Revised Application for Incidental Harassment Authorization and Letter of Authorization for the Non-Lethal Taking of Marine Mammals Resulting from the Construction and Operation of the Neptune LNG Deepwater Port, Massachusetts Bay

Submitted to:

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List of Acronyms and Abbreviations

Applicant, the	Neptune LNG LLC
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
dB	decibel
EIR	Environmental Impact Report
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
HubLine^{SM}	Algonquin HubLine^{SM}
Hz	Hertz
kHz	kiloHertz
LNG	liquefied natural gas
m^3	cubic meter(s)
MARAD	Maritime Administration
mg/L	milligram(s) per liter
MMO	Marine Mammal Observer
MMPA	Marine Mammal Protection Act
mmscfd	million standard cubic feet per day
MRA	Marine Resources Assessment
MSRA	Mandatory Ship Reporting Area
MSRS	Mandatory Ship Reporting System
Neptune	proposed *Neptune* deepwater port
NM	nautical miles
NOAA	National Oceanic and Atmospheric Administration
OCS	Outer Continental Shelf
PAM	passive acoustic monitoring
Port, the	proposed *Neptune* deepwater port
ROD	Record of Decision
SBNMS	Stellwagen Bank National Marine Sanctuary
SMA	Seasonal Management Area
SPUE	sightings per unit effort

List of Acronyms and Abbreviations, continued

SRV	shuttle and regasification vessel
TSS	Traffic Separation Scheme
USCG	U.S. Coast Guard

Information Submitted in Response to the Requirements of 50 CFR § 216.104

Neptune LNG LLC (the Applicant), a Delaware limited liability company, submits this request for an Incidental Harassment Authorization to authorize non-lethal incidental takes by harassment during the initiation of planned construction activities at its proposed *Neptune* deepwater port (*Neptune*) in accordance with the guidance under 50 Code of Federal Regulations (CFR) Part 216. Subpart I (216.101-21.106). Since construction will not be completed before the expiration of the initial Incidental Harassment Authorization, the Applicant also requests that this application serve as the basis for issuance of a follow-on Letter of Authorization to authorize non-lethal incidental takes by harassment during completion of construction activities and for the port operations at *Neptune* (the Port) that would be conducted following completion of port construction activities.

Section 216.104 sets out 14 specific items that must be addressed in requests for rulemaking and renewal of regulations pursuant to Section 101(a)(5) of the Marine Mammal Protection Act (MMPA). Each of these items is addressed in detail below.

1.0 A Detailed Description of the Specific Activity or Class of Activities That Can Be Expected to Result in Incidental Taking of Marine Mammals

The Applicant proposes to construct, own, and operate a deepwater port named *Neptune*, to be located in the federal waters of the Outer Continental Shelf (OCS) in blocks NK 19-04 6525 and NK 19-04 6575, approximately 22 miles northeast of Boston, Massachusetts, in a water depth of approximately 260 feet. The purpose of *Neptune* will be for the importing of liquefied natural gas (LNG) into the New England region.

Neptune will be capable of mooring LNG shuttle and regasification vessels (SRVs) with a capacity of approximately 140,000 cubic meters (m^3). Up to two SRVs will temporarily moor at the proposed deepwater port by means of a submerged unloading buoy system. Two separate buoys will allow natural gas to be delivered in a continuous flow, without interruption, by having a brief overlap between arriving and departing SRVs. The annual average throughput capacity will be around 500 million standard cubic feet per day (mmscfd) with an initial throughput of 400 mmscfd, and a peak capacity of approximately 750 mmscfd.

The SRVs will be equipped to store, transport, and vaporize LNG, and to odorize, meter, and send out natural gas by means of two 16-inch flexible risers and one 24-inch subsea flowline. These risers and flowline will lead to a proposed 24-inch gas transmission pipeline connecting the deepwater port to the existing 30-inch Algonquin HubLine^{SM} (HubLine^{SM}) located approximately 9 miles west of the proposed deepwater port location. The deepwater port will be designed, constructed, and operated in accordance with applicable codes and standards and will have an expected operating life of approximately 20 years. Figure 1-1 shows an isometric view of the deepwater port.

On February 15, 2005, Neptune LNG LLC submitted an application to the U.S. Coast Guard (USCG) and the Maritime Administration (MARAD) under the Deepwater Port Act for all federal authorizations required for a license to own, construct, and operate a deepwater port off the coast of Massachusetts. The project was assigned Docket Number USCG-2005-22611.

On November 3, 2006, the USCG published a final Environmental Impact Statement/Environmental Impact Report (FEIS/EIR) for the proposed *Neptune* LNG Deepwater Port License Application. This FEIS/EIR provides detailed information on the proposed project facilities, construction methods, and the analysis of potential impacts on marine mammals. The MARAD Record of Decision (ROD) on the FEIS/EIR was issued on January 29, 2007. The FEIS/EIR and ROD are incorporated herein by reference (USCG 2006), as is the Biological Opinion issued by the Northeast Regional Office of National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service on January 12, 2007 (Appendix A).

In addition, Appendix H (Volume II) of *Neptune*'s Deepwater Port License Application presents a comprehensive underwater acoustic impact analysis of the proposed construction and operation of the Port prepared by LGL Limited and JASCO Research Limited in 2005. This study is appended to this application as Appendix B. Also appended to this application (as Appendix C) are two supplements to the 2005 LGL Limited/JASCO Research Limited analysis. These supplements focus on an additional analysis of the impacts of the use of dynamic thrusters (for maintaining position while on buoy) and SRV transits through the Boston Harbor Shipping Channel.

1.1 Construction Activities

The offshore construction activities required for *Neptune* are described briefly herein and are discussed in further detail in the FEIS/EIR. The offshore installation effort for *Neptune* will be accomplished in the following sequence (see construction schedule on Figure 1-2):

- Mobilize an anchored lay barge (or a dynamic positioning derrick barge) and support vessels (i.e., anchor handling tugs, oceangoing tugs, and survey/diver support vessel) for the Proposed Pipeline Route;
- Install the flowline between the riser manifolds;
- Install the new gas transmission pipeline from the northern riser manifold to the transition manifold and the hot tap to the HubLine^{SM};
- Install the two riser manifolds and the transition manifold;
- Conduct pipeline hydrostatic testing;
- Install the anchor piles and the lower portion of the mooring lines;
- Connect the mooring lines to the unloading buoys and properly tension the mooring lines; and
- Connect the two risers and control umbilicals between the unloading buoys and the riser manifolds.

1.1.1 Construction Vessels

The derrick/lay barge, anchor-handling vessels, and survey/diver support vessel will each make two trips (one roundtrip) to and from the area of origin (likely the Gulf of Mexico), and will stay on station for the majority of the construction period. The supply vessels (or oceangoing tugs with cargo barges) and crew/survey vessel will make regular trips between the construction sites and mainly the port of Gloucester (approximately 8 miles). During project installation, the supply vessel will make approximately 102 trips (51 roundtrips) and the crew/survey vessel will make approximately 720 trips (360 roundtrips), for a combined total of 822 construction-support-related transits (411 roundtrips).

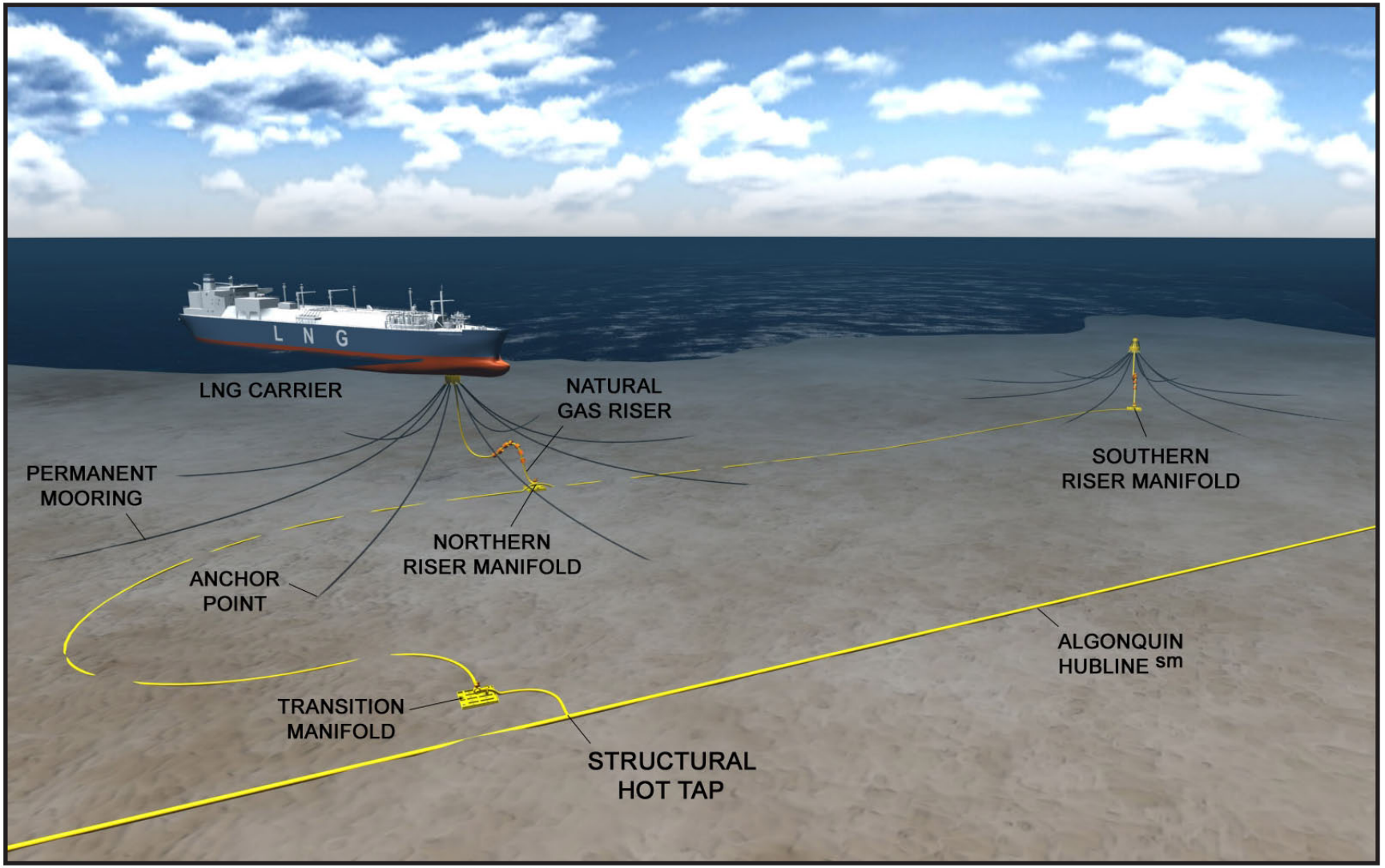

Figure 1-1 Isometric View of the Deepwater Port

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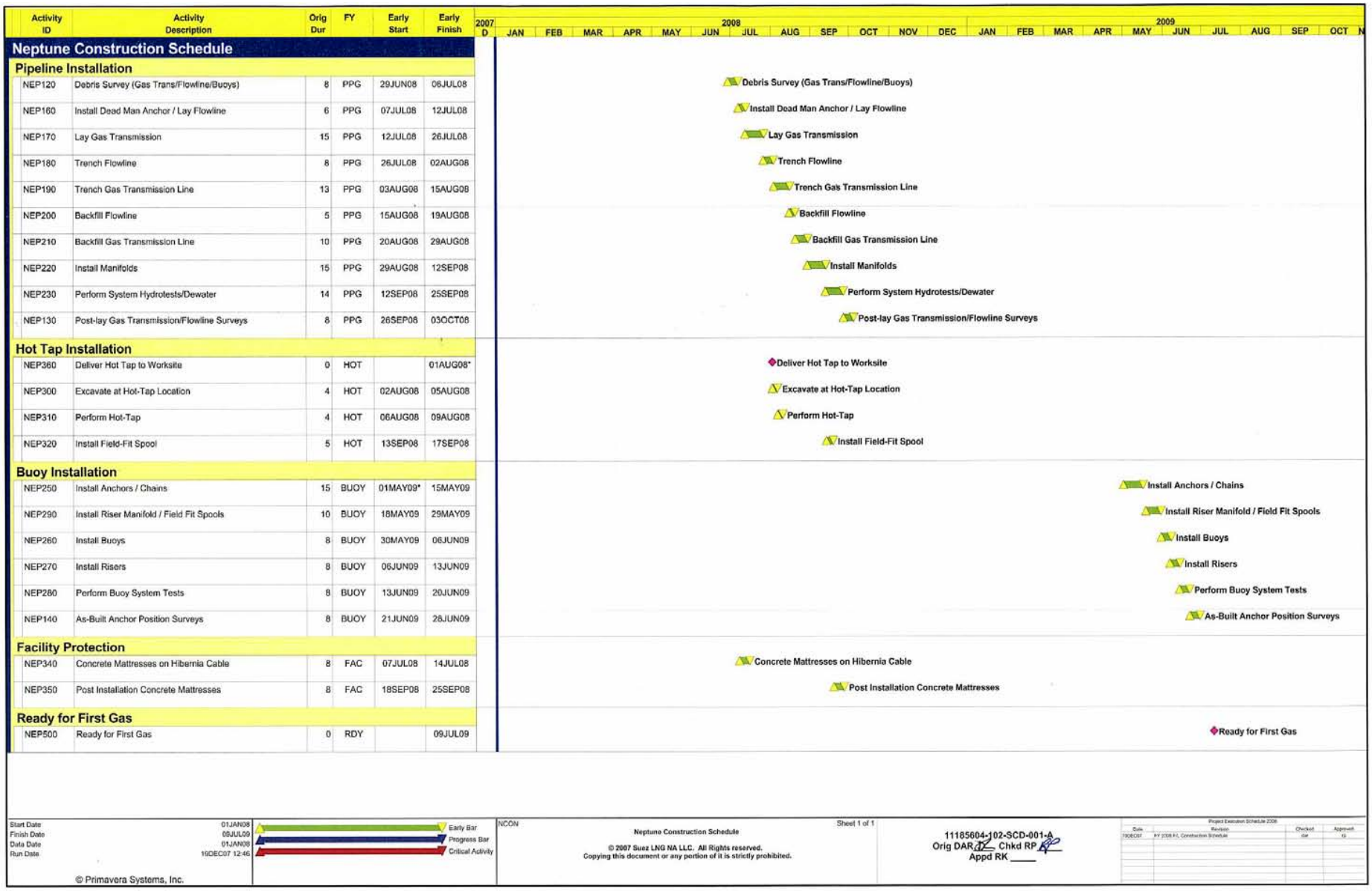

Figure 1-2 *Neptune* Project Construction Schedule

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All of the construction and support vessels will be transiting Massachusetts Bay en route to the Port. While transiting to and from the construction sites, the supply vessel and crew/survey vessel will travel at approximately 10 knots. While transiting to and from the Gulf of Mexico, the derrick/lay barge and anchor handling vessels will travel up to 12 and 14 knots respectively, but will operate either in place or at very slow speeds during construction. The survey/diver support vessel will travel at speeds up to 10 knots transiting to and from the construction area and between dive sites.

Materials including unloading buoys, mooring lines, risers, and control umbilicals will be transported from the shore-based storage area to the operating site on deck cargo barges pulled by oceangoing tugs. Cargo barges will transport the concrete-coated line pipe and manifolds to the operating site.

Approved construction procedures will be delivered to each construction vessel, and a kick-off meeting to review construction procedures, health and safety procedures, and environmental limitations will be held with key personnel prior to starting each construction activity.

1.1.2 Description of Construction Activities

Flowline and Manifolds. A pipelaying vessel will install the two riser manifolds, install the flowline between the riser manifolds. The flowline will be 24-inch-diameter line pipe with concrete weight coating, and have a length of approximately 2.5 miles. The flowline will be buried to the top of the pipe. Trenching will begin approximately 300 feet from the southern riser manifold and end approximately 300 feet from the northern manifold to avoid damaging such structures. Transition sections will use suction pumps, jetting machines, airlifts, or submersible pumps as required. A post-trenching survey will be performed to verify that the proper depth is achieved. Subsequent trenching runs might be performed to further lower sections that do not meet burial depth requirements.

Gas Transmission Pipeline to the HubLine^{SM}. The transmission pipe (with concrete weight coating) will be transported from the temporary shore base to the operating site. The construction sequence for the transmission line will begin with plowing of the pipeline trench. A pipelaying vessel will install the 24-inch-diameter pipeline (which will be buried 3 feet to the top of the pipe) from the northern riser manifold to the location of the transition manifold near the connection point to the HubLine^{SM}. A site for the transition manifold will be dredged adjacent to the HubLine^{SM}, the manifold will be laid in place, and the tie-in to the HubLine^{SM} will be completed. The gas transmission line will be buried from the transition manifold to the northern riser manifold. Trenching will begin approximately 300 feet from the northern riser manifold and end approximately 300 feet from the transition manifold to avoid damaging such structures. A post-trenching survey will be performed to verify that the proper depth is achieved. Subsequent trenching runs might be performed to further lower sections that do not meet burial depth requirements.

Pipeline Hot Tap Installation. The hot tap fitting, which will not require welding, will provide full structural reinforcement where the hole will be cut in the HubLine^{SM}. The tapping tool and actual hot tap procedure will be supplied and supervised by a specialist from the manufacturer. Prior to construction of the hot tap, divers will excavate the HubLine^{SM} tie-in location using suction pumps. The concrete weight coating will be removed from the HubLine^{SM} and inspected for suitability of the hot tap. The hinged hot tap fitting will then be lowered and opened to fit over the 30-inch HubLine^{SM}. The hot tap fitting then will be closed around the pipeline, the clamp studs and packing flanges will be tightened, and the fitting leak will be tested. The HubLine^{SM} then will be tapped and the valves will be closed. The hot tap and exposed sections of the HubLine^{SM} will be protected with concrete mats until the tie-in to the transition manifold occurs.

Hydrostatic Pipeline Integrity Testing. There will be one combined gas transmission line and flowline hydrotest (the whole system will be in-line and piggable) including flooding, cleaning, and gauging following pipelay, trenching, and burial. The gas transmission line and flowline will

require approximately 3.0 million gallons of filtered seawater, including complete flushing of the system and 676 gallons of fluorescent dye (TADCO Tracer Fluro Yellow XL500-50 Liquid Dye or an approved equivalent). This volume assumes that no water will bypass the pigs and will include approximately 1,700 gallons of water in front of the flooding pig and approximately 1,700 gallons of water between other pigs (reduced from two hydrotests to one hydrotest). Flooding will take place from the southern riser manifold to the HubLine^{SM} hot tap manifold.

All hydrotest water discharges will be in federal waters, near the unloading buoys. The total pipeline system will be swab-dried using a pig train with slugs of glycol or similar fluid. The water content of successive slugs will be sampled to verify that the total pipeline has been properly dried.

Anchor Installation. The prefabricated anchor piles will be installed offshore with a dynamic positioning derrick/anchored barge, anchor-handling vessel, or similar offshore construction equipment. The anchor points will be within a radius of 1,600 to 3,600 feet of the center of each unloading buoy. The anchor system will be installed using suction pile anchors.

Unloading Buoys. The unloading buoys will be offloaded near the designated site. An anchor-handling vessel or small derrick barge will connect the mooring lines from the anchor points to each unloading buoy, and then adjust the mooring line tensions to desired levels.

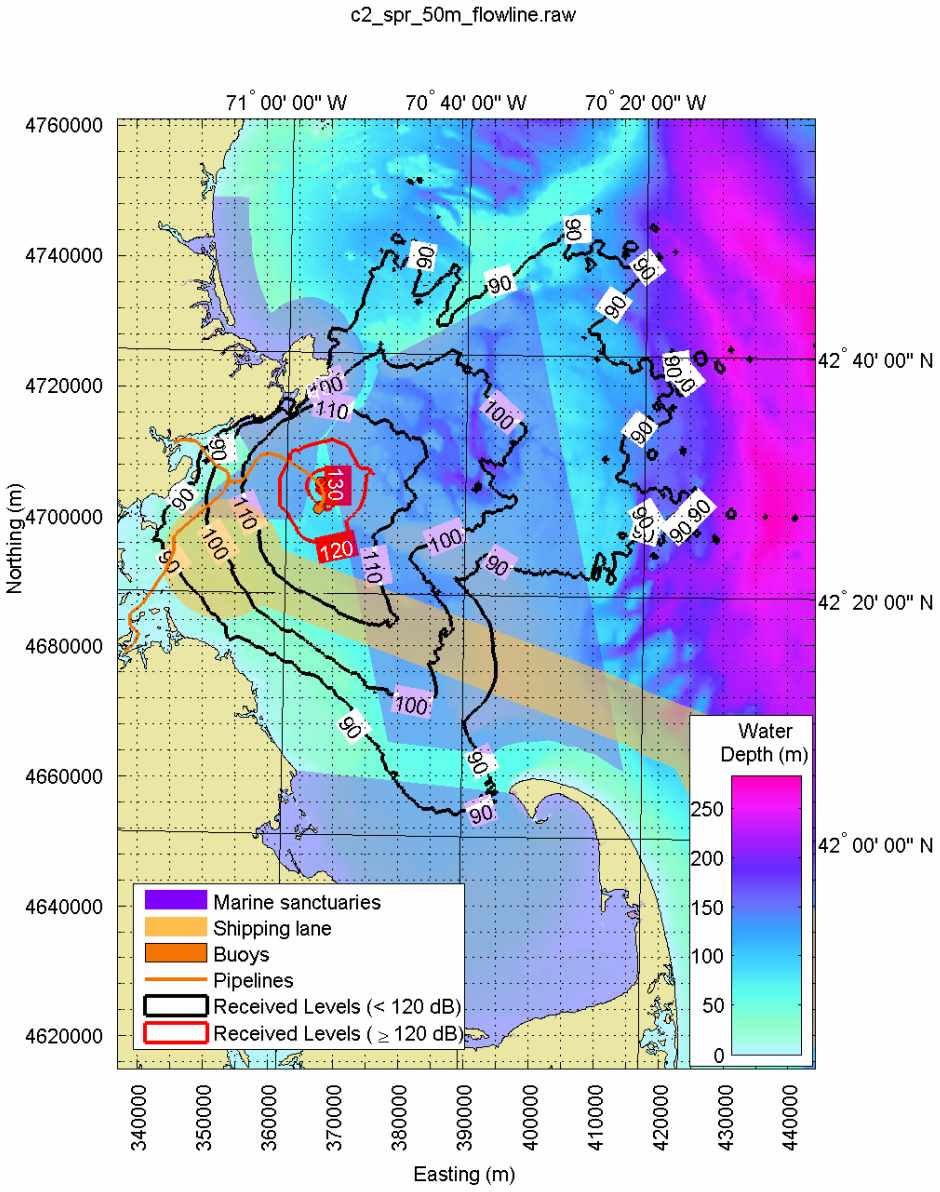
Risers. The anchor-handling vessel or small derrick barge also will connect the riser and the control umbilical between each unloading buoy and the associated riser manifold, complete the hydrostatic testing and dewatering of the risers, and test the control umbilicals.

Demobilization. Upon completion of the offshore construction effort, sidescan sonar will be used to check the area. Divers will remove construction debris from the ocean floor. All construction equipment will leave the site.

1.1.3 Construction Sound

Underwater acoustic analyses were completed for activities related to all aspects of *Neptune* construction. Activities considered to be potential sound sources during construction include installation (plowing) of flowline and main transmission pipeline routes, lowering of materials (pipe, anchors, and chains), and installation of the suction pile anchors.

Acoustic modeling was performed to predict received levels of underwater sound that could result from the construction of *Neptune* (see Appendices B and C for a discussion of the acoustic modeling methodology employed). The analysis evaluated the potential impacts of construction of the flowline and pipeline using surrogate source levels for vessels that could be employed during *Neptune's* construction. One surrogate vessel used for modeling purposes was the *Castoro II* (and four accompanying vessels). If a vessel similar to the *Castoro II* were used during pipeline construction at *Neptune*, the worst-case received sound levels for construction activities are presented in Figures 1-3 and 1-4 along the flowline between the two unloading buoys and along the pipeline route at the 50-meter depth during the spring season.



Source: LGL Limited 2005.
(Note: For modeling purposes, *Castoro II* was selected as a surrogate for vessels that might be used in the flowline and pipeline construction at *Neptune*)

Figure 1-3 Received Sound Levels at 50-meter Depth of Pipelaying by *Castoro II* Spread along Flowline Between North and South Buoys in Spring

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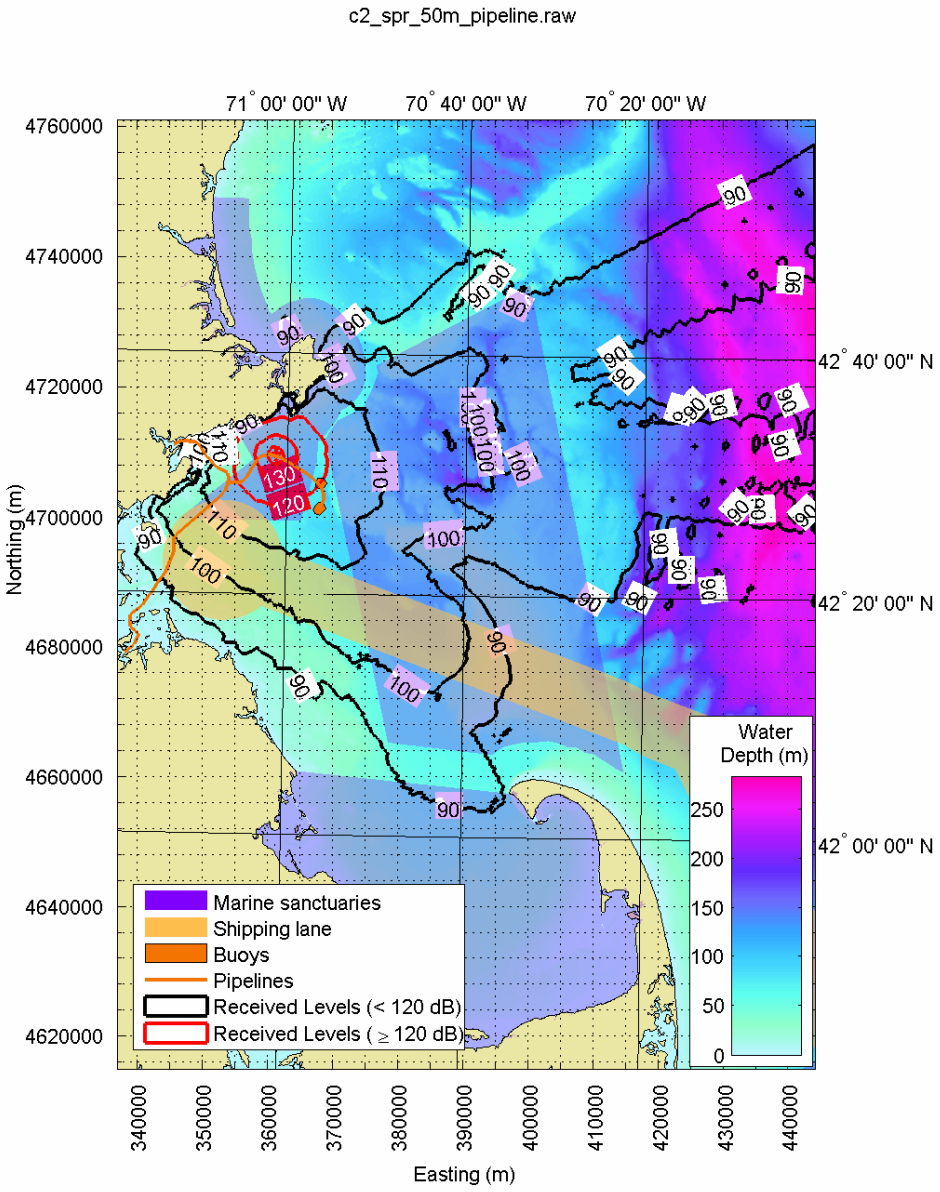

Source: LGL Limited 2005.
(Note: For modeling purposes, *Castoro II* was selected as a surrogate for vessels that might be used in the flowline and pipeline construction at *Neptune*)

Figure 1-4 Received Sound Levels at 50-meter Depth of Pipelaying by *Castoro II* Spread along Northern Route Pipeline in Spring

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1.2 Port Operations

During *Neptune* Port operations, sound will be generated by the regasification of the LNG aboard the SRVs and, as a result of the use of thrusters by vessels maneuvering and maintaining position at the Port. Of these potential construction and operations sound sources, thruster use for dynamic positioning is the most significant. The following text describes the activities that will occur at the Port upon its commissioning.

1.2.1 Description of Port Operations

Vessel Activity. The SRVs will approach the Port using the Boston Harbor Traffic Separation Scheme (TSS), entering the TSS within the Great South Channel and remaining in the TSS until they reach the Boston Harbor Precautionary Area. At the Boston Lighted Horn Buoy B (at the center of the Boston Harbor Precautionary Area), the SRV will be met by a pilot vessel and a support vessel. A pilot will board the SRV, and the support vessel will accompany the SRV to the Port. SRVs carrying LNG typically travel at speeds up to 19.5 knots. However, *Neptune* SRVs will reduce speed to 10 knots within the TSS year-round in the Off Race Point Seasonal Management Area (SMA), and to a maximum of 10 knots when traveling to and from the buoys once exiting the shipping lanes at the Boston Harbor Precautionary Area. In addition, *Neptune* is committed to reducing speed to 10 knots in the Great South Channel SMA from April 1 to July 31.

To supply a continuous flow of natural gas into the pipeline, about 50 roundtrip SRV transits will take place each year on average (one transit every 3.65 days). As an SRV approaches the Port, vessel speed will gradually be reduced. Upon arrival at the Port, one of the submerged unloading buoys will be located and retrieved from its submerged position by means of a winch and recovery line. The SRV is designed for operation in harsh environments and can connect to the unloading buoy in up to 11.5 feet significant wave heights and remain operational in up to 36 feet significant wave heights providing high operational availability. The vessel's aft/forward thrusters will be used, only as necessary, for between 10 and 30 minutes during the docking procedure. During normal conditions, the vessel will be allowed to weathervane on the single-point mooring system. However, there will be certain conditions when aft thrusters may be used to maintain the heading of the vessel into the wind when competing tides operate to push the vessel broadside to the wind. In these circumstances, the ambient sound will already be high because of the wind and associated wave sound.

Regasification System. Once an SRV is connected to a buoy, the vaporization of LNG and send-out of natural gas can begin. Each SRV will be equipped with three vaporization units, each with the capacity to vaporize 250 mmscfd. Under normal operation, two units will be in service. The third vaporization unit will be on standby mode, though all three units could operate simultaneously.

1.2.2 Operations Sound

The acoustic effects of using the thrusters for maneuvering at the unloading buoys were modeled by JASCO Research Limited (2005) (see Appendix B for supplemental analysis). The analysis assumed the use of four thrusters (two bow, two stern) at 100% power during the spring, summer, fall, and winter seasons. The one-third- (1/3-) octave band source levels for the thrusters ranged from 148.5 re 1 µPa at 1 m at 2000 Hertz to 174.5 re 1 µPa at 1 m at 10 Hertz. Figures 1-5 through 1-8 show the received sound level at 50-meter depth at the south unloading buoy during each of the four seasons. The acoustic effects of operating the regasification system at the unloading buoys were also modeled by JASCO Research Limited (2005) (see Appendix B). In addition, supplemental analysis was performed to assess the potential underwater acoustic impacts of using the two aft thrusters after mooring for maintaining the heading of the vessel in situations when competing tides operate to push the vessel broadside to the wind. The details of this analysis are found in Appendix C.

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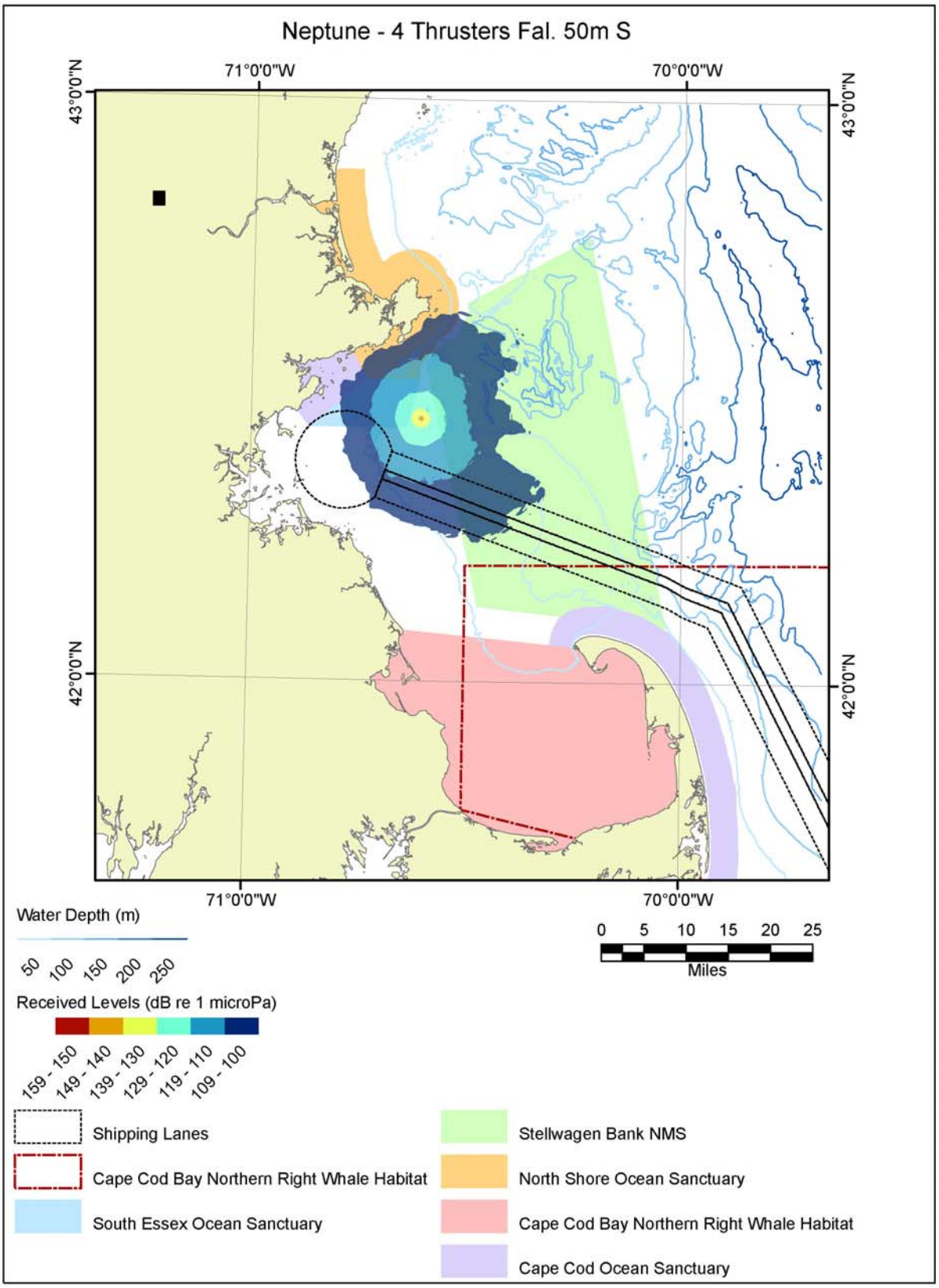

Figure 1-5 Received Sound Level at 50-meter Depth at the South Unloading Buoy During Spring

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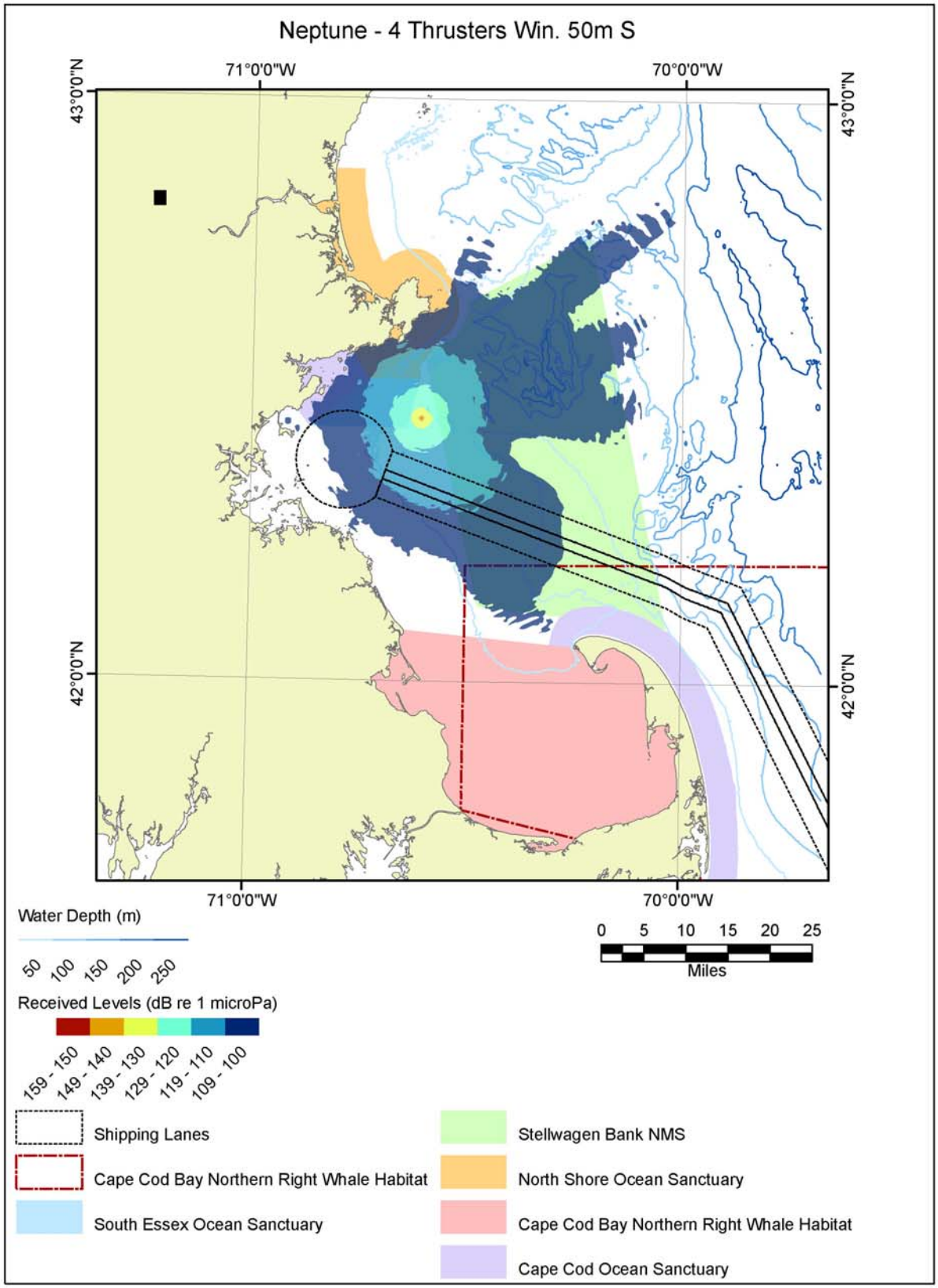

Figure 1-6 Received Sound Level at 50-meter Depth at the South Unloading Buoy During Summer

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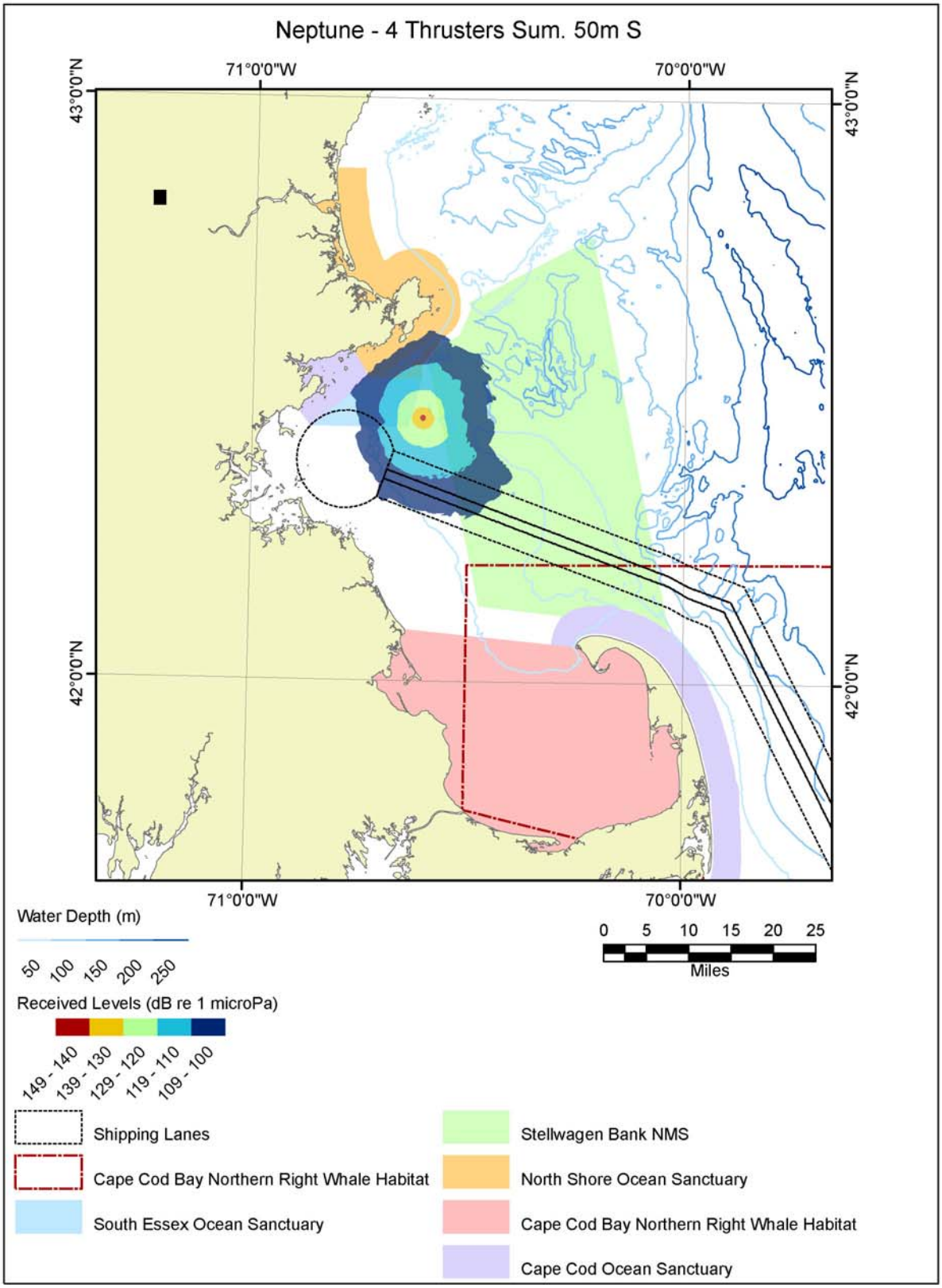

Figure 1-7 Received Sound Level at 50-meter Depth at the South Unloading Buoy During Fall

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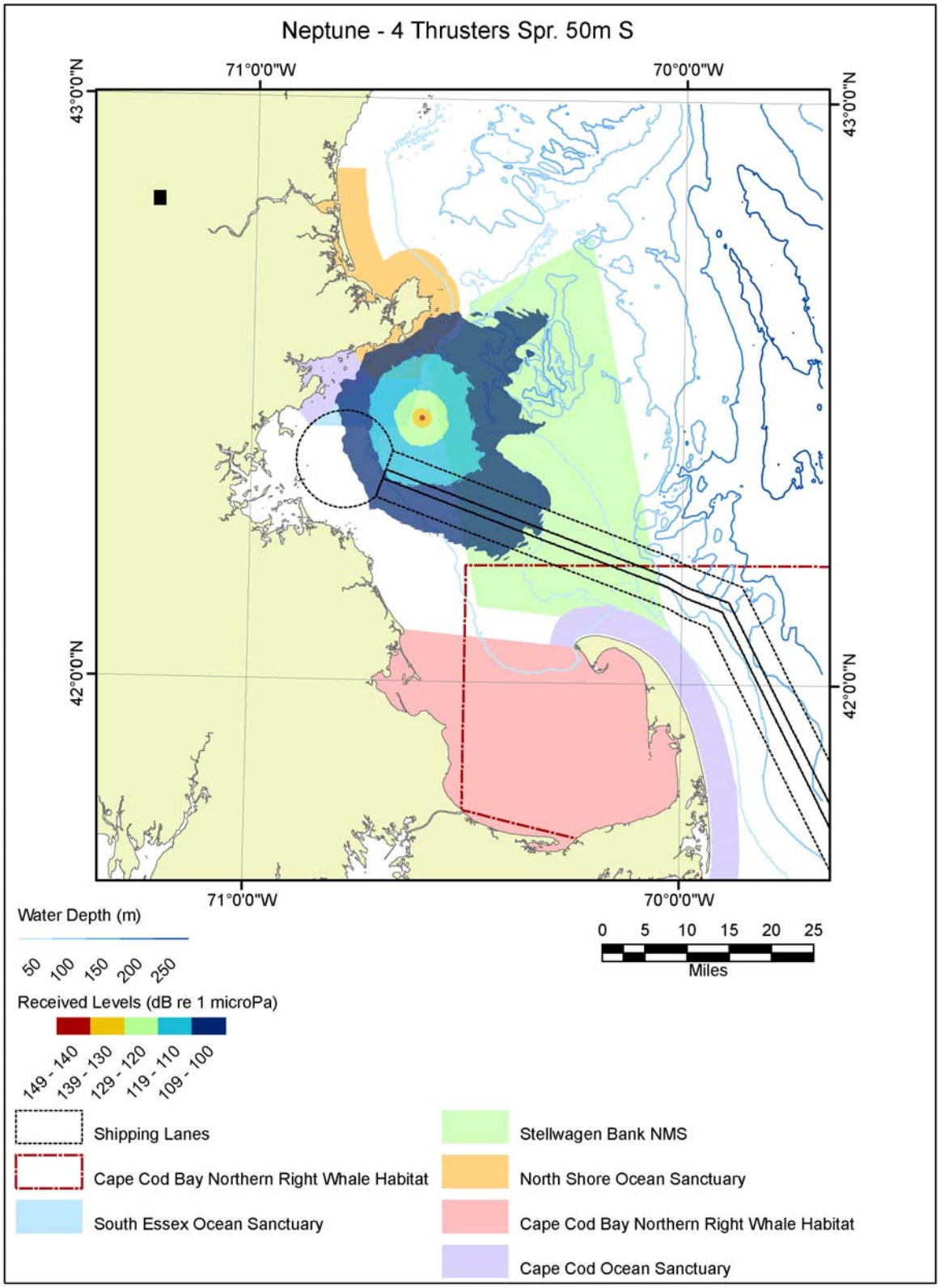

Figure 1-8 Received Sound Level at 50-meter Depth at the South Unloading Buoy During Winter

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2.0 The Dates and Duration of Such Activity and the Specific Geographic Region Where it Will Occur

2.1 Construction Dates and Duration

Construction of the deepwater port components (including SRVs, buoy system fabrication and installation, and offshore pipeline construction) is expected to take 36 months. Project components will be manufactured at seaside or upland areas and shipped to the project site for installation. On-site construction/installation activities in Massachusetts Bay will be initiated in June 2008 and completed in June 2009, assuming no delays.

2.2 Specific Geographic Region

The *Neptune* Port would be located in Massachusetts Bay within OCS blocks NK 19-04 6525 and NK 19-04 6575, at approximately 42º28'09" North Latitude and 70º36'22" West Longitude. The gas transmission pipeline would begin at the existing HubLine[SM] pipeline approximately 3 miles east of Marblehead Neck, Massachusetts. From this point, the pipeline would extend toward the northeast crossing 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 6.4 miles. The transmission line route would continue to the southeast for approximately 4.5 miles crossing state and federal waters. The proposed location of the *Neptune* and the associated pipeline is shown on Figure 2-1.

3.0 Species and Numbers of Marine Mammals in Area

Table 3-1 lists the species of marine mammals likely to be seen in the *Neptune* Project area. Sections 3.2.3 and 3.2.5 of the FEIS/EIR discuss marine mammals both protected under the MMPA and those that are listed as threatened and endangered under the Endangered Species Act (ESA).

Table 3-1 Mammals Occurring in Massachusetts Bay

Common Name	Scientific Name	Likelihood of Occurrence	Federal ESA Status	Time of Year in Massachusetts Bay
Baleen Whales (Mysticetes)				
North Atlantic right whale	*Eubalaena glacialis*	Common	Endangered	Year round (Jan-Jul peak)
Blue whale	*Balaenoptera musculus*	Rare	Endangered	Aug-Oct
Fin whale	*Balaenoptera physalus*	Common	Endangered	April-Oct
Sei whale	*Balaenoptera borealis*	Rare	Endangered	May-Jun
Minke whale	*Balaenoptera acutorostrata*	Common	--	April-Oct
Humpback whale	*Megaptera novaeangliae*	Common	Endangered	April-Oct
Toothed Whales (Odontocetes)				
Killer (orca) whale	*Orcinus orca*	Occasional	--	July-Sep
Long-finned pilot whale	*Globicephala melas*	Occasional	--	Year round (Sept-April peak)
Sperm whale	*Physeter macrocephalus*	Occasional	Endangered	Pelagic
Atlantic white-beaked dolphin	*Lagenorhynchus albirostris*	Occasional	--	April-Nov
Atlantic white-sided dolphin	*Lagenorhynchus acutus*	Common	--	Year round
Bottlenose dolphin	*Tursiops truncatus*	Occasional	--	Late summer, early fall
Common dolphin	*Delphinus delphinum*	Occasional	--	
Harbor porpoise	*Phocoena phocoena*	Common	--	Year round (Sept-April peak)
Risso's dolphin	*Grampus griseus*	Rare	--	Spring, summer, autumn

Table 3-1 Mammals Occurring in Massachusetts Bay

Common Name	Scientific Name	Likelihood of Occurrence	Federal ESA Status	Time of Year in Massachusetts Bay
Striped dolphin	*Stenella coeruleoalba*	Occasional	--	Year round
Earless of True Seals (Pinnipeds)				
Gray seal	*Halichoerus grypus*	Common	--	Year round
Harbor seal	*Phoca vitulina*	Common	--	Late Sept-early May
Harp seal	*Pagophilus groenlandica*	Occasional	--	Jan-March
Hooded seal	*Cystophora cristata*	Occasional	--	Jan-March

Note: The short-finned pilot whale (G. macrorhynchus), which is difficult to distinguish from the long-finned species at sea, has also been reported from Massachusetts (Cardoza, Jones, and French 1999); however, this species is predominantly a tropical species, with the northernmost limit of its range in the North Atlantic at Cape Hatteras (Leatherwood and Reeves 1983), and is very unlikely to be seen in the Massachusetts Bay area.
Source: USCG 2006 and LGL Limited 2005.

4.0 Status, Distribution, and Seasonal Distribution of Affected Species or Stocks of Marine Mammals

The status, distribution, and seasonal distribution of affected species are discussed in detail in Sections 3.2.3 and 3.2.5 of the FEIS/EIR and in Table 3-1 above. Sixteen (16) species of cetaceans, including dolphins, small and large toothed whales, and baleen whales may occur in the Massachusetts Bay area; 16 occur either regularly or occasionally and three rarely occur (Table 3-1). Some of these species – the North Atlantic right whale, humpback whale, blue whale, fin whale, and sei whale – are listed under the ESA as endangered. Note that the North Atlantic coastal stock of bottlenose dolphins is listed under the MMPA as "depleted." Because of its endangered listing under the ESA, the sperm whale (*Physeter macrocephalus*) is also included in Table 3-1, although it is one of the species rarely seen in Massachusetts Bay. The sperm whale is generally a deepwater animal, and its distribution off the northeastern U.S. is concentrated around the 13,280-foot-depth contour, with sightings extending offshore beyond the 6,560-foot-depth contour. Sperm whales also can be seen in shallow water south of Cape Cod from May to November (Cetacean and Turtle Assessment Program 1982).

In addition to the 16 cetacean species listed in Table 3-1, ten other cetacean species have been recorded for Massachusetts as rare vagrants or from strandings (Cardoza, Jones, and French 1999). The following six species of beaked whale are all pelagic and recorded mostly as strandings – the northern bottlenose whale (*Hyperoodon ampullatus*), Cuvier's beaked whale (Ziphius *cavirostris*), Sowerby's beaked whale (*Mesoplodon bidens*), Blainville's beaked whale (*M. densirostris*), Gervais' beaked whale (*M. europaeus*), and True's beaked whale (*M. mirus*). Vagrants include the beluga whale (*Delphinapterus leucas*), a northern species with rare vagrants reported as far south as Long Island (Katona, Rough, and Richardson 1993); the pantropical spotted dolphin (*Stenella attenuata*) and false killer whale (*Pseudorca crassidens*), which are primarily tropical species with rare sightings in Massachusetts waters (Cardoza, Jones, and French 1999); and the pygmy sperm whale (*Kogia breviceps*), which is generally an offshore species that occasionally wanders inshore. These vagrant species are not considered further in this application.

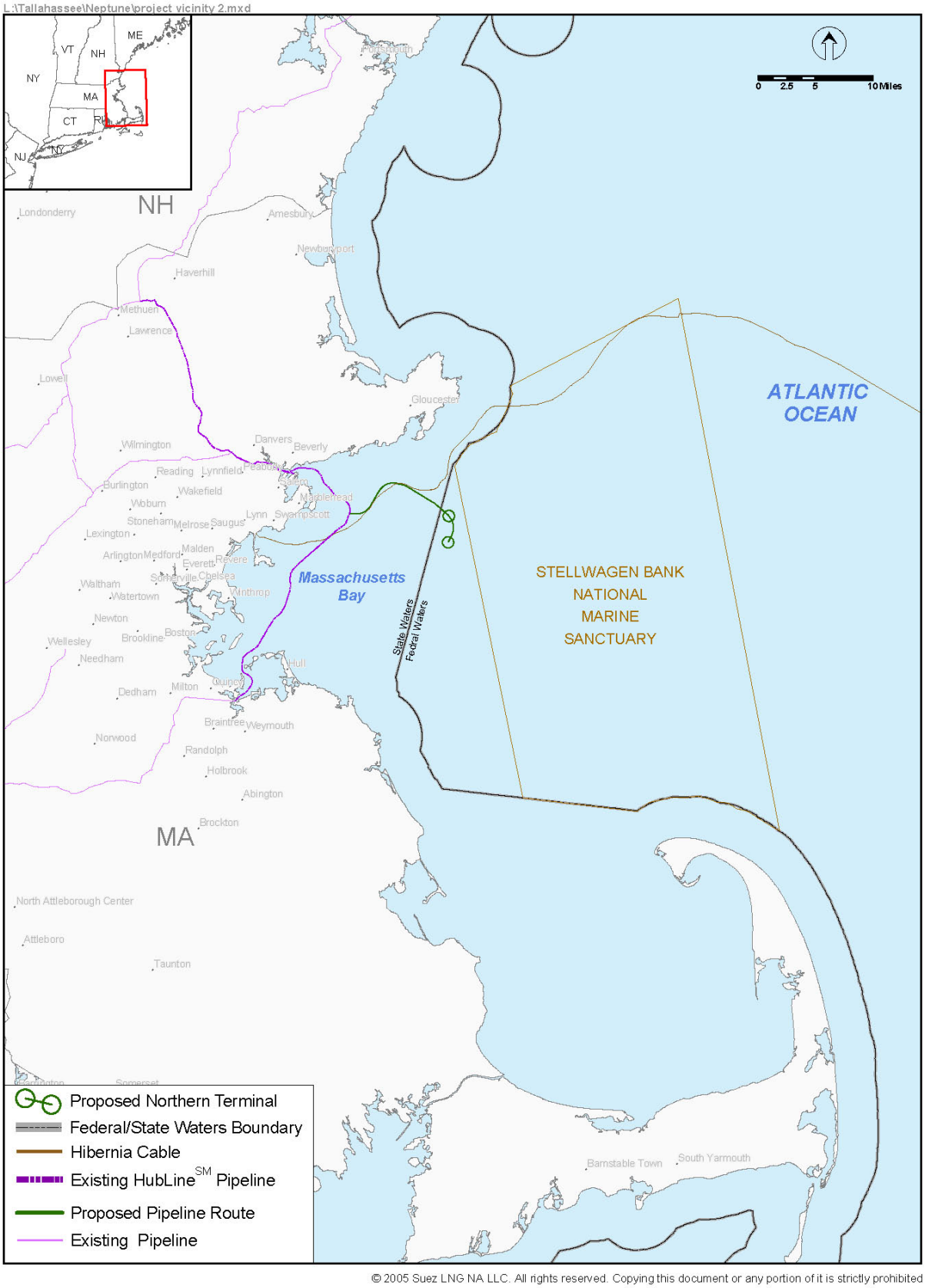

Figure 2-1 *Neptune* Port and Pipeline Route

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Four species of pinnipeds occur in the Massachusetts Bay area (Table 3-1). None of these species is listed under the ESA. Harbor seals (*Phoca vitulina*) and gray seals (*Halichoerus grypus*) can be found year-round in northeastern U.S. waters, while harp seals (*Pagophilus groenlandica*) and hooded seals (*Cystophora cristata*) are seasonal visitors from much further north, seen mostly in the winter and early spring. Prior to 1990, harp and hooded seals were sighted only very occasionally in the Gulf of Maine, but recent sightings suggest increasing numbers of these species now visit these waters (Harris *et al.* 2001; Harris, Lelli, and Jakush 2002). Juveniles of a third Arctic seal species, the ringed seal (*Pusa hispida*), are seen on occasion as far south as Cape Cod in the winter, but this species is considered to be quite rare in these waters (Provincetown Center for Coastal Studies 2005) and is not considered further in this application.

The marine mammal species for which the Applicant is seeking a one-year harassment authorization under this application for construction-related effects are: North Atlantic right whale, humpback whale, fin whale, sei whale, minke whale, long-finned pilot whale, Atlantic white-sided dolphin, and harbor porpoise (Table 4-1). The species for which *Neptune* is seeking harassment authorization under this application for operational-related effects are: North Atlantic right whale, humpback whale, fin whale, sei whale, minke whale, long-finned pilot whale, Atlantic white-sided dolphin, harbor porpoise, common dolphin, Risso's dolphin, bottlenose dolphin, and harbor seal (Table 4-1).

Table 4-1 Species for Which the Applicant Seeks Harassment Authorization

	Construction-Related Effects	Operational-Related Effects
North Atlantic right whale	X	X
Humpback whale	X	X
Fin whale	X	X
Sei whale	X	X
Minke whale	X	X
Long-finned pilot whale	X	X
Atlantic white-sided dolphin	X	X
Harbor porpoise	X	X
Common dolphin		X
Risso's dolphin		X
Bottlenose dolphin		X
Harbor seal		X

5.0 The Type of Incidental Taking Authorization That is Being Requested (i.e., Takes by Harassment Only; Takes by Harassment, Injury, and/or Death) and the Method of Take

The only type of incidental taking sought by Neptune LNG LLC in this application for either construction-related effects or operational effects is for takes by Level B sound harassment. Construction-related activities for the Port and the pipeline will generate sound exceeding the 120-decibel (dB) threshold for continuous and intermittent sound at the source. During operations of the Port, the only sound that will exceed the 120-dB threshold is associated with the maneuvering of the SRVs during final docking at the Port. The loudest source of underwater sound during construction or operation of *Neptune* will be the use of thrusters for dynamic positioning (see Sections 1.1 and 1.2 of this application).

A one-year Incidental Harassment Authorization is sought for the initial phases of *Neptune*'s period of construction in 2008. Since construction will not be completed before the expiration of the initial Incidental Harassment Authorization, the Applicant also requests that this application serve as the basis for issuance of a follow-on Letter of Authorization to authorize non-lethal incidental takes by harassment during completion of construction activities in 2009 (which may include finishing the pipeline and installing the mooring buoys) and for the port operations at *Neptune* (the Port) that would be conducted following completion of port construction activities.

6.0 Numbers of Marine Mammals That May Potentially Be Taken

Neptune LNG LLC seeks authorization for potential "taking" of small numbers of marine mammals under the jurisdiction of the National Marine Fisheries Service in the proposed region of activity. Species for which authorization is sought during construction of the pipeline and Port include eight of the 20 species identified in Section 4.0 that have the highest likelihood of occurring, at least occasionally, in the project area during the construction period. Species for which authorization is sought during *Neptune's* operations phase include the 12 species identified in Section 4.0 that have the highest likelihood of occurring, at least occasionally, in the project area during all seasons.

The only anticipated impact to marine mammals during construction and operation would be the short-term displacement of marine mammals from areas ensonified by sound generated by equipment operation and vessel movement (thruster use). The construction and operational activities proposed by *Neptune* are not expected to "take" more than small numbers of marine mammals, or have more than a negligible effect on their populations based on their seasonal density and distribution and their known reactions to exposure to such underwater sound sources.

The information contained in this section of the application relies heavily on assessments completed by LGL Limited and JASCO Research Limited in 2005 and 2006 of the effects of underwater sound generated by the proposed project on marine mammals (LGL Limited 2005, LGL Limited 2006, and JASCO Research Limited 2006) (see Appendices B and C).

The National Marine Fisheries Service recognizes three kinds of sound: continuous, intermittent (or transient), and pulsive. Neither the construction nor operation of *Neptune* will cause pulsive sound activities, including pile driving, seismic activities, or blasting.

Neptune will not cause pulsive noise activities. Rather, the sound sources of potential concern are continuous and intermittent sound sources, including underwater sound generated during pipeline/flowline construction, and operational underwater sound generated by regasification/offloading (continuous) and dynamic positioning of vessels using thrusters (intermittent). Both continuous and intermittent sound sources are subject to the National Marine Fisheries Service's 120 dB re 1µPa threshold for determining levels of continuous underwater sound that may result in the disturbance of marine mammals.

Construction-Related Underwater Sound Effects. The results of the modeled underwater analysis (LGL Limited 2005 and JASCO Research Limited 2006) for *Neptune*'s construction period are summarized as follows:

- ***Pipe-laying Activities.*** Pipe-laying activities will generate continuous but transient sound, and will likely result in variable sound levels during the construction period. Modeling conducted by JASCO Research Limited indicates that, depending on water depth, the 120-dB contour during pipe-laying activities will extend from the source (the Port) in varying directions from 3.8 to 5.9 nautical miles (NM) encompassing an area ranging from 37 to 47 square NM for the flowline at the Port, and will extend from the pipeline route out 3.5 to 4.1 NM encompassing an area from 35 to 44 square NM for the pipeline route.

- ***Installation of Anchors.*** Installation of the suction pile anchors at the Port will produce only low levels of underwater sound with no levels above the 120-dB criterion for continuous sound. The results of modeling conducted by JASCO Research Limited for installation of the suction pile anchors are detailed in Appendix B. The 120-dB threshold would not be exceeded and the 90-dB contour would occur only out to 300 to 1,000 feet from the source of the sound.

Port Operation Underwater Noise Effects. The results of the modeled underwater analysis (LGL Limited 2005 and JASCO Research Limited 2006) for the operation of *Neptune* are summarized as follows:

- ***SRV Maneuvering at the Port.*** When an SRV arrives at *Neptune*, it will use its thrusters for 10 to 30 minutes to position the vessel to connect to the unloading buoy. This will occur at alternate unloading buoys every four to eight days because only one unloading buoy would be occupied at a time, with a small overlap at changeover. It is assumed that the thrusters would be used every six days (mid-point of four to eight days) on average and that the average period of use would be 20 minutes per session (mid-point of 10 to 30 minutes), then the total period of use of thrusters for maneuvering at the Port would be 20 hours. The results of underwater acoustic modeling show that the average area ensonified by sound levels 120 dB and greater would range from 1.8 to 33.6 square NM and extend out to 0.75 to 3.27 NM from the source. The sound from the thrusters will be continuous during the periods that they are used and they will always be used at, or close to, one of the Port's two unloading buoys.

  The underwater acoustic modeling shows that with continuous use of the two aft thrusters during certain wind and tidal conditions the average area ensonified by sound levels 120 dB and greater would range from 0.8 to 14.1 square NM and extend out to 0.05 to 2.12 NM from the source.

- ***Regasification.*** The SRV will operate on-board equipment to regasify its LNG cargo while fixed to the unloading buoy. The results of underwater sound modeling show that received sound levels for regasification will not exceed 110 dB to any significant distance. In fact, the source level modeled may be higher than might be expected at 1 meter in the water because the measurements were taken in air and do not take into consideration sound dampening by the hull of the vessel.

The basis for the "take" estimate is the number of marine mammals that potentially will be exposed to sound levels in excess of 120 dB. Typically, this is determined by applying the modeled zone of influence (e.g., the area ensonified by the 120-dB contour) to the seasonal use (density) of the area by marine mammals and correcting for seasonal duration of sound-generating activities and estimated duration of individual activities when the maximum sound-generating activities are intermittent to occasional. Nearly all of the required information is readily available in the FEIS/EIR with the exception of marine mammal density estimates for the project area.

In their assessment of the biological sound effects of *Neptune* construction and operation, LGL Limited (2005 and 2006) evaluated the marine mammal density data available from two sources:

- ***Cetacean and Turtle Assessment Program*** (1982). A series of dedicated surveys of marine mammals and turtles in the Mid- and North Atlantic regions of the U.S. (which included the Gulf of Maine and Massachusetts Bay) conducted between 1978 and 1982; and
- ***U.S. Navy's*** **Marine Resources Assessment** ***(MRA) for the Northeast Operating Areas*** (Department of the Navy 2005). In this assessment the U.S. Navy used data from National Marine Fisheries Service shipboard and aerial line-transect surveys (1991 to 2003) and from other rigorously collected line-transect surveys found in the North Atlantic Right Whale Consortium database to calculate seasonal sightings per unit effort (SPUE) values for marine mammals in northeastern U.S. waters (Figure 6-1). In addition, the U.S. Navy applied geospatial and statistical interpolation to predict SPUE values at unsampled locations and provide a model of marine mammal occurrence for the entire MRA area.

The results and methodologies used by both surveys are discussed in detail in Appendix B to this application.

Using the results from the U.S. Navy's (2005) geospatial analysis model, LGL Limited developed average density-indices for marine mammals known to occur in the *Neptune* area. The LGL Limited analysis assumed that the Navy's adopted method of converting linear density-indices into areal density estimates was reasonable and assumed that the highest numbers of marine mammals in the density-index ranges would be present during *Neptune* construction and operations. Table 6-1 shows estimated densities for Massachusetts Bay. LGL Limited cautions, however, that the linear data identified by the Department of the Navy in its MRA (2005) provide an index of abundance based on all of the usable available data. To convert the linear data into densities for the purpose of assessing the underwater sound effects of the construction and operation of *Neptune*, it was assumed that the effective survey width was a 0.5-kilometer (500-meter) strip on each side of the survey vehicle. Thus, each linear kilometer of survey would encompass an area of 1 square kilometer. This, of course, is a gross oversimplification of reality. For most whale species, individuals are sighted well beyond the assumed distance of 0.5 kilometer on each side of the trackline. Thus, the adopted approach overestimates the actual numbers of animals per square kilometer because the linear estimates actually include animals beyond the 0.5-kilometer strip width. On the other hand, all surveys fail to detect a portion of the animals that are actually present on the surface or underwater. Therefore, the approach adopted here accounts for an unknown fraction of the missed animals. Because these biases cannot be quantified, it is important to treat the following numerical assessments as approximations.

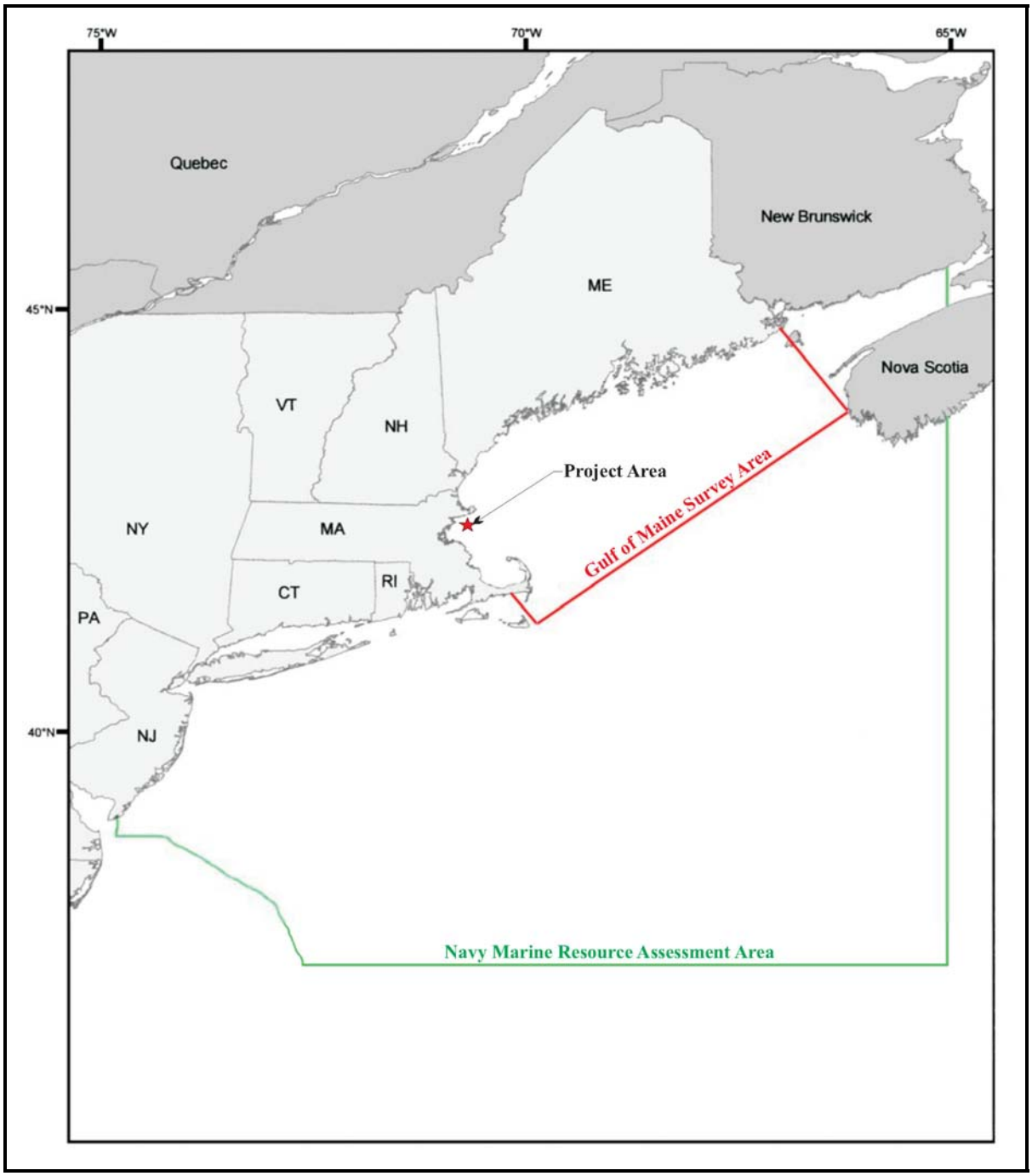

Figure 6-1 Navy Marine Resources Assessment Area

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Table 6-1 Estimated Marine Mammal Densities for Massachusetts Bay and the Numbers of Marine Mammals of Potential Risk of Harassment "Take" by *Neptune*

Species	Season	Estimated Density per 1,000 Sq Km	Estimated Take and Requested Authorization		
			Pipeline Construction Activities[3]	Operations	
				Four (4) Thrusters	Two (2) Thrusters
North Atlantic right whale	All Seasons	0.01-21.14	4	2	1
Humpback whale	Winter/Spring Summer/Fall	0.00-13.85 13.85-27.72	5	3	1
Blue whale[1]	--	--	--	--	--
Fin whale	Fall/Winter Spring/Summer	0.00-16.45 0.00-32.89	3	2	1
Sei whale (not Winter)	Fall Winter/Spring/Summer	0.00-17.27 --	3	1	1
Minke whale	All Seasons	0.00-4.66	1	1	1
Sperm whale	--	--	--	--	--
Killer whale	--	--	--	--	--
Long-finned pilot whale	All Seasons	0.01-271.42	44	31	13
Atlantic white-sided dolphin[2]	All Seasons	0.00-265.21	43	31	13
Atlantic white-beaked dolphin	--	--	--	--	--
Harbor porpoise[2]	All Seasons	0.00-162.36	26	19	8
Risso's dolphin[2]	Fall Only	0.00-503.06	--	58	24
Common dolphin[2]	Fall Only	0.00-464.07	--	53	22
Striped dolphin	--	--	--	--	--
Bottlenose dolphin[2]	Fall Only	0.03-278.81	--	32	13
Gray seal	--	--	--	--	--
Harp seal	--	--	--	--	--
Hooded seal	--	--	--	--	--
Harbor seal	Winter only	--	--	8	3

Note:
1. Blue whale sightings are rare and densities not estimated.
2. Dolphin distribution is generally patchy with a few large pods being present rather than an even distribution.
3. Installation of the suction piles would not result in any estimated takes.

Source: LGL Limited 2005.

7.0 The Anticipated Impact of the Activity on the Species or Stock

Construction and operation of *Neptune* will occur consecutively with no overlap in activities. During construction, the project activities will occur over a two-year period (see Figure 1-2) with sound from pipeline construction causing some possible disturbance to small numbers of baleen whales and toothed whales. Pinnipeds are unlikely to be present during summer and will not be affected. The installation of the suction piles will produce only low levels of sound during the construction period and will not increase the numbers of animals affected.

During the operational life of the project, marine mammals will be exposed to intermittent sound from the use of thrusters positioning the carriers at the unloading buoys and the sounds

associated with the regasification process. Under certain wind and tidal conditions, the two aft thrusters will be continuously operated to maintain the heading of the vessel into the wind when competing tides operate to push the vessel broadside to the wind. These activities will occur at each of the two fixed-location unloading buoys. The sound from the regasification process is low and does not reach the National Marine Fisheries Service's 120 dB re 1µPa disturbance criterion for continuous sound. However, the brief bursts (10 to 30 minutes) of sound associated with use of four thrusters to position the ships would have the potential to disturb marine mammals near the Port. This thruster sound could affect a maximum of about 10 baleen whales, 224 toothed whales, and eight pinnipeds. The use of two thrusters during certain weather conditions would affect about five baleen whales, 93 toothed whales, and three pinnipeds. The underwater sound generated by use of the thrusters during maneuvering or under certain wind and tidal conditions would not result in any important effects to individuals or constitute population-level harassment threat to local marine mammal stocks for the following reasons:

- Short duration and infrequency of the use of thrusters (every four to eight days and 10 to 30 minutes each episode for maneuvering, or intermittently to maintain heading during certain weather conditions);
- Relatively small but unknown amount of exposure;
- Fixed location of the sound sources; and
- Biological considerations, including the very small numbers of baleen whales involved, the patchy distribution of toothed whales in the area, and the observed ability of harbor seals to habituate to human activities including sound.

8.0 The Anticipated Impact of the Activity on the Availability of the Species or Stocks of Marine Mammals for Subsistence Use

There are no traditional subsistence hunting areas in the project area.

9.0 Anticipated Impact on Habitat

9.1 Short-Term Impacts

Construction of the *Neptune* Port and pipeline will affect marine mammal habitat in several ways: cause disturbance of the seafloor, increase turbidity slightly, and generate additional underwater sound in the area. Proposed construction activities will temporarily disturb 418 acres of seafloor (11 acres at the Port, 85 acres along the pipeline route, and an estimated 322 acres due to anchoring of construction and installation vessels). Of the proposed construction activities, pipeline installation, including trenching, plowing, jetting, and backfill, is expected to generate the most disturbance of bottom sediments. Sediment transport modeling conducted by *Neptune* indicates that initial turbidity from installation of the pipeline could reach 100 milligrams per liter (mg/L) but will subside to 20 mg/L after four hours. Turbidity associated with the flowline and hot-tap will be considerably less and also will settle within hours of the work being completed.

Construction activities will not create long-term habitat changes, and marine mammals displaced by the disturbance to the seafloor are expected to return soon after construction has ceased. Marine mammals also could be indirectly affected if benthic prey species were displaced or destroyed by construction activities. Affected species are expected to recover soon after construction has ceased and will represent only a small portion of food available to marine mammals in the area.

During construction of the *Neptune* Port and the pipeline, underwater sound levels will be temporarily elevated. These underwater sound levels will cause some species to temporarily disperse from or avoid construction areas, but they are expected to return shortly after construction is completed.

9.2 Long-Term Impacts

Operation of *Neptune* will result in long-term effects on the marine environment, including continued disturbance of the seafloor, regular withdrawal of seawater, and generation of underwater sound:

- ***Seafloor Disturbance.*** The structures associated with the Port (flowline and pipeline, unloading buoys and chains, suction anchors) will be permanent modifications to the seafloor. Up to 63.7 acres of additional seafloor will be subject to disturbance due to chain and flexible riser sweep while the buoys are occupied by SRVs.
- ***Ballast and Cooling Water Withdrawal.*** Withdrawal of ballast and cooling water at the Port as the SRV unloads cargo (approximately 2.39 million gallons per day) could potentially entrain zooplankton and ichthyoplankton that serve as prey for whale species. This estimate includes the combined seawater intake while two SRVs are moored at the Port (approximately nine hours every six days). The estimated zooplankton abundance in the vicinity of the seawater intake ranges from 25.6 to 105 individuals per gallon (Libby *et al.* 2004). This means that the daily intake will remove approximately 61.2 to 251 million individual zooplankton in a day, the equivalent of approximately 7.65 to 31.4 pounds. Since zooplankton are short-lived (most copepods live from one week to several months), these amounts will be indistinguishable from natural variability.
- ***Underwater Sound.*** During the operations of the Port, underwater sound will principally be generated by use of thrusters when SRVs are mooring at the unloading buoy and at other times for maintaining position under certain wind and tidal conditions. As previously mentioned, thruster use will be intermittent, equating to about 20 hours of use per year. The frequency and duration of the use of the thrusters, coupled with the fixed location of occurrence, will not result in significant effects to individual marine mammals.

10.0 Anticipated Impact of Habitat Loss or Modification

10.1 Short-Term Impacts

Short-term impacts on benthic communities will occur during the installation of the Port and offshore pipeline/flowline. Proposed construction activities will temporarily disturb 418 acres of seafloor (11 acres at the Port, 85 acres along the Proposed Pipeline Route, and an estimated 322 acres due to anchoring of construction and installation vessels). It is anticipated that plowing and jetting will result in some limited re-suspension of fine sediments and resettled sediments (also known as a sediment drape) in the area immediately adjacent to the project area. Resettled sediments also will constitute to seafloor disturbance. When re-suspended sediments resettle, they reduce growth, reproduction, and survival rates of benthic organisms and in extreme cases smother benthic flora and fauna. Plankton, which float, will not be affected by resettled sediment. The project is in an area of Massachusetts Bay that is largely devoid of vegetation and consists of sand, silt, clay, or mixtures of the three. The sediments support a wide variety of organisms that will be displaced or destroyed.

Recovery of soft-bottom benthic communities impacted by project installation is expected to be similar to the recovery of soft habitat associated with the construction of the HubLine[SM] (Algonquin Gas Transmission LLC 2004). Post-construction monitoring of the HubLine[SM] indicates that areas that were bucket-dredged showed the least disturbance. Displaced organisms will return shortly after construction ceases, and disrupted communities will easily re-colonize from surrounding communities of similar organisms. Similarly, disturbance to hardbottom pebble/cobble and piled boulder habitat is not expected to be significant. Some organisms could be temporarily displaced from existing shelter, thereby exposing them to increased predation, but the overall structural integrity of these areas will not be reduced (Auster and Langton 1998).

Short-term impacts on phytoplankton, zooplankton (holoplankton), and planktonic fish and shellfish eggs and larvae (meroplankton) will occur as a result of the project. Turbidity associated with Port and pipeline installation will result in temporary direct impacts on productivity, growth, and development. Phytoplankton and zooplankton abundance will be greatest during the summer construction schedule. Fish eggs and larvae are present in the project area throughout the year. Different species of fish and invertebrate eggs and larvae will be affected by the different construction schedules.

The temporary disturbance of benthic habitat from trenching for and burial of the transmission pipeline will result in direct, minor, adverse impacts from the dispersion of fish from the area and the burying, or crushing of shellfish. In the short-term, there will be a temporary, indirect, and beneficial impact from exposing benthic food sources. Seafloor disturbance could also occur as a result of resettling of suspended sediments during installation and construction of the proposed Port and Pipeline. Redeposited sediments will potentially reduce viability of demersal fish eggs and growth, reproduction, and survival rates of benthic shellfish. In extreme cases, resettled sediments could smother benthic shellfish, although many will be able to burrow vertically through resettled sediments.

10.2 Long-Term Impacts

In the long-term, approximately 64.6 acres of seafloor will be permanently disturbed to accommodate the Port (including the associated pipeline), corresponding to the permanent footprint dimensions of the 16 buoy anchors (0.1 acre); two riser manifolds, and two flowline transition areas (0.1 acre); the pipeline route's transition area, manifolds, and hot-tap tie-in (0.05 acre); areas along the pipeline where armoring is proposed (0.3 acre); the area of sweep associated with 16 anchor chains (56.9 acres); and the sweep associated with two flexible risers (6.8 acres). The area disturbed because of long-term chain and riser sweep includes 63.7 acres of soft sediment. This area will be similar in calm seas and in hurricane conditions. The chain weight will restrict the movement of the buoy or the vessel moored on the buoy. An additional 0.9 acre of soft sediments will be converted to hard substrate. The total affected area will be small compared to the soft sediments available in the proposed project area. Long-term disturbance from installation of the Port will comprise approximately 0.3 percent of the estimated 24,000 acres of similar bottom habitat surrounding the project area (northeast sector of Massachusetts Bay).

It is likely that displaced organisms will not return to the area of continual chain and riser sweep. A shift in benthic faunal community is expected in areas where soft sediment is converted to hard substrate (Algonquin Gas Transmission LLC 2005). This impact will be beneficial for species that prefer hardbottom structure and adverse for species that prefer soft sediment. Overall, because of the relatively small areas that will be affected (as described above), impacts on soft-bottom communities will be minimal.

Daily removal of seawater will reduce the food resources available for planktivorous organisms.

All species have fairly broad diets and are not dependent on any single species for survival. Because of the relatively low biomass that will be entrained by the proposed *Neptune* Port, the broad diet, and broad availability of organisms in the proposed project area, indirect impacts on the food web that result from the entrainment of planktonic fish and shellfish eggs and larvae are expected to be minor.

11.0 The Availability and Feasibility (Economic and Technological), Methods, and Manner of Conducting Such Activity or Means of Effecting the Least Practicable Impact Upon Affected Species or Stock, Their Habitat, and of Their Availability for Subsistence Uses, Paying Particular Attention to Rookeries, Mating Grounds, and Areas of Similar Significance

Neptune LNG LLC has committed to a comprehensive set of mitigation measures during construction and operation, as well as ongoing consultations with the National Marine Fisheries Service. These measures include:

- Passive acoustics program;
- Visual monitoring program;
- Safety zones;
- Reporting;
- Vessel speed;
- Ramp-up procedures; and
- Construction debris.

Details of the proposed mitigations are discussed in the Marine Mammal and Turtle Monitoring and Mitigation Plan that is included as Appendix D to this application.

There are no traditional subsistence hunting areas in the vicinity of *Neptune*.

12.0 Where the Proposed Activity Would Take Place in or Near a Traditional Arctic Subsistence Hunting Area and/or May Affect the Availability of a species or Stock of Marine Mammal for Arctic Subsistence Uses, the Applicant Must Submit a Plan of Cooperation or Information That Identifies What Measures Have Been Taken and/or Will Be Taken to Minimize Any Adverse Effects on the Availability of Marine Mammals for Subsistence Use

There are no traditional Arctic subsistence hunting areas in the vicinity of *Neptune* and there are no activities related to the proposed Port that may affect the availability of a species or stock of marine mammal for Arctic subsistence uses.

13.0 The Suggested Means of Accomplishing the Necessary Monitoring and Reporting That Will Result in Increased Knowledge of the Species, the Level of Taking or Impacts on the Population of Marine Mammals that are Expected to be Present While Conducting Activities and Suggested Means of Minimizing Burdens by Coordinating Such Reporting Requirements With Other Schemes Already Applicable to Persons Conducting Such Activity. Monitoring Plans Should Include a Description of the Survey Techniques that Would be Used to Determine the Movement and Activity of Marine Mammals Near the Activity Site(s), Including Migration and Other Habitat Uses, Such as Feeding

See the proposed Marine Mammal Monitoring and Mitigation Measures Plan for the construction and operation of the Project, which is included as Appendix D of this application.

14.0 Suggested Means of Learning of, Encouraging and Coordinating Research Opportunities, Plans, and Activities Relating to Reducing Such Incidental Taking and Evaluating Its Effects

Neptune LNG LLC has engaged personnel from the National Marine Fisheries Service and Stellwagen Bank National Marine Sanctuary (SBNMS) regarding available passive acoustic monitoring (PAM) technology that will be utilized to enhance the Plan. The primary goal of the real-time PAM program is to minimize vessel-whale interactions. The secondary goal of this program is to generate data to support research-based knowledge. Neptune LNG LLC will continue its discussions and consultations with the National Marine Fisheries Service and SBNMS personnel to develop the appropriate level of inclusion of this technology.

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Appendix A
Biological Opinion

NOTE: The Biological Opinion was previously provided in the original March 2007 IHA/LOA Application

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Appendix B

Assessment of the Effects of Underwater Noise from the Proposed *Neptune* LNG Project (October 2005)

Note: The assessment was previously provided in the original March 2007 IHA/LOA Application. Based on deep geotechnical borings drilled in August 2007 at the mooring anchor locations, it was determined that pile driving would not be necessary and is no longer considered an option.

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Appendix C

Supplements to the Assessment of the Effects of Underwater Noise from the Proposed *Neptune* LNG Project (October 2006)

Note: The supplements were previously provided in the original March 2007 IHA/LOA Application.

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Appendix D

Marine Mammal Monitoring and Mitigation Measures Plan

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A Marine Mammal/Sea Turtle Monitoring Plan (Plan) has been developed by Neptune LNG LLC to minimize the potential for impacts to marine mammals and sea turtles from the construction and operation of *Neptune*.

D.1.0 CONSTRUCTION MINIMIZATION MEASURES

During the construction phase of the project, this Plan relies on passive acoustics detection systems, human visual observers, and other measures to assist in the detection of marine mammals within the immediate construction area.

D.1.1 Passive Acoustics Program

A passive acoustic monitoring (PAM) system will be used to minimize potential risks for mammal/turtle strikes from *Neptune*'s operations and to determine whether there is any evidence that mammal and turtles avoided areas that are exposed to elevated sound levels during construction of *Neptune* and its associated pipeline. Neptune LNG LLC has engaged personnel from the National Marine Fisheries Service and Stellwagen Bank National Marine Sanctuary (SBNMS) regarding available passive acoustic technology that could be used to enhance the Plan. Three underwater acoustic elements will be addressed in the PAM program:

- **Measurement of Vessel and Equipment During Construction.** Source level (SL) measurements will provide reference sound source levels of the vessels and equipment used during construction of *Neptune*. Current model results rely on source level data from literature. As a result, there are uncertainties regarding the actual sound levels that will be introduced into the underwater environment during construction. SL measurements will be made using a combination of manned recording stations and pop-up recorders located as close as possible to the specific sources being monitored. SL measurements require that the distance from source to monitoring hydrophones be accurately measured. Range measurements are required for scaling the measured levels to a standard reference range (typically 1 meter from the source). Range measurements can be performed using GPS, radar, or laser range finders.
- **Verification of the Accuracy of the Acoustic Propagation Model.** This element will focus on assessing the accuracy of the acoustic propagation model that was used to predict the sound fields that would be generated by the project. The purpose of making sound transmission loss (TL) measurements is to obtain a dataset from which acoustic model results can be validated. TL measurements are directly comparable with acoustic model predictions. On occasion where differences are found between modeled and measured transmission loss, an examination of the discrepancies will allow a refinement of the model inputs (geo-acoustic and oceanographic data) in order to fit the modeled predictions to the measured data. This approach, referred to as model validation, ensures the highest level of confidence in acoustic model results. Transmission loss measurements are made at selected locations by measuring the rate of acoustic signal amplitude decay with range from a low power underwater sound projector. The projected sounds are varied over a predefined set of frequencies representative of the spectral distribution of the respective sound source. During each projector deployment, a multi-frequency sound signal is broadcast underwater. The signal consists of repetitions of a set of single-frequency tones at 1/3-octave band center frequencies between 200 Hertz (Hz) and 20 kiloHertz (kHz). A GPS record of broadcast location versus time is taken for each deployment to reference the TL measurements to the corresponding source-

receiver distance. The source level of the broadcast sound signal is monitored continuously using a hydrophone mounted 1 meter directly above the projector. Pop-up recording systems record the received level of underwater sound at various ranges from the broadcast signal. Post processing is required to calculate the measured TL as a function of frequency and compare it with the modeled TL.

- **Installation of the PAM Capability.** The proposed PAM system will be capable of detecting, localizing (range and bearing) and classifying vocalizing marine mammals in real-time. When combined with an action and communication plan, Neptune LNG LLC will have the capability to make timely decisions and undertake steps to minimize the potential for collisions between marine mammals (or sea turtles) and construction vessels. A typical PAM system is comprised of a combination of sensors including hydrophones, vertical and horizontal arrays, and the associated signal processing and communication systems. The PAM system proposed for *Neptune* will involve the installation of an array of auto-detection monitoring buoys moored at regular intervals in a circle surrounding the site of the terminal and associated pipeline construction. Buoys will be arranged to maximize auto detection and provide localization capability. With the existing technology, this would require six buoys moored every 5 nautical miles (NM) to provide some overlap in coverage. The buoys are designed to monitor the sound output from construction activities to ensure predicted levels are not exceeded, and detect the presence of vocally active marine mammals. This will assist in monitoring of acoustic take authorized under the Marine Mammal Protection Act (MMPA) and trigger management action if certain thresholds are exceeded.

The passive acoustic devices will be actively monitored for detections by a National Marine Fisheries Service-approved bioacoustic technician.

D.1.2 Visual Monitoring Program

Qualifications and Responsibilities of the Marine Mammal Observers. The PAM capability will be complementary to the presence of shipboard Marine Mammal Observers (MMOs). The MMOs on board the mobile project vessels will make observations to insure that no whales or turtles are struck by project vessels. These observers will have demonstrated direct field experience on a marine mammal/sea turtle observation vessel and/or aerial surveys in the Atlantic Ocean or Gulf of Mexico and will meet the experience requirements established by the National Marine Fisheries Service.

MMOs conduct systematic quantitative surveys while on duty. The distance from the vessel of all marine mammals and turtles observed is determined or estimated. Therefore, on a fine scale, the data from the MMO surveys can be used to determine whether animals show avoidance of the vessels. The systematic surveys also will document information on the species, group size, behavior, etc. of marine mammals in the area.

These professional MMOs will be on duty at all times when each vessel is moving and at selected periods when the vessel is idle, including when other vessels move around the construction lay barge. The observers (one primary and one secondary) are responsible for visually locating marine mammals and sea turtles at the ocean's surface and, to the extent possible, identifying the species. The primary observer will act as the identification specialist and the secondary observer will serve as data recorder and will assist with identification.

The shipboard observers will begin monitoring the construction area at daybreak using 25x power binoculars and/or hand-held binoculars resulting in a conservative effective search range of 0.5 mile

during clear weather conditions for the shipboard observers. The observer will scan the ocean surface by eye for a minimum of 40 minutes every hour. All sightings will be recorded on marine mammal field sighting logs. Observations of marine mammals and sea turtles will be identified to species or the lowest taxonomic level and their relative position will be recorded. During construction, the following procedures will be followed upon detection of a marine mammal or sea turtle within 0.5 mile of the construction vessels:

- Prior to construction and operation, personnel and crew members will undergo National Marine Fisheries Service-certified training regarding marine mammal and sea turtle presence and emergency collision avoidance procedures. Watches will be maintained while all vessels were underway.
- Neptune LNG LLC has committed to operating vessels at least 1 kilometer away from North Atlantic right whales (322 Code of Massachusetts Regulations [CMR] 12.00, requires a distance of 460 meters away from North Atlantic right whales). To the extent possible, vessels will also remain 91 meters away from all other whales.
- During all phases of construction, National Marine Fisheries Service-approved endangered species observers (MMOs) will be required to scan for and report all marine mammal or sea turtle sightings to the vessel captain. The captain will then alert the environmental coordinator that a marine protected species was near the construction area. The MMOs will have the authority to bring the vessel to idle or to temporarily suspend operations if a baleen whale is seen within 1 kilometer of the moving pipelay vessel or construction area. The MMO or environmental coordinator will determine whether there is a potential for harm to an individual animal and will be charged with responsibility for determining when it is safe to resume activity. In general, a vessel will not increase power again until the whale(s) leave(s) the area or has/have not been seen for 30 minutes. The vessel will then power up slowly. The work vessels on the project are fairly small and do not travel at high speeds; thus, the risk of a strike is already low, even before the mitigation.

Recordkeeping Requirements. Records will be maintained of all visual and acoustic detections of marine mammals, including relevant details such as date and time, weather conditions, species identification, approximate distance from the source, and behavioral observations. At the conclusion of the construction period, a report will be submitted to the National Marine Fisheries Service summarizing the construction activities, endangered species sightings (both visual and acoustic), and any mitigative actions taken.

Reporting. During all phases of project construction and operation, sightings of any injured or dead protected species (sea turtles and marine mammals) will be reported immediately to the U.S. Coast Guard (USCG), regardless of whether the injury or death is caused by project activities. Sightings of injured or dead whales and sea turtles will be reported to the USCG on VHF Channel 16, or to the National Marine Fisheries Service Stranding and Entanglement Hotline: (978) 281-9351. Any right whale sightings will be reported to the National Marine Fisheries Service Sighting Advisory System (SAS) at 978-585-8473.

D.1.3 Other Measures

Other key aspects of the Plan include the following:

- The requirements for reporting the activities of all construction and support vessels (including vessels below 300 gross tons will be adhered to, although their participation is not required by law) to the USCG when operating within the Mandatory Ship Reporting Area (MSRA) and remaining apprised of North Atlantic right whale movements within the construction area. All vessels entering and exiting the MSRA will report their activities to WHALESNORTH. Vessel operators will contact the USCG either by e-mail (RightWhale.MSR@noaa.gov) or Telex (236737831). If they are unable to use satellite communications equipment, they will contact the USCG Communication Area Master Station, Chesapeake, Virginia, via SITOR/NBDP (Simplex Teletype over Radio/Narrowband Direct Printing) on 8426.3 kHz, 12590.8 kHz, or 16817.8 kHz 24 hours per day, or 6314.3 kHz from 2300 Greenwich Mean Time (GMT) until 1100 GMT and 22387.8 kHz from 1100 GMT until 2300 GMT.
- Construction and support vessels will be required to display lights when operating at night, and deck lights will be required to illuminate work areas. However, use of lights will be limited to areas where work is actually taking place, and all other lights will be extinguished. Lights will be downshielded to illuminate the deck, and will not intentionally illuminate surrounding waters. If whales or their prey are attracted to the lights, it could increase the potential for interaction with equipment. However, due to the nature of project activities listed species and their prey are more likely to be displaced by seafloor disturbance, turbidity, and sound than attracted by lighting.
- Mesh grates will be used during flooding and hydrostatic testing of the pipeline and flowlines to minimize impingement and entrainment of marine mammals and sea turtles.
- Operations involving excessively noisy equipment will “ramp-up” sound sources, as long as this does not jeopardize the safety of vessels or construction workers, allowing whales a chance to leave the area before sounds reach maximum levels. Contractors will be required to utilize vessel-quieting technologies that minimize sound.
- Contractors will be required to maintain individual Spill Prevention, Control, and Containment (SPCC) Plans in place for construction vessels during construction.
- An environmental coordinator with experience coordinating projects to monitor and minimize impacts to marine mammals and sea turtles will be onsite to coordinate all issues concerning marine protected species, following all of the latest real time marine mammal and sea turtle movements. The coordinator will work to ensure that environmental standards are adhered to and adverse interactions between project equipment and listed species do not occur. During all phases of construction, MMOs will be required to scan for and report all marine mammal or sea turtle sightings to the vessel captain. The captain will then alert the environmental coordinator that a marine protected species was near the construction area. Offshore construction activities will be temporarily suspended if a marine mammal or sea turtle were observed in the construction area within 1 km of the pipelay vessel and the MMO or environmental coordinator determined there was potential for harm to an individual. The environmental coordinator will

also be able to provide information to approaching vessels about the locations of whales nearby, and vessels can reduce speed, increase vigilance, or alter course accordingly. The coordinator will also communicate with NOAA/NERO personnel, as appropriate.

To minimize the potential for accidental releases of debris overboard the barges during construction activities, the practices below will be followed:

- The discharge and disposal of garbage and other solid debris from vessels by lessees of the OCS is prohibited by the Minerals Management Service (30 CFR 250.300) and the USCG (MARPOL Annex V, Public Law 100-220 [Statute 1458]). The discharge of plastics is strictly prohibited and violations will be subject to enforcement actions. During construction, individual crew members will be responsible for ensuring that debris is not discharged into the marine environment.
- Any material that has the potential to entangle marine mammals or sea turtles (e.g., anchor lines, cables, rope, or other construction debris) will be deployed only as long as necessary to perform its task. It then will immediately be removed from the project site. All possible slack will be taken out of any potentially entangling material. In the unlikely event that an entanglement appeared likely to occur, all potentially entangling material will be removed from the water immediately. Knotless and non-floating lines will be used on construction vessels. If necessary, temporary mooring buoys will be positioned with heavy steel cables or chains to minimize potential entanglements. In the unlikely event that a marine mammal or sea turtle becomes entangled, the endangered species observer will immediately notify the National Marine Fisheries Service so that a rescue effort may be initiated.

D.2.0 OPERATIONS MINIMIZATION MEASURES

Neptune LNG LCC will incorporate minimization measures to avoid impacts to marine animals during operations of the Port, including both a passive and visual monitoring components, as described below.

D.2.1 Passive Acoustics Program

An operational PAM system will be in effect during port operations at *Neptune*. This system will include an array of buoys to cover the impact area (120 A-weighted dB) expected during regular operations. The design of the buoy array will be based on the total area of significant impact and the maximum coverage of each buoy. The purpose of the array is to determine whether operational sound output is and remains within the levels predicted, and detect major shifts in marine mammal presence in the area (i.e., abandonment). Monitoring will focus on measuring the sound source levels of the LNG carriers and the re-gasification process, verifying the acoustic propagation models used to predict the sound fields generated by the project, and gathering/recording marine mammal vocalizations. The array will be in place for the duration of the requested Letter of Authorization (five years following initiation of operations) to monitor the actual acoustic output of port operations and alert the National Marine Fisheries Service to any unanticipated adverse effects of port operations, such as large-scale abandonment of the area or greater acoustic impacts than predicted through modeling.

In addition, Neptune LNG LLC will support the National Marine Fisheries Service initiative to detect presence of marine mammals along the Boston Harbor Traffic Separation Scheme (TSS) by

installing and operating an array of near real-time acoustic detection buoys. This monitoring plan calls for the installation of ten auto-detection buoys moored at regular intervals in the northern leg of the Boston Harbor TSS within the separation zone between the incoming and outgoing lanes. The purpose of this buoy array will be to detect the presence of vocally active whales within the shipping lane, and transmit this information in real-time to SRVs approaching the *Neptune* port. Vessel captains could then take appropriate action to avoid a collision with the whale. The existing auto-detection buoy technology was developed and tested in Cape Cod Bay and the SBNMS by the Massachusetts Department of Marine Fisheries, National Marine Fisheries Service, the SBNMS, Woods Hole Oceanographic Institution, and the Bioacoustics Research Program (BRP) at Cornell University. SBNMS's recommendation was based on knowledge of this particular technology, but Neptune LNG LLC has the option to develop and explore alternative technologies that achieve the same purpose. Neptune LNG LLC has been working with Cornell University since December 2006 and is currently working on a consulting agreement to continue with the BRP. The number of buoys, duration of the program, and specific location for installation of this system will be approved in advance by the Maritime Administration (MARAD) and the National Marine Fisheries Service.

D.2.2 Visual Monitoring and Other Elements of the Plan

Prior to entering areas where right whales are known to occur, including the Great South Channel and SBNMS, SRV operators will consult recent right whale sighting information through NAVTEX (Navigation Telex Radio), NOAA Weather Radio, NOAA's Right Whale SAS, or other means to obtain the latest sighting information. Vessel operators will also receive active detections from the passive acoustic array prior to and during transit through the northern leg of the Boston Harbor TSS where the buoys are installed.

In response to active right whale sightings (detected either acoustically or through the SAS), SRVs will take appropriate actions to minimize the risk of striking whales, including reducing speed to 10 knots maximum and posting additional observers. Designated crew members will undergo National Marine Fisheries Service-certified training regarding marine mammal and sea turtle presence and collision avoidance procedures.

Vessels approaching and departing the port from LNG supply locations will enter the Boston Harbor TSS as soon as practicable and remain in the TSS until the Boston Harbor precautionary area. SRVs and support vessels will travel at 10 knots maximum when transiting to/from the port outside of the TSS. SRVs will reduce transit speed to 10 knots maximum (unless hydrographic, meteorological, or traffic conditions dictate an alternative speed to maintain the safety or maneuverability of the vessel) throughout the year in all waters within the Off Race Point Seasonal Management Area (SMA). SRVs will reduce transit speed to 10 knots maximum (unless hydrographic, meteorological, or traffic conditions dictate an alternative speed to maintain the safety or maneuverability of the vessel) from April 1 to July 31 in all waters within the Great South Channel SMA. In such cases where speeds in excess of the 10-knot speed maximums are required, the reasons for the deviation, the speed at which the vessel is operated, the area, and the time and duration of such deviation will be documented in the logbook of the vessel and reported to the National Marine Fisheries Service Northeast Region Ship Strike Coordinator.

All vessels will comply with the year-round Mandatory Ship Reporting System (MSRS). If whales are seen within 1 kilometer of the buoy, then the SRVs will wait until the whale(s) leave(s) the area before departing.