On behalf of Northeast Gateway®, L.P. (Northeast Gateway®) and accordance with Condition 12 Annex A of the Northeast Gateway® Energy Bridge™, L.P. (Northeast Gateway) Maritime Administrator of the U.S. Maritime Administration (MARAD) License to Own, Construct, and Operate a Deepwater Port issued to Northeast Gateway on May 14, 2007, and the National Oceanic and Atmospheric Administration (NOAA) Biological Opinion, Incidental Take Statement (ITS), and Incidental Harassment Authorization (IHA) as amended, Northeast Gateway is required to monitor and record marine mammal and sea turtle sightings and incidences of take that occur while Energy Bridge Regasification Vessels (EBRVs™) are transiting to the Northeast Gateway Deepwater Port (NEG Port or Port) within the designated Boston Traffic Separation Scheme (TSS), maneuvering within the Port's Area to be Avoided (ATBA), and/or while actively engaging in the use of thrusters.

For the 2013 operating year there were no activities at the NEG Port and therefore no incidents of take or harassment occurred as a result of Port operations.

Should you have any comments or concerns regarding the attached information please do not hesitate to contact me at 617-443-7521.

Sincerely,

Timothy Feehan
Environmental Project Manager
Tetra Tech, Inc.

cc: Leila Hatch – Stellwagen Bank National Marine Sanctuary
Shane Guan – NOAA NMFS Office of Protected Resources
Yvette Fields – U.S. Department of Transportation, Maritime Administration
Linden Houston – U.S. Department of Transportation, Maritime Administration
Roddy Bachman – USCG Headquarters
Ernest W. Ladkani - Excelerate Energy, L.P.
Capt. Jeff Havlicek – Northeast Gateway®, L.P.
Christopher Clark – Cornell Laboratory of Ornithology
Chris Tremblay – Cornell Laboratory of Ornithology

Tetra Tech
160 Federal Street, 3rd Floor, Boston MA, 02110
Tel 617.443.7500 Fax 617.737.3480 www.tetratech.com

Appendix K
PMMP

PREVENTION, MONITORING AND MITIGATION PLAN

Northeast Gateway Energy Bridge Deepwater Port

And

Northeast Gateway Pipeline Lateral

Prepared for:

Northeast Gateway Energy Bridge, L.L.C.
1450 Lake Robbins Drive, Suite 200
The Woodlands, TX 77380

And

Algonquin Gas Transmission, LLC
890 Winter Street, Suite 300
Waltham, MA 02451

Prepared by:

Tetra Tech EC Inc.
160 Federal Street
Boston Massachusetts 02110

June 2010

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring, and Mitigation Plan

Introduction

In accordance with Condition 12 of Annex A to the Maritime Administrator of the U.S. Maritime Administration (MARAD) License to Own, Construct, and Operate a Deepwater Port issued to Northeast Gateway®, LP (Northeast Gateway) on May 14, 2007, and the Natural Gas Act Section 7(c) Federal Energy Regulatory Commission (FERC) Certificate of Public Convenience and Necessity (Certificate) for the Northeast Gateway Pipeline Lateral (Pipeline Lateral) issued to Algonquin Gas Transmission Company (AGT), now a subsidiary of Spectra Energy Corp on March 16, 2007, Northeast Gateway and AGT, in cooperation with MARAD, the U.S. Coast Guard (USCG), the National Oceanic and Atmospheric Administration (NOAA), the Commonwealth of Massachusetts and other Federal and State agencies has established a program for preventing, monitoring, and mitigating environmental impacts (PMM Program or PMMP). All operation and maintenance activities associated with Northeast Gateway's Deepwater Port (NEG Port or Port) and the Pipeline Lateral will be consistent with the October 2006 Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR) as required under the National Environmental Policy Act (NEPA).

As required, the PMMP is comprised of all Federal, State, and Local environmental permits, certificates, licenses, and approved monitoring and mitigation plans obtained by Northeast Gateway and AGT to support the collective pre-construction, construction, post-construction, operation, and maintenance and repair of the NEG Port and Pipeline Lateral (collectively referred to as the Project). To facilitate use, the PMMP has been divided into separate Preconstruction/Construction, Operations, and Repair and Maintenance sections that have been categorized into the following major project-specific environmental resource areas of concern:

- Biological Resources (Benthic, Ichthyoplankton, Marine Mammals, Sea Turtles, Fish, Lobsters)
- Air Quality
- Geological Resources
- Water Quality
- Cultural Resource
- Socioeconomic Resources
- Ocean Use, Recreation, and Visual Resources

The PMMP also provides a general list of conditions required for ensuring overall environmental protection and compliance. Within each of the environmental resource categories, the PMMP provides a summary description of potential environmental impact(s) and associated mitigation requirement(s). The PMMP also identifies which Federal, State, and Local environmental permits, certificates, and licenses require mitigative action(s) for the specified impact(s).

It is important to note that the PMMP is a *summary* of all the environmental requirements and required mitigation and monitoring actions, and is intended to serve as a guidance document for Project participants and agencies to help facilitate the identification and evaluation of critical resource environmental monitoring, mitigation, and reporting needs throughout all phases of the

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Project. As such, the PMMP incorporates herein by reference all federal, state, and local permits, certificates, and licenses as well as the agency approved mitigation and monitoring plans that have been issued or developed for the Project. Table 1 lists the permits and approvals relied upon.

At all times the issued and approved permits, licenses, certificates, and mitigation and monitoring plans should be used in the final establishment of environmental mitigation and monitoring actions as well as the determination of compliance.

Table 1
List of Permits, Approval and Plans

Federal Permits and Approvals	
A	MARAD License
B	FERC Certificate
C	ACOE Section 10/404 Permit
D	EPA Title 1 Minor Source Permit
E-1	EPA NPDES Floodwater Permit
E-2	EPA NPDES Operations Permit
F	MMS Pipeline ROW
G	Amended NMFS Biological Opinion and Incidental Take Statement
H	Amended NMFS Incidental Harassment Authorization
State Permits and Approvals	
I	MEPA Certificate
J	Chapter 91 Waterways License
K	Water Quality Certificate
L	Pipeline Lateral CZM Certification
M	DWP CZM Certification
N	RIDEM Air permit
O	SHPO/MUBAR correspondence
P-1	SBNMS Permit-2007-002
P-2	SBNMS Permit-2007-002-A1
Local Approvals	
Q	Beverly Order of Conditions
R	Manchester–by-the Sea Order of Conditions

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

S	Marblehead Order of Conditions
T	Salem Order of Conditions
U	Weymouth Order of Conditions

Plans

V	FERC Implementation Plan
W-1	Pre-Construction Ichthyoplankton Monitoring Program
W-2	Ichthyoplankton and Water Quality Operational Monitoring Plan
X-1	Marine Mammal Detection, Monitoring, and Response Plan – Construction
X-2	Marine Mammal Detection, Monitoring, and Response Plan – Operation and Maintenance
Y	Marine Mammal Observer Protocol
Z	Construction Contingency Plan and Reporting Procedures
AA	Pipeline Lateral Final Environmental Monitoring Plan
BB	NEG Spill Response Plan and Garbage Management
CC	Unanticipated Discoveries Plan
DD	Horizon SPCC Plan
EE	Algonquin's Erosion Control Plan
FF	Marine Communications Plan

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
Biological Resources (Benthic, Ichthyoplankton, Marine Mammals, Sea Turtles, Fish, Lobsters)					
BIO-R-1	Repair and Maintenance	IHA and associated amendments ITS and associated amendments BO and associated amendments MARAD License - Annex A MEPA Certificate NMSA Section 304 (d) Recommendations Marine Mammal Detection, Monitoring and Response Plan – Annex W-2	Repair and maintenance activities may result in the incidental take/harassment of North Atlantic right whales, other marine mammals, and sea turtles.	Northeast Gateway, AGT, and other associated contractors will limit planned and, to the extent possible, unplanned repair and maintenance activities such that they avoid peaks in whale abundance.	Northeast Gateway, AGT, and other associated contractors will restrict repair and maintenance activities to the period between May 1 and November 30 so that disturbances including acoustic sound disturbance to the North Atlantic right whale can largely be avoided. In the event of unplanned/emergency repair work that cannot be scheduled during the preferred May 1 through November 30, all work will comply with the additional mitigation measures specified in the Operations and Maintenance MMDMRP (included as appendix X-2 to this PMMP) for work taking place during the months of December through April. These conditions include: • shutting down procedures; • a crew marine mammal monitoring and mitigation training program; and • speed and departure requirements and restrictions; • right whale sightings updates prior to departures A copy of the approved plan will be kept on each affected vessel at all times during repair/maintenance activities. Northeast Gateway and AGT will provide the USCG, MARAD NMFS Headquarters Office of the Protected Resources (Shane Guan, 301-713-2289, shane.guan@noaa.gov), NMFS Northeast Regional Office (Michael Asaro, 978-282-8469, michael.asaro@noaa.gov), and SBNMS (Leila Hatch, 781-545-8026, leila.hatch@noaa.gov) with a minimum of 30 days notice prior to any planned repair and/or maintenance activity. For any unanticipated repair/maintenance activity, Northeast Gateway will notify the agencies as soon as practicable after it is determined that repair work must be conducted. Northeast Gateway will continue to keep the agencies apprised of repair work plans as further details (e.g., the time, location, and nature

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					of the repair) become available. A final notification will be provided to agencies 72 hours prior to crews being deployed into the field. All planned, and to the extent possible, unplanned repair and maintenance work will be conducted during daylight hours and during periods of good visibility.
				Anchor-moored dive vessel shall be used for repair and maintenance activities to the greatest extent possible.	Should DP systems be used for maintenance and repair activities and/or activities will emit noise with a source level of 139dB re 1 mircoPa @ 1 m, Northeast Gateway, AGT, and other associated contractors will comply with the terms and conditions of the Operation and Maintenance MMDMRP, included as appendix X-2 to this PMMP. A copy of the approved plan will be kept on each affected repair/maintenance vessel at all times during repair/maintenance activities.
				Should DP systems be used for maintenance and repair activities and/or activities will emit noise with a source level of 139dB re 1 mircoPa @ 1 m, Northeast Gateway, AGT, and other associated contractors will visually monitor for the presence of the North Atlantic right whales, other marine mammals, and sea turtles within and in the vicinity of the repair/ maintenance area(s).	Northeast Gateway, AGT, and other associated contractors will comply with the terms and conditions for the use of marine mammal observers as directed in the Operation and Maintenance MMDMRP, included as appendix X-2 to this PMMP. A copy of the approved plan will be kept on each affected vessel at all times during repair/maintenance activities.

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
				Should DP systems be used for maintenance and repair activities and/or activities will emit noise with a source level of 139dB re 1 mircoPa @ 1 m, Northeast Gateway, AGT, and other associated contractors will acoustically monitor for the presence of the North Atlantic right whales and other protected marine mammals within and in the vicinity of the repair/ maintenance area(s).	All maintenance/repair activities that will emit source noise levels above 139 dB re 1 µPa @ 1 m or higher will require the installation of a passive acoustic detection system for detecting marine mammals within the project area, and provide early warnings for potential occurrence of right whales and other marine mammals in the vicinity of the project area. The number of passive acoustic detection buoys installed around the activity site will be commensurate with the type and spatial extent of maintenance/repair work required, but must be sufficient to detect vocalizing right whales within the 120-dB impact zone. Empirically measured source level data from the acoustic recording units deployed in the Port and/or Pipeline maintenance and repair area will be provided to NOAA within a reasonable timeframe. Cornell University, NMFS/NOAA approved bioacoustics technician(s), will be responsible for monitoring and disseminating AB data to the marine mammal environmental coordinator and associated MMOs. The bioacoustics technician will notify the marine mammal environmental coordinator of all detected vocalizations. All work will comply with the terms and conditions of the Operations and Maintenance MMDMRP, included as appendix X-2 to this PMMP. A copy of the approved plan will be kept on each affected repair/maintenance vessel at all times during repair/maintenance activities.
				Repair and maintenance activities will be suspended to prevent the incidental take/harassment of North Atlantic right whales, other marine mammals, or sea turtles to the extent practicable.	All repair and maintenance activities will be suspended immediately (unless divers are in the water or a remotely operated vehicle [ROV] is deployed) if a dead or injured right whale is found in the vicinity of the of the repair/ maintenance area(s). In the event that a whale is visually observed within the 2-mile (3.31-km) ZOI of a DP vessel or other vessel that has shown to emit noise with source level in excess of 139 dB re I microPa @ 1 m, the MMO will notify the repair/maintenance crew to minimize the use of thrusters until the animal has left the ZOI,

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					unless there are divers in the water or a ROV is deployed. DP vessel captains will focus on reducing thruster power to the maximum extent practicable, taking into account vessel and diver safety, during all repair and maintenance activities. Vessel captains will shut down thrusters whenever they are not needed. In the event that a marine mammal is visually observed within 0.5 mi (0.8 km) of a repair or maintenance vessel, the vessel superintendent or on-deck supervisor shall be notified immediately. The vessel's crew shall be put on a heightened state of alert and the marine mammal shall be monitored constantly to determine if it is moving toward the repair or maintenance area. Repair/maintenance vessel(s) must cease any movement and/or cease all activities that emit noises with source level of 139 dB re 1 microPa @ 1 m or higher when a right whale is sighted within or approaching at 500 yd (457 m) from the vessel or when a marine mammal other than a right whale is sighted within or approaching at 100 yd (91 m) from the vessel. Repair and maintenance work may resume after the marine mammal is positively reconfirmed outside the established zones (500 yd [457 m]) or 30 minutes have passed without a redetection. Any vessels transiting the maintenance area, such as barges or tugs, must also maintain these separation distances. Conditions regarding suspension of repair /maintenance activities are included in the Operation and Maintenance MMDMRP (see appendix X-2). A copy of the approved plan will be kept on each affected vessel at all times during repair and/or maintenance activities.

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
				To the extent possible Northeast Gateway, AGT, and other associated contractors will minimize the intensity of sound sources.	Operations involving excessively noisy equipment (source level exceeding 139 dB re 1µPa @ 1 m) will "ramp-up" sound sources, allowing whales a chance to leave the area before sounds reach maximum levels. Northeast Gateway, AGT, and other associated contractors will maintain equipment to manufacturers' specifications, including any sound-muffling devices or engine covers in order to minimize noise effects. Contractors will utilize noisy equipment only as needed and turn off equipment when not in operation. Contractors will be required to utilize equipment and implement procedures that minimize noise. The use of DP thrusters shall be minimized to the extent reasonably possible.
				To the extent possible Northeast Gateway, AGT, and other associated contractors will utilize the International Maritime Organization (IMO)-approved Boston Traffic Separation Scheme (TSS).	As appropriate, vessels shall utilize the newly-configured and International Maritime Organization (IMO)-approved Boston TSS on their approach to and departure from the repair/maintenance area at the earliest practicable point of transit,
				Vessels operating to support the repair and maintenance will consult recent right whale sighting information prior to entering into areas where the North Atlantic right whale is known to occur.	All vessels operating in areas where the North Atlantic right whale is known to occur shall obtain the latest right whale sighting information via the NAVTEX, MSR, SAS, NOAA Weather Radio, or other available means prior to repair and maintenance activities to determine if there are right whales present in the work area.

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
				Vessels operating to support the repair and maintenance will be subject to speed and distance requirements in the vicinity of North Atlantic right whales and other marine mammals and/or while traversing known habitats for these species.	Repair and maintenance vessels shall not approach closer than 500 yds (457 m) from North Atlantic right whales and 100 yds (91 m) from all other marine mammals to the extent physically feasible given navigational constraints. In addition, when approaching and departing the project area, vessels shall be operated so as to remain at least 1 km away from any visually detected North Atlantic right whale. All repair and maintenance vessels greater than or equal to 300 gross tons will maintain speeds of 10 knots or less at all times, unless an emergency situation require speeds greater than 10 knots. All deviations from these speed restrictions will be reported to the NOAA Fisheries Northeast Region Office (NERO) Ship Strike Coordinator and the NOAA National Marine Sanctuary Program (NMSP)/ Stellwagen Bank National Marine Sanctuary (SBNMS). Conditions whereby vessel operators can deviate from required speed restriction are defined in the Operation and Maintenance MMDMRP (see appendix X-2). Vessels transiting through the Cape Cod Canal and Cape Cod Bay between January 1 and May 15 must reduce speeds to 10 knots or less and follow the recommended routes charted by NOAA/NMFS to reduce interactions with right whales. In the unlikely event the Cape Cod Canal is closed during repair and/or maintenance period, the repair/maintenance vessels will transit around Cape Cod following the IMO approved Boston Traffic Separation Scheme (TSS) and adhere to the requirements established for the operation of Energy Bridge Regasification Vessels (EBRVs™) when transiting to the Port. Refer to the IHA and associated amendments (appendix H) or MARAD License – Annex A (appendix A) for transit restrictions associated with EBRVs. Vessels will reduce transit speed to 10 knots or less (unless in an emergency situation) in the following sensitive resource areas: • Year round for EBRVs and between March 1 and April 30 for

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					all other vessels in the Off Race Point Seasonal Management Area (SMA), • between April 1 and July 31 in the Great South Channel SMA, • between January 1 and May 15 in all waters in the Cape Cod Bay SMA, extending to all shorelines of Cape Cod Bay, with a northern boundary of 42˚12'N latitude, • between November 15 and April 15 in the Southeast U.S. SMA, and • between November 1 and April 30 in the Mid-Atlantic SMA Specific coordinates for these areas are listed in the MARAD License – Annex A (appendix A) and the Operation and Maintenance MMDMRP (appendix X-2) of this PMMP. Vessels less than 300 GT traveling between the shore and the project area that are not generally restricted to 10 knots will contact the Mandatory Ship Reporting (MSR) system, the Sighting Advisory System, or the project site before leaving shore for reports of active DMAs and/or recent right whale sightings and, consistent with navigation safety, restrict speeds to 10 knots or less within 8 nm of any sighting location, when traveling in any of the SMAs or when traveling in any active dynamic management area (DMA). In such cases where speeds in excess of the 10 knot maximum for an emergency situation, as defined in Section 2.0 of this PMMP are required, each such deviation shall be documented in the logbook of the vessel and, depending on investigation, legal and security restrictions, reported at the conclusion of the emergency situation to the NMFS Northeast Regional Office (NMFS/NERO) Ship Strike Coordinator and the NOAA staff at SBNMS.

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
				Any material that has the potential to entangle marine mammals and sea turtles (e.g., anchor lines, cables, rope or other construction debris) will only be deployed as needed and appropriate measures will be taken to minimize the chance of entanglement.	Slack will be taken out of potentially entangling material. If necessary, knotless and non-floating lines will be used on repair/maintenance vessels. Repair/maintenance vessel anchors will have pennant lines (cables) supported by anchor buoys to enable the tugs to relocate anchors. Northeast Gateway, AGT, and other associated contractors will remove any materials that have the potential to entangle marine mammals or sea turtles from the construction area immediately once they no longer required to support repair/maintenance activities. In the event that any material appears likely to entangle marine mammals or sea turtles, such material will be removed from the water immediately unless such action jeopardizes the safety of the vessel and crew as determined by the Captain of the vessel. In the event that a marine mammal or sea turtle becomes entangled, the marine mammal coordinator and/or MMO will notify MARAD, USCG, NOAA/NMFS (if outside the SBNM), and NMSP and SBNMS staff (if inside the SBNMS) immediately so that a rescue effort may be initiated.
				During maintenance and repair Northeast Gateway, AGT, and other associated contractors will provide reports of all marine mammal monitoring activities.	All sightings of North Atlantic right whales must be reported to and NMFS as soon as possible. Additionally, all live right whale sightings should be reported to the SAS)right whale sighting hotline, 978-585-8473), while all reports of injured/entangled/ ship struck whales should be reported to the USCG (USCG 1st District Command Center, 800-848-3942). Contact information for these agencies will also be included in the Amended BO and ITS as well as the Operation and Maintenance MMDMRP (see appendix G and appendix X-2, respectively). Status reports will be provided to NOAA/NMFS utilizing standard reporting procedures as identified in the IHA and associated amendments (see appendix H). All vessels will report their activities to the mandatory reporting section of the USCG to remain apprised of North Atlantic right

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					whale movements within the maintenance and repair area. All vessels entering the Mandatory Ship Reporting Area (MSRA) will report their activities to WHALESNORTH. Vessel operators will contact the USCG by email or telex. If they are unable to use satellite communications equipment, they will contact the USCG Communications area Master Station Chesapeake, VA. The appropriate contact information for reporting is included in the Amended BO and ITS (see appendix G). During the maintenance and repair of Port components, weekly status reports will be provided to NOAA and other pertinent agencies (USCG, MAARAD, NMFS, SBNMS) using standardized reporting forms. The weekly reports will include data collected for each distinct marine mammal species observed in the repair/maintenance area during the period that maintenance and repair activities were taking place. Specific details to be included in these weekly reports are listed in the Operation and Maintenance MMDMRP (appendix X-2) of this PMMP. An annual report on marine mammal monitoring and mitigation must be submitted to NMFS Office of Protected Resources and NMFS NERO within 90 days after expiration of the IHA (see the IHA and associated amendments [appendix H] for the items to be included in the annual report).
BIO-R-2	Repair and Maintenance	MEPA Certificate Water Quality Certification NOAA/NMFS EFH consultation MARAD License - Annex A	Repair and maintenance of the Pipeline Lateral and Flowlines could impact Essential Fish Habitat (EFH) and benthic habitat.	NEG and AGT will ensure that impacts on EFH and benthic habitat from repair and maintenance of the Pipeline and Flowlines are avoided, minimized, and mitigated through monitoring and implementing appropriate techniques as used during construction.	Routine repair and maintenance will be restricted to between the months of May and November. In the event of unplanned/emergency repair work that cannot be scheduled during the preferred May 1 through November 30, all work will comply with the additional mitigation measures specified in the Operations and Maintenance MMDMRP (included as appendix X-2 to this PMMP) for work taking place during the months of December through April. As necessary, to minimize habitat disturbance due to anchor sweep from a maintenance/repair support vessel, mid-line buoys

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
		ACOE Section 10/404 Permit MassDEP Chapter 91 Permit Beverly Order of Conditions			shall be used on anchor cables such that no more than 600 feet of cable is in contact with the seafloor. If excavation activities are required during a maintenance and repair event, to the extent possible excavated bottom sediments will be returned to the excavated area upon completion of the maintenance/repair event so that benthic communities can reestablish in the shortest time possible. Should it become necessary to use backfill materials to support a maintenance/repair activity, no imported backfill will be used, except for those previously approved in support of construction as outlined in the ACEO Section 10/404 Permit (see appendix C) and the Water Quality Certificate (see appendix K). The placement of such materials (i.e., concrete mats [“CC mats”], sand bags [in biodegradable bags], and rocks) will be conducted in accordance with the methods outlined and approved for construction in the Construction Contingency Plan and Reporting Procedures (see appendix Z). If imported sediments are required, the physical nature of the imported sediments will match the existing bottom conditions to the extent practical. To ensure protection of EFH, if a repair/maintenance activity requires the placement of additional fill material not previously authorized under the ACOE 10/404 Permit or the Water Quality Certificate the requests for use of such additional material must be coordinated with NOAA/NMFS. Depending on the magnitude of the maintenance/repair activity NEG and AGT will negotiate with federal, state and local agencies concerning the need for post repair benthic monitoring to verify benthic community recovery within the disturbed area. Protocols for conducting post-repair monitoring would be similar to those outlined in the NEG Pipeline Lateral Final Environmental Monitoring Plan (EMP) included as appendix AA to this PMMP. Restoration and reporting for maintenance/repair activities will

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					be consistent with the terms and conditions outlined in the Construction Contingency Plan and Reporting Procedures included as appendix Z to this PMMP.
BIO-R-3	Repair and Maintenance	MARAD License – Annex A	Artificial light can have adverse impacts on migratory birds.	During repair and maintenance lighting will be used in accordance with Federal regulations and restrictions will be applied to minimize adverse effects.	Lighting will be limited to the number of lights and wattage necessary to perform repair and maintenance activities. Lights used to illuminate vessel decks will be directed downward to maximize deck illumination and reduce upward illumination. Once repair and maintenance activity has been completed, all lights used only for that activity shall be extinguished.
Geological Resources					
GEO-R-1	Repair and Maintenance	MassDEP - Chapter Water Quality Certificate MARAD License - Annex A ACOE Section 10/404 Permit MEPA Certificate	Repair and maintenance activities could result in the alteration of the sea floor.	NEG will choose repair and maintenance methods, similar to construction methods, which will minimize repair and/or maintenance time and reduce impacts to the sea floor.	Maintenance/repair activities as appropriate will comply with Standard Waterways Dredging Conditions included in the MassDEP Chapter 91 Permit (see appendix J). If jetting is required to support excavation during a maintenance/repair activity, backfilling will utilize diver-placed sandbags (and/or concrete mats) or, depending on the operational requirements of the site, importation of sand or rock placed by tremie tube. No imported backfill material will be dumped from vessels on the surface. In areas where imported sediments are required, the physical nature of the imported sediments will match the existing bottom conditions to the extent practical. As necessary, to minimize disturbance due to anchor sweep from a maintenance/repair support vessel, mid-line buoys shall be used on anchor cables such that no more than 600 feet of cable is in contact with the seafloor. If during repair and maintenance a previously unknown geological hazard or hazardous waste site is found, work will immediately cease in the affected area and NEG and Algonquin will notify MARAD and the USCG of the discovery. MARAD will initiate the Federal and State coordination required to evaluate the potential site to determine how to proceed. Restoration and reporting for maintenance/repair activities will

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					be consistent with the terms and conditions outlined in the Construction Contingency Plan and Reporting Procedures included as appendix Z to this PMMP.
GEO-R-2	Repair and Maintenance	MassDEP- Chapter 91 Water Quality Certificate MARAD License - Annex A ACOE Section 10/404 Permit	Repair and maintenance activities could result in the alteration of the sea floor.	AGT will restore and monitor the condition of the sea floor.	Dependant on the magnitude of repair and maintenance activities, all Pipeline restoration and monitoring for repair and maintenance will comply with the terms and conditions previously developed for construction and outlined in the Construction Contingency Plan and Reporting Procedures included as appendix Z to this PMMP. If bottom excavation is required to support a maintenance/repair event, 60 days after the completion of the activity NEG and/or AGT will submit a survey report that evaluating the extent to which the bottom contours were restored to post repair conditions.
Water Quality/Sediment					
WQ-R-1	Repair and Maintenance	MARAD License - Annex A ACOE Section 10/404 Permit Beverly, Manchester-By-The-Sea, and Marblehead Orders of Conditions	Discharge of pollutants or contaminants into the waters of the U.S. could reduce water quality.	NEG and AGT will follow its ACOE Section 10/Section 404 Permit.	NEG and AGT have obtained permits under Section 10 of the Rivers and Harbors Act and Section 404 of the Clean Water Act (ACOE Section 10/404 Permit), in coordination with the ACOE New England District Office. The terms and conditions outlined in the ACOE Section 10/404 Permit have been included in this PMMP. NEG, AGT, and other associated contractors will comply with all terms and conditions of this permit. The ACOE Section 10/404 Permit has been Included as appendix C to this PMMP. Copies of the permits have been previously provided to MARAD and the USCG as well as the Beverly, Manchester-By-The-Sea, and Marblehead Conservation Commissions.
				NEG and AGT will complete and file a Spill Response Plan and/or Spill Prevention, Control, and Countermeasure (SPCC) Plan for repair and maintenance activities.	NEG and AGT have previously developed in cooperation with the USCG a Spill Response Plan/SPCC Plan for construction. AGT, NEG and associated contractors will comply with all terms and conditions of this plan during maintenance and repair activities. The plan has been Included as appendix DD to this PMMP. Copies of the plan have also been provided to MARAD and the USCG as well as the Beverly Conservation Commission.

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
				NEG and AGT will follow its Clean Water Act National Pollutant Discharge Elimination System Permits (NPDES).	NEG has obtained a NPDES permit to manage the discharge of pollutants to waters of the U.S. and the EBRVs will comply with the terms and conditions of this permit (see appendix E-2 of this PMMP). Copies of the permits were previously provided to MARAD and the USCG as well as to the Beverly, Manchester-By-The-Sea, and Marblehead Chambers of Commerce. Other repair/maintenance vessels will be subject to the conditions of the EPA VGP permit for discharges incidental to normal vessel operations, such as ballast water, deck runoff, bilge water, graywater, and other pollutants. Oil and engine wastes (e.g., lube oil, hydraulic fluid, and engine coolant) will be collected and transported to shore for reclaiming or disposal. Discharges of processed deck drainage water will comply with permit limitations and will produce no visible sheen.
WQ-R-2	Repair and Maintenance	NMSA Section 304 (d) Recommendations NPDES MARAD License - Annex A MassDEP Chapter 91 Water Quality Certification MEPA Certificate Manchester-By-The-Sea Order of Conditions Salem Order of Conditions	Potential impacts to water quality from repair and maintenance activities include increases in turbidity, depletion of water column dissolved oxygen, increases in water column nutrient levels from disturbed sediments, changes in water column temperature, resuspension of contaminated sediments, vessel intakes and discharge, sea water uptake and discharge of hydrostatic test water, or accidental spills and releases.	Based on the magnitude of repair and maintenance activity NEG will periodically assess water quality during repair and maintenance.	Based on the magnitude of repair and maintenance activity and NEG and AGT will coordination with federal, state, and local agencies to determine if periodic, standardized water quality monitoring should be conducted in the area of repair and maintenance. If deemed necessary methods for monitoring and evaluating water quality data will be similar to those previously approved and employed during construction. These methods provided in the EMP included as appendix AA to this PMMP. If water quality monitoring is required in support of an maintenance/repair event, NEG and AGT will provide results of such monitoring to all interested federal, state, and local agencies that request it.

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
				To reduce water quality impacts NEG and AGT will follow specific plans, permits and procedures for repair and maintenance to minimize impacts to water quality.	To the extent possible routine repair and maintenance will take place between May 1 and November 30. Activities during this time period will likely encounter fewer weather delays. This will reduce water quality impacts due to the shorter time period for repair/maintenance-related seabed disturbances, sediment resuspension and elevated turbidity plumes If jetting techniques are required to support maintenance and repair, the excavated area would be backfilled with sand, concrete mats, or other material. This material would be placed using a “tremie” tube or by divers to reduce turbidity. To minimize the potential impacts of unintentional fuel spills or similar releases during repair and maintenance activity. NEG, AGT, and other associated contractors will comply with the procedures outlined in the SPCC Plan for construction included as appendix DD to this PMMP. The plan shall be kept on each affected vessel at all times during a maintenance/repair event. NEG and AGT will also require their contractors to maintain individual SPCC Plans on each support vessels during every maintenance and repair event. A copy of these SPCC Plans will be provided to federal, state and local agencies as requested. If imported material is to be used for restoration of an area after a maintenance and repair event, the material will be clean and free of contaminants, and in the case of imported rock, contain no more than 10 percent fine material.
WQ-R-3	Repair and Maintenance	MARAD License - Annex A MassDEP Chapter 91 MEPA Certificate	Marine debris/pollution from repair and maintenance vessels could reduce water quality and impact sanctuaries.	Repair and maintenance vessels, EBRVs and service vessel personnel will comply with debris regulations under the NMSA.	No repair and maintenance vessel will dump or discharge any commercial domestic or industrial wastes into any ocean sanctuary. All repair, maintenance and support personnel will attend initial and refresher training on elimination of marine debris. NEG will not receive or ship from the Port any material for purposes of dumping it in the ocean. In accordance with MMS 2003-G11, Marine Trash and Debris

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					placards will be placed in prominent places on all fixed and floating production facilities that have sleeping or food preparation capabilities and on mobile vessels. The notices will be referenced, and their contents explained during initial orientation of crew and visitors. Placards will be sturdy enough to withstand the local environments and would be replaced when damaged or wear compromises readability.
Socioeconomic Resources					
SO-R-1	Repair and Maintenance	MassDEP - Chapter 91 Water Quality Certification MEPA Certificate FERC Certificate ACOE Section 10/404 Permit	Repair and maintenance could result in potential impacts to commercial fisheries, recreational fisheries, local populations, economies, and property values.	NEG and AGT will maintain adequate cover over the pipeline and associated structures so as to ensure they do not present a hazard to navigation, are adequately protected from scouring, will not be uncovered by sediment transport, and will not present a hazard or obstruction to fishing gear.	As with initial construction, depending on the magnitude of needed repair or maintenance activity, measures included in the Construction Contingency Plan and Reporting Procedures will be followed including the restoration of bottom contours and appropriate pipeline burial depth to ensure potential conflicts with anchor(s) and fishing gear are avoided to the extent practicable (see appendix Z).
Ocean Use, Recreation, and Visual Resources					
ORV-R-1	Repair and Maintenance	MassDEP Chapter 91 Water Quality Certificate MEPA Certificate	Navigational and waterfront public access impacts could arise from the temporary location of barges, vessels, and other offshore repair and maintenance activities.	NEG and AGT will ensure that a well-publicized system for disseminating information about repair and maintenance activities is implemented.	To ensure the proper dissemination of construction related activities to the public, a protocol appropriate to the repair and maintenance event will be established for notifying interested parties. Repair and/or maintenance contractors will at all times comply with the protocols, process and procedures set forth in the plans developed for the repair and/or maintenance event. NEG and AGT will in no way discourage, restrict, impede or otherwise interfere with public access to tidelands for fishing, fowling, navigation, and related activities to the extent possible to ensure public safety during repair and maintenance.

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
Coastal Zone					
CZ-R-1	Repair and Maintenance	FERC Certificate MCZM Consistency Determination	Repair and maintenance activities could impact coastal resources and uses within the Massachusetts Coastal Zone.	NEG and AGT will comply with the Massachusetts Coastal Zone Management Plan.	NEG and AGT have received determinations of consistency with the Coastal Zone Management Plan issued by the Massachusetts Office of Coastal Zone Management. The consistency determinations have been included as appendices L and M to this PMMP.
General					
G-R-1	Repair and Maintenance	FERC Certificate MassDEP Chapter 91 Water Quality Certification MEPA Certificate MMS	Noncompliance with mitigation measures could result in various environmental impacts.	NEG and AGT shall notify the appropriate Federal and State agencies of completion of repair and maintenance.	AGT and NEG will notify the appropriate Federal and State agencies upon completion of repair/maintenance activities. All required reporting timeframes and requirements are outlined in the individual Federal and State Permits identified within the context of this PMMP.
				NEG and AGT will employ third-party environmental inspectors to monitor and ensure compliance with mitigation measures and other grants, permits, certificates, and other authorizing documents during maintenance and repair events.	NEG and AGT previously filed and received approval from federal, state, and local agencies regarding appropriate mitigation measures to be employed throughout the life of the project. Mitigation measures have been included as appropriate throughout this PMMP. Depending on the magnitude of needed repair or maintenance activity, and following discussions with concerned agencies, NEG and AGT will employ at least one environmental inspector per repair and maintenance spread who is responsible for monitoring and ensuring compliance with mitigation measures, evaluating the repair and maintenance contractor's implementation of mitigation measures, ordering correction of acts that violate the environmental conditions in the authorizing documents, documenting compliance with environmental conditions, and maintaining status reports. The contact information for the environmental inspector will be

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.

Prevention, Monitoring and Mitigation Program For the Northeast Gateway Deepwater Port and Pipeline Lateral Repair and Maintenance					
Mitigation Number	**Phase**	**Permits/Plans**	**Impact**	**Mitigation Measure**	**Monitoring/Compliance Responsibility**
					provided to all necessary state, local, and federal agencies prior to repair and maintenance. Environmental inspectors will have “stop task” authority through the chief inspector or vessel superintendent. NEG and AGT will file an affirmative statement that all company, environmental, and contractor personnel will be trained on the implementation of environmental measures. NEG and AGT shall file updated status reports prepared by the environmental inspector with federal, state and local agencies as necessary until maintenance/repair and restoration activities are complete. Reporting details will be consistent with those previously outlined for construction in the FERC Certificate included as appendix B.
G-R-2	Repair and Maintenance	FERC Certificate MassDEP Chapter 91 Water Quality Certification MEPA Certificate MMS	Unplanned/emergency repair and maintenance activities could result in various environmental impacts.	NEG and AGT shall notify the appropriate Federal and State agencies as soon as possible of unplanned/emergency repair and maintenance activities.	NEG and AGT shall notify the appropriate Federal and State agencies as soon as practicable after it is determined that unplanned/emergency repair work must be conducted. NEG will continue to keep the agencies apprised of repair work plans as further details (e.g., the time, location, and nature of the repair) become available. A final notification will be provided to the agencies 72 hours prior to crews being deployed into the field. NEG, AGT and their contractors shall comply with all environmental conditions and mitigation measures in the authorizing documents and as outlined in this PMMP.
				NEG and AGT shall notify the appropriate Federal and State agencies of completion of the unplanned/emergency repair and maintenance activities.	AGT and NEG will notify the appropriate Federal and State agencies upon completion of the unplanned/emergency repair/maintenance activities, following the applicable reporting timeframes and requirements outlined in the relevant Federal and State Permits.

© 2010. Excelerate Energy, LP. No protected portion of this may be reproduced by any means in any form without the prior, written, express approval of the copyright owner.