DRAFT ENVIRONMENTAL ASSESSMENT

FOR TESTING

SWIMMER/DIVER DETECTION SYSTEMS

U.S. Department of Homeland Security

245 Murray Lane S.W., Bldg. 410

Washington, D. C.

January 2010

Insert DHS Finding of No Significant Impact (FONSI) Letter Here

DRAFT ENVIRONMENTAL ASSESSMENT FOR TESTING SWIMMER/DIVER DETECTION SYSTEMS

RESPONSIBLE AGENCY:

- U.S. Department of Homeland Security
  - Borders and Maritime Security Division, Science and Technology Directorate

ORGANIZATIONS DESIGNING AND CONDUCTING TESTING:

- BioSonics®, Seattle, Washington
- FarSounder, Inc. of Providence, Rhode Island
- Applied Physical Science (APS) Corporation of Groton, Connecticut

TITLE OF PROPOSED ACTION: Testing Swimmer/Diver Detection Systems

ACTION LOCATIONS: Washington, Connecticut, Rhode Island, and Massachusetts

CONTACT PERSON AT RESPONSIBLE COMMAND:

- Leslee Shumway, Program Manager, Borders and Maritime Security Division, Science and Technology Directorate, U.S. Department of Homeland Security
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REFERENCE: This Draft Environmental Assessment (EA) is prepared pursuant to 40 CFR 1500-1508, CEQ Regulations for Implementing the National Environmental Policy Act (NEPA) (http://ceq.hss.doe.gov/Nepa/regs/ceq/toc_ceq.htm).

PUBLIC COMMENTS: Comments on this Draft EA must be received by the Department of Homeland Security 30 days after receipt of document.

ABSTRACT: The U.S. Department of Homeland Security (DHS) is tasked with providing comprehensive protection to more than 360 ports and port facilities, nationwide. To meet this requirement, DHS has funded the development and testing of three sonar systems for the purpose of underwater acoustic swimmer/diver detection. These systems are: 1) the DT-X or DE-X EchoSounder Systems developed by BioSonics®, Inc. of Seattle, Washington; 2) the Low Cost Underwater Threat Detection System developed by Applied Physical Science Corporation of Groton, Connecticut; and 3) the FS3DT or the FS100kHz Systems developed by FarSounder, Inc. of Providence, Rhode Island. One or more of these systems may be selected for further development and installation as a swimmer/diver detection system in important civilian and military harbors, installations, and facilities that are adjacent to or may be accessed via the water (i.e., rivers, harbors, or lakes). The proposed action identified in this Environmental Assessment (EA) includes the continuing developmental and engineering testing of each of the three systems and ultimately a demonstration of the system efficacy to DHS. This involves a maximum of 12 days of testing over 6 to 12 months. Each day of testing would include about 4 hours of active transmissions but some tests could last up to 8 hours. Eight potential test sites have been identified in four states (Washington, Rhode Island, Connecticut, and Massachusetts). A thorough analysis of all potential impacts from the testing of these systems was investigated, including an acoustic analysis using the latest science on the susceptibility of fish, sea turtles, and marine mammals to acoustic transmissions; the latest acoustic thresholds for these species, and the most appropriate calculation techniques. Based on the scientific analysis, the proposed action will not individually nor cumulatively have a significant impact on the environment nor will it have a significant impact on species or critical habitats listed under the Endangered Species Act (ESA). No reasonably foreseeable takes of marine mammals are expected as a result of the proposed action. There would be no degradation to the quality and/or quantity of essential fish habitats (EFH) or habitat areas of particular concern from the proposed testing. No coral reefs occur near any of proposed test sites. Finally, no foreseeable direct or indirect effects on any current or future coastal uses or resources are expected as a result of the proposed action.

Executive Summary

The U.S. Department of Homeland Security (DHS) has utilized the Small Business Innovation Research (SBIR) Program to fund the development and testing of three sonar systems for the purpose of underwater acoustic swimmer/diver detection. These systems are: 1) the DT-X or DE-X EchoSounder Systems developed by BioSonics®, Inc. of Seattle, Washington (WA); 2) the Low Cost Underwater Threat Detection System developed by Applied Physical Science (APS) Corporation of Groton, Connecticut (CT); and 3) the FS3DT or the FS100kHz Systems developed by FarSounder, Inc. of Providence, Rhode Island (RI). Following a period of development and evaluation, one or more of these systems may be selected for further testing and development as well as installation as a swimmer/diver detection system in important civilian and military harbors and coastal facilities that are adjacent to or may be accessed via the water (i.e., rivers, harbors, or lakes). However, additional National Environmental Policy Act (NEPA) documentation and review would be required for any action beyond the scope of the testing and evaluation assessed in this Environmental Assessment (EA). The scope of the environmental impact review documented in this EA was limited to the proposed test series; the results of this testing are needed by DHS to determine whether to proceed further with development of this swimmer/diver detection technology. It is not the intent or purpose to use any conclusions or findings from this environmental impact review to address or predict any future uses of these systems.

DHS is tasked with providing comprehensive protection to more than 360 ports and port facilities, nationwide. One aspect of this requirement is the protection of these facilities from potential attack or infiltration by underwater swimmers. The U.S. has many critical infrastructure sites and high value dollar assets located in port and coastal regions. Chemical companies, oil refineries, power plants, tankers, and cruise ships are examples of coastal assets that are vulnerable to attack by swimmers and divers. These coastal businesses and vessels could be covertly approached by swimmers and divers whose intent would be to use explosives to wreak great damage to the coastal waters and flow of commerce, and cause injury and loss of life of many workers and residents.

At the request of the U.S. Coast Guard, the DHS's Science and Technology Directorate has developed three prototype systems that are designed to detect swimmers and divers and alert security forces of their presence. By using the SBIR Program, DHS hopes to encourage small businesses to identify and develop the sonar technologies and systems necessary to provide a reliable underwater swimmer/diver detection capability. Integral to this development effort is the requirement to test and evaluate the proposed systems *in situ* and in varying acoustic environmental conditions. The detection systems emit underwater sound ("pings") to detect and locate the swimmer/divers. Those pings are, by design, less harmful to aquatic life than commercial fish-finder sonars.

The proposed action identified in the EA includes the continuing developmental and engineering testing of each of the three systems and ultimately a demonstration of the system efficacy to DHS. To accomplish this, a conservatively estimated maximum of 12 days of testing would be required over a 6 to 12 month period in order to develop and then demonstrate each of these systems. Each of these days of testing would include about 4 hours of active transmissions, but some tests could last up to 8 hours. Eight potential test sites have been identified in four states (Washington, Rhode Island, Connecticut, and Massachusetts) and the "Affected Environment" for each of these sites was investigated in this EA.

One of these eight test sites, an optional backup site for the BioSonics® system tests, is located in Dabob Bay, Washington (WA). This test site is a part of the U.S. Navy's Dabob Bay Range Complex (DBRC) near Bremerton, WA. An existing EA written by the personnel at the Naval Undersea Warfare Center (NUWC), Keyport includes the operation of systems like the BioSonics® system on the DBRC. Keyport range personnel have reviewed an application to conduct operations on their range and have responded by memorandum (Appendix A) that this system is addressed by their EA. If and when an actual test is scheduled for the DBRC, the Range will issue an approval letter, authorizing the test and stipulating all safety and protective requirements.

The nominal scenario for testing begins with a small transducer (approximately a cubic foot in volume or less) that would be lowered into the water column and activated (i.e., begin active acoustic transmissions). Echoes of these signals would then be received by the same hydrophones that transmitted the signal and processed electronically to determine if a diver was present. These tests would be conducted from existing piers, seawalls, or other man-made coastal structure, and from small boats or barges. If testing would be conducted from watercraft, the boats or barges would remain within the areas identified in this document, and the testing would occur while the watercraft is stationary or nearly-stationary in the water. Upon completion of each days testing, the acoustic transducer would be removed. Nothing would be placed on the sea bottom and there will be no discharges of liquids or solids into the water. It should be noted that in the above described scenario, the APS system would vary from this description in that it is a multi-static sonar system (i.e., it has multiple sources and receivers deployed at any time), so the potential impact analysis for this system included a maximum of six sources that may be deployed during the APS tests.

The technical specifications (i.e., source levels, beam patterns, acoustic signal descriptions, array configurations, etc.) for each of the three systems vary, but in general, all of the systems are high frequency systems, operating between 55 and 205 kiloHertz (kHz), at relatively low sound energy levels (SELs), (i.e., <200 dB re 1 μPa^2-sec @ 1 m). To put this into perspective, these source levels are comparable to or less than many commercially available fish-finding sonars or fathometers.

A thorough acoustic analysis of each sonar system was conducted using the latest science on the susceptibility of fish, sea turtles, and marine mammals to acoustic transmissions; the latest thresholds as identified by a National Marine Fisheries Service (NMFS)-sponsored peer-reviewed paper (Southall et al. 2007); and the most appropriate calculation techniques for operations of the type described in the proposed action. Throughout this analysis, conservative assumptions were used. The results of this analysis provided seasonal estimations of the potential impacts, both Level A and B, to marine mammals in each of the test areas. These results did not include any protective measures but appropriate measures are identified in the EA.

The potential impacts to human divers were also examined in this document. The human hearing range extends from approximately 20 Hz to 20 kHz. The Naval Sea Systems Command has indicated that, for mid frequencies, sound pressure levels greater than 190 dB and 205 dB are required to produce physiological effects on un-hooded and hooded divers, respectively (DoN 1989). The frequency used in the proposed tests is far above the human hearing range. In order to exceed the 190 dB threshold, a diver would have to approach within 10 m of the source. The likelihood of this occurring is negligible. Additionally, the possibility of diver lung resonance was examined and found to be negligible because human lungs resonate at frequencies below 2 kHz, far below the frequencies proposed for this testing. Finally, the ability of system operators to observe any divers in the attesting area because of their diver flags and floats was discussed. This combined with typical sonar procedures which may reduce the transmitted source level of signal duration will further reduce the already negligible chance of impacting human divers.

Based on scientific analysis in this EA, the proposed action will not individually or cumulatively have a significant impact on the environment. Therefore, an Environmental Impact Statement (EIS) is not required under the National Environmental Policy Act (NEPA). The proposed action causes no significant impacts on species or critical habitats listed under the Endangered Species Act (ESA). No reasonably foreseeable takes of marine mammals are expected as a result of the proposed action, and for this reason, no authorization under the Marine Mammal Protection Act (MMPA) is sought. There would be no degradation to the quality and/or quantity of essential fish habitats (EFH) or habitat areas of particular concern from the proposed testing; hence, consultation with NMFS under Section 305(b)(2) of the Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA) is not required (50CFR600.920). The proposed test sites are thousands of miles from coral reefs; thus, no action is required under Executive Order 13089.

Finally, no foreseeable direct or indirect effects on any current or future coastal uses or resources are expected as a result of the proposed action. The proposed action is consistent with all enforceable policies delineated in the federally approved Coastal Zone Management Plans of Washington, Rhode Island, Connecticut, and Massachusetts. The proposed action is not included as a defined federal activity for which these states require an automatic consistency review. As required by Section 307(c)(1) of the Coastal Zone Management Act (CZMA), Negative Determinations have been submitted to the Coastal

Zone Management Programs of Washington, Rhode Island, Connecticut, and Massachusetts 90 days prior to final DHS signatory authorization for the proposed action.

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ACRONYMS AND ABBREVIATIONS

°	Degree (s)
%	Percent
ACoE	Army Corps of Engineers
APS	Applied Physical Sciences
C	Celsius or Centigrade
CATEX	Categorical Exclusion
CCMA	The Connecticut Coastal Management Act
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CGS	Connecticut General Statute(s)
CMR	Code of Massachusetts Regulations
cm/s	Centimeters per second
CRMC	Coastal Resources Management Council
CRMP	Coastal Resources Management Plan
CZMA	Coastal Zone Management Act
CZMP	Coastal Zone Management Plan
CT	Connecticut
DB	Dabob Bay
DBRC	Dabob Bay Range Complex
dB	Decibel(s)
dB re 1 µPa @ 1 m	Decibels relative to one micro-Pascal measured at one meter from center of acoustic source
dB re 1 μPa^2 –sec @ 1 m	Decibels relative to one micro-Pascal squared per second measured at one meter from an acoustic source's center
DHS	Department of Homeland Security
DoN	Department of the Navy
DPS	Distinct Population Segment
EA	Environmental Assessment
EB	Elliott Bay
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ESA	Endangered Species Act
EO	Executive Order
F	Fahrenheit
FONSI	Finding of No Significant Impact

ACRONYMS AND ABBREVIATIONS (Continued)

ft	Feet
ft/s	Feet per second
GSO	Graduate School of Oceanography
HAPC	Habitat Areas of Particular Concern
Hz	Hertz
kHz	KiloHertz
km	Kilometer(s)
km^2	Square kilometers
kts	Knots
LIS	Long Island Sound
m	Meter (s)
m/s	Meters per second
MA	Massachusetts
MCZMO	Massachusetts Coastal Zone Management Office
M.G.L.	Massachusetts General Laws
mi	Mile (s)
mi^2	Square miles
MMPA	Marine Mammal Protection Act
MOA	Military Operating Area
MPA	Marine Protected Area
msec	Millisecond(s)
MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NM	Nautical miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NUWC	Naval Undersea Warfare Center
POC	Point of contact
psu	Practical salinity units
PTS	Permanent threshold shift
RI	Rhode Island
RL	Received level
ROI	Regions of Influence
SAMP	Special Area Management Plan
sec	Second(s)

ACRONYMS AND ABBREVIATIONS (Continued)

SEL	Sound exposure level
SL	Source level
SMA	Shoreline Management Act
SPL	Sound pressure level
TL	Transmission Loss
TS	Threshold shift
TTS	Temporary threshold shift
WHOI	Woods Hole Oceanographic Institution
UM	University of Massachusetts at Dartmouth
U.S.	United States of America
U.S.C.	United States Code
USFWS	United States Fish and Wildlife Service
WA	Washington
ZOI	Zone of Influence

1 PURPOSE AND NEED FOR THE ACTION

1.1 INTRODUCTION

The United States (U.S.) Department of Homeland Security (DHS) has utilized the Small Business Innovation Research (SBIR) Program to fund the development and testing of three sonar systems for their use as underwater swimmer/diver detection systems. Following a period of development and evaluation, one or more of these systems may be selected for further test and development as well as for installation as a swimmer/diver detection system for important civilian and military harbor and coastal facilities that are adjacent to or may be accessed via the water (i.e., rivers, harbors, or lakes).

1.2 PURPOSE AND NEED

DHS is tasked with providing comprehensive protection to more than 360 ports and port facilities, nationwide. One aspect of this requirement is the protection of these facilities from potential attack or infiltration by underwater swimmers. The U.S. has many critical infrastructure sites and high value dollar assets located in port and coastal regions. Chemical companies, oil refineries, power plants, tankers, and cruise ships are examples of coastal assets that are vulnerable to attack by swimmers and divers. These coastal businesses and vessels could be covertly approached by swimmers and divers whose intent would be to use explosives to wreak great damage to the coastal waters and flow of commerce, and cause injury and loss of life of many workers and residents.

At the request of the U.S. Coast Guard, the DHS's Science and Technology Directorate has developed three prototype systems that are designed to detect swimmers and divers and alert security forces of their presence. By using the SBIR Program, DHS hopes to encourage small businesses to identify and develop the sonar technologies and systems necessary to provide a reliable underwater swimmer/diver detection capability. Integral to this development effort is the requirement to test and evaluate the proposed systems *in situ* and in varying acoustic environmental conditions. The detection systems emit underwater sound ("pings") to detect and locate the swimmer/divers. Those pings are, by design, less harmful to aquatic life than commercial fish-finder sonars.

This Environmental Assessment (EA) document has been prepared to support the testing and evaluation of the three developmental systems and does not include the installation and subsequent use of any of the systems; additional National Environmental Protection Act (NEPA) documentation and review would be required prior to any detection system deployment and use. The scope of the environmental impact review documented in this EA was limited to the proposed test series; the results of this testing are needed by DHS to determine whether to proceed further with development of this swimmer/diver detection technology. It is not the intent or purpose to use any conclusions or findings from this environmental impact review to address or predict any future uses of these systems.

The purpose of the proposed action is specifically to continue development and testing of the candidate acoustic systems. These systems are: 1) the DT-X or DE-X EchoSounder Systems developed by BioSonics® Inc. of Seattle, Washington (WA); 2) the Low Cost Underwater Threat Detection System developed by Applied Physical Sciences (APS) Corporation of Groton, Connecticut (CT); and 3) the FS3DT or the FS100kHz Systems developed by FarSounder, Inc. of Providence, Rhode Island (RI) (Table 1-1).

1.3 PROPOSED ACTION

The proposed action includes the continuing developmental and engineering testing of each of these systems and ultimately a demonstration of that system to DHS. In order to accomplish this, the conservative estimate of a 12-day testing maximum over a 6 to 12 month period was determined to complete development and then demonstrate each of the three systems. Each day of testing would include about 4 hours of active transmissions, but some tests could last up to 8 hours. During the testing, a small transducer (nominally a cubic foot in volume or less) would be lowered into the water column and activated (i.e., begin active acoustic transmissions). Echoes of these signals would then be received by the same hydrophones that transmitted the signal and processed electronically to determine if a diver was present. These tests will be conducted from existing piers, seawalls or other man-made coastal structure, or from small boats or barges. If testing would be conducted from watercraft, the boats or barges would

Table 1-1. Proposed sites for the testing of the acoustic swimmer/diver detection systems.

System	Proposed Testing/Demonstration Sites
BioSonics® DT-X or DE-X System	1) Elliot Bay, Seattle, WA 2) Dabob Bay, U.S. Navy Range, WA
FarSounder FS3DT or FS100kHz Systems	1) Eastern Narragansett Bay, RI 2) Western Narragansett Bay, RI
Applied Physical Sciences Corporation Low Cost Underwater Threat Detection System	1) University of Connecticut, Avery Point Campus, Groton, CT 2) Graduate School of Oceanography, University of Rhode Island, Narragansett, RI 3) University of Massachusetts at Dartmouth, School of Marine Science and Technology, New Bedford, MA 4) Woods Hole Oceanographic Institution, Woods Hole, MA

remain within the areas identified in this document, and the testing would occur while the watercraft is stationary or nearly stationary in the water. Upon completion of a day's testing, the transducer would be removed from the water. No equipment or instruments would be placed on the sea bottom, except potentially the temporary placement of anchors, and there would be no discharges of liquids or solids into the water. It should be noted that in the above scenario description that the Applied Physical Sciences Corporation (APS) system will vary from this description in that it is a multi-static sonar system (i.e., it has multiple sources and receivers deployed at any time) so the potential impact analysis for this system will need to include this data. For all additional analysis, this system will be assumed to have a maximum of six sources deployed.

To conduct *in-situ* development tests and demonstrations of each of the systems, each of the three companies that developed a system identified the proposed sites where they desired to conduct *in-situ* tests and demonstrations. The reasons for selecting the identified sites include: 1) proximity to the location where the company is actually assembling the system, 2) the test participants' familiarity or knowledge of the site and its facilities and capabilities, 3) the suitability of the site based on environmental (i.e., acoustic propagation) characteristics, 4) the availability of services (e.g., electrical supply), 5) the availability of that site, and 6) the fact that the sites identified are often ultimately a potential candidate for deployment of a swimmer/diver detection system for the purpose of harbor security. The proposed action analyzed in this document assumes that any or all of the sites proposed by the individual companies may and will be used by them.

The two areas identified by BioSonics® for testing of their system are Dabob and Elliott Bays (Figure 1-1). The primary site selected for the majority of the BioSonics® testing is the waters of northern Elliott Bay adjacent to Pier 90 and 91, which are part of the Port of Seattle. A secondary area in Dabob Bay, which is part of the U.S. Navy's Dabob Bay Range Complex (DBRC), has also been identified as a potential location for the final system demonstration for the BioSonics® system. This site is included as part of the proposed action should DHS require BioSonics® to demonstrate their system in a second site, or the facilities (i.e., range instrumentation, vessels, and divers) available at the Dabob Bay site are needed during the final demonstration and testing.

Acoustic testing on the DBRC is addressed in the *U.S. Navy Dabob Bay and Hood Canal Military Operating Areas Environmental Assessment* (DoN 2002), in which the Navy conducted an analysis of the potential environmental impacts on the range. In that EA analysis, a comprehensive list of the "primary in-

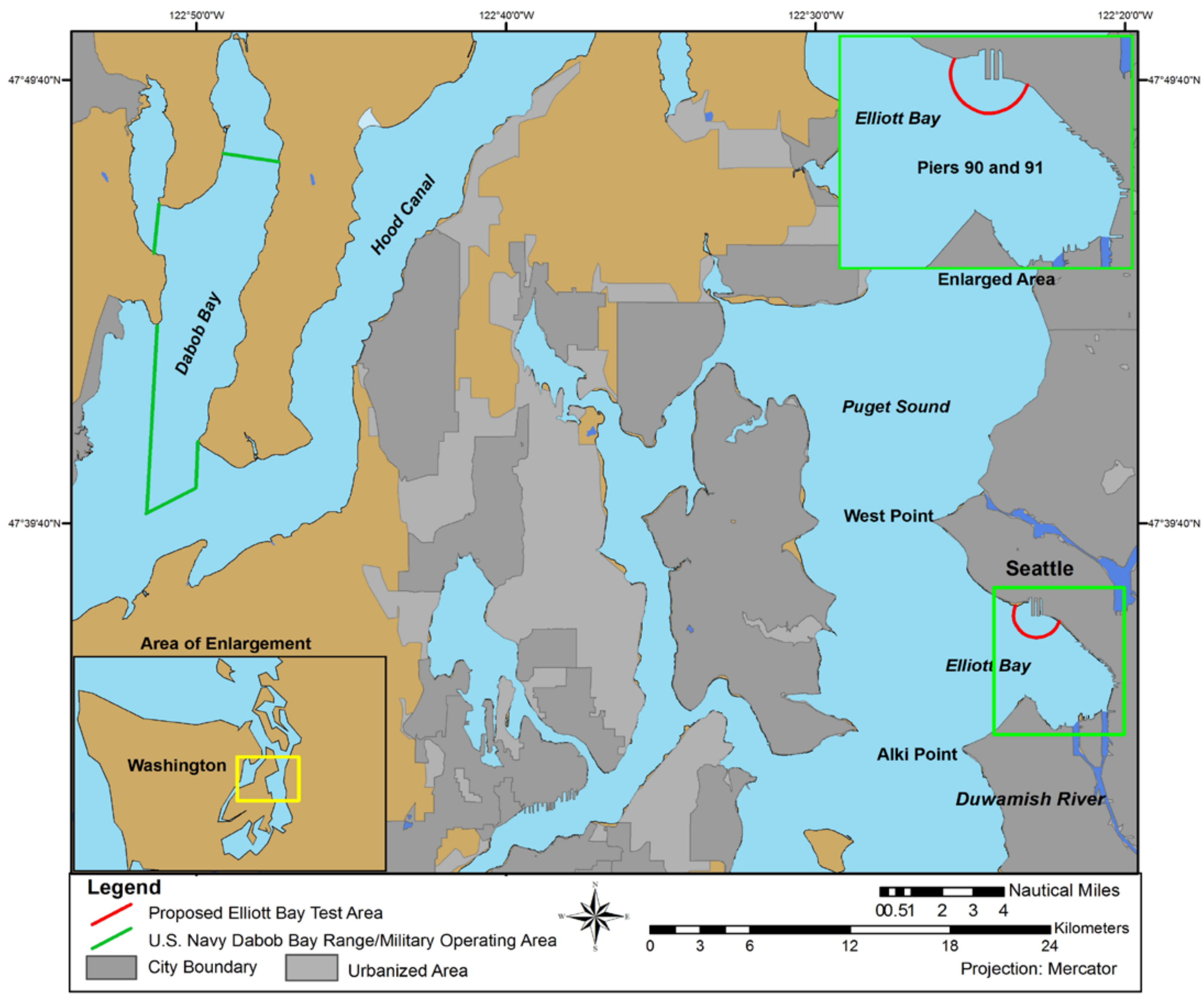

Figure 1-1. Potential Washington test areas in Elliott Bay and on the U.S. Navy's Dabob Bay Range proposed for testing of the Biosonics® swimmer/diver detection system.

water noise sources" was compiled and analyzed to examine the underwater acoustic affects to the marine environment. This list of acoustic sources is provided in Table 3.7-2 (page 3-84) of the Navy EA (DoN 2002), in which the individual noise sources are identified as are the source operating frequencies (i.e., noise production), sound intensities, descriptions of the signal durations, and the distance to the 180 decibel (dB) level. Since this Navy EA resulted in a Finding of No Significant Impact (FONSI), the acoustic parameters identified in Table 3.7-2 form the basis for the operational limitations of sonar systems or other underwater noise-producing systems on the DBRC. Essentially, the Navy EA identifies the range of frequencies for any acoustic source proposed for deployment on the DBRC; the corresponding source level for those frequencies must be less than or equal to those analyzed in the Navy EA (DoN 2002) if the source is to be allowed to operate on the range. The following is a list of the maximum allowable source levels (in decibels relative to one micro-Pascal measured at one meter from center of source [dB re 1 μPa @ 1 m]) for a source and the associated frequency bands that bound those limits:

- 500 Hertz (Hz) to 8.0 kiloHertz (kHz), 170 dB re 1 μPa @ 1 m,
- 8.0 to 68.0 kHz, 233 dB re 1 μPa @ 1 m,
- 68.0 to 74.0 dB, 194 dB re 1 μPa @ 1 m,
- 74.0 to 76.0 kHz, 210 dB re 1 μPa @ 1 m, and
- 100.0 to 1,000.0 kHz, 229 dB re 1 μPa @ 1 m.

Approval for possible deployment and transmission of the BioSonics® sonar system under the Navy EA (DoN 2002) was requested. A letter, which was drafted by the Keyport and Dabob Bay Management personnel, grants preliminary approval for use of the BioSonics® sonar system on the Dabob Bay MOA (Appendix A). This letter essentially states that the Navy Range Management concurs that operation of the BioSonics® system on the DBRC is addressed by the existing range documentation (DoN 2002). Additionally, the letter states that the range will issue a final approval letter after the specific dates for any testing are identified and range protective procedures and resources are in place to support the test. Therefore, no further discussion of this secondary site will be included in this EA document.

Two areas are proposed for the FarSounder system testing (Figure 1-2). The eastern Narragansett Bay test area includes the waters in the vicinity of the Naval Undersea Warfare Center (NUWC) piers and the harbor for Newport, RI, while the western Narragansett Bay test area includes the waters near the commercial piers at Quonset Point, RI.

Four locations in southern New England have been identified by APS as possible test sites (Figures 1-3 through 1-7). These locations include the Avery Point Campus of the University of Connecticut in Groton, CT; the University of Rhode Island's Graduate School of Oceanography in Narragansett, RI; the University of Massachusetts at Dartmouth's School of Marine Science and Technology in New Bedford, MA; and the Woods Hole Oceanographic Institution in Woods Hole, MA.

The acoustic parameters for each of the three company's swimmer/diver detection sources vary, ranging from 55 to 205 kiloHertz (kHz) and 185 to 220 decibels relative to one micro-Pascal measured at one meter (dB re 1 μPa @ 1 m [sound pressure level {SPL}] (or 190 to 195 dB re 1 μPa^2-sec @ 1 m [sound exposure level {SEL}]) (Table 1-2). The acoustic transmission and signal processing approach used by each of the companies is different. The BioSonics® approach is to produce a beam pattern from the single transducer that is narrow (i.e., about 6°) in both the horizontal and vertical directions, and then to have multiple transmissions to effectively sweep out a search arc of 180° or more (Figure 1-8). The FarSounder approach is similar to side scan sonars, in that a wide beam in the horizontal direction (with a relatively narrow vertical beam) is projected to search an approximately 90° arc during each transmission, with multiple transmissions used to widen and overlap to searching arcs (Figure 1-9). Finally, the APS approach employs multiple sources, which also act as multiple receivers to triangulate on potential threats. Each of the APS sources has a slightly different frequency (although all frequencies are still in the system frequency band) so that the location of the source can be included in the triangulation and processing of the various signals (Figure 1-10).

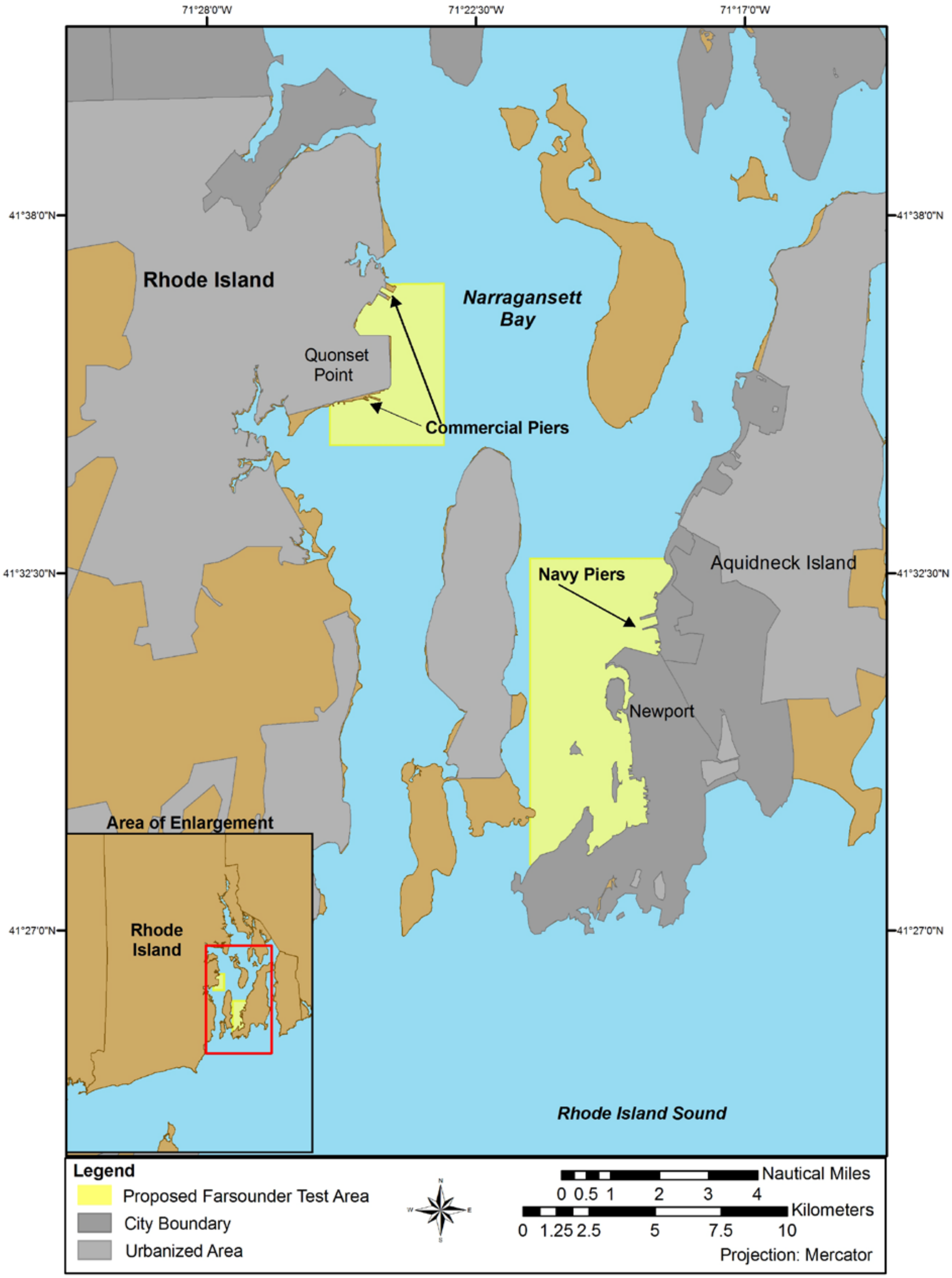

Figure 1-2. Potential Rhode Island test areas in eastern and western Narragansett Bay proposed for testing of the FarSounder swimmer/diver detection system.

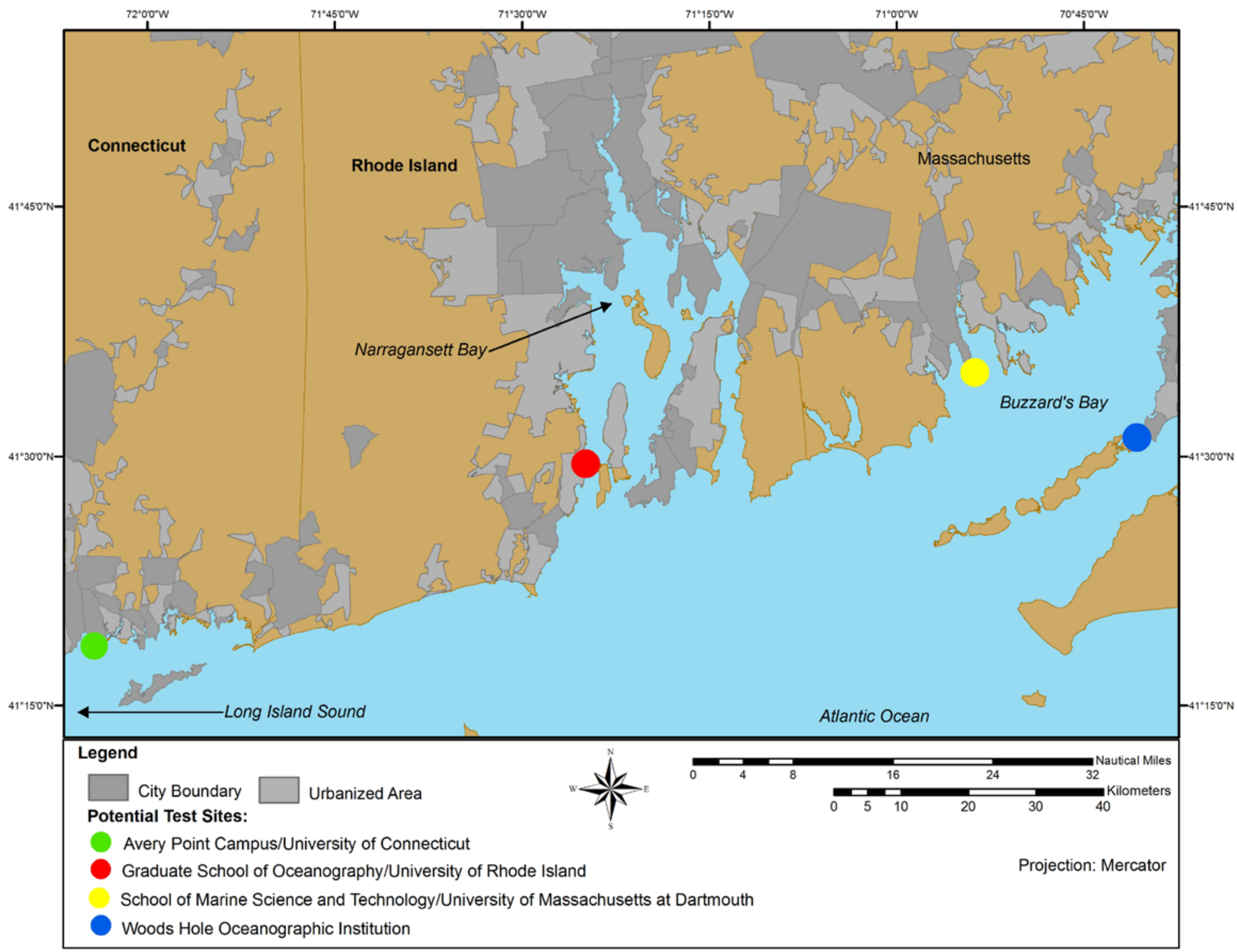

Figure 1-3. Potential test areas in eastern Long Island Sound (Connecticut), western Narragansett Bay (Rhode Island), and in western and eastern Buzzard's Bay (Massachusetts) proposed for testing of the Applied Physical Sciences swimmer/diver detection system.

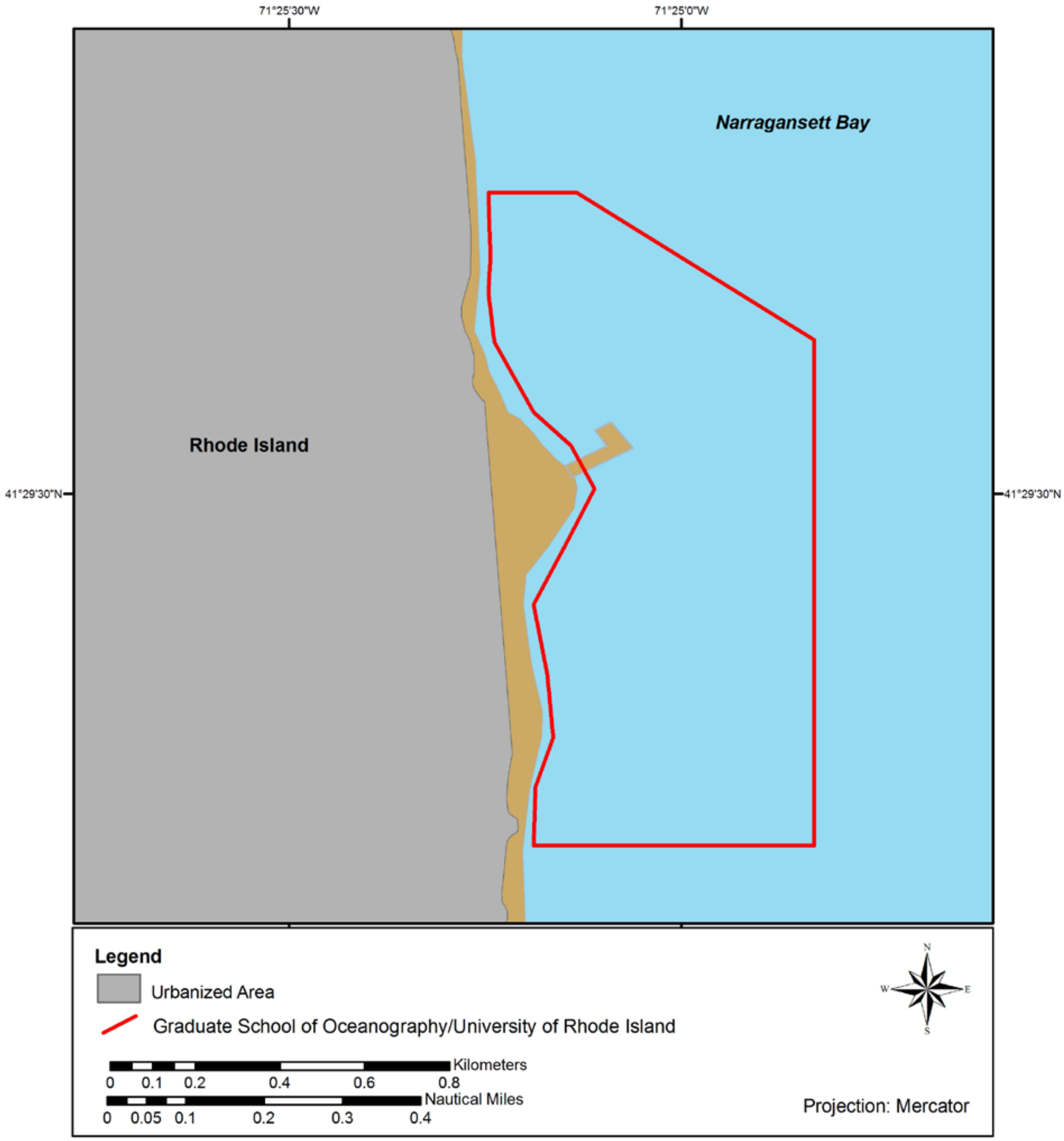

Figure 1-4. Enlargement of the potential test area off the Graduate School of Oceanography, University of Rhode Island where Applied Physical Sciences proposes to test their swimmer/diver detection system. The test area includes the campus pier.

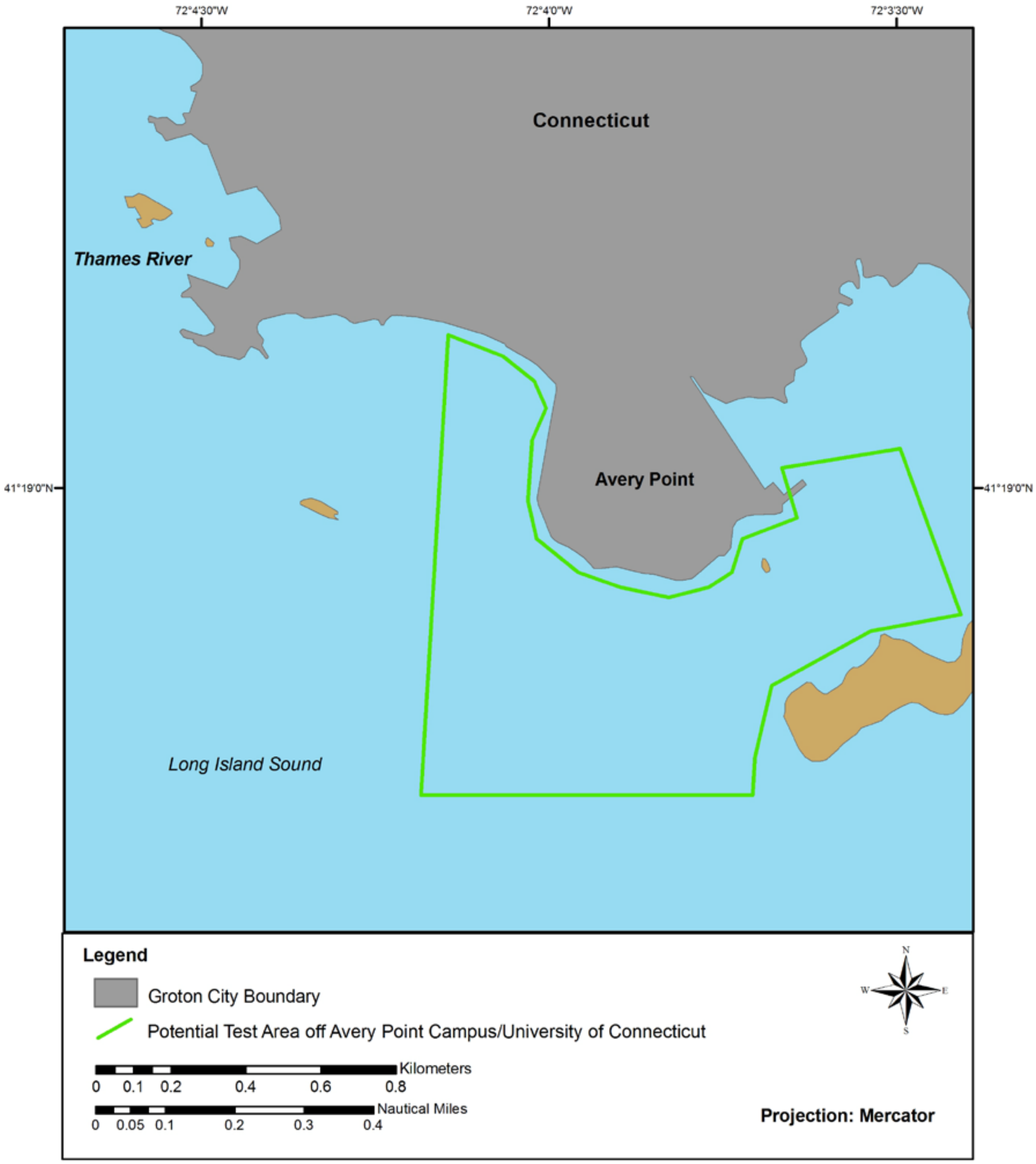

Figure 1-5. Enlargement of the potential test area off the Avery Point Campus of the University of Connecticut where Applied Physical Sciences proposes to test their swimmer/diver detection system. The test area includes the campus pier.

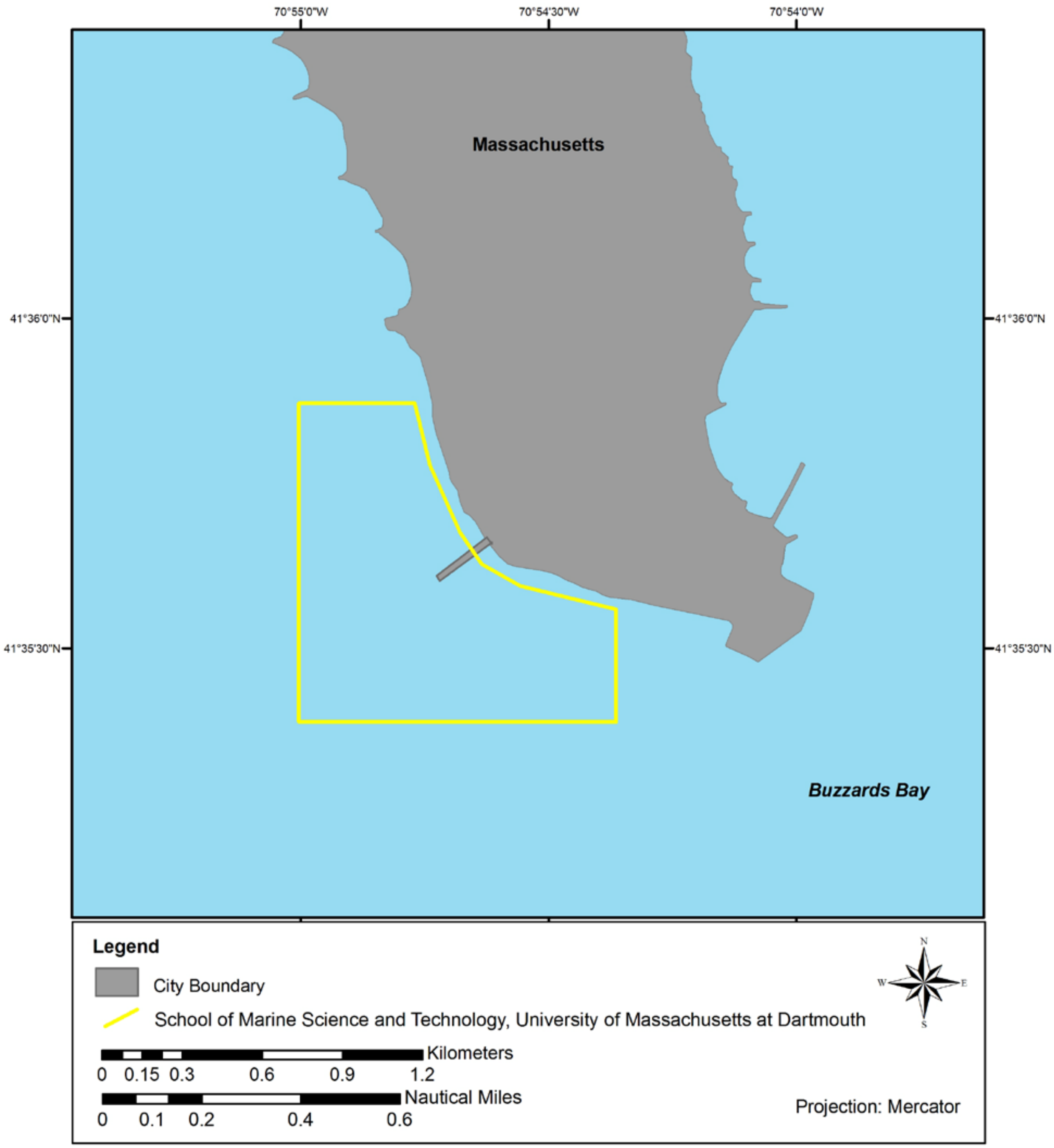

Figure 1-6 Enlargement of the potential test area off the School of Marine Science and Technology, University of Massachusetts at Dartmouth where Applied Physical Sciences proposes to test their swimmer/diver detection system. The test area includes the campus pier.

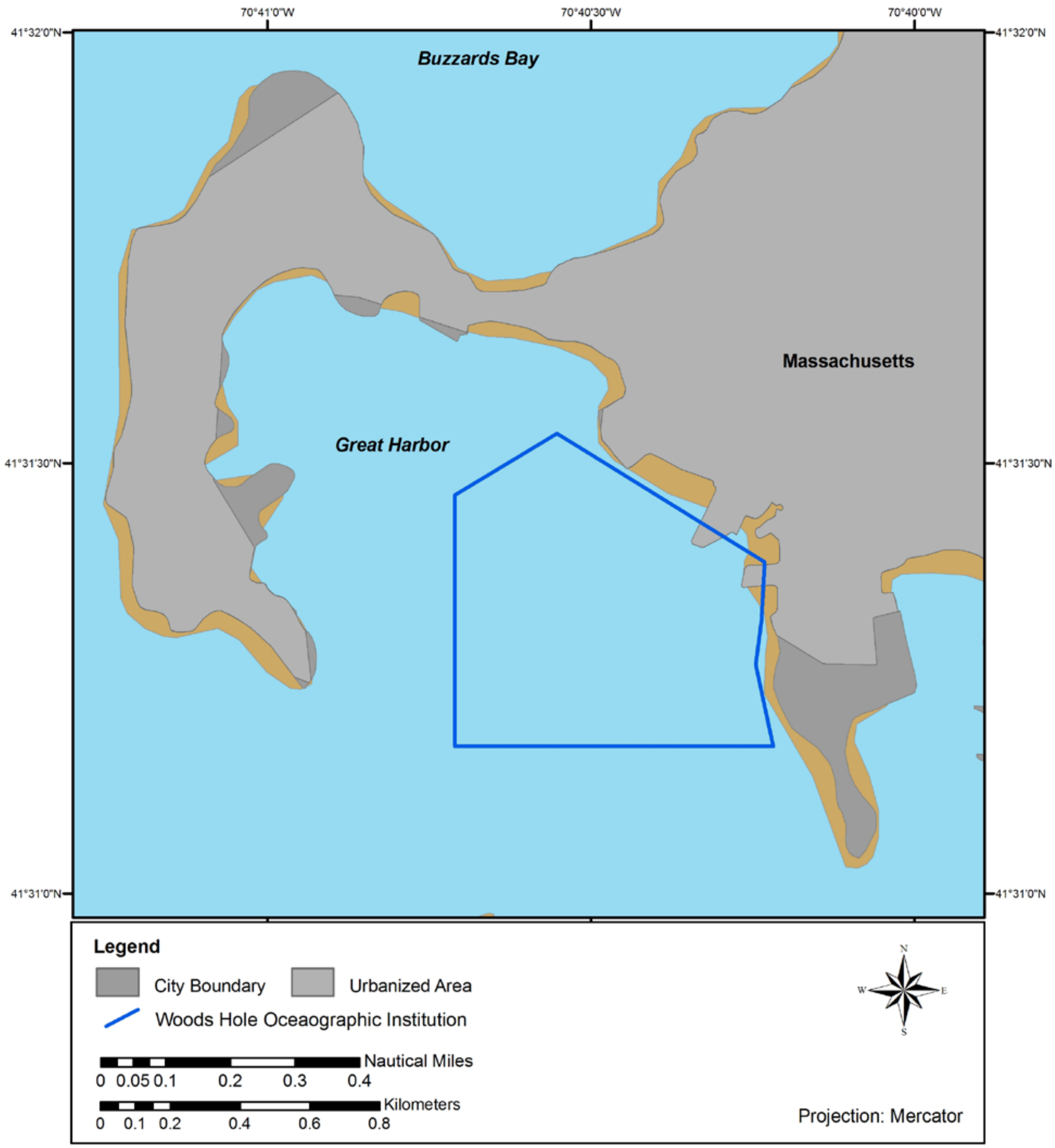

Figure 1-7. Enlargement of the potential test area off the Woods Hole Oceanographic Institution where Applied Physical Sciences proposes to test its swimmer/diver detection system. The test area includes the institution's pier.

Table 1-2. Acoustic source characteristics of the swimmer/diver detection systems.

Company	Source Name / Model	Test Frequency (kHz)	Maximum SL / [SEL] (dB re 1 μPa @ 1 m) / [dB re 1 μPa^2 –sec @ 1 m]	Pulse Length (msec)	Pulse Repetition Rate (number/s)	Number sources deployed
BioSonics®	DT-X	115 to 205	220.0/ [190.0]	0.1 to 1.0	0.1 to 30.0	1
FarSounder	FS3DT [1]	55 to 65	210/ [190.0]	1.0 to 10.0	1.0 to 10.0	1
FarSounder	FS100kHz	90 to 110	210/ [190.0]	1.0 to 10.0	1.0 to 10.0	1
APS	Low Cost Under-water Threat Detection	75 to 150[2]	185.0/ [195.0]	5.0 to 10.0	1.0 to 10.0	6

1 FarSounder did not develop this system for the DHS contract but would like to test the navigation component of their FS3DT system while testing the system developed for DHS (FS100kHz). The test of the navigation component may include transmissions at ~60 kHz. This FarSounder system is currently commercially available.

2 The APS system ideally operates at 105 kHz (±8 kHz), but APS plans to fully test the system at the broader frequency range listed in Table 1-2.

Figure 1-8. BioSonics DT-X Echosounder.

It should be noted that, in general, the maximum SEL is related to the source level (SL) based on the following equation:

SEL (in energy units) = SL (in pressure units) + 10 ∗ Log (signal duration in seconds [sec]) +10 ∗ Log (number of signals per sec).

However, the maximum SEL cannot be obtained by using the maximum SL, maximum pulse length and maximum number of signals per second (i.e., the inverse of the pulse repetition rate as shown in Table 1-2) because not all of these values actually occur simultaneously for any particular transmission. For example, in order for a signal to ensonify a potential target, which is at the maximum range of the system (e.g., assume a nominal maximum range of 1,000 m (3,280 ft) each way), it is anticipated that the highest SL would be used. However, the travel time for the acoustic signal to travel the 2,000 m (6,562 ft) from the source to the potential target and return, would take over 1.3 seconds. Since the next transmission would not be sent until the first was received, over 1.3 seconds would pass between transmissions. This represents a much lower repetition rate than maximum repetition rates provided in Table 1-2. Therefore, the maximum SEL values in Table 1-2 were derived by examining the probable combinations of SL, Pulse Length, and Repetition Rate, for each system during

Figure 1-9. FarSounder's FS100kHz and FS3DT swimmer/diver detection system.

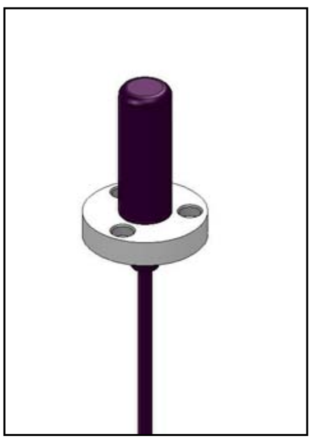

Figure 1-10. Notional diagram of the APS system.

expected operations, determining each combination's SEL, and identifying the maximum SEL for that system. The maximum SEL, with units of dB re $1\mu Pa^2$ –sec @ 1 m will be used in Chapter 4 to determine potential impacts.

Regardless of the details of the transmission patterns and processing used by these different approaches, the essential quantities of each system (i.e., how wide of an arc each system ensonifies during one "cycle" of operation, how strongly the source transmits, and how often the transmissions occur) can and are quantified and analyzed in Chapter 4 of this document based on the details in Table 1-2 and provided by these three companies.

1.4 PUBLIC INVOLVEMENT PROCESS

To announce the availability of this Draft EA, letters were sent to interested parties and an announcement was placed for five days in the appropriate major newspapers for each test locality. The DHS solicits comments on this proposed action throughout this EA process. An announcement on the availability of the Final EA (FEA) and, if appropriate, the FONSI, will be placed in the Federal Register, when available.

Compliance with some federal environmental requirements, such as the Coastal Zone Management Act, requires review by the state in which the proposed action will occur. For each of the four states in which the proposed action would occur, research netted the state organization or department name with authority or jurisdiction over the relevant aspects of the proposed action. Prior to submitting the Draft EA and other supporting materials to any of the state departments or organizations with review authority, the DHS contacted those groups to determine the specific individual and correct mailing address to whom the Draft EA and supporting materials should be submitted.

2 ALTERNATIVES INCLUDING THE PROPOSED ACTION

Several alternatives have been considered for the swimmer/diver detection system tests:

- The first alternative is the no-action alternative; the swimmer/diver detection system tests would not occur.
- The second alternative is the proposed action; the swimmer/diver detection tests would take place as planned and scheduled.
- The third alternative is to reschedule the swimmer/diver detection system for an alternate time of year, when there would be lower densities of potentially affected marine animals.

While each of the alternatives is presented, only the second alternative adequately addresses the swimmer/diver detection test objectives. Relevant discussions of all of these alternatives are presented in the following paragraphs.

2.1 ALTERNATIVE CONSIDERED AND ELIMINATED

The DHS reviewed multiple technologies for effectiveness of swimmer/diver detection when they issued the SBIR request for proposals. No other technologies suggested had technical merit as an effective solution. Many USN studies have had the same finding. The decision to pursue an acoustic system was based on the systems being: a) deployable in numerous situations, b) immediately available in the near term (i.e., within a year or so of testing and thus based on existing technology), c) effective in the swimmer/diver detection role, d) affordable for future procurement of potentially hundreds of systems, e) compatible with the various conditions existing at the possible deployment sites (e.g., fresh and salt water, ports and harbors, and near power plants), and f) available for round-the-clock operations.

Other potential methods of detecting underwater swimmers/divers or preventing their entry into unauthorized areas include the use of radar systems, optical systems, trained marine mammals, or barrier systems. Additionally, it is possible to potentially estimate the viability of acoustic systems through numerical computer models and thus forgo *in-situ* testing of these systems and preclude the possibility of environmental impacts. The other approaches were considered as alternatives but for the reasons described below were ultimately eliminated not only in the request for proposals but also were not carried forward in this document.

2.1.1 Radar Systems

Radio Detection and Ranging (RADAR) is and has been used to detect swimmers and other threats at the ocean surface. However, RADAR systems have very limited capability to penetrate into the ocean; therefore, they would not be effective at detecting submerged divers. Since RADAR systems would not be effective for underwater diver detection, they have been eliminated from further consideration in this document.

2.1.2 Optical Systems

Optical systems utilizing visible and infrared light have been tested and found to have little or no capacity to detect submerged divers. Since optical systems would not be effective in detecting submerged divers, they have been eliminated from further consideration in this document.

2.1.3 Marine Mammal Systems

Marine mammals have been trained by the U.S. Navy in the swimmer/diver detection role. However, experience has shown that this process requires a significant investment in time, expense, trained personnel, and facilities to train, operate, and maintain the mammals to accomplish the stated objectives. Additionally, animals would need to be raised or captured for approach, and their utility as well as continued effectiveness in dangerous and harmful situations are suspect. Since these drawbacks preclude the potential widespread use of marine mammals as detectors of swimmers/divers, this approach has been eliminated from further consideration.

2.1.4 Barriers

Historically, various mechanical barriers have been used to prevent swimmers and divers from entering unauthorized areas. While barriers definitely serve as a deterrent and have been successfully used for this purpose, all barriers can eventually be breached by trained divers. Additionally, the presence of barriers in places like ports and harbors can also cause delays to normal operations and damage to the benthic environment and water quality during their construction and use. Therefore, the use of barriers as deterrents has been eliminated from further consideration.

2.1.5 Numerical Computer Model Testing

Analytical and numerical computer models have been constructed to predict sonar system effectiveness. However, insufficient environmental and experimental data render the quantitative assessments of these predictive models very difficult. Underwater acoustic performance is very dependent on environmental conditions and small modeling errors can result in large differences between the model's predictions and actual in-water performance. *In-situ* "calibration" of performance models and predictions (i.e., actually measuring the active/passive acoustic characteristics of the environment and transmission/received sound levels) can significantly reduce these errors. The investigator can gain meaningful lessons-learned and measure expected system performance only by conducting a realistic *in-situ* employment involving human operators of actual systems and platforms, in environments of interest. Thus, a computer simulation would not meet the experiment's primary objective, to measure the effectiveness of the various acoustic systems to detect swimmers *in-situ*.

2.2 NO-ACTION ALTERNATIVE

Under this alternative, the swimmer/diver detection tests would not occur and the experiment's primary objective, to determine the effectiveness of the various swimmer/diver detection systems, would not be met. Failure to collect these data would delay the development, testing, and the ultimate deployment of a viable swimmer/diver detection system to protect the nation's commercial and military harbors and port facilities from potential terrorist attacks. Such attacks could create health and safety hazards and impact emergency responses, employment, trade, as well as marine life and habitats. These impacts could be immediate (i.e., loss of life) or long-lasting (i.e., disruption of commercial activities) that could affect the long-term economy of the region. Recovery would depend upon the severity and the extent of the loss.

2.3 PROPOSED ACTION

The proposed action consists of allowing three separate companies (BioSonics®, Inc. of Seattle, WA, FarSounder, Inc. of Providence, RI, and Applied Physical Sciences Corporation of Groton, CT) to conduct engineering and developmental tests and ultimately a demonstration of their proposed high-frequency, acoustic swimmer/diver detection systems. An acoustic, underwater swimmer/diver detection system is required in order to support the DHS's desire to develop one or more of these systems for operations protecting various installations in the U.S. These systems are intended to provide harbor security against potential threats from swimmers and divers, by detecting and localizing their presence. A series of tests is planned to develop these systems and to demonstrate the effectiveness of the systems. There are eight sites for the proposed tests (Table 1-1). Tests will begin in the spring or summer of 2010 and will be conducted intermittently over approximately 12 months. The tests will be conducted from small craft or from existing piers or other appropriate, man-made structures. The small craft used for the tests would be similar to the many small craft normally seen in each area. A maximum of 12 days of testing for each system is planned with a preponderance of these test activities occurring during daylight hours. For any given day of testing, which nominally consists of two, four-hour testing periods, these portable systems will be deployed, operated, and then completely removed. In this alternative, testing is allowed at any site anytime during the year identified.

2.4 TIME-OF-YEAR ALTERNATIVE

In this alternative, testing of the three systems will be conducted as described in Section 2.3, Proposed Action, but the time of testing would be limited to those seasons or months when the fewest number of marine mammals would be potentially impacted. Each of the test sites is described in Chapter 3. An appropriate division of the calendar year into "seasons" or time periods for each test area is provided in

Chapter 3, reflecting the marine mammal species diversity at that test area for that time period. Potential impacts to marine mammals for each season will be evaluated and the seasons with the least impacts will be selected as the preferred testing time for this alternative.

2.5 ALTERNATIVES SELECTED FOR FURTHER ANALYSIS

The No-Action Alternative, the Proposed Action Alternative, and the Time-of-Year Alternative will be included carried forward for further analysis. And even though the No-Action Alternative also does not meet the DHS objectives, it will be included in the analysis as a reference.

3 AFFECTED ENVIRONMENT

Testing of the underwater swimmer/diver detection systems is planned for several Pacific and Atlantic coastal locations in the U.S. The coastal locations of the proposed test areas is one of the primary features that make them ideal representatives of the type of complex urban coastal or port environments in which a potential in-water terrorist threat may occur. The baseline or current conditions describing the environments of these coastal locations are provided in this chapter. The information contained in this chapter will form the baseline from which potential impacts associated with the implementation of the proposed action, the testing the swimmer/diver detection systems designed by BioSonics®, FarSounder, and APS may be identified and evaluated. This chapter's descriptions of the affected environment for the coastal test locations are presented primarily in terms of the physical, biological, cultural, and economic environments.

3.1 RESOURCES FOR ANALYSIS

This chapter characterizes the existing physical, biological, and economic conditions and environments found in the eight potential coastal locations proposed for the test of the swimmer/diver detection systems of three companies, BioSonics®, FarSounder, and APS. In accordance with NEPA and the Council on Environmental Quality (CEQ) guidance, this chapter describing the affected environment focuses only on the resources relevant to evaluating potential effects from testing the swimmer/diver detection systems. These resources include descriptions of the physical marine environment with emphasis on sediments, physiography, underwater noise, and water resources (water quality and hydrography); the biological environment, concentrating on federally protected marine species (marine mammals, sea turtles, and fishes) and marine habitats (essential fish habitat [EFH] and marine managed areas [MMA]); the cultural environment, which concentrates on underwater archaeological resources; and the economic environment, focusing on commercial and recreational fisheries, recreational diving areas, commercial and recreational shipping and boating, and marine transportation. Since the proposed tests will take place solely in marine aquatic environments and because the tests solely involve the deployment of acoustic sources, some environmental resource areas often described in an Environmental Assessment (EA) have been purposefully omitted from the analysis and chapter. The omitted resource areas and the justification for exclusion are:

- **Air Quality and Airborne Noise**—Since the swimmer/diver detection systems employ underwater sonar technology, no air emissions or airborne noise would result from the deployment and test operation of the systems. Deployment of the detection system would be from a pier or small watercraft. Although there may be air emissions from the engine of the small watercraft used to deploy the system, these emissions would be negligible. Consequently, no significant air quality impact or noise is anticipated from deployment and testing of the systems and these resource areas are not included in this analysis.
- **Soils and Land Use**—The proposed system tests are in-water tests that entail no physical disturbances or construction activities associated with any terrestrial resources; the proposed action would not involve any activities inconsistent with current or foreseeable land-use approaches and patterns. Thus, description and evaluation of land use and soils have been eliminated from this analysis.
- **Climate**—No changes to existing climate or weather patterns or conditions would result from the proposed tests of the underwater threat-detection systems. Accordingly, this resource area has been omitted.
- **Water Resources Including Terrestrial Hydrology**—No discussion of terrestrial water resources, including hydrology, are included in this analysis as the proposed action would occur in coastal marine waters and will not affect any terrestrial aquatic resources. All relevant aquatic resources are detailed in this chapter but no further details on terrestrial resources are included.
- **Wetland and Submerged Rooted Vegetation (Seagrass) Communities**—The proposed action would not involve any physical disturbances to or construction in coastal wetland communities (salt marshes) or beds of submerged rooted vegetation (seagrass). The system tests would occur where sea grass communities and salt marshes do not currently exist. Therefore, no significant impacts to

coastal salt marshes or to seagrass communities would result from the proposed action and this resource area was not detailed further in this analysis.

- **Hazardous Materials and Wastes**—No hazardous waste or materials would be handled during the proposed action, and no release of hazardous waste or materials is foreseeably expected as a result of the proposed swimmer/diver detection system tests. If watercrafts are used to deploy any of the systems, the watercraft used would be well-maintained, seaworthy vessels from which only normal but negligible engine discharges may foreseeably be expected. Accordingly, a detailed analysis of hazardous materials and wastes has been omitted.
- **Terrestrial/Earth Resources**—No terrestrial earth resources would be associated with the proposed action, which are in-water system tests. Thus, the proposed action would have no impact upon terrestrial earth resources, and no further discussion is included in this chapter. Earth resources associated with coastal aquatic environments, such as seafloor substrate and sediments, are detailed in this chapter, and were considered in this analysis.
- **Environmental Justice**—Implementation of the proposed action would not result in adverse impacts to any environmental resource area that would be expected to disproportionately affect minority or low-income human populations in the areas adjacent to the test areas. Since no significant impacts are foreseeable, no further discussion or analysis of environmental justice has been included.
- **Sociologic or Terrestrial Economic Resources**—The proposed action does not involve any activities that would contribute to changes in socioeconomic resources such as demography, communities, or social institutions. All personnel involved in the system tests reside in the local communities and no additional personnel are required for the tests. Details about the marine economic resources, such as commercial or recreational fishing or commercial shipping, have been described in this analysis. Since no significant impacts will occur to the sociological or overall economic resources of the area as a result of the swimmer/diver detection tests, no further consideration of these resources has been given in this analysis.

3.2 REGION OF INFLUENCE

The dynamic, busy marine locations selected for the tests of the swimmer/diver detection systems are ideal examples of the types of coastal or inshore environment in which a potential underwater threat may occur. The swimmer/diver detection systems are designed to be a line of defense for critical port or coastal facilities. The swimmer/diver detection systems are not designed to be employed in offshore or deepwater environments.

The region of influence (ROI) for the tests of the swimmer/diver detection systems is defined as the area where each system would be deployed. The planned deployment for system testing is in eight harbor or coastal settings (i.e., test areas) that encompass existing piers or other in-water structures from which the systems would be deployed; during some tests, the systems may be deployed from small watercraft within a designated test area. The ROI for the proposed system tests, therefore, would include the entire water column of the test area from surface to the seafloor, including the bottom substrate (sediments and underlying hard rock) (Table 3-1). The size of the test areas varies but all encompass at least one large pier (Figures 1-1 to 1-3).

The proposed ROI for the BioSonics®, system test are in the inland waters of Washington, in northern Elliott Bay or on the U.S. Navy's Dabob Bay Military Operating Area (MOA), hereafter referred to as the "Dabob Range" (see Figure 1-1). FarSounder will deploy their swimmer/diver detection system in proposed test areas in western and eastern Narragansett Bay, Rhode Island (see Figure 1-2). The proposed ROI for the APS system tests includes four test areas in southern New England waters (Figure 1-3). The APS test areas are located in the nearshore waters adjacent to marine academic or research institutions, all of which have pier facilities from which the APS system may be deployed. The four proposed test areas are located in: 1) Long Island Sound off the University of Connecticut's Avery Point Campus (Figure 1-4), 2) in Narragansett Bay off the University of Rhode Island's Graduate School of Oceanography (GSO) campus (Figure 1-5), 3) in Buzzards Bay off the University of Massachusetts at

Table 3-1. Regions of influence (ROI) by company that developed each of the swimmer/diver detection systems, potential geographic test areas for each test, and the designation applied to each ROI or test area.

Company	Geographic Test Area: Region of Influence (ROI)	ROI Designation
BioSonics®	Elliot Bay, Pier 90 and 91, Washington	BioSonics®–EB
	Dabob Bay, Navy Dabob MOA, Washington	BioSonics®–DB
FarSounder	Narragansett Bay, Western Passage/ Quonset Pier, Rhode Island	FarSounder–West
	Narragansett Bay, Eastern Passage/ Navy Pier, Rhode Island	FarSounder–East
Applied Physical Sciences (APS)	Long Island Sound, University of Connecticut, Avery Point Campus, Connecticut	APS–Avery
	Narragansett Bay, University of Rhode Island, Graduate School of Oceanography, Narragansett Bay Campus, Rhode Island	APS–GSO
	Buzzards Bay, University of Massachusetts at Dartmouth, School of Marine Science and Technology, New Bedford, Massachusetts	APS–UM
	Great Harbor, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts	APS–WHOI

Dartmouth's (UM) School of Marine Science and Technology (Figure 1-6), and 4) in Great Harbor off Massachusetts's Woods Hole Oceanographic Institution (WHOI) (Figure 1-7).

3.3 PHYSICAL ENVIRONMENT

Since the proposed action entails the testing of underwater sound sources, information about the acoustic underwater environment and how sound travels underwater must be included in addition to the more standard information about the physical environment. A generic description of the nearshore acoustic environment begins this section and is followed by more specific descriptions of the physical environments of each of the eight proposed test areas.

3.3.1 Acoustic Environment

The acoustic environment of shallow-water settings where the proposed system tests are planned is complex and can be difficult to predict as it can change rapidly due to local physical conditions (e.g., rainstorms, tides, or outflow from rivers). Sound transmission in shallow marine waters is dependent upon many factors, including water depth, type of bottom or seafloor substrate, thickness of the bottom substrate, seafloor gradient, water temperature, water column stratification, and roughness of the sea surface (i.e., waves).

Bottom substrate is an important determinant in the propagation of acoustic energy through water as water-saturated unconsolidated sediments (e.g., sand, silt, clay, or mud) absorb rather than reflect sound energy, resulting in a loss of sound energy that would be transmitted through the water column. This is known as "bottom loss" or transmission loss. Transmission loss or increased sound attenuation (reduction) can also be caused by the downward refraction of sound that occurs seasonally when waters are density-stratified. Water column stratification most frequently occurs in the summer and early fall when fewer storms and milder winds develop, which would cause mixing of the water column, and when the surface waters are heated by higher atmospheric temperatures and longer hours of radiant heating. A mixed water column means that sound propagation may only be slightly downward curving, due to the increasing sound speed associated with the increasing pressure at increasing depth. However, since the waters in the proposed test areas are relatively shallow, it is expected that the acoustic energy will probably extend throughout the water column and that interactions with both the surface and the bottom will occur more frequently as the range from the source increases. Additionally, propagation paths exist in these type of areas where the water depth is decreasing, such as when the sound energy propagates over to the other side of a bay or over a sand bar. And as sound signals moves into shallower water and hits the seafloor, the angle at which they strike the bottom substrate (incident angle) becomes more vertical with each consecutive bottom interaction; the energy lost into the bottom increases each time the sound signals interact with the seafloor. Also, the high frequency of the sound emitted by the detection systems lead to very high absorption loss in the water in general. The combined effect of these phenomena is a rapid decrease in the magnitude of the sound (i.e., intensity) as the range increases. The seasonal parameters as well as the bottom substrate and water depth of each of the proposed test areas have been factored into the analysis determining the acoustic environment of each of the proposed test areas and of the resulting acoustic impacts associated with the sound transmissions during each test.

3.3.2 BioSonics®–DB

Testing of the BioSonics® swimmer/diver detection system is proposed for two locations in the inland waters of Washington, in Dabob and Elliott Bays (see Figure 1-1). The Dabob Range is instrumented with acoustic monitoring equipment installed on the seafloor to provide acoustic tracking during sea tests, which makes the range an advantageous location for acoustic tests such the BioSonics® swimmer/diver detection system. The Navy uses the Dabob Range for in-water testing of underwater systems such as torpedoes, countermeasures, targets, and ship systems.

The proposed testing of the BioSonics®® system on the Navy's Dabob Range is covered under an existing Environmental Assessment (EA), which encompasses all ongoing and future operations and tests taking place on the Dabob Range (DoN 2002). This EA, prepared by the Navy in 2002, is the current NEPA document governing operations on the Dabob Range. The Dabob Range EA concluded that no significant effects will occur as a result of any of the analyzed operations, including underwater acoustic operations. The acoustic analyses completed for the Dabob Range EA evaluated numerous acoustic sources, including sonars, covering frequencies from 0.05 kiloHertz (kHz) to 1,000 kHz. The Dabob Range EA noted that the acoustic frequencies associated with underwater tests on the range would not significantly impact fish resources outside the immediate area of the emission (18 to 24 meters (m) [59 to 79 feet {ft}]), as most of the acoustic signals will not be continuous. The EA further noted that the level of sound emissions would be limited to that which has been shown to produce only avoidance reactions in fishes. During operations in which underwater acoustics are used, the Navy will conduct marine mammal surveys using trained observers to ensure that no large cetaceans are in the vicinity of the testing and that no harbor seals are within 91 m (299 ft) of the test area. Based on these findings, the Navy concluded that no significant effects would result from operations on the range, and in accordance with section 7(a)(2) of the Endangered Species Act, the U.S. Fish and Wildlife Service and the National Marine Fisheries Service (NMFS) were consulted and they concurred with the Navy's findings. The result was a signed FONSI for Dabob Range operations.

The frequencies of the BioSonics®, system proposed for use on the Dabob Range fall within the frequency range analyzed for the Dabob Range EA. Additionally, the source level for the BioSonics® detection source is less than or equal to that of the sonar sources analyzed in the Dabob Range EA. Therefore, the Navy's environmental division (Keyport, WA) that manages the Dabob Range has made the determination that the BioSonics® system's source has less potential impact than those acoustic sources examined for and covered by the 2002 EA for the Dabob Range. Thus, the testing of the BioSonics® source is covered under the Navy's existing Dabob Range EA (DoN 2002) and no foreseeable environmental impacts are expected as a result of the BioSonics® testing (Appendix A).

3.3.3 BioSonics®–EB

The second test location of the BioSonics® swimmer/diver detection system is proposed in northern Elliot Bay. Elliott Bay is a 21-square kilometer (km^2) (8 square mile [mi^2]), highly modified, urban embayment of central Puget Sound, WA that is bounded by Alki Point to the south and West Point to the north (Figure 1-1). A small portion of the northward-flowing water from Puget Sound's Main Passage is transported into Elliott Bay at Alki Point, flowing counterclockwise around the bay (Ebbesmeyer 1998). Permanent tidally-influenced eddies (circular currents) are found off Alki Point and West Point, with additional eddies formed in the interior of the bay. Inner Elliott Bay receives freshwater input from Duwamish River, which discharges into southeastern Elliott Bay. Tides in Elliott Bay are mixed semidiurnal with a tidal range of ~4 m (13 ft) (King County Department of Natural Resources 2001).

The mean water temperature in Elliott Bay ranges from 8°Celsius (C) (46°Fahrenheit [F]) to 14°C (57°F) seasonally (Ebbesmeyer 1998; King County Department of Natural Resources 2001). The mean seasonal salinities in the bay range from 26.4 practical salinity units (psu) in winter to 29.2 psu in the late summer (King County Department of Natural Resources 2001). Surface salinities also vary with geography in the bay, with salinities from 17 to 21 psu near the mouth of the Duwamish River (East and West Waterways), where freshwater discharges into the bay, to 29 psu in the southwestern bay, where the more saline Puget Sound waters enter Elliott Bay (Annis 1996). Water temperatures and salinities of Elliot Bay result in density stratification of the bay for most of the year; that is, the warmer, fresher (less saline) waters overlay the colder, more saline waters, forming a two-layer system. The deepest waters in Elliott Bay, ~190 m (623 ft), are located at the western boundary of the bay where it empties into Puget Sound, but most of the bay is less than 180 m deep (Figure 3-1; NOAA 2002). The bottom substrate of Elliott Bay consists of unconsolidated terrigenous sediments (sand, gravel, clay, and mud) that originated from Duwamish River input, glacial reworking, or bluff erosion (Stark et al. 2000). No natural intertidal beaches, which at one time might have been a sediment source, exist any longer along the shore of Elliott Bay (King County Department of Natural Resources 2001). The highest sedimentation rates in the Puget Sound System occur at Elliott Bay.

The proposed BioSonics® test area is situated in the dynamic bay environment that also encompasses the Port of Seattle. The shoreline of Elliott Bay is heavily altered with over 65% of the bay's shoreline occupied by in-water and overwater structures (piers, wharfs, and docks) (King County Department of Natural Resources 2001). The ROI for the test area proposed for Elliott Bay encompasses an area 0.5 nautical miles (NM) (0.6 mi) from the commercial Piers 90 and 91, which lie along the northern shore of the bay. Piers 90 and 91 are large commercial piers that are 610 m (2,000 ft) and 686 m (2,250 ft) in length, respectively (Port of Seattle 2007). Water depths at the end of Piers 90 and 91 have been reported at 12 m (39 ft) (Port of Seattle 2007) to about 50 m (197 ft) (Figure 3-1) (NOAA 2002). Ship anchorage areas lie directly to the west and east of Piers 90 and 91. The major commercial district of Seattle lies along the eastern shore of Elliott Bay.

3.3.3.1 Washington State Coastal Zone—Federal Consistency

Elliott Bay, bordered on three sides by King County, lies within the coastal zone of the state of Washington. Washington's coastal zone includes all land and water from shore seaward to 3 NM in 15 coastal counties that border saltwater either on the Pacific Ocean or the Puget Sound (Swanson 2001). The resources of the U.S. coast are protected under the Coastal Zone Management Act (CZMA) of 1972 and its amendments. This act established a national program through which states can develop and implement coastal zone management plans and additionally instituted a federal consistency requirement (Section 307(c)(1)). This requirement of the CZMA stipulates that federal agencies conducting an activity that is reasonably likely to affect any land or water use or natural resource of the coastal zone are required to do so in a manner consistent, to the maximum extent practicable, with the enforceable policies of a state's coastal management program and must ensure that their actions are consistent to the maximum extent practicable with the enforceable policies of a state's coastal management program. Enforceable policies are state policies that are legally binding through constitutional provisions, laws,

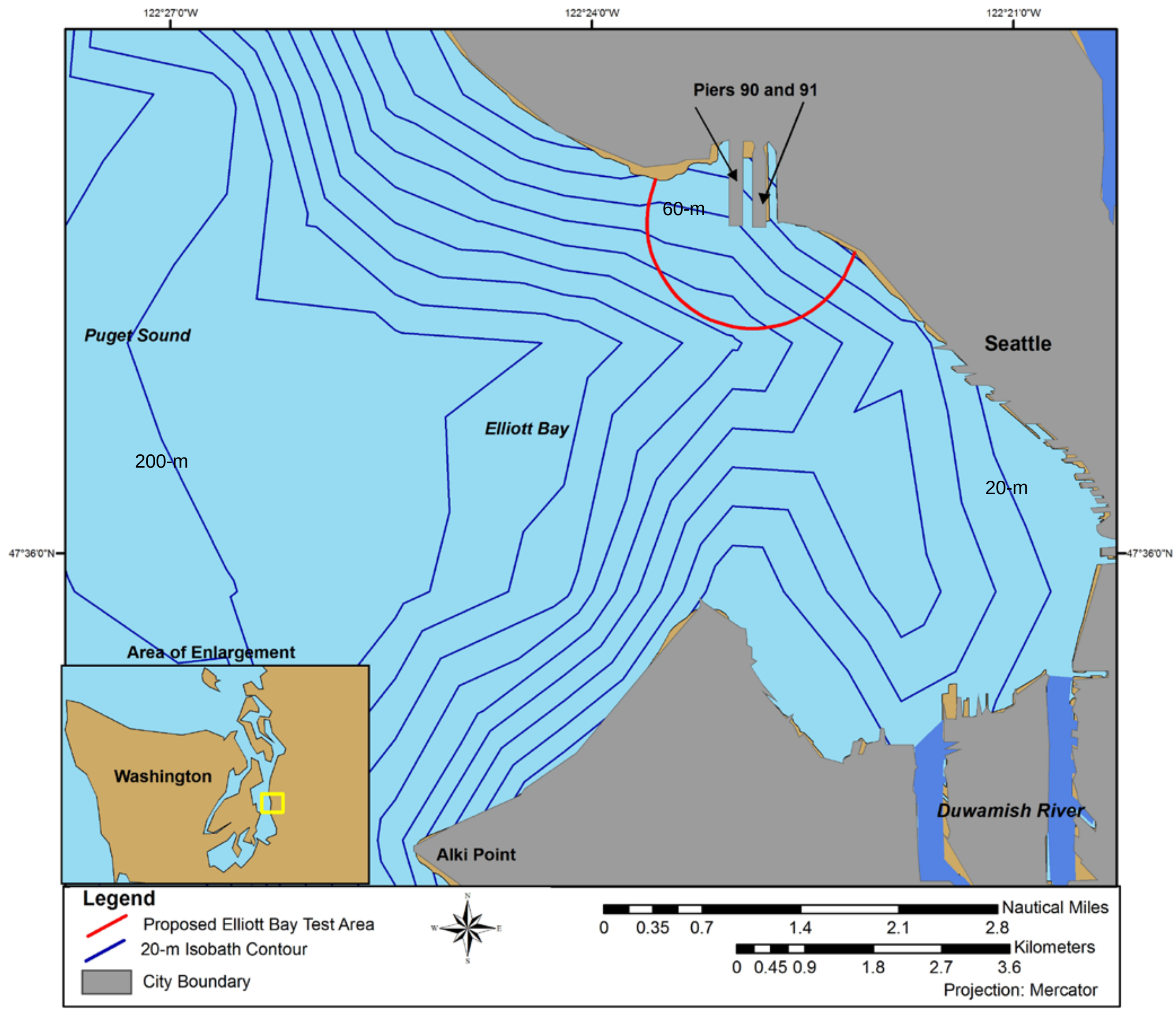

Figure 3-1. Bathymetry (NOAA 2002) of Elliott Bay, Washington and of the proposed test area of the Biosonics® swimmer/diver detection system.

regulations, land use plans, ordinances, and judicial or administrative decisions and by which a state exerts control over private and public land and water uses and natural resources in the coastal zone. The enforceable policies outline the permissible land and water uses within the coastal zone that have a direct and significant impact on coastal waters. The question of whether a specific federal agency activity may affect any natural resource, land use, or water use in the coastal zone is determined by the federal agency. Effects in the coastal zone that the federal agency may reasonably anticipate as a result of its action include cumulative and secondary effects.

In 1976, Washington became the first state in the nation to have a coastal zone management plan federally approved. The Washington CZM Program (CZMP) consists of six state laws, or "authorities" and their implementing regulations, which include the enforceable policies (Appendix B-1) that Washington uses to manage activities in the coastal zone and programs that are engendered to further the purpose of the CZMA (Swanson 2001). The state government Department of Ecology is authorized to implement the CZMP in Washington and functions as the lead agency, but local governments exercise primary authority for implementing the CZMP statutes locally.

Washington's enforceable policies are included in these authorities: Shoreline Management Act, Clean Water Act, Clean Air Act, State Environmental Policy Act, the Energy Facility Site Evaluation Council law, and the Ocean Resources Management Act (Appendix B-1). The Clean Water Act and Clean Air Act are federal laws for which Washington's Water Pollution Control Act and Clean Air Washington Act, respectively, authorize compliance. The Shoreline Management Act (SMA) is the foundation and core authority of Washington's CZMP and is both a land use and environmental protection statute. The 4,443 km (2,761 mi) of marine shoreline and over 7,770 km^2 (3,000 mi^2) of marine waters in Washington are subject to the SMA (Swanson 2001). The Washington CZMP is currently in the process of updating the guidelines for the SMA, which, when federally approved, will amend the CZMP. The SMA has classified the waters of Puget Sound seaward of the low-tide line, including Elliott Bay, to be a "*Shoreline of Statewide Significance*". Shorelines of significance are special regions of Washington's coastal zone in which special uses are preferred (Swanson 2001). The preferred uses for *Shorelines of Statewide Significance*, in order of priority, are to protect the statewide interest over local interest; preserve the natural character of the shoreline; result in long-term over short-term benefit; protect the resources and ecology of the shoreline; increase public access to publicly owned shoreline areas; and increase recreational opportunities for the public in the shoreline area (DoE 2007).

3.3.4 FarSounder–West, FarSounder–East, and APS–GSO

Three test areas are proposed for Narragansett Bay, RI. Both FarSounder system tests and one APS system test are proposed to occur in the bay. Since these test areas are located in the same water body, and much of the physical description of the environment is the same for all locations, the physical environment of the three Narragansett Bay test areas will be described together here to eliminate redundancy.

Narragansett Bay is a shallow, tidally-influenced, well-mixed temperate estuary that is 40 to 45 km (25 to 28 mi) in length, north to south, and about 16 to 18 km (10 to 11 mi) at its widest point, with an approximate area of 342 km^2 (132 mi^2) (Kremer and Nixon 1976; Chinman and Nixon 1985). Entrances into the bay from Rhode Island Sound and the Atlantic Ocean include three deep passages: the West Passage, East Passage, and Sakonnet River, all of which are drowned river valleys (RIDA 1992).

Greenwich Bay and Mount Hope Bay are major branches of Narragansett Bay and together comprise the Narragansett Bay System. The watershed for the Narragansett Bay System encompasses drainages in Rhode Island (40 percent [%]) and Massachusetts (60%) (CRC 2004). Freshwater flows into the bay system from seven rivers and many tributaries. Since most of the freshwater sources are in the northern reaches of the bay system and the mouth of the bay is open to saltwater from the ocean, a north-south salinity gradient exists in the bay, with the lowest salinity waters located in the upper bay and the highest salinities found in the lower bay. Salinities in the lower bay range from 30 to 32 psu (Hale 1988). Since density increases with salinity, dense salty waters also occur near the bay bottom; some of the most saline waters in the bay are found at depth in the Eastern Passage (Hale 1988).

The bay bottom tapers or slopes gradually from Rhode Island Sound to the head of the bay. Narragansett Bay is fairly shallow on average, with a mean depth of 9 m (29 ft); the mean depth of the West Passage and the Sakonnet River is 7.5 m (24.5 ft) at mean low water while depths in the East Passage are much deeper, with a mean water depth of about 17.7 m (58 ft) and a maximum of 160 m (525 ft) (Hicks 1959; NBO 2005).

Tides in this region of southern New England are semidiurnal with a range from 1.1 to 1.6 m (3.6 to 5.3 ft) (Ely 1988). Tidal currents throughout the bay are moderate at 22 to 77 centimeters/second (cm/s) (0.7 to 2.5 ft/sec) (Spaulding and White 1988). Circulation in the bay is primarily driven by tides, but wind also plays a role. Wind patterns are seasonal, with the highest average monthly wind speeds (5 m/sec [16 ft/s]) occurring in December and January from a predominantly northeasterly direction (Spaulding and White 1988). Glaciation is responsible for the rocky, rugged coastline of Narragansett Bay, as retreating glaciers left bedrock, boulders, and rock blocks exposed near shore. Including islands, the Narragansett Bay System has roughly 545 km (339 mi) of coastline (Ely 1988). In the Narragansett Bay System, terrigenous bottom sediments predominate, the origin of which are largely riverine (terrestrial) or reworked glacial deposits. Clays and silts are the most abundant sediments interspersed with areas of sand (Figure 3-3) (McMaster 1960; NBO 2005). There are only two small pockets of gravel sediments in the bay, one of which is located along the southwestern shore of Aquidneck Island in the FarSounder–East test area.

The FarSounder–West test area is located in western Narragansett Bay off Quonset Point and is roughly 10 km^2 (4 mi^2) in size while the FarSounder–East test area is located in the East Passage of the bay off western Aquidneck Island and is about 25 km^2 (10 mi^2) in size (Figure 3-2). Nearly the entire width of the East Passage is encompassed by the FarSounder–East test area. The APS–GSO test area is located in the southwestern bay off the GSO campus and is roughly 0.9 km^2 (0.35 mi^2) in size. The proposed FarSounder and APS–GSO ROI encompass commercial, academic, and navy piers from which the system can be deployed. Water depths in the test areas range from < 20 to over 160 m (< 66 to 525 ft) (NBO 2005). The FarSounder–West ROI is characterized by shallow water depths of no more than 20 m and a seafloor that is gently sloping with little vertical relief (Figure 3-2). Large commercial piers are located along the south and eastern shore of Quonset Point and a commercial shipping lane to these piers runs diagonally across the FarSounder–West test area. The FarSounder–East ROI is quite different, with more complex bathymetry, water depths ranging from < 20 m (< 66 ft) near the shore to 160 m (525 ft), and a seafloor gradient that is steeply sloping on each side of the East Passage to form a channel roughly in the center of the passage. Nearly all commercial ship traffic into Narragansett Bay travels through the East Passage and the FarSounder–West ROI. The water depths in the APS–GSO ROI are as deep as 40 m (131 ft) and the seafloor has little vertical relief. The dock in the APS–GSO ROI is located at the GSO campus and is the berthing location of the vessel affiliated with GSO; the dock is used solely for academic purposes.

3.3.4.1 Rhode Island Coastal Zone—Federal Consistency

The approximately 676 km (420 mi) of shoreline in Rhode Island are protected under the CZMA by the Coastal Resources Management Plan (CRMP) approved in 1978. The Coastal Resources Management Council (CRMC) manages the plan and its implementation in Rhode Island. The CRMC is a regulatory and permitting agency as well as a management organization. The authorization for the enforceable policies associated with the RICRMP is § 46-23 of the RI General Laws. The RICRMP contains enforceable policies that are associated with various water usage types; coastal features, including shoreline, inland, contiguous, critical, and freshwater features; and activities (Appendix B-2).

Federal activities in Rhode Island are not only subject to compliance with the CZMA but also with Executive Order (EO) 12372. This EO was issued in July of 1982 under the Demonstration Cities and Metropolitan Government Act and the Intergovernmental Cooperation Act. It establishes a mechanism for state, local, and community representatives to review and comment on projects or programs seeking or receiving federal financial assistance. The EO is implemented on the state level under the authority and guidance of EO 83-11 through the RI Intergovernmental Review (IGR) process. Any state agency, local government, or private organization seeking federal funds for any activity occurring within RI must submit grant or cooperative agency applications for IGR. Federal agencies subject to EO 12372 are required to "accommodate or explain" identified inconsistencies with state policies and plans but are under no obligation under the EO to alter the proposed activity. A federal agency subject to IGR submits an

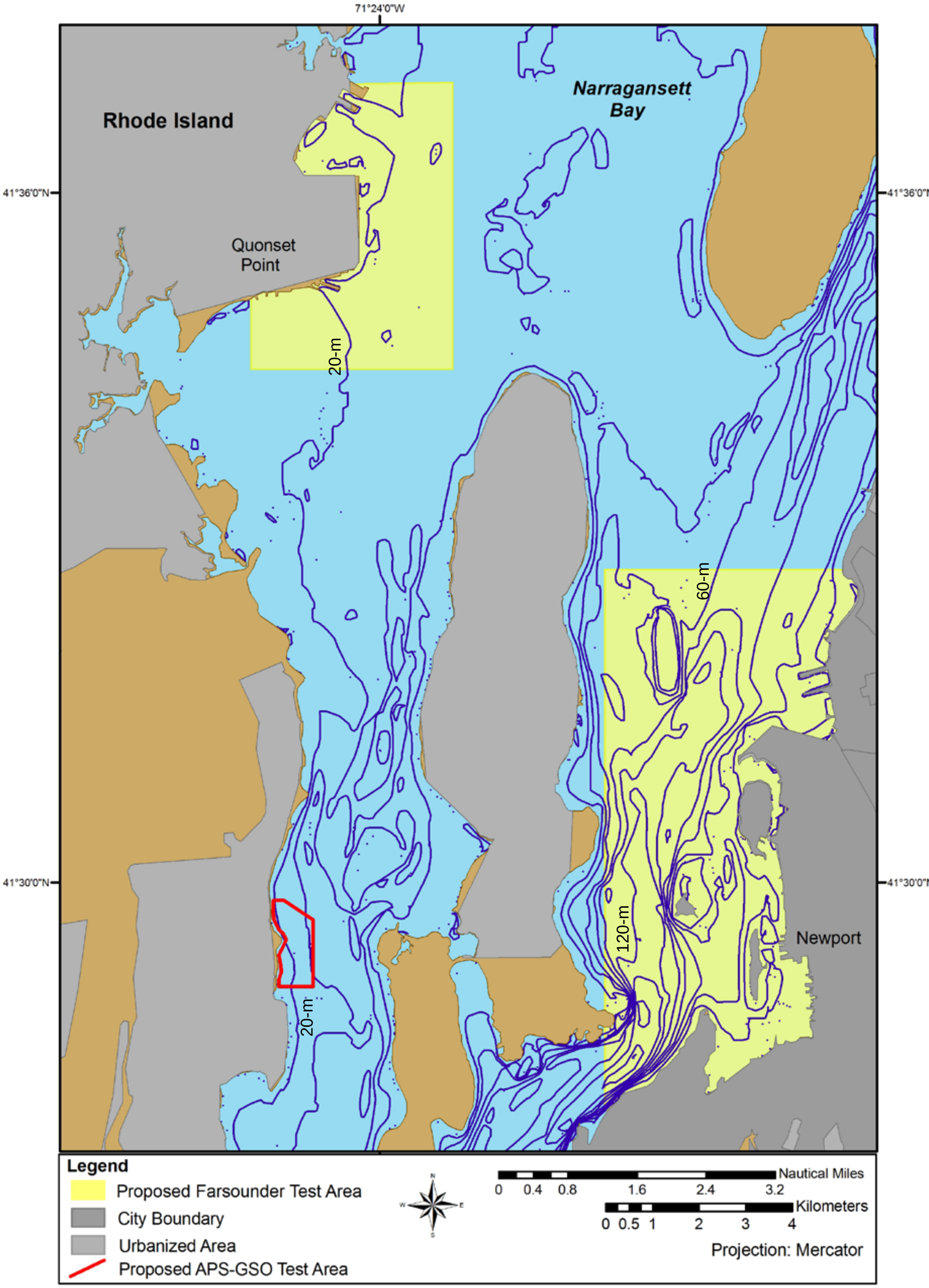

Figure 3-2. Bathymetry of Narragansett Bay and of the proposed FarSounder and APS-GSO test areas (NBO 2005).

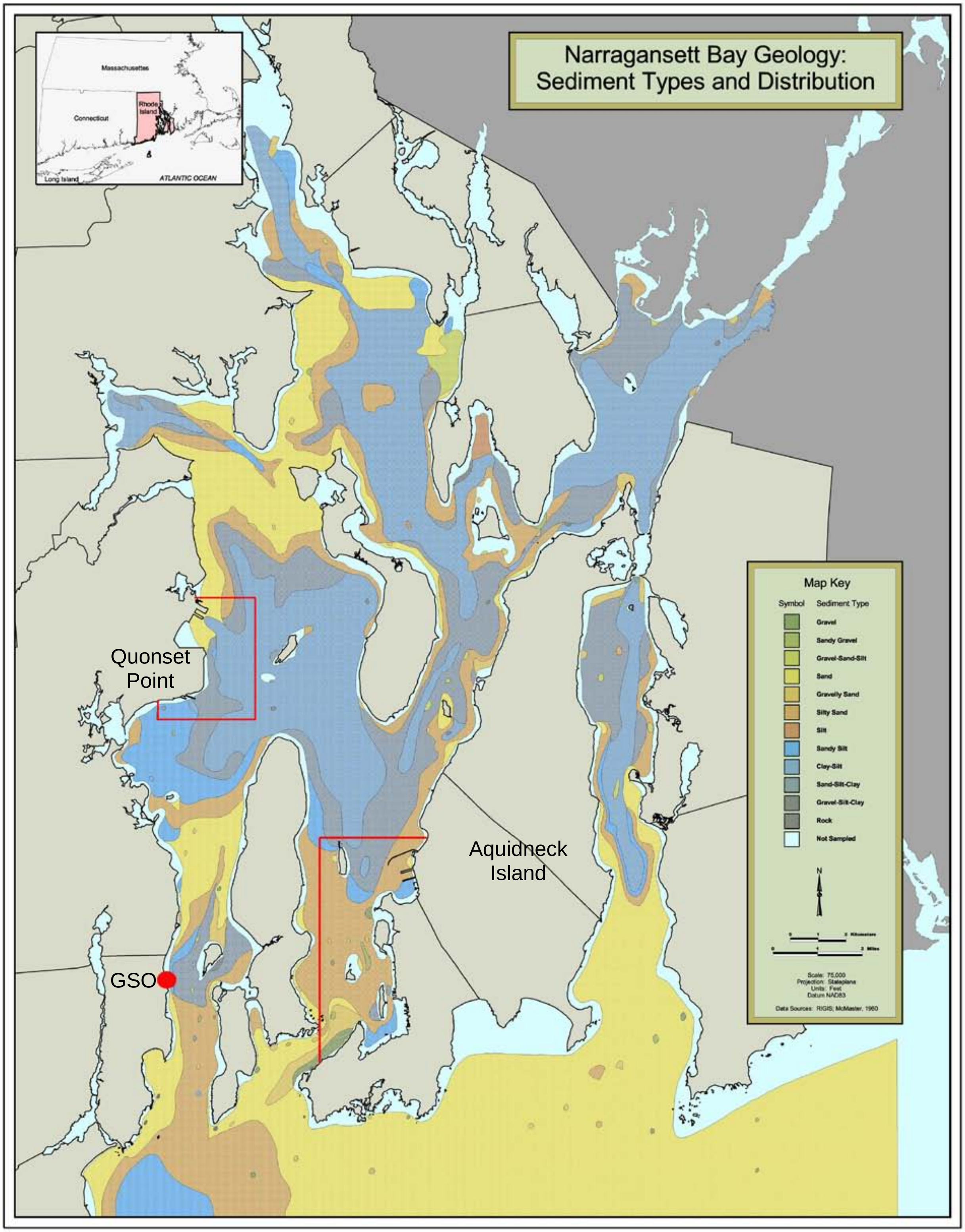

Figure 3-3. Distribution of bottom substrate in the Narragansett Bay System and in the FarSounder and APS–GSO test areas (shown in red) (NBO 2005).

application to the Clearinghouse, the RI Department of Administration, Division of Planning for review. While EO 12372 is mostly applicable to federal financial assistance activities, direct federal actions, environmental impact statements required pursuant to the NEPA, and Army Corps of Engineer (ACoE) permit applications are also subject to the IGR. The CRMC can also review any proposed federal actions under EO 12372 that may affect any coastal use or resource in addition to separately reviewing the action under section 307 of the CZMA.

For the purpose of federal consistency, RIs coastal zone includes the area from the state's seaward boundary (3 NM [3.5 mi]) to the inland boundaries of the state's 21 coastal communities (CRMC 1997). The jurisdiction for federal activities of the inland extent of RIs coastal zone boundary is a three-tiered system that depends on the type and location of a federal activity. The first tier of RIs coastal zone extends 61 m (200 ft) inland of a coastal feature or watersheds for which a SAMP has been adopted. The second tier of the RIs coastal zone boundary extends inland to include the 21 coastal communities. Within this second tier, all federal (as well as state) activities must also be consistent with the state CRMP. The third tier of RIs coastal zone encompasses the entire state for certain activities that the state has predetermined may affect coastal resources or uses regardless of location within the state. These activities include energy generation, transfer processing, or storage; chemical processing; minerals extraction; sewage treatment and disposal; and solid waste disposal (CRMC 1997).

Six classifications (Types 1 through 6) of tidal waters and usages have been designated in the RICRMP, ranging from pristine, undeveloped waters through increasing amounts of alteration and shoreline development (CRMC 2007). Shoreline features included as enforceable policies include: coastal beaches; barrier islands and spits; wetlands; headlands, cliffs, and bluffs; rocky shores; manmade shores; dunes; and areas of historical or archaeological significance. Freshwater wetlands found in the RI coastal zone, including areas along riverbanks, are afforded additional protection. Critical coastal areas include watersheds of poorly flushed estuaries and other areas of varying ecological functions. Special Area Management Plans (SAMP) address the specific environmental concerns of these critical and priority management areas. SAMP have been designed to facilitate the redevelopment of urban waterfront, maintain and improve public shore access, as well as conserve and restore habitat (NOAA 2007a). RI has specific enforceable policies governing SAMs. Six SAMPs have been designated in Narragansett Bay, one of which is located along the entire western side of Aquidneck Island (Figure 3-4). A SAMP, once approved by the CRMC, requires that federal, state, and local governments abide by SAMP policies. The Aquidneck Island SAMP has not yet been adopted by the CRMC.

Figure 3-4. Location of designated special area management plans (SAMP) in relation to proposed test areas (shown in red) (CRMC 2007).

The water types designated for the proposed test areas in Narragansett Bay include all types of water usage categories designated by the RICRMP (Appendix B-2). The proposed FarSounder–West test area primarily includes waters that are classified as Type 4 (multi-use waters) but the nearshore waters are Type 6 (industrial waters and commercial navigation channels). A balance must be maintained in Type 4 waters between recreational boating, commercial traffic, and fishing activities (CRMC 2007). In Type 6 waters, commercial and water-based industrial activities take precedence over all other activities. While the majority of the waters in the FarSounder–East test area are Type 4 waters, waters categorized as Types 1, 2, 3, 5, and 6 are also included in the test area. FarSounder–East also includes the waters of the Aquidneck Island SAMP. Type 1 waters are found off shorelines that are in a natural, undisturbed state with low-intensity usage and in which alterations are largely unacceptable (CRMC 2007). Type 2 waters are found predominately off residentially developed coastal areas and while they also are characterized by low-intensity usage, some alterations such as the construction of docks is allowed. Waters that are dominated by commercial facilities that support recreational boating (i.e., marinas and boatyards) are categorized as Type 3 waters, and activities, such as dredging, that are necessary for the continuation of these commercial enterprises are expected. Type 5 and 6 waters are adjacent to highly altered shorelines. Waters adjacent to ports and harbors in which commercial and recreational activities coexist are listed as Type 5 waters. At the APS–GSO test area, the waters are categorized as primarily Type 2 waters with some Type 4 waters in the deeper test area.

3.3.5 APS–Avery

The second of the APS proposed test areas is located off Avery Point, CT in the nearshore waters of Long Island Sound (see Figure 1-5). Long Island Sound (LIS) is a major, highly impacted coastal estuary on the U.S. East Coast and is located adjacent to the most densely populated region of the U.S.; LIS lies between Connecticut and Long Island, New York (NY). LIS is about 150 km (93 mi) long, 30 km (19 mi) at its widest, with an area of 3,367 km^2 (1,300 mi^2) (LISS 1989; Signell et al. 1998).

The sound is open to the waters of Block Island Sound and the Atlantic Ocean on its eastern end while on the western end the sound is connected to New York Harbor through the East River. The majority (90%) of the freshwater that flows into LIS primarily comes from three Connecticut Rivers, the Thames, Connecticut, and Housatonic Rivers. Five states (CT, NY, Massachusetts [MA], Vermont, and New Hampshire) comprise the watershed for LIS with a total drainage area of 41,623 km^2 (16,071 mi^2) (LISS 1989; Schimmel et al. 1999). Currents are predominately tidal-driven and are strongest in the eastern end of the sound, at about 120 cm/s (3.9 ft/s). Tides are semi-diurnal with a variable tidal range, from 0.8 m (2.6 ft) on the eastern end of the sound to 2.2 m (7.2 ft) on the western end (Signell et al. 1998).

Salinities in the sound range from 23 to 35 psu with a decided west to east gradient of increasing salinity and surface water temperatures ranging from 0 to 22.8°C (32° to 73°F) (LISS 1989). There is strong seasonality in both temperature and salinity, with the highest temperature variability occurring in winter while spring exhibits the highest salinity variance, caused by higher freshwater input (Lee and Lwiza 2005). Water column stratification occurs in the sound during the summer. LIS is a fairly shallow estuary with average depths of 24 m (79 ft) (Signell et al. 1998). The deepest waters in LIS are found in the easternmost sound, where it empties into Rhode Island Sound and waters are as deep as 90 m (295 ft) (Figure 3-5; NOAA 1999). The seafloor of the sound is relatively flat, with little vertical relief. Rock sills act as barriers along the bottom, separating the sound's seafloor into three to five subareas and altering deep circulation within LIS (Schimmel et al. 1999). The distribution of sediments on the seafloor of LIS is patchy (Figure 3-6). Gravel dominates the floor of the eastern sound, where tidal currents are high and glacial deposits are abundant, while sands cover the east-central and nearshore seafloor of the sound, and silts as well as clays dominate the lower energy bottom environments of the central and western sound (USGS 2007).

APS–Avery is located in northeastern LIS adjacent to Avery Point, CT. The ROI for APS–Avery is 0.89 km^2 (0.34 mi^2) in area and encompasses the pier located on the University of Connecticut's Avery Point campus. Waters in the APS–Avery test area are shallow, < 10 m (33 ft) in depth, with a uniform, gradually sloping seafloor (Figure 3-5). The mouth of the Thames River lies just to the west of the test area, and the land adjacent to the test area is highly developed.

3.3.5.1 Connecticut Coastal Zone—Federal Consistency

Connecticut's coastal zone occurs along the northern border of LIS and includes 995 km (618 mi) of coastline (NOAA 2007b). The coastal zone in Connecticut is protected under the CZMA by The Connecticut Coastal Management Act (CCMA), approved in 1980. The Long Island Sound Program of the Department of Environmental Protection is the lead agency that manages and implements the Connecticut CZP in conjunction with development regulation at the local community level. Connecticut defines the coastal zone in two-tiers, with the first tier, or coastal boundary, including waters from 3 NM (state territorial limit) from shore to 305 m (1,000 ft) inland from the mean high-tide line, while the second

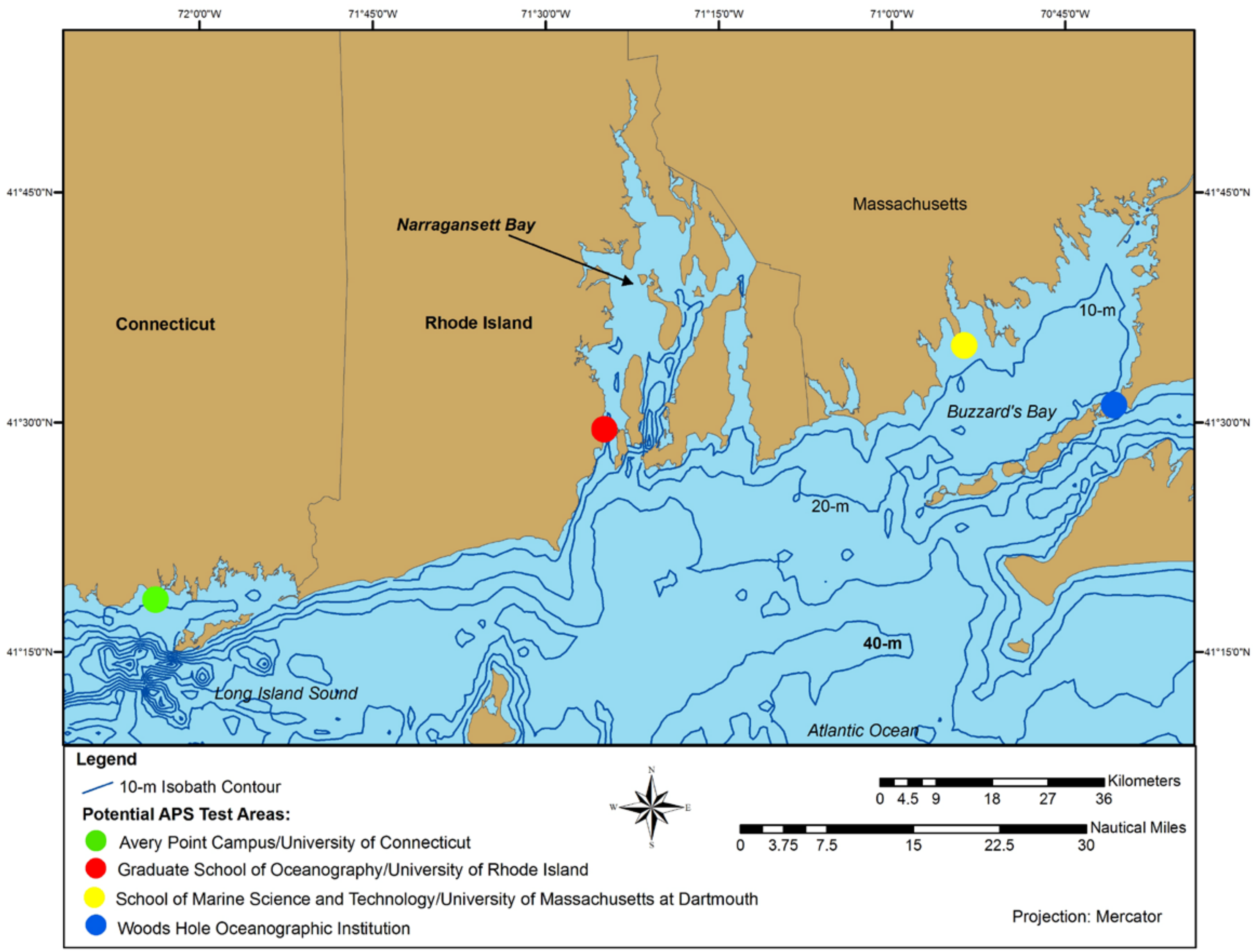

Figure 3-5. Bathymetry of the APS proposed test areas in eastern Long Island Sound, Narragansett Bay, and Buzzards Bay.

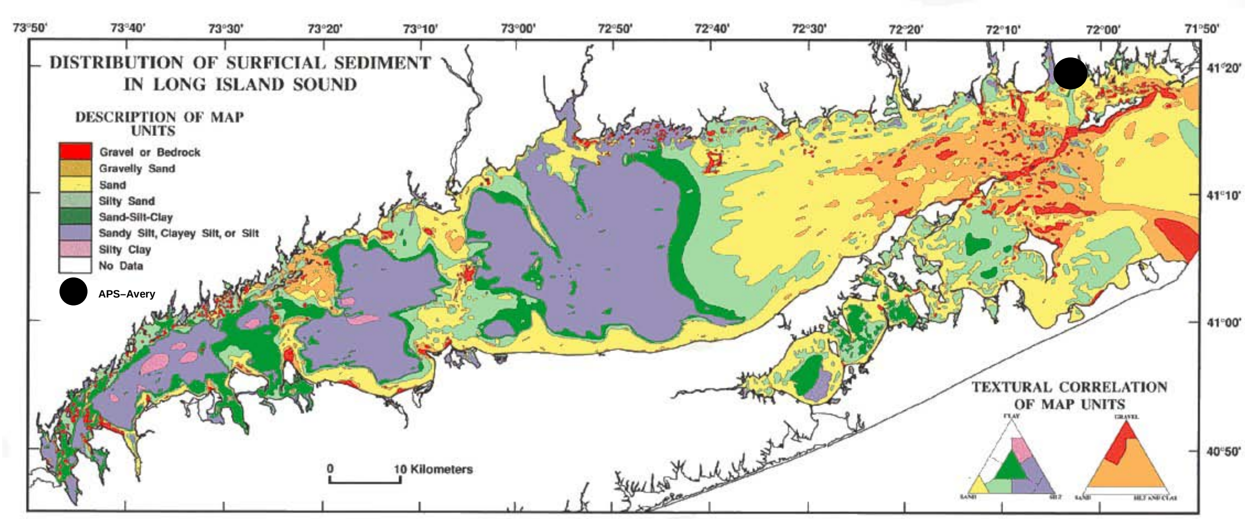

Figure 3-6. Distribution of bottom sediments in LIS and in the APS–Avery test area (USGS 2007).

tier, or coastal area, includes the land and water of the state's 36 coastal communities (CCMA 1980). The APS–Avery test area is located within the tier one coastal zone boundary of Connecticut.

The authorization for enforcing the state CZMP is codified in the Connecticut General Statutes (CGS) (Sections 22a-90 through 22a-112), as amended; Structures, Dredging, and Fill Statutes; and the Tidal Wetlands Act. The state's enforceable policies are encompassed by these coastal resource uses: general coastal resources; bluffs and escarpments; beaches and dunes; coastal hazard areas, freshwater wetlands and watercourses, coastal waters, estuarine embayments, nearshore waters; and offshore waters; developed shoreline; islands; intertidal flats; rocky shorefront, shorelands; energy facilities; shellfish concentration areas; tidal wetlands; dams, dikes, and reservoirs; general development; boating; coastal recreation and access; coastal structures and filling; dredging and navigation; fisheries; cultural resources; open space and agricultural lands; ports and harbors; transportation; fuels, chemicals, and hazardous materials; sewer and water lines; solid waste; and water dependent uses. The associated state statutes enforcing each of these resource areas are found detailed in Appendix B-3. The policies for general coastal resources apply to all activities occurring within Connecticut's coastal zone.

3.3.6 APS–UM and APS–WHOI

Two of the APS test areas for their swimmer/diver detection system, APS–UM and APS–WHOI, are located in Buzzards Bay, MA. Buzzards Bay is a large estuary that separates most of Cape Cod from mainland MA and opens to the Atlantic Ocean to the south, Vineyard Sound to the east, and Cape Cod Bay to the northeast via the Cape Cod Canal (Figure 3-5). The bay is 45 km (28 mi) in length, averages about 13 km (8 mi) in width, and has an area of 590 km^2 (228 mi^2) (CCMP 1991). There are approximately 499 km (310 mi) of coastline along the mainland portion of Buzzards Bay (CCMP 1991). Seven major rivers drain into the bay from the west while streams and groundwater supply the freshwater input from the eastern drainage basin; the watershed for Buzzards Bay encompasses 1,104 km^2 (426 mi^2) (Howes et al. 1996). Although land surrounding Buzzards Bay remains undeveloped, portions of the coast are heavily developed and industrialized.

Overall, Buzzards Bay is a tidally driven, well-mixed estuary. Circulation within Buzzards Bay is dominated by tidal currents, but wind-driven circulation contributes to the density driven flow within the bay of about 1 cm/s (0.3 ft/s) (Howes et al. 1996). The Elizabeth Islands to the south of the bay protect the bay from large ocean waves and storm swells. Tides are primarily semi-diurnal with a mean tidal range of about 1.2 m (3.9 ft) (Howes et al. 1996). Buzzards Bay remains well-mixed during most of the year since the shallowness of the bay and strong tidal mixing prevent the development of strong density stratification of the water column, although it does periodically (CCMP 1991). Water temperatures in the bay range from the summer maximum of 22°C (71.6°F) to -3°C (28°F) in winter. During the coldest winters, the upper bay often freezes. Salinities in the bay vary little annually due to low freshwater input, remaining at about 30 psu virtually at all times throughout the bay (Turner and Borkman 1997). Salinities may be slightly higher closer to the mouth of the bay.

Buzzards Bay is a shallow estuary, with water depths ranging from 5 to 10 m at mean low water near the head of the bay to slightly over 20 m near the mouth, with a baywide average of 11 m (36 ft) (Howes et al. 1996). The bay was formed by glaciation, with the leading edge of the glaciers having deposited glacial till at the southeastern side of the bay in what is now the Elizabeth Islands. This southeastern shore of the bay remains relatively smooth as a result. Sediments within the bay are terrestrial in origin (runoff or glacial deposits) and range from muds and silts in the deeper central regions to sands, gravels, and boulders in the shallower nearshore areas and near the eastern head of the bay (Figure 3-7; Howes et al. 1996).

APS–UM and APS–WHOI are located along the western and eastern shores, respectively, of Buzzards Bay (Figure 3-5). The ROI for APS–UM is 0.97 km2 (0.38 mi^2) in area and includes the pier of the School of Marine Science and Technology. The water depth within the APS–UM test area is < 10 m (< 33.3 ft) and the seafloor is featureless. The test area is located just off the developed shoreline of the New Bedford fishing port. The areal extent of the APS–WHOI ROI is 0.66 km^2 (0.25 mi^2) and < 10 m (3.3 ft) in depth. The WHOI pier is located within the ROI as are several other NMFS and city docks.

3.3.6.1 Massachusetts Coastal Zone—Federal Consistency

Massachusetts has an extensive coast, with approximately 2,445 km (1,519 mi) of shoreline within the state. In 1978, the MA CZMP (MCZMP) was approved and details more than 20 enforceable policies as well as nine management principles that govern activities within the state's coastal zone. The MCZMP is codified in 301 Code of MA Regulations (CMR) 20.00. The coastal zone of MA is defined as the area extending from the limit of the state's territorial waters (3 NM) to roughly 0.8 km (0.5 mi) inland from shore including all islands, wetlands, and coastal waters (NOAA 2007c). More specifically, the MCZMP defines an inland boundary as 30.5 m (100 ft) inland from specified roads or transportation lines. The MA CZM Office (MCZMO) within the MA Executive Office of Energy and Environmental Affairs is the lead agency overseeing the MA plan although the MCZMO works closely with a network of other agencies to implement the MCZMP.

The enforceable policies of the MCZMP are authorized under MA General Laws and Executive Order 181 and 194; the enforceable policies are categorized into these seven broad categories: water quality, habitat, protected areas, coastal hazards, ports and harbor infrastructure, energy, and ocean resources (Appendix B-4). Additionally, the MCZMP also includes management principles that are not currently enforceable through existing statutes and regulations. These management principles are provided as guidance as they represent the preferred policy of the MCZMP. The areas covered by the management principles include ports, public access, energy, and growth management. The regulations for federal consistency with the MCZMP are specified in 301 CMR 21.00.

3.4 BIOLOGICAL ENVIRONMENT

Information is presented in this section on each group of protected species (marine mammals, sea turtles, and fishes) and protected habitats including essential fish habitat that may potentially occur in test areas. Protection is afforded to marine species under federal resource legislation such as the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA), while marine habitats are protected under the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA), also known popularly as the Sustainable Fisheries Act; the Marine Protection, Research, and Sanctuaries Act (MPRSA); and Executive Orders (EO) 13089 and 13158. All marine mammals are protected by the MMPA (of 1972, amended in 1988 and 1994), while the ESA (of 1973, as amended) provides protection to those species, including marine mammals, whose existence is considered threatened or endangered; the ESA also protects the habitat considered vital to the continued existence of critically endangered species. The NMFS and the U.S. Fish and Wildlife Service (USFWS) jointly share jurisdiction of marine mammals under the MMPA and the ESA. The NMFS manages all cetaceans and all pinnipeds except the walrus, while the USFWS manages the walrus, sirenians (manatees and dugongs), otters, and polar bears.

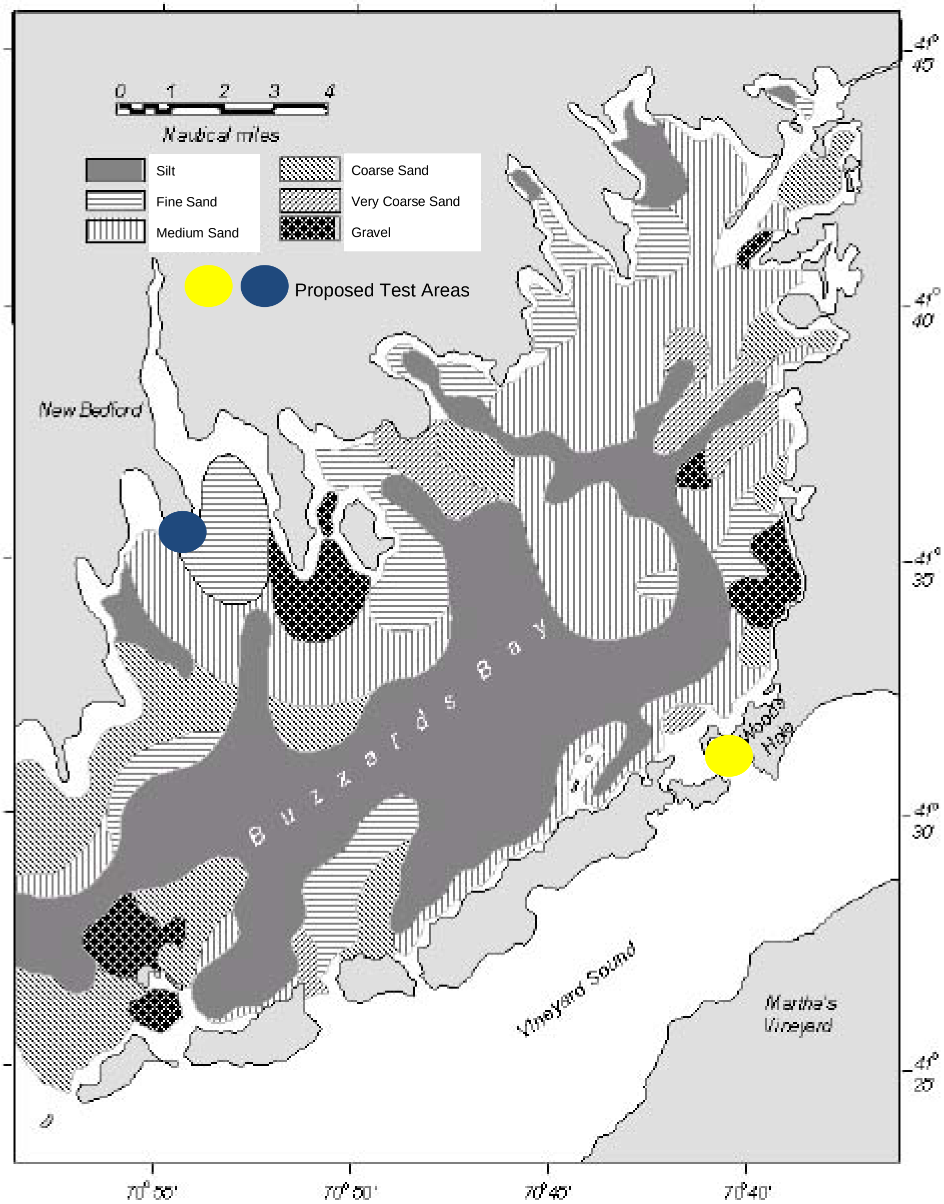

Figure 3-7. Distribution of bottom sediments in Buzzards Bay and in the vicinity of the APS test areas (Howes et al. 1996).

One of the most significant mandates in the MSFCMA is the essential fish habitat (EFH) provision, which provides the means to conserve fish habitat. This provision is an acknowledgment of the importance habitat plays on the continued sustainability of all life stages of federally managed fish and invertebrate species. Establishing and affording federal protection to a network of marine habitats and sites of cultural or ecological significance is the goal of the MPRSA and EO 13158.

Although coral reefs do not occur extensively in U.S. territorial waters outside of Hawaii and Florida, EO 13089 was put into force to guard and maintain these existing but highly vulnerable habitats. In the contiguous U.S. waters, no coral reefs exist north of Florida waters or in west coast waters. Therefore, EO 13089 on coral reefs does not apply to this action.

3.4.1 Marine Mammals

This section provides information on the marine mammal species that are most likely to occur in BioSonics®, FarSounder, and APS test areas during all seasons. Presented first will be marine mammal species diversity and densities specific to the coastal estuaries proposed for the swimmer/diver detection tests. Descriptions of all the marine mammal species potentially occurring in all the test areas will follow including a brief description of each species, the status, distribution, and hearing frequencies, when known. Marine mammal species information is introduced by group type, with suborders of cetaceans (whales, dolphins, and porpoises), mysticete (baleen whales) and odontocete (toothed whales) listed first, followed by pinniped (seals, sea lions, and walruses), and fissiped (otters) species.

For the purposes of this EA, seasons are defined for the New England test areas as winter (December through February), spring (March to May), summer (June through August), and fall (September to November) but as warm (May to October) and cold (November through April) for the test area in the Washington inland waters.

3.4.1.1 Introduction

The distribution of marine mammals is difficult to predict as these animals are highly mobile and are capable of traveling long distances. Some baleen whales, such as the humpback whale, make extensive annual migrations to low-latitude mating and calving grounds in the winter and to high-latitude feeding grounds in the spring and summer (Corkeron and Connor 1999). At nearly 16,093 km (8,690 NM) round trip distance, the migratory movements of the humpback whale represent the longest migration of any mammal (Clapham 2002). Despite this mobility, however, the distribution of marine mammals is not typically random. The distribution of most marine mammals is not homogeneous and is often characterized by irregular clusters (patches) of occurrence that frequently correlate with locations of high prey abundance. Marine mammals are often associated with features such as oceanographic fronts or regions of persistent upwelling because these areas of increased primary productivity attract marine mammal prey, such as squid and fishes.

3.4.1.2 Marine Mammal Species Diversity and Density Estimates

As a consequence of this often spotty distribution, the density of many marine mammal species is also irregular and is highly dependent upon geography and seasonality. Density estimates are a critical component needed to analytically assess risk to marine mammals from activities occurring in the marine environment. However critical, marine mammal density estimates rarely exist, especially for inshore or coastal regions such as the settings for the proposed action. No marine mammal density values exist for any of the coastal water bodies where the swimmer/diver detection systems would be tested. Due to this data lack, surrogate density values often must be employed so that potential impacts can be calculated for each species.

For the Elliott Bay test area, densities computed for the Greater Puget Sound waters by a variety of researchers were used as surrogate density values for the marine mammal species potentially occurring in the bay. For the southern New England test areas, comprehensive marine mammal densities that were derived for the entire east coast's continental shelf waters were used (DoN 2007). These densities were derived by spatial modeling so that it is possible to obtain a density for the inner shelf waters closest to the mouths of LIS, Narragansett Bay, and Buzzards Bay.

The densities used in this EA represent the best population data available for these little surveyed waters. It should be noted that the densities of marine mammals occurring in the coastal habitats where the testing would take place are very likely lower than the densities used for the EA analyses. The result of using the higher densities is that the resulting impact potentials are very conservative.

- *Elliott Bay*

  In the Elliott Bay region as many as 12 species of marine mammals potentially may occur (Table 3-2; NMFS 1998a). Several of the marine mammal species only occur seasonally in the test area. For instance, in the Greater Puget Sound region, southern resident killer whales occur predominantly from May through October, with only rare resident killer whales from the J Pod being observed during the remainder of the year. California sea lions, however, occur from November through April, after which they have migrated out of the area for the duration of the year. Of the 12 species of marine mammals potentially occurring in Elliot Bay, seven are cetaceans, four are pinnipeds, and one is a fissiped. Three of the marine mammal species are listed as endangered or threatened species under the ESA; endangered species include humpback whales and the southern resident stock of killer whales while the eastern stock of Steller sea lions is designated as threatened. Only the southern resident killer whale stock has critical habitat designated in the vicinity of the test area. Of the mysticete species, only the humpback, minke, and gray whales have been recorded in the Greater Puget Sound region that includes Elliott Bay (Table 3-2). The odontocete species potentially occurring in the Elliott Bay region include killer whales, Pacific white-sided dolphins, Dall's porpoises, and harbor porpoises. Four pinniped species, the harbor seal, California sea lion, Steller sea lion, and northern elephant seal have been observed in the inland waters of Washington (NMFS 1998a). Although not currently included in the northern sea otter's range, it is possible that sea otters could potentially occur in Elliott Bay. The Dall's and harbor porpoises are the most likely cetaceans to occur in Elliott Bay while the harbor seal is the most likely occurring pinniped.

- *Narragansett Bay*

While as many as 40 marine mammal species potentially occur in northeastern U.S. waters (DoN 2005; Waring et al. 2007), only 12 of those species could possibly occur in the waters of Narragansett Bay during winter or spring (Table 3-3; Massie 1998; Kenney 2007). Occurrence data on marine mammals in RI waters, especially in Narragansett Bay, are extremely limited. No cetacean surveys have occurred in Narragansett Bay and only seasonal, intermittent surveys of harbor seals have ever taken place (Payne and Schneider 1984; Payne and Selzer 1989; Schroeder 2000). Most marine mammal species, particularly cetaceans, are known in RI waters primarily from strandings. A stranding occurs when a marine mammal (dead or alive) does not purposefully come ashore. Several of the marine mammals that potentially occur in the bay only do so seasonally; all of the possible pinniped (seal) species, for instance, only occur in the waters of RI from fall through spring (DoN 2005).

Of the 12 marine mammals potentially occurring in Narragansett Bay during winter or spring, three are baleen whale species, including the fin whale, humpback whale, and minke whale. Two of these species, the humpback and fin, are listed as endangered under the ESA. No baleen whales are expected to occur from winter to spring in Narragansett Bay, as these cetaceans should have migrated from their summer feeding grounds in Cape Cod Bay, the Great South Channel, Gulf of Maine, and the Scotian Shelf to more tropical, warm waters where they calve and breed during winter. Based on the lack of occurrences in the bay (Kenney 2007) and the low probability of occurrence associated with densities of these species on the continental shelf during these periods (DoN 2007), it is very unlikely that either of the endangered baleen whales potentially occurring in the bay will be present during any time of year. Even though four marine mammal species, including two seal and two dolphin species, may possibly occur in the bay throughout the year (Table 3-3), it is unlikely that any but the seal species would be present in Narragansett Bay during the winter or spring. The marine mammal species with the highest likelihood of occurrence in the bay from winter through spring is the harbor seal. More than 20 harbor seal haulouts have been identified in Narragansett Bay (Schroeder 2000).

- *Long Island Sound*

With the exception of the harbor seal, few marine mammals are known to occur in LIS, and the harbor seal only occurs in these waters seasonally (fall through late spring). Ten species of marine mammals have potential occurrence in the sound, six odontocetes and four pinnipeds (Table 3-4; Weiss 1995). However, of the ten species, it is most likely that pilot whales and harbor porpoises would be found in this estuary during any part of the year. Of the ten potential species, the harbor seal is the marine mammal species most likely to be observed in LIS. No dedicated surveys focused on observations of marine mammals have occurred in these waters. Irregular surveys monitoring seals on their known haulouts (locations where seals purposefully come ashore) have occurred during winter. Some species of pinnipeds, such as the harp and hooded seals, are known primarily from stranding records in LIS. All four of the potentially occurring pinniped species are likely to be found in the sound during

Table 3-2. ESA and MMPA status, expected occurrence level in Elliott Bay (EB), and density estimates for the marine mammal species that may occur in Elliott Bay, WA. Densities for these species represent values computed for the Greater Puget Sound (GPS) since no densities have been estimated for Elliott Bay. The warm season corresponds to the period from May through October while the cool season corresponds to November through April. Sources: Angliss et al. 2007; Calambokidis and Osmek 1998; Calambokidis et al. 1997, 2000; Carretta et al. 2007; Carter et al. 2007; Everitt et al. 1980; Falcone et al. 2005; Jeffries et al. 2003; Laidre et al. 2002; NMFS 1997a, 1998a, 2006, 2007).

Species	ESA and MMPA Status	Cold Season (Nov to Apr) EB Occurrence Level[1]	Cold Season GPS Density Estimate (animals/km^2)	Warm Season (May to Oct) EB Occurrence Level[1]	Warm Season GPS Density Estimate (animals/km^2)
Mysticetes					
Gray Whale (*Eschrichtius robustus*)		Rare	< 0.0003	Regular	0.0043
Humpback Whale (*Megaptera novaeangliae*)	Endangered	Rare	0.0025	Rare	0.0025
Minke Whale (*Balaenoptera acutorostrata*)		Rare	0.0006	Rare	0.0016
Odontocetes					
Dall's Porpoise (*Phocoenoides dalli*)		Regular	0.051	Regular	0.051
Harbor Porpoise (*Phocoena phocoena*)		Regular	0.611	Regular	0.611
Killer Whale (*Orcinus orca*)—Southern Resident	Endangered	Rare	0.002 (J Pod only)	Regular	0.007
Killer Whale (*Orcinus orca*)—Transients		Rare	< 0.0003	Rare	< 0.0003
Pacific White-sided Dolphin (*Lagenorhynchus obliquidens*)		Rare	< 0.0003	Rare	< 0.0003
Pinnipeds					
Harbor Seal (*Phoca vitulina richardsi*)		Regular	0.4539	Regular	0.4539
California Sea Lion (*Zalophus californianus*)		Regular	0.478	Extralimital	< 0.0003
Stellar Sea Lion (*Eumetopias jubatus*)	Threatened	Regular	0.0064	Regular	< 0.0003
Northern Elephant Seal (*Mirounga angustirostris*)		Rare	0.0017	Rare	< 0.0003
Fissipeds					
Washington/Northern Sea Otter		Extralimital	0	Extralimital	0

1 **Regular** = A species that occurs as a normal part of the fauna of an area regardless of its overall abundance;
Rare = A species that occurs in an area only very sporadically or very seldom;
Extralimital = A species that does not normally occur in an area as it is beyond its normal distributional range but for which one or more occurrence records exist in the area.
2 **NA**=Not available.

Table 3-3. Marine mammal species that may occur in Narragansett Bay as well as the designated ESA and MMPA status for each species, the expected occurrence level in Narragansett Bay (Massie 1998; Kenney 2007), and density estimates (DoN 2007). Density estimates for these species were derived from density values computed for the nearshore continental shelf waters south of Narragansett Bay since no overall marine mammal surveys have ever been completed or densities calculated for Narragansett Bay.

Species	**ESA and MMPA Status**	**Winter Occurrence Level[1]**	**Spring to Fall Occurrence Level[1]**	**Winter Shelf Density Estimates (animals/km^2)**	**Spring Shelf Density Estimates (animals/km^2)**	**Summer Shelf Density Estimate (animals/km^2)**	**Fall Shelf Density Estimate (animals/km^2)**
Mysticetes							
Fin Whale (*Balaenoptera physalus*)	Endangered	Extralimital	Rare	0.0004	0.0004	0.0004	0.0004
Humpback Whale (*Megaptera novaeangliae*)	Endangered	Extralimital	Rare	0	0	0	0
Minke Whale (*Balaenoptera acutorostrata*)		Rare	Rare	0	0	0	0
Odontocetes							
Atlantic White-sided Dolphin (*Lagenorhynchus acutus*)		Rare	Rare	0	0	0	0
Common Dolphin (*Delphinus delphis*)		Rare	Rare	0	0	0	0
Striped Dolphin (*Stenella coeruleoalba*)		Rare	Regular	0.0014	0.0014	0.0014	0.0014
Pilot Whales (*Globicephala* spp.)		Rare	Rare	0.1618	0.7525	0.2337	0.2337
Harbor porpoise (*Phocoena phocoena*)		Rare	Regular	0.0002	0.0002	0	0.0002
Pinnipeds							
Harbor Seal (*Phoca vitulina concolor*)		Regular	Extralimital	0.0974	0.0974	0	0.0974
Gray Seal (*Halichoerus grypus*)		Rare	Rare	0.1412	0.1412	0.1412	0.1412
Harp Seal (*Phoca groenlandica*)		Extralimital	Extralimital	NA[2]	NA	NA	NA
Hooded Seal (*Cystophora cristata*)		Extralimital	Extralimital	NA	NA	NA	NA

1 **Regular** = A species that occurs as a normal part of the fauna of an area regardless of its overall abundance;
Rare = A species that occurs in an area only very sporadically or very seldom;
Extralimital = A species that does not normally occur in an area as it is beyond its normal distributional range but for which one or more occurrence records exist in the area.
2 **NA**=Not available.

Table 3-4. Marine mammal species that may occur in Long Island Sound as well as the designated ESA and MMPA status for each species, the expected occurrence level in Long Island Sound (Weiss 1995), and density estimates (DoN 2007). **Density estimates for these species were derived from density values computed for the nearshore continental shelf waters southeast of the sound since no overall marine mammal surveys have ever been completed or densities calculated for Long Island Sound.**

Species	ESA and MMPA Status	Winter Occurrence Level[1]	Winter Shelf Density Estimates (animals/km^2)	Spring to Fall Occurrence Level[1]	Spring Shelf Density Estimates (animals/km^2)	Summer Shelf Density Estimate (animals/km^2)	Fall Shelf Density Estimate (animals/km^2)
Odontocetes							
Atlantic White-sided Dolphin (*Lagenorhynchus acutus*)		Rare	0	Rare	0	0	0
Bottlenose Dolphin (*Tursiops truncatus*)		Rare	0.0062	Rare	0.0107	0.0242	0.0035
Common Dolphin (*Delphinus delphis*)		Rare	0	Rare	0	0	0
Harbor porpoise (*Phocoena phocoena*)		Rare	0.0002	Regular	0.0002	0	0.0002
Pilot Whales (*Globicephala* spp.)		Rare	0.1618	Regular	0.7525	0.2337	0.2337
Striped Dolphin (*Stenella coeruleoalba*)		Rare	0.0014	Rare	0.0014	0.0014	0.0014
Pinnipeds							
Harbor Seal (*Phoca vitulina concolor*)		Regular	0.0974	Extralimital	0.0974	0	0.0974
Gray Seal (*Halichoerus grypus*)		Rare	NA	Rare	NA	NA	NA
Harp Seal (*Phoca groenlandica*)		Extralimital	NA[2]	Extralimital	NA	NA	NA
Hooded Seal (*Cystophora cristata*)		Extralimital	NA	Extralimital	NA	NA	NA

1 **Regular** = A species that occurs as a normal part of the fauna of an area regardless of its overall abundance;
Rare = A species that occurs in an area only very sporadically or very seldom;
Extralimital = A species that does not normally occur in an area as it is beyond its normal distributional range but for which one or more occurrence records exist in the area.
2 **NA**=Not available.

the last fall through spring (Barlas 1999; DoN 2005). Known harbor seal haulouts are located in the eastern and western most parts of the sound. No ESA-listed marine mammal species are expected to occur in the sound.

- *Buzzards Bay*

Suitable cetacean habitat does not appear to occur within Buzzards Bay, likely due to the shallowness of the bay, absence of topographic relief, and lack of oceanographic features that concentrate prey species (Howes et al. 1996). Although rare individual cetaceans have been reported over the last century, they have been observed only near the entrance to Buzzards Bay. It is most probable that pinniped species would be likely to occur within Buzzards Bay. The four pinniped species likely to occur with regularity, especially in winter and spring, are the harbor and gray seals; hooded and harp seals have occurred rarely and are only known from stranding records (Table 3-5; LCE 2008). The only breeding colonies for gray seals in U.S. waters are located off southeastern Cape Cod, and gray seals remain in this area year-round. It is therefore likely that in nearby Buzzards Bay that gray seals may potentially occur year-round (Barlas 1999). At least a handful of harbor and gray seal haulouts have been identified in the bay (deHart 2002; LCE 2008).

3.4.1.3 Cetacean Species Potentially Occurring in the Test Areas

- *Mysticetes (Baleen Whales)*

Mysticetes, or baleen whales, include blue, fin, sei, Bryde's, minke, humpback, gray, bowhead, and right whales. Baleen whales range in size from the smallest, the minke whale, which are 10 to 15 m (33 to 42.9 ft) long, to the largest, the blue whale, which can exceed 30 m (98.4 ft) in length. Most mysticete whales vocalize at varying frequencies. Instead of teeth, mysticete whales possess baleen plates that extend from the upper jaw and are covered by long bristles on one side that strain fish or zooplankton from ocean water. Most mysticete whale species undertake extensive seasonal migrations from boreal feeding grounds, where the warmer months of the year are spent foraging to tropical to subtropical breeding, and calving grounds, where the colder months are spent. Gray whales and right whales are examples of mysticete whales that undertake long seasonal movements. Gray whales feed in Alaskan waters during summer but migrate to Baja, California to breed and give birth during winter. North Atlantic right whales forage on extensive grounds off southern New England and southeastern Canada during summer, but mothers and calves migrate to warmer waters off northern Florida and southern Georgia where they overwinter.

- *Minke Whales (Balaenoptera acutorostrata)*

  The minke whale is one of the smaller baleen whales, with adults reaching just over 9.4 m (30.8 ft) (Jefferson et al. 1993). While no data on hearing ability for this species are available, Ketten (1997) hypothesized that mysticetes have acute infrasonic hearing.

  Minke whales have a widespread distribution in polar, temperate, and tropical waters of the world's oceans but are less common in tropical waters (Jefferson et al. 1993). Minke whales are present in the North Pacific from near the equator to the Arctic (Horwood 1990). The NMFS recognizes three stocks of minke whales within the Pacific U.S. EEZ: a California/Oregon/Washington stock, an Alaskan stock, and a Hawaiian stock (Carretta et al. 2007). The minimum population estimate for the California/Oregon/Washington stock of the minke whale is 585 individuals (Carretta et al. 2007). In the North Atlantic, there are four recognized populations–Canadian East Coast, West Greenland, Central North Atlantic, and Northeastern North Atlantic (Waring et al. 2007). Minke whales off the eastern U.S. are considered to be part of the Canadian East Coast stock, which inhabits the area from the eastern half of the Davis Strait out to 45ºW and south to the Gulf of Mexico. Although the total stock size is not known, the abundance for the Canadian East Coast minke whale stock has been estimated at 4,018 individuals (Waring et al. 2007).

Table 3-5. Marine mammal species that may occur in Buzzards Bay as well as the designated ESA and MMPA status for each species, the expected occurrence level in Buzzards Bay (Howes et al. 1996; LCE 2008), and density estimates (DoN 2007). **Density estimates for these species were derived from density values computed for the nearshore continental shelf waters southeast of the sound since no overall marine mammal surveys have ever been completed or densities calculated for Buzzards Bay.**

Species	**ESA and MMPA Status**	**Winter Occurrence Level[1]**	**Winter Shelf Density Estimates (animals/km^2)**	**Spring to Fall Occurrence Level[1]**	**Spring Shelf Density Estimates (animals/km^2)**	**Summer Shelf Density Estimate (animals/km^2)**	**Fall Shelf Density Estimate (animals/km^2)**
Pinnipeds							
Harbor Seal (*Phoca vitulina concolor*)		Regular	0.0974	Extralimital	0.0974	0	0.0974
Gray Seal (*Halichoerus grypus*)		Regular	0.1412	Rare	0.1412	0.1412	0.1412
Harp Seal (*Phoca groenlandica*)		Extralimital	NA[2]	Extralimital	NA	NA	NA
Hooded Seal (*Cystophora cristata*)		Extralimital	NA	Extralimital	NA	NA	NA

1 **Regular** = A species that occurs as a normal part of the fauna of an area regardless of its overall abundance;
Rare = A species that occurs in an area only very sporadically or very seldom;
Extralimital = A species that does not normally occur in an area as it is beyond its normal distributional range but for which one or more occurrence records exist in the area.
2 **NA**=Not available.

The summer range of minkes in the Pacific extends northward to the Chukchi Sea, but in winter, minke whales are found southward to within 2° of the equator (Perrin and Brownell 2002). There is no obvious migration from low-latitude, winter breeding grounds to high-latitude, summer feeding locations in the western North Pacific, as there is in the North Atlantic (Horwood 1990). Minke whales have been observed year-round in Puget Sound (Dorsey et al. 1990). In inland waters of Washington, minke whales occur primarily in the San Juan Islands and Juan de Fuca Strait but rare sightings occur in central and southern Puget Sound (DoN 2006).

Off eastern North America, the minke whale generally occupies waters over the continental shelf, including inshore bays and estuaries (Waring and Palka 2002). Minke whales off the U.S. Atlantic coast apparently move offshore and south out of New England waters in winter (Mellinger et al. 2000). Spring and summer are times of relatively widespread and common occurrence in southern New England waters, and during this time, minkes are most abundant (Waring et al. 2007). Few minkes occur in southern New England waters during fall; during winter, minkes appears to be largely absent from these waters (Murphy 1995).

- *Humpback Whales (Megaptera novaeangliae)*

Humpback whale adults are 11 to 16 m (36 to 53 ft) in length and are more robust than other rorquals. Little is known about humpback hearing, but Houser et al. (2001) produced the first predicted audiogram for the humpback, which indicates hearing sensitivity at frequencies from 700 Hz to 10 kHz, with maximum relative sensitivity between 2 and 6 kHz.

Humpback whales are listed as endangered under the ESA, but no critical habitat has been designated for this species in the Pacific or Atlantic Oceans. Humpback whales are globally distributed in all major oceans and most seas. They are generally found during the summer on high-latitude feeding grounds and during the winter in the tropics and subtropics around islands, over shallow banks, and along continental coasts, where calving occurs. Most humpback whale sightings are in nearshore and in continental shelf waters.

Recent information suggests that there are probably three stocks or populations of humpback whales in the North Pacific: the Eastern (the California/Oregon/Washington-Mexico stock), Central, and Western North Pacific stocks (Carretta et al. 2007). The minimum population estimate for the Eastern North Pacific stock of humpback whales is 1,158 individuals (Carretta et al. 2007). An estimated 902 humpback whales comprise the Gulf of Maine stock (Waring et al. 2007).

Humpback whales off California, Oregon, and Washington States form a discrete feeding aggregation, with the U.S./Canada border as an approximate geographic boundary between the California and Alaska feeding groups (Carretta et al. 2007). Individuals of the Eastern North Pacific stock migrate along the west coast of the continental U.S. between the Mexican breeding ground and their northern feeding grounds. Humpback whales feed in the offshore Pacific Northwest during the non-breeding season and are present in Washington state waters from May through November (Green et al. 1992). Humpback whales were common in inland Washington state waters until the early 1900s; presently, however, humpbacks only occasionally occur in Puget Sound (Scheffer and Slipp 1948; Everitt et al. 1980; Osborne and Ransom 1988).

In the North Atlantic, humpbacks are found from spring through fall on feeding grounds, of which the Gulf of Maine is one of the principal summer grounds. The largest numbers of humpback whales occur on these feeding grounds from mid-April to mid-November. Distribution in this region has been largely correlated to prey species and abundance. During the winter, most of the North Atlantic population of humpback whales is believed to migrate south to calving grounds in the West Indies region (Whitehead and Moore 1982). The migratory routes taken during the southbound and northbound migrations are not known.

- *Fin Whales (Balaenoptera physalus)*

  The fin whale is the second-largest whale species, with adults reaching 24 m (79 ft) in length (Jefferson et al. 1993). No information exists on hearing of fin whales but Ketten (1997) suggests that mysticetes possess infrasonic hearing.

  Fin whales are broadly distributed throughout the world's oceans, usually in temperate and boreal continental shelf, slope, and oceanic waters and less commonly in the tropics (Reeves et al. 2002). Globally, this species tends to be aggregated in locations where populations of prey are most plentiful, irrespective of water depth. There are an estimated 2,814 individual fin whales in the U.S. Atlantic (Waring et al. 2007). Fin whales are classified as endangered under the ESA, but no critical habitat has been designated for this species in the North Atlantic.

  The overall range of fin whales in the North Atlantic extends from the Gulf of Mexico/Caribbean and Mediterranean north to Greenland, Iceland, and Norway (Gambell 1985; NMFS 1998a). In general, fin whales are more common north of about 30ºN (NMFS 1998a). In the western North Atlantic, the fin whale is the most commonly sighted large whale in continental shelf waters from the mid-Atlantic coast of the U.S. to eastern Canada (Waring et al. 2007). The fin whale is the most common whale species acoustically detected with Navy deepwater hydrophone arrays in the North Atlantic (Clark 1995). In all seasons, fin whales are the dominant large cetacean species in shelf waters of New England. Fin whales are not completely absent from U.S. Atlantic continental shelf waters in winter; this is the most likely large whale species to be sighted. Perhaps a fifth to a quarter of the spring/summer peak population remains in this area year-round (CETAP 1982; Hain et al. 1992).

- *Gray Whales (Eschrichtius robustus)*

  Adult gray whales are 11 to 15 m (36 to 49 ft) in length, weigh up to 35 metric tons (77, 162 pounds), and are distributed only in the North Pacific Ocean (Jefferson et al. 1993). The structure of the gray whale ear is evolved for low-frequency hearing (Ketten 1992). The ability of gray whales to hear frequencies < 2 kHz (as low as 0.8 kHz) has been demonstrated in playback studies (Moore and Clarke 2002).

  There are two North Pacific populations of gray whales, western (Korean-Okhotsk) and eastern (California-Chukchi) stocks (Angliss and Outlaw 2007). The eastern population has recovered from the exploitation of the late 1800s and early 1900s to the extent that in 1994 this species was removed from the ESA list of threatened and endangered species. The minimum population estimate for the eastern Pacific stock of the gray whale is 17,752 individuals, with an average abundance estimate of 18,813 whales (Angliss and Outlaw 2007).

  Gray whales occur primarily in shallow waters and feed in waters less than 68 m (221 ft) deep (Jones and Swartz 2002). A pronounced seasonal north-south migration from the feeding grounds in Alaska to the breeding grounds in Mexico is a characteristic of the eastern Pacific gray whale stock. During the southbound migration to Mexico, gray whales pass along the coast of Washington State between early December and mid-February and return northward along the Washington coast from mid-February through April, while cows and calves pass later from late April through May (Herzing and Mate 1984). Some gray whales travel into the Strait of Juan de Fuca and Puget Sound during the spring migration and have even been observed through the early summer months feeding in the sound (Calambokidis et al. 1994, 2000). In recent years, gray whales have been sighted in the southern part of Puget Sound, including Elliott Bay (Associated Press 2005).

  Gray whales are predominantly bottom feeders, engulfing mud or bottom sediments from which they filter amphipods and other crustaceans (Nerini 1984). Gray whales that summer in Washington State waters feed on benthic invertebrates but have also been observed feeding on dense aggregations of ghost shrimp in northern Puget Sound (Weitkamp et al. 1992).

- *Odontocetes (Toothed Whales)*

Odontocetes include all toothed whales, dolphins, and porpoises. Odontocetes are predators that actively hunt prey such as fishes, squid, and even smaller marine mammals nearly continuously. Odontocetes range in size from a about 1 m in length (porpoises) to 15 to 20 m (49.2 to 65.6 ft) (sperm whales). Odontocetes have typical mammalian teeth that are modified for various purposes; a single blowhole; and are generally excellent divers. Sperm whales, for example, routinely dive to depths of 1,000 m (3,281 ft) but can dive as deep as 2,800 m (9,186 ft), remaining submerged for an hour or more. All odontocetes are capable of acoustic communication involving the generation of sonic and/or ultrasonic signals such as whistles, burst-pulse sounds, and clicking signals. Odontocetes are considered social and intelligent animals.

- *Harbor Porpoise (Phocoena phocoena)*

Ranging between 1.4 and 1.8 m (4.6 and 5.9 ft) in length, harbor porpoises are among the smallest cetaceans occurring in the North Atlantic and Pacific Oceans (Jefferson et al. 1993). Maximum hearing sensitivity in the harbor porpoise occurs between 100 and 140 kHz (Kastelein et al. 2002). More recent psycho-acoustic studies found the range of best hearing to be 16 to 140 kHz, with a reduced sensitivity around 64 kHz (Kastelein et al. 2002).

Nine stocks, including the Inland Washington State stock, comprise the harbor porpoise population in the eastern Pacific Ocean; the Inland Washington stock is composed of an estimated 3,123 animals (uncorrected) and ranges east of Cape Flattery (Carretta et al. 2007). There are four proposed separate populations of harbor porpoises in the western North Atlantic: Gulf of Maine/Bay of Fundy, Gulf of St. Lawrence, Newfoundland, and Greenland (Gaskin 1992). The best estimate of abundance for the Gulf of Maine/Bay of Fundy stock of harbor porpoises is 89,700 individuals (Waring et al. 2007).

Harbor porpoises occur mostly in cool (< 17°C), temperate to subarctic continental shelf (< 200 m) waters (Read 1999). Harbor porpoises occur year-round and breed in the inland waters of Washington (Osborne et al. 1988). Harbor porpoise strandings within Puget Sound are a common spring occurrence, occurring most frequently during May with 70% of all annual strandings recorded between March and June (NMFS 2005a). The harbor porpoise historically occurred commonly throughout Puget Sound (Scheffer and Slipp 1948) but there has been a significant decline in harbor porpoise sightings within southern Puget Sound since the 1940s and most recent sightings have been reported from central Puget Sound (Carretta et al. 2007).

Off the northeastern U.S., harbor porpoise distribution is strongly concentrated in the Gulf of Maine/Georges Bank region, with more scattered occurrences to the mid-Atlantic (CETAP 1982). During summer (July through September), harbor porpoises are concentrated in the northern Gulf of Maine and southern Bay of Fundy region, generally in waters less than 150 m deep (Palka 1995). During fall, harbor porpoise densities are widely dispersed from New Jersey to Maine with concentrations in the southwestern Gulf of Maine (NMFS 2001). During winter, intermediate densities of harbor porpoises can be found in waters off New Jersey to North Carolina, and lower densities are found in waters off New York to New Brunswick, Canada.

- *Killer Whale (Orcinus orca)*

Killer whales are the largest member of the dolphin family, reaching upwards of 7.7 to 9.0 m (25 to 30 ft) (Dahlheim and Heyning 1999). Both behavioral and auditory brainstem response (ABR) techniques indicate killer whales can hear a frequency range of 1 to 100 kHz and are most sensitive at 20 kHz, which is one the lowest maximum sensitivities known among toothed whales (Szymanski et al. 1999).

In the eastern North Pacific Ocean, the three ecotypes of killer whales that are currently recognized are residents, transients, and offshores (Caretta et al. 2007). Resident killer whales are distinguished from the other ecotypes by a distinct morphology and pigmentation pattern (Ford et al. 1994). There are two resident stocks, the northern and southern resident stocks, which reside in distinct geographic areas. The Southern Resident Killer Whale (SRKW) stock (or population segment) resides primarily in the transboundary area of southern British Columbia and

Washington inland (the Georgia Basin) waters, but its winter distribution is far less well understood and may range further to include coastal waters from British Columbia south to Oregon coast and Monterey, California (Krahn et al. 2004). The core summer range of the SRKWs is predominantly the Strait of Georgia, Strait of Juan de Fuca, and Haro Strait; the southern residents do spend time in other inland waters during summer, including Puget Sound, but to a much lesser degree than in their core area (Krahn et al. 2004; NMFS 2007). In fall, the core range expands to include Puget Sound but by winter, most southern residents are no longer sighted in inland Washington waters (Krahn et al. 2004). J pod, however, does spend intermittent periods in Puget Sound and Georgia Basin from fall through spring and members of this pod are the most likely killer whales to be sighted in the Puget Sound in winter and spring (Krahn et al. 2004; NMFS 2007).

The SRKW stock currently is estimated at 90 individuals comprised in three pods, or groups of related whales that travel together. These pods consist of the J pod with 24 members, the K pod that includes 22 whales, and the L pod, which is the largest group and includes 44 killer whales (NMFS-NWR 2006a) (Carretta et al. 2007; NMFS 2007). The SRKW stock was recently listed as endangered under the ESA (NMFS 2005b) and is designated as depleted under the MMPA. Critical habitat (see below) has been designated for the SRKWs.

Salmon, particularly the largest salmonid, the chinook, are the principle prey for resident killer whales in Washington waters (Ford and Ellis 2005). Other salmonids appear to be eaten less frequently, as are rockfish, halibut, lingcod, and herring. Autumn movements of SRKW into Puget Sound roughly correspond with chum and chinook salmon runs (Osborne 1999).

Critical Habitat: Critical habitat for the SRKW has been designated for three specific areas in the inland waters of Washington that will cover 6,630 km^2 (2,560 mi^2) of the core summer area (Figure 3-8). The three regions proposed for SRKW critical habitat are Haro Strait and waters around the San Juan Islands; Puget Sound; and the Strait of Juan de Fuca, (NMFS 2006a). The waters associated with eighteen military sites in Washington inland waters are excluded from the critical habitat designation (NMFS 2006a).

- *Pacific White-sided Dolphin (Lagenorhynchus obliquidens)*

This dolphin may reach 2.5 m (9 ft) in length and may weigh as much as 180 kg 397 pounds) (Jefferson et al. 1993). Although two forms, the northern and southern, are recognized for the eastern North Pacific Ocean, they cannot be differentiated without genetic analyses. The minimum population estimate for the Pacific white-sided dolphins occurring in California/Oregon/Washington waters is 39,822 individuals (Carretta et al. 2007). The Pacific white-sided dolphin occurs most commonly in temperate waters of the north Pacific both in oceanic and coastal waters from Mexico to Alaska (Carretta et al. 2007). Seasonally, these dolphins make north-to-south movements in the eastern North Pacific, occurring off California during the colder water months and shifting northward into Oregon and Washington waters as water temperatures increase during late spring and summer (Carretta et al. 2007). Peak abundance off Oregon and Washington typically occurs in May (Green et al. 1993). Pacific white-sided dolphins only rarely occur in the inland waters of Washington, occurring primarily in the Strait of Juan de Fuca (Everitt et al. 1980; Calambokidis and Baird 1994). Pacific white-sided dolphins feed primarily on squid, salmonids, and other fishes in Washington waters but feed on epipelagic fishes elsewhere (Everitt et al. 1980; Stroud et al. 1981; Morton 2000).

- *Dall's porpoise (Phocoenoides dalli)*

Dall's porpoise is the largest member of the porpoise family, with a maximum length of 2.4 m (7.8 ft) and weight of 200 kg (441 lb) (Jefferson 2002). There are no published data on hearing abilities of this species; however, based on the morphology of the cochlea, it is estimated that the upper hearing threshold is about 170 to 200 kHz (Awbrey et al. 1979).

Endemic to the North Pacific Ocean, the Dall's porpoise is distributed in cool temperate to subarctic (< 17°C) waters (Jefferson 1988). This species is found from northern Baja California, Mexico and southern Japan north to Alaska but only occurs commonly between 32°N and 62°N in

Figure 3-8. Designated critical habitat for the Southern Resident Killer Whale stock in inland Washington waters (NMFS-NWR 2006b).

the eastern North Pacific (Morejohn 1979; Houck and Jefferson 1999). The stock structure in the eastern North Pacific Ocean is not well known but a minimum population has been estimated at 75,915 for Dall's porpoises in California/Oregon/Washington waters (Carretta et al. 2007). North-south movements along the U.S. west coast occur on seasonal and inter-annual time scales; Dall's porpoises shift their distribution southward during cooler-water periods (Forney and Barlow 1998). The Dall's porpoise occurs year-round and breeds in deeper (> 50 m [164 ft]) Washington inland waters, where it is one of the most common cetacean species (Calambokidis and Baird 1994). This porpoise occurs less commonly in Puget Sound (Osborne et al. 1988) and little is known about the movement patterns of this species in inland waters. In Washington waters, Dall's porpoise are known to feed on squid, capelin, eulachon, and righteye flounder (Stroud et al. 1981).

- *Atlantic White-sided Dolphin (Lagenorhynchus acutus)*

  Adult Atlantic white-sided dolphins reach 2.5 to 2.8 m (8.2 to 9.2 ft) in length. No hearing data are available for this species. Three stock units have been suggested for the Atlantic white-sided dolphin in the western North Atlantic: Gulf of Maine, Gulf of St. Lawrence, and Labrador Sea (Palka et al. 1997; Waring et al. 2004). The total number of white-sided dolphins along the U.S. and Canadian Atlantic coast is unknown but the best estimate of abundance for the Gulf of Maine stock is 51,640 individuals (Waring et al. 2007).

  Atlantic white-sided dolphins are found in cold temperate to subpolar waters of the North Atlantic, from New England in the west and France in the east to north to Greenland, Iceland, and southern Norway (Jefferson et al. 1993). This species is found primarily in continental shelf waters to the 100 m depth contour (CETAP 1982). This species is most common over the continental shelf from Hudson Canyon north to the Gulf of Maine (Palka et al. 1997). Virginia and North Carolina waters appear to represent the southern edge of the range (Testaverde and Mead 1980). Sightings occur year-round south of Georges Bank, particularly around Hudson Canyon, but in low densities (CETAP 1982; Waring et al. 2007).

- *Common Dolphin (Delphinus delphis)*

  Common dolphins reach a maximum length of up to 2.6 m (8.5 ft) (Jefferson et al. 1993). Popov and Klishin (1998) recorded auditory brainstem responses up to 128 kHz at a level of 100 dB above the minimum threshold; minimum thresholds were observed at frequencies of 60 to 70 kHz.

  The best estimate of abundance for the western North Atlantic stock of common dolphins is 30,768 individuals. This stock is no longer considered to be a strategic stock and information is available on the stock structure for the western North Atlantic (Waring et al. 2007). Common dolphins are found worldwide in temperate, tropical, and subtropical seas. Along the U.S. Atlantic coast, the common dolphin is typically found in temperate to cooler continental shelf and slope waters from Florida to Newfoundland (Waring and Palka 2002).

- *Striped Dolphin (Stenella coeruleoalba)*

  This is a relatively robust dolphin that grows to 2.6 m (8.5 ft) in length. The striped dolphin's range of most sensitive hearing (defined as the frequency range with sensitivities within 10 dB of maximum sensitivity) was determined to be 29 to 123 kHz using standard psycho-acoustic techniques; maximum sensitivity occurred at 64 kHz (Kastelein et al. 2003). Hearing sensitivity became less sensitive below 32 kHz and above 120 kHz (Kastelein et al. 2003).

  The best estimate of abundance for the western North Atlantic stock of striped dolphins is 61,546 individuals (Waring et al. 2007). There is no information available for striped dolphin stock structure for the western North Atlantic (Waring et al. 2007). The striped dolphin has a worldwide distribution in temperate to tropical oceanic waters. Striped dolphins in the western North Atlantic range from Nova Scotia to at least Jamaica and the Gulf of Mexico. Striped dolphins are distributed along the continental shelf edge from Cape Hatteras, NC, to the southern margin of Georges Bank and also occur offshore over the continental slope and rise in the mid-Atlantic region (CETAP 1982).

- *Pilot Whales (Globicephala spp.)*

  Pilot whales are among the largest members of the dolphin family. In the northwestern Atlantic, two species of pilot whales occur. The long-finned pilot whale may reach from 5.7 to 6.7 m (18.7 to 22 ft) in length while the short-finned pilot whale is 5.5 to 6.1 m (18 to 20 ft) in length (Jefferson et al. 1993). There are no hearing data available for either pilot whale species.

  The best estimate of abundance for pilot whales (combined short-finned and long-finned pilot whales) in the western North Atlantic is 14,524 individuals (Waring et al. 2007). While pilot whales are typically distributed along the continental shelf break, movements over the continental shelf are commonly observed in the northeastern U.S. (Payne and Heinemann 1993). The distribution of pilot whales generally follows the shelf edge throughout the northeastern U.S.; however, this species is also commonly sighted on the continental shelf and inshore of the 100 m isobath, as well as seaward of the 2,000 m isobath (CETAP 1982; Payne and Heinemann 1993).

- *Bottlenose Dolphin (Tursiops truncatus)*

  There is striking regional variation in body size in this abundant dolphin, with adults ranging in size from 1.9 to 3.8 m (6.2 to 12.5) (Jefferson et al. 1993). Hearing in the bottlenose dolphin has been well-studied. The bottlenose dolphin has a functional high-frequency hearing limit of 160 kHz (Au 1993) and can hear sounds at frequencies as low as 40 to 125 Hz (Turl 1993). Scientists have reported a range of best sensitivity between 25 and 70 kHz, with peaks in sensitivity occurring at 25 and 50 kHz at levels of 47 and 46 dB re 1 µPa-m (Nachtigall et al. 2000).

  The overall range of *Tursiops* is worldwide in tropical and temperate waters. In the U.S. Atlantic, the bottlenose dolphin is distributed along the coast from Long Island, New York, to the Florida Keys (Wang et al. 1994). The current stock assessment assumes that coastal bottlenose dolphins from New Jersey to Florida form a single stock (Waring et al. 2007); however, recent work in the southeast U.S. waters suggests that multiple coastal stocks of bottlenose dolphins exist and include year-round residents, seasonal residents, and migratory groups (NMFS-SEFSC 2001). Estimated overall abundance for the western North Atlantic coastal stock of bottlenose dolphins is 9,206 dolphins (Waring et al. 2007). Wiley et al. (1994) documented a nearly two-year residency of two bottlenose dolphins in Cape Cod Bay, Massachusetts, an area that is north of existing residency reports for this species along the U.S. Atlantic Coast.

➢ *Pinnipeds (Seals, Sea Lions, and Walruses)*

Sea lions, otariids, are differentiated from seals, phocids, by their external ear flaps and elongated front flippers that allow them to move more agilely on land. Feeding on a variety of fishes, squid, and even mollusks, pinnipeds are active predators, feeding nearly continuously except during breeding and molting seasons. Pinnipeds purposefully come ashore for varying periods, usually on a daily basis, at coastal haulouts and rookeries to rest, thermoregulate, give birth, mate, or molt their fur.

- *Harbor seal (Phoca vitulina richardsi and concolor)*

  Harbor seals are considered small to medium-sized seals with maximum lengths and weights of 1.9 m (6 ft) and 150 kg (331 lb.), respectively (Jefferson et al. 1993). The harbor or common seal is a phocid seal that occurs throughout the northern hemisphere. Five defined subspecies exist, with the subspecies *richardsi* found off the U.S. Pacific coast while the *concolor* subspecies occurs off the northern U.S. Atlantic coast. Harbor seals hear frequencies from 1 to 180 kHz (most sensitive at frequencies below 50 kHz; above 60 kHz sensitivity rapidly decreases) in water and from 0.25 kHz to 30 kHz in air (most sensitive from 6 to 16 kHz using behavior and auditory brainstem response testing) (Richardson 1995; Terhune and Turnbull 1995; Wolski et al. 2003).

  The harbor seal is the most common and widely distributed pinniped species in Pacific Northwest and New England waters (Payne and Selzer 1989; Jeffries et al. 2000). Harbor seals are a coastal species, rarely found more than 20 km (12 mi) from shore and frequently occupying bays, estuaries, and inlets (Baird 2001). Harbor seals come ashore daily at intertidal to subtidal haulout sites that vary in substrate. In the Washington region haulout substrate includes rock outcrops; rocky, cobble, or sand beaches; sandbars; islands; log-booms; docks; rafts; and floats (Jeffries et al. 2000). In southern New England, harbor seals haulout primarily on isolated rock outcroppings located just off shore (Schroeder 2000).

Harbor seals occur year-round and breed in the inland waters of Washington. Three separate harbor seal stocks are recognized along the west coast of the continental U.S. with the Washington Inland Waters stock encompassing Hood Canal, Puget Sound, and the Strait of Juan de Fuca out to Cape Flattery (Carretta et al. 2007). The minimum population for the Washington Inland in 2006 was estimated at 12,844 harbor seals (Carretta et al. 2007). Harbor seals occur seasonally in New England waters, usually arriving beginning in September and departing by late spring for their breeding and pupping grounds in Maine and the Canadian Maritimes. The best estimate of abundance for the western North Atlantic stock of harbor seals is 99,340 individuals (Waring et al. 2007). An estimated 5,575 harbor seals were estimated to overwinter in southern New England in 1999, increasing from an estimated 2,834 individuals in 1981 (Barlas 1999).

Jeffries et al. (2000) have identified more than 50 haulout sites in Puget Sound, with the largest haulouts located at Gertrude Island, Woodard Bay, and Nisqually River in southern Puget Sound. Only one haulout site is located in the vicinity of Elliott Bay; the West Point buoy, located just off West Point, is used by < 100 harbor seals and is not considered a major haulout (Jeffries et al. 2000). Woodard Bay and Gertrude Island are the two most important rookery sites for harbor seals in the Puget Sound area (Calambokidis and Jeffries 1991). Peak harbor seal numbers are present on haulout sites during the pupping season (July through early September) and annual molt (September through November) and lowest during winter (Jeffries et al. 2000; Jeffries et al. 2003). During pupping season, females spend 90 to 100% of their time ashore (Jeffries et al. 2003). Although harbor seals exhibit a distinctive annual cycle of abundance, many seals remain close to their haulout sites throughout the year. More than 20 haulout sites are located in Narragansett Bay, RI, with the most heavily occupied haulout site located between APS–GSO and FarSounder–West test areas (Figure 3-9). The major eastern LIS haulout site at Fisher's Island is located in close proximity to the APS–Avery test area, lying just south of the test area in the middle of the sound. Haulouts exist in the Great Harbor area, located in the outer reaches of the harbor at a small distance from APS WHOI–test area.

- *Gray Seal (Halichoerus grypus)*

Gray seals are large and robust; adult males can reach 2.3 m (7.6 ft) in length and weigh 310 kg (683 pounds) (Jefferson et al. 1993). The hearing ability of the gray seal has been studied using auditory evoked potential methods. In water, gray seals are most sensitive at frequencies of 20 or 25 kHz. Gray seals have in-air hearing sensitivities at 4 kHz (Ridgway and Joyce 1975).

The gray seal is considered to be a coastal species (Lesage and Hammill 2001) that occurs throughout temperate and subarctic waters on both sides of the North Atlantic Ocean (Davies 1957). There are at least three populations of gray seals in the North Atlantic Ocean: eastern North Atlantic, western North Atlantic, and Baltic (Boskovic et al. 1996). In the western North Atlantic Ocean, the gray seal population is centered in the Canadian Maritimes, including the Gulf of St. Lawrence and the Atlantic Coasts of Nova Scotia, Newfoundland, and Labrador. Current estimates of the gray seal population in the western North Atlantic are not available, but in 1997 there were an estimated 195,000 individuals (DFO 2003). Barlas (1999) estimated the southern New England population of gray seals at 3,050 individuals with breeding colonies at Muskegat and Monemot Islands. Hoover et al. (1999) reported sighting as many as 30 adult gray seals at one haulout site in New York waters. There are gray seal sightings and strandings in RI and LIS. Next to harbor seals, gray seals are the most commonly sighted seal in the northeastern U.S.

- *Harp Seal (Phoca groenlandica) and Hooded Seal (Cystophora cristata)*

The hooded and harp, are considered ice seals due to their close association with pack ice. Although the most southern limit to their normal range is the Gulf of St. Lawrence, Canada, over the last two decades, a dramatic increase has been recorded in the number of these ice seals in eastern U.S. waters (Mignucci-Giannoni and Odell 2001). The suggestion is that this increase may be due to declining prey availability as fish stocks collapse and are no longer capable of supporting the currently large seal populations; ice seals are then forced to move to less optimal

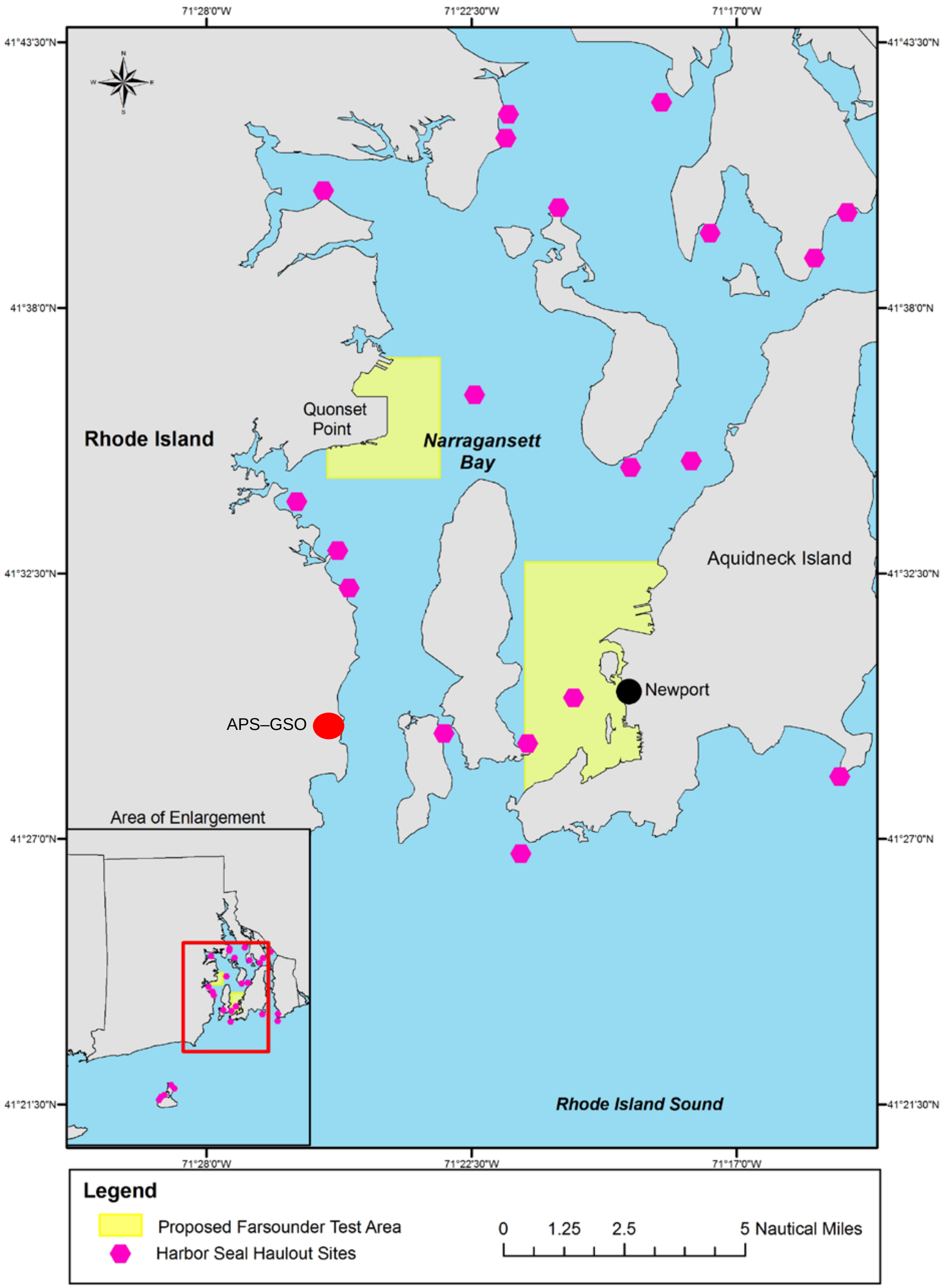

Figure 3-9. Harbor seal haulouts located in the vicinity of the FarSounder and APS–GSO test areas (NBO 2005).

feeding grounds further south (McAlpine et al. 1999). Although extralimital to southern New England, harp and hooded seals have occurred in the region seasonally, from late January to March. There is a possibility that either of the ice seals may be present in bay waters during the time of the experiment since they have been observed from winter through spring in RI, CT, and MA waters.

- *California Sea Lion (Zalophus californianus californianus)*

The California sea lion is an otarid (eared) pinniped that is divided into three subspecies and is perhaps the most recognized of all seals or sea lions. Although the lengths of these sea lions do not differ dramatically in males and females (2.2 m [7 ft]), males are much larger than females in mass, averaging 390 kg (860 lb) compared to the average female mass of 110 kg (243 lb) (Jefferson et al. 1993). California sea lions range from Mexico to British Columbia and are divided into three stocks; only one stock is located in U.S. Pacific waters. The minimum population size of the U.S. stock is 138,881 individuals (Carretta et al. 2007).

California sea lions are predominantly coastal dwellers, frequenting bays, harbors, and river mouths and often hauling out on man-made structures such as piers, jetties, offshore buoys, and oil platforms (Riedman 1990; Jefferson et al. 1993). California sea lions in the inland waters of Washington also haul out on log booms and U.S. Navy submarines and are often seen rafted off river mouths (Jeffries et al. 2000; DoN 2001b). In the nonbreeding season, adult and subadult males migrate northward along the U.S. coast to central and northern California, Oregon, Washington, and Vancouver Island, returning south the following spring (Mate 1975). They occur in Washington State waters in the non-breeding season from around September through June and are concentrated in the inland waters of Washington (NMFS 1997a). The California sea lion uses haulout sites along the outer Washington coast, Strait of Juan de Fuca, and in Puget Sound; haulout sites are located on jetties, offshore rocks and islands, log-booms, marina docks, and navigation buoys (Jeffries et al. 2000). This species also may be seen resting in the water, rafted together in groups in Puget Sound. Only male California sea lions of all age classes migrate into Pacific Northwest waters as females remain near their breeding rookeries off the coast of California and Mexico. California sea lions were considered rare in Washington waters prior to the 1950's but currently as many as 3,000 to 5,000 animals move into Washington and British Columbia waters during the fall and remain until the late spring (Jeffries et al. 2000). The primary California sea lion haulout and rafting location is located near the Shilshole Bay Marina in central Puget Sound but small numbers of sea lions also regularly are found on navigation buoys from the Nisqually Delta to Port Townsend. California sea lions feed on a wide variety of prey. In the Pacific Northwest, prey species include Pacific whiting, squid, anchovy, steelhead, lamprey, and salmon (Everitt et al. 1981).

- *Steller Sea Lion (Eumetopias jubatus)*

The Steller sea lion, or northern sea lion, is the largest otariid sea lion species. These animals can grow to 2.8 m (9.3 ft) in length and 566 kg (1,248 lb) in weight (Jefferson et al. 1993). The Steller sea lion is distributed in coastal waters of the North Pacific rim from southern California north through the Aleutian and Pribilof Islands and west Japan (Jefferson et al. 1993). The population of Steller sea lions in U.S. waters is recognized as two stocks, the eastern and western, with Cape Suckling, Alaska (144°W) as the division point separating the two stocks (Angliss and Outlaw 2007). As a species, the Steller sea lion is listed as threatened under the ESA but in 1997, the NMFS reclassified western stock as endangered while maintaining the threatened status for the eastern stock (NMFS 1997b). No critical habitat has been designated for this species in inland Washington water; critical habitat only is designated (see below) in Alaskan waters. The minimum population estimate for the eastern stock of Steller sea lions is estimated as 44,555 individuals (Angliss and Outlaw 2007).

Although there are no rookeries (a coastal site where sea lions breed and give birth) in Washington, Steller sea lion rookeries are located in British Columbia, Oregon, and northern

California (Angliss and Outlaw 2007). Outside of the breeding season, Steller sea lions disperse widely and occur seasonally throughout inland Washington waters (Calambokidis and Baird 1994). In Washington State, the number of Steller sea lions varies seasonally, with peak counts occurring during the fall and winter months (Jeffries et al. 2000; NMFS 2007). Haulout sites in inland Washington are located on jetties, offshore rock outcrops, and coastal islands, while in Puget Sound, Steller sea lions also haul out on navigation buoys (Jeffries et al. 2000). Steller sea lions have been observed rafting together in the water as well. Steller sea lions are opportunistic predators, feeding primarily on fishes and cephalopods near land or in relatively shallow water (Pitcher and Calkins 1981). The Steller diet varies geographically and seasonally (Merrick et al. 1997). This species feeds on squid, octopus, and fishes in Washington waters but salmon makes up only a small part of the Steller diet (Calambokidis and Baird 1994).

Critical Habitat: Although not designated in Washington, Oregon, or California, critical habitat has been designated through much of southern Alaska including all major haulout and rookery sites and three large offshore foraging areas (NMFS 1997b).

- *Northern Elephant Seal (Mirounga angustirostris)*

The northern elephant seal is the largest pinniped in the Northern Hemisphere and one of the most sexually dimorphic of all mammals (Deutsch et al. 1994). The northern elephant seal adults reach lengths of 3.0 to 4.1 m (9.8 to 13.5 ft) and weights of 360 to 2,300 kg (794 to 5,071 lb), with males at the higher end of both ranges (Deutsch et al. 1994). Although northern elephant seals range throughout the northeastern Pacific Ocean from Mexico to Alaska, the geographic range of females is much more restricted with only males migrating as far north as Alaskan waters (Le Boeuf et al. 2000). The northern elephant seal population has recovered dramatically after being nearly exterminated in the late 1800s (Stewart et al. 1994). In U.S. waters, one stock is recognized, the California breeding stock, which is conservatively estimated with a minimum population size of 60,547 elephant seals (Carretta et al. 2007).

Two north-south migrations occur during the year between the breeding rookeries in southern California to foraging locations offshore and northward along the coast into Alaska. Males and females and age classes segregate during migration and foraging; adults venture offshore while juveniles and subadults are often seen along the coasts of Oregon, Washington State, and British Columbia (Condit and Le Boeuf 1984; Stewart and Huber 1993). Pups have even been sighted at haulout sites on Protection and Minor Islands, located in inland Washington waters (Jeffries et al. 2000). The northern elephant seal occurs in small numbers throughout the year in inland Washington waters and uses beaches at Destruction, Protection, and Smith/Minor Islands as well as Dungeness Spit to haul out (Jeffries et al. 2000).

Males and females pursue different foraging strategies. Females range widely over deep water, apparently foraging on patchily distributed, vertically migrating, pelagic fishes, crustaceans, and cephalopods, while males forage along the continental margin and likely feed on benthic prey (Antonelis et al. 1994; Le Boeuf et al. 2000).

- *Fissipeds (Otters)*

Fissipeds are a suborder of carnivores that include many terrestrial species including the mustelid family, of which six species of fully or partially marine otters are members. All marine otters are found in high latitudes, but it is only the sea otter and chunago that feed exclusively at sea (Estes and Bodkin 2002). Marine otters occupy a wide variety of habitats in the Atlantic and Pacific Oceans.

- *Northern Sea Otter ((Enhydra lutris kenyoni)*

The sea otter is the largest mustelid species. Male sea otters reach a maximum length of 1.5 m (4.9 ft) and maximum weights of 45 kg (99 lb) (Jefferson et al. 1993). There are three recognized subspecies of sea otters, including two northern and one southern subspecies. The northern subspecies that occurs from the Commander and Aleutian Islands throughout central and southeastern coastal Alaskan as well as off British Columbia, Washington, and occasionally

Oregon waters is *Enhydra lutris kenyoni (*USFWS 2003). This subspecies is not listed under the ESA. The USFWS, using MMPA guidelines, does not designate stocks of sea otters by subspecies. Thus, five stocks of sea otters are recognized, three in Alaskan waters and single stocks in California and Washington (USFWS 2005). Sea otters were hunted to extirpation in Washington and Oregon; sea otters were absent from Washington waters from 1911 through 1969 (Jameson et al. 1982). Re-introduction efforts begun in 1969 have been successful in Washington to the extent that the Washington stock has grown from the 59 sea otters re-introduced to 743 sea otters in 2004 (Lance et al. 2004). Most of this number occurs in the Pacific coastal waters of Washington although otters have begun re-populating the inland waters, even inhabiting territory not been historically occupied, such as Puget Sound.

Sea otters are resident year-round in Washington waters although they only rarely occur in the southern inland waters of Washington (Lance et al. 2004). Sea otters occupy nearly all coastal marine habitats, from bays and estuaries to exposed rocky shores (Riedman and Estes 1990).

3.4.2 Sea Turtles

There are seven living species of sea turtles worldwide. Sea turtles are long-lived reptiles that have wholly adapted to life in the ocean even though they begin their lives on land. After hatching, sea turtles spend the majority of their remaining lives at sea, returning to land primarily to nest. Female sea turtles nest in tropical, subtropical, and warm-temperate latitudes, often in the same region where they were born (Miller 1997). All species of sea turtles are listed under the ESA in U.S. waters. Critical habitat has not been designated for any of these species in the U.S. Pacific or Atlantic.

Sea turtle hearing sensitivity is not well studied. The range of maximum sensitivity for sea turtles is 100 to 800 Hz, with an upper limit of about 2,000 Hz (Lenhardt 1994). A few preliminary investigations using adult green, loggerhead, and Kemp's ridley turtles suggest that these sea turtles are most sensitive to low-frequency sounds (Ridgway et al. 1969; Bartol et al. 1999). Sensitivity even within the optimal hearing range is apparently low—threshold detection levels in water are relatively high at 160 to 200 dB re 1 μPa-m (Lenhardt 1994).

The distribution of many sea turtle species is dependent upon and often restricted by water temperature (Epperly et al. 1995; Coles and Musick 2000). Although occurrences of four ESA-listed species of sea turtles (green*,* olive ridley, loggerhead, and leatherback turtles) (Table 3-6) have been documented in Washington waters, nearly all occurrences have been in Pacific and not inland waters (DoN 2006). Sea turtles only very rarely travel into the inland waters of Washington, and no records are known for these species in Puget Sound (DoN 2006). The lack of sea turtle occurrences in the inland waters of Washington can most likely be correlated with the low water temperatures in these estuarine habitats. The inland waters of Washington likely represent suboptimal sea turtle habitat as the average annual water temperature range (9.3° to 10.2°C) falls below the preferred temperature range 13.3° to 28°C (Coles and Musick 2000). At 10°C, sea turtles become lethargic and cold-stunning can occur (Coles and Musick 2000). Green turtles, for instance, lose the ability to dive at 9°C and remain floating horizontally until they either warm or die (Schwartz 1978). Thus, no sea turtles are expected to occur in Elliott Bay.

The situation in southern New England waters is far different. Sea turtles occur in southern New England waters in summer and fall but during winter and spring they are primarily absent from the region due to the low water temperatures (Table 3-7). Every spring, when water temperatures exceed 15°C (59°F), several thousand sea turtles make their annual northern migration into New England waters to take advantage of abundant prey (Shoop and Kenney 1992). In June, sea turtles are commonly seen off Georges Bank along the edge of the Gulf Stream Current and apparently move inshore throughout the summer months (Bleakney 1965). Inshore areas such as LIS and Cape Cod Bay are highly utilized developmental habitats for juvenile loggerhead, Kemp's ridley, and green turtles while coastal waters off New York, New England, and Canada, and especially the Gulf of Maine are often frequented by adult leatherback turtles (Lazell 1980). Since the inshore waters of the test areas are not associated with the warming effects of the Gulf Stream Current, the waters of southern New England and LIS are unsuitable for sea turtles during the coldest months of the year (Morreale and Standora 1998). This is evidenced by

Table 3-6 Sea turtle species that may potentially occur in the vicinity of the BioSonics–EB test area, their status under the ESA, and expected occurrence level in the test area.

Species Name	ESA Status	Occurrence Level[1]
Olive ridley turtle (*Lepidochelys olivacea)*	Threatened	Extralimital
Leatherback turtle (*Dermochelys coriacea)*	Endangered	Rare
Loggerhead turtle (*Caretta caretta)*	Threatened	Extralimital
Green turtle (*Chelonia mydas)*	Threatened	Extralimital

1 **Regular** = A species that occurs as a normal part of the fauna of the area regardless of its abundance;
Rare = A species that only occurs in the area sporadically;
Extralimital = A species that does not normally occur in the area as it is beyond its normal distributional range but for which one or more occurrence records exist in the area.

the high tendency for sea turtles to suffer from coldstunning in the late fall to early winter, which causes hundreds to strand on northeastern U.S. beaches each year. No sea turtles nest in New England; the furthest north a sea turtle nest has ever been recorded was in southern New Jersey (Brandner 1983).

Five species of protected sea turtles (green, hawksbill, Kemp's ridley, loggerhead, and leatherback turtles) occur in the northwest Atlantic coastal waters of the eastern U.S. and are potentially found in the waters of LIS, Narragansett Bay, and Buzzards Bay during the summer and fall (Table 3-7). Only three species, the loggerhead, leatherback, and Kemp's ridley turtles, are found during winter and spring in southern New England waters (DoN 2005). No sea turtles would be expected at any of the New England or LIS test areas in winter or spring but the occurrence of sea turtles during summer and fall is more likely in the waters of LIS, Narragansett Bay, and Buzzards Bay.

Table 3-7. Sea turtle species that may occur in LIS, Narragansett Bay, or Buzzards Bay with their ESA status and expected occurrence level in these waters (DoN 2005).

Species Name	ESA Status	Occurrence Level[1] in Winter and Spring	Occurrence Level in Summer and Fall
Kemp's Ridley Turtle *Lepidochelys kempii*	Endangered	Rare	Rare
Leatherback Turtle (*Dermochelys coriacea)*	Endangered	Rare	Regular
Loggerhead Turtle (*Caretta caretta)*	Threatened	Rare	Regular
Green Turtle (*Chelonia mydas)*	Threatened	Extralimital	Rare
Hawksbill Turtle (*Eretmochelys imbricata)*	Endangered	Extralimital	Rare

1 **Regular** = A species that occurs as a normal part of the fauna of the area regardless of its abundance;
Rare = A species that only occurs in the area sporadically;
Extralimital = A species that does not normally occur in the area as it is beyond its normal distributional range but for which one or more occurrence records exist in the area.

3.4.3 Fishes

3.4.3.1 Fishes of Puget Sound and Elliott Bay

The waters of Puget Sound support a diverse fish assemblage and highly productive fishery that consists of 230 species representing 71 families of pelagic (e.g., salmonids), finfish, and demersal (e.g., forage fish and groundfish) fishes (Palsson et al. 2003b). One of the most important marine resources found in the Pacific Northwest is the Pacific salmonid. Salmonids include both salmon and trout species, which support important traditional, commercial, and recreational fisheries in the Washington and have long been an integral part of the Native American culture and heritage. Salmon are an extremely important part of both marine and terrestrial ecosystems (Gende et al. 2002). For example, the distribution and movement patterns of some marine mammal species, in particular, southern resident killer whales are driven by the occurrences of the important prey, salmon.

In inland Washington waters, as many as nine species of salmonids, salmon and trout, occur (Somerton and Murray 1976). Of the salmon species occurring in Puget Sound, two species are ESA-listed; the chinook salmon and steelhead trout are considered threatened while the coho salmon is considered a species of concern in the sound (Table 3-8; NMFS 2005h; 2005c). Only the Chinook salmon has critical habitat designated in Puget Sound.

Table 3-8. Salmonid species that may potentially occur in the vicinity of the BioSonics®–EB, their status under the ESA, and overall occurrence level area in fall and winter.

SPECIES NAME		**ESA STATUS**	**OCCURRENCE LEVEL**[1]
Chinook salmon	*Oncorhynchus*	Threatened	Regular
Steelhead trout	*Oncorhynchus mykiss*	Threatened	Regular
Coho salmon	*Oncorhynchus kisutch*	Species of Concern	Regular

1 **Regular** = A species that occurs as a normal part of the fauna of the area regardless of its abundance;
Rare = A species that only occurs in the area sporadically;
Extralimital = A species that does not normally occur in the area as it is beyond its normal distributional range but for which one or more occurrence records exist in the area.

- <u>Chinook Salmon (*Oncorhynchus tshawytscha)*</u>

Chinook salmon are the largest of the Pacific salmonids, weighing as much as 45 kg (99 lb) and reaching 1.5 m (4.9 ft) in length (PFMC 2000). Currently, the NMFS has identified 17 evolutionarily significant units (ESUs) of chinook salmon in Washington, Oregon, Idaho, and California; each ESU is treated as a separate species under the ESA (NMFS 2005c). The Puget Sound ESU is considered threatened under the ESA and critical habitat has been designated (see below).

Chinook salmon are found in freshwater to seawater from the surface to depths of 250 m (820 ft) depending on lifestage. Early life history stages of chinook occur in freshwater but juveniles and adults live in marine habitats of Washington coastal and inland waters as well as Oregon and California. Chinook salmon exhibit one of the more diverse and complex life history strategies of all Pacific salmonids (PFMC 2000). Some juveniles migrate to the ocean immediately after hatching but most remain in freshwater for 30 to 90 days (PFMC 2000). Juveniles that reside in freshwater streams and rivers spend a year or more before performing extensive offshore migrations to the ocean. Ocean residency varies but may last from 1 to 6 years (Healey 1991). To spawn, all chinook return to their natal river during the spring and early summer, several months prior to spawning (Healey 1991). In marine environments the chinook's diet consist of crab larvae, fish, phytoplankton, and cephalopods (Beauchamp et al. 1983).

<u>*Critical Habitat*</u>: In Puget Sound, approximately 3,721 km (2,312 mi) of nearshore marine habitat were designated as critical habitat in 2005 (Figure 3-10) in addition to habitat in nearby streams and rivers (NMFS 2005d). Military areas were exempted from federal designation.

- <u>Steelhead Trout (*Oncorhynchus mykiss)*</u>

Adult steelhead trout typically weigh 7.0 kg (15 lb) or less with lengths as long as 76 cm (2.5 ft) (PFMC 2000). Currently 15 ESUs have been identified for steelhead in Washington, Oregon, Idaho, and California (NMFS 1997c). Twelve of these ESUs have designations of either endangered or

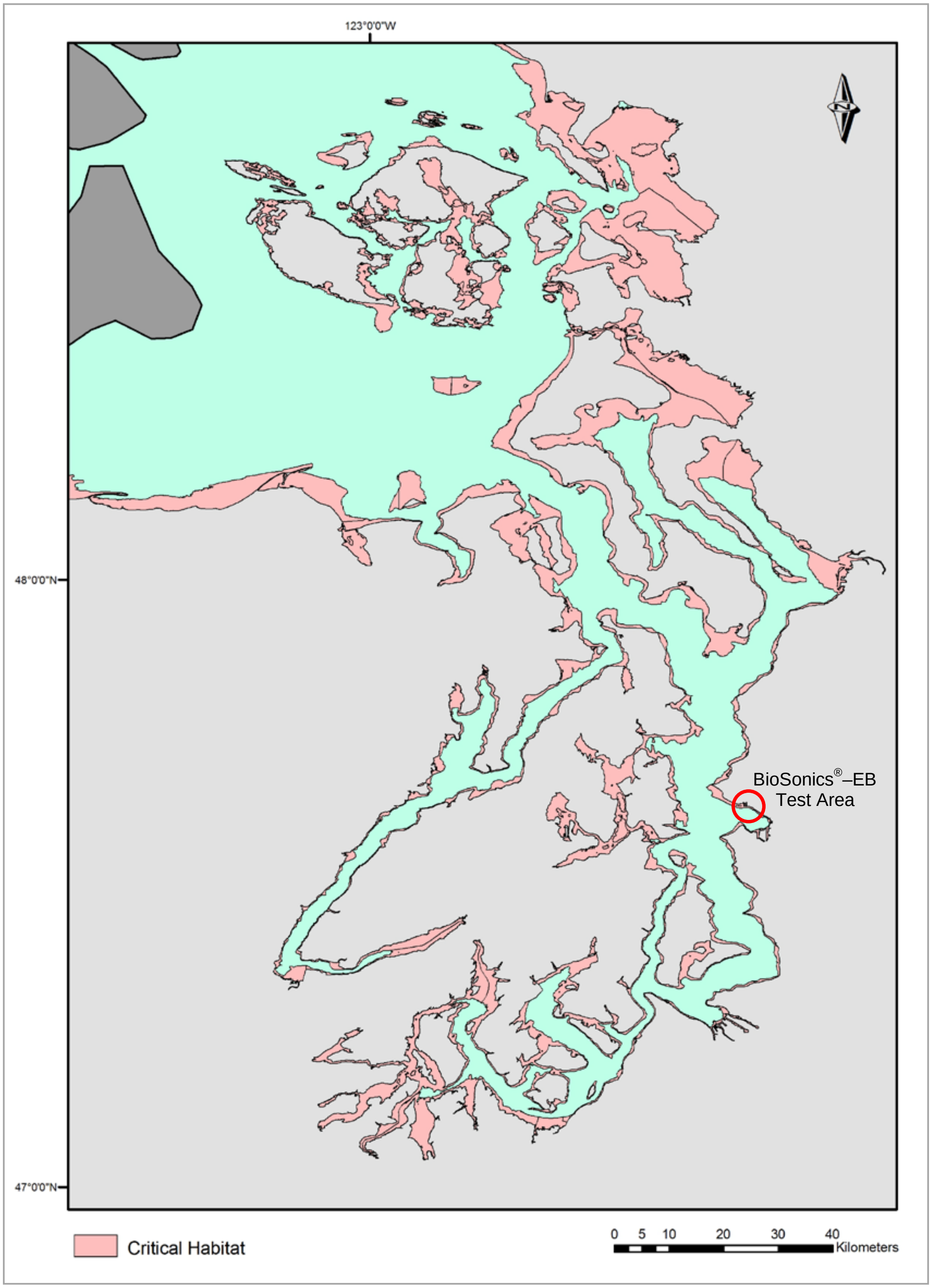

Figure 3-10. Designated critical habitat for the chinook salmon in the inland waters of Washington and the proximity to the BioSonics®–EB test area (NMFS-NWR 2005).

threatened, and have designated critical habitat (NMFS 2007). The ESU for Puget Sound was designated as threatened in 2007 (NMFS 2007a). Critical habitat has not yet been designated yet for the steelhead in Puget Sound.

Steelhead trout are found in fresh water to saltwater at depths ranging from the surface to 200 m. Both inland and coastal types of steelhead trout occur in Washington, Oregon, and British Columbia; coastal steelhead occur in Puget Sound (Busby et al. 1996). Most streams in the Puget Sound region contain steelhead trout (Pauley et al. 1986). While early life history stages of the steelhead are found only in freshwater habitats, the later life history stages of the anadromous life form (i.e., juveniles and adults) occur in the Puget Sound. Adult steelhead feed on a variety of invertebrates, including crustaceans and mollusks inhabiting benthic habitats, as well as smaller species of fish and/or their eggs while young steelhead feed primarily on zooplankton (Busby et al. 1996).

3.4.3.2 Essential Fish Habitat of Greater Puget Sound

In recognition of the critical importance that habitat plays in the lifestages of fish and invertebrate species, the MSFCMA, commonly called the Sustainable Fisheries Act, called for the establishment of fishery management councils that, among other tasks, would identify (designate) and protect habitat essential to the production of federally managed species; this habitat is termed essential fish habitat (EFH). EFH areas can be classified with an additional protective designation, habitat areas of particular concern (HAPC), if they are especially sensitive, rare, subject to stress from anthropogenic activities, or have a special ecological function. The Pacific Fisheries Management Council manages EFH in the Washington area.

In the Puget Sound region, EFH has been designated for 55 species of fish and invertebrates (Table 3-9). The marine and estuarine waters of the Puget Sound are designated EFH for salmonids, coastal pelagic, and groundfish (PFMC 1998a, 1998b, and 1999). The marine extent of EFH for salmon, coastal pelagic species, and Pacific coast groundfish includes all those waters from the nearshore and tidal submerged environments within Washington inland and coastal waters seaward to the EEZ (PFMC 1998a, 1998b, and 1999). No EFH has been designated for highly migratory species in Puget Sound. Habitat areas of particular concern (HAPCs) have been designated in the Puget Sound and Elliott Bay for the Pacific coast groundfish. Essentially all state waters and seabottom including those in Puget Sound have been designated as HAPC for the groundfish (NMFS 2006b).

EFH in the Elliott Bay test area can be characterized in the following general habitat categories:

- <u>Marine and Estuarine Water Column</u>: This habitat includes the vertical column of water from the surface to the ocean floor. Depending on the species, the designated habitat may only refer to part of the water column such as the surface or bottom waters. This habitat is important for a wide variety of species and their lifestages.
- <u>Marine and Estuarine Waters of Specific Temperature Ranges</u>: This habitat is essentially a subset of the marine and estuarine habitat but is restricted to water a thermal range within a set geographic area.

3.4.3.3 Fishes of Southern New England

A combination of temperate and tropical/subtropical demersal and pelagic species of fish occur southern New England coastal waters. Although the most abundant or commonly occurring fish are temperate species, the proximity of the bay to the Gulf Stream's warm waters results in the frequent occurrence of tropical/subtropical species in the bay. A variety of invertebrate species, many of which are commercially harvested (e.g., Atlantic surfclam and the quahog) are also found in the bay. Some of the more than 25 species of fishes found in this region, such as winter flounder and tautog, are year-round residents while others, such as the striped bass and bluefish, only occur seasonally, usually in summer through fall (Hale 1988; Massie1998). Winter flounder have historically dominated the fish assemblage of the bay systems but that trend has changed over the last several decades. A shift from benthic, or bottom dwelling, fishes (e.g., winter flounder) to pelagic, or water column, fishes (e.g., herring) has occured in the Narragansett Bay System over the last 30 years (Jeffries and Terceiro 1985; MHBNL 2003).

Table 3-9. Species for which essential fish habitat has been designated in the Elliott Bay and Puget Sound region (PFMC 1998a, 1998b, and 1999).

Pacific Salmon	Chinook salmon Coho salmon Puget Sound Pink Salmon
Coastal Pelagic Species	Northern anchovy Pacific sardine Pacific mackerel
Pacific Coast Groundfish	Arrowtooth Flounder Butter sole Dover Sole English sole Flathead sole Petrale sole Rex sole Rock sole Sand sole Starry flounder Pacific sanddab Bocaccio Brown rockfish Copper rockfish Quillback rockfish Redstripe rockfish Rosethorn rockfish Splitnose rockfish Tiger rockfish Yelloweye rockfish Yellowtail rockfish Cabezon Kelp greenling Lingcod Pacific cod Pacific hake California skate Longnose skate Spiny dogfish

Although the Gulf of Maine Distinct Population Segment (DPS) of the Atlantic salmon (*Salmo salar) stock* is listed as endangered, the Narragansett Bay stock is not listed under ESA. Only one fish with potential occurrence in southern New England waters is listed under the ESA, the shortnose sturgeon (*Acipenser* *brevirostrum).* The shortnose sturgeon is anadromous, living mainly in slower moving river waters or nearshore marine waters with periodic migrations into faster moving freshwater areas to spawn. Occurring in most major river systems from Maine to Florida, the shortnose sturgeon prefers nearshore marine, estuarine, and riverine habitat (NMFS 1998b). Although originally listed as endangered range-wide, the NMFS recognizes 19 DPSs, each defined as a river/estuarine system in which shortnose sturgeons have been captured within the generation time of the species (30 years): New Brunswick, Canada; Maine; Massachusetts; Connecticut; New York; New Jersey/Delaware; Maryland/Virginia; North Carolina; South Carolina; Georgia; and Florida (NMFS 1998b). The MA DPS includes the Merrimack River and the CT DPS includes the Connecticut River in which sturgeon populations are estimated at 33 and 297 to 714 fishes, respectively (NMFS 1998b). There are no known shortnose sturgeon populations in the rivers located between the Massachusetts and Connecticut DPSs. Although shortnose sturgeon historically occurred in RI coastal waters and in Narragansett Bay, no shortnose sturgeon have been sighted or caught during the last 30 years or generation time for the species. The Merrimack River is located on the Atlantic coast of MA and the Connecticut River flows into central LIS. Therefore, it is extremely unlikely and highly improbable that the endangered shortnose sturgeon will occur in Narragansett or Buzzards Bays or within the test areas when FarSounder and APS will be testing the swimmer/diver detection systems. Since the Connecticut River is located some distance west of the APS–Avery test area, it is also highly unlikely that any sturgeons would occur at that test area.

Some of the fishes occurring in the test areas of southern New England are managed by various federal agencies including the NMFS (highly migratory species including skates), the New England Fishery Management Council (most temperate species), the Mid-Atlantic Fishery Management Council (temperate and some subtropical species), and the South Atlantic Fishery Management Council (coastal migratory pelagic group [king and Spanish mackerel]).

3.4.3.4 Essential Fish Habitat

The Northeast Fisheries Management Council, Mid-Atlantic Fisheries Management Council, the NMFS, and South Atlantic Fishery Management Council regulate and manage EFH designated in Narragansett Bay, Buzzards Bay, and LIS. EFH in this region has been designated for at least one lifestage of 18 fish species that are federally managed (Table 3-10; Packer et al. 2003a; Packer et al. 2003b; NERO 2007). Designated EFH for the bays and LIS can be characterized in the following general habitat categories:

- Marine and Estuarine Water Column: This habitat includes the vertical column of water from the surface to the ocean floor. Depending on the species, the designated habitat may only refer to part of the water column, such as surface waters for haddock larvae. This habitat is important for a wide variety of species and lifestages.
- Marine and Estuarine Waters of Specific Salinity Ranges: Essentially a subset of the marine and estuarine habitat, this habitat is restricted to waters with specific salinity ranges within a set geographic area.
- Benthic Substrate: Seafloor habitats consisting of specific compositions of sediments or substrate types such as sand, gravel, or mud and consisting of surface textures such as rough bottom. These habitats are utilized by a variety species for spawning/nesting, development, dispersal, and feeding.
- Structured Habitat: This type of benthic habitat consists of natural or man-made structures that provide sheltered habitat for a variety of species. Natural structures include any type of biologically produced materials that rise above the seafloor including sponge or shellfish beds; hydroid communities; amphipod, worm tube, or bryozoan clusters, as well as algae or seagrass beds.

3.4.4 Marine Protected Areas

Executive Order 13158 specifies that the federal government create a national system of marine protected areas (MPAs), which are defined as "any area of the marine environment that has been reserved by federal, state, territorial, tribal, or local laws or regulations to provide lasting protection for part or all of the natural and cultural resources therein". MPAs include National Marine Sanctuaries, National Seashores, National Monuments, National Parks, National Estuarine Research Reserves, National Wildlife Refuges, and fishery closure areas.

Table 3-10. Fish and invertebrate species for which essential fish habitat has been federally designated for at least one lifestage in Narragansett Bay (Packer et al. 2003a; Packer 2003b; NERO 2007).

Species	
Atlantic Mackerel	*Scomber scombrus*
Atlantic Herring	*Clupea harengus*
Black Sea Bass	*Centropristus striata*
Atlantic Surfclam	*Spisula solidissima*
Bluefish	*Pomatomus saltatrix*
Haddock	*Melanogrammus aeglefinus*
King Mackerel	*Scomberomorus cavalla*
Little Skate	*Raja erinacea*
Longfin Inshore Squid	*Loligo pealeii*
Northern Shortfin Squid	*Illex illecebrosus*
Red Hake	*Urophycis chuss*
Scup	*Stenotomus chrysops*
Spanish Mackerel	*Scomberomorus maculatus*
Summer Flounder	*Paralicthys dentatus*
Spiny Dogfish	*Squalus acanthias*
Windowpane Flounder	*Scopthalmus aquosus*
Winter Flounder	*Pleuronectes americanus*
Winter Skate	*Raja ocellata*

In Rhode Island, there is one MPA located in the vicinity of the test areas. One of a network of 26 federal reserves, the Narragansett Bay National Estuarine Research Reserves is located in the heart of the bay and includes Prudence, Dyer, Hope, and Patience Islands (Figure 3-11). The reserve encompasses 2,353 acres of land on the four islands and 1,591 acres of the adjoining water area to a depth of about 4 m (NOAA 2004). The reserve is located approximately 1.8 km (1 NM) to the east of the FarSounder–West test area while the eastern test area lies approximately 3.7 km (2 NM) to the south of the reserve.

In Buzzards Bay, there are no federally designated MPA but the state has designated three MPA as Areas of Critical Environmental Concern at Bourne Back River, Herring River, and Pocasset River, all of which are located at the upper bay's boundary. An additional state designated MPA is located in Dartmouth, MA at the Demarest Lloyd State Park. This site is the closest MPA in proximity to the APS–UM test area. There are no MPAs in the vicinity of APS–WHOI.

No designated MPAs are located in Elliott Bay. The closest MPA is Blake Island Underwater Park, located southwest of Elliott Bay in Puget Sound. No MPAs are designated in LIS or Connecticut.

3.5 ECONOMIC ENVIRONMENT

3.5.1 Commercial Fishing and Aquaculture

3.5.1.1 Elliott Bay

Commercial fishing is an important part of the economy in Washington. Commercial fishery operations are active and are key suppliers of seafood and marine products to both domestic and foreign markets. In 2006, commercial fishery landings harvested in Washington were 107,906 metric tons at a approximate value of $197 million (NMFS 2007b). Seattle, found along the banks of Elliott Bay, and the largest fishing port in Puget Sound, is ranked 62nd in dollar value of all U.S. fishing ports, with landings of $9.3 in 2006 (NMFS 2007c). No aquaculture companies or sites currently exist in Elliott Bay.

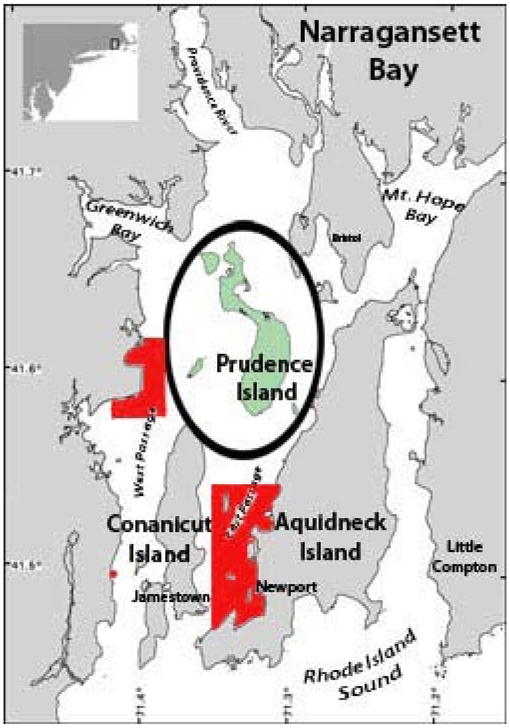

Figure 3-11. Location of the Narragansett Bay Estuarine Research Reserve (green islands) and test areas (in red) (NBNEER 2008).

3.5.1.2 Southern New England

Commercial fishing is an important part of the economy in the states of New England. Commercial fishery operations are active and key suppliers of seafood and marine products to both domestic and foreign markets. The shellfish, lobster, and bottom trawl fisheries are active in Narragansett Bay (Figure 3-12). Shellfish are primarily harvested in the FarSounder–West test area although some fish and lobster are also harvested in the deeper waters of that area. Lobsters are the primary target of commercial harvest in the eastern bay test area but shellfish and fishes are also harvested. The primary fishing port for the bay is Point Judith (located at the southwestern entrance to Narragansett Bay), which in 2006 was ranked twelfth in the U.S. in dollar value of its landings, which were valued at $46 million (NMFS 2007d). More than 51,000 metric tons of fish and invertebrates were landed in RI in 2006 (NMFS 2007e). The primary fishing port in CT is located at Stonington, which is ranked 68th by dollars of fish landed (NMFS 2007d). In 2006, about 5,000 metric tons of fish products were landed in the state of CT (NMFS 2007e). New Bedford, MA, located in Buzzards Bay, is the number 1 fishing port in the U.S. from 2001 through 2006, having landed $281.2 Million and 170 million pounds of fish in 2006 (CCMP 1991; NMFS 2007d). The fishing fleet out of New Bedford is the largest on the U.S. east coast (CCMP 1991). Over 170,000 metric tons of fish products were landed in MA during 2006 for a net value of $437 Million (NMFS 2007e).

In 2006, more than 25 aquaculture sites existed in Narragansett Bay (Figure 3-13; NBO 2005; CRMC 2006). The total value of aquaculture in the state of Rhode Island in 2006 was valued at $13,621 per acre with over 99 acres under cultivation. Shellfish are the focus of aquaculture in the bay, with clams and oysters as the species of interest. No aquaculture sites are located within the bounds of either possible FarSounder test areas or in close proximity to the APS–GSO site. One aquaculture site that cultures oysters is located 9.7 km (6 mi) from the APS–Avery test area (CDABALS 2007). In the vicinity of the two test areas in Buzzards Bay, six aquaculture sites are located. Five aquaculture sites are within 16 km (10 mi) from APS–WHOI while one aquaculture site is within 8 km (5 mi) of APS–UM (GMCME 2007).

3.5.2 Recreational Fishing

3.5.2.1 Elliott Bay

Recreational and sport fishing is allowed year round for trout, salmon, and other game fish in Elliott Bay; most recreational salmon fishing targets coho, chinook, chum, and sockeye (King County Department of Natural Resources 1998). More than 100 species of resident marine fish occur in the Elliott Bay and Duwamish Estuary. Although anglers catch bottomfish, cod, perch, and crab, salmon dominate the recreational harvest (King County Department of Natural Resources 1998). A sport fishing preserve is designated in Elliott Bay for the area defined by a line drawn between Terminal 91 and the Duwamish Head on the east and Fourmile Rock and Alki Point on the west this area is avoided by commercial fishers during recreational harvest seasons (King County Department of Natural Resources 1998).

3.5.2.2 Southern New England

With such extensive coastline and diverse aquatic habitats, southern New England waters support a large population of recreational fishermen. Coastal waters in RI provide recreation to as many as 800,000 anglers each year and annually, recreational fishing generates $1 billion for the state’s economy (Chisolm2007). More than 70 species are caught by recreational fishermen including bluefin tuna, cod, flounder, and striped bass. Recreational catches for all New England states total over 22 million fish

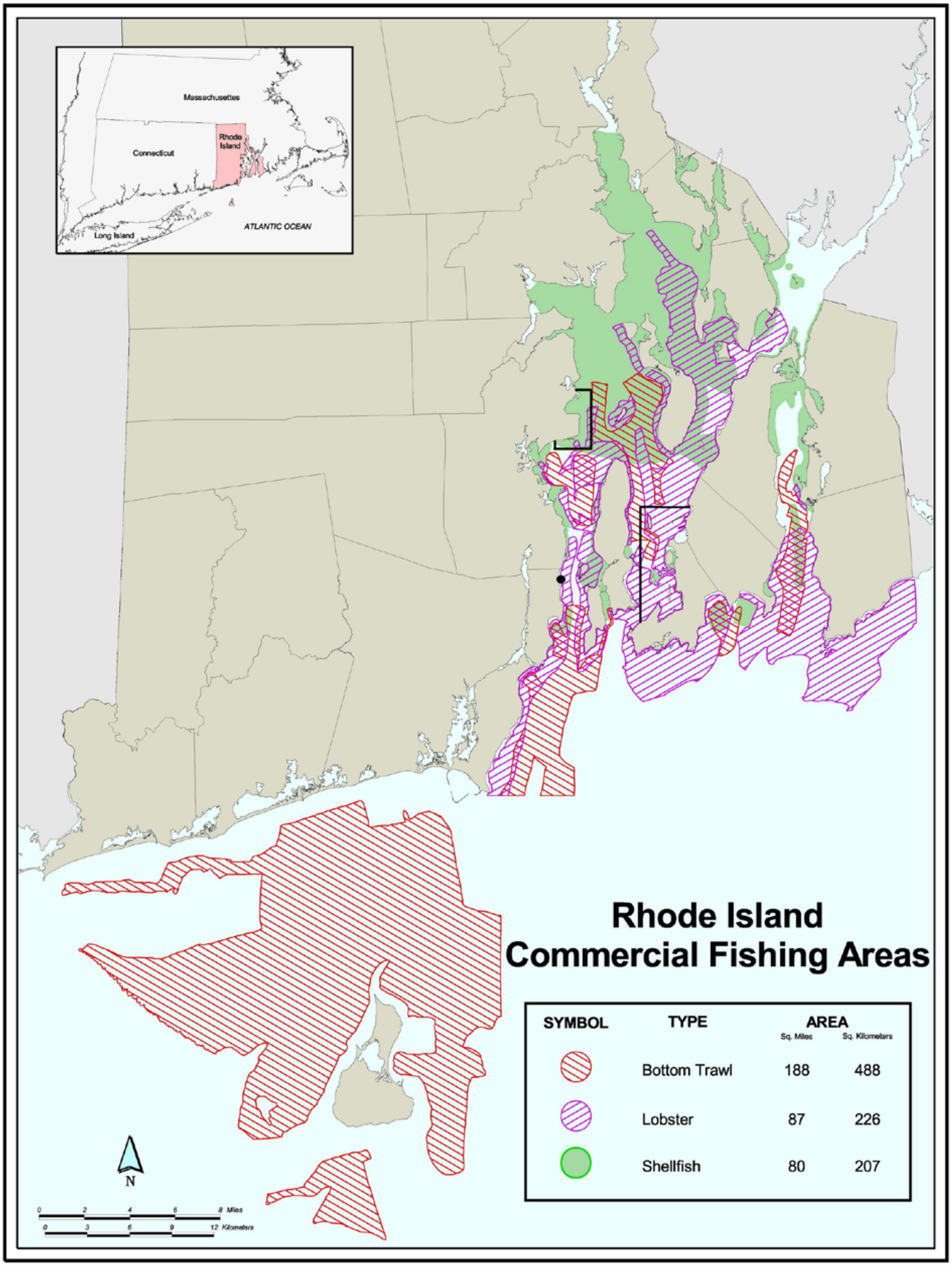

Figure 3-12. Distribution of commercial fishing in Rhode Island waters by gear type and target species; locations of test areas shown in black (NBO 2005).

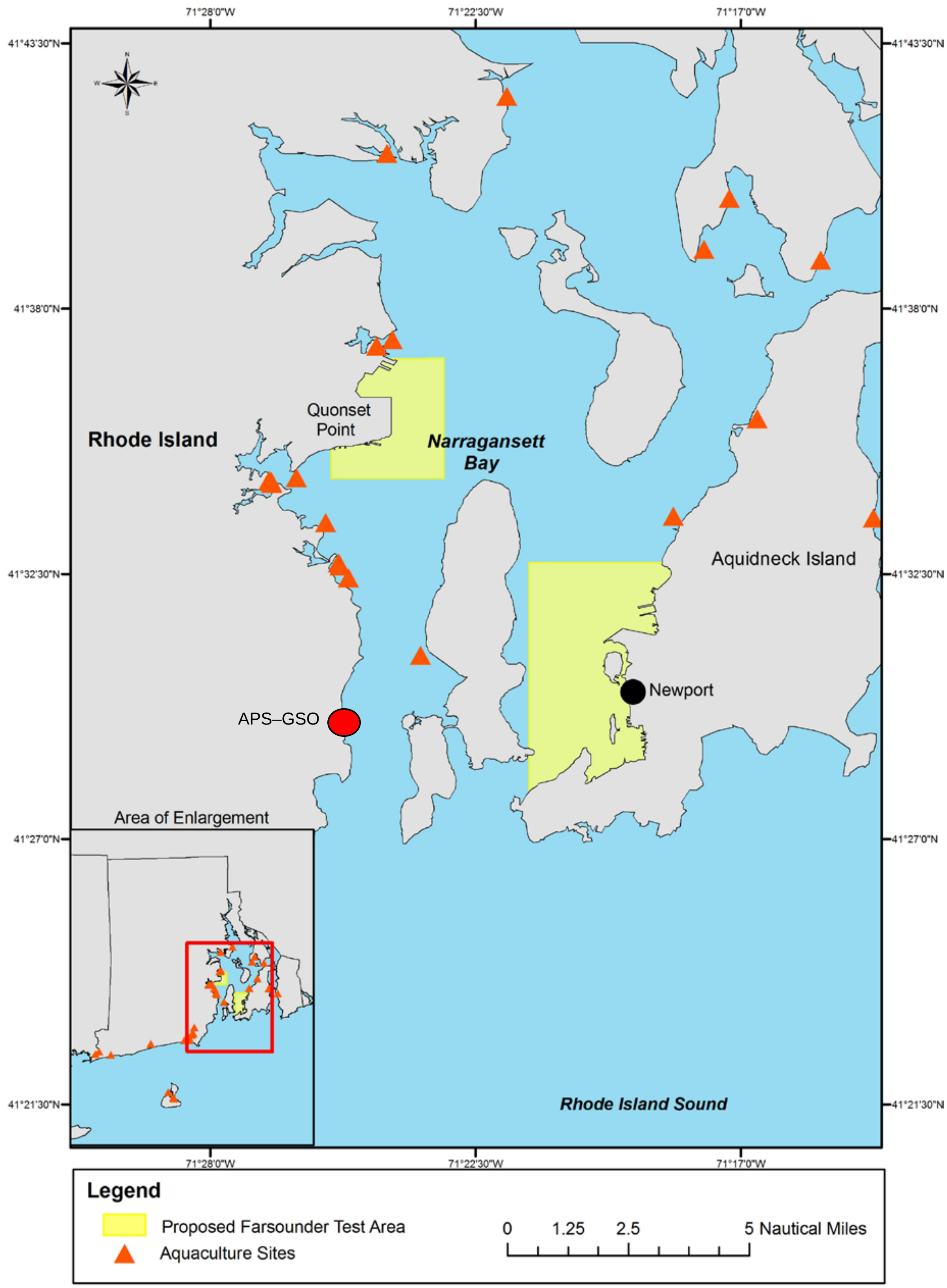

Figure 3-13. Locations of aquaculture enterprises in the vicinity of the FarSounder and APS test areas in Narragansett Bay (NBO 2005).

annually (Van Voorhees and Pritchard 2004). Recreational fishing locations in Narragansett Bay primarily include nearshore waters along the bay's shore but also include deeper waters in the northern part of the bay (Figure 3-14). The FarSounder–East test area encompasses more known recreational fishing locations than are located at the other bay test area in which only a small part of the shoreline is utilized for recreational fishing.

3.5.3 Recreational Diving

3.5.3.3 Elliott Bay

Four recognized recreational dive sites are located in Elliott Bay (NW Dive News 2004) (Table 3-11). The closest dive site to the proposed BioSonics®–EB test site is the Don Armini Ramp location, which is located on the south side of Elliott Bay near the mouth of the Duwamish River.

Table 3-11. Recreational diving locations in the Elliott Bay vicinity (NW Dive News 2004).

Dive Site Location	Distance from BioSonics®–EB (km)
Don Armini Ramp (47°35.5687'N 122°22.9913'W)	4.1
Seacrest Park (47°35.2965'N 122°22.7820'W)	5.2
Alk Pipeline (47°34.3631'N 122°24.8389'W)	7.1
Alki Beach Park (47°34.6722'N 122°24.9153'W)	10.4

3.5.3.4 Southern New England

Fort Wetherill, located on the southeastern tip of Conanicut Island, is the primary dive site in Narragansett Bay (DEM 2007). The waters of the bay generally lack the visibility desired by recreational scuba divers, and the bay water temperature is too low for much of the year for most divers. The Fort Wetherill location is about 8.6 km (4.6 NM) from the APS–GSO site, 13.6 km (7.3 NM) from the FarSounder–West site, but is only about 0.6 km (0.33 NM) from the FarSounder–East site. No recreational dive sites are known near or within the FarSounder–West test area. Some recreational diving also occurs at Fort Adams State Park in Newport, RI, which is located within the FarSounder–East test area (DEM 2007).

No recreational diving sites are known for Buzzards Bay (SNE 2007). One recreational diving site is located very near the APS–Avery test area. This dive site is off Rita Santacroce Drive, Avery Point, Groton, CT (NEDivers 2007), which is located 0.5 km (0.27 NM).

3.5.4 Commercial and Recreational Ship and Boat Traffic

3.5.4.1 Elliott Bay

Shipping in Elliott Bay includes state-run ferries, commercial tourist and fishing vessels, recreational vessels, and commercial ship traffic, which are present in the vicinity of the piers at most hours of the day and all days of the week. A ship anchorage areas lie directly to the west and east of Piers 90 and 91. Five commercial ferry lines transit through Elliot Bay as well as a water taxi, which operates seven days per week between Pier 55 and Seacrest Park. Additionally, the Victoria Clipper Ferry Service operates three high speed ferries in the Puget Sound area (Washington State Department of Natural Resources 2007). Four traffic separation lanes guide traffic into the Port of Seattle from Puget Sound.

The port of Seattle is ranked 9th nationally in container port traffic in 2006 with 1,987,360 twenty-foot equivalent units of traffic (Port of Seattle 2006) and 42nd in the world for container traffic in 2005 (Containerisation International 2007). The U.S. Army Corps of Engineers ranked the Port of Seattle as 30th in short tons of commercial traffic in 2005 (Port of Seattle 2006).

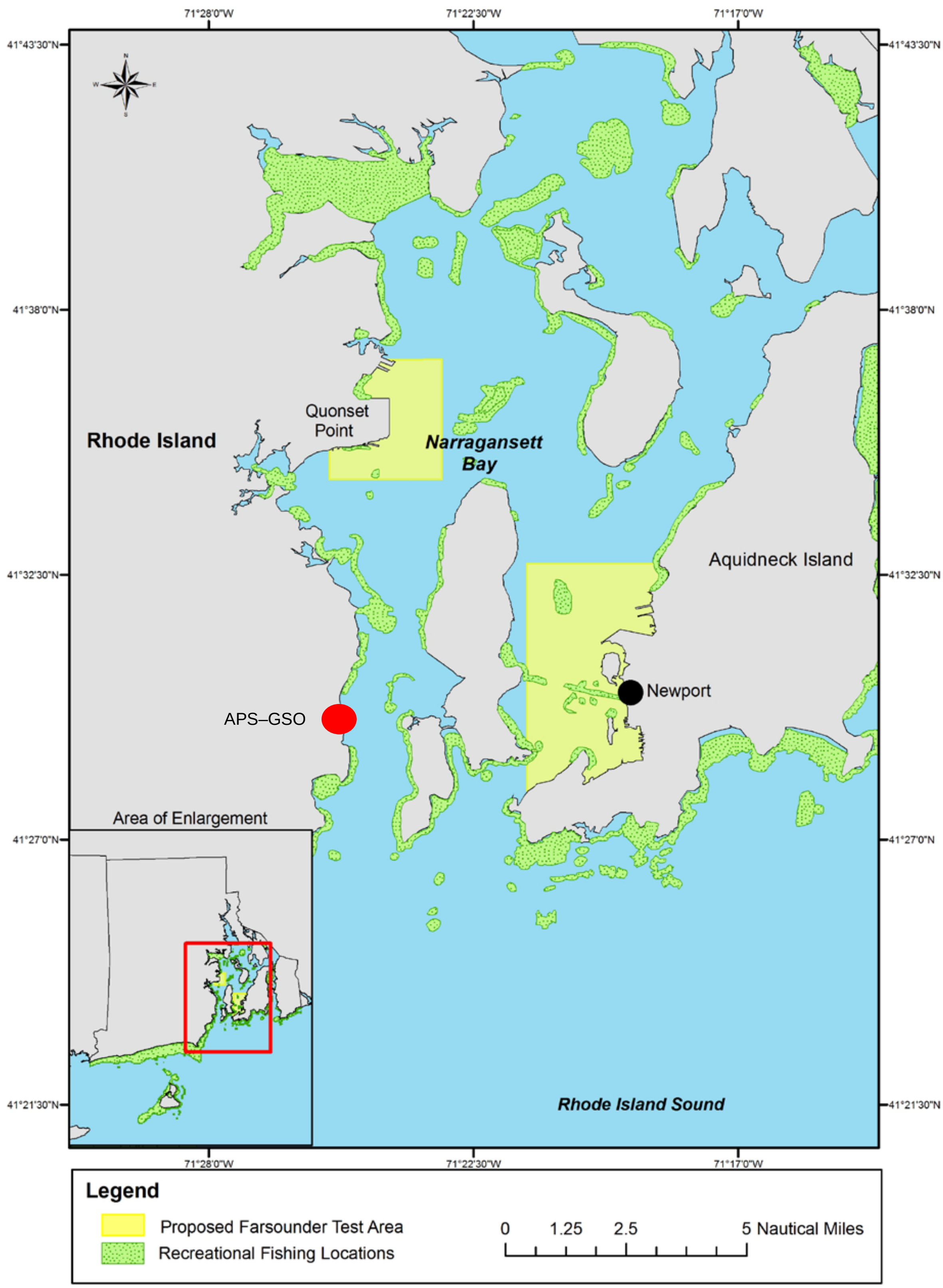

Figure 3-14. Distribution of recreational fishing activities in Narragansett Bay and the FarSounder and APS test areas (NBO 2005).

3.5.4.2 Southern New England

The majority of commercial shipping traffic into and out of Narragansett Bay travels through the East Passage, the deepest of the three passages into the bay. North of the eastern test area, commercial shipping traffic diverges, with some commercial shipping traffic venturing westward in the bay to Quonset Point. A commercial ferry departs from a pier near Quonset Point May through October while container and other shipping utilize the commercial piers at northern Quonset Point. Piers are also located in the eastern test area at the Naval Underwater Warfare Center just north of Newport. Thus, most of the commercial shipping traffic is likely to travel through the eastern bay test area with far more limited commercial ships transiting the FarSounder–East test area.

Recreational boating is largely a summer and early fall activity in Narragansett Bay. Newport, the city adjacent to the eastern test area, is the sailing capital of Rhode Island and supports several large marinas. Marinas exists north and south of Quonset Point in the western bay as well. However, few recreational boaters venture forth in the bay during winter or spring.

Buzzards Bay is part of the Atlantic Intracoastal Waterway system, and is connected to Cape Cod Bay by the Cape Cod Canal. The 480-foot wide Cape Cod Canal (operated by the US Army Corps of Engineers) is the world's widest sea-level canal. More than 20,000 vessels pass through the Canal annually (USACoE 20007). Many of these vessels are smaller recreational vessels, but in a busy 24-hour period, perhaps 30 to 60 larger transport vessels, including tankers, barges, tugs, ferries, fishing vessels, container vessels, cruise ships, and other transport vessels, pass through the canal. In 2002, the Army Corps noted that 1.9 to 2.0 billion gallons of petroleum products were shipped through the Cape Cod Canal annually (BBNEP 2007). With such small test areas located along the shore, the APS test areas in Buzzards Bay would experience little of the ship traffic traversing the bay to the Cape Cod Canal. APS–WHOI is the test area most likely to experience the heaviest recreational and small commercial boat traffic as it is located in the Woods Hole harbor, which in summer is heavily used. No commercial boat or ship traffic should traverse the APS–Avery test area, as it is located along the shore and occupies a very small area.

3.6 CULTURAL RESOURCES

Since the proposed action entails in-water tests, the only possible cultural resources would be shipwrecks of historical or archaeological significance. Although many shipwrecks are located in the coastal waters proposed for the testing, most are recent wrecks, primarily of fishing or other commercial vessels. However, off Newport, RI, several shipwrecks of archaeological significance exist. Newport Harbor is located within the FarSounder–East test area. The Rhode Island Historical Preservation and Heritage Commission oversees all underwater archaeology in RI via the Marine Archaeology Project. For several years during the summer, underwater archaeological surveys have taken place in Newport Harbor. One of the significant multi-year survey efforts that has been underway in Newport Harbor is the identification and survey of 13 British transports sunk in the harbor on August 5 to 9, 1778 (RIMAP 2008).

4 POTENTIAL ENVIRONMENTAL IMPACTS AND CONSEQUENCES

The potential effects of the proposed tests are addressed in this chapter of the EA. Since there are no coral reefs within over 1,000 NM of any of the proposed test areas, there is no potential impact to coral reefs, and they will not be discussed further.

4.1 POTENTIAL IMPACTS TO WATER AND SEDIMENT RESOURCES

4.1.1 Physical Characteristics of Equipment

For each of the sonar systems to be tested, the exact configuration and size will vary, but the BioSonics® DT-X Echosounder (see Figure 1-8) is fairly representative of all of these systems. Essentially, each system uses one independent underwater hydrophone transducer (or in the case of the APS system, up to six transducers) independent underwater hydrophone transducers, which are connected by an electrical cable to a combination power supply and processor. The power supply and processor would be located on the pier or in the boat from which the system is deployed. In the case of the BioSonics® system, the equipment consists of a display/control unit similar to a laptop computer and a transducer attached on the end of a waterproof cable. The transducer is approximately 0.18 m (7 inches [in.]) in diameter and 0.165 m (6.5 in.) thick. There are no liquids, gases, or materials enclosed which could potential be released into the environment. The proposed tests will involve putting the transducer into the water a few feet below the surface, activating the transducer, and recording the returning echoes. The equipment will be deployed over the side of a small watercraft or from a pier, but all components are retrieved at the end of a day's testing and removed from the site.

4.1.2 Potential Impacts of the Proposed Action

Since no liquids, gases, or loose materials are included as a part of any of the detection systems, no gas, liquids, or debris would be released into the environment and all components would be retrieved and removed daily at the end of testing. Therefore, there is negligible potential for the proposed action to impact the water, sediment, or air quality during or after the testing.

4.1.3 Potential Impacts of the No Action Alternative

If the No-Action Alternative is selected, no swimmer/diver detection systems would be tested and the DHS objectives would not be met. Additionally, since no action will occur under this alternative, no liquids, gases, or materials will be released into the environment, and there is no potential for impact to the water, sediment, or air quality in any of the test site identified in Section 1.0. However, if the failure to test and eventually deploy a swimmer/diver detection system resulted in a terrorist action in any port, serious impacts to the environment could result from the runoff of chemical, toxic, or even nuclear materials and by-products into the waters near the terrorist action.

4.1.4 Potential Impacts of the Proposed Action on Essential Fish Habitat

Since no liquids, gases, or materials included as a part of any of the systems, no gases or liquids will be released into the environment, and the systems will be deployed in the water column, but not have contact with the bottom, the potential for acoustic impacts on the quantity or quality of fish habitats is negligible. An anchor may be used to assist the small boat (if used) in station-keeping or to ensure that the detection system source remains stationary. However, these anchors will be removed upon the completion of testing and their effect on the benthic EFH should be negligible and ephemeral.

4.2 POTENTIAL ACOUSTIC IMPACTS

4.2.1 Acoustic Characteristics of Equipment

Detailed characteristics of the acoustic transmissions planned for the swimmer/diver detection system Tests were previously provided in Table 2-1. Although these systems collectively are capable of producing signals at 38, 70, 100, 120, 200, 420, and 1,000 kHz, for this application and series of test, only the 55 through 205 kHz frequencies will be used. These high frequencies are at the upper hearing limit of even those species specialized for hearing high frequency signals and typically will not be detected by most other species. To be conservative, the mathematical analysis tacitly initially assumes that all species could potentially be affected.

4.2.2 Potential Acoustic Impact of the Proposed Action

4.2.2.1 Potential Acoustic Impact on Fish

Fish can be classified by their hearing capabilities. A number of fish, found in widely diverse groups, have specializations that enhance their hearing capabilities. These fish, often called “hearing specialists,” can hear a wider range of frequencies and sounds with lower intensities than fishes without such specializations (“hearing generalists”) (Popper and Fay 1993). Examples of hearing specialists include goldfish, catfish, and squirrelfish (Fay 1988).

The upper frequency limit for hearing generalists varies by species, and it may be as low as 200 Hz in a flatfish or perch, to 800 Hz in some salmon; best hearing is generally in the center of the hearing range. Hearing specialists hear a wider range of frequencies, with an upper range of 2,500 and 4,000 Hz, which is a band that falls within the range of the human voice. Best sensitivity in these species generally is from 200 to 800 Hz, a band found in the speaking voice of a human. All of the swimmer/diver detection systems identified in the proposed action operate at frequency far above the hearing capability of any known fish and therefore these systems will have no effect on any fish.

4.2.2.2 Potential Acoustic Impact on Sea Turtles

Sea turtle auditory sensitivity has not been well-studied, although a few investigations suggest that it is limited to low-frequency bands. Results from the study of the cochlear of green turtles suggest they have a useful hearing range of perhaps 60 to 1,000 Hz but hear best from about 200 Hz up to 700 Hz (Ridgway et al. 1969). Recent work with six loggerhead sea turtles found the most sensitive threshold at 250 Hz, with a rapid decline in sensitivity above 1000 Hz (Bartol et al. 1999). Calculated in-water hearing thresholds within the useful range appear to be high (e.g., about 160 to 200 dB re 1 μPa) (Lenhardt 1994). An animal’s threshold for temporary threshold shift (TTS) is typically far above its lowest hearing threshold. The frequencies used by all of the swimmer/diver detection systems identified in the proposed action are far above the hearing capability of sea turtles. This fact combined with the negligible chance of encountering any sea turtles at any of the proposed testing site, strengthens the conclusion that these tests would have no impact on sea turtles.

4.2.2.3 Potential Acoustic Impact on Marine Mammals

“Behavioral Responses and Temporary Shift in Masked Hearing Threshold of Bottlenose Dolphins, *Tursiops truncatus*, to 1-second tones of 141 to 203 dB re 1 μPa” (Ridgway et al. 1997) (often referred to as the “TTS Study”) is one of the first of a series of comprehensive studies of the effect of acoustic noise on marine mammals. During this study, researchers observed behavioral modifications and temporary shifts in the hearing sensitivity of bottlenose dolphins exposed to 1-second tones at frequencies between 3 and 75 kHz. More recent work (Schlundt et al. 2000) extended the data to 400 Hz, included work with beluga whales, and used masking noise to create a consistent ambient noise environment. The conclusions of these studies are that changes in behavior and temporary shifts in the hearing levels of odontocetes were observed at the average received levels of 186 dB and 195 dB, respectively, between the frequencies of 3 and 20 kHz. For a frequency of 75 kHz, TTS values ranged between 182 dB re 1 μPa for one dolphin, while a second dolphin showed no TTS after exposure to 193 dB re 1 μPa. For this analysis a TTS threshold of 187 dB re 1 μPa was used for cetaceans. Schlundt et al. (2000) also reported changes in behavior of the tested animals for 75 kHz at about 177 dB re 1 μPa. Additionally, based on the recent NMFS-sponsored paper on acoustic thresholds (Southall et al 2007), PTS for non-pulsed signals can be approximated by adding 20 dB to TTS values. Therefore, the PTS value should be 207 dB re 1 μPa. In order to attempt to capture the reasonable probability that animals will be exposed to multiple transmissions, the pressure based thresholds identified above, have been converted into the appropriate energy metrics listed below.

Therefore for cetaceans, the selected levels for the Change in Behavior, TTS, and PTS metrics that were used in this document are as follows (Ridgway et al. 1997; Schlundt et al. 2000; Southall et al. 2007):

Change in Behavior (Level B):	177 dB re 1 μPa2 – sec
Temporary Threshold Shift:	187 dB re 1 μPa2 – sec
Permanent Threshold Shift (Level A):	207 dB re 1 μPa2 – sec

For the purposes of this document and calculations, the hearing capability of pinnipeds is assumed to be somewhat more sensitive than that of the small odontocetes. This assumption is supported by the similar results of Kastak et al. (1999) and Nachtigall et al. (2001) when exposing pinnipeds and odontocetes to long duration signals for frequencies between 1 to 10 kHz.

Therefore for pinnipeds the selected levels used to calculate Change in Behavior, TTS, and PTS metrics that were used in this document are as follows (Kastak et al. 1999; Nachtigall et al. 2001):

Change in Behavior (Level B):	173 dB re 1 μPa2 – sec
Temporary Threshold Shift:	183 dB re 1 μPa2 – sec
Permanent Threshold Shift (Level A):	203 dB re 1 μPa2 – sec

For the proposed systems, which operate between 55 and 205 kHz, it should be noted that pinnipeds have elevated hearing thresholds based on audiogram data (Richardson, 1995); therefore, these thresholds are conservative as they are based on results from signals with frequencies between 1 to 10 kHz. Also, note that the thresholds identified for use with pinnipeds, will also be used for fissipeds (otters).

The final step in determining a Zone of Influence (ZOI), or region around each source where the received level (RL) equals or exceeds the thresholds listed above, is to convolve these thresholds with the known SEL values for each source from Table 1-2. The equation governing this calculation is:

$$RL = SEL - TL$$

where: RL is received level (dB), SEL is sound exposure level (dB), and TL is transmission loss (dB).

The maximum range to even the lowest of the thresholds is on the order on tens of meters (Table 4-1). At these short ranges, local propagation conditions have negligible affects on the shortest and strongest transmission paths. In this case the Transmission Loss (TL) is dominated by spherical spreading loss and the range to any given TL can be found by the equation:

$$TL = 20 * LOG\{R\}$$

Where R is range (m).

Table 4-1. Calculated Zones of Influence (ZOI) for the acoustic detection sources.

		ZOI meters (ft)		
		BioSonics®	**FarSounder**	**APS**
Cetaceans	**PTS – Level A**	< 1.0 (< 3.2)	< 1.0 (< 3.2)	< 1.0 (< 3.2)
	TTS *	3.2 (10.4)	1.4 (4.6)	< 1.0 (< 3.2)
	Behavior – Level B	10.0 (32.8)	4.5 (14.7)	< 1.0 (< 3.2)
Pinnipeds	**PTS – Level A**	< 1.0 (< 3.2)	< 1.0 (<3.2)	< 1.0 (< 3.2)
	TTS *	5.0 (16.4)	2.2 (7.3)	< 1.0 (<3.2)
	Behavior – Level B	15.8 (51.9)	7.1 (23.2)	< 1.0 (< 3.2)

* TTS is provided for information purposes only and was not used in any calculations.

To determine the potential impacts to the species potentially present at each test area, the following assumptions, many of which are conservative, were made:

- Only the BioSonics® source will be deployed at the Washington test areas;

- Both the FarSounder and APS sources will be deployed at the Rhode Island test areas;
- Only the APS source will be deployed at the Connecticut and Massachusetts test areas;
- The results reported by season for each test area assume all of the testing for the sources at deployed at each test area occurred during that season;
- Testing consisted of 12 days of testing with two 4-hr tests per day;
- The maximum SEL for each source was used throughout the testing;
- The sources were effectively stationary, but marine mammals would move in the vicinity of the sources at speeds of 2 knots (kts) (3.7 km/hr);
- Animals were evenly distributed in depth throughout the water column;
- The BioSonics® and FarSounder systems projected signals in a 180° arc, while the APS sources were omni-directional;
- Only one of the BioSonics® and FarSounder sources will be deployed at a time, but six APS sources will be operating simultaneously;
- The water depth was conservatively assumed to be only 10 m (32.8 ft) deep; and
- No protective measures were applied.

Based on these assumptions, the three-dimensional volume ensonified by each source, at each site, for each ZOI was then calculated. These volumes were then multiplied by the marine mammal densities identified in Chapter 3 to arrive at potential impact estimates (Tables 4-2 through 4-5).

The possibility of Level A and B impacts resulting from the analysis and calculations is negligible for all test areas and species except for pilot whales during spring in the Rhode Island test areas (APS–GSO, FarSounder–East and –West) (Table 4-3). The pilot whale Level B take estimate for spring in the Narragansett Bay test areas is 0.252. This level of estimated take for pilot whales during spring potentially indicates that the proposed APS and FarSounder sources “may affect” pilot whales. However, this is misleading. The spring density of pilot whales in both test areas is 0.7552 animals/km^2. This density was derived from continental shelf survey data, where pilot whales occur routinely, and is the only density available. Using this continental-shelf derived density for coastal test areas where pilot whales only very rarely occur results in an overestimated take, which is not truly representative of the environment. In effect, the take estimate for pilot whales in spring at these test areas is negligible. Additionally, the minimum ZOI of 1 m was used in all calculations (Table 4-1) because of the way acoustic source levels are referenced (e.g., 200 dB re 1 µPa at 1 m). The use of this minimum ZOI results in the overestimation of the affected areas in the take calculations. Considering these factors, the likelihood of any species being impacted at Level A or B is negligible in all test areas.

4.2.2.4 Potential Acoustic Impact on Human Divers

The human hearing range extends from approximately 20 Hz to 20 kHz. The frequencies used in the proposed tests are far above the human hearing range. The Naval Sea Systems Command has indicated that, for mid frequencies (1 to 10 kHz), sound pressure levels greater than 190 dB and 205 dB are required to produce physiological effects on un-hooded and hooded divers, respectively (DoN 1989). To exceed the 190 dB threshold, a diver would have to approach within 10 m of the source. Effectively, the 190 and 205 dB levels are also used for ranges up to 20 kHz, or for the upper range of human hearing.

Historically, concern has been raised about the potential for acoustic signals to cause injury to diver due to the resonance of air-filled cavities (i.e., the lungs) at certain frequencies. The proposed action will not cause any potential resonance impacts to human divers because the resonance frequency for human lungs is typically far below the (minimum) 60 kHz transmitted by any of the proposed sources (note that the resonance for fish swim bladders is between 2 and 10 kHz and human lungs, which are larger than swim bladders, would resonate at frequencies < 2 kHz [Urick 1983]). Therefore, human lungs cannot resonate at the frequencies transmitted by the proposed sources.

All divers (including both commercial and recreational divers, who may just be in the vicinity of the proposed tests, and divers actually participating in the proposed act) are required to mark their position underwater with a surface float and flag. Thus, it would be unlikely that the system operators would not be

Table 4-2. Potential Level A and B Impacts for the Biosonics®–EB test area in Elliott Bay, WA.				
Species	**Level A Takes**		**Level B Takes**	
	Cold Season	**Warm Season**	**Cold Season**	**Warm Season**
Mysticetes				
Minke Whale	0.000	0.000	0.000	0.001
Humpback Whale	0.000	0.000	0.001	0.001
Gray Whale	0.000	0.000	0.000	0.002
Odontocetes				
Killer Whale—Southern Resident	0.000	0.000	0.001	0.004
Killer Whale—Transients	0.000	0.000	0.000	0.000
Pacific White-sided Dolphin	0.000	0.000	0.000	0.000
Dall's Porpoise	0.001	0.001	0.026	0.026
Harbor Porpoise	0.006	0.006	0.317	0.317
Pinnipeds				
California Sea Lion	0.005	0.000	0.391	0.000
Steller Sea Lion	0.000	0.000	0.005	0.000
Harbor Seal	0.005	0.005	0.372	0.372
Northern Elephant Seal	0.000	0.000	0.001	0.000
Fissipeds				
Washington/Northern Sea Otter	0.000	0.000	0.000	0.000

aware of divers that were in the vicinity of the test areas or that divers could approach the sources without being observed.

Finally, during system testing when test divers are present, it is expected that the operators will decrease the source level, the signal length, or both to better detect the target (diver) at close distances. Many active sonar systems decrease source levels to reduce reverberation and decrease signal lengths to reduce the minimum range at which a target can be detected. These reductions in source level and signal length have the effect of reducing the diver's received level.

These combined factors result in a negligible potential impact to any human swimmers or divers that may be present while the detection sources are transmitting (active).

4.2.3 Potential Acoustic Impact of the No Action Alternative

If the No Action Alternative is selected, the three swimmer/diver detection systems would not be tested and the DHS objectives would not be met. Additionally, since no action will occur under this alternative, no acoustic transmission will be made and there is no possibility of impacting any marine animal directly.

Table 4-3. Potential Level A and B Impacts for the FarSounder and APS–GSO test areas in Narragansett Bay, RI.

Species	Level A Takes				Level B Takes			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
Mysticetes								
Humpback Whale	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fin Whale	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Minke Whale	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Odontocetes								
Striped Dolphin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Common Dolphin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Atlantic White-sided Dolphin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pilot Whales	0.022	0.101	0.031	0.031	0.054	0.252	0.078	0.078
Harbor Porpoises	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pinnipeds								
Harp Seal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hooded Seal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gray Seal	0.019	0.019	0.019	0.019	0.070	0.070	0.070	0.070
Harbor Seal	0.013	0.013	0.000	0.013	0.048	0.048	0.000	0.048

However, if the failure to test and eventually deploy a swimmer/diver detection system resulted in a terrorist action in any of these test sites and another location in the US, serious impacts to the environment could result from the runoff of chemical, toxic or even nuclear materials and by-products into the coastal waters or harbors.

4.2.4 Comparison of the Proposed Action and the Alternative Testing Time Alternative

Essentially, the only factor which changes the impact results from season to season is the variation of marine mammal densities across these seasons. There are only very slight changes to the negligible possibility of Level A impacts, between seasons for all of the sites. In Washington, the most pronounced change is the lower potential impacts to California Sea Lions during the warm season, when this species is effectively absent from that area. In the New England sites the only significant change (other than that

Table 4-4. Potential Level A and B Impacts for the APS–Avery test area in Long Island Sound, Connecticut.

Species	Level A Takes				Level B Takes			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
Odontocetes								
Striped Dolphin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Common Dolphin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Atlantic White-sided Dolphin	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Bottlenose Dolphin	0.001	0.001	0.003	0.000	0.001	0.001	0.003	0.000
Pilot Whales	0.020	0.094	0.029	0.029	0.020	0.094	0.029	0.029
Harbor Porpoises	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pinnipeds								
Harbor Seal	0.012	0.012	0.000	0.012	0.012	0.012	0.000	0.012

Table 4-5. Potential Level A and B Impacts for the APS–UM and APS–WHOI test areas in Buzzards Bay, MA.

Species	Level A Takes				Level B Takes			
	Winter	Spring	Summer	Fall	Winter	Spring	Summer	Fall
Pinnipeds								
Harp Seal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Hooded Seal	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Gray Seal	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.018
Harbor Seal	0.012	0.012	0.000	0.012	0.012	0.012	0.000	0.012

of pilot whales, which was discussed previously) is a reduction from 0.012 to 0.000 Level B takes for harbor seals during the summer. The minor seasonal changes in potential impacts can be observed, but they not significant. Additionally, based on the current timelines for testing, and the preference for divers and operators to test these systems during the warmer seasons, it is not unreasonable to believe that most of these test will occur during the summer anyway, if that option is available to the test personnel.

4.3 POTENTIAL OF SOCIOECONOMIC IMPACTS

4.3.1 Potential Socioeconomic Impact of the Proposed Action

4.3.1.1 Commercial and Recreational Fishing and Aquaculture

As discussed in section 4.2.2.1, no acoustic impacts on fish are anticipated. In addition, the localized nature of all experimental activities and the extremely short duration of the experiment combine to result in a negligible portion of any fish or invertebrate population being disturbed by the physical testing during the proposed action.

4.3.1.2 Commercial Shipping and Recreational Boating

The localized nature of all experiment activities and vessels involved would pose a negligible impact on commercial shipping and recreational boating in the area during the proposed action. The combination of negligible impacts on both Commercial and Recreational Fishing and Aquaculture (section 4.3.1.1) and Commercial Shipping and Recreational Boating, constitutes a negligible impact on all economic resources as defined in Chapter 3.

4.3.1.3 Human Diving Activities

As previously addressed, the potential for adverse effects from acoustic sources on human divers is considered negligible.

4.3.1.4 Cultural Resources

As previously addressed, the only cultural resource identified in Chapter 3 and Appendix B, is the archaeological site present in Narragansett Bay, specificallyl in the Newport, RI harbor. Since the acoustic transmissions cannot impact these sites and all divers involved with system testing would be instructed to minimize interactions with the bottom and specifically to avoid these wreck sites, the potential for adverse effects from the proposed action is considered negligible.

4.3.2 Potential Socioeconomic Impact of the No-Action Alternative

If the No-Action Alternative is selected, the three swimmer/diver detection systems would not be tested and the DHS objectives would not be met. Additionally, since no action would occur under this alternative, no acoustic transmission would be made, and there is no possibility of impacting the socioeconomics of each of the test areas directly, except for the potential loss of business to individual companies that have built these systems. However, if the failure to test and eventually deploy a swimmer/diver detection system resulted in a terrorist action in any U.S. port, innumerable serious impacts to the socioeconomics of that port area could result.

4.4 COASTAL ZONE MANAGEMENT ACT

4.4.1 Potential Impact of the Proposed Action

Appendix B provides a detailed list of the enforceable laws and Federal Actions that constitute the CZMA policies for the four states (Washington, Rhode Island, Connecticut, and Massachusetts) potentially affected by the proposed action. The details of applicability and consistency of the proposed action to each state's enforceable policies are also shown in the Appendix B tables. In general, the drafting of this EA triggers the requirement to report the proposed action to these states and to seek their consistency concurrence. The relatively benign nature of the proposed action (i.e., limited in locations and durations transmission of low-power acoustic signals, no release of any gases or fluids, no disruption of the coasts, bluff, or sea bottom) resulted in consistency with each state's enforceable policies. As required by Section 307(c)(1) of the CZMA, Negative Determinations have been submitted to the CZMPs of Washington, Rhode Island, Connecticut, and Massachusetts 90 days prior to final DHS signatory authorization for the proposed action.

As identified in Appendix B-1, Washington State's CZMP has identified six enforceable policies: the Shoreline Management Act, the Clean Water Act, the Clean Air Act, the State Environmental Policy Act, the Energy Facility Site Evaluation Council law, and the Ocean Resources Management Act. These laws and their requirements have been reviewed and the proposed action was determined to be consistent because, 1) the proposed action does not affect the coastal zone or the shoreline, 2) the proposed action does not rise to a level of potential impact that requires federal approval, 3) no state or federal permits, licenses, or approvals are required, and 4) the action does not require that any fees be paid. Also, the proposed action is not one included in the list of Federal Actions identified by Washington as one requiring mandatory consistency review.

The Proposed Action is consistent with Rhode Island's identified enforceable policies (Appendix B-2). Although in the vicinity of the operations, no transmissions will occur in any Type 1 waters, and due to the effects of transmission loss, any transmitted signal reaching the Type 1 waters will have been greatly reduced in strength (energy) and far below to the level at which a potential impact would occur. Additionally, the presence of known archaeological sites in Newport Harbor is recognized, but neither the acoustic transmissions nor the divers who would be participating in the testing (who would be moving in the water column in a planned track and would be instructed not to disturb the bottom or anything on the bottom) would impact these sites. Also, the proposed action is not included in the list of Federal Actions identified by Rhode Island's CZMP that require consistency review by the state.

After review of the identified enforceable policies in Connecticut's CZMP, the proposed action has been concluded to be consistent with all policies (Appendix B-3). The proposed action is not one of Connecticut's listed Federal Actions that requires automatic consistency review by the state.

The Massachusetts CZMP's enforceable policies have been reviewed, with the resulting conclusion that the proposed action is consistent. Last, the Massachusetts list of Federal Actions for which consistency review by the state is mandatory does not include the type of activity proposed in this DHS action.

4.4.2 Potential Acoustic Impact of the No-Action Alternative

If the No-Action Alternative is selected, none of the swimmer/diver detection systems would be tested and the DHS objectives would not be met. Additionally, since no action will occur under this alternative, it is consistent with Washington state CZMA policy.

4.5 CUMULATIVE IMPACTS

As has been determined in Sections 4.1 through 4.4, the proposed action's potential to impact marine mammals, sea turtles, and fish is negligible, as is its potential to denigrate the quality of the water, air, or fish habitat. Since all components would be retrieved and removed daily at the end of testing and none of the detection systems contain liquids, gases, or loose materials, no gas, liquids, or debris would be released into the environment. Additionally, the short duration of these experiments, combined with the limited use of the human-made resources in the test areas (e.g., piers or jetties), ensure that potential impacts on the socio-economic resources of the test areas is also negligible.

The only possible means by which the testing of the swimmer/diver detection systems could have any potential impact or contribute to a larger cumulative impact is through the introduction of acoustic energy (i.e., sonar transmissions) into the environment. The exact nature of and contributors to anthropogenic underwater sound in each of the test areas is varied and constantly changing. Since the exact dates when the proposed tests will occur cannot be known at this time, detailed knowledge of other sonar activity in the vicinity of the test areas can only be estimated. However, the proposed acoustic testing is essentially equivalent to adding one more fish-finding sonar or fathometer to the test areas identified in this EA. Many (i.e., estimates of tens to hundreds of boats depending on the test area) of these fathometer or fish-finding systems are already installed and potentially operating on commercial, U.S. Coast Guard, and recreational ships and boats. The overall affect of all of these systems is negligible (i.e., fish and sea turtles can even hear them, while marine mammals, who can hear the source and are only impacted at very short ranges, occur less frequently at the proposed test areas), so the contribution of one addition source for a short period of time is also negligible.

With the exception of the FarSounder–East test area (and the BioSonics®–DB site, which is not being discussed), none of the test areas is routinely used for U.S. Navy operations or testing, so the possibility of naval sonars being present at these sites is negligible. At FarSounder–East, naval testing and operations normally occurs in the deeper waters of Narragansett Bay or along the Naval Undersea Warfare Center (NUWC) piers. U.S. Navy acoustic testing in FarSounder–East would potentially interfere acoustically with the proposed detection system testing. Therefore, FarSounder would not test simultaneously with the Navy. Therefore, the possibility of a cumulative impact from the proposed detection system's testing and naval testing is negligible.

Due to the frequency specifications of the sources identified in the proposed action (i.e., all sources will be operating at frequencies of 60 kHz or higher), the only other human-made sources of similar sounds will potentially be other commercial and military sonars using those frequencies. The sonars that operate at 60 kHz or higher are not the standard powerful sonars used for anti-submarine warfare, which typically operate at 1 to 10 kHz, or even weapons or communication sonars that operate between 10 to 30 kHz. Sonars operating at 60 kHz or higher are the significantly lower-powered fathometers, fish-finding sonars, and oceanographic/scientific equipment. Also, other sources of human-made noise (i.e., from ship/boat propulsion systems, power plant, sewage treatment plants, etc.) are also typically below 10 kHz. The significance of this differentiation is twofold. First, sonars that operate at these higher frequencies are rapidly attenuated (i.e., reduced) as they propagate through the water. Also, these uses of sonar normally require a sonar that is directed towards the bottom (i.e., for fathometers and fish finders). Therefore, their ensonified areas are usually fairly small, directly under the boat using them, and it is unlikely that their ensonified areas overlap or contribute to each other. Secondly, except for the small chance of an isolated scientific system deployment, these systems are normally mounted on boats/ships, that can be readily seen. Therefore, concurrent and potential cumulative operations will easily be avoided.

4.6 PROTECTIVE MEASURES

The incorporation and implementation of the following protective measures should eliminate any potential impact to marine mammals and sea turtles:

1. If a small craft is used in the test series, it will maneuver, as feasible, to avoid closing within 457 m (1,499 ft) of any marine mammal or sea turtle.
2. Beginning 10 minutes before the initiation of an acoustic source transmission event and continuing throughout the event, visual inspection of the water's surface for marine animals will be conducted. If an animal is observed approaching within 16 m (52.5 ft) of the acoustic source, the transmission will not commence or will be suspended until the animal is not observed for 10 minutes within the 16 m radius of the source.
3. Divers will be instructed to minimize interactions or disturbances of the ocean bottom and to specifically avoid archaeological (shipwreck) sites in the Newport, RI harbor or wherever they may be observed.

These protective measures are applicable only to the test series as described in the proposed action and are not intended to establish precedents for future operational employment of similar or other systems.

5 CONCLUSION

The conclusions resulting from the scientific analysis presented in this EA are:

- The proposed action would not individually nor cumulatively have a significant impact on the environment. Therefore, an Environmental Impact Statement (EIS) is not required under the National Environmental Policy Act (NEPA).
- A conclusion of no significant impacts to ESA-listed species or critical habitats can be made.
- No reasonably foreseeable takes of marine mammals are expected as a result of the proposed action, and for this reason, no authorization under the Marine Mammal Protection Act (MMPA) is sought.
- There will be no degradation to the quality and/or quantity of EFH or habitat areas of particular concern resulting from the proposed testing; hence, consultation with NMFS under Section 305(b)(2) of the Magnuson-Stevens Fisheries Conservation and Management Act (MSFCMA) is not required (50CFR600.920).
- Since no coral reefs occur in the vicinity of any of the proposed test areas, with the most northerly coral reefs in U.S. waters occurring thousands of miles away from any proposed test area, no action is required under Executive Order 13089.
- No foreseeable direct or indirect effects on any current or future coastal uses or resources are expected as a result of the proposed action. The proposed action is consistent with all enforceable policies delineated in the federally approved Coastal Zone Management Plans of Washington, Rhode Island, Connecticut, and Massachusetts. The proposed action is not included as a defined federal activity for which the states require an automatic consistency review. As required by Section 307(c)(1) of the Coastal Zone Management Act (CZMA), Negative Determinations have been submitted to the Coastal Zone Management Programs of Washington, Rhode Island, Connecticut, and Massachusetts 90 days prior to final DHS signatory authorization for the proposed action.
- The scope of the environmental impact review documented in this EA was limited to the proposed test series; the results of this testing are needed by DHS to determine whether to proceed further with development of this swimmer/diver detection technology. It is not the intent or purpose to use any conclusions or findings from this environmental impact review to address or predict any future uses of these systems.

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APPENDIX A: PRELIMINARY AUTHORIZATION FOR DHS/BIOSONICS® TESTING ON THE DABOB BAY MOA

MEMO TO RECORD REGARDING THE BIOSONIC UNDERWATER ACOUSTIC SENTINEL UWACS

POC: Deb Triplett Gillum

Maximum acoustic output levels were developed for the environmental compliance documentation associated with operations at Keyport and Dabob Bay Range Complex (DBRC) sites. The reference Environmental Assessments (EAs) culminated in Findings of No Significant Impact in accordance with the National Environmental Protection Act.

The Biosonic Underwater Acoustic Sentry (UWACS) falls within the maximum envelope for both Keyport and Dabob sites. The Sound Pressure Level at 200 kHz is a maximum of 220 dB re 1 µPa @ 1m. The maximum acceptable is 235 dB in Keyport and 229 dB in DBRC at this frequency.

The current information does not include the:

- location of the test,
- the number of tests,
- whether any items whether part of the system or used in launch or recovery will be left behind.
- Whether this is an over the side system
- Whether it will be mounted to a fixture on the bottom or on a fixed surface, and
- if the unit should be lost, how it will be recovered.

Though I am awaiting more details, the initial information regarding acoustic output seems to be similar to many other test scenarios and covered in the Keyport and Dabob Bay Range Complex EAs and therefore would be reasonable to test in those locations. No other locations have been evaluated for environmental compliance for this system.

References:

Environmental Assessment for ongoing and future operations at U. S. Navy Dabob Bay and Hood Canal Military Operating Areas dated, May 2002.

Environmental Assessment Autonomous Underwater Vehicle Fest Keyport Range Washington dated July 2003.

Shaari Unger 6/20/2007

APPENDIX B-1: ENFORCEABLE POLICIES OF WASHINGTON'S COASTAL ZONE MANAGEMENT PROGRAM (SWANSON 2001)

Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Shoreline Management Act	▪ Applies to all shorelines of state ▪ Categorizes shorelines ▪ Establishes a planning program and regulatory permit system ▪ Identifies shorelines of statewide significance for which special-use priorities have been established	▪ All waters of Puget Sound considered "shorelines" of statewide significance; most applicable preferred usage is the protection of resources and ecology ▪ Shoreline of Elliott Bay, location of the proposed action, is not specified as shoreline of statewide significance ▪ No permit required for proposed action	▪ Although the proposed action takes place in the waters of Puget Sound (i.e., Elliott Bay), neither the ecology nor resources of Elliott Bay/Puget Sound are altered nor impacted by the proposed action ▪ Proposed Action Consistent
Clean Water Act	▪ Federal law for which state's Water Pollution Control Act authorizes compliance ▪ Manages coastal development to improve, safeguard, and restore water ▪ Protects the natural resources and existing uses of all state waters ▪ Requires permits for discharges	▪ No pollutants or discharges would be generated by proposed action; no permit required ▪ Proposed action is consistent with environmentally sound use of water resources	▪ Proposed Action Consistent
Clean Air Act	▪ Federal law for which state's Clean Air Washington Act authorizes compliance ▪ Protects and enhances air quality by creating rules setting emission standards ▪ Prohibits the open burning of certain materials especially in urban areas ▪ Requires permits for combustion facilities	▪ Proposed action would generate no air emissions, nor would any materials be combusted during proposed action	▪ Not Applicable

APPENDIX B-1: WASHINGTON ENFORCEABLE POLICIES (CONTINUED)

Enforceable Policy	Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
State Environmental Policy Act	▪ Requires government agencies to perform environmental review for activities that need state/local approval, permits, or variance ▪ Assists in preparation of NEPA (EIS) documents for major actions ▪ Provides training and guidance for local agencies and the public ▪ Prepares rule amendments and interpretation guidance ▪ Manages a statewide information clearinghouse	▪ No local/state permits or approval required ▪ No EIS necessary for proposed action	▪ Not Applicable
Energy Facility Site Evaluation Council Law	▪ Requires permits for large thermal energy facilities or oil refineries processing petroleum that is transported over marine waters and for petroleum and natural gas pipelines	▪ Proposed action would involve no processing or transportation of petroleum products	▪ Not Applicable
Ocean Resources Management Act	▪ Establishes guidelines for state and local management authority over Washington's Pacific coastal waters, seabed, and shorelines ▪ Sets policies for state and local plans for coastal waters ▪ Declares state policy to conserve liquid fossil fuel reserves	▪ Proposed action would take place in inland, not Pacific Ocean, waters of Washington	▪ Not Applicable

Federal Activities Subject to Washington State Consistency Review:

1. Resource use and development plans (e.g., Regional Economic Development Plan by the Pacific Northwest Regional Commission).
2. Planning, construction, modification, or removal of public works, facilities, or other structures (e.g., Corps dredging projects).
3. Acquisition, utilization, or disposal of land or water resources (e.g., purchase of a refuge by the Fish and Wildlife Service).
4. Federal agency activities requiring a federal license or permit from another federal agency.

APPENDIX B-1: WASHINGTON ENFORCEABLE POLICIES (CONTINUED)

5. Regulation or guidelines affecting the priority, siting, placement, design, or permissibility of uses.
6. Operation or conduct of new or existing uses when such operation would result in physical changes in the coastal zone such as air and water pollution, covering of water surface, removal of vegetation or new construction (e.g., timber harvest and related activities on federal forest lands).
7. Federal assistance to entities other than state or local governments, such as Indian tribes and individuals proposing activities in the coastal zone.
8. DOI pre-lease sale activities for OCS exploration and development.

Activities requiring federal permits or licenses are subject to consistency review by Washington's Coastal Zone Management Program.

APPENDIX B-2: ENFORCEABLE POLICIES OF RHODE ISLAND'S COASTAL ZONE MANAGEMENT PROGRAM

(COASTAL RESOURCES MANAGEMENT COUNCIL 1977, AS AMENDED 2007)

Authorization under § 46-23 of the Rhode Island General Laws

Coastal Resource/ Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Tidal Waters— Conservation Areas (Type 1)	▪ Waters abut shorelines in a natural undisturbed condition ▪ High scenic value ▪ Low-intensity use ▪ Alterations unsuitable and unacceptable	▪ The test area for FarSounder–East in the proposed action encompasses Type 1 Waters ▪ No alterations to the water quality or bottom substrate would occur in conjunction with the proposed action	▪ Source is located in Type 3 and 5 waters in Newport Harbor and negligible signal will reach the Type 1 waters ▪ Proposed Action is Consistent
Tidal Waters— Low Intensity Use (Type 2)	▪ Waters adjacent to predominantly residential areas ▪ High scenic value ▪ Low-intensity use ▪ Docks acceptable but other alterations are prohibited	▪ The test areas for the APS–GSO and FarSounder–East of the proposed action include Type 2 Waters ▪ The proposed action would entail no construction activities nor alterations to the water quality and bottom substrate	▪ Source may operate in Type 2 waters for short periods, but this will have negligible effects on these waters ▪ Proposed Action is Consistent
Tidal Waters— High Intensity Boating (Type 3)	▪ Waters dominated by commercial facilities that support recreational boating ▪ Marinas, boatyards, and associated businesses take priority over all other types of business ▪ Dredging and shoreline alterations acceptable	▪ The test area for FarSounder–East of the proposed action encompasses Type 3 Waters ▪ No dredging or any other type of bottom alterations would be included in the proposed action	▪ Proposed Action is Consistent
Tidal Waters— Multipurpose Waters (Type 4)	▪ Includes waters of Narragansett Bay and Block Island and Rhode Island Sounds ▪ Balance must be maintained among fishing, recreational boating, and commercial traffic ▪ High water quality and healthy ecosystem are primary goals	▪ The three RI test areas of the proposed action all include Type 4 Waters ▪ Water quality and bottom substrate would not be changed as a result of the proposed action ▪ The bay ecosystem would not be affected by the transient noise additions to the ambient underwater sound environment	▪ Proposed Action is Consistent

APPENDIX B-2: RHODE ISLAND'S ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource/ Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Tidal Waters— Commercial and Recreational Harbors (Type 5)	▪ Waters adjacent to port and harbors ▪ Waters in which recreational and commercial activities co-exist ▪ Maintenance of adequate water depths is essential; high water quality is seldom achievable ▪ Some filling may be acceptable and desirable	▪ The FarSounder–East test area of the proposed action includes Type 5 Waters ▪ No alterations to the bay bottom nor to the water depths would be associated with the proposed action ▪ Commercial nor recreational marine activities would be affected by the proposed action	▪ Proposed Action is Consistent
Tidal Waters— Industrial Waters and Commercial Navigation Channels (Type 6)	▪ Waters adjacent to developed waterfronts ▪ Water-dependent industrial and commercial activities take precedence over all other activities ▪ Maintenance of adequate water depths; high water quality is seldom achievable ▪ Fill may be acceptable and desirable	▪ One of the planned test areas for the proposed action, FarSounder–West, includes Type 6 Waters ▪ The proposed action would not affect commercial or industrial activities ▪ No construction nor dredging activities are part of the proposed action ▪ Water quality would not be affected by the proposed action	▪ Proposed Action is Consistent
Shoreline Features— Coastal Beaches	▪ Unconsolidated, usually unvegetated, sediments commonly subject to wave action but may also include a vegetative beach berm ▪ Beaches extend from mean low water landward to upland rise, the base of a dune, headland bluff, or coastal protection structures ▪ Maintain public access ▪ No alterations to beaches adjacent to Type 1 and 2 waters	▪ The proposed action would not take place on land ▪ No alterations to beaches or to public access of beaches would result from the proposed action	▪ Proposed Action is Consistent

APPENDIX B-2: RHODE ISLAND'S ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource/ Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Shoreline Features— Barrier Islands and Spits	▪ Includes islands or spits comprised of sand and/or gravel parallel to coast but separated from mainland by a coastal pond, tidal water body, or coastal wetland ▪ Development of barrier features: undeveloped, moderately developed, and developed ▪ Development activities and alterations permitted depend upon level of development	▪ The proposed action would not take place on land but in the nearshore marine environment ▪ No aspects of the proposed action would affect barrier islands or spits	▪ Not Applicable
Shoreline Features— Coastal Wetlands	▪ Includes salt marshes and freshwater or brackish wetlands ▪ Goal is to preserve and restore wetlands ▪ Alterations to wetlands abutting Type 1 waters are prohibited	▪ The proposed action would take place in the bay waters or from an existing in-water structure (pier) ▪ No wetlands would be affected as a result of the proposed action	▪ Proposed Action is Consistent
Shoreline Features— Coastal Headlands, Bluffs, and Cliffs	▪ Elevated land forms on headlands directly abutting coastal waters, a beach, coastal wetland, and rocky shore ▪ Construction prohibited that can undermine cliff or bluff; construction possible at or adjacent to some headlands ▪ Goal to preserve scenic and ecological value	▪ The proposed action would not take place on land ▪ Neither the stability, ecological worth, nor the aesthetic value of the coastal headlands (including bluffs and cliffs) would be altered by the proposed action	▪ Proposed Action is Consistent
Shoreline Features— Rocky Shores	▪ Naturally occurring shorelines of bedrock ledge or boulder-strewn areas, extending from mean low water to above mean high water ▪ No alteration of rocky shores adjacent to Type 1 waters	▪ The proposed action would not take place on land ▪ No effects to the water quality nor biota of the rocky shore would be caused by the proposed action	▪ Proposed Action is Consistent

APPENDIX B-2: RHODE ISLAND'S ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource/ Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Shoreline Features— Manmade Shorelines	▪ Characterized by concentrations of shoreline protection structures and other alterations to the extent that natural shoreline features no longer dominate ▪ Most commonly abut Type 3, 5, and 6 waters	▪ The proposed action would take place on an existing in-water structure (pier) ▪ No additional construction activities or alterations to the existing structure would be entailed by the proposed action	▪ Proposed Action is Consistent
Shoreline Features— Dunes	▪ Elevated accumulations of sand formed by wind ▪ Construction prohibited in high hazard areas and setbacks for most construction ▪ Foredune alteration prohibited when adjacent to Type 1 and 2 waters	▪ The proposed action would not take place on land	▪ Not Applicable
Shoreline Features— Areas of Historic and Archaeological Significance	▪ Districts, sites, buildings, structures, objects, and landscapes included or eligible for inclusion in state and national registers of historic places, or areas designated as historically or archaeologically sensitive according to RI Historical Preservation Commission model ▪ Preservation of this resource is high priority	▪ The proposed action would take place in the nearshore marine environment and not on land ▪ The FarSounder–East proposed test area encompasses Newport Harbor, where underwater archaeological research is ongoing to locate 18th Century sunken vessels and associated artifacts	▪ Sonar source operations would not affect existing archaeological sites and divers would be executing specific movement tracks that would not disturb any artifacts ▪ Proposed Action is Consistent
Freshwater Wetlands in the Coastal Vicinity	▪ Freshwater wetlands (including bogs, marshes, rivers, swamps, ponds, and areas subject to flooding) in coastal regions and those areas within 15 m (50 ft) of riverbanks or floodplains (tributary wetlands) ▪ No alterations to freshwater wetlands	▪ The proposed action would take place in the marine environment ▪ Neither water quality nor any feature of freshwater wetlands would be affected by the proposed action	▪ Not Applicable

APPENDIX B-2: RHODE ISLAND'S ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource/ Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Inland of Shoreline Features and Contiguous Areas	▪ Activities proposed inland of shoreline features or contiguous areas are subject to review and possible permitting ▪ Activities include mineral extraction; solid waste disposal; chemical processing, transport, and storage; power generation; petroleum processing, storage, or transfer; and sewage treatment and disposal	▪ The proposed action would take place in the marine environment of Narragansett Bay	▪ Not Applicable
Critical Coastal Areas	▪ Includes watersheds of poorly flushed estuaries and other critical coastal areas that vary in their ecological functions ▪ Special Area Management Plans (SAMP) address the specific environmental concerns of these priority management areas ▪ Federal agencies must abide by the policies of SAMP ▪ Development of SAMP also carries out federal mandate to manage areas of particular concern ▪ SAMP are ecosystem-based management strategies to preserve and restore ecological systems ▪ Six SAMP exist in Rhode Island	▪ The proposed FarSounder–East test area is located in the Aquidneck Island SAMP, which would implement critical parts of the West Side Master Plan ▪ No effects to the marine environment included in the Aquidneck Island SAMP would result from the proposed action	▪ No policies have yet been approved for the Aquidneck Island SAMP ▪ Since no effects to the marine would result from the proposed action, the proposed action is consistent

Federal Activities Subject to Rhode Island's Consistency Review:

1. Activities taking place within any coastal community:
   ° Filling, removing, or grading of shoreline features
   ° Residential, commercial, industrial, and recreational structures
   ° Recreational boating facilities
   ° Mooring and anchoring of houseboats and floating businesses

APPENDIX B-2: RHODE ISLAND'S ENFORCEABLE POLICIES (CONTINUED)

° Treatment of sewage and stormwater
° Construction of shoreline protection facilities
° Energy-related activities and structures
° Dredging and dredge material disposal
° Filling in tidal waters
° Aquaculture
° Mosquito Ditching
° Construction of public roadways, bridges, parking lots, railroad lines and airports
° Maintenance of structures
° Alterations to freshwater flows to tidal waters and water bodies and coastal ponds

2. Activities taking place anywhere within the state:
   ° Power generating plants (excluding facilities of less than a 40-megawatt capacity)
   ° Petroleum storage facilities (excluding storage facilities of less than 2,400-barrel capacity)
   ° Chemical or petroleum processing facilities
   ° Minerals extraction
   ° Sewage treatment and disposal facilities (excluding individual sewage disposal systems)
   ° Solid waste disposal facilities
   ° Desalination plants

3. Management Plans
   ° Fisheries Management Plans developed under the Magnuson Fisheries Conservation and Management Act
   ° Oil Spill Response Plans

4. Miscellaneous Direct Federal Activities:
   ° Land acquisition, transfer and disposal
   ° Site selection plans for ocean disposal of dredged materials
   ° Revisions to Flood Insurance Study and National Flood Insurance maps

Activities requiring a permit, license, or other state-approved authority are subject to state consistency review.

APPENDIX B-3: ENFORCEABLE POLICIES OF CONNECTICUT'S COASTAL ZONE MANAGEMENT PROGRAM

(CONNECTICUT COASTAL MANAGEMENT ACT 1980)

Coastal Resource and Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
General Coastal Resources— CGS* 22a-92(a)(2)	▪ Preserves and enhances coastal resources in accordance with the policies established by: ▫ Chapter 439 (Environmental Protection Department) ▫ Chapter 440 (Wetlands and Watercourses) ▫ Chapter 446i (Water Resources) ▫ Chapter 446k (Water Pollution Control) ▫ Chapter 474 (Pollution) ▫ Chapter 477 (Flood Control and Beach Erosion)	▪ Proposed action would not occur on land but on an existing in-water structure along a developed shoreline or from a watercraft ▪ No pollutants or discharges would be generated by proposed action; no permit required ▪ No construction nor development activities would be involved with the proposed action ▪ No acoustic impacts to marine species are reasonably expected as a result of the proposed action	▪ No effects to wetlands, beaches, dunes, islands, public recreational areas, bluffs, nor escarpments would result from the proposed action ▪ No changes to circulation or wave action would result from the proposed action ▪ No terrestrial species would be affected by the proposed action ▪ No effects to protected marine species would be reasonably foreseen as a result of the proposed action ▪ No wetlands nor wetland species would be affected by the proposed action ▪ Proposed Action is Consistent
Bluffs and Escarpments— CGS 22a-92(b)(2)(A)	▪ Manages and preserves coastal bluffs and escarpments by protecting slope and toe ▪ Uses discouraged that alter natural rates of erosion or the essential patterns and supply of sediments to the littoral transport system	▪ The proposed action would not take place on land but from an existing in-water structure or watercraft	▪ No direct effects to bluffs or escarpments would result from the action ▪ No alteration of circulation or wave patterns would result from the action ▪ Proposed Action is Consistent

APPENDIX B-3: CONNECTICUT ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource and Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Beaches and Dunes— CGS 22a-92(b)(2)(C) and CGS 22a-92(c)(1)(K)	▪ Preserves the dynamics of natural beach systems to provide critical wildlife habitats, reservoir for sand supply, buffer for coastal flooding and erosion, and valuable recreation opportunities ▪ Ensures that coastal uses are compatible with the capabilities of the beach system and do not unreasonably interfere with the natural processes of erosion and sedimentation ▪ Permits required for development of new coastal structures that could potentially obstruct passage along public beaches	▪ Proposed action would not take place on land but on an existing in-water structure or from a watercraft ▪ No construction activities or development are part of the proposed action ▪ No permit required for the proposed action	▪ No effects on beaches, dunes, nor beach access would result from the action ▪ Proposed action will not disrupt the natural longshore sediment transport system ▪ Proposed Action is Consistent
Coastal Hazard Area— CGS 22a-92(a)(2), CGS 22a-92(b)(2)(F), CGS 22a-92(b)(2)(J), and CGS 22a-92(c)(2)(B)	▪ Considers effect of coastal flooding and erosion on coastal development ▪ Manages coastal hazard areas ▪ Minimizes effects of erosion and sedimentation on coastal land uses ▪ Maintains, enhances, or restores natural patterns of water circulation and fresh/saltwater exchange	▪ The proposed action would not take place in a Coastal Hazard Area, as defined by CGS section 22a-93(7)(H) ▪ No construction or development of any new infrastructure are included in the proposed action	▪ No alteration of the circulation would result from the action ▪ Proposed Action is Consistent
Freshwater Wetlands and Watercourses—CGS 22a-92(a)(2)	▪ Preserves and enhances freshwater wetlands and watercourses in accordance with the policies established by Chapter 440	▪ The proposed action would take place in the marine environment	▪ No freshwater wetlands or watercourses would be affected by the action ▪ Proposed Action is Consistent

APPENDIX B-3: CONNECTICUT ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource and Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Coastal Waters, Estuarine Embayments, Nearshore Waters, and Offshore Waters— CGS 22a-92(a)(2) and CGS 22a-92(c)(2)(A)	▪ Protects, enhances, and manages estuarine embayments to ensure that coastal uses sustain biological productivity, maintain healthy marine populations, and maintain essential patterns of circulation, drainage and basin configuration ▪ Addresses water quality standards for these areas to ensure consistency with the federal Water Pollution Control Act (Clean Water Act) ▪ Prohibits the discharge of untreated waste and pollutants	▪ No discharges, including pollutants, are anticipated in association with the proposed action ▪ No acoustic impacts to marine species are reasonably expected as a result of the proposed action	▪ No effects to circulation or to water quality would result from the proposed action ▪ No effects to protected marine species or biological productivity are foreseeably expected as a result of the proposed action ▪ Proposed Action is Consistent
Developed Shorefront— CGS 22a-92(b)(2)(G)	▪ Promotes the use of existing developed shorefront areas for marine-related uses, such as commercial and recreational fishing, boating, and other water-dependent commercial, industrial, and recreational uses	▪ The proposed action would take place along a developed shoreline	▪ No effects to commercial or recreational fishing, boating, or other water-based uses are foreseeably expected as a result of the action ▪ Proposed Action is Consistent
Islands— CGS 22a-92(b) 2)(H)	▪ Manages undeveloped islands to promote their use as critical habitats and to maintain the value of undeveloped islands as a major source of recreational open space	▪ Watercraft or an existing in-water structure will be the site of the proposed action	▪ No effects to insular species would result from the proposed action ▪ Recreational activities associated with islands would be unaffected by the action ▪ Proposed Action is Consistent

APPENDIX B-3: CONNECTICUT ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource and Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Intertidal Flats—CGS 22a-92(b)(2)(D) and CGS 22a-92(c)(1)(K)	▪ Manages intertidal flats to preserve their value as a nutrient source, reservoir, and habitat ▪ Encourages the restoration and enhancement of degraded intertidal flats ▪ Allows coastal uses that minimize change in the natural current flows, depth, slope, sedimentation, and nutrient storage functions and disallows uses that substantially accelerate erosion or lead to significant despoliation of tidal flats	▪ The proposed action would not take place in or near intertidal flats	▪ No effects to intertidal flats would result from the action ▪ No changes to circulation, water depth, sedimentation, or nutrient entrapment would result from the proposed action ▪ Proposed Action is Consistent
Rocky Shorefront—CGS 22a-92(b)(2)(B)	▪ Manages rocky shorefronts to ensure that development will not reduce the capability of the system to support a healthy intertidal biological community ▪ Provides areas for feeding grounds and refuge for shorebirds and finfish ▪ Provides areas to dissipate and absorb storm and wave energies	▪ The action would take place off an existing in-water structure along a developed shoreline	▪ No effects to rocky shorelines or biota would result from the proposed action ▪ Proposed Action is Consistent
Shorelands— CGS 22a-92(b)(2)(I)	▪ Regulates shore land use and development in a way that minimizes effects upon adjacent coastal systems and resources	▪ The proposed action would not occur on land nor does it include any development activities	▪ No effects to shore lands would result from the proposed action ▪ Proposed Action is Consistent
Energy Facilities— CGS 16-50g and CGS 16-50p(a)	▪ Addresses legislative findings and purposes for energy facilities as well as addresses the certification proceeding decisions	▪ No energy facility is involved in the proposed action	▪ Not Applicable

APPENDIX B-3: CONNECTICUT ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource and Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Shellfish Concentration Areas— CGS 22a-92(c)(1)(I), 19a-98(a), 19a-96, and 19a-101	▪ Manages the state's fisheries to promote the economic benefits of commercial and recreational fishing and enhance recreational fishing opportunities ▪ Optimizes the yield of all species and prevents the depletion or extinction of indigenous species ▪ Maintain and enhance the productivity of natural estuarine resources, and preserve healthy fisheries resources for future generations	▪ The proposed action will take place from an existing in-water structure from which no recreational or commercial fishing takes place ▪ No discharges or pollutants would be reasonably expected in association with the proposed action	▪ The proposed action would not affect the harvest of shellfish commercially nor recreationally ▪ If the proposed action were to occur on a watercraft, the vessel would avoid all commercial or recreational vessels ▪ The viability of the indigenous species would not be affected since shellfish possess no hearing organs ▪ Proposed Action is Consistent
Tidal Wetlands—CGS 22a-92(a)(2), CGS 22a-92(b)(2)(E), and CGS 22a-92(c)(1)(B)	▪ Preserves and prevents harm to tidal wetlands so their vital natural functions are maintained ▪ Encourages the rehabilitation and restoration of degraded tidal wetlands, and the creation of wetlands for the purposes of shellfish and finfish management, habitat creation, and dredge spoil disposal ▪ Regulates filling of tidal wetlands and nearshore, offshore, and intertidal waters to create new land from existing wetlands and coastal waters	▪ The proposed action will take place from an existing in-water structure on a developed shoreline or from a watercraft	▪ Proposed Action is Consistent
Dams, Dikes, and Reservoirs— CGS 22a-92(a)(2)	▪ Preserves and enhances coastal resources in accordance with the policies established by chapters 439, 440, 446i, 446k, 447, 474 and 477	▪ The proposed action would not take place on land	▪ Not Applicable

APPENDIX B-3: CONNECTICUT ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource and Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
General Development—CGS 22a-92(a)(1) and CGS 22a-92(a)(4)	▪ Coordinates planning and regulatory activities of public agencies at all levels of government to insure maximum protection of coastal resources while minimizing conflicts and disruption of economic development	▪ No involvement with developmental planning and coordination are expected from this action	▪ Not Applicable
Boating— CGS 22a-92(b)(1)(G), CGS 22a-92(b)(1)(H), and CGS 22a-92(b)(1)(I)	▪ Encourages increased use of recreational boating in coastal waters ▪ Protects coastal resources by requiring that boating uses and facilities minimize disruption or degradation of natural coastal resources ▪ Maintains existing authorized commercial fishing and recreational boating harbor space and coordinates the design and location of proposed recreational boating facilities	▪ Watercraft may be used for the proposed action ▪ If watercraft would be used for the action, the vessel would be deployed from an existing marina or boat facility	▪ Proposed Action is Consistent
Coastal Recreation and Access— CGS 22a-92(a)(2), CGS 22a-92(a)(6), CGS 22a-92(c)(1)(J), and CGS 22a-92(c)(1)(K)	▪ Encourages public access to the waters of Long Island Sound by expansion, development and effective use of state-owned recreational facilities within the coastal area that are consistent with resource conservation and rights of private property owners	▪ No part of the proposed action would take place on land	▪ Coastal recreation and access would not be affected by the proposed action since it doesn't take place on land ▪ Proposed Action is Consistent

APPENDIX B-3: CONNECTICUT ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource and Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Coastal Structures and Filling—CGS 22a-92(a)(2), CGS 22a-92(b)(1)(D), CGS 22a-92(c)(1)(B), CGS 22a-92(c)(1)(K), and CGS 22a-92(c)(2)(B)	▪ Requires the design, construction, and maintenance of structures in tidal wetlands and coastal waters minimize effects to coastal resources, circulation and sedimentation patterns, water quality, flooding, and erosion ▪ Regulates any filling of tidal wetlands and nearshore, offshore, and intertidal waters for the purpose of creating new land from existing wetlands and coastal waters	▪ No construction or fill activities are part of the proposed action	▪ Not Applicable
Dredging and Navigation—CGS 22a-92(a)(2), CGS 22a-92(c)(1)(C), CGS 22a-92(c)(1)(D), CGS 22a-92(c)(1)(E), and CGS 15-1	▪ Provides for maintenance and enhancement of federally-maintained navigation facilities to effectively and efficiently plan and provide for environmentally sound dredging and disposal of dredged materials ▪ Reduces the need for future dredging by requiring that new or expanded navigation channels, basins, and anchorages take advantage of existing or authorized water depths and circulation ▪ Regulates new dredging in tidal wetlands except where no alternative exists and effects to coastal resources are minimal	▪ No dredging will occur during the proposed action ▪ No federally maintained navigation facilities will be part of the proposed action	▪ Not Applicable

APPENDIX B-3: CONNECTICUT ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource and Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Fisheries— CGS 22a-92(c)(1)(I), and CGS section 26-302, Article 1	▪ Manages the state's fisheries to promote the economic benefits of commercial and recreational fishing ▪ Enhances recreational fishing opportunities ▪ Optimizes the yield of all species ▪ Prevents the depletion or extinction of indigenous species ▪ Maintains and enhances the productivity of natural estuarine resources ▪ Preserves healthy fisheries resources for future generations	▪ No commercial fisheries would be disrupted nor would fishery economics be affected by the proposed action ▪ No indigenous fish species would be affected by the proposed action ▪ Essential fish habitat would not be affected as a result of the proposed action	▪ Proposed Action is Consistent
Cultural Resources— CGS 22a-92(b)(1)(J)	▪ Requires mitigation measures where development would impact historical, archaeological, or paleontological resources designated by the SHPO**	▪ The proposed action would take place in the nearshore marine environment, where no shipwrecks, the only possible cultural resource, have been located	▪ Proposed Action is Consistent
Open Space and Agricultural Lands— CGS 22a-92(a)(2) and CGS 12-107a	▪ Preserves and enhances coastal resources in accordance with the policies established by chapters 439, 440, 446i, 446k, 447, 474, and 477	▪ The nearshore coastal waters would be the location for the proposed action	▪ Not Applicable
Ports and Harbors— CGS 22a-92(b)(1)(C)	▪ Promotes the development, reuse, or redevelopment of existing urban and commercial fishing ports	▪ Existing commercial or academic institution piers or nearby waters would be the location for the proposed action	▪ Proposed Action is Consistent
Transportation— CGS 22a-92(b)(1)(F), CGS 22a-92(c)(1)(F), CGS 22a-92(c)(1)(G), and CGS 22a-92(c)(1)(H)	▪ Regulates use of rehabilitation, upgrading, and improvement of existing transportation facilities as the primary means of meeting transportation needs in the coastal area	▪ No transportation facilities or upgrading or improvements of those facilities would be affected by the proposed action	▪ Not Applicable

APPENDIX B-3: CONNECTICUT ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource and Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Fuel, Chemicals, and Hazardous Materials— CGS 22a-92(a)(2), CGS 22a-92(b)(1)(C), CGS 22a-92(b)(1)(E), and CGS 22a-92(c)(1)(A)	▪ Promotes the development, reuse, or redevelopment of existing urban and commercial fishing ports ▪ Regulates uses that unreasonably congest navigation channels or unreasonably preclude boating support facilities ▪ Regulates uses to minimize the risk of oil and chemical spills at port facilities ▪ Regulates the siting within the coastal boundary of new tank farms and other new fuel and chemical storage facilities ▪ Minimizes the risk of spillage of petroleum products and hazardous substances ▪ Provides effective containment and cleanup facilities for accidental spills	▪ A National Pollutant Discharge Elimination System permit is not required for: ▫ Effluent from properly functioning oil/water separators ▫ Sewage (when discharge is necessary) ▫ Graywater ▫ Cooling water ▫ Weather deck runoff, including fresh water washdowns ▫ Ballast water ▪ Existing pier facility would be used for the proposed action ▪ No petroleum products are associated with the proposed action	▪ No permit would be required for the Proposed Action ▪ Proposed Action is Consistent
Sewer and Water Lines— CGS 22a-92(b)(1)(B)	▪ Locates and phases sewer and water lines to encourage concentrated development in areas that are suitable for development ▪ Disapproves extension of sewer and water services into developed and undeveloped beaches, barrier beaches, and tidal wetlands	▪ The proposed action would not take place on land	▪ Not Applicable

APPENDIX B-3: CONNECTICUT ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource and Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Solid Waste— CGS 22a-92(a)(2)	▪ Makes provisions for safe and sanitary disposal of all solid wastes, including: septic tank pumping; sludge from water pollution abatement facilities and water supply treatment plants; solid residues and sludge from air pollution control facilities; and solid wastes from commercial, industrial, agricultural, and mining operations; but excluding wastes that are toxic or hazardous	▪ The proposed action would not involve the generation of solid waste within the state's coastal zone	▪ Not Applicable
Water-dependent Uses— CGS 22a-92(a)(3) and CGS 22a-92(b)(1)(A)	▪ Addresses high priority and preference to uses and facilities that are dependent on close proximity to the water or the shorelands immediately adjacent to marine and tidal waters ▪ Manages uses in the coastal boundary through existing municipal planning, zoning, and other local regulatory authorities and through existing state structures, dredging, and wetlands	▪ The proposed action would take place from an existing pier or in waters in close proximity to shore	▪ Proposed Action is Consistent

*CGS: Connecticut General Statutes
**SHPO: State Historic Preservation Officer

Federal Activities Subject to Connecticut Coastal Zone Consistency Review:

Department of Commerce

➢ National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries (NMFS)

Fisheries management plans and implementing mechanisms pursuant to Magnuson-Stevens Act of 1996, as amended; Atlantic Tunas Convention Act of 1975, as amended; Marine Mammals

APPENDIX B-3: CONNECTICUT ENFORCEABLE POLICIES (CONTINUED)

- Protection Act of 1972, as amended; and/or the Atlantic Coastal Fisheries Cooperative Management Act of 1993, as amended.
- Designation of essential fish habitat pursuant to the Magnuson-Stevens Act of 1996, as amended.

➢ National Oceanic and Atmospheric Administration (NOAA), National Ocean Service (NOS)

- Designation of a marine sanctuary pursuant to Marine Protection, Research and Sanctuaries Act of 1972, as amended.

Department of Defense

➢ Army Corps of Engineers (ACOE)

- Selection of open water dredged material disposal sites pursuant to the Clean Water Act (33 USC Section 1251 et.seq.), as amended, and/or the Marine Protection, Research and Sanctuaries Act (33 USC Section 1401 et.seq.), as amended.
- New or changes to existing nationwide, regional, or Connecticut-only general permits issued pursuant to 33 CFR Parts 320 - 330, as amended.
- Beach erosion control projects conducted pursuant to Section 103 of the Rivers and Harbors Act of 1962, as amended.
- Flood control projects conducted pursuant to Section 205 of the Flood Control Act of 1948, as amended.
- Navigation projects conducted pursuant to Section 107 of the Rivers and Harbor Act of 1960, as amended.
- Snagging and clearing for flood control conducted pursuant to Section 208 of the Flood Control Act of 1937, as amended.
- Protection, clearing, and straightening channels pursuant to Section 3 of the Rivers and Harbors Act, as amended.
- Dredged material management plans pursuant to Engineering Circular (E. C.) 1165-100 Policy National Harbor Programs Dredged Material Management Plans, as amended.
- Acquisition or disposal of land pursuant to 33 USC Chapter 12, as amended, and/or The Property Act (40 USC 101), as amended.
- Operational plans, procedures, and facilities for handling or storage of hazardous materials.
- Location, design, acquisition of new or expanded defense installations pursuant to 10 U.S.C. § 2802, as amended, regardless of the facility's active or reserve status, and including associated housing, transportation, or other facilities on properties.
- Establishment or modification of impact, compatibility, security areas, or other restricted use zones pursuant to 10 U.S.C. § 2802, as amended and regardless of whether on the upland or in the water if the establishment or modification of such an area or zone will restrict existing or future public access to or navigation on or through coastal waters.

➢ All DOD Agencies other than Army Corps or Engineers (ACOE)

- Acquisition or disposal of land pursuant to 10 USC 2661 et.seq.10 U.S.C. § 2802, as amended, and/or The Property Act (40 USC 101)10 U.S.C. § 2802, as amended.

Department of Homeland Security—Coast Guard

- Establishment or modification of impact, compatibility, security zones, waterfront safety zones, or other restricted use zones pursuant to 33 USC Sections 1221 et.seq.10 U.S.C. § 2802, as amended, regardless of whether on the upland or in the water if the establishment or modification of such an area or zone will restrict existing or future public access or navigation within the coastal area as defined in Connecticut General Statutes section 22a-93(3).
- Expansion, abandonment, or designation of anchorages, lightering areas, or shipping lanes pursuant to 33 USC 471 et. seq., as amended.
- Acquisition or disposal of land pursuant to 14 USC 92, as amended, and/or The Property Act (40 USC 101), as amended.

APPENDIX B-3: CONNECTICUT ENFORCEABLE POLICIES (CONTINUED)

- Construction or reconstruction pursuant to 14 USC 92, as amended, affecting the overall size or configuration of buildings or other facilities (e.g., boat launch ramps, stormwater management system components, paved parking, boardwalks) on any Federally owned or leased property abutting or containing tidal or coastal waters, as defined in Connecticut General Statutes section 22a-93(5) or tidal wetlands as defined in Connecticut General Statutes section 22a-29(2).
- Rules or regulations or changes thereto, pursuant to 33 USC 499, as amended, affecting the operation of moveable bridges over tidal, coastal, or navigable waters.
- Area Contingency Plans developed pursuant to 33 USC Section 1321, as amended.
- Location, placement, or removal of air or sea navigation devices pursuant to 33 USC 472 et. seq., as amended, except when such actions are part of routine maintenance operations or are intended to reset aids that have shifted due to weather or other causes.
- Location, design, construction or enlargement of Coast Guard stations pursuant to 14 USC 93, as amended.
- Development of rules or regulations pursuant to 44 CFR Part 1, as amended, and applicable to construction or reconstruction of buildings or changes in land use.

Department of the Interior

➢ Bureau of Indian Affairs (BIA)

- Land transfer into trust for Native American tribe pursuant to 25 CFR Part 151, as amended.

➢ Fish and Wildlife Service (FWS)

- Acquisition or disposal of land pursuant to 16 USC Part 742f or 742k, as amended, and/or The Property Act (40 USC 101), as amended.
- Construction or reconstruction pursuant to 16 U.S.C. § 742f, as amended, and affecting the overall size or configuration of buildings or other facilities (e.g., boat launch ramps, stormwater management system components, paved parking, boardwalks) on any Federally owned or leased property abutting or containing coastal waters or tidal wetlands.
- Comprehensive Conservation Plans for wildlife refuges and other wildlife areas, including land protection plans, pursuant to The National Wildlife Refuge System Improvement Act of 1997, as amended.

➢ Minerals Management Service (MSS)

- OCS oil and gas lease sales pursuant to the Outer Continental Shelf Lands Act (43 U.S.C. §§1331 et seq.), as amended.

➢ National Park Service (NPS)

- Acquisition or disposal of land pursuant to the Property Act (40 USC 101), as amended.
- Construction or reconstruction pursuant to 16 U.S.C. §§ 1-460, as amended, and affecting the overall size or configuration of buildings or other facilities (e.g., boat launch ramps, stormwater management system components, paved parking, boardwalks) on any federally owned or leased property abutting containing coastal waters or tidal wetlands.

Department of Transportation

➢ Federal Aviation Administration (FAA)

- Expansion, land clearing, new construction, safety improvements, and other federal development activities pursuant to 49 USC 106(n), as amended, and affecting the layout of airports, including proposals for new airports.
- Acquisition or disposal of land pursuant to 49 USC 106(n), as amended, and/or 49 USC 40110, as amended.
- Construction or reconstruction pursuant to 49 USC 106(n), as amended, and/or 49 USC 40110, as amended, affecting the overall size or configuration of buildings or other facilities (e.g., runways, taxiways, lighting systems, stormwater management system components, paved parking) on any federally owned or leased property.

APPENDIX B-3: CONNECTICUT ENFORCEABLE POLICIES (CONTINUED)

- Location, placement, construction, demolition, or removal of air navigation facilities pursuant to 49 USC 44502, as amended.

Environmental Protection Agency (EPA)

- Removal and remedial activities conducted under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended.
- Adoption of new or amendment to existing "new source performance standards" pursuant to 40 CFR Part 60, as amended, including Subparts D, Da and Db, as amended.
- Designation of open water dredged material disposal sites pursuant to the Clean Water Act (33 USC Section 1251 et.seq.), as amended, and/or the Marine Protection, Research and Sanctuaries Act (33 USC Section 1401 et.seq.), as amended.

General Services Administration

- Acquisition or disposal of land pursuant to the Property Act (40 USC 101), as amended.
- Construction or reconstruction pursuant to The Public Buildings Act of 1959, as amended, and affecting the overall size or configuration of buildings or other facilities (e.g., boat launch ramps, stormwater management system components, paved parking, boardwalks) on any Federally owned or leased property abutting or containing tidal or coastal waters, as defined in Connecticut General Statutes section 22a-93(5) or tidal wetlands as defined in Connecticut General Statues section 22a-29(2).

APPENDIX B-4: ENFORCEABLE POLICIES OF MASSACHUSETTS' COASTAL ZONE MANAGEMENT PROGRAM

(301 Code of MA Regulations 20.00 1978)

Authorization under MA General Laws (M.G.L.) c. 21

Coastal Resource and Enforceable Policy	Policy Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Water Quality— M.G.L. c. 21, §§ 26-53; M.G.L. c. 21A, § 13; M.G.L. c. 21A, § 14; M.G.L. c. 30, §§ 61-62H	▪ Ensure that point-source discharges in or affecting the coastal zone are consistent with federally approved state effluent limitations and water quality standards ▪ Ensure that nonpoint pollution controls promote the attainment of state surface water quality standards in the coastal zone ▪ Ensure that activities in or affecting the coastal zone conform to applicable state and federal requirements governing subsurface waste discharges	▪ No discharges or pollutants would result from the proposed action ▪ The proposed action would take place in the nearshore, coastal marine environment, not on land ▪ The proposed action would entail no discharge of wastes in the subsurface	▪ Proposed Action is Consistent
Habitat— M.G.L. c. 131, § 40; M.G.L. c. 130, § 105; M.G.L. c. 132A	▪ Protect coastal resource areas, including salt marshes, shellfish beds, dunes, beaches, barrier beaches, salt ponds, eelgrass beds, and fresh water wetlands for their important role as natural habitats ▪ Restore degraded or former wetland resources in coastal areas and ensure that activities in coastal areas do not further wetland degradation but instead take advantage of opportunities to engage in wetland restoration	▪ The proposed action would take place on an existing in-water structure or from a watercraft in the nearshore waters ▪ The proposed action would not take place on land or in the coastal margin, such as wetlands	▪ Proposed Action is Consistent

APPENDIX B-4: MASSACHUSETTS ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource and Enforceable Policy	Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Protected Areas— M.G.L. c'-21, § 17B; M.G.L. c. 9, §§ 26-27D; M.G.L. c. 21A, § 2(7); M.G.L. c. 4OC	▪ Assure preservation, restoration, and enhancement of complexes of coastal resources of regional or statewide significance through the Areas of Critical Environmental Concern (ACEC) Program ▪ Protect state and locally designated scenic rivers and state classified scenic rivers in the coastal zone ▪ Review and ensure that proposed developments in or near designated or registered historic districts or sites respect the preservation intent of the designation and that potential adverse effects are minimized	▪ The proposed action would take place in the nearshore, marine environment and no rivers would be involved in the action ▪ No construction or development activities are involved in the proposed action ▪ The proposed action site is not of statewide significance	▪ Proposed Action is Consistent
Energy— M.G.L. c. 164, §§ 69H-69Q; M.G.L. c. 132A	▪ Consider siting in alternative coastal locations for coastally dependent energy facilities ▪ Consider siting in areas outside of the coastal zone for non-coastally dependent energy facilities ▪ Weigh the environmental and safety impacts of locating proposed energy facilities at alternative sites	▪ The proposed action would entail no construction or development activities	▪ Not Applicable

APPENDIX B-4: MASSACHUSETTS ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource and Enforceable Policy	Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Coastal Hazards— M.G.L. c. 21A, § 14; Executive Order 149; M.G.L. c. 21A, § 2(7); M.G.L. c. 21A, § 13; M.G.L. c. 30, §§ 61-62H; M.G.L. c. 21, §§ 26-53	▪ Preserve, protect, restore, and enhance the beneficial functions of storm damage prevention and flood control provided by natural coastal landforms, such as dunes, beaches, barrier beaches, coastal banks, land subject to coastal storm flowage, salt marshes, and land under the ocean ▪ Ensure that construction in water bodies and contiguous land areas will minimize interference with water circulation and sediment transport ▪ Approve permits for flood or erosion control projects only when there will be no significant adverse effects on the project site or adjacent or downcoast areas ▪ Ensure that state and federally funded public-works projects proposed for location within the coastal zone will: ▫ not exacerbate existing hazards or damage natural buffers or other natural resources, ▫ be reasonably safe from flood and erosion related damage, ▫ not promote growth and development in hazard-prone or buffer areas, especially in Velocity zones and Areas of Critical Environmental Concern, and	▪ No construction or development activities would be involved in the proposed action ▪ No permits would be required for the proposed action ▪ The proposed action would entail use of an existing in-water structure ▪ No public funds would be involved with the performance or planning of the proposed action	▪ Proposed Action is Consistent

APPENDIX B-4: MASSACHUSETTS ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource and Enforceable Policy	Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Coastal Hazards (Continued)	▫ not be used on Coastal Barrier Resource Units for new or substantial reconstruction of structures in a manner inconsistent with the Coastal Barrier Resource/Improvement Acts ▪ Prioritize public funds for acquisition of hazardous coastal areas for conservation or recreational use and relocation of structures out of coastal high hazard areas, considering effects on use and manageability of the area		
Ports and Harbors Infrastructure— M.G.L. c. 91; M.G.L. c. III, §§ 150A-150B; M.G.L. c. 161A	▪ Ensure that dredging and disposal of dredged material minimizes adverse effects on water quality, physical processes, marine productivity, and public health ▪ Promote public benefit from channel dredging, ensuring that designated ports and developed harbors are given highest priority in the allocation of federal and state dredging funds ▪ Preserve and enhance the capacity of Designated Port Areas (DPA) to accommodate water-dependent industrial uses and prevent the exclusion of such uses from tidelands and any other DPA lands that a state agency owns, regulates, or has other legal jurisdiction over	▪ No dredging activities would be involved with the proposed action ▪ The proposed action would not be located at a port facility but at an existing in-water structure ▪ The proposed action would be in the nearshore marine environment ▪ No discharges or pollutants would be associated with the proposed action	▪ Not Applicable

APPENDIX B-4: MASSACHUSETTS ENFORCEABLE POLICIES (CONTINUED)

Coastal Resource and Enforceable Policy	Description/Purpose	Applicability to Proposed Action	Consistency of Proposed Action
Ports and Harbors Infrastructure (Continued)	▪ Ensure that dredging is consistent with marine environmental policies		
Ocean Resources— M.G.L. c. 132A; M.G.L. c. 30, §§ 61-62H; M.G.L. c. 21, §§ 54-58; M.G.L. c. III, § 17; M.G.L. c. III, § 127A	▪ Support the development of environmentally sustainable aquaculture, both for commercial and enhancement (public shellfish stocking) purposes ▪ Ensure that the review process regulating aquaculture facility sites (and access routes to those areas) protects ecologically significant resources (salt marshes, dunes, beaches, barrier beaches, and salt ponds) and minimizes adverse impacts upon the coastal and marine environment ▪ Consider extraction of marine minerals in areas of state jurisdiction, except where prohibited by the MA Ocean Sanctuaries Act, where and when the protection of fisheries, air and marine water quality, marine resources, and navigation and recreation can be assured ▪ Accommodate offshore sand and gravel mining in areas and in ways that will not adversely affect shoreline areas due to alteration of wave direction and dynamics, marine resources, and navigation. Mining of sand and gravel, when and where permitted, will be primarily for the purpose of beach nourishment	▪ The proposed action would not be located in the vicinity of any aquaculture sites ▪ No marine minerals would be extracted as part of the proposed action ▪ The proposed action would be located at an existing in-water structure or in the near vicinity to the structure ▪ No mining would be entailed in the proposed action ▪ No mining permits would be necessary for the proposed action	▪ Proposed Action is Consistent

APPENDIX B-4: MASSACHUSETTS ENFORCEABLE POLICIES (CONTINUED)

Federal Activities Subject to Massachusetts Consistency Review:

Listed activities or development projects that Massachusetts Coastal Zone Management (MCZM) will routinely review for federal consistency include:

1. Army Corps of Engineers (ACOE):
   a. project authorization for dredging, channel works, breakwaters, other navigational works, erosion control structures, beach replenishment, and dams;
   b. selection of disposal sites for dredged material from federal harbors and navigation channels, other navigation works, erosion control structures, beach replenishment, and dams;
   c. real property acquisition or disposal.
2. Department of Defense (DOD):
   a. location, design, construction or disposal of new or enlarged defense installations.
3. Department of Transportation (DOT):
   a. Federal Aviation Administration (FAA): location, design, construction, or disposal of aviation communication or air navigation facilities;
   b. United States Coast Guard (USCG): location, design, construction, enlargement, or disposal of Coast Guard facilities.
4. Department of Interior (DOI):
   a. Bureau of Land Management: oil and gas leasing on federal lands, including Outer Continental Shelf lease sales;
   b. National Park Service: location, design, construction, or disposal of facilities or real property acquisition or disposal;
   c. United States Fisheries and Wildlife Service: location, design, construction, or disposal of facilities or real property acquisition or disposal.
5. General Services Administration (GSA):
   a. location, design, construction or disposal of federal facilities;
   b. real property acquisition or disposal.
6. Amtrak, Conrail:
   a. railroad expansion, construction or abandonments

Activities requiring federal permits or licenses are subject to consistency review by Massachusetts' Coastal Zone Management Program.