Appendices A-I
of the
Draft Atlantic Fleet Active Sonar Training Environmental Impact Statement/ Overseas Environmental Impact Statement

Lead Agency:
Department of the Navy
Action Proponent:
United States Fleet Forces Command
For Additional Information:
Naval Command, Atlantic Division
Attention: Code EV22 (Atlantic Fleet Sonar Project Manager)
6506 Hampton Boulevard
Norfolk, VA 23508-1278
Phone: (757) 322-4767
Fax: (888) 875-6781
http://afasteis.gcsaic.com
Cooperating Agency:
Office of Protected Resources
National Marine Fisheries Service
1315 East-West Highway
Silver Spring, Maryland 20910-3226

Published February 2008

Abstract:
The Department of the Navy has prepared this Environmental Impact Statement/Overseas Environmental Impact Statement to analyze the potential environmental effects associated with the use of active sonar during Atlantic Fleet training exercises, maintenance, and research, development, test, and evaluation activities. The potential effects to physical, biological, and man-made environmental resources associated with the training alternatives were studied to determine how the proposed action could affect these resources.

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AGENCY CORRESPONDENCE

COOPERATING AGENCY CORRESPONDENCE

EARLY CONSULTATION CORRESPONDENCE

COOPERATING AGENCY CORRESPONDENCE

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, DC 20350-2000

IN REPLY REFER TO

5090
Ser N456C/7U158019
15 February 2007

Dr. William T. Hogarth
Assistant Administrator
National Oceanic and Atmospheric
Administration (NOAA) Fisheries
1315 East West Highway
Silver Springs, MD 20910

Dear Dr. Hogarth:

In accordance with the National Environmental Policy Act (NEPA), the Department of the Navy (Navy) has initiated preparation of an Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) to evaluate potential environmental effects associated with mine warfare (MIW) and antisubmarine warfare (ASW) active sonar training exercises along the east coast of the United States and the Gulf of Mexico. The Proposed Action will further our statutory obligations under Title 10 of the United States Code governing the roles and responsibilities of the Navy.

In order to adequately evaluate the potential environmental effects of the Proposed Action, the Navy and National Marine Fisheries Service (NMFS) will need to work together on acoustic effects to marine species protected under the Marine Mammal Protection Act (MMPA) and the Endangered Species Act (ESA). To assist in this effort, and in accordance with 40 CFR Section 1501.6 and the Council on Environmental Quality Cooperating Agency guidance issued on 30 January 2002, the Navy requests NMFS serve as a cooperating agency for the development of this "Atlantic Fleet Active Sonar Training" (AFAST) EIS/OEIS.

The Proposed Action for the AFAST EIS/OEIS involves:

- MIW and ASW sonar training exercises including Independent Unit Level Training, Coordinated Unit Level Training, and Strike Group Training exercises.
- Active sonar training exercises including air, surface, and subsurface sonar platforms that are manned by personnel who require training in order to maintain certification and readiness for deployment.
- Identifying areas in which to conduct ASW and MIW active sonar training along the east coast and Gulf of Mexico.

The purpose of the proposed action is to provide and maintain the long-term viability of Navy active sonar training for the U.S. Atlantic Fleet ship, submarine, and aircraft crews to meet deployment requirements and maintain proficiency of ASW and MIW skills. The need for the proposed action is to meet the legal mandate for the Chief of Naval Operations to organize, equip, and train all naval forces for combat as directed in 10 U.S.C. 5062. Navy forces must train to deal with the threat of modern quiet submarines; the most effective detection technology available is active sonar detection. In addition, Navy forces must train to detect mines which can prevent access to strategic areas, damage fleet forces, and disrupt commerce.

The EIS/OEIS will consider two Action Alternatives to accomplish these objectives, in addition to the No Action Alternative. The No Action Alternative is the continuation of year-round training within and adjacent to Navy East Coast and Gulf of Mexico Operating Areas.

The EIS/OEIS will address foreseeable activities in the particular geographical areas affected by the No-Action Alternative and action alternatives. This EIS/OEIS will include acoustic exposure modeling and an effects analysis for marine mammals. The effects analysis will be based upon validated Navy acoustic models and agreed upon Navy/NMFS evaluation methodology. In addition, other environmental resource areas that will be addressed, as applicable, in the EIS/OEIS include the physical environment; socioeconomic resources; and biological resources including wildlife, threatened and endangered species, marine mammals, migratory birds, fish and fisheries, essential fish habitat, coastal, marine and benthic communities, and special biological resource areas.

As the lead agency, the Navy will be responsible for overseeing preparation of the EIS/OEIS, which will include, but not be limited to the following:

- Gathering all necessary background information and preparing the EIS/OEIS and all necessary authorization requests associated with acoustic issues.
- Working with NMFS personnel to determine the method of estimating potential effects to protected marine species, including threatened and endangered species.
- Determining the scope of the EIS/OEIS, including the alternatives evaluated.
- Circulating the appropriate NEPA documentation to the general public and any other interested parties.
- Scheduling and supervising meetings held in support of the NEPA process, and compiling any comments received.
- Maintaining an administrative record and responding to any Freedom of Information Act requests relating to the EIS/OEIS.

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Navy requests that NMFS, as cooperating agency, provide support as follows:

- Provide timely comments after agency information meetings and on working drafts of the EIS/OEIS documents. The Navy requests that comments on draft EIS/OEIS documents be provided within 21 calendar days.

- Respond to Navy requests for information, in particular related to review of the acoustic effects analyses and evaluation of effects associated with protection and mitigation measures.

- Coordinating, to the maximum extent practicable, any public comment periods necessary in the MMPA authorization process with the Navy's NEPA public comment periods, including discussion of coordinated comment response for consideration in the Final EIS/OEIS and NMFS rulemaking processes.

- Participate, as necessary, in meetings hosted by the Navy for discussion of EIS/OEIS related issues.

- Adhere to the overall project schedule agreed upon by the Navy and NMFS.

- Provide a formal, written response to this request.

The Navy appreciates your consideration of this request. My point of contact for this action is Ms. Karen M. Foskey, (703) 602-2859, email: karen.foskey@navy.mil.

Sincerely,

J.A. SYMONDS
Rear Admiral, U.S. Navy
Director, Environmental Readiness Division

Copy to:
ASN (I&E)
DASN (E)
OAGC (I&E)
FLTFORCOM N77
CNRSE N45
CNRMA N45
NAVFACLANT EV2

3

1

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
1315 East-West Highway
Silver Spring, Maryland 20910
THE DIRECTOR

MAR 12 2007

Admiral J.A. Symonds
Director, Environmental Readiness Division
Department of the Navy
2000 Navy Pentagon
Washington, DC 20350-2000

Dear Admiral Symonds:

Thank you for your letter requesting the National Marine Fisheries Service (NOAA Fisheries) be a cooperating agency in the preparation of an Environmental Impact Statement (EIS) to evaluate potential environmental effects associated with mine warfare (MIW) and antisubmarine warfare (ASW) active sonar training exercises along the east coast of the United States and the Gulf of Mexico. We support the Navy's decision to prepare an EIS for this Atlantic Fleet Active Sonar Training (AFAST) and agree to be a cooperating agency, due, in part, to our responsibilities under section 101(a)(5)(A) of the Marine Mammal Protection Act (MMPA) and section 7 of the Endangered Species Act. We met with the Navy on February 7, 2007, and are currently working on a joint plan that will address how NOAA Fisheries and the Navy will cooperate during the development of multiple Navy EISs for Training Ranges and Major Exercises, including AFAST. Until the joint plan is complete, NOAA Fisheries will make every effort to support the Navy in the specific ways described in the Navy's February 15, 2007, letter.

If you need any additional information, please contact Ms. Jolie Harrison, (301) 713-2289, ext. 166.

Sincerely,

William T. Hogarth, Ph.D.

THE ASSISTANT ADMINISTRATOR
FOR FISHERIES

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EARLY CONSULTATION CORRESPONDENCE

DEPARTMENT OF THE NAVY
OFFICE OF THE CHIEF OF NAVAL OPERATIONS
2000 NAVY PENTAGON
WASHINGTON, DC 20350-2000

IN REPLY REFER TO

5090
Ser N456K/7U158231
17 August 2007

Mr. P. Michael Payne
Division Chief
Permits, Conservation, and Education Division
Office of Protected Resources
National Marine Fisheries Service (NMFS)
National Oceanic and Atmospheric Administration
B-SSMC3 Room 13821
1315 East-West Highway
Silver Spring, MD 20910-3282

Dear Mr. Payne:

The Commander, U.S. Fleet Forces Command (USFF) is preparing an Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS) to assess the potential environmental impacts associated with the conduct of Anti-Submarine Warfare (ASW) and Mine Warfare (MIW) activities within the Atlantic Fleet Area of Responsibility (Atlantic Fleet Active Sonar Training (AFAST) EIS/OEIS). The proposed action is to provide active sonar training for U.S. Navy Atlatnic fleet ship, submarine and aircraft crews to meet the requirements of the Fleet Readiness Training Plan (FRTP) and stay proficient in ASW and MIW skills. As part of the EIS/OEIS analysis, the Navy seeks to define where active sonar activities will occur within and adjacent to existing operating areas (OPAREAs) located along the East Coast of the United States and the Gulf of Mexico. These areas will be used to accommodate ASW, MIW and Improved Extended Echo Ranging (IEER) explosive sonobuoy training and research, development, test and evaluation (RDT&E) activities.

Conduct of these activities will likely result in acoustic exposure of marine mammals listed under the Marine Mammal Protection Act (MMPA) from active sonar and IEER , and likely requires a Letter of Authorization (LOA). As such, the Navy will be submitting an LOA request to your office in the coming months for these activities. Navy has prepared a draft of this LOA request and has been working with your staff on its contents. It is expected that species for which an LOA is sought will include species listed under the Endangered Species Act (ESA).

As an applicant for an MMPA permit, the Navy requests your office initiate early consultation procedures with the Endangered Species Division, in accordance with Section 7(a)(3) of the ESA, and its implementing regulations at 50 CFR §402.11. In accordance with these regulations, the Navy's preliminary draft AFAST EIS/OEIS provided to your office on August 8, 2007 through our cooperating agency relationship under the National Environmental Policy Act (NEPA) serves as the Navy's definitive proposal outlining the action. As previously stated, the effects of the proposed action for purposes of the MMPA permit will be from potential exposure to acoustic energy from active sonar and the IEER impulsive source. The level of magnitude of these effects is still being modeled, and will be included in the Navy's request for an LOA. In addition, the consideration of specific geographic locations of ASW and MIW training and testing will be informed by the public participation process afforded under NEPA.

Title 10, Section 5062 of the United States Code requires the Navy to be "organized, trained, and equipped primarily for prompt and sustained combat incident to operations at sea." The current and emerging training and RDT&E activities that are being analyzed are conducted in fulfillment of this legal requirement. Thus, in accordance with 50 CFR §402.11(b), this letter serves as the Navy's certification that it has a definite proposal and intends to implement the proposal should an MMPA authorization be obtained from your office.

We appreciate your continued support in helping us to meet our Section 7 responsibilities. My point of contact for this matter is Ms. Elizabeth Phelps 703-604-5420 or elizabeth.phelps@navy.mil, or Commander, U.S. Fleet Forces point of contact is Mr. Jene Nissen, 757-836-5221 or richard.j.nissen@navy.mil.

Sincerely,

R E Tickle

Ronald Tickle
Head, Operational Environmental
Readiness and Planning Branch
Environmental Readiness Division
(OPNAV N45)

Copy to:
OPNAV N43
USFF N77

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APPENDIX B

DISTRIBUTION LIST AND STAKEHOLDER LIST

DISTRIBUTION LIST

The individuals, agencies, and organizations listed in Table B-1 received a CD with a copy of the Atlantic Fleet Active Sonar Training (AFAST) Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS). Please note that not all states have a clearinghouse. For these states, a copy of the AFAST EIS/OEIS was sent to the most relevant state agency. Please refer to Table B-2, Stakeholder List, for a list of individuals, agencies, and organizations that received notification of the availability of the AFAST EIS/OEIS. Upon request, a copy of the AFAST EIS/OEIS will be sent to these individuals, agencies, and organizations.

Table B-1. AFAST EIS/OEIS Distribution List

STATE CLEARINGHOUSES OR APPROPRIATE STATE AGENCY	
Maine	
Joyce Benson State Planning Office 184 State Street 38 State House Station Augusta, Maine 04333	
New Hampshire	
Amy Ignatius, Acting Director New Hampshire Office of Energy and Planning Attn: Intergovernmental Review Process Mark Toussiant 57 Regional Drive Concord, New Hampshire 03301	
Massachusetts	
Rick Sullivan, Commissioner Department of Conservation and Recreation 251 Causeway Street, Suite 600 Boston, MA 02114-2104	
Rhode Island	
Joyce Karger Department of Administration One Capitol Hill Providence, Rhode Island 02908	
Connecticut	
Karl J. Wagener, Executive Director Connecticut Council on Environmental Quality 79 Elm Street Hartford, CT 06106	

Table B-1. AFAST EIS/OEIS Distribution List Cont'd

STATE CLEARINGHOUSES OR APPROPRIATE STATE AGENCY Cont'd	
New York	
Pete Grannis, Commissioner New York State Department of Environmental Conservation 625 Broadway Albany, NY 12233-1011	
Delaware	
Jennifer L. Carlson Associate Fiscal and Policy Analyst Office of Management and Budget Budget Development, Planning & Administration Haslet Armory, Third Floor 122 William Penn Street Dover, Delaware 19901	
New Jersey	
Lisa P. Jackson, Commissioner New Jersey Department of Environmental Protection 401 E State Street, 7th Floor, East Wing P.O. Box 402 Trenton, NJ 08625-0492	
Maryland	
Linda C. Janey, J.D. Director, Maryland State Clearinghouse For Intergovernmental Assistance 301 West Preston Street, Room 1104 Baltimore, Maryland 21201-2305	
Virginia	
David K. Paylor, Director Virginia Department of Environmental Quality 629 East Main Street P.O. Box 1105 Richmond, VA 23218	
North Carolina	
Chrys Baggett State Environmental Review Clearinghouse NC Department of Administration 1301 Mail Service Center Raleigh, NC 27699-1301	

Table B-1. AFAST EIS/OEIS Distribution List Cont'd

STATE CLEARINGHOUSES OR APPROPRIATE STATE AGENCY Cont'd	
South Carolina	
Jean Ricard Office of State Budget 1201 Main Street, Suite 870 Columbia, South Carolina 29201	
Georgia	
Barbara Jackson Georgia State Clearinghouse 270 Washington Street, SW, 8th Floor Atlanta, Georgia 30334	
Florida	
Lauren P. Milligan Florida State Clearinghouse Florida Department of Environmental Protection 3900 Commonwealth Blvd. Mail Station 47 Tallahassee, Florida 32399-3000	
Alabama	
Office of the Director Alabama Department of Environmental Management P.O. Box 301463 Montgomery, AL 36130-1463	
Mississippi	
Janet Riddell Clearinghouse Officer Department of Finance and Administration 1301 Woolfolk Building, Suite E 501 North West Street Jackson, Mississippi 39201	
Louisiana	
Secretary Mike McDaniel, Ph.D. Louisiana Department of Environmental Quality Office of the Secretary P.O. Box 4301 Baton Rouge, LA 70821-4301	

Table B-1. AFAST EIS/OEIS Distribution List Cont'd

STATE CLEARINGHOUSES OR APPROPRIATE STATE AGENCY Cont'd	
Texas	
Denise S. Francis Director, State Grants Team State Grants Division Office of the Governor P.O. Box 12428 Austin, Texas 78711	
FEDERAL AGENCIES	
U.S. Environmental Protection Agency	
US Environmental Protection Agency Office of Federal Activities EIS Filing Section Mail Code 2252-A, Room 7241 Ariel Rios Building (South Oval Lobby) 1200 Pennsylvania, NW Washington, DC 20460	Mr. Robert Varney Regional Administrator US EPA New England, Region I 1 Congress Street, Suite 1100 Boston, MA 02114
Mr. Alan J. Steinberg Regional Administrator US EPA Region II 290 Broadway New York, NY 10007	Mr. Thomas E. Slenkamp Deputy Director Office of Environmental Programs US EPA Region III 1650 Arch Street Philadelphia, PA 19103
Mr. Jimmy Palmer Regional Administrator US EPA Region IV Sam Nunn Atlanta Federal Center 61 Forsyth Street SW Atlanta, GA 30303	Mr. Richard Greene Regional Administrator US EPA Region VI Fountain Place, 12th Floor, Suite 1200 1445 Ross Avenue Dallas, TX 75202
National Oceanic & Atmospheric Administration	
Kyle Baker NMFS Southeast Regional Office 263 13th Avenue South St. Petersburg, FL 33701	Leila Hatch Stellwagen Bank National Marine Sanctuary 175 Edward Foster Road Scituate, MA 02066
Keith Mullen Southeast Fisheries Science Center 75 Virginia Beach Drive Miami, FL 33149	Becky Shortland Gray's Reef National Marine Sanctuary 10 Ocean Science Circle Savannah, GA 31411
Kristen Koyama NMFS Northeast Regional Office 1 Blackburn Drive Gloucester, MA 01930	Jolie Harrison NMFS Headquarters 1315 East-West Highway Silver Spring, MD 20910

Table B-1. AFAST EIS/OEIS Distribution List Cont'd

FEDERAL AGENCIES Cont'd	
Richard Merrick Northeast Fisheries Science Center 166 Water Street Woods Hole, MA 02543-1026	Craig Johnson NMFS Headquarters 1315 East-West Highway Silver Spring, MD 20910
U.S. Army Corps of Engineers	
LTG Robert L. Van Antwerp Commander US Army Corps of Engineers 441 G Street Northwest Washington DC 20314-1000	
Marine Mammal Commission	
Dr. Robert Ginier Scientific Program Director Marine Mammal Commission 4340 East-West Highway, Room 905 Bethesda, MD 20814	
U. S. Navy	
Tom Egeland Office of the Assistant Secretary of the Navy (Installations and Environment) 1000 Navy Pentagon Washington, D.C. 20350-1000	Karen Foskey, N456H Chief of Naval Operations (N45) 2511 Jefferson Davis Highway Suite 2000 Arlington, VA 22202
Tom Fetherston NAVSEA Newport Building 1351/412H 1176 Howell Street Newport, RI 02841	
Appointed Councils	
Mr. Wayne Swingle Executive Director Gulf of Mexico Fishery Management Council 2203 N. Lois Avenue, Suite 1100 Tampa, FL 33607	Mr. Daniel T. Furlong Executive Director Mid-Atlantic Fishery Management Council Federal Building, Suite 2115 300 S. New Street Dover, DE 19904
Mr. Paul J. Howard Executive Director New England Fishery Management Council 50 Water Street, Mill 2 Newburyport, MA 01950	Mr. Robert Mahood Executive Director South Atlantic Fishery Management Council 4055 Faber Place Drive, Suite 201 North Charleston, SC 29405

Table B-1. AFAST EIS/OEIS Distribution List Cont'd

INDIVIDUALS	
Axel Westerberg New London, CT	Mark Sayger Havelock, NC
Andrew J. McGuckin Morehead City, NC	Zoey Hanson-Dibello Norwich, CT
Debbie Daloisio Panama City Beach, FL	John Eisler Jacksonville, FL
Deb Venn Jacksonville, FL	Rafael Facundo Middleburg, FL
Greg Wahl Charleston, SC	Rick Spaulding Bainbridge Island, WA
INFORMATION REPOSITORIES	
Portland Public Library 5 Monument Square Portland, ME 04101	Boston Public Library - Central Library 700 Boylston Street Boston, MA 02116
Kirn Memorial Library 301 East City Hall Avenue Norfolk, VA 23510	New London Public Library 63 Huntington Street New London, CT 06320
Charleston County Public Library 68 Calhoun Street Charleston, SC 29401	Carteret County Public Library 210 Turner Street Morehead City, NC 28516
Bay County Public Library 25 West Government Street Panama City, FL 32402	Jacksonville Public Library 303 North Laura Street Jacksonville, FL 32202
Corpus Christi Public Library Central Library 805 Comanche Corpus Christi, TX 78401	Anne Arundel County Public Library 1410 West Street Annapolis, MD 21401
Camden County Public Library 1410 Highway 40 East Kingsland, GA 31548	

STAKEHOLDER LIST

The individuals, agencies, and organizations listed in Table B-2 received notification of the availability of the AFAST EIS/OEIS. Copies of the AFAST EIS/OEIS will be distributed to these individuals, agencies, and organizations at their request.

Table B-2. AFAST EIS/OEIS Stakeholder List

CONGRESSIONAL REPRESENTATIVES	
Maine	
The Honorable Susan M. Collins US Senate 413 Dirksen Senate Office Building Washington, DC 20510	The Honorable Olympia J. Snowe US Senate 154 Russell Senate Office Building Washington, DC 20510
The Honorable Tom Allen US Congressman 1st District, Maine 1127 Longworth House Office Building Washington, DC 20515	The Honorable Mike Michaud US Congressman 2nd District, Maine 1724 Longworth House Office Building Washington, DC 20515
New Hampshire	
The Honorable Judd Gregg US Senate 393 Russell Senate Office Building Washington, DC 20510	The Honorable John E. Sununu US Senate 111 Russell Senate Office Building Washington, DC 20510
The Honorable Carol Shea-Porter US Congresswoman 1st District, New Hampshire 1508 Longworth House Office Building Washington, DC 20515	The Honorable Paul Hodes US Congressman 2nd District, New Hampshire 506 Cannon House Office Building Washington, DC 20515
Massachusetts	
The Honorable Edward M. Kennedy US Senate 317 Russell Senate Office Building Washington, DC 20510	The Honorable John F. Kerry US Senate 304 Russell Senate Office Building Washington, DC 20510
The Honorable John W. Olver US Congressman 1st District, Massachusetts 1111 Longworth House Office Building Washington, DC 20515	The Honorable Richard E. Neal US Congressman 2nd District, Massachusetts 2208 Rayburn House Office Building Washington, DC 20515

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

CONGRESSIONAL REPRESENTATIVES Cont'd	
The Honorable James P. McGovern US Congressman 3rd District, Massachusetts 438 Cannon House Office Building Washington, DC 20515	The Honorable Barney Frank US Congressman 4th District, Massachusetts 2252 Rayburn House Office Building Washington, DC 20515
The Honorable Martin T. Meehan US Congressman 5th District, Massachusetts 2229 Rayburn House Office Building Washington, DC 20515	The Honorable John F. Tierney US Congressman 6th District, Massachusetts 2238 Rayburn House Office Building Washington, DC 20515
The Honorable Edward J. Markey US Congressman 7th District, Massachusetts 2108 Rayburn House Office Building Washington, DC 20515	The Honorable Michael E. Capuano US Congressman 8th District, Massachusetts 1530 Longworth House Office Building Washington, DC 20515
The Honorable Stephen F. Lynch US Congressman 9th District, Massachusetts 221 Cannon House Office Building Washington, DC 20515	The Honorable William D. Delahunt US Congressman 10th District, Massachusetts 2454 Rayburn House Office Building Washington, DC 20515
Rhode Island	
The Honorable Sheldon Whitehouse US Senate 502 Hart Senate Office Building Washington, DC 20510	The Honorable Jack Reed US Senate 728 Hart Senate Office Building Washington, DC 20510
The Honorable Patrick J. Kennedy US Congressman 1st District, Rhode Island 407 Cannon House Office Building Washington, DC 20515	The Honorable James R. Langevin US Congressman 2nd District, Rhode Island 109 Cannon House Office Building Washington, DC 20515
Connecticut	
The Honorable Christopher J. Dodd US Senate 448 Russell Senate Office Building Washington, DC 20510	The Honorable Joseph I. Lieberman US Senate 706 Hart Senate Office Building Washington, DC 20510
The Honorable John B. Larson US Congressman 1st District, Connecticut 1005 Longworth House Office Building Washington, DC 20515	The Honorable Joe Courtney US Congressman 2nd District, Connecticut 215 Cannon House Office Building Washington, DC 20515

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

CONGRESSIONAL REPRESENTATIVES Cont'd	
The Honorable Rosa L. DeLauro US Congresswoman 3rd District, Connecticut 2262 Rayburn House Office Building Washington, DC 20515	The Honorable Christopher Shays US Congressman 4th District, Connecticut 1126 Longworth House Office Building Washington, DC 20515
The Honorable Christopher Murphy US Congressman 5th District, Connecticut 501 Cannon House Office Building Washington, DC 20515	
New York	
The Honorable Hillary Rodham Clinton US Senate 476 Russell Senate Office Building Washington, DC 20510	The Honorable Charles E. Schumer US Senate 313 Hart Senate Office Building Washington, DC 20510
The Honorable Timothy H. Bishop US Congressman 1st District, New York 225 Cannon House Office Building Washington, DC 20515	The Honorable Steve Israel US Congressman 2nd District, New York 432 Cannon House Office Building Washington, DC 20515
The Honorable Peter T. King US Congressman 3rd District, New York 436 Cannon House Office Building Washington, DC 20515	The Honorable Carolyn B. McCarthy US Congresswoman 4th District, New York 106 Cannon House Office Building Washington, DC 20515
The Honorable Gary L. Ackerman US Congressman 5th District, New York 2243 Rayburn House Office Building Washington, DC 20515	The Honorable Gregory W. Meeks US Congressman 6th District, New York 2342 Rayburn House Office Building Washington, DC 20515
The Honorable Joseph Crowley US Congressman 7th District, New York 312 Cannon House Office Building Washington, DC 20515	The Honorable Jerrod Nadler US Congressman 8th District, New York 2334 Rayburn House Office Building Washington, DC 20515
The Honorable Anthony D. Weiner US Congressman 9th District, New York 1122 Longworth House Office Building Washington, DC 20515	The Honorable Edolphus Towns US Congressman 10th District, New York 2232 Rayburn House Office Building Washington, DC 20515

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

CONGRESSIONAL REPRESENTATIVES Cont'd	
The Honorable Yvette Clarke US Congresswoman 11th District, New York 1029 Longworth House Office Building Washington, DC 20515	The Honorable Nydia M. Velazquez US Congresswoman 12th District, New York 2466 Rayburn House Office Building Washington, DC 20515
The Honorable Vito Fossella US Congressman 13th District, New York 2453 Rayburn House Office Building Washington, DC 20515	The Honorable Carolyn B. Maloney US Congresswoman 14th District, New York 2331 Rayburn House Office Building Washington, DC 20515
The Honorable Charles B. Rangel US Congressman 15th District, New York 2354 Rayburn House Office Building Washington, DC 20515	The Honorable Jose E. Serrano US Congressman 16th District, New York 2227 Rayburn House Office Building Washington, DC 20515
The Honorable Eliot L. Engel US Congressman 17th District, New York 2161 Rayburn House Office Building Washington, DC 20515	The Honorable Nita M. Lowey US Congresswoman 18th District, New York 2329 Rayburn House Office Building Washington, DC 20515
The Honorable John Hall US Congressman 19th District, New York 1217 Longworth House Office Building Washington, DC 20515	The Honorable Kirsten Gillibrand US Congresswoman 20th District, New York 120 Cannon House Office Building Washington, DC 20515
The Honorable Michael R. McNulty US Congressman 21st District, New York 2210 Rayburn House Office Building Washington, DC 20515	The Honorable Maurice D. Hinchey US Congressman 22nd District, New York 2431 Rayburn House Office Building Washington, DC 20515
The Honorable John M. McHugh US Congressman 23rd District, New York 2366 Rayburn House Office Building Washington, DC 20515	The Honorable Michael Arcuri US Congressman 24th District, New York 327 Cannon House Office Building Washington, DC 20515
The Honorable James T. Walsh US Congressman 25th District, New York 2372 Rayburn House Office Building Washington, DC 20515	The Honorable Thomas M. Reynolds US Congressman 26th District, New York 332 Cannon House Office Building Washington, DC 20515

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

CONGRESSIONAL REPRESENTATIVES Cont'd	
The Honorable Brian Higgins US Congressman 27th District, New York 431 Cannon House Office Building Washington, DC 20515	The Honorable Louise McIntosh Slaughter US Congresswoman 28th District, New York 2469 Rayburn House Office Building Washington, DC 20515
The Honorable John R. Kuhl, Jr. US Congressman 29th District, New York 1505 Longworth House Office Building Washington, DC 20515	
Delaware	
The Honorable Joseph Biden US Senate 201 Russell Senate Office Building Washington, DC 20510	The Honorable Thomas Carper US Senate 513 Hart Senate Office Building Washington, DC 20510
The Honorable Michael Castle US Congressman At Large, Delaware 1233 Longworth House Office Building Washington, DC 20515	
New Jersey	
The Honorable Frank R. Lautenberg US Senate 324 Hart Senate Office Building Washington, DC 20510	The Honorable Robert Menendez US Senate 317 Hart Senate Office Building Washington, DC 20510
The Honorable Robert E. Andrews US Congressman 1st District, New Jersey 2439 Rayburn House Office Building Washington, DC 20515	The Honorable Frank A. LoBiondo US Congressman 2nd District, New Jersey 2427 Rayburn House Office Building Washington, DC 20515
The Honorable Jim Saxton US Congressman 3rd District, New Jersey 2217 Rayburn House Office Building Washington, DC 20515	The Honorable Christopher H. Smith US Congressman 4th District, New Jersey 2373 Rayburn House Office Building Washington, DC 20515
The Honorable Scott Garrett US Congressman 5th District, New Jersey 1318 Longworth House Office Building Washington, DC 20515	The Honorable Frank Pallone, Jr. US Congressman 6th District, New Jersey 237 Cannon House Office Building Washington, DC 20515

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

CONGRESSIONAL REPRESENTATIVES Cont'd	
The Honorable Michael A. Ferguson US Congressman 7th District, New Jersey 214 Cannon House Office Building Washington, DC 20515	The Honorable Bill Pascrell, Jr. US Congressman 8th District, New Jersey 2464 Rayburn House Office Building Washington, DC 20515
The Honorable Steven R. Rothman US Congressman 9th District, New Jersey 2303 Rayburn House Office Building Washington, DC 20515	The Honorable Donald M. Payne US Congressman 10th District, New Jersey 2209 Rayburn House Office Building Washington, DC 20515
The Honorable Rodney P. Frelinghuysen US Congressman 11th District, New Jersey 2442 Rayburn House Office Building Washington, DC 20515	The Honorable Rush D. Holt US Congressman 12th District, New Jersey 1019 Longworth House Office Building Washington, DC 20515
Maryland	
The Honorable Barbara Mikulski US Senate 503 Hart Senate Office Building Washington, DC 20510	The Honorable Benjamin Cardin US Senate 509 Hart Senate Office Building Washington, DC 20510
The Honorable Wayne Gilchrest US Congressman 1st District, Maryland 2245 Rayburn House Office Building Washington, DC 20515	The Honorable C.A. Dutch Ruppersberger US Congressman 2nd District, Maryland 1730 Longworth House Office Building Washington, DC 20515
The Honorable John Sarbanes US Congressman 3rd District, Maryland 426 Cannon House Office Building Washington, DC 20515	The Honorable Albert R. Wynn US Congressman 4th District, Maryland 2470 Rayburn House Office Building Washington, DC 20515
The Honorable Steny H. Hoyer US Congressman 5th District, Maryland 1705 Longworth House Office Building Washington, DC 20515	The Honorable Roscoe G. Bartlett US Congressman 6th District, Maryland 2412 Rayburn House Office Building Washington, DC 20515
The Honorable Elijah E. Cummings US Congressman 7th District, Maryland 2235 Rayburn House Office Building Washington, DC 20515	The Honorable Christopher Van Hollen, Jr. US Congressman 8th District, Maryland 1707 Longworth House Office Building Washington, DC 20515

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

CONGRESSIONAL REPRESENTATIVES Cont'd	
Virginia	
The Honorable Jim Webb US Senate 144 Russell Senate Office Building Washington, DC 20510	The Honorable John Warner US Senate 225 Russell Senate Office Building Washington, DC 20510
The Honorable JoAnn Davis US Congresswoman 1st District, Virginia 1123 Longworth House Office Building Washington, DC 20515	The Honorable Thelma D. Drake US Congresswoman 2nd District, Virginia 1208 Longworth House Office Building Washington, DC 20515
The Honorable Robert C. Scott US Congressman 3rd District, Virginia 1201 Longworth House Office Building Washington, DC 20515	The Honorable J. Randy Forbes US Congressman 4th District, Virginia 307 Cannon House Office Building Washington, DC 20515
The Honorable Virgil H. Goode, Jr. US Congressman 5th District, Virginia 1520 Longworth House Office Building Washington, DC 20515	The Honorable Bob Goodlatte US Congressman 6th District, Virginia 2240 Rayburn House Office Building Washington, DC 20515
The Honorable Eric Cantor US Congressman 7th District, Virginia 329 Cannon House Office Building Washington, DC 20515	The Honorable James P. Moran US Congressman 8th District, Virginia 2239 Rayburn House Office Building Washington, DC 20515
The Honorable Rick Boucher US Congressman 9th District, Virginia 2187 Rayburn House Office Building Washington, DC 20515	The Honorable Frank R. Wolf US Congressman 10th District, Virginia 241 Cannon House Office Building Washington, DC 20515
The Honorable Tom Davis US Congressman 11th District, Virginia 2348 Rayburn House Office Building Washington, DC 20515	
North Carolina	
The Honorable Richard Burr US Senate 217 Russell Senate Office Building Washington, DC 20510	The Honorable Elizabeth Dole US Senate 555 Dirksen Senate Office Building Washington, DC 20510

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

CONGRESSIONAL REPRESENTATIVES Cont'd	
The Honorable G.K. Butterfield US Congressman 1st District, North Carolina 413 Cannon House Office Building Washington, DC 20515	The Honorable Bob Etheridge US Congressman 2nd District, North Carolina 1533 Longworth House Office Building Washington, DC 20515
The Honorable Walter B. Jones US Congressman 3rd District, North Carolina 2333 Rayburn House Office Building Washington, DC 20515	The Honorable David Price US Congressman 4th District, North Carolina 2162 Rayburn House Office Building Washington, DC 20515
The Honorable Virginia Foxx US Congresswoman 5th District, North Carolina 430 Cannon House Office Building Washington, DC 20515	The Honorable Howard Coble US Congressman 6th District, North Carolina 2468 Rayburn House Office Building Washington, DC 20515
The Honorable Mike McIntyre US Congressman 7th District, North Carolina 2437 Rayburn House Office Building Washington, DC 20515	The Honorable Robin Hayes US Congressman 8th District, North Carolina 130 Cannon House Office Building Washington, DC 20515
The Honorable Sue Myrick US Congresswoman 9th District, North Carolina 230 Cannon House Office Building Washington, DC 20515	The Honorable Patrick McHenry US Congressman 10th District, North Carolina 224 Cannon House Office Building Washington, DC 20515
The Honorable Heath Schuler US Congressman 11th District, North Carolina 512 Cannon House Office Building Washington, DC 20515	The Honorable Mel Watt US Congressman 12th District, North Carolina 2236 Rayburn House Office Building Washington, DC 20515
The Honorable Brad Miller US Congressman 13th District, North Carolina 1722 Longworth House Office Building Washington, DC 20515	
South Carolina	
The Honorable Jim DeMint US Senate 340 Russell Senate Office Building Washington, DC 20510	The Honorable Lindsay Graham US Senate 290 Russell Senate Office Building Washington, DC 20510

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

CONGRESSIONAL REPRESENTATIVES Cont'd	
The Honorable Henry Brown US Congressman 1st District, South Carolina 1124 Longworth House Office Building Washington, DC 20515	The Honorable Joe Wilson US Congressman 2nd District, South Carolina 212 Cannon House Office Building Washington, DC 20515
The Honorable James Clyburn US Congressman 6th District, South Carolina 2135 Rayburn House Office Building Washington, DC 20515	
Georgia	
The Honorable Saxby Chambliss US Senate 416 Russell Senate Office Building Washington, DC 20510	The Honorable Johnny Isakson US Senate 120 Russell Senate Office Building Washington, DC 20510
The Honorable Jack Kingston US Congressman 1st District, Georgia 2368 Rayburn House Office Building Washington, DC 20515	The Honorable John Barrow US Congressman 12th District, Georgia 213 Cannon House Office Building Washington, DC 20515
Florida	
The Honorable Mel Martinez US Senate 356 Hart Senate Office Building Washington, DC 20510	The Honorable Bill Nelson US Senate 716 Hart Senate Office Building Washington, DC 20510
The Honorable Jeff Miller US Congressman 1st District, Florida 1535 Longworth House Office Building Washington, DC 20515	The Honorable F. Allen Boyd, Jr. US Congressman 2nd District, Florida 1227 Longworth House Office Building Washington, DC 20515
The Honorable Corrine Brown US Congresswoman 3rd District, Florida 2336 Rayburn House Office Building Washington, DC 20515	The Honorable Ander Crenshaw US Congressman 4th District, Florida 127 Cannon House Office Building Washington, DC 20515
The Honorable Ginny Brown-Waite US Congresswoman 5th District, Florida 414 Cannon House Office Building Washington, DC 20515	The Honorable Cliff Stearns US Congressman 6th District, Florida 2370 Rayburn House Office Building Washington, DC 20515

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

CONGRESSIONAL REPRESENTATIVES Cont'd	
The Honorable John Mica US Congressman 7th District, Florida 2313 Rayburn House Office Building Washington, DC 20515	The Honorable Ric Keller US Congressman 8th District, Florida 419 Cannon House Office Building Washington, DC 20515
The Honorable Gus Bilirakis US Congressman 9th District, Florida 1630 Longworth House Office Building Washington, DC 20515	The Honorable Bill Young US Congressman 10th District, Florida 2407 Rayburn House Office Building Washington, DC 20515
The Honorable Kathy Castor US Congresswoman 11th District, Florida 317 Cannon House Office Building Washington, DC 20515	The Honorable Adam Putnam US Congressman 12th District, Florida 1725 Longworth House Office Building Washington, DC 20515
The Honorable Vern Buchanan US Congressman 13th District, Florida 1516 Longworth House Office Building Washington, DC 20515	The Honorable Connie Mack US Congressman 14th District, Florida 115 Cannon House Office Building Washington, DC 20515
The Honorable Dave Weldon US Congressman 15th District, Florida 2347 Rayburn House Office Building Washington, DC 20515	The Honorable Tim Mahoney US Congressman 16th District, Florida 1541 Longworth House Office Building Washington, DC 20515
The Honorable Kendrick Meek US Congressman 17th District, Florida 1039 Longworth House Office Building Washington, DC 20515	The Honorable Ileana Ros-Lehtinen US Congresswoman 18th District, Florida 2160 Rayburn House Office Building Washington, DC 20515
The Honorable Robert Wexler US Congressman 19th District, Florida 2241 Rayburn House Office Building Washington, DC 20515	The Honorable Debbie Wasserman Schultz US Congresswoman 20th District, Florida 118 Cannon House Office Building Washington, DC 20515
The Honorable Lincoln Diaz-Balart US Congressman 21st District, Florida 2244 Rayburn House Office Building Washington, DC 20515	The Honorable Ron Klein US Congressman 22nd District, Florida 313 Cannon House Office Building Washington, DC 20515

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

CONGRESSIONAL REPRESENTATIVES Cont'd	
The Honorable Alcee Hastings US Congressman 23rd District, Florida 2353 Rayburn House Office Building Washington, DC 20515	The Honorable Tom Feeney US Congressman 24th District, Florida 323 Cannon House Office Building Washington, DC 20515
The Honorable Mario Diaz-Balart US Congressman 25th District, Florida 328 Cannon House Office Building Washington, DC 20515	
Alabama	
The Honorable Jeff Sessions US Senate 335 Russell Senate Office Building Washington, DC 20510	The Honorable Richard Shelby US Senate 110 Hart Senate Office Building Washington, DC 20510
The Honorable Jo Bonner US Congressman 1st District, Alabama 422 Cannon House Office Building Washington, DC 20515	The Honorable Terry Everett US Congressman 2nd District, Alabama 2312 Rayburn House Office Building Washington, DC 20515
The Honorable Robert Aderholt US Congressman 4th District, Alabama 1433 Longworth House Office Building Washington, DC 20515	The Honorable Spencer Bachus US Congressman 6th District, Alabama 2246 Rayburn House Office Building Washington, DC 2015
The Honorable Arthur Davis US Congressman 7th District, Alabama 208 Cannon House Office Building Washington, DC 20515	
Mississippi	
The Honorable Thad Cochran US Senate 113 Dirksen Senate Office Building Washington, DC 20510	The Honorable Trent Lott US Senate 487 Russell Senate Office Building Washington, DC 20510
The Honorable Roger Wicker US Congressman 1st District, Mississippi 2350 Rayburn House Office Building Washington, DC 20515	The Honorable Bennie G. Thompson US Congressman 2nd District, Mississippi 2432 Rayburn House Office Building Washington, DC 20515

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

CONGRESSIONAL REPRESENTATIVES Cont'd	
The Honorable Charles Pickering, Jr. US Congressman 3^{rd} District, Mississippi 229 Cannon House Office Building Washington, DC 20515	The Honorable Gene Taylor US Congressman 4^{th} District, Mississippi 2269 Rayburn House Office Building Washington, DC 20515
Louisiana	
The Honorable Mary Landrieu US Senate 724 Hart Senate Office Building Washington, DC 20510	The Honorable David Vitter US Senate 516 Hart Senate Office Building Washington, DC 20510
The Honorable Bobby Jindal US Congressman 1^{st} District, Louisiana 1205 Longworth House Office Building Washington, DC 20515	The Honorable William Jefferson US Congressman 2^{nd} District, Louisiana 2113 Rayburn House Office Building Washington, DC 20515
The Honorable Charlie Melancon US Congressman 3^{rd} District, Louisiana 404 Cannon House Office Building Washington, DC 20515	The Honorable Charles Boustany, Jr. US Congressman 7^{th} District, Louisiana 1117 Longworth House Office Building Washington, DC 20515
Texas	
The Honorable John Cornyn US Senate 517 Hart Senate Office Building Washington, DC 20510	The Honorable Kay Bailey Hutchison US Senate 284 Russell Senate Office Building Washington, DC 20510
The Honorable Ted Poe US Congressman 2^{nd} District, Texas 1605 Longworth House Office Building Washington, DC 20515	The Honorable John Culberson US Congressman 7^{th} District, Texas 428 Cannon House Office Building Washington, DC 20515
The Honorable Kevin Brady US Congressman 8^{th} District, Texas 301 Cannon House Office Building Washington, DC 20515	The Honorable Michael Conaway US Congressman 11^{th} District, Texas 511 Cannon House Office Building Washington, DC 20515
The Honorable Ron Paul US Congressman 14^{th} District, Texas 203 Cannon House Office Building Washington, DC 20515	The Honorable Ruben Hinojosa US Congressman 15^{th} District, Texas 2463 Rayburn House Office Building Washington, DC 20515

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

CONGRESSIONAL REPRESENTATIVES Cont'd	
The Honorable Chet Edwards US Congressman 17th District, Texas 2369 Rayburn House Office Building Washington, DC 20515	The Honorable Sheila Jackson-Lee US Congresswoman 18th District, Texas 2435 Rayburn House Office Building Washington, DC 20515
The Honorable Randy Neugebauer US Congressman 19th District, Texas 429 Cannon House Office Building Washington, DC 20515	The Honorable Ciro Rodriguez US Congressman 23rd District, Texas 436 Cannon House Office Building Washington, DC 20515
The Honorable Gene Green US Congressman 29th District, Texas 2335 Rayburn House Office Building Washington, DC 20515	The Honorable Lloyd Doggett US Congressman 25th District, Texas 201 Cannon House Office Building Washington, DC 20515
The Honorable Nick Lampson US Congressman 24th District, Texas 436 Cannon House Office Building Washington, DC 20515	The Honorable Henry Cuellar US Congressman 28th District, Texas 336 Cannon House Office Building Washington, DC 20515
The Honorable Solomon Ortiz US Congressman 27th District, Texas 2110 Rayburn House Office Building Washington, DC 20515	The Honorable John Carter US Congressman 31st District, Texas 408 Cannon House Office Building Washington, DC 20515
STATE ELECTED OFFICIALS	
Maine	
Governor John E. Baldacci Office of the Governor #1 State House Station Augusta, ME 04333	The Honorable Beth Edmonds ME Senate – Cumberland County 3 State House Station Augusta, ME 04333
The Honorable Elizabeth H. Mitchell ME Senate – Kennebec County 3 State House Station Augusta, ME 04333	The Honorable Carol Weston ME Senate – Waldo County 3 State House Station Augusta, ME 04333
Representative Glenn Cummings ME House – Portland 2 State House Station, Room 303 Augusta, ME 04333	Representative Hannah M. Pingree ME House – North Haven 2 State House Station, Room 333 Augusta, ME 04333
Representative Joseph A. Tardy ME House – Newport 2 State House Station, Room 332 Augusta, ME 04333	

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
New Hampshire	
Governor John Lynch Office of the Governor State House 25 Capitol Street Concord, NH 03301	The Honorable Raymond S. Burton NH Executive Council – 1st District 338 River Road Bath, NH 03740
The Honorable Paul Hodes NH Executive Council – 2nd District 8 McIntire Road Nelson, NH 03457	The Honorable Beverly A. Hollingworth NH Executive Council – 3rd District 209 Winnacunnet Road Hampton, NH 03842
The Honorable Raymond J. Wieczorek NH Executive Council – 4th District 1060 Ray Street Manchester, NH 03104	The Honorable Debora Pignatelli NH Executive Council – 5th District 22 Appletree Green Nashua, NH 03062
Massachusetts	
Governor Deval Patrick Office of the Governor State House, Room 360 Boston, MA 02133	The Honorable Therese Murray MA Senate State House, Room 330 Boston, MA 02133
The Honorable Frederick E. Berry MA Senate State House, Room 333 Boston, MA 02133	The Honorable Richard R. Tisei MA Senate State House, Room 308 Boston, MA 02133
Representative Salvatore F. DiMasi MA House – 3rd District State House, Room 356 Boston, MA 02133	Representative John H. Rogers MA House – 12th District State House, Room 370 Boston, MA 02133
Representative Bradley H. Jones, Jr. MA House – 20th District State House, Room 124 Boston, MA 02133	
Rhode Island	
Governor Donald L. Carcieri Office of the Governor 222 State House, Room 115 Providence, RI 02903	The Honorable M. Teresa Paiva-Weed RI Senate – 13th District 316 State House Providence, RI 02903
The Honorable Joseph A. Montalbano RI Senate – 17th District 318 State House Providence, RI 02903	The Honorable Dennis L. Algiere RI Senate – 38th District 6 Elm Street Westerly, RI 02891
Representative Gordon D. Fox RI House – 4th District 323 State House Providence, RI 02903	Representative William J. Murphy RI House – 26th District 323 State House Providence, RI 02903

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
Representative Robert A. Watson RI House – 30th District 106 State House Providence, RI 02903	
Connecticut	
Governor M. Jodi Rell Officer of the Governor 210 Capitol Avenue Hartford, CT 06106	The Honorable Martin M. Looney CT Senate – 11th District Legislative Office Building, Room 3300 Hartford, CT 06106
The Honorable John McKinney CT Senate – 28th District Legislative Office Building, Room 3400 Hartford, CT 06106	The Honorable Donald E. Williams, Jr. CT Senate – 29th District Legislative Office Building, Room 3300 Hartford, CT 06106
The Honorable Len Fasano CT Senate – 34th District Legislative Office Building, Room 3400 Hartford, CT 06106	Representative Lawrence F. Cafero CT House – 86th District Legislative Office Building, Room 4200 Hartford, CT 06106
Representative James A. Amann CT House – 118th District Legislative Office Building, Room 4105 Hartford, CT 06106	Representative Christopher G. Donovan CT House – 142nd District Legislative Office Building, Room 4106 Hartford, CT 06106
New York	
Governor Eliot Spitzer Office of the Governor State Capitol Albany, NY 12224	The Honorable Kenneth P. Lavalle NY Senate – 1st District Legislative Office Building, Room 806 Albany, NY 12247
The Honorable Malcolm A. Smith NY Senate – 14th District 250 Broadway, Suite 1930 New York, NY 10007	The Honorable Joseph L. Bruno NY Senate – 43rd District Legislative Office Building, Room 909 Albany, NY 12247
Representative Sheldon Silver NY House – 64th District 250 Broadway, Suite 2307 New York, NY 10007	Representative Ron Canestrari NY House – 106th District Legislative Office Building, Room 926 Albany, NY 12248
Representative James Tedisco NY House – 110th District 12 Jay Street Schenectady, NY 12305	
Delaware	
Governor Ruth Ann Minner Office of the Governor Tatnail Building William Penn Street, 2nd Floor Dover, DE 19901	The Honorable Harris B. McDowell, III. DE Senate – 1st District PO Box 1401 Dover, DE 19903

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
The Honorable Margaret Rose Henry DE Senate – 2nd District PO Box 1401 Dover, DE 19903	The Honorable Catherine L. Cloutier DE Senate – 5th District PO Box 1401 Dover, DE 19903
The Honorable Dorinda A. Conner DE Senate – 12th District PO Box 1401 Dover, DE 19903	The Honorable James T. Vaughn DE Senate – 14th District PO Box 1401 Dover, DE 19903
The Honorable Colin R.J. Bonini DE Senate – 16th District PO Box 1401 Dover, DE 19903	The Honorable John C. Still, III. DE Senate – 17th District PO Box 1401 Dover, DE 19903
The Honorable F. Gary Simpson DE Senate – 18th District PO Box 1401 Dover, DE 19903	The Honorable George H. Bunting, Jr. DE Senate – 20th District PO Box 1401 Dover, DE 19903
Representative Hazel D. Plant DE House – 2nd District PO Box 1401 Dover, DE 19903	Representative Richard C. Cathcart DE House – 9th District PO Box 1401 Dover, DE 19903
Representative Diana M. McWilliams DE House – 6th District PO Box 1401 Dover, DE 19903	Representative Robert J. Valihura DE House – 10th District PO Box 1401 Dover, DE 19903
Representative Gregory F. Lavalle DE House – 11th District PO Box 1401 Dover, DE 19903	Representative Peter C. Swartzkopf DE House – 14th District PO Box 1401 Dover, DE 19903
Representative Valerie Longhurst DE House – 15th District PO Box 1401 Dover, DE 19903	Representative James Johnson DE House – 16th District PO Box 1401 Dover, DE 19903
Representative Michael P. Mulrooney DE House – 17th District PO Box 1401 Dover, DE 19903	Representative Bruce C. Ennis DE House – 28th District PO Box 1401 Dover, DE 19903
Representative Donna D. Stone DE House – 32nd District PO Box 1401 Dover, DE 19903	Representative Robert Walls DE House – 33rd District PO Box 1401 Dover, DE 19903
Representative V. George Carey DE House – 36th District PO Box 1401 Dover, DE 19903	Representative Joseph W. Booth DE House – 37th District PO Box 1401 Dover, DE 19903

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
Representative Gerald W. Hocker DE House – 38th District PO Box 1401 Dover, DE 19903	Representative Gregory Hastings DE House – 41st District PO Box 1401 Dover, DE 19903
New Jersey	
Governor Jon S. Corzine Office of the Governor PO Box 001 Trenton, NJ 08625	The Honorable Leonard Lance NJ Senate – 23rd District 119 Main Street Flemington, NJ 08822
The Honorable Richard J. Codey NJ Senate – 27th District 449 Mount Pleasant Avenue West Orange, NJ 07052	The Honorable Bernard F. Kenny, Jr. NJ Senate – 33rd District 235 Hudson Street, Suite 1-A Hoboken, NJ 07030
Representative Joseph J. Roberts, Jr. NJ House – 5th District Brooklawn Shopping Plaza Route 130 & Browning Road Brooklawn, NJ 08030	Representative Bonnie Watson Coleman NJ House – 15th District 226 West State Street Trenton, NJ 08608
Representative Alex DeCroce NJ House – 26th District 101 Gibraltar Drive, Suite 1-A Morris Plains, NJ 07950	
Maryland	
Governor Martin O'Malley Office of the Governor 100 State Circle Annapolis, MD 21401	The Honorable J. Lowell Stoltzfus MD Senate – 38th District James Senate Office Building, Room 323 11 Bladen Street Annapolis, MD 21401
Representative Norman H. Conway MD House – 38th B District House Office Building, Room 121 6 Bladen Street Annapolis, MD 21401	Representative James E. Mathia, Jr. MD House – 38th B District House Office Building, Room 307 6 Bladen Street Annapolis, MD 21401
Virginia	
Governor Tim Kaine Office of the Governor Patrick Henry Building, 3rd Floor 111 East Broad Street Richmond, VA 23219	The Honorable Martin E. Williams VA Senate – 1st District PO Box 396 Richmond, VA 23218
The Honorable Mamie E. Locke VA Senate – 2nd District PO Box 396 Richmond, VA 23218	The Honorable Thomas K. Norment, Jr. VA Senate – 3rd District PO Box 396 Richmond, VA 23218

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
The Honorable Yvonne B. Miller VA Senate – 5th District PO Box 396 Richmond, VA 23218	The Honorable Rick Rerras VA Senate – 6th District PO Box 396 Richmond, VA 23218
The Honorable Frank W. Wagner VA Senate – 7th District PO Box 396 Richmond, VA 23218	The Honorable Patricia S. Ticer VA Senate – 30th District PO Box 396 Richmond, VA 23218
The Honorable Mary Margaret Whipple VA Senate – 31st District PO Box 396 Richmond, VA 23218	Delegate Terrie L. Suit VA Delegate – 81st District PO Box 406 Richmond, VA 23218
Delegate Robert J. Wittman VA Delegate – 99th District PO Box 406 Richmond, VA 23218	Delegate Lynwood W. Lewis, Jr. VA Delegate – 100th District PO Box 406 Richmond, VA 23218
North Carolina	
Governor Michael F. Easley Office of the Governor 20301 Mail Service Center Raleigh, NC 27699	The Honorable Marc Basnight NC Senate – 1st District Legislative Office Building, Room 2007 Raleigh, NC 27601
The Honorable Jean Preston NC Senate – 2nd District Legislative Office Building, Room 1121 Raleigh, NC 27603	The Honorable Harry Brown NC Senate – 6th District Legislative Office Building, Room 515 Raleigh, NC 27603
The Honorable R.C. Soles, Jr. NC Senate – 8th District Legislative Office Building, Room 2022 Raleigh, NC 27601	The Honorable Julia Boseman NC Senate – 9th District Legislative Office Building, Room 309 Raleigh, NC 27603
Representative Bill Owens NC House – 1st District Legislative Office Building, Room 635 Raleigh, NC 27603	Representative Timothy L. Spear NC House – 2nd District Legislative Office Building, Room 402 Raleigh, NC 27603
Representative Pat McElraft NC House – 13th District Legislative Office Building, Room 603 Raleigh, NC 27603	Representative George G. Cleveland NC House – 14th District Legislative Office Building, Room 504 Raleigh, NC 27603
Representative W. Robert Grady NC House – 15th District Legislative Office Building, Room 302 Raleigh, NC 27603	Representative Carolyn H. Justice NC House – 16th District Legislative Office Building, Room 306A3 Raleigh, NC 27603

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
Representative Bonner L. Stiller NC House – 17th District Legislative Office Building, Room 306A2 Raleigh, NC 27603	Representative Daniel F. McComas NC House – 19th District Legislative Office Building, Room 506 Raleigh, NC 27603
Representative Paul Stam NC House – 37th District Legislative Office Building, Room 613 Raleigh, NC 27601	Representative Joe Hackney NC House – 54th District Legislative Office Building, Room 2304 Raleigh, NC 27601
Representative Hugh Holliman NC House – 81st District Legislative Office Building, Room 2301 Raleigh, NC 27601	
South Carolina	
Governor Mark Sanford Office of the Governor PO Box 12267 Columbia, SC 29211	The Honorable Ray Cleary SC Senate – 34th District 501 Gressette Building Columbia, SC 29202
The Honorable Lawrence Grooms SC Senate – 37th District 203 Gressette Building Columbia, SC 29202	The Honorable Randy Scott SC Senate – 38th District 606 Gressette Building Columbia, SC 29202
The Honorable Glen F. McConnell SC Senate – 41st District 101 Gressette Building Columbia, SC 29202	The Honorable Robert Ford SC Senate – 42nd District 506 Gressette Building Columbia, SC 29202
The Honorable George Campsen, III. SC Senate – 43rd District 604 Gressette Building Columbia, SC 29202	The Honorable Clementa Pinckney SC Senate – 45th District 613 Gressette Building Columbia, SC 29202
The Honorable Catherine C. Ceips SC Senate – 46th District 608 Gressette Building Columbia, SC 29202	Representative Converse Chellis, III. SC House – 94th District 519C Blatt Building Columbia, SC 29202
Representative Annette Young SC House – 98th District 308C Blatt Building Columbia, SC 29202	Representative James Merrill SC House – 99th District 518B Blatt Building Columbia, SC 29202
Representative Vida Miller SC House – 108th District 335D Blatt Building Columbia, SC 29202	Representative David Mack, III. SC House – 109th District 328D Blatt Building Columbia, SC 29202

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
Representative Harry Limehouse, III. SC House – 110th District 326C Blatt Building Columbia, SC 29202	Representative Floyd Breeland SC House – 111th District 328C Blatt Building Columbia, SC 29202
Representative Ben Hagwood, Jr. SC House – 112th District 306B Blatt Building Columbia, SC 29202	Representative J. Seth Whipper SC House – 113th District 328A Blatt Building Columbia, SC 29202
Representative Robert Harrell SC House – 114th District 506 Blatt Building Columbia, SC 29202	Representative Wallace Scarborough SC House – 115th District 326B Blatt Building Columbia, SC 29202
Representative Robert Brown SC House – 116th District 330D Blatt Building Columbia, SC 29202	Representative Thomas Dantizer SC House – 117th District 308B Blatt Building Columbia, SC 29202
Representative William Herbkersman SC House – 118th District 434B Blatt Building Columbia, SC 29202	Representative Leonidas E. Stavrinakis SC House – 119th District 420D Blatt Building Columbia, SC 29202
Representative Kenneth Hodges SC House – 121st District 434A Blatt Building Columbia, SC 29202	Representative Curtis Brantley SC House – 122nd District 314D Blatt Building Columbia, SC 29202
Representative Richard Chalk, Jr. SC House – 123rd District 404C Blatt Building Columbia, SC 29202	
Georgia	
Governor Sonny Perdue Office of the Governor Georgia State Capitol Atlanta, GA 30334	The Honorable Eric Johnson GA Senate – 1st District 321 State Capitol Atlanta, GA 30334
The Honorable Jeff Chapman GA Senate – 3rd District 110 D State Capitol Atlanta, GA 30334	The Honorable Jack Hill GA Senate – 4th District 234 State Capitol Atlanta, GA 30334
The Honorable Tommie Williams GA Senate – 19th District 236 State Capitol Atlanta, GA 30334	Representative Buddy Carter GA House – 159th District Coverdell Legislative Office Building, Suite 508 Atlanta, GA 30334

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
Representative Bob Bryant GA House – 160th District Coverdell Legislative Office Building, Suite 608 Atlanta, GA 30334	Representative Lester Jackson GA House – 161st District Coverdell Legislative Office Building, Suite 511 Atlanta, GA 30334
Representative J. Craig Gordon GA House – 162nd District Coverdell Legislative Office Building, Suite 607 Atlanta, GA 30334	Representative Burke Day GA House – 163rd District State Capitol, Room 218 Atlanta, GA 30334
Representative Ron Stephens GA House – 164th District State Capitol, Room 228 Atlanta, GA 30334	Representative Al Williams GA House – 165th District Coverdell Legislative Office Building, Suite 511 Atlanta, GA 30334
Representative Terry Barnard GA House – 166th District State Capitol, Room 401 Atlanta, GA 30334	Representative Roger Bert Lane GA House – 167th District Coverdell Legislative Office Building, Suite 404 Atlanta, GA 30334
Representative Tommy Smith GA House – 168th District State Capitol, Room 131 Atlanta, GA 30334	Representative Mark Williams GA House – 178th District Coverdell Legislative Office Building, Suite 504 Atlanta, GA 30334
Representative Jerry Keen GA House – 179th District State Capitol, Room 338 Atlanta, GA 30334	Representative Cecily Hill GA House – 180th District Coverdell Legislative Office Building, Suite 501 Atlanta, GA 30334
Florida	
Governor Charlie Crist Office of the Governor PL-05 The Capitol Tallahassee, FL 32399	The Honorable Durell Peaden, Jr. FL Senate – 2nd District 598 North Ferdon Blvd. Crestview, FL 32536
The Honorable Alfred Lawson, Jr. FL Senate – 6th District Senate Office Building, Room 210 404 South Monroe Street Tallahassee, FL 32399	The Honorable Evelyn J. Lynn FL Senate – 7th District 536 North Halifax, Avenue, Suite 101 Daytona Beach, FL 32118
The Honorable James King, Jr. FL Senate – 8th District 9485 Regency Square Blvd., Suite 108 Jacksonville, FL 32225	The Honorable Daniel Webster FL Senate – 9th District 315 South Dillard Street Winter Garden, FL 34787

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
The Honorable Michael Bennett FL Senate – 21st District 3653 Cortez Road West, Suite 90 Bradenton, FL 34210	The Honorable Lisa Carlton FL Senate – 23rd District 2127 S. Tamiami Trail Osprey, FL 34229
The Honorable Bill Posey FL Senate – 24th District 1802 S. Fiske Blvd., Suite 108 Rockledge, FL 32955	The Honorable Mike Haridopolos FL Senate – 26th District 1360 Sarno Road, Suite C Melbourne, FL 32935
The Honorable Ken Pruitt FL Senate – 28th District 1850 SW Fountainview Blvd., Suite 200 Port St. Lucie, FL 34986	The Honorable Steven A. Geller FL Senate – 31st District 400 South Federal Highway, Suite 204 Hallandale Beach, FL 33009
The Honorable Burt Saunders FL Senate – 37th District Administration Building, Suite 304 3301 E. Tamiami Trail Naples, FL 34112	The Honorable Larcenia Bullard FL Senate – 39th District 8603 S. Dixie Highway, Suite 304 Miami, FL 33143
Representative Greg Evers FL House – 1st District 5224 Willing Street Milton, FL 32570	Representative Dave Murzin FL House – 2nd District 7100 Plantation Road, #3 Pensacola, FL 32504
Representative Clay Ford FL House – 3rd District 1804 W. Garden Street Pensacola, FL 32501	Representative Ray Sansom FL House – 4th District 99 Eglin Parkway NE, Suite 18 Fort Walton Beach, FL 32548
Representative Donald Brown FL House – 5th District OWCC Building 2, #205 908 Highway 90 West DeFuniak Springs, FL 32433	Representative Jimmy T. Patronis FL House – 6th District 455 Harrison Avenue, Suite A Panama City, FL 32401
Representative Marti Coley FL House – 7th District Chipola College, Building L, Room 108 3094 Indian Circle Marianna, FL 32446	Representative Aaron Bean FL House – 12th District 905 South 8th Street Fernandina Beach, FL 32034
Representative Terry L. Fields FL House – 14th District Hope Plaza, Suite 307 435 Clark Road Jacksonville, FL 32218	Representative Audrey Gibson FL House – 15th District 101 East Union Street, Suite 402 Jacksonville, FL 32202
Representative Mark Mahon FL House – 16th District 233 East Bay Street, Suite 1133 Jacksonville, FL 32202	Representative Stan Jordan FL House – 17th District 3414-A North Main Street Jacksonville, FL 32206

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
Representative Don Davis FL House – 18th District 2320 South 3rd Street, Suite 3 Jacksonville Beach, FL 32250	Representative Dick Kravitz FL House – 19th District 155 Blanding Blvd., Suite 10 Orange Park, FL 32073
Representative William L. Proctor FL House – 20th District 900 SR 16, Suite 2 St. Augustine, FL 32084	Representative Joe H. Pickens FL House – 21st District 3841 Reid Street, Suite 5 Palatka, FL 32177
Representative Pat Patterson FL House – 26th District 230 North Woodland Blvd., Room 222 DeLand, FL 32720	Representative Joyce Cusack FL House – 27th District 224 North Woodland Blvd. DeLand, FL 32720
Representative Dorothy Hukill FL House – 28th District 2990 S. Atlantic Avenue, Suite 100 Daytona Beach Shores, FL 32118	Representative Thad Altman FL House – 30th District PO Box 411780 Melbourne, FL 32941
Representative Bob Allen FL House – 32nd District 321 Magnolia Avenue Merritt Island, FL 32952	Representative James C. Frishe FL House – 54th District 125 Indian Rocks Road North, Suite A Belleaiir Bluffs, FL 33770
Representative Marsha L. Bowen FL House – 65th District 353 Avenue "C" Southwest Winter Haven, FL 33880	Representative Bill Galvano FL House – 68th District 1023 Manatee Avenue West, Suite 715 Bradenton, FL 34205
Representative Keith Fitzgerald FL House – 69th District 1660 Ringling Blvd., Suite 310-311 Sarasota, FL 34236	Representative Doug Holder FL House – 70th District 8486 S. Tamiami Trail Sarasota, FL 34238
Representative Michael Grant FL House – 71st District County Administration Building 18500 Murdock Circle Port Charlotte, FL 33948	Representative Gary Aubuchon FL House – 74th District 3501 Del Prado Blvd., Suite 305 Cape Coral, FL 33904
Representative Trudi Williams FL House – 75th District 12811 Kenwood Lane, Suite 212 Fort Myers, FL 33907	Representative Garrett Richter FL House – 76th District Administration Building, Suite 203 3301 E. Tamiami Trail Naples, FL 34112
Representative Adam Hasner FL House – 87th District 33 NE 4th Avenue Delray Beach, FL 33483	Representative Dan Gelber FL House – 106th District Third Floor 19 Meridian Avenue Miami Beach, FL 33139

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
Representative Ron Saunders FL House – 120th District 90311 Overseas Highway, Suite A PO Box 699 Tavernier, FL 33070	
Alabama	
Governor Robert Riley Office of the Governor State Capitol 600 Dexter Avenue Montgomery, AL 36130	The Honorable Phil Poole AL Senate – 21st District 11 S. Union Street, Room 736 Montgomery, AL 36130
The Honorable W.H. Lindsey AL Senate – 22nd District 11 S. Union Street, Room 721 Montgomery, AL 36130	The Honorable Henry Sanders AL Senate – 23rd District 11 S. Union Street, Room 730 Montgomery, AL 36130
The Honorable Bobby Singleton AL Senate – 24th District 11 S. Union Street, Room 734 Montgomery, AL 36130	The Honorable Jimmy Holley AL Senate – 31st District 11 S. Union Street, Room 731-C Montgomery, AL 36130
The Honorable Trip Pittman AL Senate – 32nd District 11 S. Union Street, Room 738-B Montgomery, AL 36130	The Honorable Ben Brooks AL Senate – 35th District 11 S. Union Street, Room 735-A Montgomery, AL 36130
Representative Ken Guin AL House – 14th District 11 S. Union Street, Room 517-E Montgomery, AL 36130	Representative William Thigpen, Sr. AL House – 16th District 11 S. Union Street, Room 538-D Montgomery, AL 36130
Representative Alan Harper AL House – 61st District 11 S. Union Street, Room 538-C Montgomery, AL 36130	Representative Gerald Allen AL House – 62nd District 11 S. Union Street, Room 531 Montgomery, AL 36130
Representative Dr. Robert Bentley AL House – 63rd District 11 S. Union Street, Room 537-D Montgomery, AL 36130	Representative Harry Shiver AL House – 64th District 11 S. Union Street, Room 526-D Montgomery, AL 36130
Representative Marc Keahey AL House – 65th District 11 S. Union Street, Room 630-A Montgomery, AL 36130	Representative Alan Baker AL House – 66th District 11 S. Union Street Montgomery, AL 36130
Representative Yusuf Salaam AL House – 67th District 11 S. Union Street, Room 539-E Montgomery, AL 36130	Representative James Thomas AL House – 69th District 11 S. Union Street, Room 525-B Montgomery, AL 36130

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
Representative Chris England AL House – 70th District 11 S. Union Street, Room 539-B Montgomery, AL 36130	Representative A.J. McCampbell AL House – 71st District 11 S. Union Street, Room 539-C Montgomery, AL 36130
Representative Ralph Howard AL House – 72nd District 11 S. Union Street, Room 527-D Montgomery, AL 36130	Representative Seth Hammett AL House – 92nd District 11 S. Union Street, Room 519-A Montgomery, AL 36130
Representative Joe Faust AL House – 94th District 11 S. Union Street, Room 524-C Montgomery, AL 36130	Representative Stephen McMillan AL House – 95th District 11 S. Union Street, Room 532 Montgomery, AL 36130
Representative Randy Davis AL House – 96th District 11 S. Union Street, Room 538-B Montgomery, AL 36130	
Mississippi	
Governor Haley Barbour Office of the Governor PO Box 139 Jackson, MS 39205	The Honorable Lydia Graves Chassaniol MS Senate – 14th District PO Box 1018 Jackson, MS 39215
The Honorable Gary Jackson MS Senate – 15th District PO Box 1018 Jackson, MS 39215	The Honorable Bennie Turner MS Senate – 16th District PO Box 1018, Room 404B-NC Jackson, MS 39215
The Honorable Gloria Williamson MS Senate – 18th District PO Box 1018 Jackson, MS 39215	The Honorable Joseph Thomas MS Senate – 21st District PO Box 1018 Jackson, MS 39215
The Honorable David L. Jordan MS Senate – 24th District PO Box 1018, Room 405A-NC Jackson, MS 39215	The Honorable Terry Burton MS Senate – 31st District PO Box 1018, Room 212C-NC Jackson, MS 39215
The Honorable Videt Carmichel MS Senate – 33rd District PO Box 1018 Jackson, MS 39215	The Honorable Billy Thames MS Senate – 34th District PO Box 1018, Room 404A-NC Jackson, MS 39215
The Honorable Scottie R. Cuevas MS Senate – 46th District PO Box 1018 Jackson, MS 39215	The Honorable Tommy Robertson MS Senate – 51st District PO Box 1018, Room 215C-NC Jackson, MS 39215

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
The Honorable Tommy Moffatt MS Senate – 52nd District PO Box 1018, Room 213D-NC Jackson, MS 39215	Representative Linda Whittington MS House – 34th District PO Box 1018 Jackson, MS 39215
Representative Dannie Reed MS House – 35th District PO Box 1018 Jackson, MS 39215	Representative Tyrone Ellis MS House – 38th District PO Box 1018, Room 112C-NC Jackson, MS 39215
Representative Reecy Dickson MS House – 42nd District PO Box 1018, Room 400E-NC Jackson, MS 39215	Representative Gale Gregory MS House – 43rd District PO Box 1018 Jackson, MS 39215
Representative C. Scott Bounds MS House – 44th District PO Box 1018 Jackson, MS 39215	Representative Bennett Malone MS House – 45th District PO Box 1018, Room 401C-NC Jackson, MS 39215
Representative Bobby Howell MS House – 46th District PO Box 1018, Room 201-NC Jackson, MS 39215	Representative Bryant Clark MS House – 47th District PO Box 1018 Jackson, MS 39215
Representative Mary Ann Stevens MS House – 48th District PO Box 1018, Room 201M4-NC Jackson, MS 39215	Representative Billy Nicholson MS House – 78th District PO Box 1018, Room 400F-NC Jackson, MS 39215
Representative Charles Young, Sr. MS House – 82nd District PO Box 1018, Room 205A-NC Jackson, MS 39215	Representative Greg Snowden MS House – 83rd District PO Box 1018, Room 400F-NC Jackson, MS 39215
Representative Eric Robinson MS House – 84th District PO Box 1018, Room 115-NC Jackson, MS 39215	Representative Dirk Dedeaux MS House – 93rd District PO Box 1018, Room 102-NC Jackson, MS 39215
Representative Frank Hamilton MS House – 109th District PO Box 1018, Room 400E-NC Jackson, MS 39215	Representative Carmel Wells-Smith MS House – 111th District PO Box 1018, Room 201M6-NC Jackson, MS 39215
Representative J.P. Compretta MS House – 122nd District PO Box 1018, Room 302-NC Jackson, MS 39215	

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
Louisiana	
Governor Piyush "Bobby" Jindal Attn: Constituent Services PO Box 94004 Baton Rouge, LA 70804	The Honorable Walter J. Boasso LA Senate – 1st District PO Box 94183 Baton Rouge, LA 70804
The Honorable J. Chris Ullo LA Senate – 8th District PO Box 94183 Baton Rouge, LA 70804	The Honorable D.A. Gautreaux LA Senate – 21st District PO Box 94183 Baton Rouge, LA 70804
The Honorable Craig F. Romero LA Senate – 22nd District PO Box 94183 Baton Rouge, LA 70804	The Honorable Nick Gautreaux LA Senate – 26th District PO Box 94183 Baton Rouge, LA 70804
The Honorable Gerald J. Theunissen LA Senate – 25th District PO Box 94183 Baton Rouge, LA 70804	Representative Joe R. Salter LA House – 24th District PO Box 250 Florien, LA 71429
Representative Mickey Frith LA House – 47th District 407 Charity Street, Suite 102 Abbeville, LA 70510	Representative Troy Hebert LA House – 49th District PO Box 32 Jeanerette, LA 70544
Representative Jack D. Smith LA House – 50th District St. Mary Parish Courthouse, Room 304 Franklin, LA 70538	Representative Carla Blanchard LA House – 51st District 1006 8th Street Morgon City, LA 70380
Representative Damon J. Baldone LA House – 53rd District 162 New Orleans Blvd. Houma, LA 70364	Representative Loulan J. Pitre, Jr. LA House – 54th District 104 West 65th Street Cut Off, LA 70345
Representative Kenneth L. Odinet, Sr. LA House – 103rd District 127 Highway 22 East, Suite W7 Madisonville, LA 70447	Representative Ernest D. Wooton LA House – 105th District 8018 Highway 83, Suite 214 Belle Chasse, LA 70037
Texas	
Governor Rick Perry Office of the Governor PO Box 12428 Austin, TX 78711	The Honorable Kyle Janek TX Senate – 17th District Capitol Station PO Box 12068 Austin, TX 78711
The Honorable Glenn Hegar TX Senate – 18th District Capitol Station PO Box 12068 Austin, TX 78711	The Honorable Eddie Lucio, Jr. TX Senate – 27th District Capitol Station PO Box 12068 Austin, TX 78711

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE ELECTED OFFICIALS Cont'd	
Representative Tom Craddick TX House – 82nd District PO Box 2910, Room CAP 2W.13 Austin, TX 78768	Representative Allan Ritter TX House – 21st District PO Box 2910, Room EXT E2.406 Austin, TX 78768
Representative Dennis Bonnen TX House – 25th District PO Box 2910, Room EXT E2.602 Austin, TX 78768	Representative Mike O'Day TX House – 29th District PO Box 2910, Room EXT E1.208 Austin, TX 78768
Representative Juan M. Garcia TX House – 32nd District PO Box 2910, Room EXT E2.320 Austin, TX 78768	Representative Solomon Ortiz TX House – 33rd District PO Box 2910, Room EXT E1.322 Austin, TX 78768
Representative Juan Manuel Escobar TX House – 43rd District PO Box 2910, Room EXT E2.606 Austin, TX 78768	
CITY OFFICIALS	
Massachusetts	
The Honorable Thomas Menino Mayor of Boston Mayor's Office 1 City Hall Plaza Boston, MA 02210	
Connecticut	
The Honorable Margaret Curtin Mayor of New London New London City Hall 181 State Street New London, CT 06320	
Virginia	
The Honorable Paul Fraim Mayor of Norfolk 1109 City Hall Building 810 Union Street Norfolk, VA 23510	
North Carolina	
The Honorable Gerald Jones, Jr. Mayor of Morehead City Town of Morehead City 706 Arendell Street Morehead City, NC 28557	Mr. John Langdon Carteret County Manager 302 Courthouse Square Beaufort, NC 28516

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

CITY OFFICIALS Cont'd	
South Carolina	
The Honorable Joseph Riley, Jr. Mayor of Charleston 80 Broad Street Charleston, SC 29401	
Florida	
The Honorable John Peyton Mayor of Jacksonville 117 W. Duval Street, #400 Jacksonville, FL 32202	The Honorable Lauren DeGeorge Mayor of Panama City 3529 E. 3rd Street Panama City, FL 32401
FEDERAL AGENCIES	
U.S. Department of the Interior	
Mr. H. Dale Hall Director US Fish and Wildlife Service 1849 C Street, NW Washington, DC 20240	Mr. Sam Hamilton Director, Southeast Region US Fish and Wildlife Service 1875 Century Blvd., Suite 400 Atlanta, GA 30345
Mr. Marvin Moriarty Director, Northeast Regional Office US Fish and Wildlife Service 300 Westgate Center Drive Hadley, MA 01035	Ms. Johnnie Burton Director Minerals Management Service 1849 C Street, NW Washington, DC 20240
Department of Commerce	
Dr. William Hogarth Assistant Administrator National Marine Fisheries Service 1315 East West Highway, SSMC3 Silver Spring, MD 20910	Mr. Jim Lecky Director National Marine Fisheries Service Office of Protected Resources 1315 East West Highway Silver Spring, MD 20910
National Oceanic and Atmospheric Administration 14th Street & Constitution Avenue NW, Room 6217 Washington, DC 02023	Dr. Roy E. Crabtree Regional Administrator, Southeast Region National Oceanic & Atmospheric Administration National Marine Fisheries Service 263 13th Avenue, South St. Petersburg, FL 33701
Ms. Patricia Kurkul Regional Administrator, Northeast Region National Oceanic & Atmospheric Administration National Marine Fisheries One Blackburn Drive Gloucester, MA 01930	

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

FEDERAL AGENCIES Cont'd	
U.S. Department of Transportation	
Admiral Thad W. Allen Commandant (G-MWV) US Coast Guard – Headquarters 2100 Second Street, SW Washington, DC 20593	Rear Admiral Larry Hereth US Coast Guard – 5th District 431 Crawford Street Portsmouth, VA 23704
Rear Admiral Timothy S. Sullivan District Commander 1st Coast Guard District 408 Atlantic Avenue Boston, MA 02110	Rear Admiral Joel R. Whitehead District Commander 8th Coast Guard District Hale Boggs Federal Building 500 Poydras Street New Orleans, LA 70130
Ms. Shelley Meyer Sylivant Naval Surface Warfare Center (NSWC) 2202 Cambridge Downs Drive Morehead City, NC 28557	
STATE AGENCIES	
Maine	
Mr. Patrick K. McGowan Department of Conservation Commissioner's Office 22 State House Station Augusta, ME 04333-0022	Mr. James Brooks Director Department of Environmental Protection Bureau of Air Quality 28 Tyson Drive Augusta, ME 04333-0017
Mr. Gary P. Cleaves General Manager Maine Military Authority 32 Connecticut Road Limestone, ME 04750	Mr. Andrew Fisk Director Department of Environmental Protection Bureau of Land and Water Quality 28 Tyson Drive Augusta, ME 04333
Ms. Martha Freeman Director Maine Coastal Program 38 State House Station 184 State Street Augusta, ME 04333	Mr. Mark Hyland Acting Director Department of Environmental Protection Bureau of Remediation & Waste Management 28 Tyson Drive Augusta, ME 04333
Major General John Libby Adjutant General & Commissioner Maine Army National Guard The State of Maine Department of Defense Veterans and Emergency Camp Keyes Augusta, ME 04333	Mr. David P. Littell Department of Environmental Protection Office of the Commissioner 28 Tyson Drive Augusta, ME 04333

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE AGENCIES Cont'd	
Mr. Roland D. Martin Commissioner Department of Inland Fisheries & Wildlife 41 State House Station 284 State Street Augusta, ME 04333	Mr. Earle G. Shettleworth, Jr. Director Historic Preservation Commission 65 State House Station 55 Capitol Street Augusta, ME 04333
New Hampshire	
Mr. George Bald Commissioner New Hampshire Department of Resources & Economic Development 172 Pembroke Road PO Box 1856 Concord, NH 03302	Mr. Roy Duddy Director State of New Hampshire Economic Development NH Business Resource Center 172 Pembroke Road PO Box 1856 Concord, NH 03302
Mr. Philip A. Bryce Director NH Division of Forests & Lands PO Box 1856 Concord, NH 03302	Major General Kenneth R. Clark Adjutant General New Hampshire National Guard The Adjutant General's Department 4 Pembroke Road Concord, NH 03301
Mr. John J. Barthelmes Commissioner NH Department of Safety James H. Hayes Safety Building 33 Hazen Drive Concord, NH 03305	Mr. Van McLeod Commissioner Department of Cultural Resources 20 Park Street Concord, NH 03301
Mr. Tom Burack NH Department of Environmental Services Commissioner's Office 29 Hazen Drive Concord, NH 03302	Mr. Lee E. Perry Executive Director NH Fish and Game Department 11 Hazen Drive Concord, NH 03301
Massachusetts	
Ms. Priscilla E. Geigis Acting Commissioner Department of Conservation and Recreation 251 Causeway Street, Suite 600 Boston, MA 02114	Mr. Lawrence B. Adams Executive Director Central MA Regional Planning Commission 35 Harvard Street Worcester, MA 01609
Mr. Timothy W. Brennan Executive Director Pioneer Valley Planning Commission 26 Central Street, Suite 34 West Springfield, MA 01089	Mr. Dennis DiZoglio Executive Director Merrimack Valley Planning Commission 160 Main Street Haverhill, MA 01830

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE AGENCIES Cont'd	
Mr. John Auerbach Commissioner Department of Public Health 250 Washington Street Boston, MA 02108	Ms. Kristin Decas Deputy Director MA Seaport Advisory Council 40 Center Street Fairhaven, MA 02719
Mr. Richard Dimino President Metropolitan Area Planning Council 60 Temple Place Boston, MA 02111	Mr. Marc Draisen Executive Director Metropolitan Area Planning Council 60 Temple Place Boston, MA 02111
Ms. Linda Dunlavy Executive Director Franklin Regional Council of Governments 425 Main Street, Suite 20 Greenfield, MA 01301	Ms. Margo Fenn Executive Director Cape Cod Commission 3225 Main Street PO Box 226 Barnstable, MA 02630
Mr. Richard M. Flynn Executive Director Northern Middlesex Council of Government Gallagher Terminal, Floor 3B 115 Thorndike Street Lowell, MA 01852	Mr. Ian A. Bowles Secretary Executive Office of Environmental Affairs 100 Cambridge, 9th Floor Boston, MA 02114
Mr. Nathaniel Karns Executive Director Berkshire Regional Planning Commission 1 Fenn Street, Suite 201 Pittsfield, MA 01201	Mr. Thomas J. Kinton, Jr. Chief Executive Officer MA Port Authority (Massport) 1 Harborside Drive, Suite 200S East Boston, MA 02128
Mr. John Knipe, Jr. Chair Central MA Regional Planning Commission 35 Harvard Street Worcester, MA 01609	Mr. Victor Koivumaki Chairman Montachusett Regional Planning Commission R1427 Water Street Fitchburg, MA 01420
Mr. Frederick A. Laskey Executive Director MA Water Resources Authority Charlestown Navy Yard 100 1st Avenue Boston, MA 02129	Mr. Robert Lavoie Chairman Merrimack Valley Planning Commission 160 Main Street Haverhill, MA 01830

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE AGENCIES Cont'd	
Mr. Mark London Executive Director Martha's Vineyard Commission PO Box 1447 Oak Bluffs, MA 02557	Ms. Laila Michaud Executive Director Montachusett Regional Planning Commission R1427 Water Street Fitchburg, MA 01420
Ms. Lorri-Ann Miller Chair Southeastern Regional Planning & Economic Development District 88 Broadway Taunton, MA 02780	Dr. Judy Ann Bigby Secretary Massachusetts Executive Office of Health & Human Services 1 Ashburton Place, 11th Floor Boston, MA 02108
Mr. Barry Rector Chairman Nantucket Planning & Economic Development Commission 2 Fairgrounds Road Nantucket, MA 02557	Ms. Linda Sibley Chairman Martha's Vineyard Commission PO Box 1447 Oak Bluffs, MA 02557
Mr. Stephen C. Smith Executive Director Southeastern Regional Planning & Economic Development District 88 Broadway Taunton, MA 02780	Mr. Andrew Vorce AICP, Director Nantucket Planning & Economic Development Commission 2 Fairgrounds Road Nantucket, MA 02557
Rhode Island	
Dr. W. Michael Sullivan Director Department of Environmental Management 235 Promenade Street Providence, RI 02908	Major General Robert Bray Adjutant General RI National Guard Joint Force Headquarters Command Readiness Center 645 New London Avenue Cranston, RI 02920
Mr. Grover Fugate Executive Director Coastal Resources Management Council Stedman Government Center, Suite 3 4808 Tower Hill Road Wakefield, RI 02879	Dr. David R. Gifford Director Department of Health 3 Capitol Hill Providence, RI 02908
Mr. Juan Mariscal General Manager Water Resources Board 1 Capitol Hill, 3rd Floor Providence, RI 02908	Mr. Daniel W. Varin Chair Water Resources Board 1 Capitol Hill, 3rd Floor Providence, RI 02908

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE AGENCIES Cont'd	
Connecticut	
Ms. Gina McCarthy Commissioner Department of Environmental Protection 79 Elm Street Hartford, CT 06106	Ms. Joan McDonald Commissioner Department of Economic & Community Development 505 Hudson Street Hartford, CT 06106
Dr. J. Robert Galvin Commissioner CT Department of Public Health 410 Capitol Avenue Hartford, CT 06106	Mr. Thomas F. Harrison Chairman CT Council of Environmental Quality 79 Elm Street Hartford, CT 06106
Major General Thaddeus J. Martin Adjutant General CT National Guard CT Military Department 360 Broad Street Hartford, CT 06105	Mr. S. Derek Phelps Executive Director CT Siting Council 10 Franklin Square New Britain, CT 06051
Mr. Brian Toal Principal Investigator CT Environmental Public Health Tracking, EPHT 410 Capitol Avenue, MS #11EOH PO Box 340308 Hartford, CT 06134	Mr. Karl J. Wagener Executive Director CT Council on Environmental Quality 79 Elm Street Hartford, CT 06106
Mr. David Fox CT Department of Environmental Protection Office of Environmental Review 79 Elm Street Hartford, CT 06106	
New York	
Mr. Pete Grannis Commissioner Department of Environmental Conservation 625 Broadway Albany, NY 12233	Ms. Maureen Coleman Assistant Commissioner Office of Legislative Affairs 625 Broadway Albany, NY 12233
Mr. Carl Johnson Deputy Commissioner Office of Air & Waste Management 625 Broadway Albany, NY 12233	Ms. Ruth A. Moore Deputy Commissioner Office of Natural Resources & Water Quality 625 Broadway Albany, NY 12233

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE AGENCIES Cont'd	
Mr. Willie Janeway Regional Director, Region 3 Department of Environmental Conservation 21 South Putt Corners New Paltz, NY 12561	Mr. Peter A. Scully Regional Director, Region 1 Department of Environmental Conservation SUNY-Building 40 50 Circle Road Stony Brook, NY 11790
Delaware	
Mr. John Hughes Secretary Department of Natural Resources & Environmental Control 89 Kings Highway Dover, DE 19901	Ms. Sarah Cooksey Environmental Program Administrator DE Department of Natural Resources & Environmental Control Soil and Water Coastal Management Program 89 Kings Highway Dover, DE 19901
New Jersey	
Ms. Lisa P. Jackson Commissioner Department of Environmental Protection 401 East State Street, 7th Floor, East Wing PO Box 402 Trenton, NJ 08625	Mr. Chuck Chiarello Chairperson Pinelands Municipal Council 15 Springfield Road PO Box 7 New Lisbon, NJ 08064
Ms. Carol R. Collier Executive Director Delaware River Basin Commission 25 State Police Drive PO Box 7360 West Trenton, NJ 08628	Ms. Caren S. Franzini Chief Executive Officer NJ Economic Development Authority PO Box 990 Trenton, NJ 08625
Dr. Larry A. Greene Chairman NJ Historical Commission NJ Department of State PO Box 305 Trenton, NJ 08625	Major General William T. Grisoli Chair Delaware River Basin Commission 25 State Police Drive PO Box 7360 West Trenton, NJ 08628
Ms. Barbara Haney Irvine Executive Director New Jersey Historic Trust Department of Community Affairs PO Box 457 Trenton, NJ 08625	Mr. Charles M. Kuperus Secretary of Agriculture Department of Agriculture PO Box 330 Trenton, NJ 08625

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE AGENCIES Cont'd	
Major General Glenn K. Rieth Adjutant General NJ Military & Veterans Affairs PO Box 340 Trenton, NJ 08625	Mr. Ralph Siegel Executive Director Garden State Preservation Trust 135 West Hanover Street PO Box 750 Trenton, NJ 08625
Ms. Betty Wilson Chairperson Jersey Pinelands Commission 15 Springfield Road New Lisbon, NJ 08064	Mr. Ken Koschek NJ Department of Environmental Protection Office of Permit Coordination & Environmental Review PO Box 418 Trenton, NJ 08625
Maryland	
Mr. John R. Griffin Secretary Department of Natural Resources Tawes State Office Building 580 Taylor Avenue Annapolis, MD 21401	Ms. Shari T. Wilson Secretary Department of Environment Montgomery Park Business Center 1800 Washington Blvd. Baltimore, MD 21230
Virginia	
Mr. Steven G. Bowman Commissioner Marine Resources Commission 2600 Washington Avenue, 3rd Floor Newport News, VA 23607	Mr. Robert S. Bloxom Secretary Department of Agriculture & Forestry Patrick Henry Building, 4th Floor 1111 East Broad Street Richmond, VA 23219
Mr. Richard D. Brown Director Department of Planning & Budget Patrick Henry Executive Office Building 1111 East Broad Street, Room 5040 Richmond, VA 23219	Mr. L. Preston Bryant, Jr. Secretary Department of Natural Resources PO Box 1475 Richmond, VA 23219
Mr. Carl E. Garrison, III. State Forester Department of Forestry 900 Natural Resources Drive, Suite 800 Charlottesville, VA 22903	Mr. Timothy Gette Executive Director/CEO Virginia Museum of Natural History 21 Starling Avenue Martinsville, VA 24112
Mr. Pierce R. Homer Secretary of Transportation Department of Transportation PO Box 1475 Richmond, VA 23218	Ms. Ellie Irons Program Manager Office of Environmental Impact Review VA Department of Environmental Quality 629 East Main Street, Suite 901 PO Box 10009 Richmond, VA 23240

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE AGENCIES Cont'd	
Ms. Kathleen Kilpatrick Director Department of Historic Resources 2801 Kensington Avenue Richmond, VA 23221	Mr. Daniel LeGrande Area Manager Virginia Port Authority 600 World Trade Center Norfolk, VA 23510
Mr. Joseph H. Maroon Director VA Department of Conservation & Recreation 203 Governor Street, Suite 213 Richmond, VA 23219	Mr. W. Gerald Massengill Interim Director Department of Game & Inland Fisheries 4010 West Broad Street Richmond, VA 23230
Major General Robert B. Newman, Jr. Adjutant General Department of Military Affairs VA National Guard 202 North 9th Street, 4th Floor Richmond, VA 23219	Mr. David K. Paylor Director Department of Environmental Quality 629 East Main Street, Suite 901 PO Box 1105 Richmond, VA 23218
North Carolina	
Mr. William G. Ross, Jr. Secretary North Carolina Department of Environmental & Natural Resources 1601 Mail Service Center Raleigh, NC 27699	Mr. Bryan E. Beatty Secretary NC Department of Crime Control & Public Safety 4701 Mail Service Center Raleigh, NC 27699
Ms. Lisbeth C. Evans Secretary NC Department of Cultural Resources 109 East Jones Street 4601 Mail Service Center Raleigh, NC 27699	Mr. Richard Hamilton Executive Director NC Wildlife Resources Commission 1701 Mail Service Center Raleigh, NC 27699
Mr. Wes Seegars Chairman NC Wildlife Resources Commission PO Box 1756 Goldsboro, NC 27533	Mr. Bill Flournoy North Carolina Department of Environment and Natural Resources Office of Conservation and Community Affairs 1601 Mail Service Center Raleigh, NC 27699
Charlan Owens North Carolina Department of Environment and Natural Resources Division of Coastal Management 1367 US 17 South Elizabeth City, NC 27909	Mr. Steven H. Everhart NC Wildlife Resources Commission 127 Cardinal Drive Wilmington, NC 28405

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE AGENCIES Cont'd	
South Carolina	
Mr. John Frampton Director Department of Natural Resources PO Box 167 Columbia, SC 29202	Mr. Cecil Campbell Coastal Region Forester South Carolina Forestry Commission 413 Sidneys Road Walterboro, SC 29488
Mr. Bernard S. Groseclose, Jr. President/CEO SC State Ports Authority 176 Concord Street PO Box 22287 Charleston, SC 29413	Mr. C. Earl Hunter Commissioner SC Department of Health & Environmental Control 2600 Bull Street Columbia, SC 29201
Mr. Chad Prosser Director SC Department of Parks, Recreation, & Tourism 1205 Pendleton Street Columbia, SC 29201	Mr. Robert C. Schowalter State Forester South Carolina Forestry Commission 5500 Broad River Road Columbia, SC 29201
Major General Stanhope S. Spears Office of the Adjutant General SC Military Department 1 National Guard Road Columbia, SC 29201	Mr. Hugh E. Weathers Commissioner SC Department of Agriculture PO Box 11280 1200 Senate Street Columbia, SC 29211
Georgia	
Mr. Noel Holcomb Commissioner Georgia Department of Natural Resources East Tower, Suite 1252 2 Martin Luther King, Jr. Drive, SE Atlanta, GA 30334	Mr. Chris Clark Executive Director Georgia Environmental Facilities Authority Harris Tower, Suite 900 233 Peachtree Street, NE Atlanta, GA 30303
Mr. Craig S. Lesser Commissioner Department of Economic Development 75 5th Street, NW, Suite 1200 Atlanta, GA 30334	Major General David B. Poythress Adjutant General Georgia Department of Defense PO Box 17965 Atlanta, GA 30316
Mr. Robert Farris Director Georgia Forestry Commission 5645 Riggins Mill Road Dry Branch, GA 31020	

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE AGENCIES Cont'd	
Florida	
Mr. Michael W. Sole Secretary Department of Environmental Protection 3900 Commonwealth Blvd., MS 49 Tallahassee, FL 32399	Major General Douglas Burnett Adjutant General Florida Department of Military Affairs St. Francis Barracks 82 Marine Street St. Augustine, FL 32084
Ms. Pamela Dana Director Office of Tourism, Trade, & Economic Development 400 S. Monroe Street Tallahassee, FL 32399	Ms. Sally Mann Florida Department of Environmental Protection Marjory Stoneman Douglas Building 3900 Commonwealth Blvd. Tallahassee, FL 32399
Ms. Mary Ann Poole Florida Fish & Wildlife Conservation Commission Office of Policy & Stakeholder Coordination 620 S. Meridian Street Tallahassee, FL 32399	
Alabama	
Mr. R. Vernon Minton Director Alabama Department of Conservation & Natural Resources Marine Resources Division PO Box 189 Dauphin Island, AL 36528	Major General John M. White Adjutant General Alabama State Defense Force PO Box 3711 Montgomery, AL 36109
Col. John Neubauer Executive Director Alabama Historical Commission 468 S. Perry Street Montgomery, AL 36130	Mr. James H. Griggs Director Alabama Department of Conservation & Natural Resources Lands Division, Coastal Section 64 N. Union Street, Suite 468 Montgomery, AL 36130
Mr. Don Heath Chairman Alabama Forestry Commission PO Box 302550 Montgomery, AL 36130	Mr. M. Barnett Lawley Commissioner of Conservation Alabama Department of Conservation & Natural Resources 64 N. Union Street, Suite 468 Montgomery, AL 36130

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE AGENCIES Cont'd	
Mr. Gaines C. McCorquodale Chairman State Oil & Gas Board of Alabama 420 Hackberry Lane PO Box 869999 Tuscaloosa, AL 35486	Mr. Ron Sparks Commissioner Alabama Department of Agriculture & Industries 1445 Federal Drive Montgomery, AL 36107
Ms. Debi Thomas Executive Assistant Environmental Management Commission PO Box 301436 Montgomery, AL 36130	Mr. Neal Wade Director Alabama Development Office 401 Adams Avenue, 6th Floor Montgomery, AL 36130
Mr. Onis Glenn, III. Director Alabama Department of Environmental Management PO Box 301463 Montgomery, AL 36130	
Mississippi	
Dr. Vernon Asper Chairman Mississippi Department of Marine Resources 1141 Bayview Avenue, Suite 101 Biloxi, MS 39530	Mr. Donald R. Allee Executive Director/CEO Mississippi State Port Authority PO Box 40 Gulfport, MS 39502
Ms. Trudy Fisher Executive Director Department of Environmental Quality PO Box 20305 Jackson, MS 39289	Major General Harold A. Cross Adjutant General MS National Guard Joint Force Headquarters 1410 Riverside Drive Jackson, MS 39296
Mr. Don Underwood Executive Director Mississippi Soil & Water Conservation Commission PO Box 23005 Jackson, MS 39225	Mr. Don Pittman President Pat Harrison Waterway District 6081 Highway 49 South PO Drawer 1509 Hattiesburg, MS 39403
Ms. Terry Teague Gulf of Mexico Program Office Mail Code: EPA/GMPO Stennis Space Center Stennis Space Center, MS 39529	Mr. Robert E. Cox Chairman Mississippi Forestry Commission 1732 Douglastown Road Maben, MS 39750

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

STATE AGENCIES Cont'd	
Mr. David A. Scott Chairman Mississippi State Oil & Gas Board 500 Greymont Avenue, Suite E Jackson, MS 39202	
Louisiana	
Mr. Scott A. Angelle Secretary Louisiana Department of Natural Resources PO Box 94396 Baton Rouge, LA 70804	Dr. Mike McDaniel Secretary Department of Environmental Quality PO Box 4301 Baton Rouge, LA 70802
Mr. Michael Olivier Secretary/CEO Department of Economic Development PO Box 94185 Baton Rouge, LA 70804	
Texas	
Ms. Kathleen Hartnett White Chairman Texas Commission of Environmental Quality MC 100 PO Box 13087 Austin, TX 78711	Mr. Joseph J. Beal Director Lower Colorado River Authority PO Box 220 Austin, TX 78767
Col. Peter P. Flores Executive Director Texas Parks & Wildlife Department 6300 Ocean Drive 4200 Smith School Road Austin, TX 78744	Mr. Phil Ford General Manager Brazos River Authority 4600 Cobbs Drive PO Box 7555 Waco, TX 76714
Lt. Col. Jerry Patterson Commissioner Texas General Land Office 1700 North Congress Avenue, Suite 935 Austin, TX 78701	Mr. Scott W. Tinker Director Bureau of Economic Geology The University of Texas at Austin University Station, Box X Austin, TX 78713
Mr. J. Kevin Ward Executive Administrator Texas Water Development Board Stephen F. Austin Building PO Box 13231 Austin, TX 78711	Lt. Gen. Charles G. Rodriguez Adjutant General Texas National Guard 2200 West 35th Street Austin, TX 78763

Table B-2. AFAST EIS/OEIS Stakeholder List Cont'd

NON-GOVERNMENTAL ORGANIZATIONS	
Southern Environmental Law Center (SELC) Ms. Michele Nowlin 200 W. Franklin St., Suite 300 Chapel Hill, NC 27516	Southeastern Ct. Enterprises (SECTER) Mr. John Markowicz 190 Governor Winthrop Blvd. New London, CT 06320
The Humane Society of the United States Ms. Naomi Rose, PhD, marine mammal scientist 2100 L. Street, NW Washington, DC 20037	Marine Acoustics, Inc. Ms. Kimberly Skrupky 4100 Fairfax Drive, Suite 730 Arlington, VA 22203
Southern Environmental Law Center (SELC) Ms. Anna Davis 200 W. Franklin Street, Suite 330 Chapel Hill, NC 27516	Pender Watch & Conservancy Mr. Jack Spruill 1836 Corcus Ferry Road Hampstead, NC 28443
North Carolina Coastal Federation Ms. Christine Miller 813 S. Yaupon Terrace Morehead City, NC 28557	Save the Whales Rick, Pam, Victoria, & Veronica Arma 113 Holman Road Williamsburg, VA 231850
Captain Anderson Sightseeing Betty Canaugh 1424 Canaugh Lane Southport, FL 32409	Florida Chapter Sierra Club John S. Glenn, Conservation Chair 214 N. 17th Street Fernandina Beach, FL 32034
Citizens Opposing Active Sonar Threats COAST Russell Wray 536 Point Road Hancock, ME 04640	Natural Resources Defense Council Joel R. Reynolds, director Marine Mammal Protection Project 1314 Second Street Santa Monica, CA 90401
Carteret County Crossroads P.O. Box 155 Beaufort, NC 28443	Neuse River Foundation 220 S. Front Street New Bern, NC 28560
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APPENDIX C

EXERCISE AND SONAR TYPE DESCRIPTIONS

EXERCISE AND SONAR TYPE DESCRIPTIONS

Unit Level Training (ULT), Coordinated ULT, Strike Group training, active sonar maintenance, and research, development, test, and evaluation (RDT&E) activities are addressed within this appendix. The active acoustic systems associated with each training platform (aircraft, ships, submarines, etc.) are identified. This is followed by 17 scenario descriptions defining the platforms that participate in each active sonar event. The yearly frequency of each scenario occurrence is listed. The criteria for selection of active sonar sources for inclusion in the analysis are presented. Lastly, the operating parameters for each selected source are described to the extent classification restrictions permit.

C.1 ACOUSTIC SOURCES

Various active acoustic sources that may or may not affect the local marine mammal population are deployed by platforms during each of the training exercises, maintenance events, and RDT&E activities discussed in this appendix. The following sections discuss the acoustic sources that would be present during such training exercises, maintenance events, and RDT&E activities.

C.1.1 Surface Ship Sonars

- AN/SQS-53 – a computer-controlled, hull-mounted surface-ship sonar that has both active and passive operating capabilities, providing precise information for anti-submarine warfare (ASW) weapons control and guidance. The system is designed to perform direct-path ASW search, detection, localization, and tracking from a hull-mounted transducer array. The AN/SQS-53 (Figure C-1) is characterized as a mid-frequency active (MFA) sonar, operating from 1 to 10 kilohertz (kHz); however, the exact frequency is classified. The AN/SQS-53 sonar is the major component to the AN/SQQ-89 sonar suite, and it is installed on Arleigh Burke Class guided missile destroyers (DDGs), and Ticonderoga Class guided missile cruisers (CGs) (FAS, 1999).

Figure C-1. Arleigh Burke Class DDG equipped with AN/SQS-53 (L); Ticonderoga Class CG showing AN/SQS-53 (R)

- AN/SQS-53 Kingfisher – a modification to the AN/SQS-53 sonar system that provides the surface ship with an object detection capability. The system uses MFA sonar, although the exact frequency range is classified. This sonar system is installed on Arleigh Burke Class DDGs, and Ticonderoga Class CGs (FAS, 1999).

- AN/SQS-56 – a hull-mounted sonar that features digital implementation, system control by a built-in mini computer, and an advanced display system. The sonar is an active/passive, preformed beam, digital sonar providing panoramic active echo ranging and passive digital multibeam steering (DIMUS) surveillance. The sonar system is characterized as MFA sonar, although the exact frequency range is classified. The AN/SQS-56 (Figure C-2) is the major component of the AN/SQQ-89 sonar suite and is installed on Oliver Hazard Perry Class frigates (FFGs) (FAS, 1998).

Figure C-2. Oliver Hazard Perry Class FFG equipped with AN/SQS-56

- AN/SQR-19 – a tactical towed array sonar (TACTAS) that is able to passively detect adversary submarines at a very long range. The AN/SQR-19, which is a component of the AN/SQQ-89 sonar suite, is a series of passive hydrophones towed from a cable several thousand feet behind the ship. This sonar system is a passive sensing device; therefore, it is not analyzed in this Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS). The AN/SQR-19 (Figure C-3) can be deployed by Arleigh Burke Class DDGs, Ticonderoga Class CGs, and Oliver Hazard Perry Class FFGs (FAS, 1998).

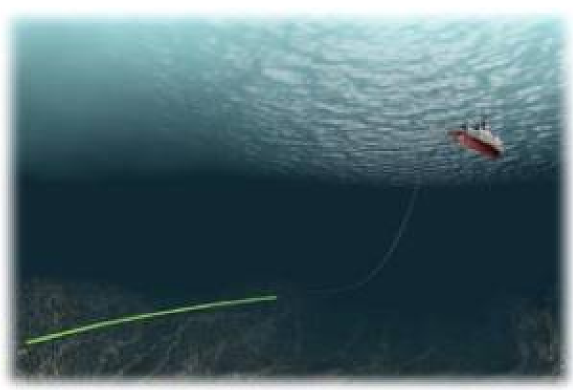

Figure C-3. AN/SQR-19

C.1.2 Surface Ship Fathometer

The surface ship fathometer (AN/UQN-4) is used to measure the depth of water from the ship's keel to the ocean floor for safe operational navigation. Fathometers are operated from all classes of United States (U.S.) Navy surface ships and are considered MFA sonar, although the exact frequency range is classified (FAS, 1999).

C.1.3 Submarine Sonars

- <u>AN/BQQ-5</u> **–** a bow- and hull-mounted passive and active search and attack sonar system. The system includes the TB-16 and TB-23 or TB-29 towed arrays and Combat Control System (CCS) MK 2. This sonar system is characterized as MFA, although the exact frequency range is classified. The AN/BQQ-5 (Figure C-4) sonar system is installed on Los Angeles Class nuclear attack submarines (SSNs) and Ohio Class ballistic missile nuclear submarines (SSBNs), although the AN/BQQ-5 systems installed on Ohio Class SSBNs do not have an active sonar capability (FAS, 1998). The AN/BQQ-5 system is being phased out on all submarines in favor of the AN/BQQ-10 sonar. The operating parameters of both systems with regard to sound output in the ocean are almost identical. For these reasons, these systems will be referred to as AN/BQQ-10 in this EIS.

Figure C-4. AN/BQQ-5

- <u>AN/BQQ-10 (also known as Advanced Rapid Commercial-Off-the-Shelf Insertion [ARCI])</u> – a four-phase program for transforming existing submarine sonar systems (i.e., AN/BQQ-5) from legacy systems to more capable and flexible active and passive systems with enhanced processing using commercial-off-the-shelf (COTS) components. The system is characterized as MFA, although the exact frequency range is classified. The AN/BQQ-10 (Figure C-5) is installed on Seawolf Class SSNs, Virginia Class SSNs, Los Angeles Class SSNs, and Ohio Class SSBN/nuclear guided missile submarines (SSGNs). The BQQ-10 systems installed on Ohio Class SSBNs do not have an active sonar capability (FAS, 1998).

Figure C-5. Sailors operating AN/BQQ-10

C.1.4 Submarine Fathometer

A submarine fathometer (AN/BQN-17, AN/UQN-4) is used to measure the depth of water from the submarine's keel to the ocean floor for safe operational navigation. All U.S. Navy submarines operate fathometers, which operate at MFA, although the exact frequency range is classified (FAS, 1999).

C.1.5 Submarine Auxiliary Sonar Systems

- TB-16, TB-23, TB-29, and TB-33 – passive acoustic sensor arrays, which are towed behind a submarine on a cable 732 meters (m) (2,400 feet [ft]) long, 0.94 centimeters (cm) (0.37 inches [in]) in diameter, weighing 204 kilograms (kg) (450 pounds [lbs]) (Figure C-6). The actual arrays vary in length from several hundred to several thousand feet long, depending on the type. These arrays are not analyzed in the EIS/OEIS because they are not active sensing devices.

  All submarines can deploy two towed arrays, the TB-16 and either the TB-23, TB-29, or the new TB-33. While submerged, a submarine usually has the TB-16 towed array deployed at all times (FAS, 2007).

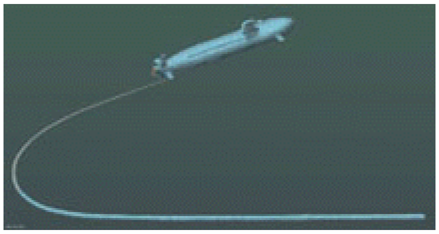

Figure C-6. Submarine Towed Array

- AN/BQS-15 – an under-ice navigation and mine-hunting sonar (Figure C-7) that uses both mid- and high-frequency (i.e., greater than 10 kHz) active sonar, although the exact frequencies are classified. Later versions of the AN/BQS-15 are also referred to as Submarine Active Detection Sonar (SADS). The Advanced Mine Detection System (AMDS) is being phased in on all ships and will eventually replace the AN/BQS-15 and SADS. These systems are installed on Seawolf Class SSNs, Virginia Class SSNs, Los Angeles Class SSNs, and Ohio Class SSGNs (FAS, 1998).

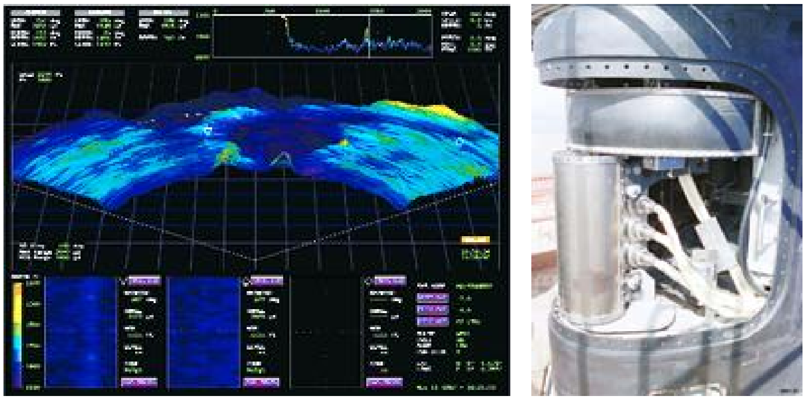

Figure C-7. AN/BQS-15 display (L), and sensor components (R)

- <u>AN/WQC-2</u> – an MFA sonar underwater communications system that can transmit either voice or signal data in two bands, 1.5 to 3.1 kHz or 8.3 to 11.1 kHz. The AN/WQC-2 (Figure C-8), also referred to as the "underwater telephone" (UWT), is on all submarines and most surface ships, and allows voice and tonal communications between ships and submarines (FAS, 1999; EDO Corp., 2004).

Figure C-8. AN/WQC-2 transducer (L), and control unit (R)

C.1.6 Aircraft Sonar Systems

Aircraft sonar systems that could be deployed during active sonar events include sonobuoys (tonal [active], listening [passive], and extended echo ranging [EER] or improved extended echo ranging [IEER]) and dipping sonar (AN/AQS-13/22 or AN/AOS-22). Sonobuoys may be deployed by Marine Patrol Aircraft (MPA) or SH-60 helicopters. A sonobuoy is an expendable device used by aircraft for the detection of underwater acoustic energy and for conducting vertical water column temperature measurements. Most sonobuoys are passive, but some can generate active acoustic signals as well as listen passively. Dipping sonars are used by SH-60 helicopters. Dipping sonar is an active or passive sonar device lowered on cable by helicopters to detect or maintain contact with underwater targets. A description of various types of sonobuoys and dipping sonar is provided below.

- <u>AN/AQS-13 Helicopter Dipping Sonar</u> – an active scanning sonar that detects and maintains contact with underwater targets through a transducer lowered into the water from a hovering helicopter. It operates at mid-frequency, although the exact frequency is classified. The AN/AQS-13 (Figure C-9) is operated by SH-60 helicopters (FAS, 1999).

Figure C-9. AN/AQS-13 being deployed by SH-60 helicopter

- <u>AN/AQS-22 Airborne Low-Frequency Sonar (ALFS)</u> – the U.S. Navy's dipping sonar system for the SH-60 helicopter Light Airborne Multi-Purpose System III (LAMPS III), which is deployed from aircraft carriers, cruisers, destroyers, and frigates. It operates at mid-frequency, although the exact frequency is classified. The AN/AQS-22 (Figure C-10) employs both deep- and shallow-water capabilities (Raytheon, 2005).

Figure C-10. AN/AQS-22 being deployed by SH-60 helicopter

- <u>AN/SSQ-62C Directional Command Activated Sonobuoy System (DICASS)</u> – sonobuoy that operates under direct command from ASW fixed-wing aircraft or SH-60 helicopters (Figure C-11). The system can determine the range and bearing of the target relative to the sonobuoys position and can deploy to various depths within the water column. The active sonar operates at mid-frequency, although the exact frequency range is classified. After water entry, the sonobuoy transmits sonar pulses (continuous waveform [CW] or linear frequency modulation [LFM]) upon command from the aircraft. The echoes from the active sonar signal are processed in the buoy and transmitted to the receiving station onboard the launching aircraft (FAS, 1998).

Figure C-11. AN/SQS-62 (L); MPA equipped with AN/SQS-62 sonobuoys (R)

- <u>AN/SSQ-110A Explosive Source Sonobuoy</u> – a commandable, air-dropped, high source level explosive sonobuoy. The AN/SSQ-110A explosive source sonobuoy (Figure C-12) is composed of two sections, an active (explosive) section and a passive section. The upper section is called the "control buoy" and is similar to the upper electronics package of the AN/SSQ-62 DICASS sonobuoy. The lower section consists of two signal underwater sound (SUS) explosive payloads of Class A explosive weighing 1.9 kg (4.2 lbs) each. The arming and firing mechanism is hydrostatically armed and detonated. Once in the water, the SUS charges explode, creating a loud acoustic signal. The echoes from the explosive charge are then analyzed on the aircraft to determine a submarine's position. The AN/SSQ-110A explosive source sonobuoy is deployed by MPA (FAS, 1998).

Figure C-12. MPA deploying AN/SSQ-110A

- AN/SSQ-53D/E Directional Frequency Analysis and Recording (DIFAR) – a passive sonobuoy deployed by MPA aircraft and SH-60 helicopters. The DIFAR sonobuoy (Figure C-13) provides acoustic signature data and bearing of the target of interest to the monitoring unit(s) and can be used for search, detection, and classification. The buoy uses a hydrophone with directional detection capabilities in the very low frequency, low frequency, and mid-frequency ranges, as well as an omnidirectional hydrophone for general listening purposes (FAS, 1998).

Figure C-13. AN/SSQ-53 (L); AN/SSQ-53 being loaded onto MPA (R)

C.1.7 Mine-Hunting Sonar Systems

Mine-hunting sonars are used to detect, locate, and characterize mine-like objects under various environmental conditions, including those suspended in the water (i.e., moored mines), mines on the ocean floor (i.e., proud mines), and mines buried under the ocean floor. In addition, the majority of the sonar sensors used can be deployed by more then one platform (i.e., towed body from a helicopter, unmanned underwater vehicles [UUVs], surf zone crawler, or surface ship) and may be interchangeable within the sensor package. Types of mine-hunting sonar systems are described below.

- AN/AQS-14 – an active-controlled, helicopter-towed mine-hunting active sonar (Figure C-14). It is a multibeam, side-looking sonar with electronic beam forming, all-range focusing, and an adaptive processor. The high frequency (HF) sonar system's exact frequency is classified. The system consists of three parts: a stabilized underwater vehicle, electromechanical tow cable, and airborne electronic console. The underwater vehicle is 3.3 m (10.7 ft) long and can be maintained at a fixed depth above the sea floor.

It is towed by MH-60 helicopters. This system was not analyzed in this document, due to the fact that it operates above 200 kHz (Global Security, 2007).

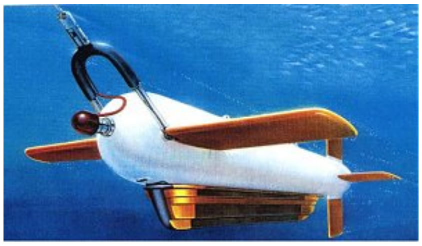

Figure C-14. AN/AQS-14

- <u>AN/AQS-24</u> – the upgraded version of AN/AQS-14, including digital electronics, smaller avionics, higher resolution (image clarity), and the optional addition of a laser line scanner for target identification (Deagal, 2007). The HF side-looking sonar is towed by MH-53 helicopters (Figure C-15), but the exact frequency range is classified. This system was not analyzed in this document, due to the fact that it operates above 200 kHz.

Figure C-15. AN/AQS-24

- <u>AN/BLQ-11 Long Term Mine Reconnaissance System (LMRS)</u> – a UUV (Figure C-16) that, when in operation, can be launched and recovered through the torpedo tubes by all classes of submarines. It can be equipped with MFA sonar for mine detection and is intended to extend the submarine's reach for mine reconnaissance missions, although the exact frequency is classified (FAS, 2000).

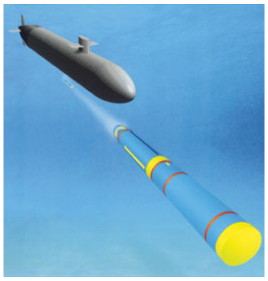

Figure C-16. AN/BLQ-11

- <u>AN/SQQ-32</u> – a variable-depth mine detection and classification HF active sonar (Figure C-17), although the system's exact frequency range is classified. The AN/SQQ-32 became the standard sonar for the Avenger Class mine countermeasures (MCM), replacing the AN/SQQ-30. The AN/SQQ-32 displays search and classification information simultaneously and independently, using separate search and classification transducers in a stable, variable-depth body. The AN/SQQ-32 can also be used from the vessel's hull in shallow water (FAS, 1998).

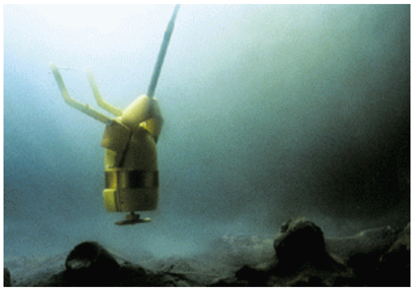

Figure C-17. AN/SQQ-32

- AN/AQS-20A-FLS/VSS/SLS/GFS – a high-frequency active towed sonar system composed of five independent sonar sensors intended to detect and identify deeper moored mines and visible bottom mines (Figure C-18). The exact frequency range of this system is classified. It consists of a state-of-the-art, side-looking, multibeam active sonar system that delivers real-time high-resolution imagery of the ocean bottom. The AN/AQS-20 is towed by MH-53, H-60 helicopters and RMS. This system was not analyzed in this document, due to the fact that it operates above 200 kHz (GlobalSecurity, 2007).

Figure C-18. AN/AQS-20

- AN/SLQ-48 – a system (Figure C-19) that uses a remote-controlled submersible vehicle to identify underwater objects and, if they are mines, render them safe. The operating frequency of the AN/SLQ-48 is classified. The prime feature is the 1,225-kg (2,700-lb), tethered, video and sonar-equipped mine neutralization vehicle (MNV), which places an explosive destructive charge on bottom mines and cuts the cables of moored mines. The AN/SLQ-48 is best suited to deep water and is deployed by Avenger Class MCMs. This system was not analyzed in this document, due to the fact that it operates above 200 kHz (FAS, 1999).

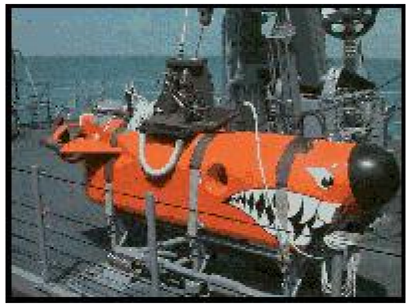

Figure C-19. AN/SLQ-48

- AN/SLQ-37 – installed on Avenger Class MCMs and consists of a straight tail magnetic sweep (M MK 5A) combined with the A MK 4(v) and/or A MK 6(b) active acoustic sweep sonar. The operating frequency of the AN/SLQ-37 (Figure C-20) is classified. Earlier versions of these components were used by Navy World War II sweepers. The system can be configured several ways, including diverting the magnetic cable and/or the acoustic devices by using components of the AN/SLQ-38 mechanical sweep gear. This system was not analyzed in this document, due to the fact that it operates above 200 kHz (FAS, 1998).

Figure C-20. Avenger Class MCM equipped with AN/SLQ-37

- SEABAT – a forward-looking active sonar that provides high-resolution sonar imaging of the water column or ocean floor for mine and object detection. The SEABAT (Figure C-21) can be carried by (Remotely Operated Vehicles/Unmanned Undersea Vehicles [ROVs/UUVs]) and operates at high frequency and low power , ranging from 100 to 455 kHz . Although the low spectrum of this system is below 200 kHz, it was not analyzed due to its low power and its infrequent operation (Reson Inc., 2007).

Figure C-21. SEABAT

- Dual Frequency Acoustic Lens System (DFALS) – an active sonar intended to detect buried or proud objects and mines. The active frequencies are unavailable. The DFALSs have low source levels, and are installed on ROVs and UUVs.

C.1.8 Torpedoes

Torpedoes are the primary ASW weapon used by surface ships, aircraft, and submarines. When torpedoes operate actively, they transmit an active acoustic signal to ensonify the target and use the received echoes for guidance.

- MK 48 and MK 48 Advanced Capability (ADCAP) (Figure C-22) are heavyweight torpedoes deployed on all classes of Navy submarines. MK 48 and MK 48 ADCAP torpedoes are inert and considered HF sonar, but the frequency ranges are classified. Due to the fact that both torpedoes are essentially identical in terms of environmental interaction, they will be referred to collectively as the MK48 in this EIS (FAS, 1998).


Figure C-22. MK 48/MK 48 ADCAP (L); Seawolf Class SSN launching MK-48/MK-48 ADCAP (R)

- MK 46 Lightweight Torpedo (Figure C-23) are ASW torpedoes. They are less than half the size of the MK 48 and can be launched from surface ships, helicopters, and fixed wing aircraft. When used in training, the MK 46 is inert and considered HF sonar, but the exact frequency range is classified. When dropped from an aircraft, the MK 46 may have a parachute, which is jettisoned when it enters the water. The MK 46 torpedo also carries a small sea dye marker (Fluorescein) that is marks the torpedo's position on the surface to facilitate recovery. The MK 46 is planned to remain in service until 2015. (FAS, 1998).


Figure C-23. MK 46 Torpedo at launch (L), and recovery (R)

- <u>MK 54 Lightweight Hybrid Torpedo (LHT)</u> (Figure C-24) can be launched from surface ships, fixed wing aircraft, and helicopters. The MK-54 is half the size of a MK 48. The training torpedoes are inert and may carry a parachute, which is jettisoned as it enters the water. The MK 54 torpedo also carries a small sea dye marker (Fluorescein) that is marks the torpedo's position on the surface to facilitate recovery (GlobalSecurity.org, 2007).

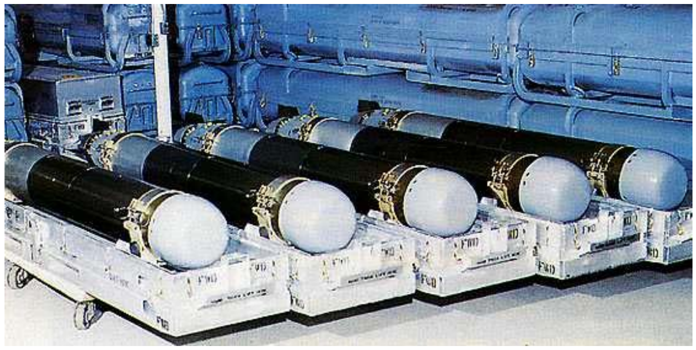

Figure C-24. MK 54 Torpedoes

C.1.9 Countermeasures

Several types of countermeasure (CM) devices (Figure C-25) could be deployed during active sonar events, including the Noise Acoustic Emitter (NAE), Acoustic Device Countermeasure (ADC) MK 1, MK 2, MK 3, MK 4 and the AN/SLQ-25A (NIXIE). CM devices are submarine simulators and act as decoys to avert localization and torpedo attacks. Countermeasures produce low- and mid-frequency sound. The NAE and ADC are deployed from submarines and are free floating, while the AN/SLQ-25 (NIXIE) is towed from surface ships (FAS, 1999).

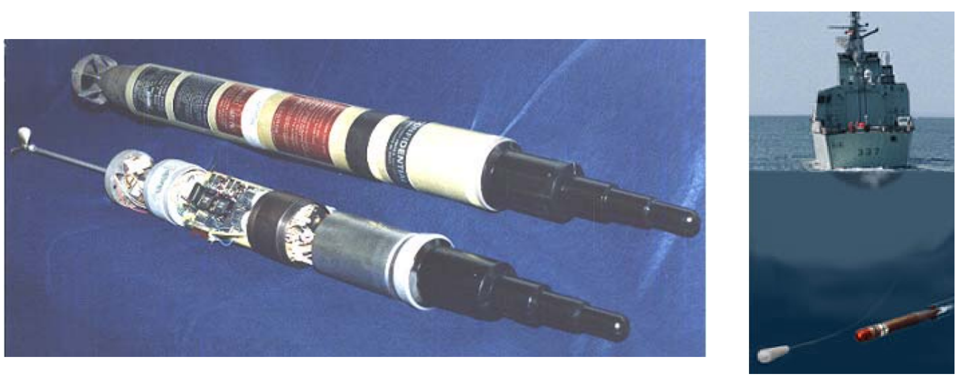

Figure C-25. ADC CM (L), and AN/SLQ-25 (NIXIE) CM (R)

C.1.10 Exercise Training Targets

There are two types of training targets, the MK 30 Acoustic Target and the MK 39 Expendable Mobile ASW Training Target (EMATT) (Figure C-26). ASW training targets simulate submarines as an ASW target in the absence of participation by a submarine in an exercise. They are equipped with acoustic projectors emanating sounds to simulate submarine acoustic signatures, and echo repeaters to simulate the characteristics of the reflection of a sonar signal from a submarine.

Figure C-26. MK 39 EMATT (L) and MK 30 (R)

In addition, surface targets such as "sleds" (aluminum catamarans), seaborne powered targets (radio-controlled high-speed boats), and target drone units (TDUs) could also be deployed during training exercises.

C.1.11 Tracking Pingers, Transponders, and Acoustical Communications (ACOMs)

Tracking pingers are installed on training platforms to track the position of underwater vehicles. The pingers generate a precise, preset, acoustic signal for each target to be tracked. ACOMs and transponders provide the communication link between sensor packages and base platform allowing information to be exchanged.

MK 84 Pinger Signal, Underwater Sound (SUS) – an air or surface dropped noisemaking device (Figure C-27) that emits one of five mid-frequency tonal patterns using two MFA sonars with frequencies at 3.1 and 3.5 kHz; it is used to provide prearranged signal communications to submerged submarines (Sparton Inc., 2006).

Figure C-27. MK 84

- RMS – HF active sonar locator beacon that operates from 16 to 30 kHz (Figure C-28). It is utilized to aid divers in identifying the location of the RMS UUV (AN/WLD-1), which is deployed from surface ships.

Figure C-28. RMS

C.2 TRAINING EXERCISES/MAINTENANCE AND RDT&E DESCRIPTIONS

This appendix attempts to capture and describe all Naval Fleet training activities occurring within the Atlantic Ocean and Gulf of Mexico that require the use of active sonar. The identified sonar training activities have been grouped into the following four categories plus RDT&E:

A) Basic/ULT: The basic phase focuses on completion of platform specific ULT requirements: team training both on board and ashore, unit level exercises in port and at sea, unit inspections, assessments, qualifications, and certifications. During the basic phase, a unit will maximize distance learning options for individual skills development. Additionally, a unit will maximize in-port synthetic training. Successful completion of the ULT phase ensures units are proficient in all required mission essential capabilities, meet various certification criteria, and are ready for more complex integrated training events. ULT follows an instituted assess, train, and certify process.

B) Integrated/Strike Group Training: The goal of integrated phase training is to synthesize unit/staff actions into coordinated strike group operations in a challenging, multi-warfare operational environment. This phase provides an opportunity for strike group decision makers and watchstanders to complete staff planning and warfare commanders courses; conduct multi-unit in-port and at-sea training; and to build on individual skill proficiencies attained in their respective basic phase. The integrated phase is adaptable in order to provide training for Major Combat Operations (MCO) Surge certification, Major Combat Operations (MCO) Ready certification, and/or tailored training to support emergent combatant commander requirements.

C) Sustainment Training: The sustainment phase begins upon completion of the integrated phase, continues throughout the post deployment period and ends with the commencement of the maintenance phase. Sustainment consists of a variety of training evolutions designed to sustain warfighting readiness as a group, multi-unit, or unit until and following employment. Sustainment phase training exercises units and staffs in multi-mission planning and execution, and to inter-operate in a joint/coalition environment. Sustainment training, in port and at sea, allows forces to demonstrate proficiency in operating as part of a joint and coalition combined force, and ensures that proficiency is maintained in all mission essential tasks in order to maintain MCO Ready. The extent of the sustainment training will vary depending on the unit's length of time in an MCO Ready status, as well as the anticipated tasking. During sustainment, units/groups maintain an MCO Ready status until the commencement of the maintenance phase, unless otherwise directed by the Fleet Commander. Unit/group integrity during this period is vital to ensure integrated proficiency is maintained. This is especially vital for strike groups.

D) Active Sonar Maintenance: Maintenance events captured and discussed within this document only refer to AN/SQS-53, AN/SQS-56 and AN/BQQ-10 events that require active pinging.

E) RDT&E Activities: For RDT&E activities included in this analysis, active sonar activities occur in similar locations as representative ULT events.

C.2.1 Fleet Readiness Training Plan (FRTP)

The Fleet Readiness Training Plan (FRTP) was implemented under the overall Fleet Readiness Program, which ensures that, at any one time, there are six Carrier Strike Groups (CSGs) on deployment or available for deployment within 30 days, as well as two CSGs available for deployment within 90 days. FRTP provides for a flexible and scalable approach to training that aligns Navy capabilities and missions in support of combatant commander and Navy requirements. FRTP requirements are defined through fleet training instructions. A notional FRTP for strike group and individual unit (e.g., ship) deployers consists of four phases: maintenance, basic, integrated and sustainment. This results in defined progressive levels of employable capability for Navy forces. Unit level and coordinated unit level training takes place during the maintenance and basic phases. Strike group training takes place during the intermediate and sustainment phases. During the early stages of the FRTP, it is quite common to see a noted reduction in proficiency associated with deployment readiness activities. The reduction in proficiency can be attributed to extended maintenance periods and crew turnover. Thus, the ULT conducted during the initial stages of the FRTP are performed utilizing a minimal number of fleet training resources, because units training in the latter stages of the FRTP have priority to ensure full combat readiness prior to deployment. The basic design of FRTP is progressive in nature, and proficiency of units should steadily increase as they move into the later stages of FRTP. The three principle phases of the FRTP are described in detail below.

C.2.2 Unit Level Training (ULTs) Event Descriptions

The ULT phase lasts approximately 6 months and is the responsibility of the type commander (TYCOM) and unit's commanding officer. This phase focuses on completion of TYCOM ULT requirements: team training both on board and ashore, unit level exercises in port and at sea, unit inspections, assessments, qualifications, and certifications. During the basic phase, a unit will maximize schoolhouse learning options for individual skills development. Additionally, a unit will maximize in-port synthetic training. Successful completion of basic phase ensures units are proficient in all required warfare areas, meet TYCOM certification criteria, and are ready for more complex integrated training events. During the basic phase, ULT will focus on the following training requirements:

- Unit and System Familiarization or Operation
- System Maintenance
- Equipment Operation and Operator Maintenance
- Equipment/Component Trouble-Shooting, Repair and Overhaul
- Interactive Courseware (ICW)
- Team and Sub-team Training
- Flight Deck Operations
- Command and Control Training
- Engineering and Damage Control
- Combat Systems
- Casualty Control Scenarios
- Anti-Ship Missile Defense (ASMD)/Combat Air Patrol (CAP) Coordination
- Rules of Engagement Play
- Ship/Aircraft Integration

- Harpoon Missile Engagements
- Ballast/Deballast Training
- Well Deck Operations (i.e., allowing water in to allow for the docking of Landing Craft Air Cushions [LCACs])
- Underway Replenishment
- Rescue/Salvage

There may also be additional training areas dependent upon requirements to support anticipated missions while forward deployed. The primary objectives of this training are geared around specialty training associated with mine warfare, amphibious and salvage operations.

Amphibious Warfare Specialty Training: Consists of post-maintenance or inter-deployment specialized warfare training for amphibious class ships.

MCM Warfare Specialty Training: The goal is to develop an organic training capability that will improve team proficiency prior to MIW evaluation during MIW Specialty Training, fleet operations, and integrated mine countermeasure operations.

Salvage Training (SALVTRA): The objective of this specialized training is to ensure that all salvage ships are trained and ready to respond immediately and effectively to any diving and salvage mission (GlobalSecurity.org, 2005).

The majority of the ULT events conducted can occur at any time during the maintenance and basic phases.

<u>Assumptions Made With Regards to ULT Events:</u>

A) If the hourly usage associated with a sonar system was provided in a range (e.g., 6 to 12 hours [hrs] per event) then an average was taken to represent the total number of hrs per event (e.g., 9 hrs/event).

B) The numbers of events per ULT have been provided on a per ship basis. Thus, to calculate the total number of events occurring over the period of a year, the total number of available ships identified as being home ported at Naval Stations along the Atlantic and Gulf of Mexico waters were multiplied by the total number of individual events per ship. Based on the information captured, the following total number of ships were used:

   (1) DDGs = 26 ships
   (2) CGs = 11 ships
   (3) FFGs = 17 ships
   (4) MCMs = 9 ships
   (5) SSNs/SSGNs/SSBNs = 30 submarines

C) All three sensors contained within the variable depth body function at the same time.

D) The AN/SLQ-48 is utilized 50 percent of the time and the AN/SQQ-32 is utilized 100 percent of the time during MIW events unless informed otherwise.

E) When the AN/SQS-53 and the AN/SQS-56 sonar are used, they function 70 percent of the time in search mode and 30 percent of the time in track mode.

F) Specific ASW ULT sonar operations are conducted using both active and passive modes of sonar. During such events, the overall duration of each mode is split 50/50, and of those, 50 percent are conducted using synthetic (simulated) equivalents.

G) If ULT is conducted once every 2 years, then half the DDGs, FFGs, and CGs conduct this training each year on a rotational basis.

H) The SSN's AN/BQQ-10 sonar would only emit one ping every 2 hrs.

C.2.3 Coordinated Unit Level Training/Strike Group Training Event Descriptions

Squadron Commander's Exercise (RONEX)

The RONEX is conducted during the intermediate training phase and is designed to bring ships that have mastered individual unit mine countermeasures (MCM) disciplines together as a task force under the MCM squadron in a tactical exercise scenario, and provide additional training as required. The RONEX is designed to provide intermediate phase training in mine sweeping, mine hunting and mine neutralization capabilities in a multi-ship environment and is the second training phase of a three-part series designed to give ships' crews the skills needed for effective mine countermeasures capability. Typically the RONEX is conducted within the Gulf of Mexico near Corpus Christi, Texas, and/or Panama City, Florida.

Assumptions Made:

A) All three of the sensors on the AN/SQS-32 will be active at the same time for the duration of the exercise.

Southeastern ASW Training Initiative (SEASWTI)

The SEASWTI is a Commander, Second Fleet training initiative conducted to assess Atlantic Fleet ASW performance and capability among various units operating together in a "real world" threat environment. The need for the exercise is to maintain the highly perishable skills of ASW proficiency among operators of Navy ships, submarines, and aircraft.

Assumptions Made:

A) On average the SEASWTI exercise is conducted over a 5 day period.

B) The SEASWTI exercise could potentially be conducted using either DDGs or FFGs. It is assumed that AN/SQS-56 sonar system is used 50 percent of the time and the AN/SQS-53 is utilized the remaining 50 percent of the time.

C) The AN/SQS-53 and AN/SQS-56 would be operated in search mode 70 percent of the time and in track mode 30 percent of the time.

D) The SSN's AN/BQQ-10 sonar would only emit one ping every 2 hrs.

E) The SH-60F would dip the AN/AQS-13 five times per day for an average .25 hrs per dip.

Submarine Commanders Course (SCC Ops)

SCC Ops is a Commander, U.S. Submarine Forces requirement to provide the necessary training to prospective submarine commanders in rigorous and realistic scenarios. This training assesses prospective commanding officers' abilities to operate in numerous hostile environments, encompassing surface ships, aircraft as well as other submarines. The need for this training is to ensure they are properly trained for command at sea to maximize the submarines' survivability during real world operations.

Assumptions Made:

A) All Undersea Warfare capable surface ships, SSNs and helicopters partaking in the training event will be actively utilizing their sonar systems continuously over the 24-hr training period.

B) During the Mini-War event, the two AN/SQS-53 sonar systems and the AN/SQS-56 system would be used 50 percent of the time and the AN/AQS-13/22 would be used the other 50 percent of the time.

C) The AN/SQS-53 and AN/SQS-56 would be operated in search mode 70 percent of the time and in track mode 30 percent of the time.

D) The AN/BQQ-10 would only ping once every 2 hours and would equally use the short pulse and long pulse modes.

E) It has been assumed that this course is conducted two times per year on the East Coast.

Group Sail

The Group Sail Exercise typically involves two to three ships and up to two helicopters searching for, locating, and attacking one submarine. Typically, one ship and helicopter are actively prosecuting while the other ship and helicopter are repositioning. While the ships are searching for the submarine, the submarine may practice simulated attacks against the ships. Multiple acoustic sources may be active at one time.

Assumptions Made

A) The AN/SQS-53 and AN/SQS-56 would be operated in search mode 70 percent of the time and in track mode 30 percent of the time.

B) The SSBN's AN/BQQ-10 sonar would only emit one ping every 2 hrs.

C) At least one helicopter with a AN/AQS-22 unit would be continuously active over the 6-hr event duration.

Integrated ASW Course

IAC is a tailored course of instruction designed to improve Sea Combat Commander (SCC) and Strike Group integrated ASW warfighting skill sets. Key components for this course of instruction are; coordinated ASW training for the SCC or ASW Commander (ASWC) and staff, key shipboard decision makers and ASW watch teams. IAC consists of two phases: Integrated ASW Course phase I, (IAC I) and Integrated ASW Course phase II, (IAC II). IAC I is an approved Navy course of instruction consisting of five days of basic and intermediate level classroom training. IAC II is intended to leverage the knowledge gained during IAC I and build the basic ASW coordination and integration skills of the Strike Group ASW Team. IAC II is a coordinated training scenario that typically involves three DDG's, one CG and one FFG, two to three embarked helicopters, a submarine and one MPA aircraft searching for, locating, and attacking one submarine. The scenario consists of two 12-hour events that occur five times per year. While the ships are searching for the submarine, the submarine may practice simulated attacks against the ships. The ships and their embarked helicopters conduct ASW localization training using the AN/SQS-53, AN/SQS-56, and AN/AQS-13 or AN/AQS-22 dipping sonar. The submarine also periodically operates the AN/BQQ-10 sonar and approximately 18 tonal sonobuoys may also be used per scenario. Multiple acoustic sources may be active at one time. These events would be taking place within and seaward of the VACAPES, CHPT, JAX/CHASN OPAREAs or within and adjacent to the GOMEX OPAREA. During these exercises, some activities may occur in more than one OPAREA.

Assumptions Made

A) The AN/SQS-53 and AN/SQS-56 would be operated in search mode 70 percent of the time and in track mode 30 percent of the time.

B) The SSN's AN/BQQ-10 sonar would only emit one ping every 2 hrs.

C) At least one helicopter with a AN/AQS-22 unit would be continuously active over the event duration.

C.2.4 Integrated and Sustainment Training Event Descriptions

The goal of integrated phase training is to synthesize unit/staff actions into coordinated strike group operations in a challenging, multi-warfare operational environment. This phase provides an opportunity for strike group decision makers and watchstanders to complete staff planning and warfare commanders' courses, conduct multi-unit in-port and at-sea training, and build on individual skill proficiencies attained in their respective basic phase. The integrated phase is adaptable in order to provide training for MCO Surge certification, MCO Ready certification, and/or tailored training to support emergent combatant commander requirements. The sustainment phase begins upon completion of the integrated phase, continues throughout the post deployment period and ends with the commencement of the maintenance phase. Sustainment consists of a variety of training evolutions designed to sustain warfighting readiness as a group, multi-unit, or unit until and following employment. Sustainment phase training exercises units and staffs in multi-mission planning and execution, and to inter-operate in a joint/coalition environment. Sustainment training, in port and at sea, allows forces to demonstrate proficiency in operating as part of a joint and coalition combined force and ensures that proficiency is maintained in order to maintain MCO Ready. The extent of the sustainment training will vary depending on the unit's length of time in a MCO Ready status, as well as the anticipated tasking. During sustainment, units/groups maintain a MCO Ready status until the commencement of the maintenance phase, unless otherwise directed by the Fleet Commander. Unit/group integrity during this period is vital to ensure integrated proficiency is maintained. This is especially vital for strike groups.

Carrier Strike Group (CSG) Composite Training Unit Exercise (COMPTUEX)

Each CSG performs a rehearsal called Composite Training Unit Exercise (COMPTUEX) before departing for deployment. Prior to the COMPTUEX, each ship and aircraft in the strike group has practiced/trained in their specialty. The COMPTUEX is an intermediate-level strike group exercise designed to forge the group into a cohesive fighting team. COMPTUEX is a critical step in the training cycle and a prerequisite for the strike group's Joint Task Force Exercise (Global Security Org., 2005).

COMPTUEX is normally conducted during a 2 to 3 week period 6 to 8 weeks before JTFEX and consists of an 18 day schedule of event (SOE) driven exercise, and a 3 day Final Battle Problem (FBP) (Global Security Org., 2005).

Assumptions Made:

A) COMPTUEX is three times per year on the East Coast and once a year in the Gulf of Mexico.

B) AN/BQQ-10 systems are only pinged once every 2 hrs and an equal number of short pulse and long pulse pings are emitted.

C) The AN/SQS-53 and AN/SQS-56 are operated in search mode 70 percent of the time and in track mode 30 percent of the time.

D) Four ASW capable vessels participate in the COMPTUEX exercise.

E) ASW-5-I – Shallow Water Exercise and ASW-8-I – Choke Point Transit occur once per COMPTUEX or JTFEX. Each event is conducted four times per year. Thus, on a yearly basis each event is conducted two times in conjunction with a COMPTUEX, and two times with a JTFEX.

Expeditionary Strike Group (ESG) Composite Training Unit Exercise (COMPTUEX)

In the past, the Navy and Marine Corps deployed Amphibious Ready Group (ARG) rotational forces overseas. The ARG typically consisted of a three amphibious ships and a Marine Expeditionary Unit. However, in recent years the Navy and Marine Corps have changed the way they deploy forces overseas. The new operational concept is called Expeditionary Strike Group (ESG), which has replaced the traditional Amphibious Ready Group, Marine Expeditionary Unit (ARG/MEU[SOC]) arrangement. Each ESG has nominally been assigned a dedicated guided missile cruiser, a guided missile destroyer, an FFG and a fast attack submarine. These enhancements provide the ESG with additional capabilities, including the ability to launch Tomahawk Land Attack Missiles (TLAMs). Under the new concept, the CSG and the ESG can be combined to form an Expeditionary Strike Force (ESF), with the combined capability of deep strike with aircraft and TLAMs, as well as an amphibious entry capability and expanded support for Special Operations Forces.

Thus, the Navy has implemented an ESG training strategy in an effort to ensure pre-deployment readiness of its forces. The ESG COMPTUEX combines both on-land and in-water operations to facilitate training associated with amphibious operations and live air-to-ground operations.

Assumptions Made:

A) ESG COMPTUEX is conducted three times per year.

B) AN/BQQ-10 systems ping once every 2 hrs. An equal number of short pulse and long pulse pings are emitted.

C) The AN/SQS-53 and AN/SQS-56 are operated in search mode 75 percent of the time and in track mode 25 percent of the time.

D) Four ASW-capable vessels participate in the ESG COMPTUEX events.

Gulf of Mexico Exercise (GOMEX)

The GOMEX is scheduled quarterly for those MCM units that have completed the basic training phase. GOMEX is conducted as a part of the advanced phase and brings air, surface, and underwater MCM units together. GOMEX focuses on integrated MCM operations in preparation for participation with the battle group in major fleet exercises involving complex MCM operations. MCM Squadron Commanders tailor the intermediate and advanced phases to the forces involved and will consider the types of scenarios to be encountered in upcoming major fleet exercises and deployments. GOMEX marks the transition of a mine warfare readiness group from training to ready-to-deploy status and includes integrated surface, air and explosive ordnance disposal (EOD) MCM operations (GlobalSecurity.org, 2005).

The advanced level GOMEX is an integrated exercise involving all parts of the MCM triad (surface MCM [SMCM], airborne MCM [AMCM], and undersea MCM [UMCM] forces). The GOMEX is scheduled to allow sufficient time to integrate lessons learned from the RONEX, and is a scenario-driven event against a reasonably complex threat. The GOMEX is assessed in an effort to provide post-exercise analysis to the participants and a final certification report to Mine Warfare Command (COMINEWARCOM).

Assumptions Made:

A) All three sensors on the AN/AQQ-32 are operated simultaneously through the training event.

Joint Task Force Exercise (JTFEX)

This is the culmination of training and preparation for deployment. This exercise requires the U.S. Naval and often, Allied forces, to integrate all assets to accomplish missions in a multi-threat, multi-dimensional environment. The exercise serves as the ready-to-deploy certification for the Navy-Marine team, requiring tests of critical plans, synchronized employment of available assets and realistic training with live ordnance. The JTFEX is typically scheduled 6 to 8 weeks prior to deployment and is conducted over a period of 21 days at sea.

<u>Assumptions Made:</u>

A) JTFEX exercises are conducted three times per year on the East Coast and once a year in the Gulf of Mexico.

B) The AN/SQS-53 and AN/SQS-56 are operated in search mode 70 percent of the time and in track mode 30 percent of the time.

C) The AN/BQQ-10 sonar would only ping once every 2 hours, and an equal number of short pulse and long pulse pings would be emitted.

D) The JTFEX Free Play Exercise would consist of three 6-hr events conducted four times per year.

E) ASW-5-I – Shallow Water Exercise and ASW-8-I – Choke Point Transit occur once per COMPTUEX or JTFEX. Each event is conducted four times per year. Thus, on a yearly basis each event is conducted two times in conjunction with a COMPTUEX and two times with a JTFEX.

Table C-1 summarizes training events utilizing active sonars analyzed in this EIS (sonars with frequencies lower than 200 kHz). It includes the type of event and the number of each training event.

Table C-1. Captured Exercises and Tempo

Training Phase	Event Name/ Description	Annual Requirement	No. of Synthetic Events	No. of Passive Events	No of Active Events	Total No. of Events	Platform(s)*	Active Sonar Use / Event / Platform	Total Active Sonar Use per event	Active Sonar Use /Year	Area (NM^2)
Unit Level Training (ULT) Events ***(usage shown per exercise and annually)***											
AN/SQQ-32- *usage shown in hours*											
MIW ULT	MIW-1-SF Mine Sweeping Mechanical Gear	2 per MCM annually	0	0	18	18	1 MCM	9	9	162	1NM X 2NM
MIW ULT	MIW-4.1-SF Mine hunting Countermeasures	5 per MCM annually	0	0	95	95	1 MCM	15	15	1425	1NM X 2NM
MIW ULT	MIW-4.4-SF Contact Marking	1 per MCM annually	0	0	19	19	1 MCM	3	3	57	1NM X 2NM
MIW ULT	MIW-4.7-SF MNV Ops	7 per MCM annually	67	0	67	133	1 MCM	1	1	67	1NM X 2NM
MIW ULT	MIW-8-SF Danning	1 per MCM annually	0	0	10	10	1 MCM	2	2	20	1NM X 2NM
MIW ULT	MIW-8.6-SF: Transiting Mineable Waterways	2 per MCM annually	19	0	19	38	1 MCM	1.5	1.5	29	1NM X 2NM
MIW ULT	MIW-11.1-SF Route Survey Operations	1 per MCM annually	0	0	19	19	1 MCM	15	15	285	1NM X 2NM
MIW ULT	MIW-13-SF Sonar Conditions Check	1 per MCM annually	0	0	19	19	1 MCM	1.5	1.5	29	1NM X 2NM
Totals :					**266**					**2074**	
AN/SQS-53- *usage shown in hours*											
Surface ASW ULT	ASW-19-SF RTT Attack Operations	2 per DDG or CG annually	19	37	19	74	1 DDG or CG	2	2	37	20NM X 30NM
Surface ASW ULT	ASW-52-SF - WQC-6 Probe Alert Ops	1 per DDG or CG annually	0	19	19	37	1 DDG or CG	1	1	19	No Reqmt
Surface ASW ULT	ASW-8-SF Active Operations	4 per DDG or CG annually	74	0	74	148	1 DDG or CG	4	4	296	20NM X 30NM
Surface ASW ULT	ASW-15-SF Submarine Familiarization	1 per DDG or CG annually	0	0	37	37	1 DDG or CG	2	2	74	20NM X 30NM
Surface ASW ULT	ASW-18-SF SVTT Attack Operations	2 per DDG or CG annually	19	37	19	74	1 DDG or CG	2	2	37	20NM X 20NM
Surface ASW ULT	ASW-22-SF - ASW Screening	4 per DDG or CG annually	37	74	37	148	1 DDG or CG	6	6	222	30NM X 40NM
Surface ASW ULT	ASW-31-SF - Close-In Screening for Surface Force	1 per DDG or CG annually	9	19	9	37	1 DDG or CG	6	6	54	30NM X 40NM
Surface ASW ULT	ASW-32-SF - Perimeter Screening of Surface Force	1 per DDG or CG annually	9	19	9	37	1 DDG or CG	6	6	54	30NM X 40NM
Surface ASW ULT	ASW-33-SF - Barrier Search / Defend AOA	1 per DDG or CG annually	9	19	9	37	1 DDG or CG	6	6	54	30NM X 40NM
Surface ASW ULT	ASW-42-SF Ship/Fixed-Wing Coordination	1 per DDG or CG every other year	0	0	19	19	1 DDG or CG	4	4	76	20NM X 30NM
Surface ASW ULT	ASW-48-SF Acoustic Data Collection	2 per DDG or CG annually	37	0	37	74	1 DDG or CG	2	2	74	20NM X 20NM
Surface ASW ULT	ASW-24-SF LAMPS Prosecution	1 per DDG or CG annually	0	0	37	37	1 DDG or CG	2	2	74	20NM X 30NM
Totals :					**325**					**1071**	
Surface Ship Object Detection & Navigation ULT	ASW-54-SF Small Object Avoidance	2 per DDG or CG annually	0	0	74	74	1 DDG or CG	2	2	148	5NM X 10NM
Totals :					**74**					**148**	
AN/SQS-56- *usage shown in hours*											
Surface ASW ULT	ASW-8-SF Active Operations	4 per FFG annually	34	0	34	68	1 FFG	4	4	136	20NM X 30NM
Surface ASW ULT	ASW-15-SF Submarine Familiarization	1 per FFG annually	0	0	17	17	1 FFG	2	2	34	20NM X 30NM
Surface ASW ULT	ASW-18-SF SVTT Attack Operations	2 per FFG annually	9	17	9	34	1 FFG	2	2	17	20NM X 20NM
Surface ASW ULT	ASW-22-SF - ASW Screening	4 per FFG annually	17	34	17	68	1 FFG	6	6	102	30NM X 40NM
Surface ASW ULT	ASW-31-SF - Close-In Screening for Surface Force	1 per FFG annually	4	9	4	17	1 FFG	6	6	24	30NM X 40NM
Surface ASW ULT	ASW-32-SF - Perimeter Screening of Surface Force	1 per FFG annually	4	9	4	17	1 FFG	6	6	24	30NM X 40NM
Surface ASW ULT	ASW-33-SF - Barrier Search / Defend AOA	1 per FFG annually	4	9	4	17	1 FFG	6	6	24	30NM X 40NM
Surface ASW ULT	ASW-42-SF Ship/Fixed-Wing Coordination	1 per FFG every other year	0	0	9	9	1 FFG	4	4	36	20NM X 30NM
Surface ASW ULT	ASW-48-SF Acoustic Data Collection	2 per FFG annually	17	0	17	34	1 FFG	2	2	34	20NM X 20NM
Surface ASW ULT	ASW-24-SF LAMPS Prosecution	1 per FFG annually	0	0	17	17	1 FFG	2	2	34	20NM X 30NM
Totals :					**132**					**465**	

Training Phase	Event Name/ Description	Annual Requirement	No. of Synthetic Events	No. of Passive Events	No of Active Events	Total No. of Events	Platform(s)*	Active Sonar Use / Event / Platform	Total Active Sonar Use per event	Active Sonar Use /Year	Area (NM^2)
Surface Ship Object Detection & Navigation ULT	ASW-54-SF Surface Ship Small Object Avoidance	2 per FFG annually	0	0	34	34	1 FFG	2	2	68	5NM X 10 NM
Totals :					**34**					**68**	
AN/AQS- 13 and 22 Dipping Sonar - *usage shown in hours (10 pings per five-minute dip)*											
Helicopter ASW ULT	ASW-24-SF LAMPS Prosecution	1 per MH-60R annually	0	0	54	54	1 SH-60R	1	1	54	20NM X 30NM
Helicopter ASW ULT	ASW-41-SF LAMPS III Control	1 per DDG or CG every two years	9	0	9	19	1 SH-60R	1	1	9	20NM X 30NM
Helicopter ASW ULT	ASW-49-SF Non-LAMPS Helo Control	1 per DDG or CG annually	0	0	37	37	1 SH-60R	1	1	37	20NM X 30NM
Helicopter ASW ULT	RDT&E	2 per year	0	0	60	60	1 SH-60R	1	1	60	
Totals :					**160**					**160**	
AN/BQQ- 5 or 10- *usage shown in pings (one pings every two hours)*											
Submarine ULT	ASW/USW-05-AS-A Covert and Overt Evasion (Submarine)	1 per SSN annually	0	0	25	25	1 SSN	36	36	900	30NM X 40NM
Submarine ULT	ASW/USW-08-AS-P-W Approach and Attack Diesel Submarine	1 per SSN annually	0	0	25	25	1 SSN	36	36	900	30NM X 40NM
Submarine ULT	MOB-02-AS-A Navigate in Restricted Waters and Reduced Visibility	1 per SSN annually	0	0	25	25	1 SSN	36	36	900	30NM X 40NM
Submarine ULT	MOB-06-AS-A Navigate in Restricted Waters and Reduced Visibility with Casualties	1 per SSN annually	0	0	25	25	1 SSN	36	36	900	30NM X 40NM
Totals :					**100**					**3600**	
AN/BQS-15 - *usage shown in hours*											
Submarine ULT	Submarine Navigation ULT	1 per SSN or SSBN monthly	0	0	300	300	1 SSN or SSBN	1.5	1.5	450	5NM X 10NM
Totals :					**300**					**450**	
AN/SSQ- 62 DICASS Sonobuoy- *usage shown in number of sonobuoys (each buoy pings 12 times over six minutes)*											
Helo ASW ULT	ASW-24-SF LAMPS Prosecution	1 per DDG, CG, and FFG annually	0	0	54	54	1 SH-60	4	4	216	20NM X 30NM
Helo ASW ULT	ASW-41-SF LAMPS III Control	1 per DDG, CG, and FFG every other year	14	0	14	27	1 SH-60	3	3	42	20NM X 30NM
Helo ASW ULT	ASW-49-SF Non-LAMPS Helo Control	1 per DDG or CG annually	0	0	37	37	1 SH-60	3	3	111	20NM X 30NM
Helo ASW ULT	RDT&E		0	0	60	60	1 SH-60	3	3	180	20NM X 30NM
Totals :					**165**					**549**	
MPA ASW ULT	ASW-42-SF Ship/Fixed-Wing Coordination	1 per DDG, CG, and FFG every other year	0	0	37	37	1 MPA	4	4	148	20NM X 30NM
MPA ASW ULT	ASW 201- Littoral ASW (& similar RDT&E)		0	0	78	78	1 MPA	10	10	780	60NM X 60NM
MPA ASW ULT	ASW 202- Open Ocean ASW (& similar RDT&E)		0	0	111	111	1 MPA	10	10	1110	60NM X 60NM
MPA ASW ULT	ASW 203- Coordinated ASW (& similar RDT&E)		0	0	74	74	1 MPA	4	4	296	60NM X 60NM
MPA ASW ULT	ASW 204- Range Torpex (& similar RDT&E)		0	0	83	83	1 MPA	2	2	166	30NM X 30NM
MPA ASW ULT	ASW 205 (& similar RDT&E)		0	0	129	129	1 MPA	3	3	387	60NM X 60NM
MPA ASW ULT	ASW 206 (& similar RDT&E)		0	0	132	132	1 MPA	3	3	396	60NM X 60NM
MPA ASW ULT	ASW 210		0	0	82	82	1 MPA	3	3	246	60NM X 60NM
MPA ASW ULT	MOB 203- Crew PQS (& similar RDT&E)		0	0	65	65	1 MPA	1	1	65	30NM X 30NM
Totals :					**791**					**3594**	

Training Phase	Event Name/ Description	Annual Requirement	No. of Synthetic Events	No. of Passive Events	No of Active Events	Total No. of Events	Platform(s)*	Active Sonar Use / Event / Platform	Total Active Sonar Use per event	Active Sonar Use /Year	Area (NM^2)
MK-46 or 54 Torpedo- *usage shown in number of torpedoes (each torpedo pings for approximately 15 minutes)*											
Surface ASW ULT	RDT&E	2 per year	0	0	2	2	1 DDG or FFG	2	4	8	
Helicopter ASW ULT	RDT&E	2 per year	0	0	2	2	1 helicopter	2	4	8	
MPA ASW ULT	RDT&E	2 per year	0	0	2	2	1 MPA	2	4	8	
Totals :					**6**					**25**	
MK-48 Torpedo- *usage shown in number of torpedoes (each torpedo pings for approximately 15 minutes)*											
Submarine ASW ULT	RDT&E	2 per year	0	0	2	2	1 submarine	16	16	32	
Totals :					**2**					**32**	
AN/SSQ-110A IEER sonobuoy- *usage shown in number of sonobuoys (each sonobuoy has two explosive packages)*											
MPA ASW ULT	ASW 205 (& similar RDT&E)		0	0	99	99	1 MPA	4	4	396	60NM X 60NM
MPA ASW ULT	ASW 210		0	0	70	70	1 MPA	4	4	280	60NM X 60NM
Totals :					**169**					**676**	
AN/SLQ-25A (NIXIE)- *usage shown in hours*											
Surface ASW ULT	ASW-51-SF Torpedo Countermeasures	Up to 2 per DDG, CG, FFG, CVN, AO, AOE, LHA, and LPD annually	0	0	158	158	1 DDG, CG, FFG, CVN, AO, AOE, LHA, or LPD			108	20NM X 20NM
Totals :					**158**					**108**	
Acoustic Device Countermeasures (total of MK-1, MK-2, MK-3, and MK-4) – *usage shown in number of units*											
Surface ASW ULT	Various ASW ULT's	Surface Units	0	0	225	179	Surface Units	1	1	225	
Totals:					**225**					**225**	
Noise Acoustic Emitter (NAE) – *usage shown in number of units*											
Surface ASW ULT	Various ASW ULT's	Surface Units	0	0	127	127	Surface Units	1	1	127	
Totals:					**127**					**127**	
Coordinated ULTs (usage shown per exercise and annually)											
AN/SQQ-32- *usage shown in hours*											
Coordinated MIW ULT	GOMEX	4 times per year in the Gulf of Mexico	0	0	4	4	4 MCMs	90	360	1440	20NM X 20NM
Coordinated MIW ULT	RONEX	4 times per year in the Gulf of Mexico	0	0	4	4	4 MCMs	60	240	960	20NM X 20NM
Totals :					**8**					**2400**	
AN/SQS-53- *usage shown in hours*											
Coordinated ASW ULT	Integrated ASW Course (IAC)	Two scenarios that occur five times a year for training (hours shown include both scenarios)	0	0	5	5	3 DDGs	19	57	285	120NM X 60NM
Totals :					**5**					**285**	
Coordinated ASW ULT	Group Sail	20 times per year	0	0	20	20	2 DDGs	6	12	240	
Totals :					**20**					**240**	
Coordinated ASW ULT	Southeastern Integrated Training Initiative (SEASWITI)- Submarine Familiarization	4 times per year & 1 similar RDT&E	0	0	5	5	2 DDGs	4	8	40	10NM X 20NM
Coordinated ASW ULT	SEASWITI- Tactical Training	4 times per year & 1 similar RDT&E	0	0	5	5	2 DDGs	8	16	80	10NM X 20NM
Coordinated ASW ULT	SEASWITI- Freeplay Event	4 times per year & 1 similar RDT&E	0	0	5	5	2 DDGs	28	56	280	10NM X 20NM
Totals :					**15**					**440**	

Training Phase	Event Name/ Description	Annual Requirement	No. of Synthetic Events	No. of Passive Events	No of Active Events	Total No. of Events	Platform(s)*	Active Sonar Use / Event / Platform	Total Active Sonar Use per event	Active Sonar Use /Year	Area (NM^2)
ANSQS-56- *usage shown in hours*											
Coordinated ASW ULT	Integrated ASW Course	Two scenarios that occur five times a year for training (hours shown include both scenarios)	0	0	5	5	1 FFG	20	20	100	120NM X 60NM
Totals :					5					100	
Coordinated ASW ULT	Group Sail	20 times per year	0	0	20	20	1 FFG	6	6	120	
Totals :					**20**					**120**	
Coordinated ASW ULT	SEASWITI- Submarine Familiarization	4 times per year & 1 similar RDT&E	0	0	5	5	1 FFG	4	4	20	10NM X 20NM
Coordinated ASW ULT	SEASWITI- Tactical Training	4 times per year & 1 similar RDT&E	0	0	5	5	1 FFG	8	8	40	10NM X 20NM
Coordinated ASW ULT	SEASWITI- Freeplay Event	4 times per year & 1 similar RDT&E	0	0	5	5	1 FFG	28	28	140	10NM X 20NM
Totals :					**15**					**200**	
AN/AQS-13/22 dipping sonar - *usage shown in hours (10 pings per dip)*											
Coordinated ASW ULT	Integrated ASW Course	Two scenarios that occur five times a year for training (hours shown include both scenarios)	0	0	5	5	1 helo	1	1	5	120NM X 60NM
Totals :					**5**					**5**	
Coordinated ASW ULT	Group Sail	20 times per year	0	0	20	20	2 helos	1.5	3	60	
Totals :					**20**					**60**	
Coordinated ASW ULT	SEASWITI- Submarine Familiarization	4 times per year & 1 similar RDT&E	0	0	5	5	1 helo	0.2	0.2	1	10NM X 20NM
Coordinated ASW ULT	SEASWITI- Tactical Training	4 times per year & 1 similar RDT&E	0	0	5	5	1 helo	0.4	0.4	2	10NM X 20NM
Coordinated ASW ULT	SEASWITI- Freeplay Event	4 times per year & 1 similar RDT&E	0	0	5	5	1 helo	1.4	1.4	7	10NM X 20NM
Totals :					**15**					**10**	
BQQ-5 or 10- *usage shown in pings*											
Coordinated ASW ULT	Integrated ASW Course	Two scenarios that occur five times a year for training (pings shown include both scenarios)	0	0	5	5	2 SSNs	6	12	60	120NM X 60NM
Totals :					**5**					**60**	
Coordinated Submarine ASW	SCC Ops- Sub vs. Sub	2 times per year	0	0	2	2	2 SSNs	12	24	48	30NM X 50NM
Totals :					**2**					**48**	
Coordinated ASW ULT	Group Sail	20 times per year	0	0	0	20	1 SSN	2	2	40	
Totals :					**20**					**40**	
Coordinated ASW ULT	SEASWITI- Submarine Familiarization	4 times per year & 1 similar RDT&E	0	0	5	5	2 SSNs (only one actively pinging)	2	2	10	10NM X 20NM
Coordinated ASW ULT	SEASWITI- Tactical Training	4 times per year & 1 similar RDT&E	0	0	5	5	2 SSNs (only one actively pinging)	4	4	20	10NM X 20NM
Coordinated ASW ULT	SEASWITI- Freeplay Event	4 times per year & 1 similar RDT&E	0	0	5	5	2 SSNs (only one actively pinging)	14	14	70	10NM X 20NM
Totals :					**15**					**100**	

Training Phase	Event Name/ Description	Annual Requirement	No. of Synthetic Events	No. of Passive Events	No of Active Events	Total No. of Events	Platform(s)*	Active Sonar Use / Event / Platform	Total Active Sonar Use per event	Active Sonar Use /Year	Area (NM^2)
AN/SSQ- 62 DICASS sonobuoy- *usage shown in number of sonobuoys (each buoy pings 12 times over six minutes)*											
Coordinated ASW ULT	Integrated ASW Course	Two scenarios that occur five times a year for training (sonobuoys shown include expenditure for both scenarios),	0	0	5	5	MPA and helo	36	36	180	120NM X 60NM
Totals :					5					**180**	
Coordinated ASW ULT	Group Sail	20 times per year	0	0	20	20	1 helo	2	4	80	
Totals :					**20**					**80**	
Coordinated ASW ULT	SEASWITI- Submarine Familiarization	4 times per year & 1 similar RDT&E	0	0	5	5	MPA	4	4	20	10NM X 20NM
Coordinated ASW ULT	SEASWITI- Tactical Training	4 times per year & 1 similar RDT&E	0	0	5	5	MPA	8	8	40	10NM X 20NM
Coordinated ASW ULT	SEASWITI- Freeplay Event	4 times per year & 1 similar RDT&E	0	0	5	5	MPA	12	12	60	10NM X 20NM
Totals :					**15**					**120**	
Strike Group Training *(anticipate up to 2 JTFEXs and 4 COMPTUEXs on the East Coast and 1 COMPTUEX in the Gulf of Mexico)*											
AN/SQS-53- *usage shown in hours*											
CSG COMPTUEX and ESG COMPTUEX	ASW Proficiency Training	1 time per CSG COMPTUEX & ESG COMPTUEX	0	0	5	5	3 DDGs or CGs	13	40	200	5NM X 20NM
CSG COMPTUEX and ESG COMPTUEX	Battle Problem - Area Search and Straight Transit (simulated choke point)	Occurs four times during each CSG COMPTUEX and ESG COMPTUEX (hours shown are sum of four events during one COMPTUEX) , plus equivalent of one similar RDT&E COMPTUEX event annually	0	0	6	6	2 DDGs and 1 CG	30	90	540	60NM X 80NM
JTFEX	Freeplay	1 time per JTFEX	0	0	2	2	3 DDGs and 1 CGs	25	100	200	60NM X 80NM up to 180NM X 180NM
Totals :										**940**	
AN/SQS-56- *usage shown in hours*											
CSG COMPTUEX and ESG COMPTUEX	ASW Proficiency Training	1 time per COMPTUEX & ESGEX	0	0	5	5	1 FFG	14	14	70	5NM X 20NM
CSG COMPTUEX and ESG COMPTUEX	Battle Problem - Area Search and Straight Transit (simulated choke point)	Occurs four times during each CSG COMPTUEX and ESG COMPTUEX (hours shown are sum of four events during one COMPTUEX) , plus equivalent of one similar RDT&E COMPTUEX event annually	0	0	6	6	1 FFG	30	30	180	60NM X 80NM
JTFEX	Freeplay	1 time per JTFEX	0	0	2	2	2 FFGs	25	50	100	60NM X 80NM up to 180NM X 180NM
Totals :										**350**	

Training Phase	Event Name/ Description	Annual Requirement	No. of Synthetic Events	No. of Passive Events	No of Active Events	Total No. of Events	Platform(s)*	Active Sonar Use / Event / Platform	Total Active Sonar Use per event	Active Sonar Use /Year	Area (NM^2)
AN/AQS-13 or 22- *usage shown in hours (10 pings per 5-minute dip)*											
CSG COMPTUEX	ASW Proficiency Training	1 time per CSG COMPTUEX	0	0	3	3	1 helo	0.25	0.25	0.75	5NM X 20NM
CSG COMPTUEX	Battle Problem - Area Search and Straight Transit (simulated choke point)	Occurs four times during CSG COMPTUEX (hours shown are sum of four events during one COMPTUEX) , plus equivalent of one similar RDT&E COMPTUEX event annually	0	0	4	4	1 helo	2	2	8	60NM X 80NM
JTFEX	Freeplay	1 time per JTFEX	0	0	2	2	1 helo	1	1	2	60NM X 80NM up to 180NM X 180NM
Totals :										**11**	
BQQ-5 or 10- *usage shown in pings*											
CSG COMPTUEX and ESG COMPTUEX	ASW Proficiency Training	1 time per CSG COMPTUEX & ESG COMPTUEX	0	0	5	5	2 SSNs	2	4	20	5NM X 20NM
CSG COMPTUEX and ESG COMPTUEX	Battle Problem - Area Search and Straight Transit (simulated choke point)	Occurs four times during CSG COMPTUEX (pings shown are sum of four events during one COMPTUEX) , plus equivalent of one similar RDT&E COMPTUEX event annually	0	0	6	6	2 SSNs	8	16	96	60NM X 80NM
JTFEX	Freeplay	1 time per JTFEX	0	0	2	2	3 SSNs	2	6	12	60NM X 80NM up to 180NM X 180NM
Totals :										**108**	
AN/SSQ- 62 DICASS- *usage shown in number of sonobuoys (each buoy pings 12 times over six minutes)*											
CSG COMPTUEX and ESG COMPTUEX	ASW Proficiency Training	1 time per CSG COMPTUEX & ESG COMPTUEX	0	0	5	5	helicopter	4	4	20	5NM X 20NM
CSG COMPTUEX and ESG COMPTUEX	Battle Problem - Area Search and Straight Transit (simulated choke point)	Occurs four times during CSG COMPTUEX (sonobuoy expenditure shown is sum of four events during one COMPTUEX) , plus equivalent of one similar RDT&E COMPTUEX event annually	0	0	6	6	MPA and helicopter	72	72	432	60NM X 80NM
JTFEX	Freeplay	1 time per JTFEX	0	0	2	2	MPA and helicopter	18	18	36	60NM X 80NM up to 180NM X 180NM
JTFEX	ASW 201- Littoral ASW	5 times per JTFEX (sonobuoys shown for all five events)	0	0	2	2	MPA	NA	50	100	60NM X 60NM
CSG COMPTUEX and ESG COMPTUEX	ASW 201- Littoral ASW	2 times per COMPTUEX (sonobuoys shown for both events)	0	0	5	5	MPA	NA	50	250	
JTFEX	ASW 203- Coordinated ASW	10 times per JTFEX (sonobuoys shown for all 10 events)	0	0	2	2	MPA	NA	100	200	60NM X 60NM
CSG COMPTUEX and ESG COMPTUEX	ASW 203- Coordinated ASW	5 times per COMPTUEX (sonobuoys shown for all 5 events)	0	0	5	5	MPA	NA	50	250	
JTFEX	ASW 205- EER	1 time per JTFEX	0	0	2	2	MPA	NA	3	6	60NM X 60NM

Training Phase	Event Name/ Description	Annual Requirement	No. of Synthetic Events	No. of Passive Events	No of Active Events	Total No. of Events	Platform(s)*	Active Sonar Use / Event / Platform	Total Active Sonar Use per event	Active Sonar Use /Year	Area (NM^2)
CSG COMPTUEX and ESG COMPTUEX	ASW 205- EER	1 time per COMPTUEX	0	0	5	5	MPA	NA	3	15	
JTFEX	ASW 206- IEER	1 time per JTFEX	0	0	2	2	MPA	NA	3	6	60NM X 60NM
CSG COMPTUEX and ESG COMPTUEX	ASW 206- IEER	1 time per COMPTUEX	0	0	5	5	MPA	NA	3	15	
Totals :										**1330**	
AN/SSQ-110A IEER sonobuoy- *usage shown in number of sonobuoys (each sonobuoy has two explosive packages)*											
JTFEX, CSG COMPTUEX, and ESG COMPTUEX	ASW 205- EER	1 time per JTFEX and COMPTUEX	0	0	7	7	MPA	NA	14	98	60NM X 60NM
JTFEX, CSG COMPTUEX, and ESG COMPTUEX	ASW 206- IEER	1 time per JTFEX and COMPTUEX	0	0	7	7	MPA	NA	14	98	
Totals :										**196**	
Maintenance											
AN/SQS-53- *usage shown in hours*											
Maintenance	R-2M- MRC	12 per CG annually (In port or underway)	0	0	132	132	CG	1.8	1.8	238	NA
Totals :					**132**					**238**	
AN/SQS-56- *usage shown in hours*											
Maintenance	Q-26R/30R/33R MRC	1 per FFG per quarter in port or underway	0	0	68	68	FFG	4	4	272	NA
Maintenance	MRC -10Q	1 per FFG per quarter in port	0	0	68	68	FFG	2	2	136	NA
Maintenance	R-16M MRC	1 per FFG per month underway	0	0	204	204	FFG	0.2	0.2	41	NA
Totals :					**278**					**449**	
AN/BQQ-5 or AN/BQQ-10- *usage shown in pings (60 pings per hour)*											
Maintenance		1 per SSN every quarter	0	0	100	100	SSN	60	60	6000	
Totals :					**100**					**6000**	

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APPENDIX D

DESCRIPTION OF ALTERNATIVES DEVELOPMENT

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DESCRIPTION OF ALTERNATIVES DEVELOPMENT

The Navy developed its action alternatives to both meet the training requirements of the Atlantic Fleet and minimize potential environmental effects. The environmental effect of most concern is exposure of marine mammals to underwater sound. Since the Navy requires active sonar use as part of training and research, development, test, and evaluation (RDT&E), potential marine mammal exposures could not be lessened by reducing use of sound sources. Exposures can be reduced by training in areas with fewer marine mammals or in sound propagation environments in which sound sources have smaller footprints. The goal of alternatives development was to identify active sonar use areas which meet the Navy's training requirements and minimize use of areas in which, due to high animal densities and sound propagation, would result in exposing greater numbers of marine mammals to sound.

Two components were needed to develop alternatives: operational requirements and the results of a surrogate modeling effort. Marine mammals and the manner in which sound travels can vary by location and season. Therefore, seasonal and spatial data on these two factors were combined in a surrogate model to provide a visual comparison of the potential for high, medium, and low sound exposures to marine mammals throughout the Study Area. Next, the Navy identified active sonar areas that met operational requirements. These areas were then refined using the surrogate model to reduce potential exposures of marine mammals to underwater sound. It should be noted that this effort was only used for the development of the alternatives. The actual exposures for the Proposed Action were calculated separately (refer to Chapter 4 and Appendix H, Summary of Acoustic Modeling Results). An overview of the steps involved in this process included the following actions:

1. Gathered training event information from the operational community concerning proximities to homeports, air stations, and support facilities; water depth; training area size; acoustic environment; controlled air and sea space; and target availability and recovery requirements.
2. Obtained the most current available marine mammal density data, from the habitat suitability study conducted by Geo–Marine, Inc. (GMI).
3. Modeled sound propagation in multiple environments present in the Study Area.
4. Using the marine mammal density and sound propagation data, developed marine mammal exposure potential maps. These maps provided a visual comparison of the likelihood of sound exposures to marine mammals throughout the Study Area.
5. Identified potential active sonar areas that met the operational requirements while reducing marine mammal exposures to the extent feasible.

In addition, designated marine sanctuaries were considered in the development of all alternatives. At the present time, the Navy does not conduct active sonar activities in the Stellwagen Bank, USS Monitor, Gray's Reef, Flower Garden, and Florida Keys National Marine Sanctuaries. If it is determined that an active sonar activity may occur in the Gray's Reef, Flower Garden, or Florida Keys National Marine Sanctuaries, naval activities will be carried out in a manner that avoids to the maximum extent practicable any adverse impacts on sanctuary resources and qualities. If necessary, the Navy would consult with the Director, Office of Ocean and Coastal Resource Management in accordance with 15 CFR 922.

Stellwagen Bank and USS Monitor National Marine Sanctuary regulations specifically preclude the Navy from conducting operations in this area without first entering consultation. If it is determined that an active sonar activity or vessel transit may occur in the Stellwagen Bank or Monitor National Marine Sanctuaries, the Navy would consult with the Director, Office of Ocean and Coastal Resource Management in accordance with 15 CFR 922.

D.2 D.1 ALTERNATIVE DEVELOPMENT STEPS

The following subsections provide a more detailed discussion of each of the alternatives development process.

D.1.1 Operational Data Gathering

To ensure that the active sonar areas designated during the development of Alternatives 1, 2, and 3 met the operational requirements associated with specific Atlantic Fleet Active Sonar Training (AFAST) activities, the Navy operational and RDT&E communities were queried for operational requirements associated with various active sonar training activities. The operational requirements for specific AFAST activities and platforms are presented in Table D-1.

D.1.2 Development of Training Areas Based on Operation Data

The operational requirements captured for each of the training activities were then used to identify the overall minimal operational training area size and operationally preferred training area size. The operationally preferred training area size took into account activities occurring simultaneously in the same water and air space. The Navy AFAST Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) team developed training areas for each of the captured training activities using ArcGIS that met the operationally preferred training area sizes. The team then used the water depth and proximity to homeports, air stations, and support facility requirements to place the training areas on a map in locations that met the specific training event requirements. The Navy AFAST EIS/OEIS team then reviewed the placement of the training areas to ensure they meet all the operational requirements depicted in Table D-1.

D.1.3 Marine Mammal Density Data

Next, the Navy AFAST EIS/OEIS team initiated the development of a marine mammal density grid. In the past, the Navy utilized the original marine mammal density reports associated with the respective Operating Area (OPAREA) Marine Resource Assessments (MRAs). The density data contained in these reports divided the marine mammal species data into two depth strata (i.e., on-shelf and off-shelf). However, prior to beginning the AFAST EIS/OEIS effort, the Navy realized that the accuracy and fidelity of the marine mammal densities could be significantly improved through the development and use of habitat suitability modeling. Thus, the Navy contracted GMI to update the marine mammal density data using a habitat suitability study as described within the *Navy OPAREA Density Estimates (NODE) for the Northeast OPAREAS* report (DON, 2007a*)*, the *NODE for the Southeast OPAREAS* report (DON, 2007b), and the *NODE for the GOMEX OPAREA* report (DON 2007d).

Table D-1. Operational Requirements per Activity Type

	Realistic Training Environmental Requirements	Year-Round Opportunities	Proximity to Homeports	Controlled Sea and Air Space	Training Area Size	Water Depth	Proximity to Support Facilities	Acoustic Environment	Target Availability
Littoral ASW Independent ULT	Y	Y	**Max:** 100 NM **Special Exception: Helicopter Dipping** **Max:** 20 NM **Min:** 4 NM **Optimal:** 15 NM (The dip areas provide shallow and deep water close to NAS JAX).	**Dipping:** Y **Surface Ship:** N/A **Submarine:** N/A **MPA:** Y	60 NM x 90 NM	**Min:** 100 ft **Max:** 3,000 ft	N/A	Convergence Zone (seasonal) and a variety of environments	N/A
Open-Ocean ASW Independent ULT	Y	Y	**Greater OPAREA** **Max:** 100 NM	**Dipping:** Y **Surface Ship:** N/A **Submarine:** N/A **MPA:** Y	60-NM x 130-NM	**Min:** 1,200 ft **Max:** 3,000 ft	N/A	Convergence Zone (seasonal) and a variety of environments	N/A
MIW Independent ULT	Y	Y	**Max:** 100 NM	N	60 NM x 80 NM	**Min:** 30 ft	Y	Convergence Zone (seasonal) and a variety of environments	Y

Table D-1. Operational Requirements per Activity Type Cont'd

	Realistic Training Environmental Requirements	Year-Round Opportunities	Proximity to Homeports	Controlled Sea and Air Space	Training Area Size	Water Depth	Proximity to Support Facilities	Acoustic Environment	Target Availability
Object Detection/ Navigational Sonar Independent ULT	Y	Y	**Optimal:** leaving and entering port	N/A	2-NM buffer on each side of transit lane	**Min:** 45 ft	N/A	N/A	N/A
Coordinated ULT	Y	Y	**Max :** 100 NM **Optimal:** <90 NM	Y	60 NM x 130 NM	**Min:** 100 ft **Max:** 3,000 ft	N/A	Surface Duct and Bottom Bounce, Low Bottom Loss Area, and Gulf Stream	Y
Strike Group Training Exercise	Y	Y	**Max :** 120 NM **Optimal:** 90 NM CVN Ops require 100-120 NM of shore prior to blue water "no divert" certification	Y	80 NM x 120 NM	**Min:** 100 ft **Max:** 3,000 ft	N/A	Surface duct and Convergence Zone, and Gulf Stream	N/A
RDT&E Activities	Y	Y	N/A	Y	**General:** 3-NM x 5-NM **Sonobuoys**: 100 NM x 100 NM	**Min:** 40 ft **Max**: 2,000 ft	**Max:** 60 NM **Optimal:** 20 NM	Dependent on Specific Test Activities	Y
Active Sonar Maintenance	N/A	Y	Pierside	N/A	Pierside	N/A	Pierside	N/A	N/A

ASW– Anti-Submarine Warfare; ft – Feet ; Max – Maximum; Min – Minimum; MIW – Mine Warfare; N/A – Not Applicable; NM – Nautical Miles; OPAREA – Operating Area RDT&E – Research, Development, Test, and Evaluation; ULT – Unit-Level Training

The updated marine mammal densities showed a number of different on-shelf and off-shelf densities for the same species based on the location and the environmental parameters present. The older density data were used to fill in any gaps identified within the new density files.
The density data were placed into 10 kilometer (km) (5 nautical mile [NM]) by 10 km (5 NM) grid boxes, which were then saved as species-specific density layers for easy viewing on a map overlay in ArcGIS. The updated density layers consisted of various size density grids. Thus, the density required re-sampling in order to generate consistent 10 km (5 NM) by 10 km (5 NM) grids of animal densities. The density data was re-projected to Albers NAD83 using ArcMap and all data was regridded to 100 meter (m) x 100 m (328 feet [ft] x 328 ft) cells. This was the smallest size that could be handled on a reasonable basis by the computer. The density data was then resampled to 10 x 10 km (5 NM x 5 NM) squares. To accomplish this, a 10 km (5 NM) grid was created and applied like a cookie cutter to each data set. This produced perfectly aligned 100 square kilometer (km^2) (29 square nautical miles [NM^2]) areas that could then be summed and/or multiplied by each other.

D.1.4 Acoustic Propagation Data

To develop a representative acoustic footprint, the AFAST EIS/OEIS team utilized one of the primary mid-frequency hull-mounted sonars, AN/SQS-53, as the sample system. However, any sonar system could have been used for the purposes of developing a representative acoustic footprint. The AN/SQS-53 was modeled within each of the 36 acoustic provinces in the Atlantic Ocean and Gulf of Mexico to provide the estimated one hour seasonal exposure footprints for the 195 decibels references to 1 squared micro Pascal second (dB re 1 μPa^2-s) and 190 dB re 1μPa^2-s energy flux density (EFD) levels. These levels were chosen because they encompass both permanent threshold shift (PTS) and temporary threshold shift (TTS) exposures, in addition to a portion of the behavioral responses (at the time of this analysis, dose function criteria were under development). The methodology used and a detailed description of the acoustic modeling conducted are discussed in detail in the Naval Undersea Warfare Center (NUWC), Newport Division, AFAST EIS/OEIS Acoustic Technical Report, 2007 (NUWC, 2007).

An acoustic province is an area that has similar sound propagation properties. Individual layers containing sound spreading information for all 36 provinces of the Study Area were produced in ArcGIS so that they could be layered under the Study Area.

D.1.5 Development of Relative Exposure Grids

Using the AN/SQS-53 acoustic footprints and the marine mammal density data, map grids were created to show areas of low to high likelihood of marine mammal exposure to sound. To develop the potential exposure grids, 100 hrs of active AN/SQS-53 mid-frequency hull-mounted sonar was analyzed in each of the 10 km x 10 km (5 x 5 NM) marine mammal density grids boxes seaward to 556 km (300 NM). The AN/SQS-53 was assumed to be operated in both search and track modes with a 70/30 split between the two modes. The estimated exposures generated from this sample scenario were for comparison purposes only and should not be mistaken as the actual exposure data associated with the analysis of the Proposed Action. It should be noted that any of the sonar systems addressed within the AFAST EIS/OEIS could have been utilized in the relative exposure grids, resulting in identical areas of potential high exposures. The AN/SQS-53 was chosen because the acoustic footprints associated with this system were the first set of data received. In addition, the use of 100 hrs is purely relative. Any time frame could have been used and would have generated identical results related to areas of high potential for exposures. However, 100 hrs was used because it provided enough definition in the data to clearly show areas of high, medium, and low exposure potential.

The number of animals exposed to sound was calculated by multiplying the total exposure footprint for 100 hrs of AN/SQS-53 by the weighted average density for each individual species during each season within each of the 10 km (5 NM) by 10 km (5 NM) grid boxes as shown in Figure D-1. Seasonal exposure footprints were provided for the 195 dB re 1µPa^2-s EFD and 190 dB re 1µPa^2-s EFD thresholds for both the first hour and subsequent hours of sonar operation. The calculated exposure footprints are smaller during the first hour of operation and then become consistent with subsequent sonar operation hours. The area impacted by 100 hrs of AN/SQS-53 sonar operation was calculated using the methodology discussed below.

The ***195 EFD*** and ***190 EFD*** areas represent the first hour footprint and ***195 EFD/dA*** and ***190 EFD/dA*** areas represent the subsequent time footprints, and allowing subscripts (*s*) and (*t*) to represent search and track modes respectively, and ***D*** to represent the density of marine species, then total footprint ***TF*** can be calculated as:

$$TF = 0.7 * ((195_s + 190_s) + 99(195_s' + 190_s')) + 0.3\,((195_t + 190_t) + 99(195_t' + 190_t'))$$

And Exposures (***E***) can be calculated from:

$$E = TF * D$$

Using the above calculation, the estimated seasonal exposures for each 10 km (5 NM) by 10 km (5 NM) grid were calculated for each animal, resulting in calculated exposure grids. The calculated exposure grids of marine mammals were then placed into ArcGIS as seven independent layers for the purpose of identifying areas of low marine mammal exposures during alternatives development. The grids were color-coded to show areas of high (red) to low (green) possible sound exposures. The color-coded grids were then used as a tool to assist placing sonar training areas.

The surrogate analysis focused on the potential exposures to beaked whales, right whales, and sperm whales. In addition, calculated exposure grids were generated for mysticetes and odontocetes, and an overall exposure grid was generated for Marine Mammal Protection Act (MMPA) and Endangered Species Act (ESA) species. However, the overall MMPA and ESA maps did not show the definition needed to identify the potential difference in area exposures. It has been assumed that the higher species density numbers associated with specific species within these groupings (i.e. dolphins and humpbacks) masked the exposure data. As a result, there was little to no difference in exposure numbers across the Study Area on the MMPA and ESA exposure maps.

The surrogate environmental analysis was strictly used to aid in the development of the alternatives, and was not intended to support the actual effects analysis associated with active sonar training contained in Chapter 4.

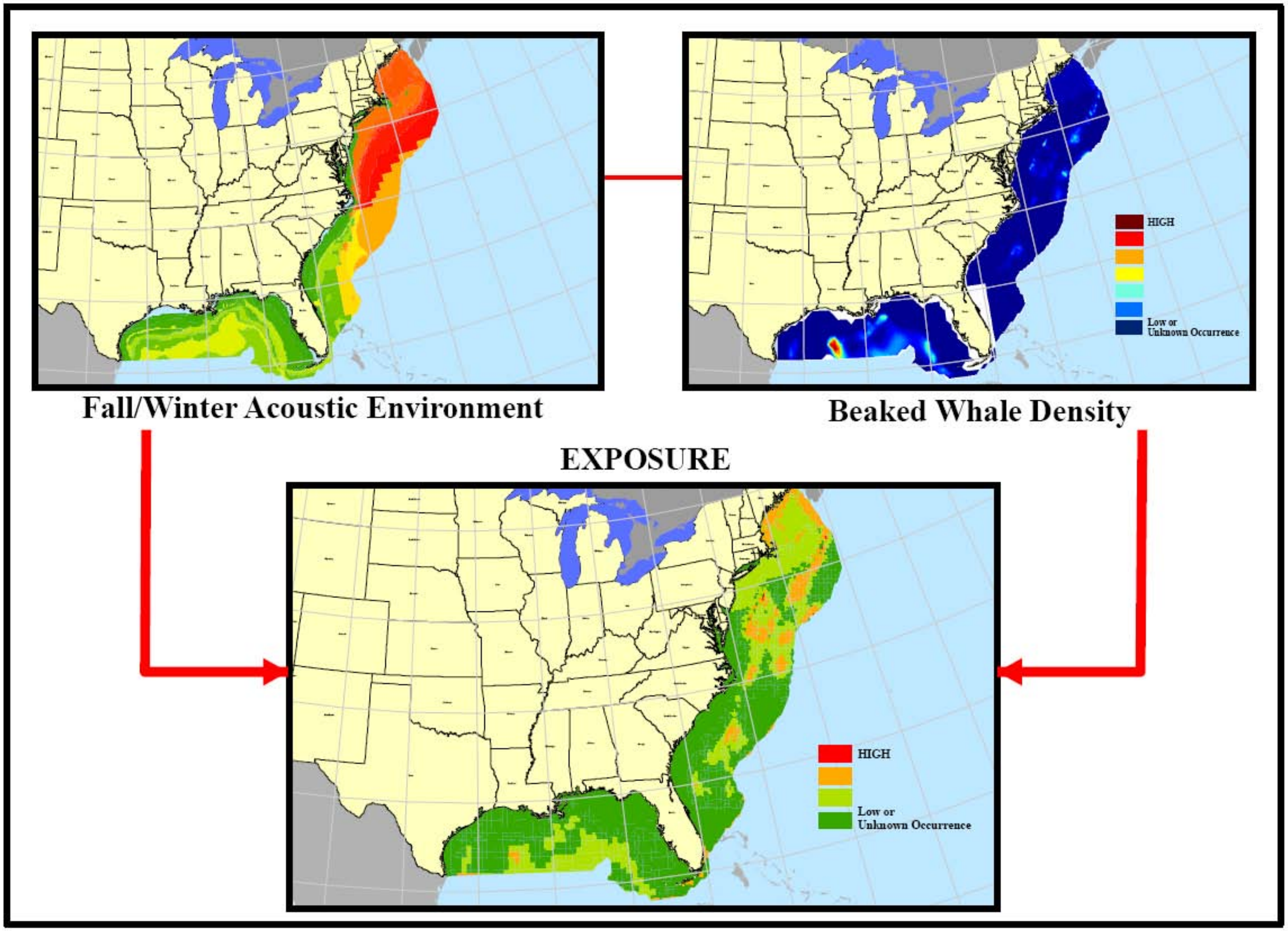

Figure D-1. Flow Diagram of Map Generated for Beaked Whale Exposures (Fall)

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D.2 ALTERNATIVE 1: DESIGNATED ACTIVE SONAR AREAS

The development of Alternative 1 focused on the designation of fixed active sonar areas based on operational criteria and quantitative and geographic environmental analysis. These areas met the operational criteria initially identified according to the process described in Section D.1.2.

D.2.1 Alternative 1 Development

In the development of Alternative 1, the AFAST EIS/OEIS team used the estimated exposures grids generated during the surrogate modeling for all four seasons, as described in Section D.1.5, and the optimal operational requirements to identify training areas. The analysis focused on beaked whales, North Atlantic right whales, and sperm whales as representative species, due to either their ESA status or sensitivity to sound exposures. Optimal sonar use area shape files were created in ArcGIS and placed in locations that met the requirements for each type of training. If any areas of high exposures were noted to be present within the potential training areas, the training areas were moved or reduced in size in an effort to exclude the potential high exposure areas. However, prior to adjusting the size, shape or locations of any identified training areas, the AFAST EIS/OEIS team identified the boundary constraints and operational requirements for which the training area could be moved or adjusted and still meet the requirements captured in Table D-1.

The calculated seasonal exposure grids for beaked whales, Northern Atlantic right whales and sperm whales were utilized as the primary driver for the placement of the training areas under Alternative 1. Based on ESA status and species behavioral patterns, beaked whale, North Atlantic right whale, and sperm whale densities were specifically considered during the environmental analysis. However, based on the well-published sensitivities that beaked whales exhibit to mid-frequency active (MFA) sonar, beaked whale seasonal density graphics and exposure grids serve as the primary data used to limit the placement of the training areas locations under Alternative 1. The following sections describe how the training areas designated for each type of training event were geographically moved and/or altered to avoid areas of high exposures.

D.2.2 Independent ULT Areas

Utilizing the operational requirements listed in Table D-1, the AFAST EIS/OEIS team developed Independent ULT boundary constraints. These boundary constraints defined the area within each OPAREA that would meet the operational requirements. The exposure grids generated for each season during the surrogate environmental analysis were then utilized to identify areas of high exposure potential within each OPAREA. If any of the high exposure areas fell within the designated ULT areas, the ULT areas were then moved or reshaped within the boundary constraints to avoid areas of high exposures.

For operational requirements, shallow water is water with a depth less than 183 m (600 ft).

D.2.2.1 Anti-Submarine Warfare (ASW) ULT Areas

Feedback received from the operational community during the data gathering effort specified that all ASW ULT activities require both a shallow 30 m (100 ft) and a deep-water, 914 m (3,000 ft) training area within each of the OPAREAs proposed under Alternative 1.

The following sections discuss the ASW ULT boundary constraints for the various types of platform-based ASW ULT activities.

D.2.2.1.1 ASW Surface Ship ULT Areas

Under Alternative 1, ASW surface ship ULT areas were designated using the operational criteria presented in Table D-1. Based on the requirements received from the operational community, ASW surface ship ULT activities require a 111 km x 167 km (60 NM x 90 NM) shallow-water training area and a 111 km x 241 km (60 NM x 130 NM) deep-water training area. However, the actual ASW surface ship ULT areas utilized during the surrogate environmental analysis consisted of a 185 x 222 km (100 NM x 120 NM) shallow-water ASW surface ship ULT area and a 185 x 222 km (100 NM x 120 NM) deep-water ASW surface ship ULT area. To provide the greatest training flexibility, the ASW surface ship ULT areas designated for the surrogate environmental analysis were larger than the actual operational size requirements. The Navy ensured that ASW surface ship ULT areas were provided in each OPAREA.

The shallow and deep-water ASW surface ship ULT areas were then compared to the GMI density graphics and the gridded exposure estimate layers that were generated during the surrogate environmental analysis for each of the four seasons. As a result, the ASW ULT area boxes were geographically moved to areas of lower marine mammal densities and exposures, while meeting the minimal operational training requirements as shown in Figures D-5 through D-14 and D-21 through D-32. These exposure maps clearly show that the proposed ASW surface ship ULT areas were placed outside areas of potential high marine mammal exposures. They also show that the beaked whale exposures were the primary driver used in the placement of the proposed ASW surface ship ULT areas.

D.2.2.1.2 ASW Helicopter Dipping Sonar ULT Areas

Under Alternative 1, the operational data received identifies the primary bed-down locations for Navy helicopter squadrons that would train with dipping sonars (i.e., AN/SQS-13/22). The data received from the operational community determined that the primary area used for ASW helicopter dipping sonar ULT activities is located within the Tactical Air Navigation (TACAN) area located within the controlled airspace (i.e., W-158) just offshore of Mayport Naval Air Station. The operational data captured and presented in Table D-1 identifies that the entry point for such training is required to be no further then 7 km (4 NM) from the air station. Thus, based on the stringent operational requirements associated with the ASW helicopter dipping sonar ULT activities, minimal to no flexibility exists in moving or reshaping the designated training area. As a result, the ASW helicopter-dipping sonar ULT area remains geographically unchanged for all alternatives, as shown in Figures D-5 through D-14 and D-21 through D-32.

However, ASW helicopters assigned to ships would conduct dipping sonar activities within the ASW Surface Ship ULT areas since they are only restricted by the location of the surface combatant.

D.2.2.1.3 ASW Submarine ULT Areas

ASW submarine ULT activities require a 56 km x 56 km (30 NM x 30 NM) training area. Thus, the majority of ASW submarine ULT activities could be conducted within the 185 x 222 km (100 NM x 120 NM) ASW surface ship ULT sonar training areas that were previously designated using the exposure grids as shown in Figures D-5 through D-14 and D-21 through D-32.

In addition, ASW submarine ULT activities require a 48 km x 37 km (26 NM x 20 NM) shallow-water (i.e. 91 to 183 m [300 to 600 ft] depth) training areas located on the shelf in each southeastern OPAREA.

D.2.2.1.4 ASW Maritime Patrol Aircraft (MPA) ULT Areas

ASW MPA ULT activities require a 167 km x 167 km (90 NM x 90 NM) training area with a water depth range of 20 to 333 fathoms (ftms) (120 to 2,000 ft). Thus, all ASW MPA ULT activities deploying passive and tonal sonobuoys could be conducted within the 185 km x 222 km (100 NM x 120 NM) ASW surface ship ULT sonar training areas previously designated using the exposure grids as shown in Figures D-5 through D-14 and D-21 through D-32.

In addition, the operational data received associated with ASW MPA Improved Extended Echo Ranging (IEER) system ULT activities involving the deployment of explosive source sonobuoys (AN/SSQ-110A) indicate that the majority of explosive source sonobuoy deployment would be conducted within 185 x 185 km (100 x 100 NM) training areas located within the JAX/CHASN, CHPT, Northeast (NE), and Gulf of Mexico (GOMEX) OPAREAs. Thus, potential 185 km x 185 km (100 NM x 100 NM) training areas were digitalized for each of the applicable OPAREAs. Next the potential training area boxes were placed within the three Atlantic OPAREAs and were compared to the six density graphics and estimated exposure grids for each of the four seasons. Based on the comparison of potential marine mammal exposures, all three 185 km x 185 km (100 x 100 NM) training boxes within the Atlantic OPAREAs fell inside the already designated training areas for the ASW surface ship ULT areas.

The 185 x 185 km (100 x 100 NM) potential MPA IEER ULT area for explosive source sonobuoys (AN/SSQ-110A) within the Gulf of Mexico was determined based on coordinates captured in operational data received. The location of the box was then compared to the six density graphics and exposure grids for each of the four seasons. Based on the comparison, the 185 km x 185 km (100 NM x 100 NM) was geographically moved northeast onto the shelf to an area of lower marine mammal densities and exposures, as shown in Figures D-10 through D-14, D-22 through D-25, and D-34 through D-37.

D.2.2.2 Mine Warfare (MIW) ULT Areas

To maintain platform certifications and proficiency associated with MIW, the U.S. Navy conducts a variety of different MIW ULT activities throughout the year using various high frequency sonar systems deployed from surfaces ships (mine countermeasure [MCM] and mine hunting-coastal [MHC]), unmanned aerial vehicles (UAVs) and helicopters. This analysis only considered designating areas for ship-based systems operating at less than 200 kHz.

Based on the feedback received from the operational community, presented in Table D-1, MIW ULT activities require water depths out to approximately 40 m (131 ft) of water. Thus, all MIW ULT activities would be conducted on the shelf.

D.2.2.2.1 MIW Surface Ship ULT Areas

MIW surface ship ULT activities involve either a MHC or MCM surface ship using its over-the-side-sonar systems (i.e., AN/SQQ-32) to detect, classify, and localize bottom and moored mine-like objects (MLOs). MIW Surface Ship ULT activities would require a 37 km x 37 km (20 NM x 20 NM) training area located within the western portion of the Gulf of Mexico.

The MIW surface ship ULT areas were compared to the six density graphics and the exposure grids that were generated during the Surrogate Environmental Analysis for each of the four seasons. Based on the habitat preference of the beaked whale, sperm whale and North Atlantic right whale, the comparison showed that the entire Corpus Christi OPAREA does not have any areas of potential high exposures for any of the three whale species. As a result, the proposed MIW surface ship training area within the western portion of the GOMEX OPAREA is geographically unchanged for all alternatives as shown in Figures D-10 through D-14, D-22 through D-25, and D-34 through D-37.

D.2.3 Coordinated ULT Activities

Based on the data received from the operational community, the majority of the ASW Coordinated ULT activities would require a 111 km x 241 km (60 NM x 130 NM) training area within 167 km (90 NM) of a military air field. Therefore, the majority of ASW Coordinated ULT areas would overlap with the ASW surface ship ULT areas that were designated and placed using the estimated exposure grids.

However, based on specific training needs, certain ASW Coordinated ULT activities require the designation of additional training areas. The following sections discuss the various types of ASW Coordinated ULT activities conducted. In addition, these sections discuss the designated operating areas associated with each type of ASW Coordinated ULT activity based on the surrogate environmental analysis.

D.2.3.1 ASW Coordinated ULT Activities

Based on the data received from the operational community, the majority of the ASW Coordinated ULT activities would require a 111 km x 241 km (60 NM x 130 NM) training area within 167 km (90 NM) of a military air field. Therefore, the majority of ASW Coordinated ULT areas would overlap with the ASW surface ship ULT areas that were designated and placed using the estimated exposure grids.

However, based on specific training needs, certain ASW Coordinated ULT activities require the designation of additional training areas. The following sections discuss the various types of ASW Coordinated ULT activities conducted. In addition, these sections discuss the designated operating areas associated with each type of ASW Coordinated ULT activity based on the surrogate environmental analysis.

D.2.3.1.1 ASW Surface Ship Coordinated ULT Areas

Based on the operational data received and presented in Table D-1, the 185 km x 222 km (100 NM x 120 NM) training areas designated in each of the Atlantic Ocean OPAREAs for ASW surface ship ULT activities would meet the operational criteria associated with conducting the majority of ASW surface ship Coordinated ULT activities.

However, the operational data notes that the current Southeastern Anti-Submarine Warfare Integrated Training Initiative (SEASWITI) training area utilizes the Kilo, Lima, Mike warning areas within the JAX OPAREA. In order to meet the maximum distance from homeport, the western boundary (i.e., training area entry point) of the SEASWITI training area needs to be between 167 and 185 km (90 and 100 NM) from port. Therefore, based on the maximum operational distance requirement of 426 km (230 NM), the eastern boundary of the training area was determined to be 241 km (130 NM) east of the western boundary. Utilizing the maximum distance from homeport to training area entry point requirement, a 185 km (100 NM) arc was digitized around Mayport defining the potential locations of the southern and northern boundaries for SEASWITI training area entry points that meet the maximum 167 and 185 km (90 and 100 NM) entry point requirement.

During the development of the SEASWITI training box, the previously defined ASW surface ship ULT boxes within the JAX/CHASN OPAREA overlapped the eastern portion of the SEASWITI designated training area. Thus, only the western portion of the SEASWITI box needed to be compared to the six density graphics and exposure grids that were generated during the Surrogate Environmental Analysis for each of the four seasons. As a result, the western portion of the SEASWITI training box was geographically moved to an area of lower marine mammal densities and exposures, while meeting the maximum distance for the entry point to the training area as shown in Figures D-5 through D-14 and D-21 through D-32.

D.2.3.1.2 ASW Submarine Coordinated ULT Areas

Torpedo Exercise (TORPEX) activities require a 55 km x 55 km (30 NM x 30 NM) training areas that is located within 77 NM of a homeport. The data received from the operational community show that TORPEX activities typically occur within the eastern portion of the GOMEX OPAREA, the VACAPES OPAREA, and the NE OPAREA.

TORPEX activities occurring within the eastern portion of the GOMEX OPAREA are typically conducted in the Charlie and Delta areas of W-151 (Naval Surface Warfare Center Panama City Division [NSWC PCD] OPAREA) and W-155 (Naval Air Station Pensacola [Pensacola] OPAREA). Utilizing the minimum depth requirement of 30 m (100 ft) for TORPEX activities, the review determined that the northern boundary of the TORPEX training area within the Gulf of Mexico would be the 50 ftm (300 ft) curve. The southern boundary of the TORPEX area follows the southern boundary of the Delta area, which in turn equates to the 371 km (200 NM) line. The western boundary of the TORPEX training area was determined to be the eastern boundary of the Pensacola OPAREA out to the 371 km (200 NM) line. The eastern boundary of the TORPEX training area was determined to be the eastern boundary of the NSWCD PCD OPAREA out to the 200 NM line.

After determining the boundaries of the overall general TORPEX area that would meet the TORPEX criteria presented in Table D-1, a 111 km x 148 km (60 NM x 80 NM) TORPEX area was digitalized using ArcGIS. The digitalized area was then compared to the six density graphics and estimated exposure grids for each of the four seasons. Based on the seasonal comparison of potential exposures, the review determined that the current location of the TORPEX training would remain unchanged. However, the TORPEX area needed to be reduced in size to avoid a pocket of high exposures to sperm whales occurring in the western portion of the training area near the eastern edge of the Desoto Canyon. As a result, the overall size of the GOMEX TORPEX training area was reduced to a 111 x 74 km (60 x 40 NM) area that still exceeded the minimal area size requirement as shown in Figures D-10 through D-14, D-22 through D-25, and D-34 through D-37.

The operational data received noted that TORPEX activities have been conducted within the VACAPES OPAREA in the past. However, no operational data was received defining the required area within the VACAPES OPAREA. Personal communications via phone calls and email with U.S. Navy operators was initiated in order to verify that the VACAPES TORPEX area is still a current training requirement. The feedback from the operational community verified that the VACAPES TORPEX area is still a hard requirement and needs to be included in the AFAST analysis. The data received during the verification effort reported that the VACAPES TORPEX was typically conducted on-shelf in the northern portion of the OPAREA. Therefore, an additional 111 km x 74 km (60 NM x 40 NM) training area was digitalized and compared to the six density graphics and estimated exposure grids for each of the four seasons within the VACAPES OPAREA. As a result, the VACAPES TORPEX box was geographically placed in an area of lower marine mammal densities and exposures while meeting the minimal operational training requirements as shown in Figures D-6 through D-9, D-18 through D-21, and D-30 through D-33.

TORPEX activities in the Northeast occur in designated boxes near the southern boundary of the Boston OPAREA. Due to proximity to support facilities and ongoing informal consultation over use of these areas, the location of TORPEX boxes in the Northeast will remain unchanged across all alternatives.

D.2.4 Strike Group Training Exercises Areas

For Strike Group Training exercise areas, the carrier airfield diversion requirement of 222 km (120 NM) was utilized to determine the western boundary of the general exercise area. To remain consistent with the placement of the western boundary, the 100 ftm (600 ft) curve was utilized as the western boundary of the general Strike Group Training exercise areas based on its average distance from shore of 185 km (100 NM). The eastern boundary of the Strike Group Training exercise was designated to be 371 km (200 NM) from the 100 ftm curve or 556 km (300 NM) from shore. Based on the operational requirements associated with the Strike Group Training exercises and locations of Navy homeports, the 28°N latitude line was designated as the southern boundary. Based on the requirements to conduct Missile Exercises (MISSLEX), the 38°N latitude line located in the northern portion of VACAPES was designated as the northern boundary of the Strike Group exercise areas.

Once the overall general area associated with Strike Group exercises was delineated, the required area for conducting such exercises was compared to the overall size of the digitalized ASW surface ship ULT boxes and to the density graphics and estimated exposure grids for each of the four seasons within the JAX/CHASN, CHPT and VACAPES OPAREAs. The comparison reveals the two 185 km x 222 km (100 NM x 120 NM) ASW surface ship ULT areas designated for each Atlantic OPAREA are more than sufficient in size to accommodate Strike Group Exercises. Therefore, under Alternative 1, Strike Group exercises would be conducted within the same 185 km x 222 km (100 NM x 120 NM) training boxes as ASW surface ship ULT activities within the JAX/CHASN, CHPT and VACAPES OPAREAs, as shown in Figures D-5 through D-14 and D-21 through D-32.

The historically used Strike Group exercise area within the Gulf of Mexico is located in and south of the GOMEX OPAREA (i.e., W-151 [NSWC PC OPAREA] and W-155 [Pensacola OPAREA]). This area was compared to the six density graphics and estimated exposure grids within the Gulf of Mexico for each of the four seasons. This comparison showed that the northern portion of the currently designated Strike Group exercise area is already located in an area of reduced marine mammal exposure potential. Thus, the existing training area location would be within the northern portions of the GOMEX Strike Group exercise area as shown in Figures D-10 through D-14, D-22 through D-25 and D-34 through D-37.

D.2.5 Object Detection/Navigational Sonar Training Areas

The information received from the operational community determined that both surface ships, as well as submarines, utilize active sonar for object detection and navigational purposes when departing from and returning to port. The level of usage is directly related to weather conditions and overall visibility as well as training requirements.

Therefore, navigational sonar training areas for surface ships using the AN/SQS-53 or AN/SQS-56 Kingfisher modes were designated using existing shipping lanes and channels that are currently utilized to access both Norfolk and Mayport Navy Stations. Ships can potentially operate on either side of a shipping lane or channel. Therefore, a 4-km (2 NM) buffer was included on each side of the shipping lanes and channels making up the designated object detection and navigational sonar training area. Information received from the operational community determined that the surface ship object detection and navigational sonar training area for Norfolk should begin just east of the Chesapeake Bay Tunnel and run out to Buoys 1 and 2, and from port out to the FTJ buoy in Mayport. Since this training has stringent requirements to occur during transit from and to port, no flexibility exists associated with moving the designated training areas. In addition, no marine mammal density measurements were available for the estuaries and inshore areas associated with homeports, thus no exposure comparisons could be made.

Similarly, the object detection and navigational sonar training areas for submarines were designated using the identical process described above for surface ships. The submarine transit lanes used for entering and departing Norfolk, Groton, and Kings Bay sub bases were buffered by 4 km (2 NM) on each side all the way from port out to open water as shown in Figures D-6 through D-9, D-18 through D-21, and D-30 through D-33.

D.2.6 Research, Development, Test, & Evaluation (RDT&E) Event Areas

Under Alternative 1, the RDT&E activities would typically be conducted within the OPAREAs adjacent to U.S. Navy RDT&E facility locations. Therefore, the majority of the MIW RDT&E activities would be conducted on the shelf within the GOMEX OPAREA. The majority of the MIW RDT&E activities would occur within the littoral zone offshore of NSWC PC. No new density numbers exist for the inshore waters associated with the NSWC PC OPAREA. Thus, a comparison of potential exposures within the littoral zone and bays adjacent to the NSWC PC facility could not accurately be conducted. In addition, the majority of the systems utilized during these activities would be operated at frequencies above 200 kilohertz (kHz) and were not analyzed, as these signals attenuate rapidly during propagation (30 decibel (dB)/km or more signal spreading losses), resulting in very short propagation distances. In addition, such frequencies are outside the known hearing range of most marine mammals. Therefore, no specific area was designated for MIW RDT&E activities under Alternative 1.

ASW RDT&E activities captured in the operational data are associated with the testing of sonobuoys. Thus, the majority of the ASW RDT&E would occur within the VACAPES and NE OPAREAs adjacent to Patuxent River Naval Air Station and the Naval Undersea Warfare Center, Newport facilities. Therefore, since the RDT&E activities involve the use of sonobuoys, the ASW RDT&E locations would remain consistent with those designated for the ASW MPA ULT activities, as shown in Figures D-2 through D-37.

D.2.7 Active Sonar Maintenance Areas

Active sonar maintenance areas associated with surface ship and submarine sonars occur most often at pier side. The pier side maintenance areas occur within the homeports of the surface ships or submarines. Thus, Norfolk and Mayport have been designated as surface ship sonar (i.e., AN/SQS-53 an AN/SQS-56) maintenance areas. Kings Bay, Georgia and Groton, Connecticut ports have been identified as the two maintenance areas for submarine sonars (i.e., AN-BQQ-5 or BQQ-10).

Since the majority of the maintenance activities occur pier side while in port, no flexibility exists in geographically moving the location of active sonar maintenance activities.

Based on the stringent criteria that active sonar maintenance occurs pier side within homeports, no flexibility exists associated with moving the designated training areas. As result, these areas remained unchanged for all alternatives. Due to the minimal size of these areas, they are not depicted on any of the Appendix D maps.

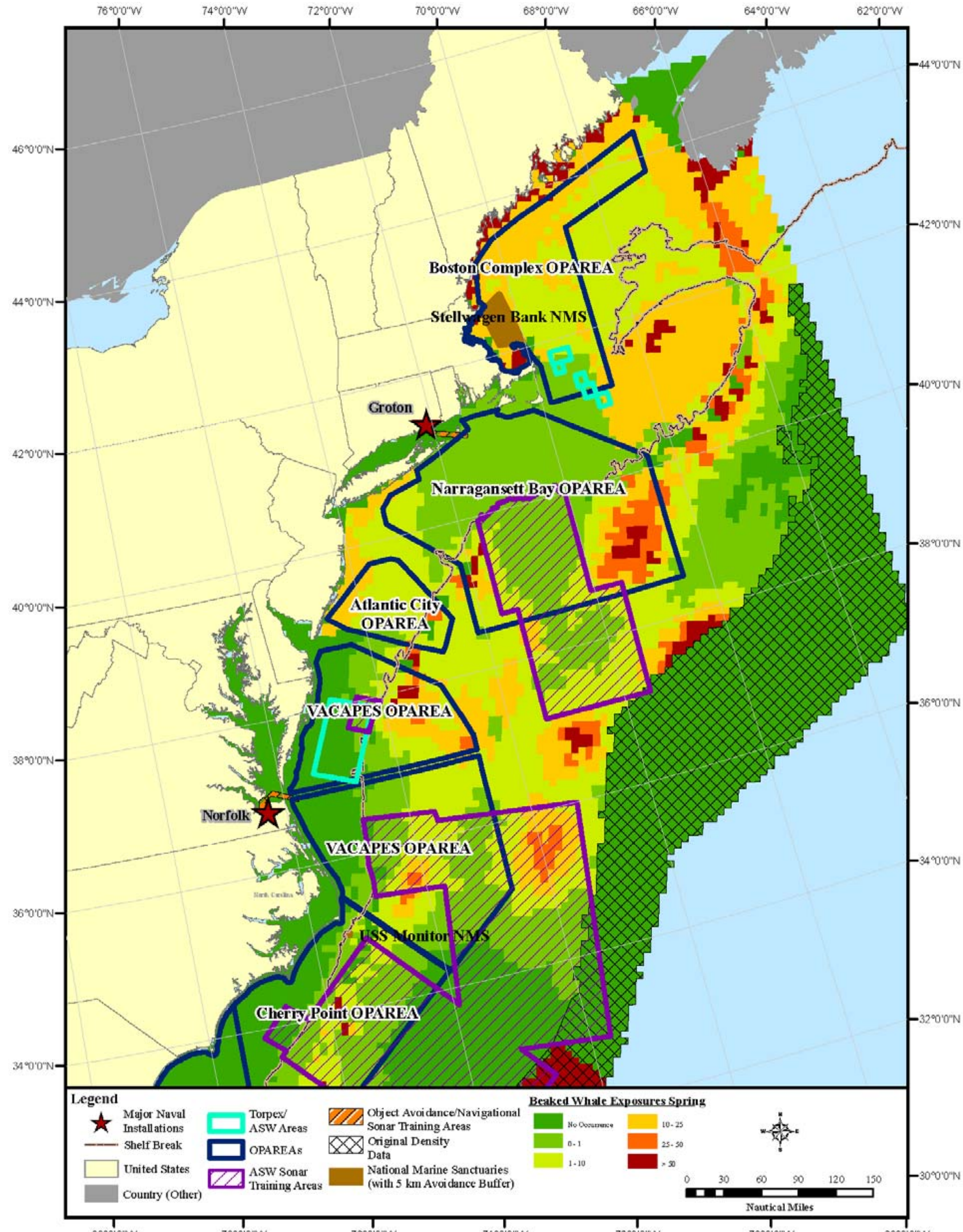

Figure D-2. Alternative 1, NE Beaked Whale-Spring

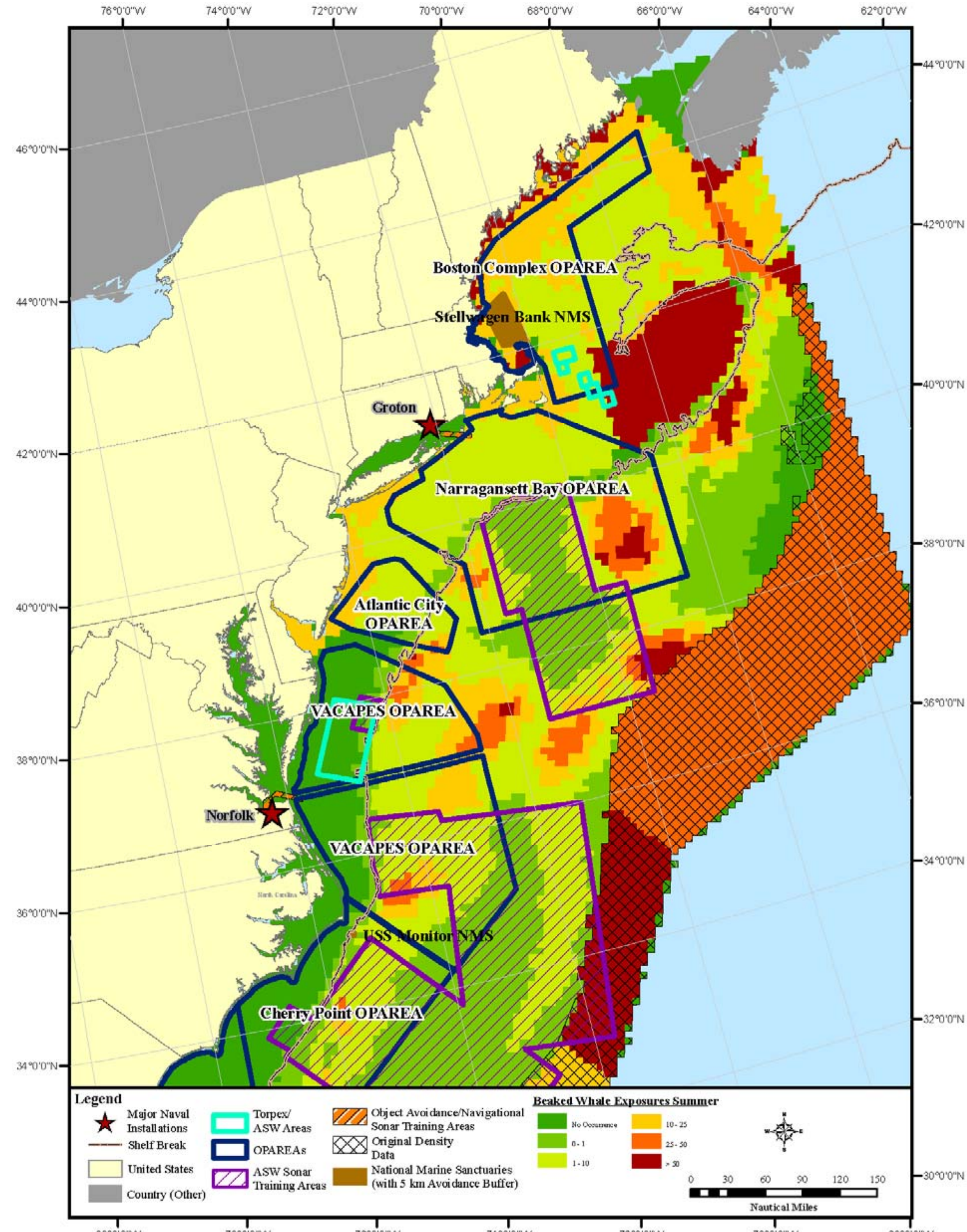

Figure D-3. Alternative 1, NE Beaked Whale-Summer

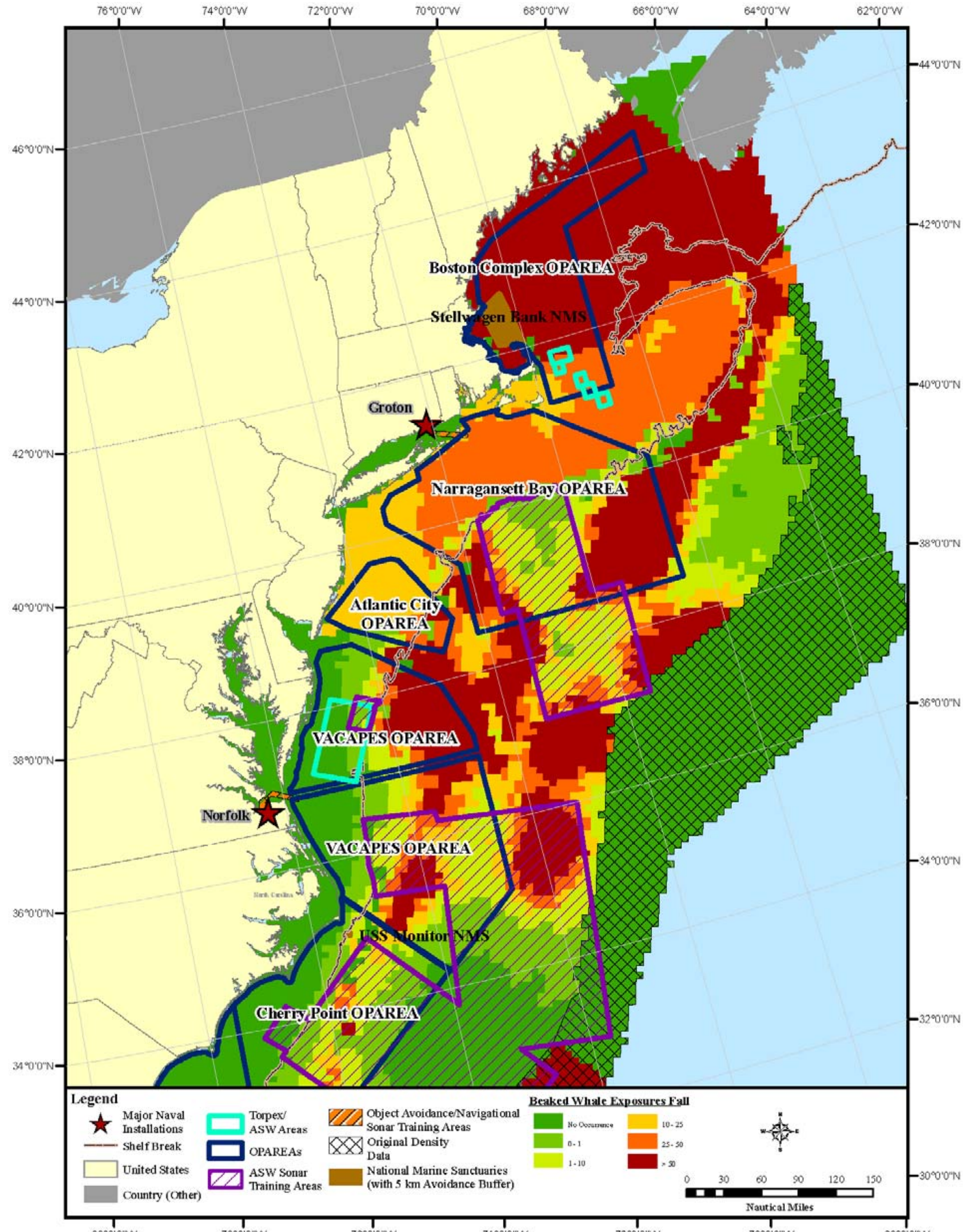

Figure D-4. Alternative 1, NE Beaked Whale-Fall

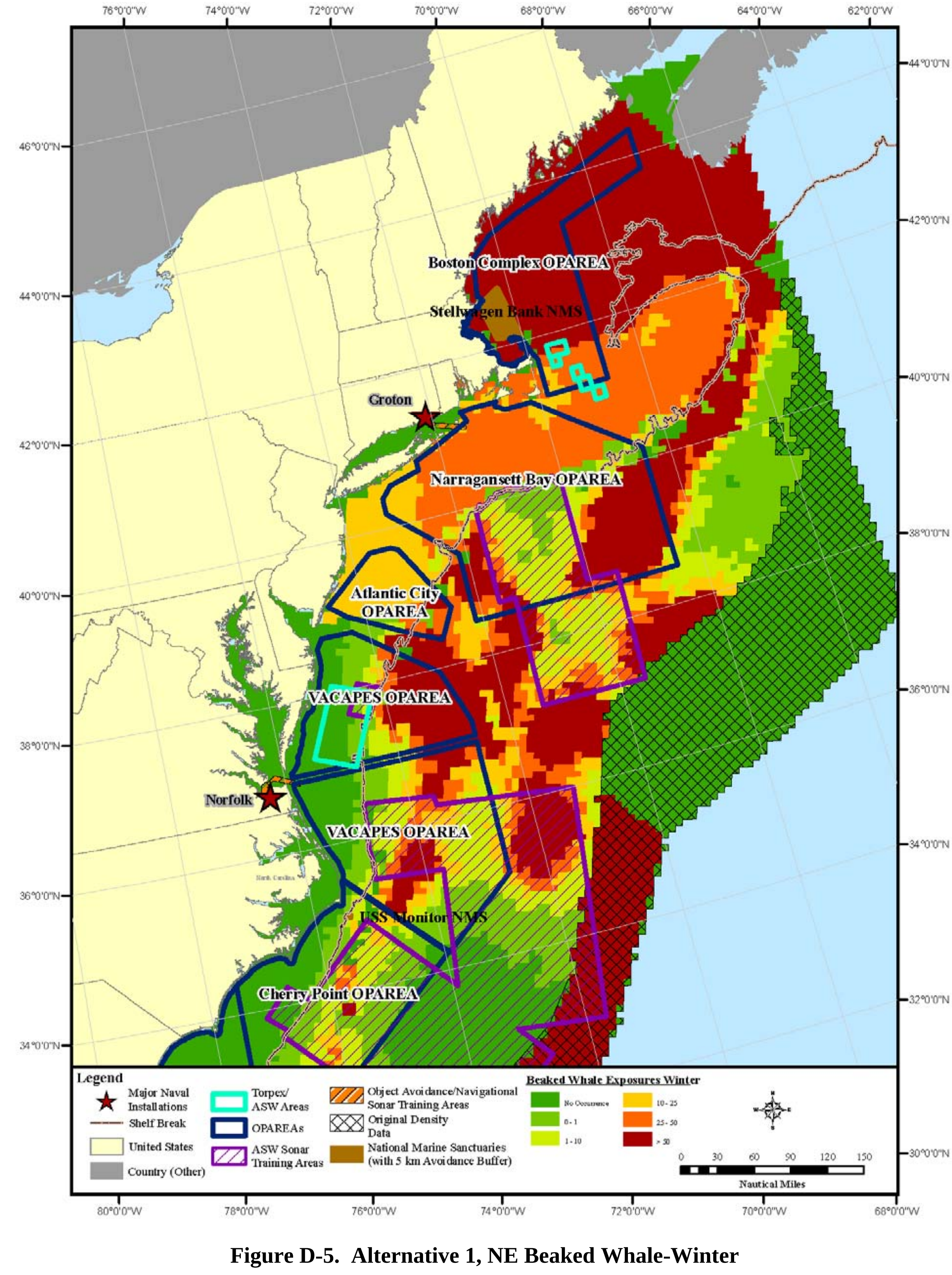

Figure D-5. Alternative 1, NE Beaked Whale-Winter

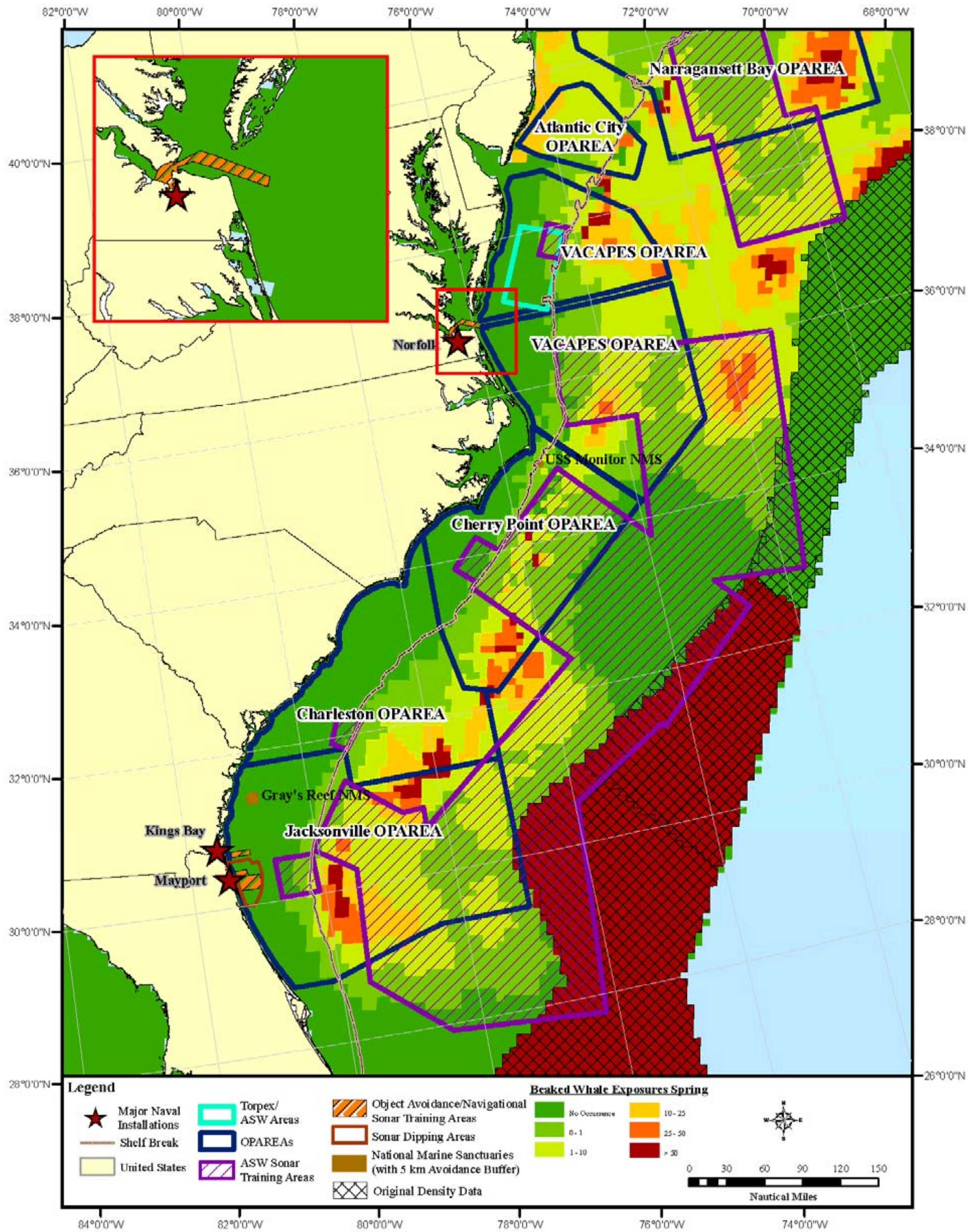

Figure D-6. Alternative 1, SE Beaked Whale-Spring

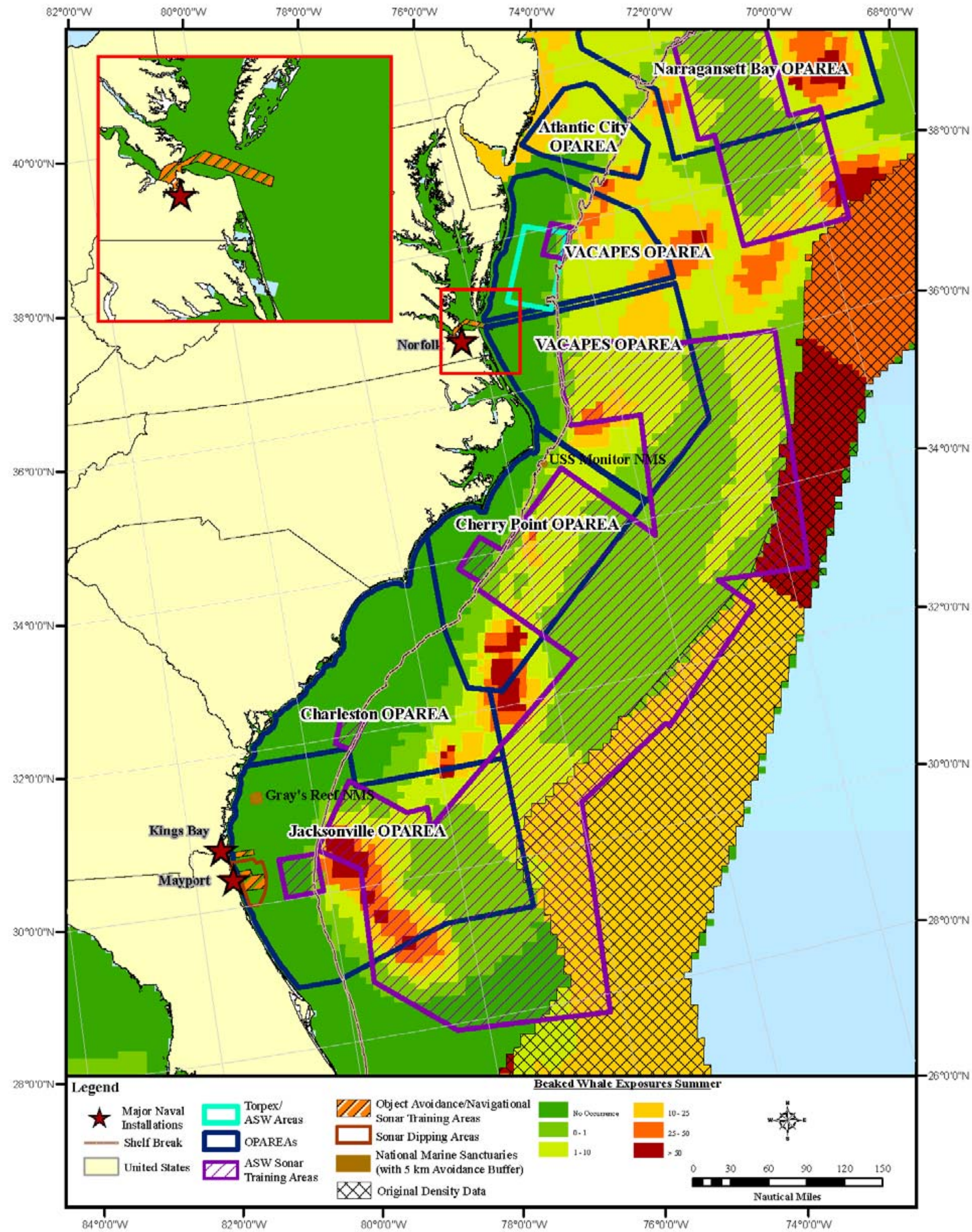

Figure D-7. Alternative 1, SE Beaked Whale-Summer

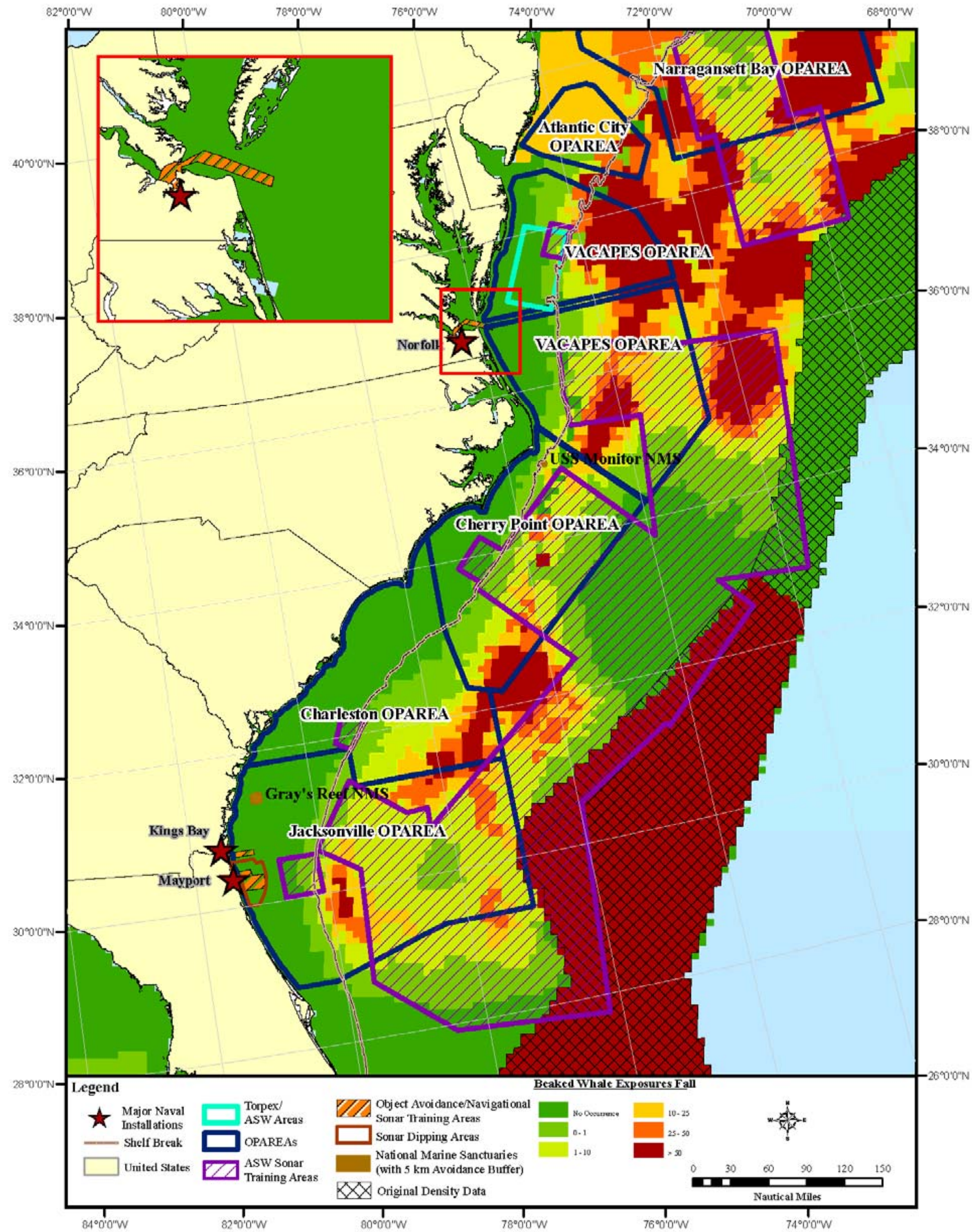

Figure D-8. Alternative 1, SE Beaked Whale-Fall

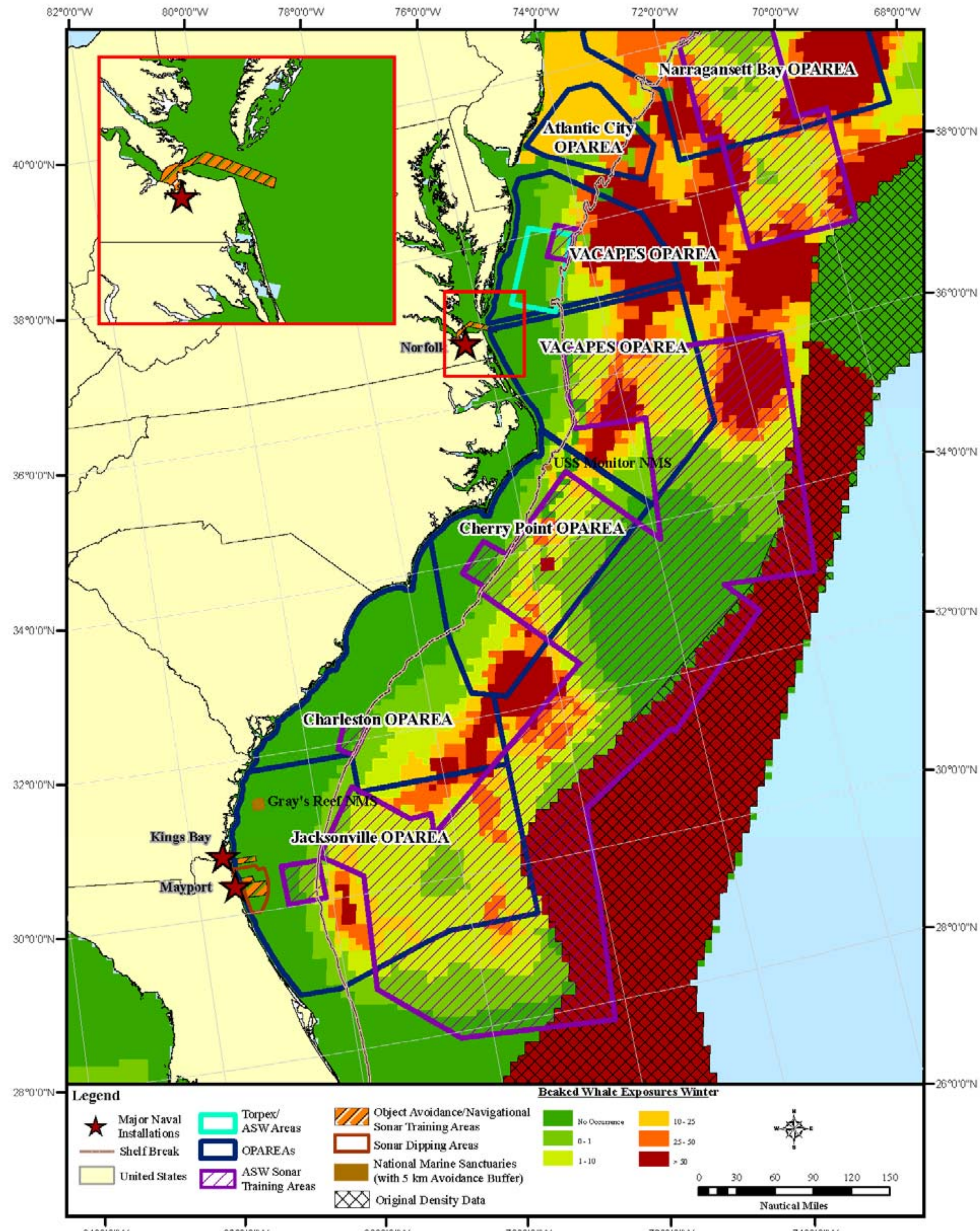

Figure D-9. Alternative 1, SE Beaked Whale-Winter

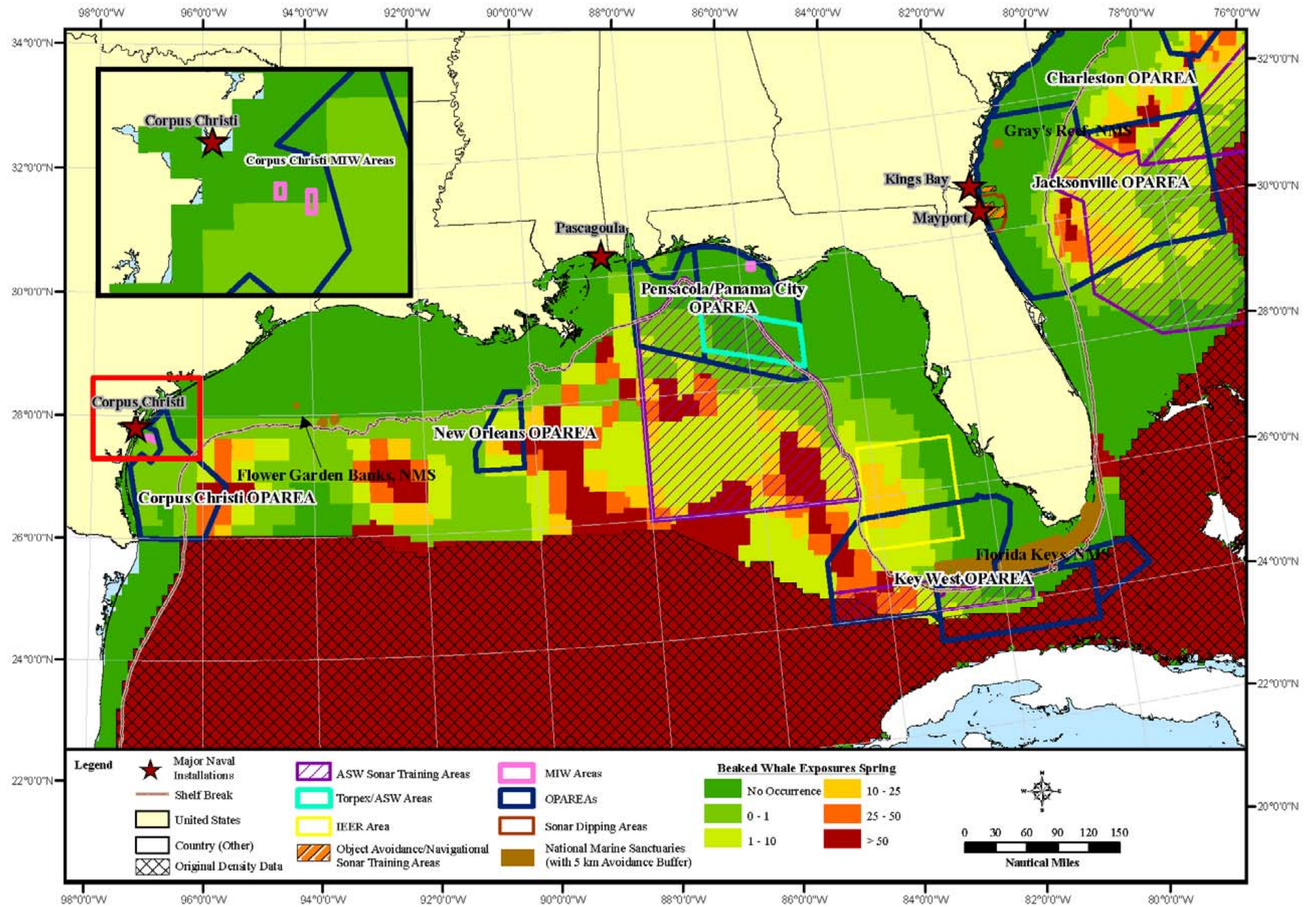

Figure D-10. Alternative 1, GOMEX Beaked Whale-Spring

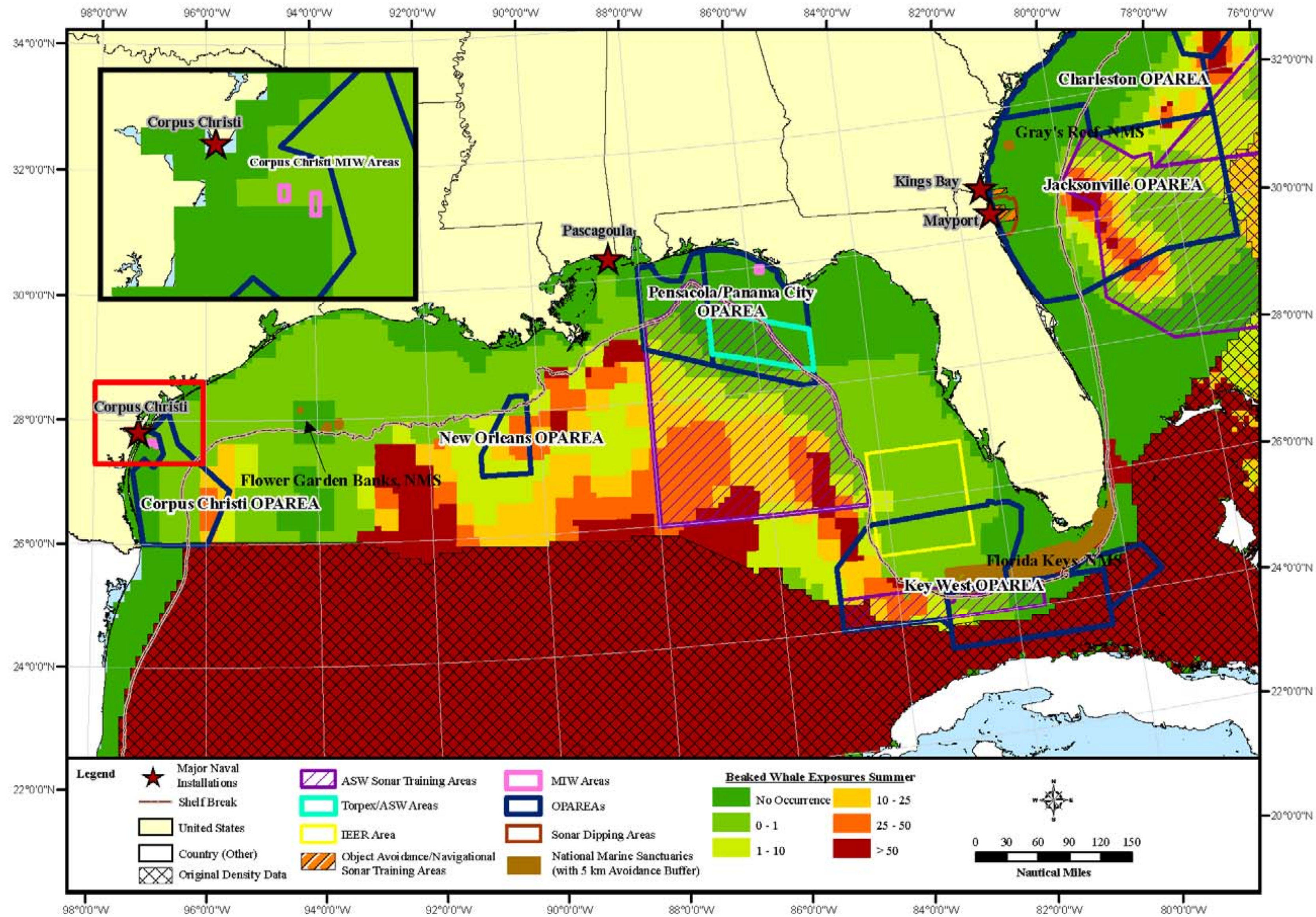

Figure D-11. Alternative 1, GOMEX Beaked Whale-Summer

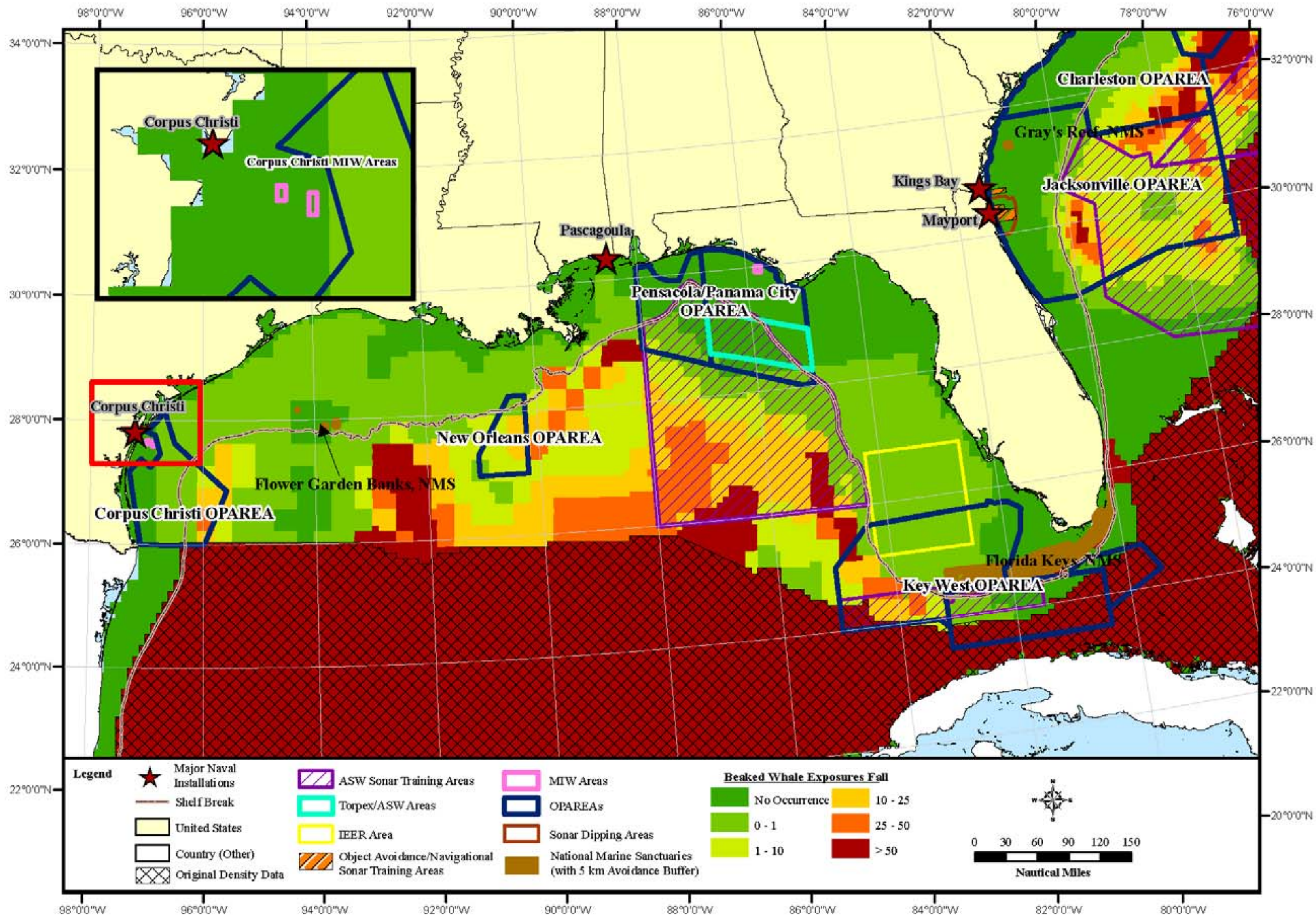

Figure D-12. Alternative 1, GOMEX Beaked Whale-Fall

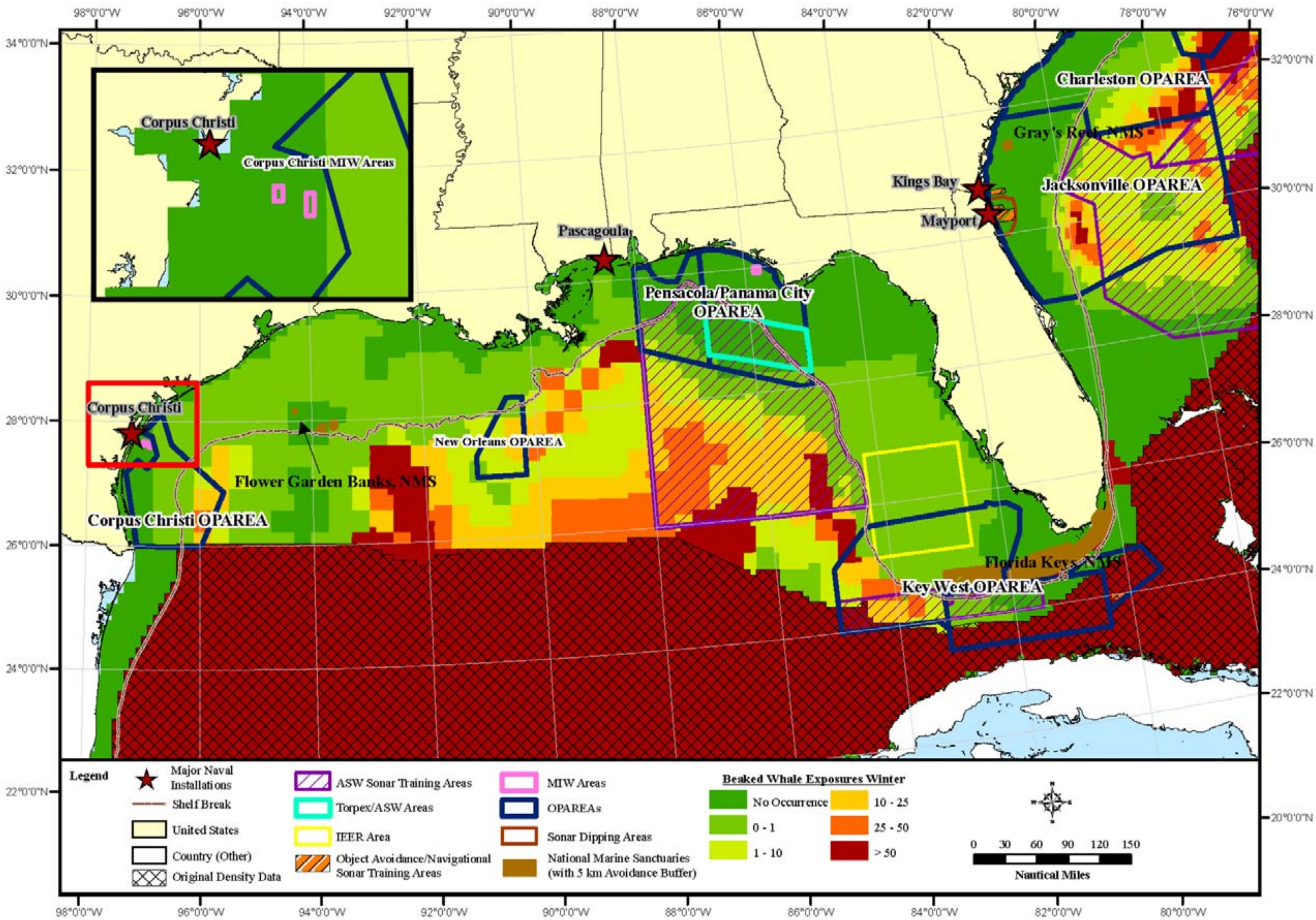

Figure D-13. Alternative 1, GOMEX Beaked Whale-Winter

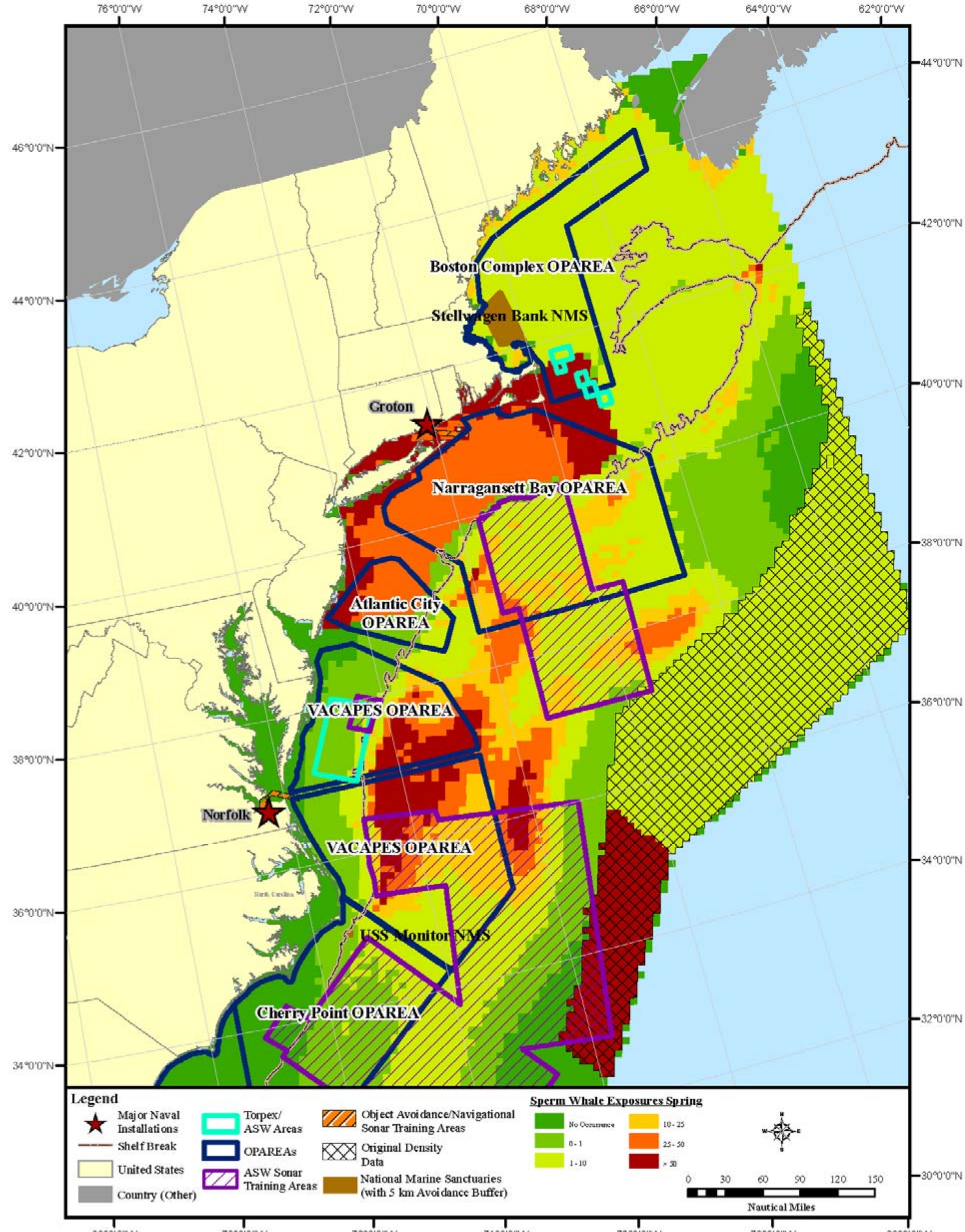

Figure D-14. Alternative 1, NE Sperm Whale-Spring

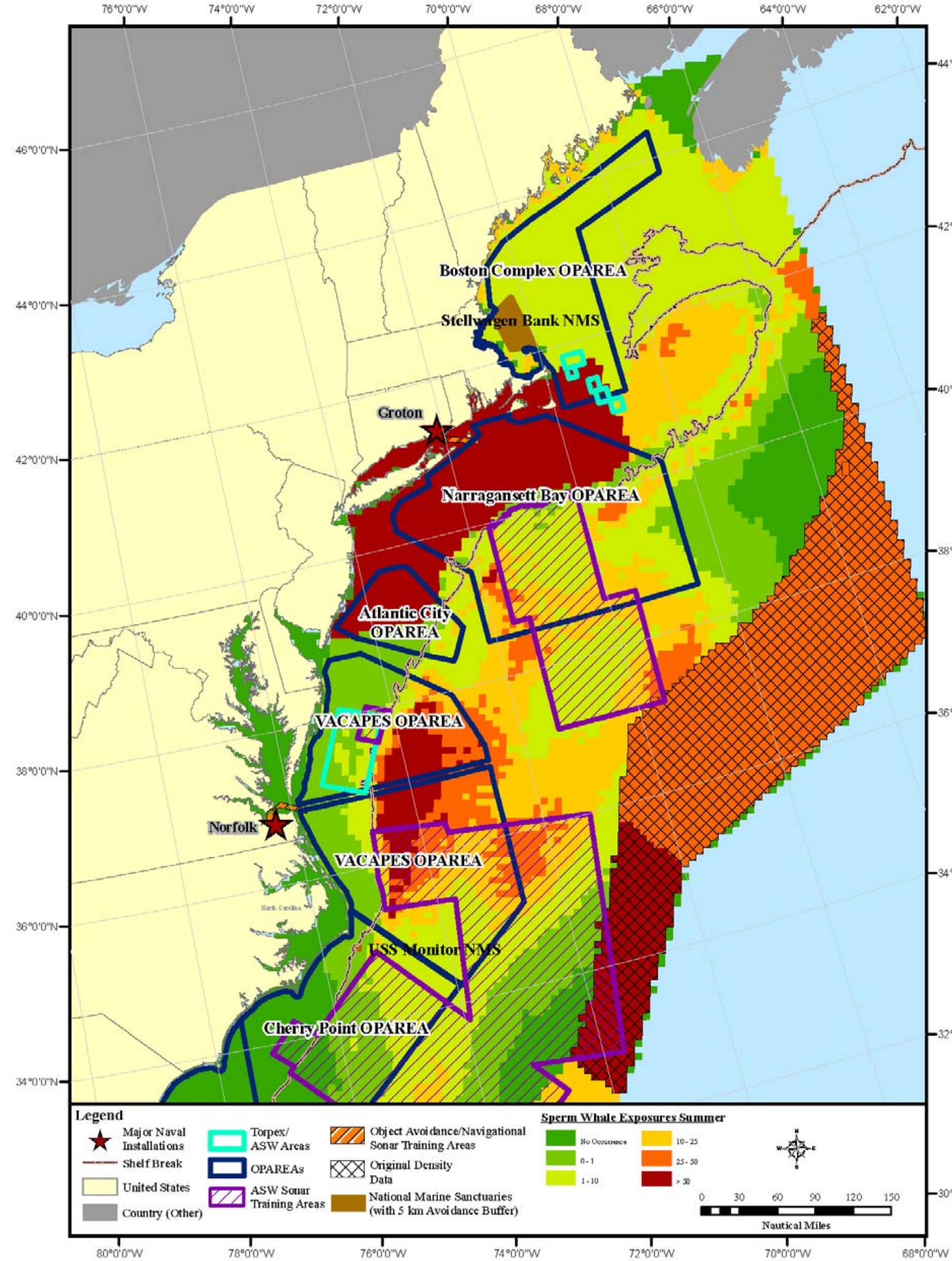

Figure D-15. Alternative 1, NE Sperm Whale-Summer

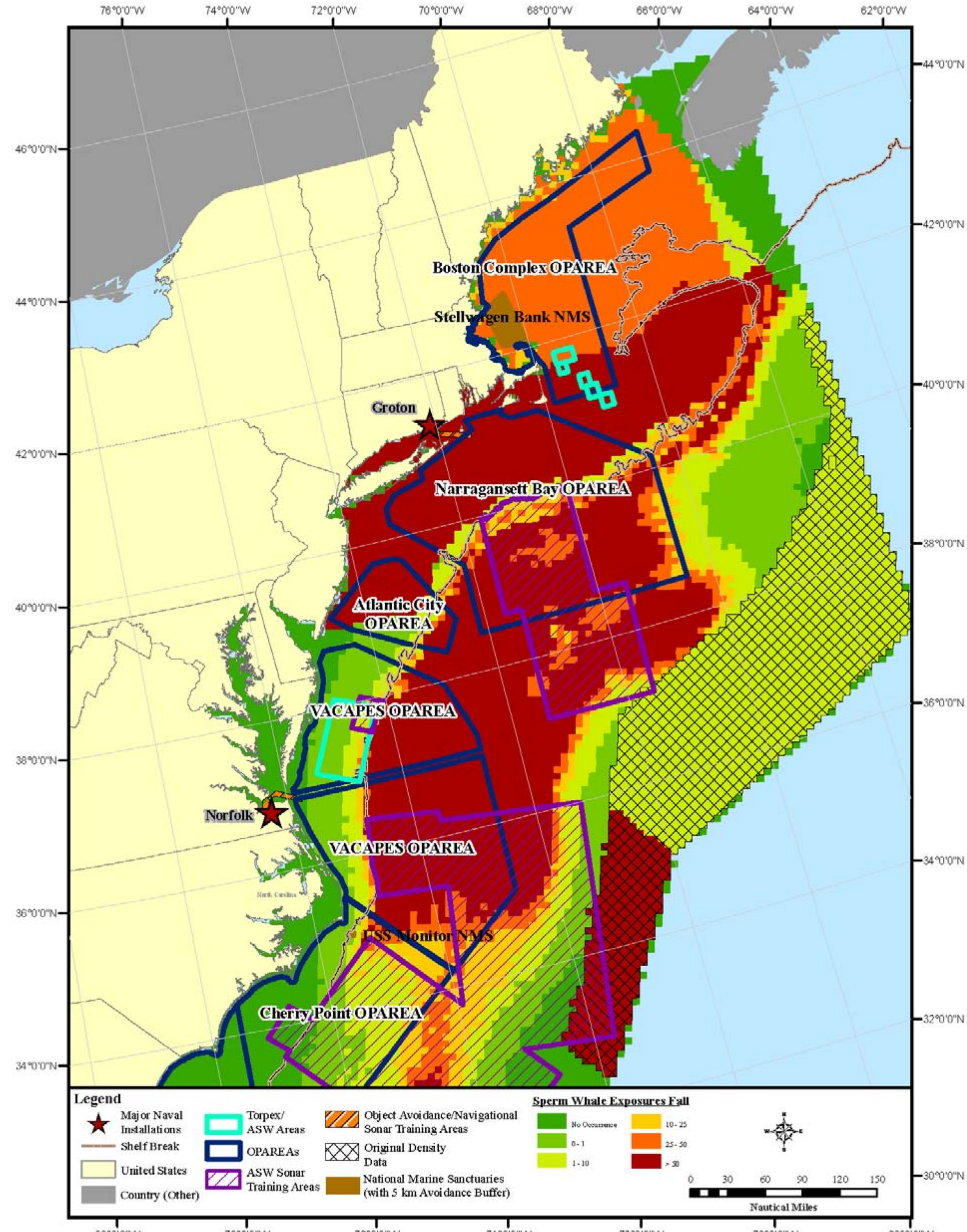

Figure D-16. Alternative 1, NE Sperm Whale-Fall

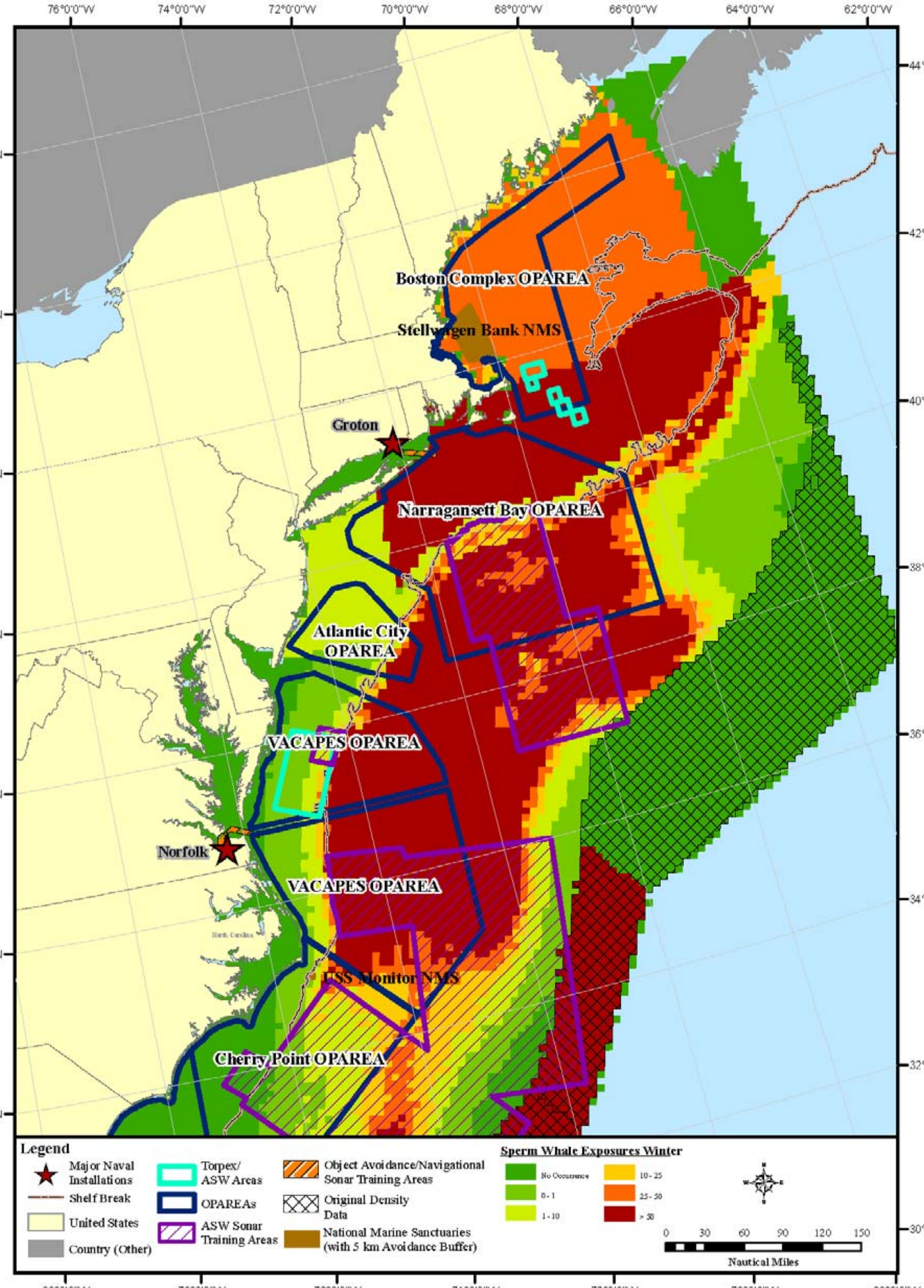

Figure D-17. Alternative 1, NE Sperm Whale-Winter

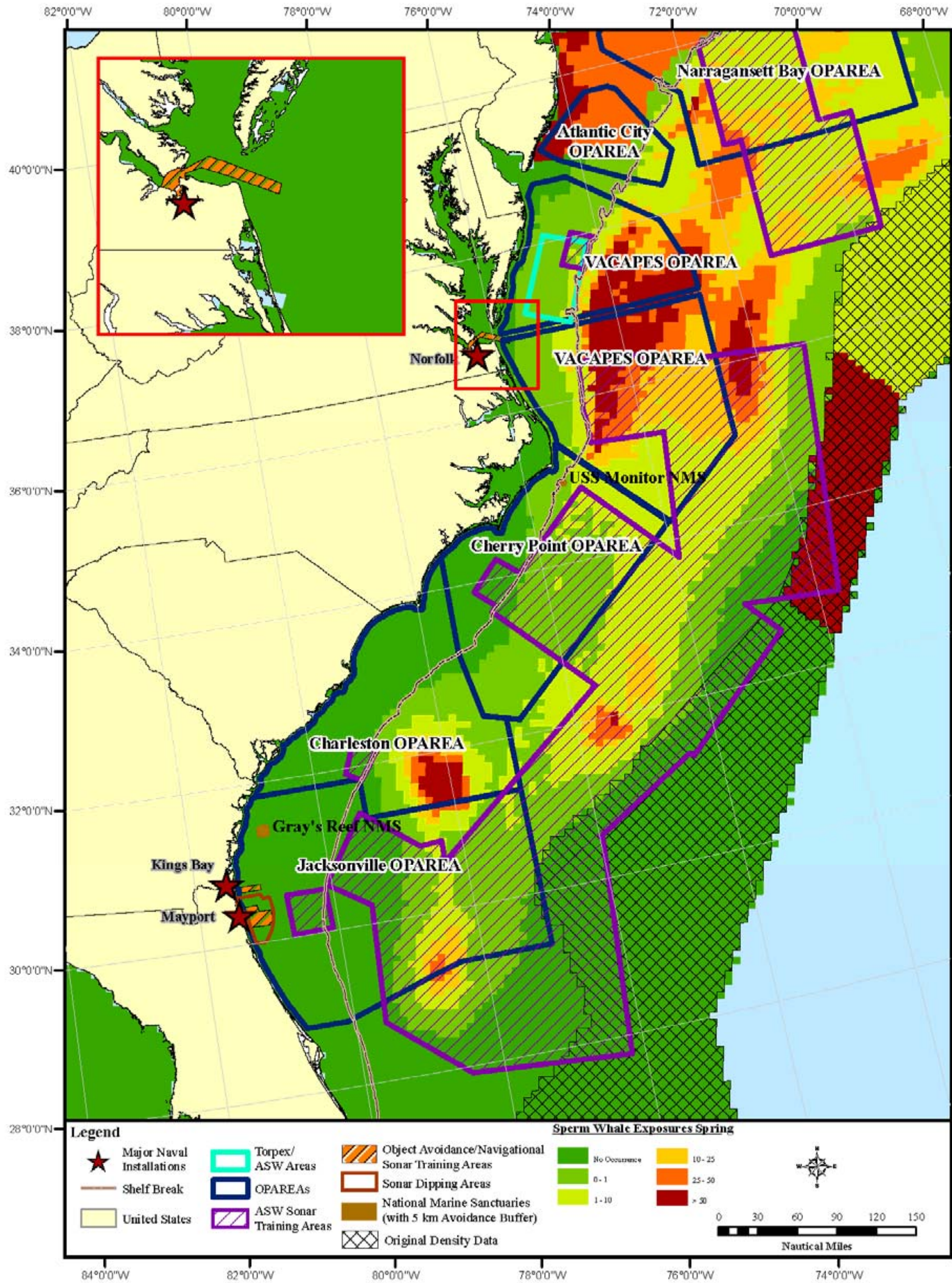

Figure D-18. Alternative 1, SE Sperm Whale-Spring

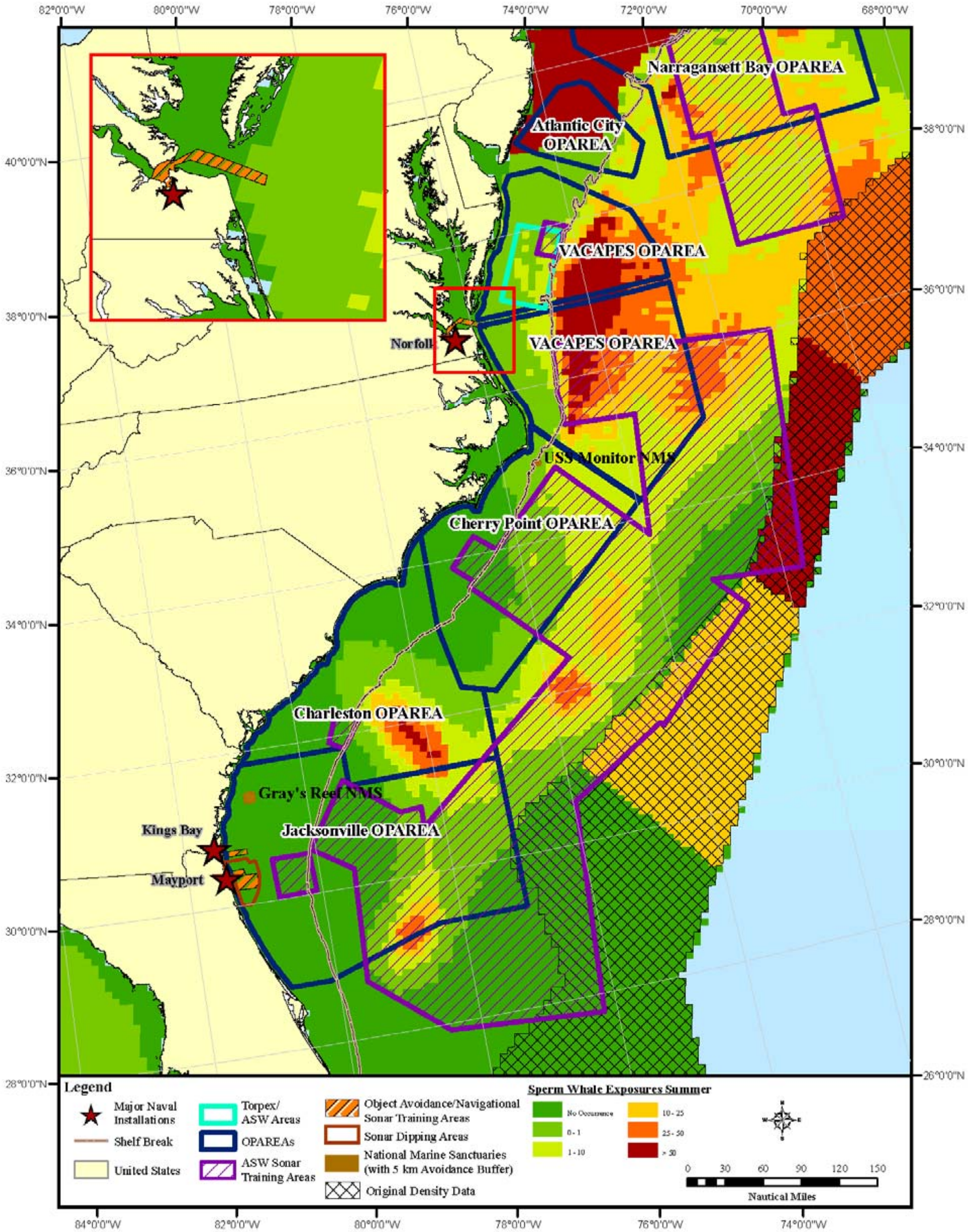

Figure D-19. Alternative 1, SE Sperm Whale-Summer

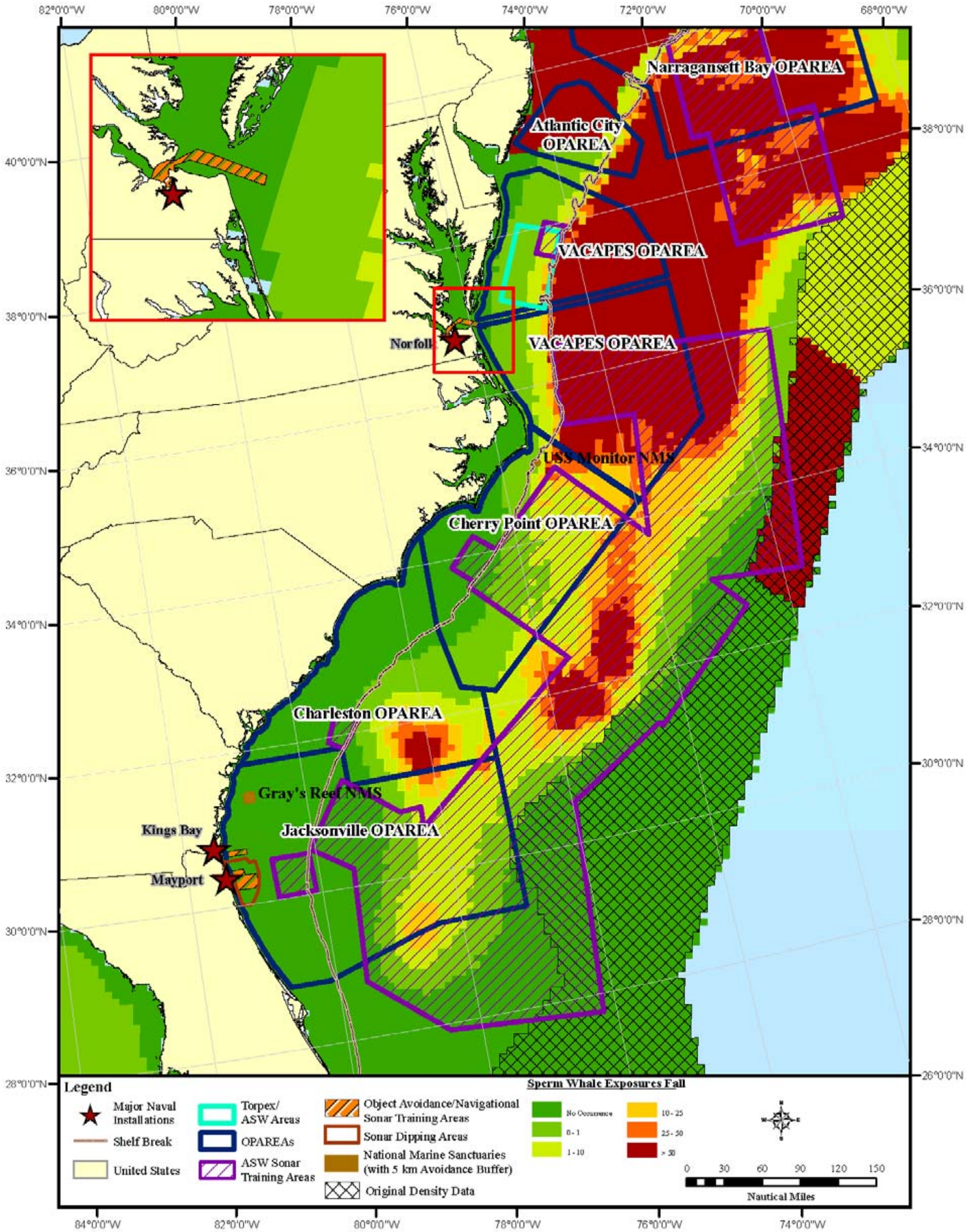

Figure D-20. Alternative 1, SE Sperm Whale-Fall

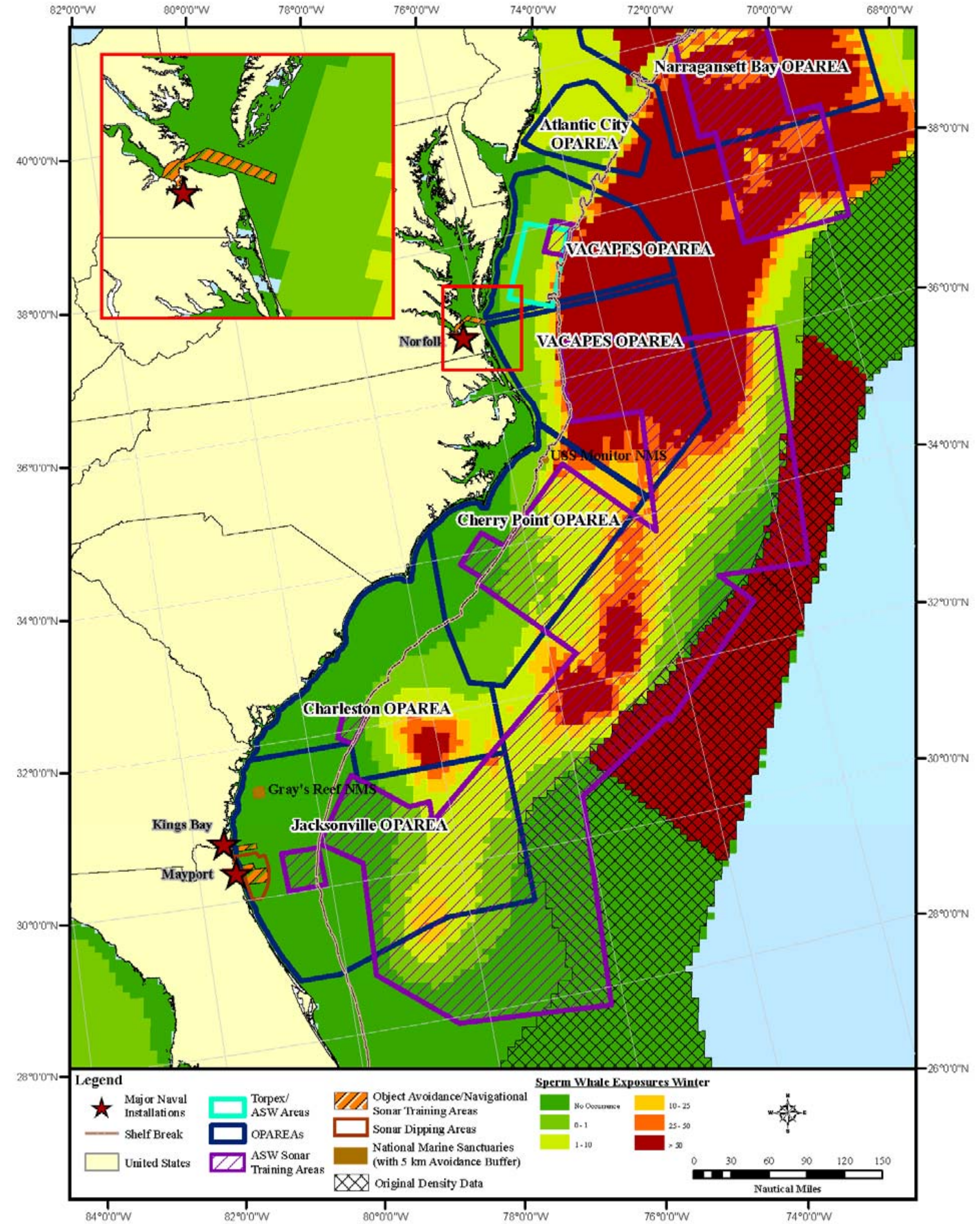

Figure D-21. Alternative 1, SE Sperm Whale-Winter

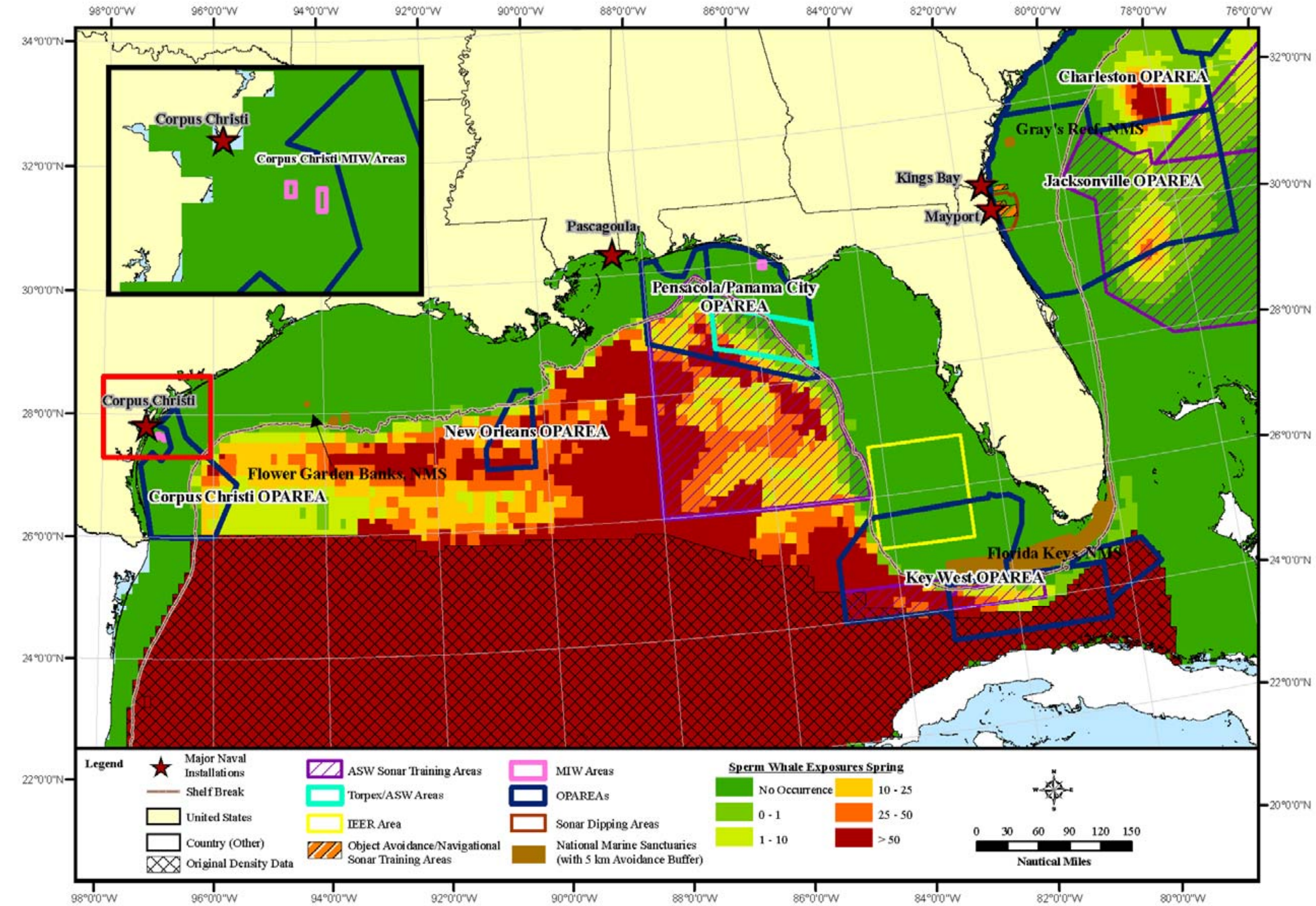

Figure D-22. Alternative 1, GOMEX Sperm Whale-Spring

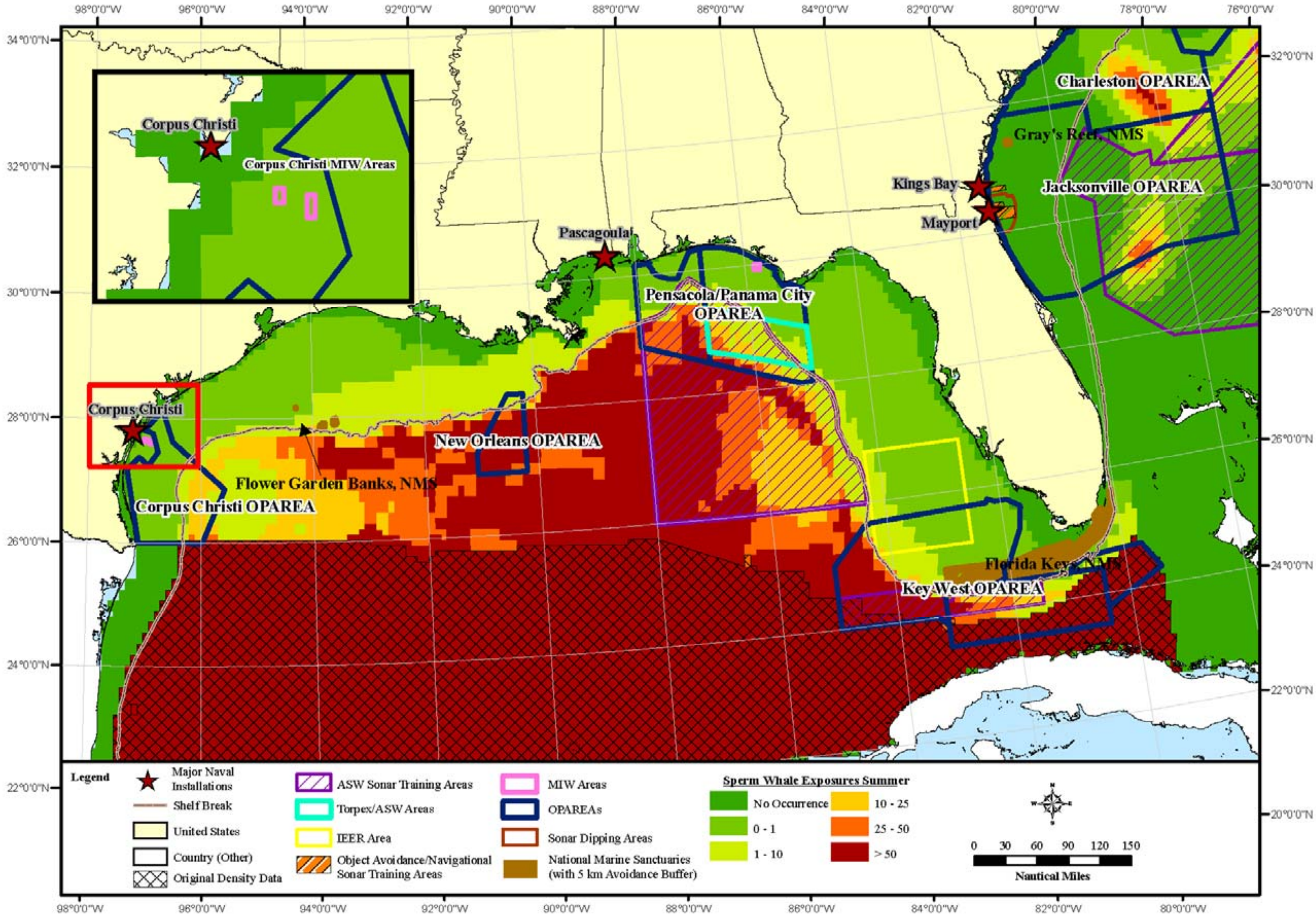

Figure D-23. Alternative 1, GOMEX Sperm Whale-Summer

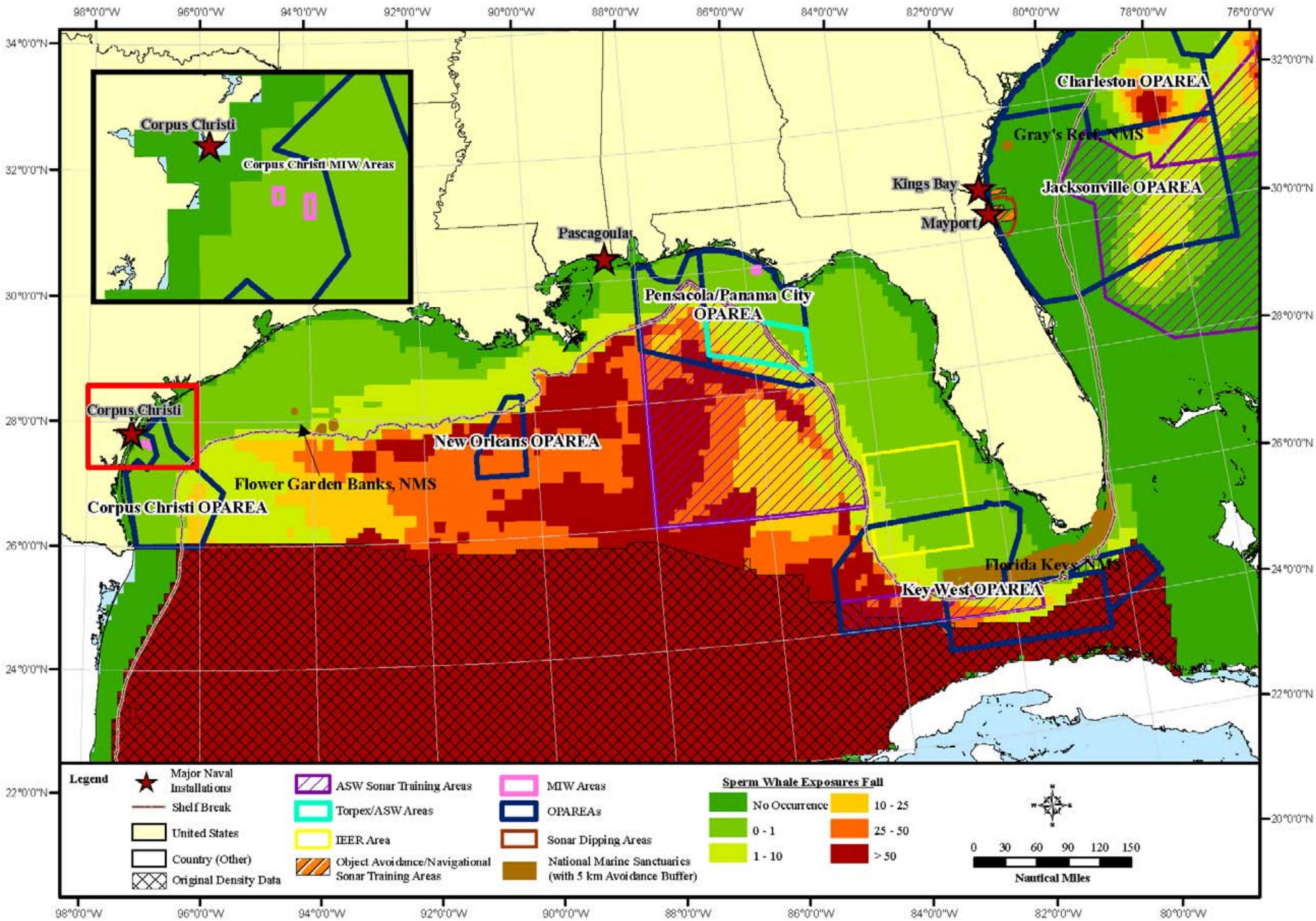

Figure D-24. Alternative 1, GOMEX Sperm Whale-Fall

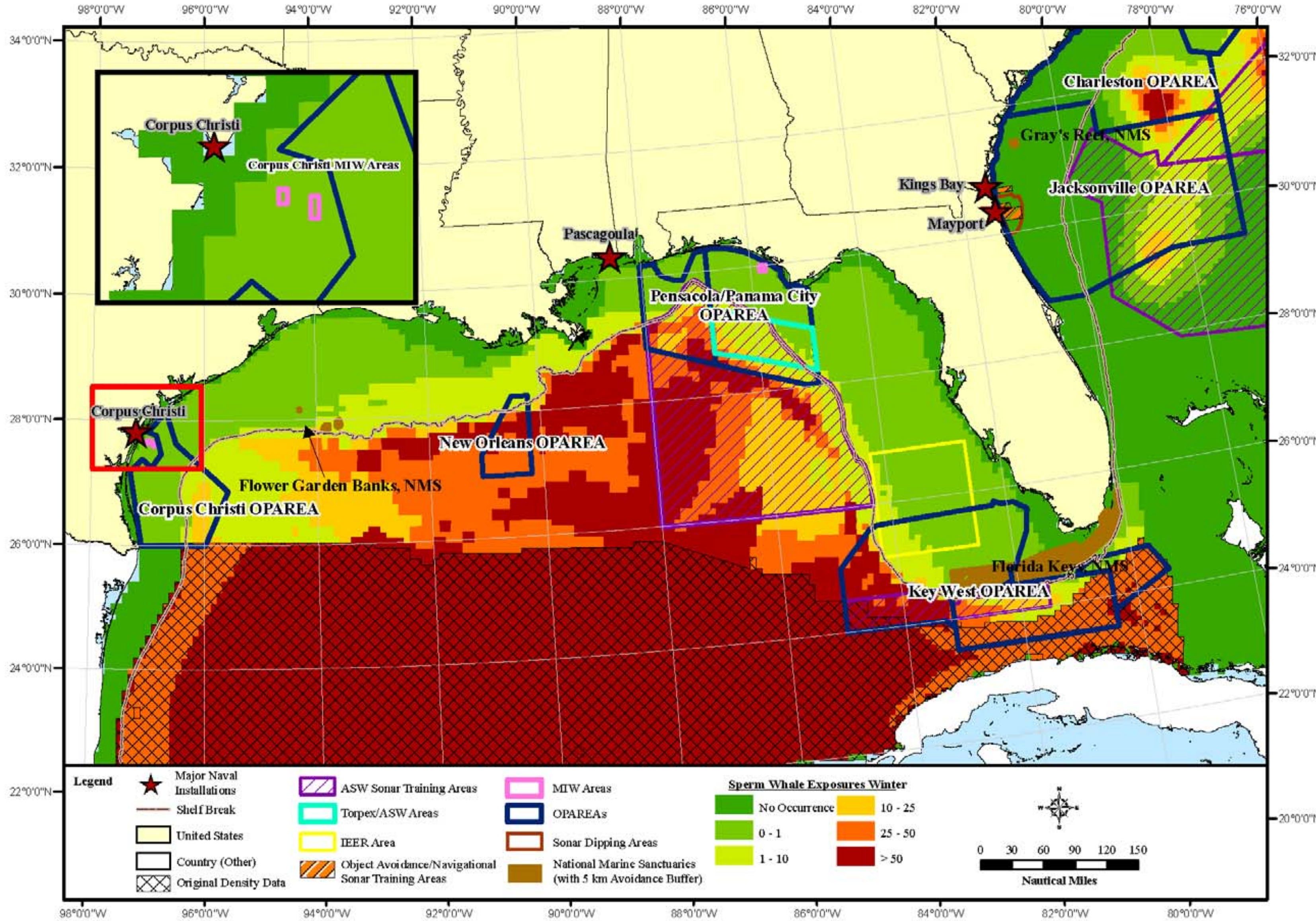

Figure D-25. Alternative 1, GOMEX Sperm Whale-Winter

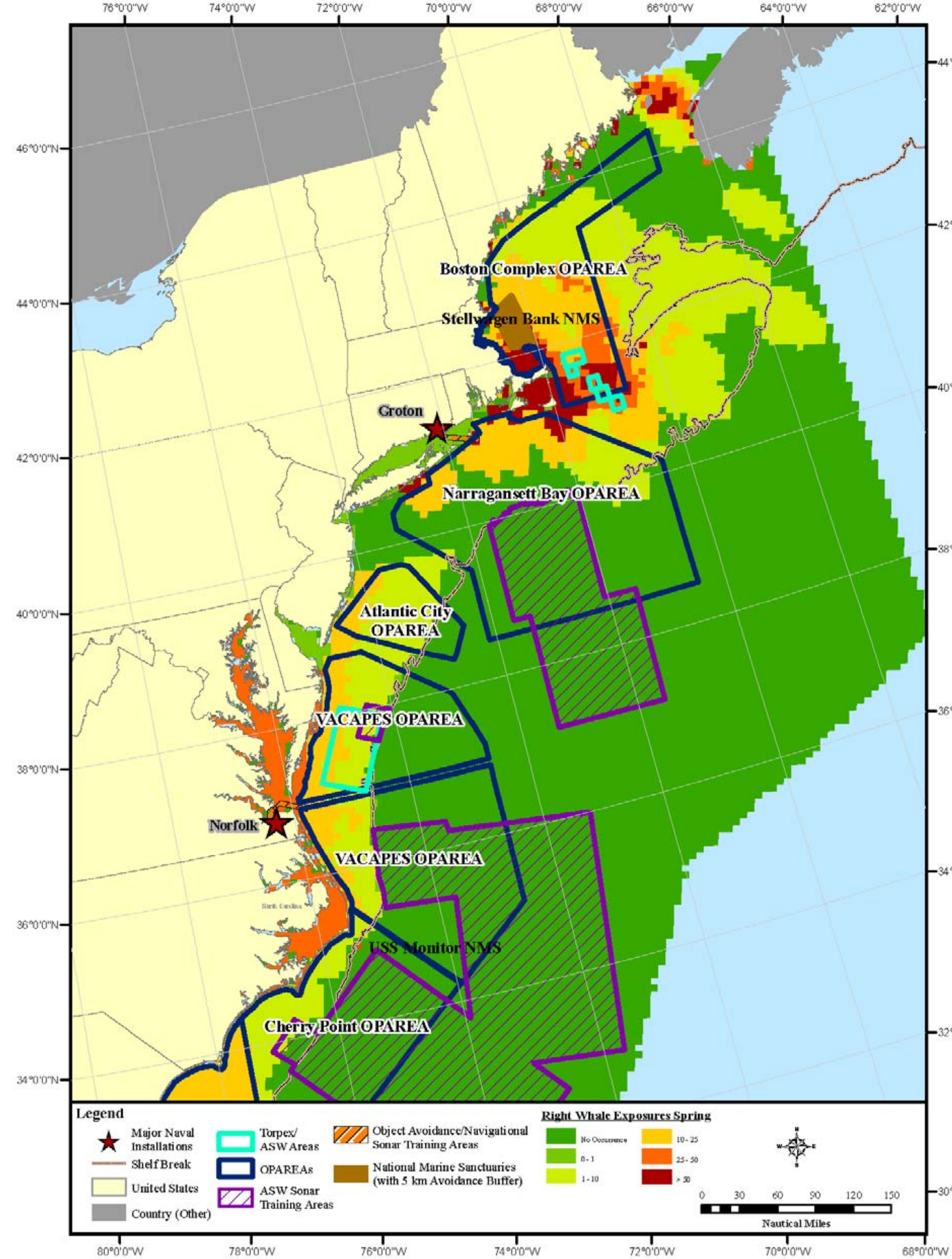

Figure D-26. Alternative 1, NE Right Whale-Spring

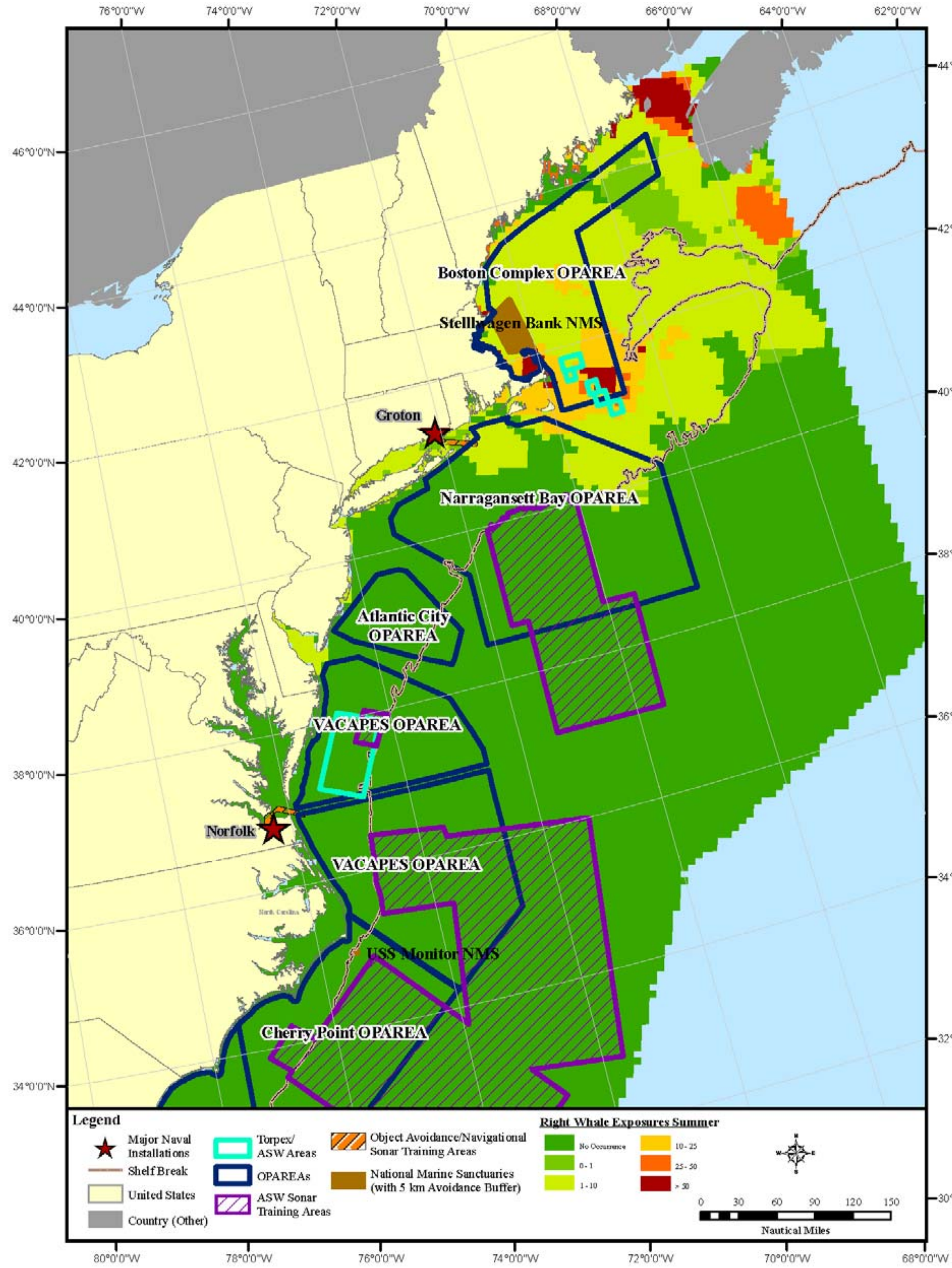

Figure D-27. Alternative 1, NE Right Whale-Summer

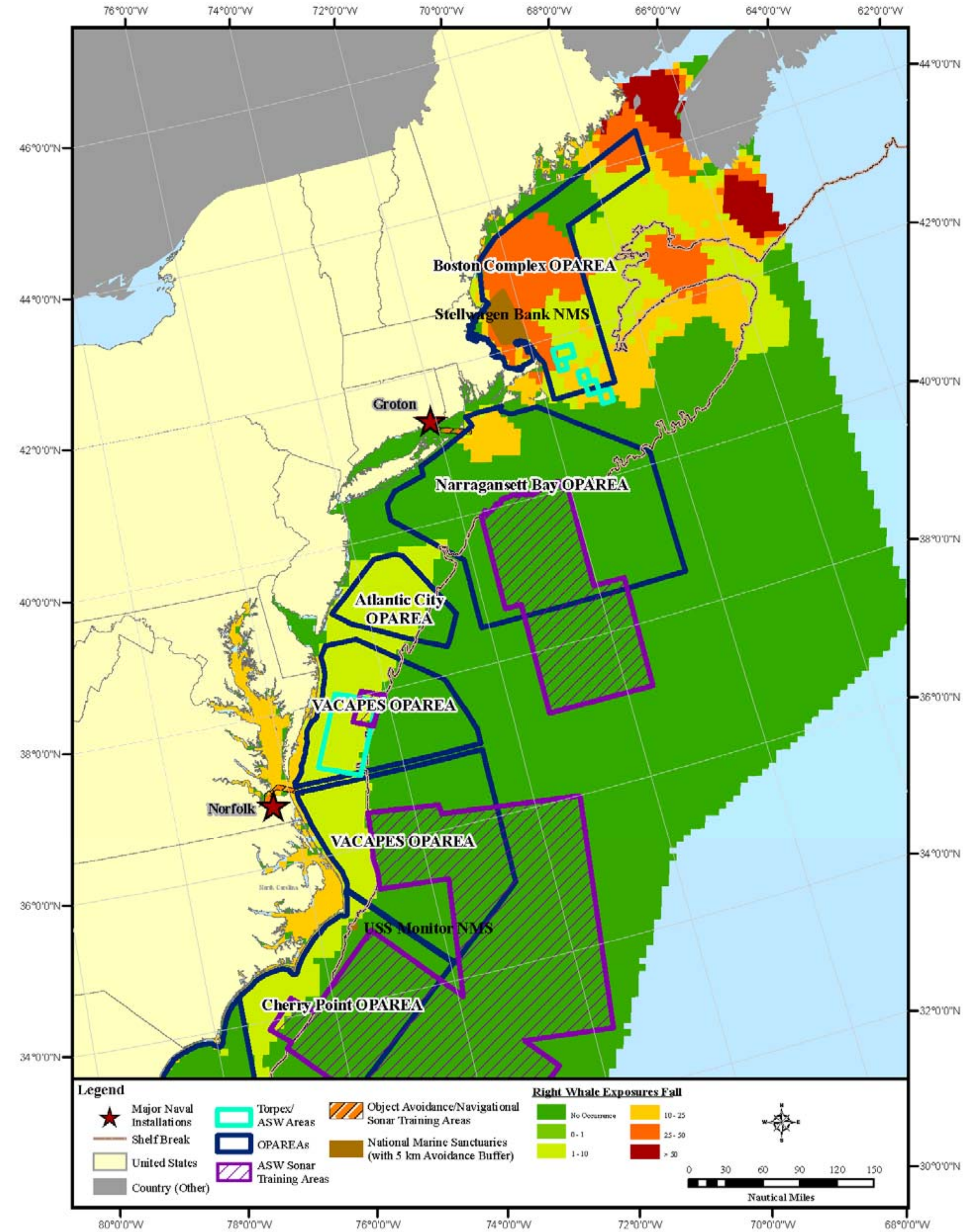

Figure D-28. Alternative 1, NE Right Whale-Fall

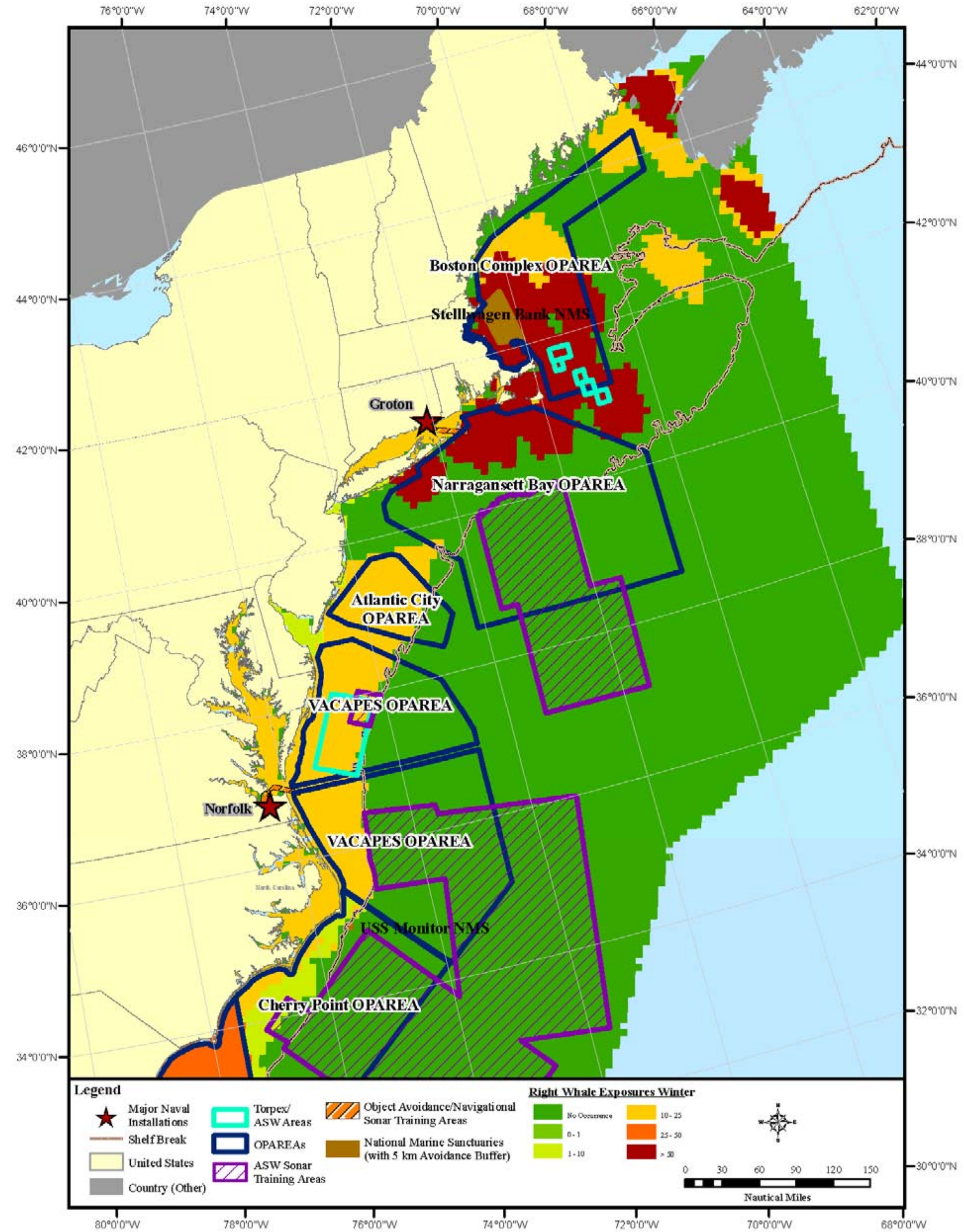

Figure D-29. Alternative 1, NE Right Whale-Winter

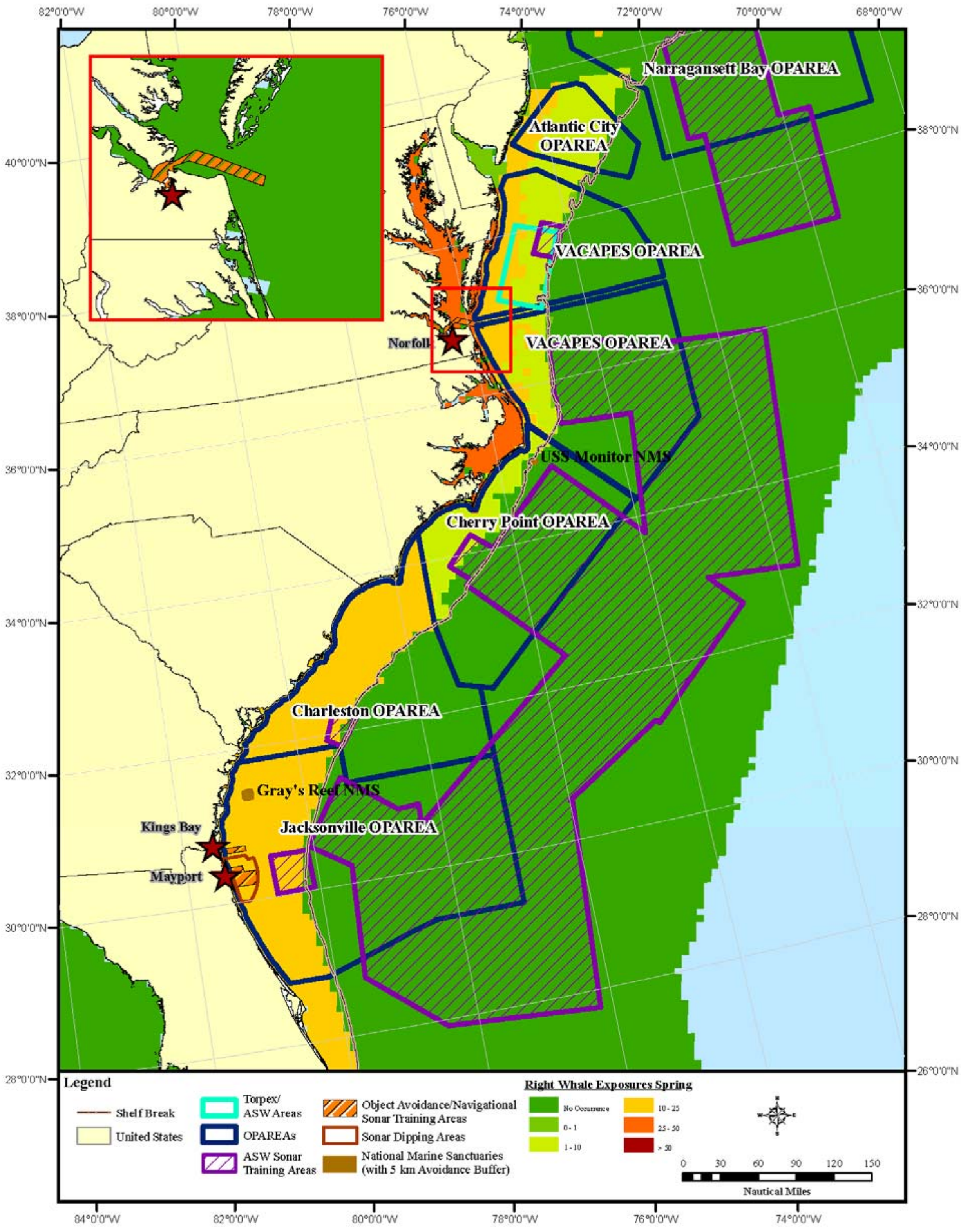

Figure D-30. Alternative 1, SE Right Whale-Spring

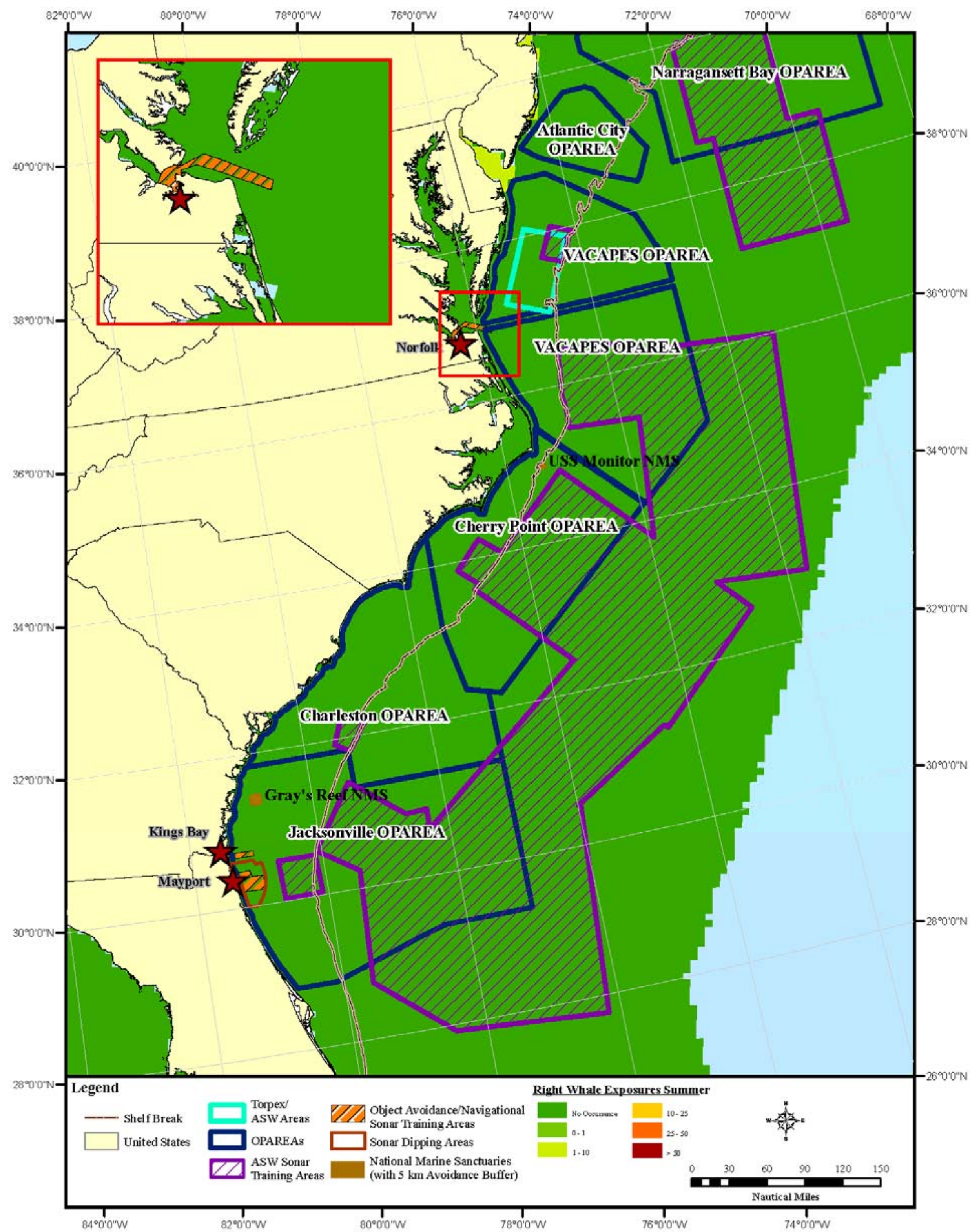

Figure D-31. Alternative 1, SE Right Whale-Summer

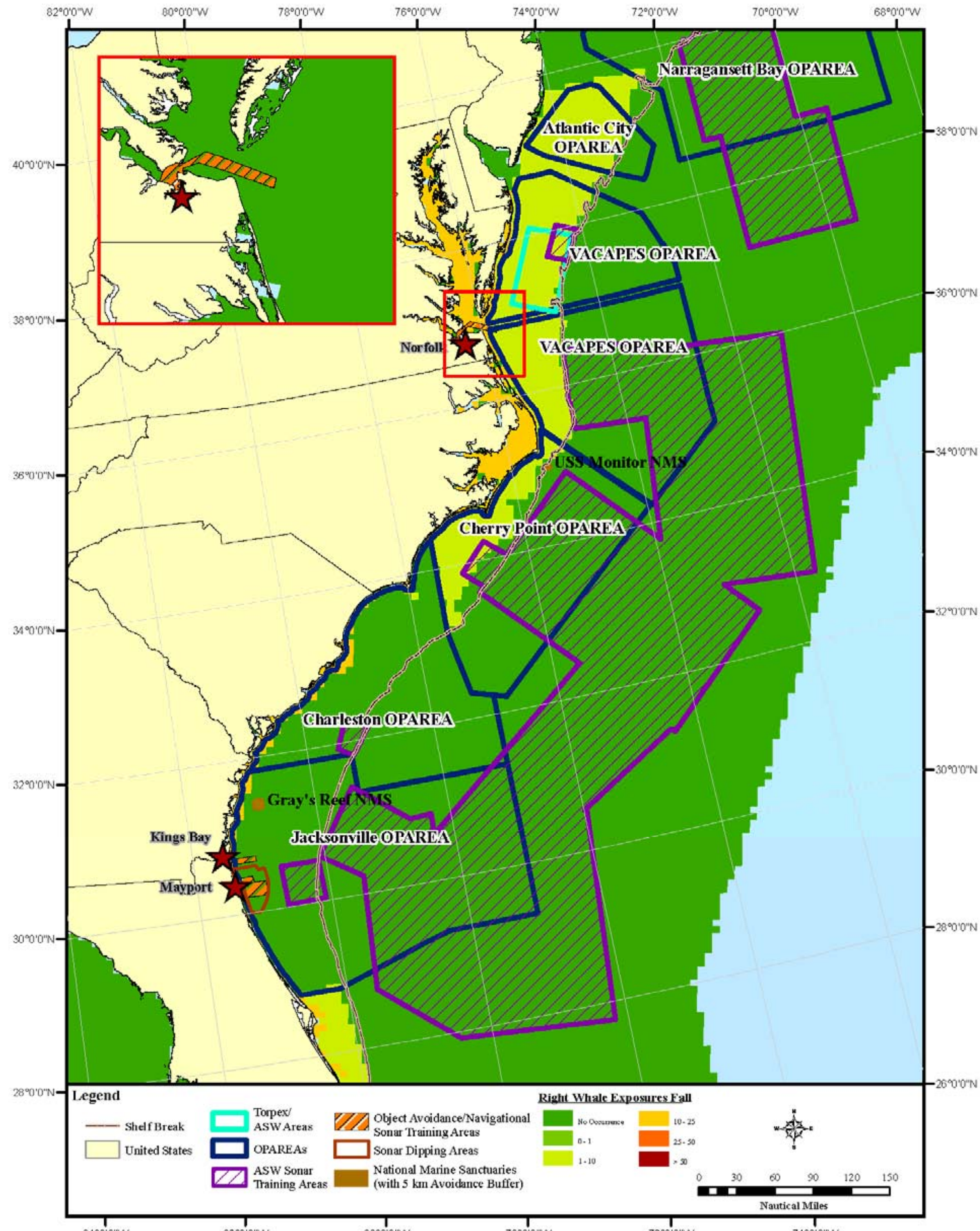

Figure D-32. Alternative 1, SE Right Whale-Fall

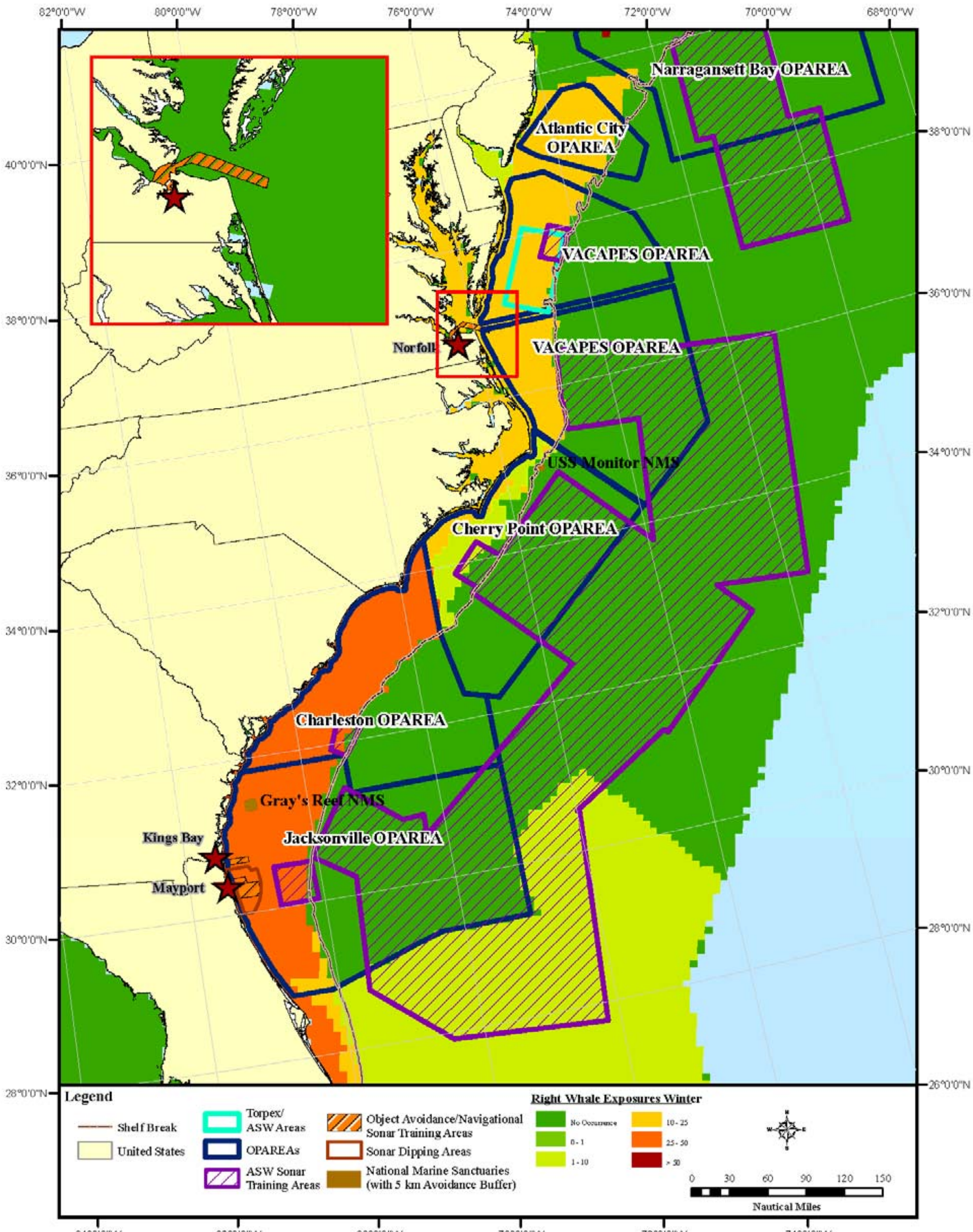

Figure D-33. Alternative 1, SE Right Whale-Winter

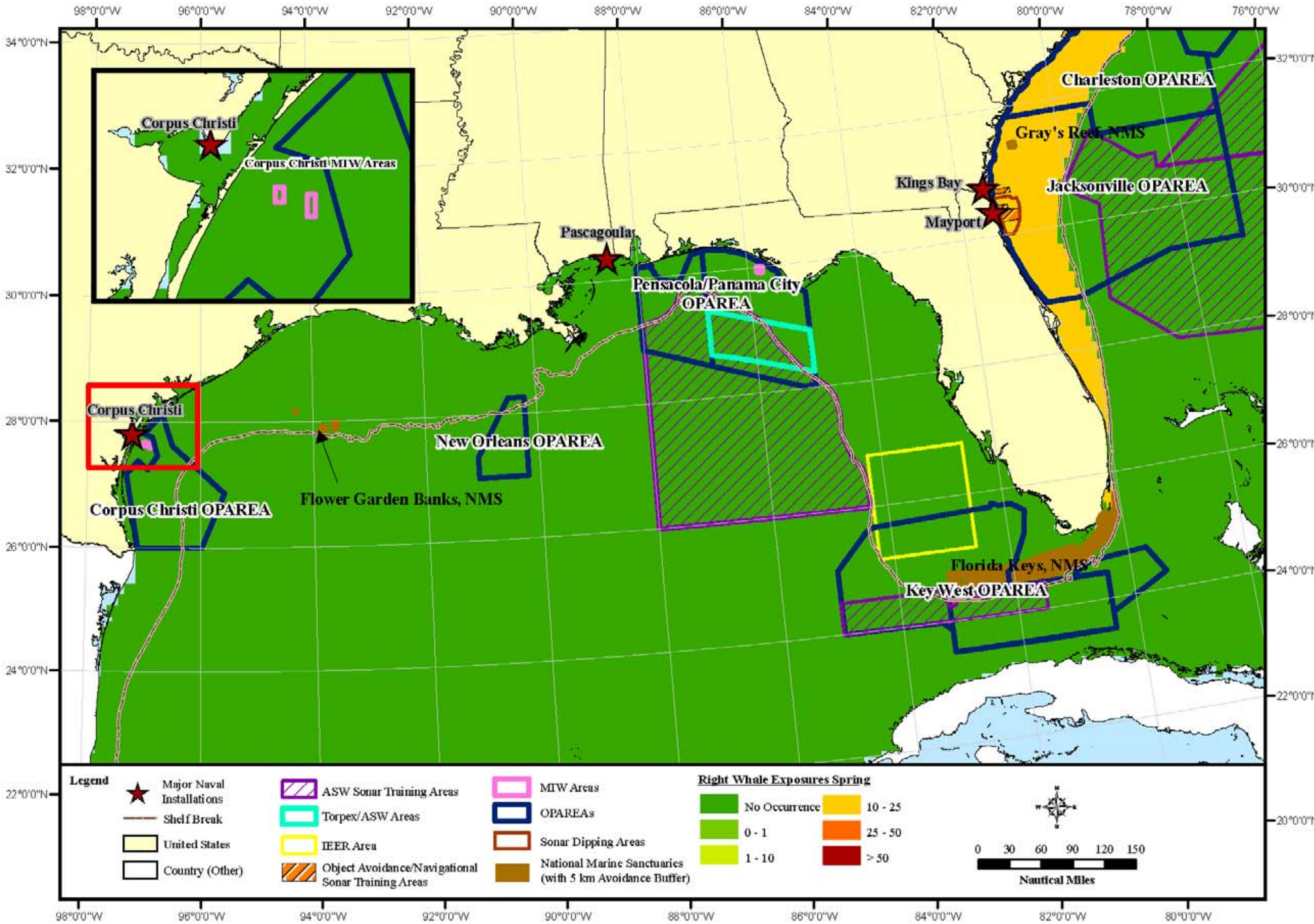

Figure D-34. Alternative 1, GOMEX Right Whale-Spring

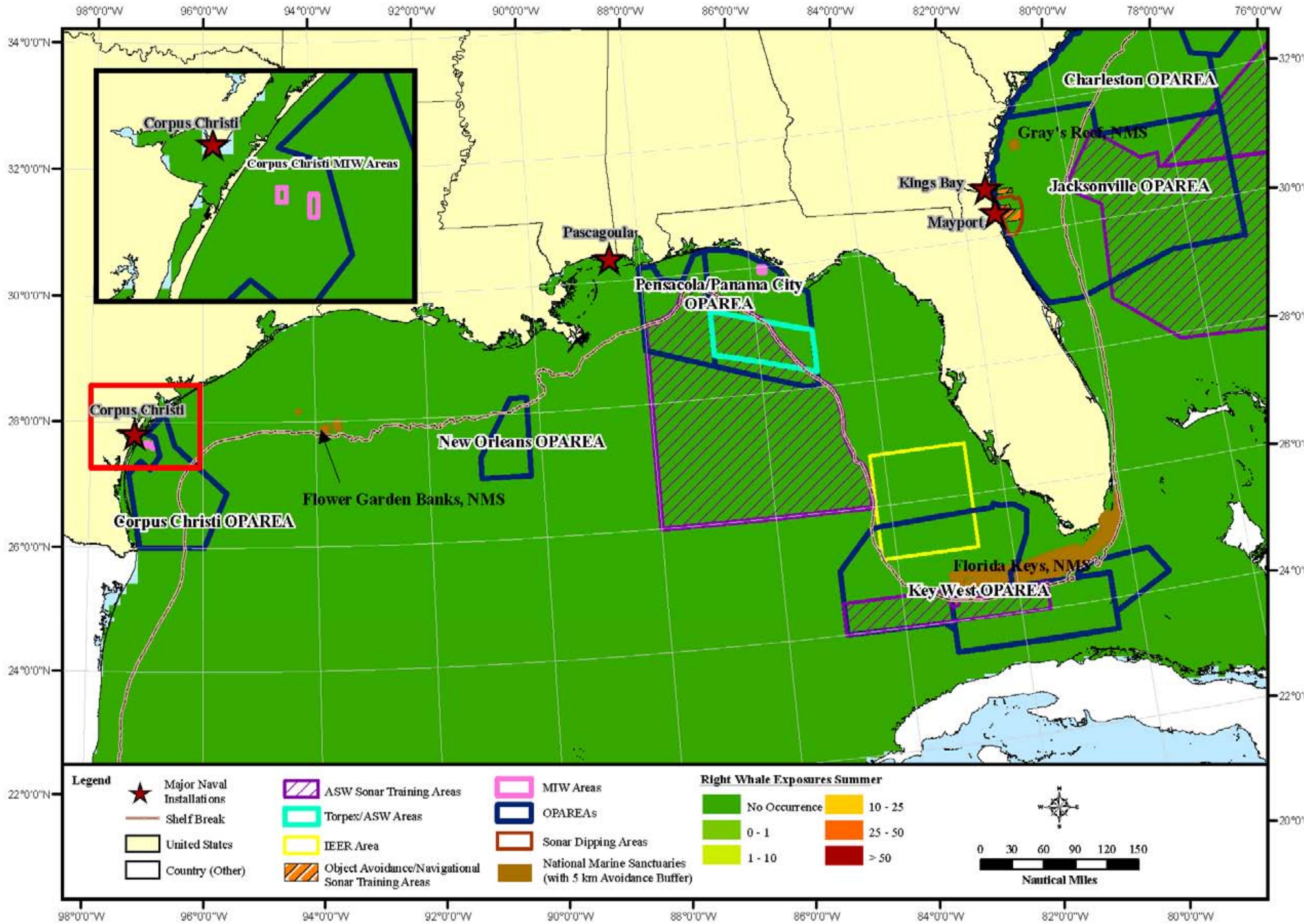

Figure D-35. Alternative 1, GOMEX Right Whale-Summer

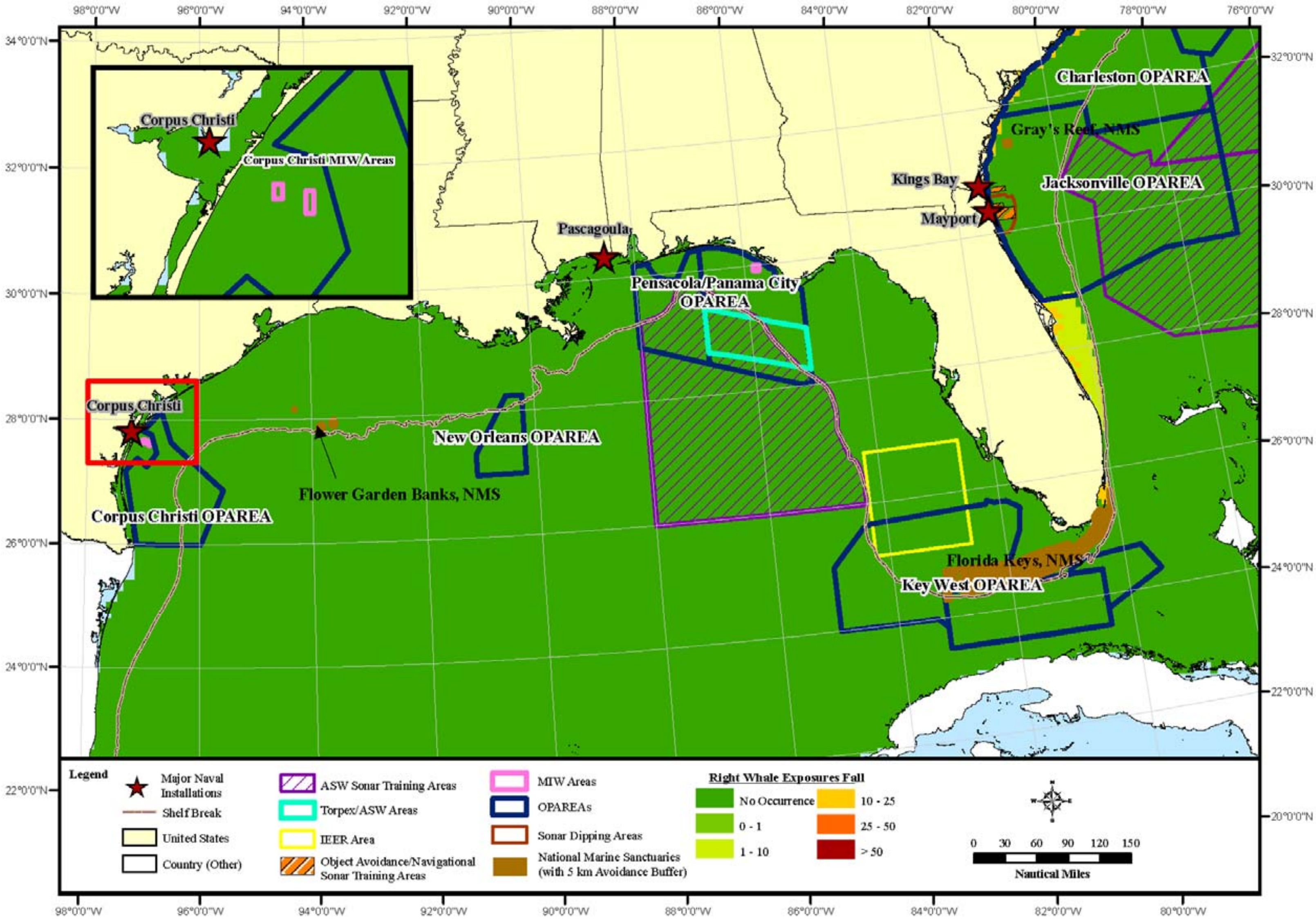

Figure D-36. Alternative 1, GOMEX Right Whale-Fall

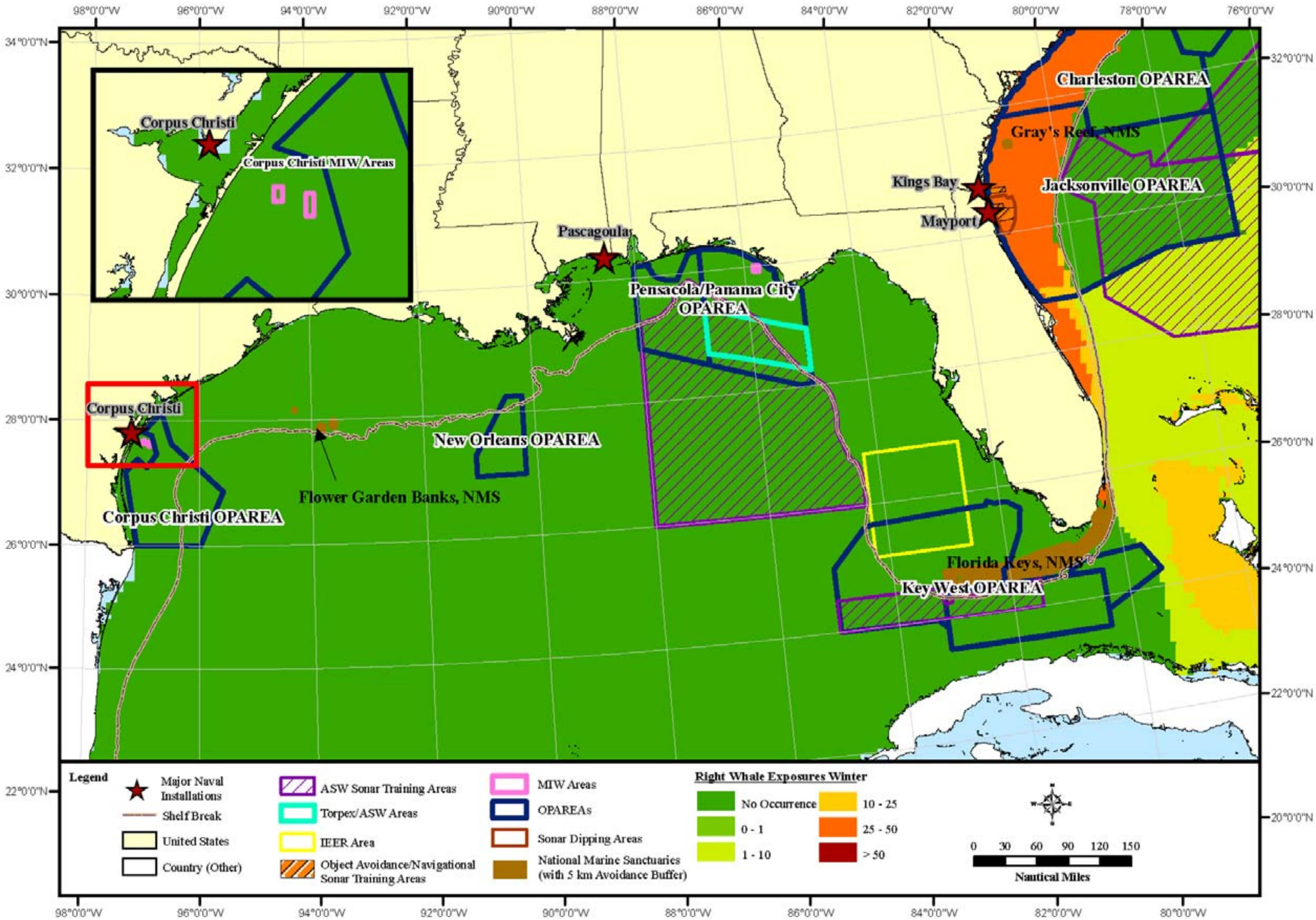

Figure D-37. Alternative 1, GOMEX Right Whale-Winter

D.3 ALTERNATIVE 2: DESIGNATED SEASONAL ACTIVE SONAR AREAS

In the development of Alternative 2, the Geographic Information System (GIS) layers containing the proposed training areas designated under Alternative 1 were uploaded into a map for easy viewing. Then the gridded layers containing the estimated exposures for beaked, northern right, and sperm whales were uploaded under the Alternative 1 designated training areas. Each individual estimated exposure grid for each season per species was viewed under the proposed Alternative 1 designated training areas as a means of identifying any seasonal areas within or directly adjacent to Alternative 1 designated training areas that showed a seasonal spike or decrease in densities or exposures for any of the three whale species.

If an exposure or density spike was identified during any of the four seasons for any of the three species within or adjacent to the Alternative 1 designated training areas, the suspect area was marked for removal from the Alternative 1 training area for that season. Likewise, if the comparison identified a specific area adjacent to Alternative 1 training areas showing a reduction in the exposure potential for a specific season for all three whale species, it was marked as a seasonal area to be added to the applicable designated Alternative 1 training area.

Based on the results of the surrogate environmental analysis, it was determined that there are no seasonal changes for the Gulf of Mexico and Northeast OPAREAs. Seasonal changes do exist for the VACAPES and JAX/CHASN OPAREAs. To account for these seasonal changes, modifications were made to the following active sonar areas:

a. Section of ASW training box removed in VACAPES OPAREA during winter.
b. Summer entry boxes to the SEASWITI area moved in JAX OPAREA.
c. Summer and Fall SEASWITI corridor added to JAX/CHAS and CHPT OPAREA.

Thus, the following sections only address the specific seasonal changes to the Alternative 1 designated training areas. These changes equate to the only differences between proposed Alternative 1 and Alternative 2 training areas.

D.3.1 Seasonal Changes Within the JAX/CHASN and CHPT OPAREAs

The majority of the ASW surface ship Coordinated ULT areas designated under Alternative 1 remain geographically unchanged under Alternative 2 as shown in Figures D-38 through D-217. However, based on the results of the seasonal comparisons, the SEASWITI entry box shown in Figures D-86 through D-97 is shifted southward during the summer but remains geographically unchanged throughout the remaining seasons. In addition, a small triangular portion along the northeast boundary of the SEASWITI entry box is removed during the winter season.

The seasonal comparison also identified an area of low density and exposure potential for all three whale species that would provide a transit corridor between the OPAREAs, located along the shelf break between the JAX/CHASN and CHPT OPAREAs. Under Alternative 2, this area would be added to the overall ASW ULT areas during the fall and summer seasons, as shown in Figures D-86 through D-97 and D-122 through 133.

D.3.2 Seasonal Changes Within the VACAPES OPAREA

The proposed ASW training areas designated within the VACAPES OPAREA remain unchanged for all seasons except winter. The comparison of the estimated exposure grids with the Alternative 1 designated training areas determined that the portion of the training areas bordering the shelf break as shown in Figure D-61 contained high levels of potential beaked whale exposures during the winter season. As a result, the southern portion of the training area was removed during the winter season as shown in Figures D-146 through D-149.

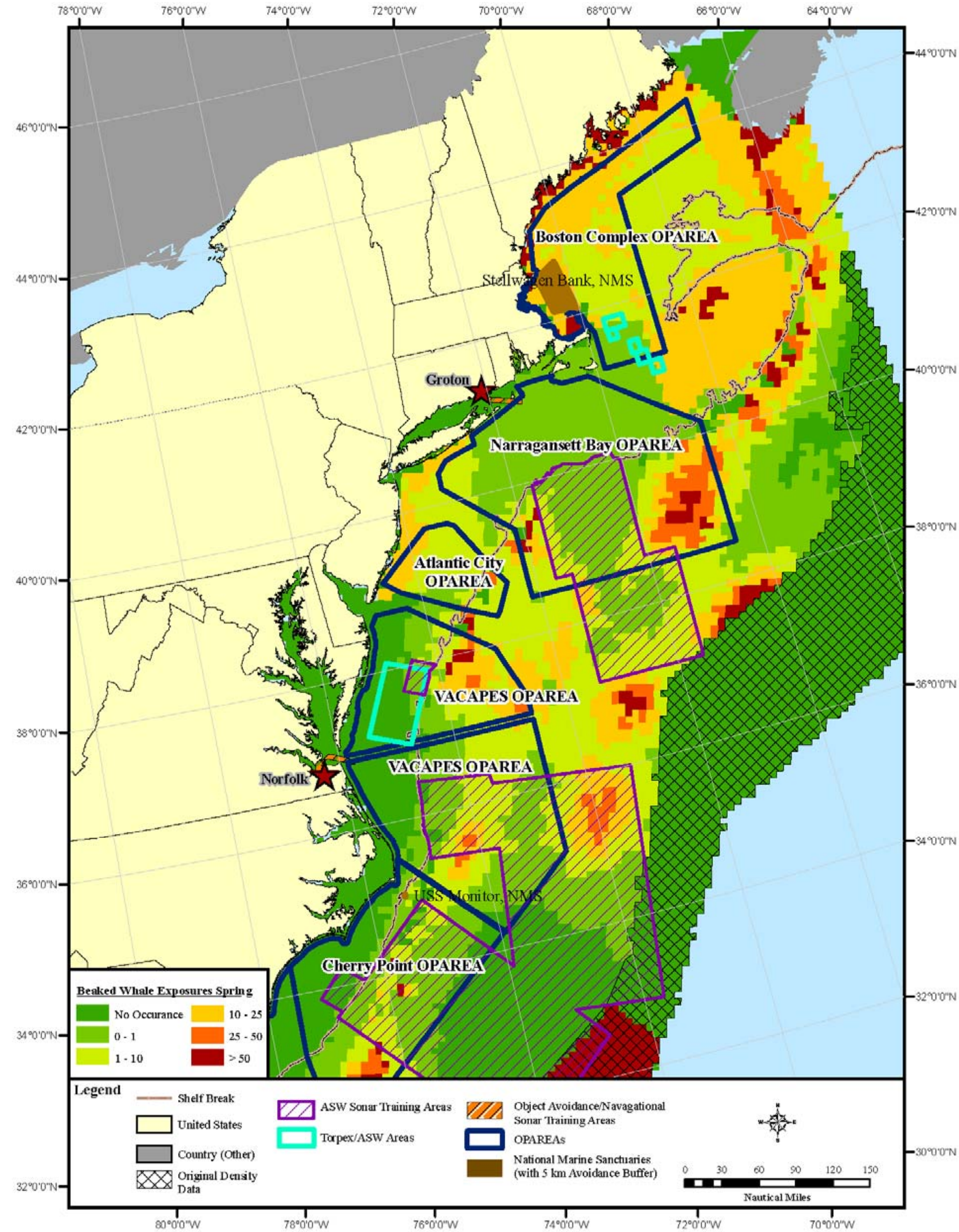

Figure D-38. Alternative 2, Spring NE Beaked Whale (Spring)

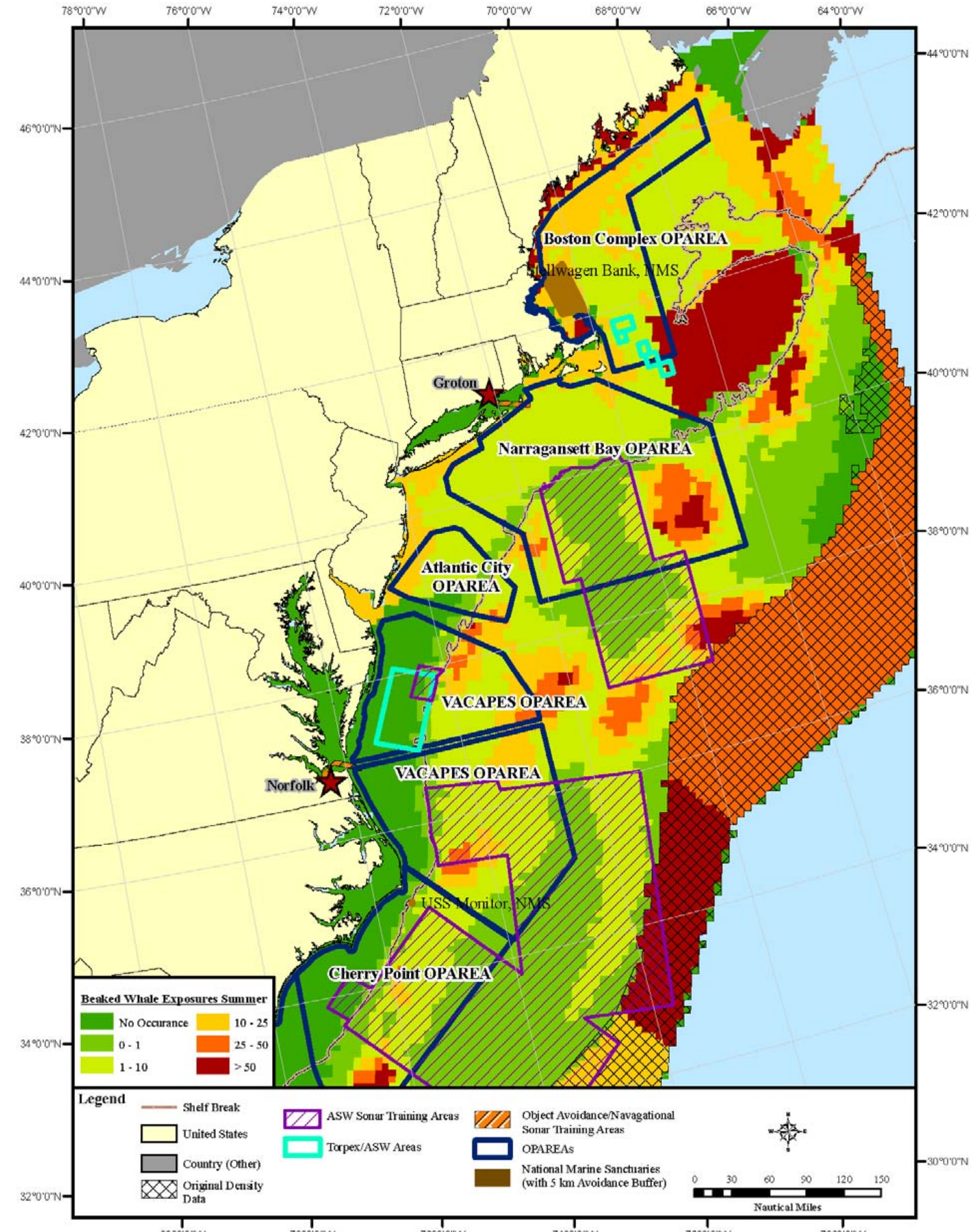

Figure D-39. Alternative 2, Spring NE Beaked Whale (Summer)

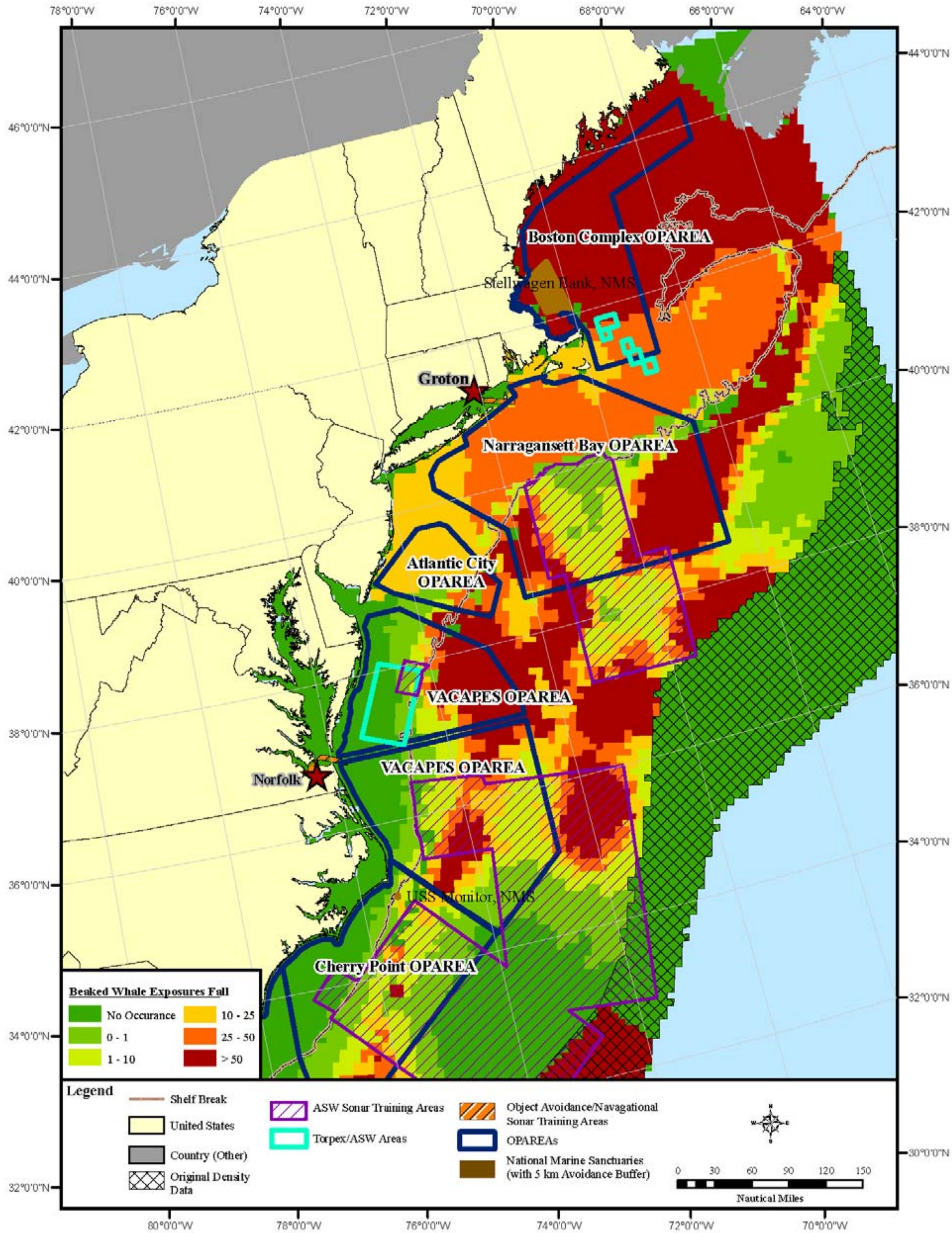

Figure D-40. Alternative 2, Spring NE Beaked Whale (Fall)

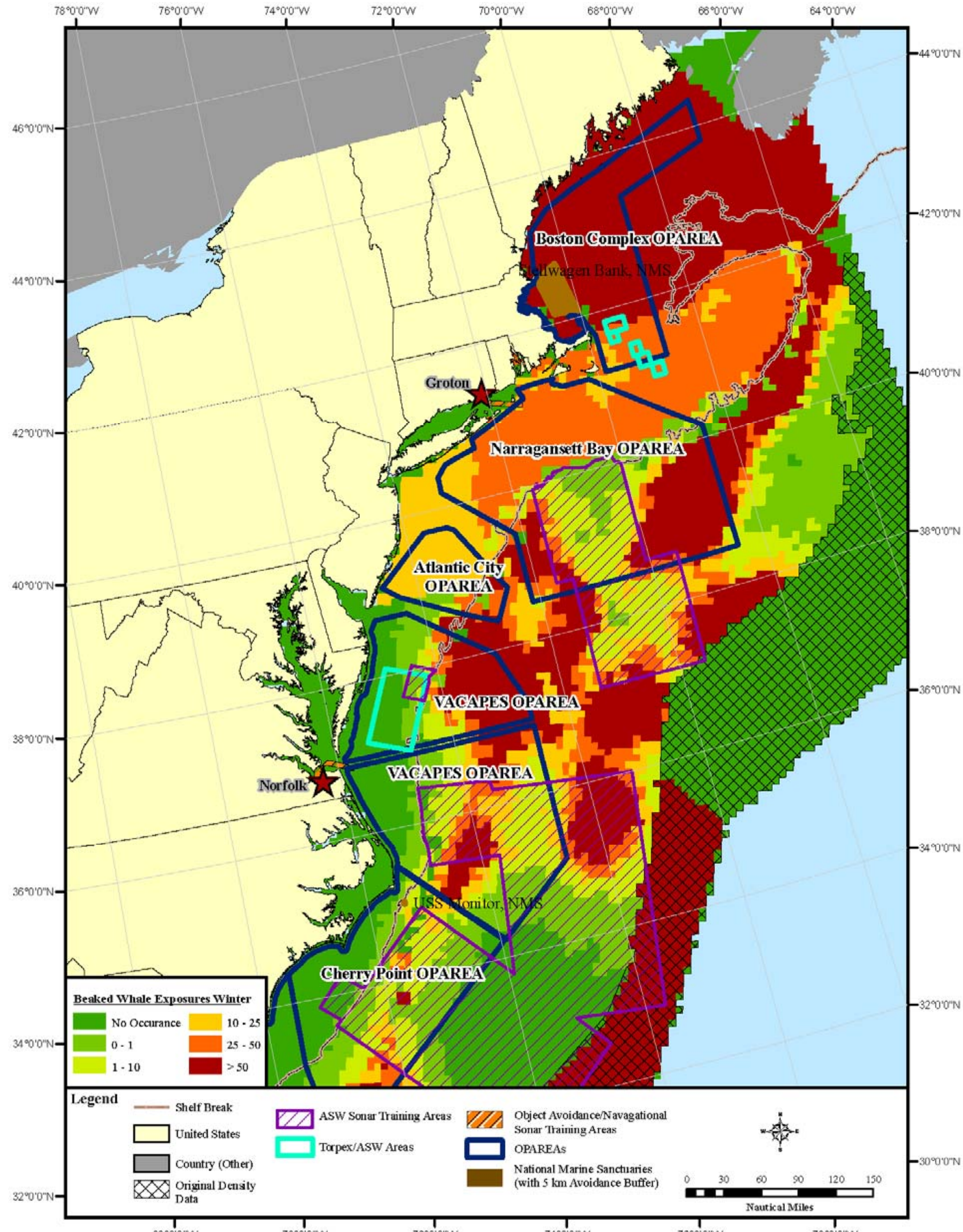

Figure D-41. Alternative 2, Spring NE Beaked Whale (Winter)

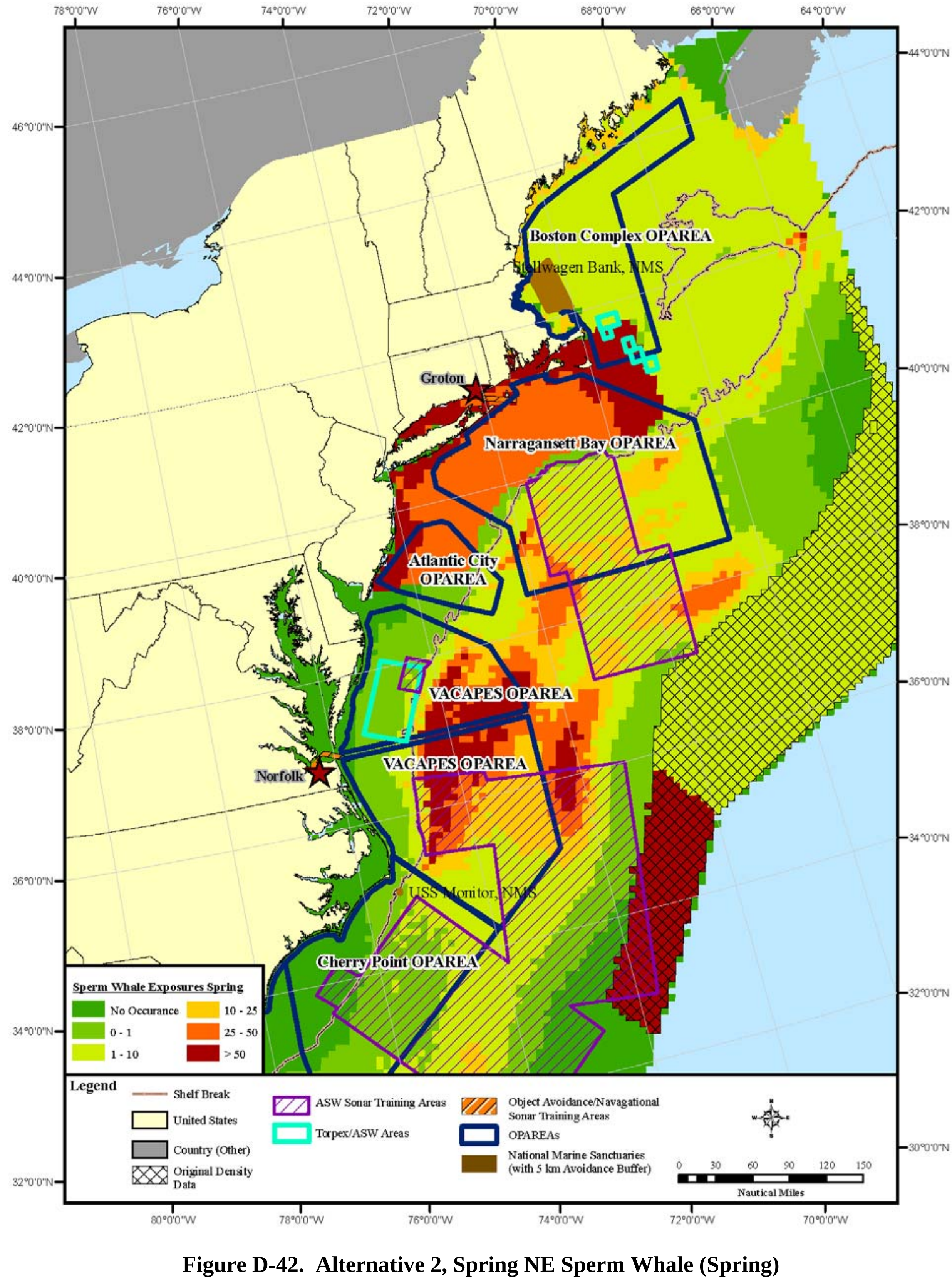

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Figure D-42. Alternative 2, Spring NE Sperm Whale (Spring)

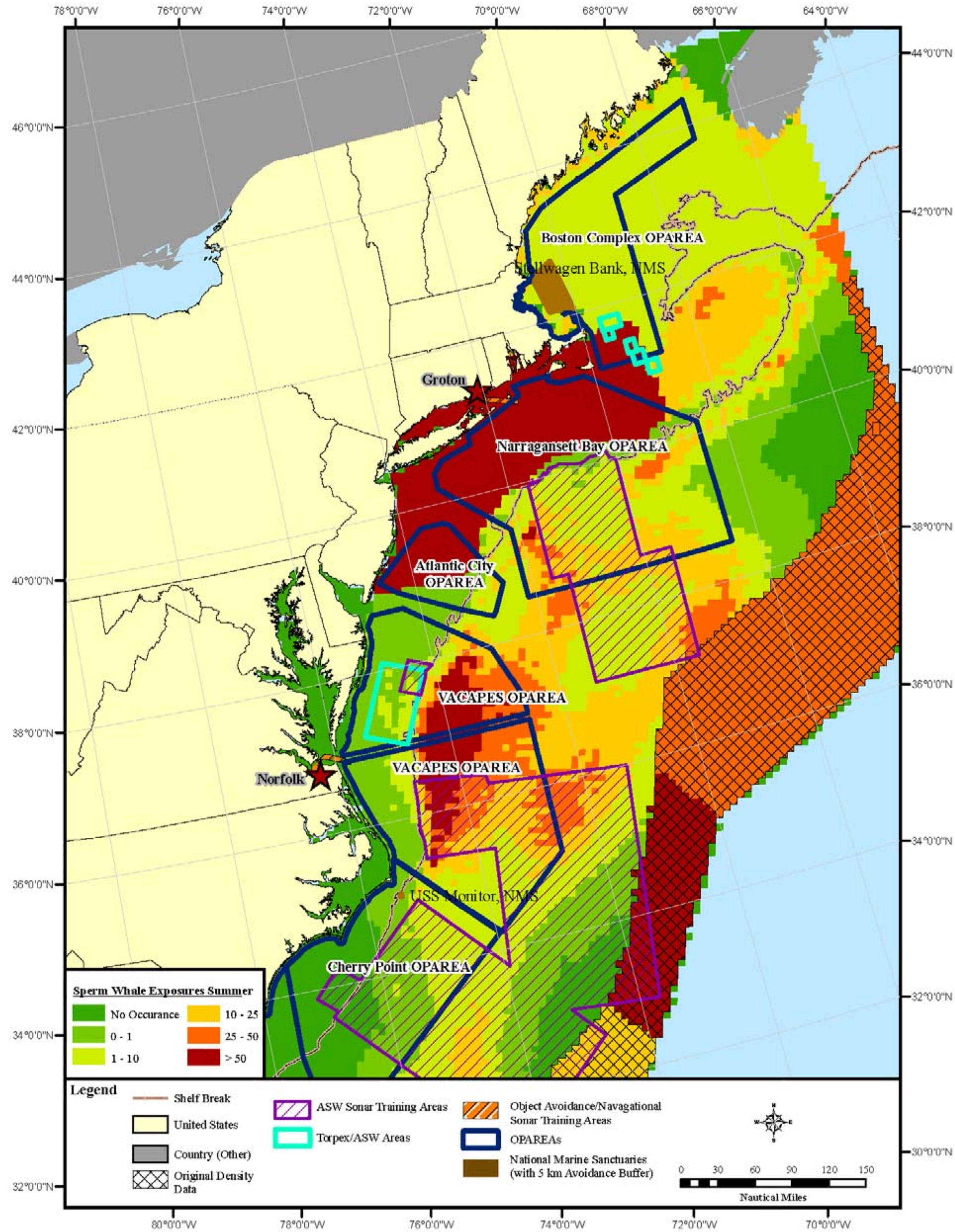

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Figure D-43. Alternative 2, Spring NE Sperm Whale (Summer)

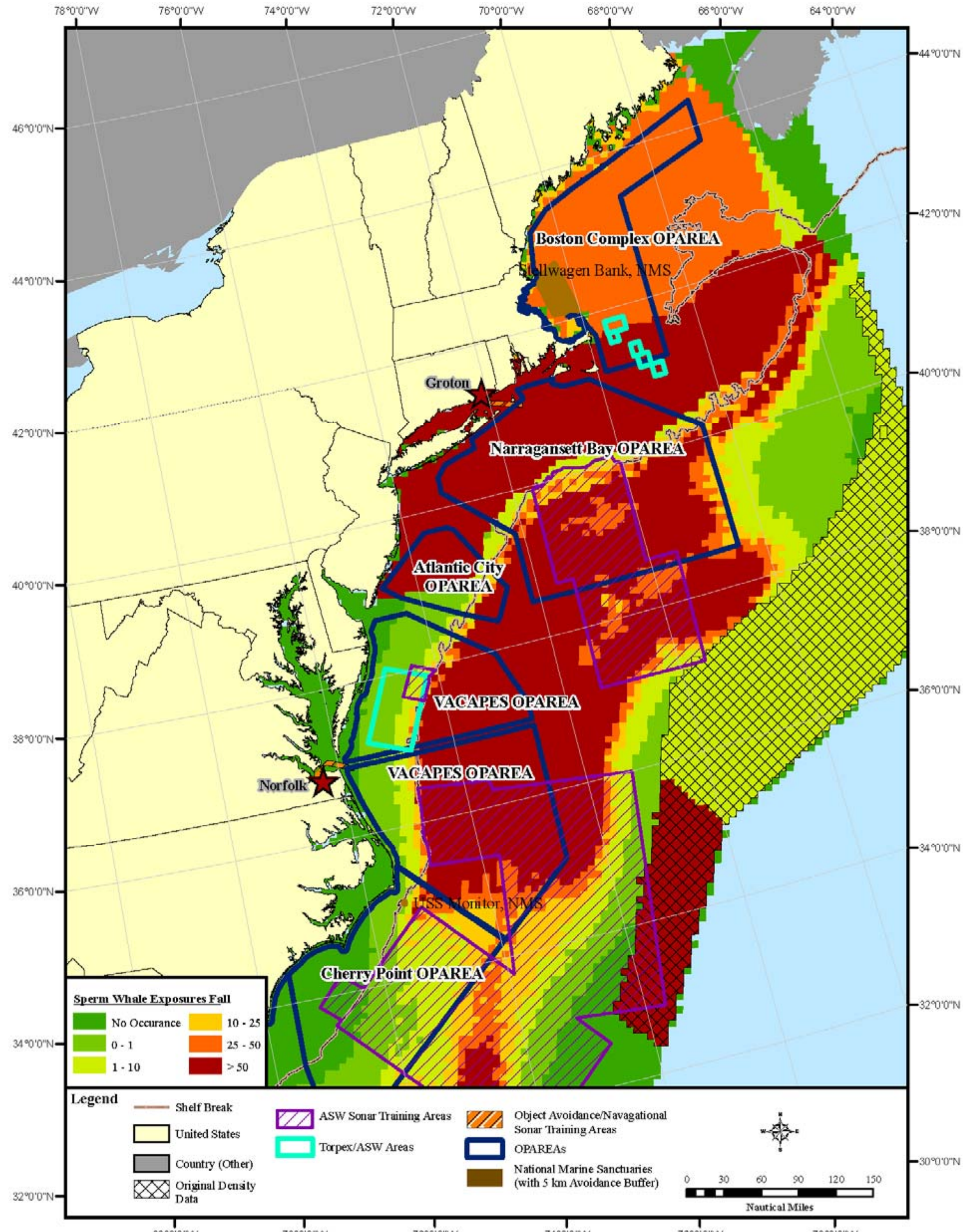

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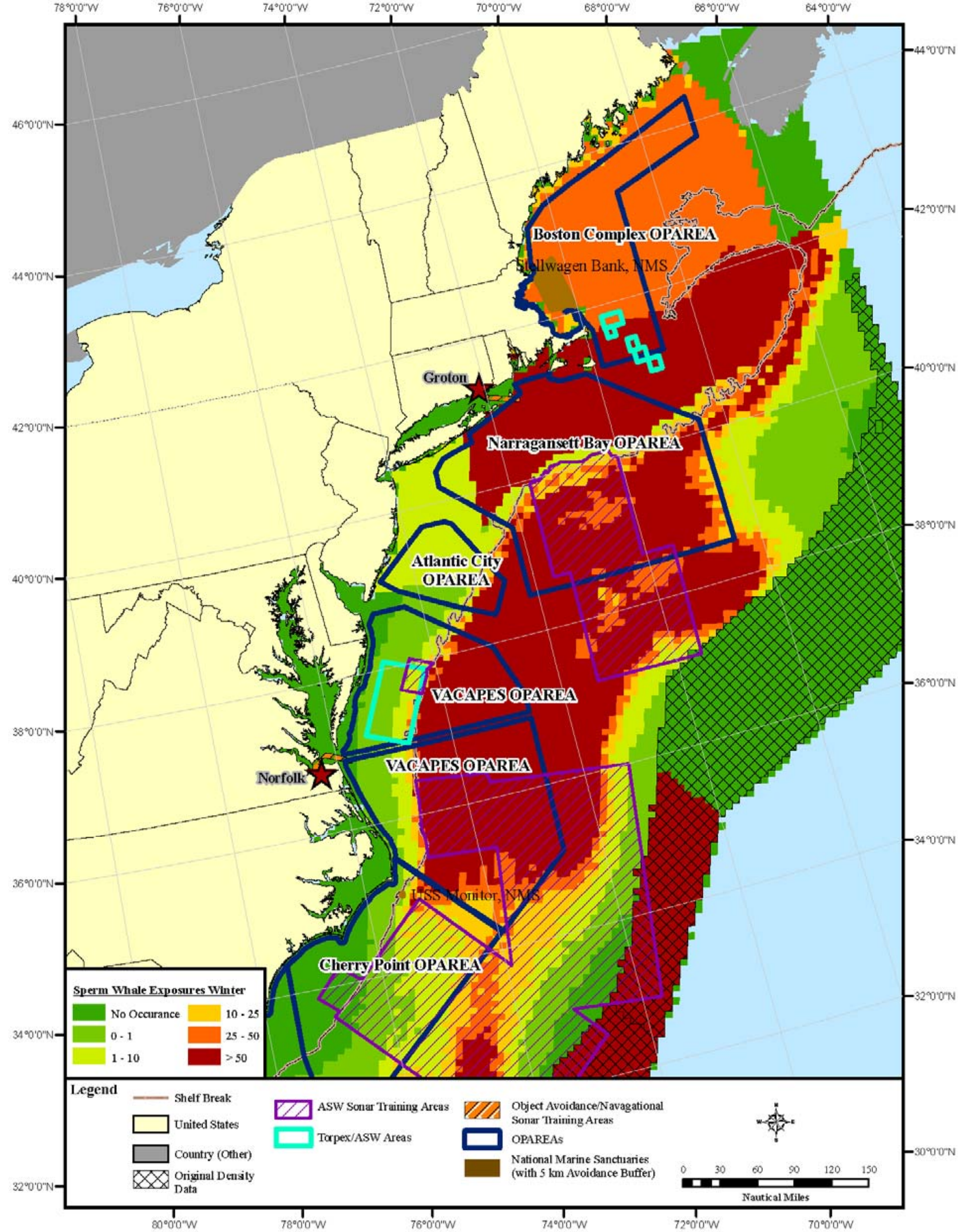
Figure D-44. Alternative 2, Spring NE Sperm Whale (Fall)



1 **Figure D-45. Alternative 2, Spring NE Sperm Whale (Winter)**

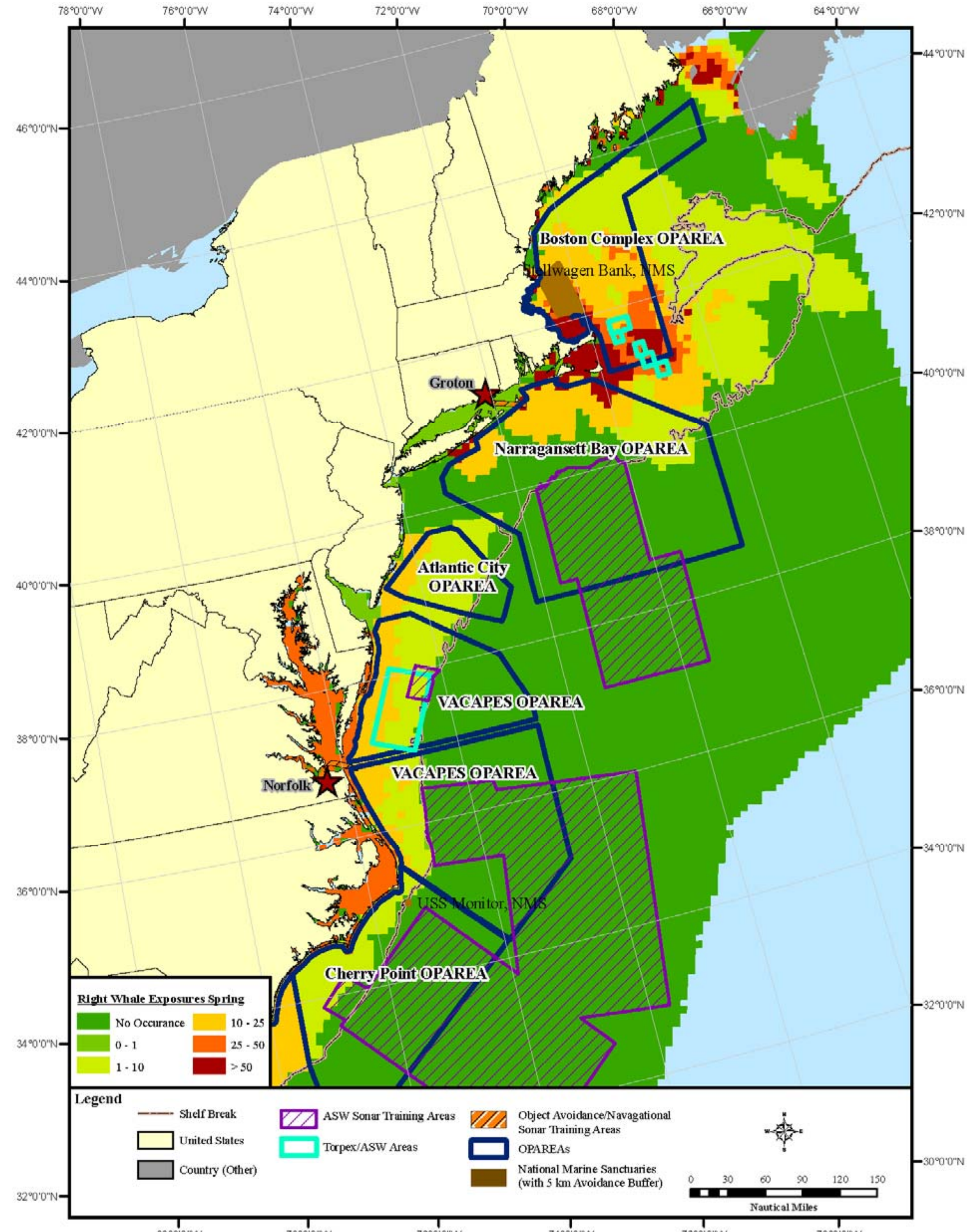


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Figure D-46. Alternative 2, Spring NE Right Whale (Spring)

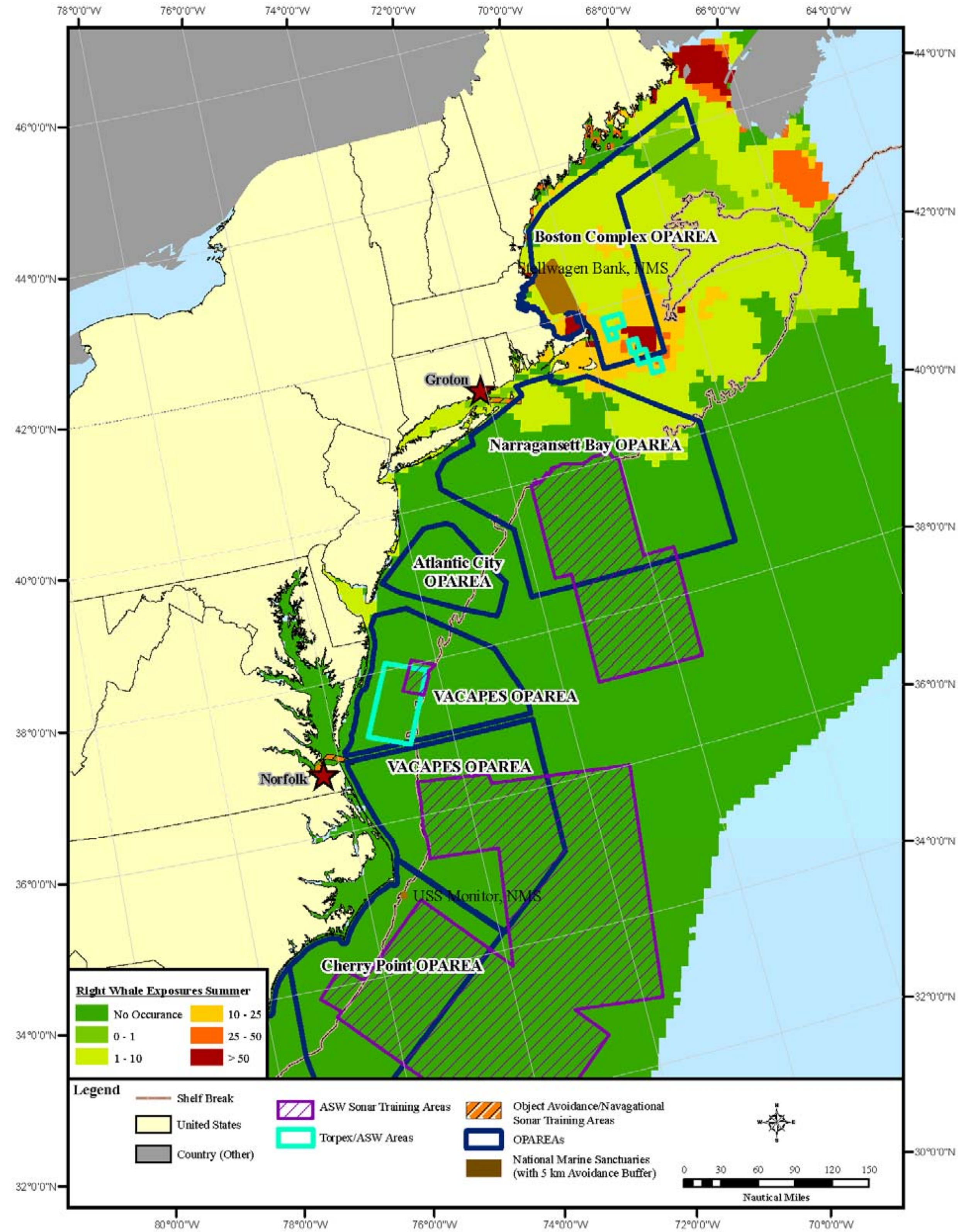

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Figure D-47. Alternative 2, Spring NE Right Whale (Summer)

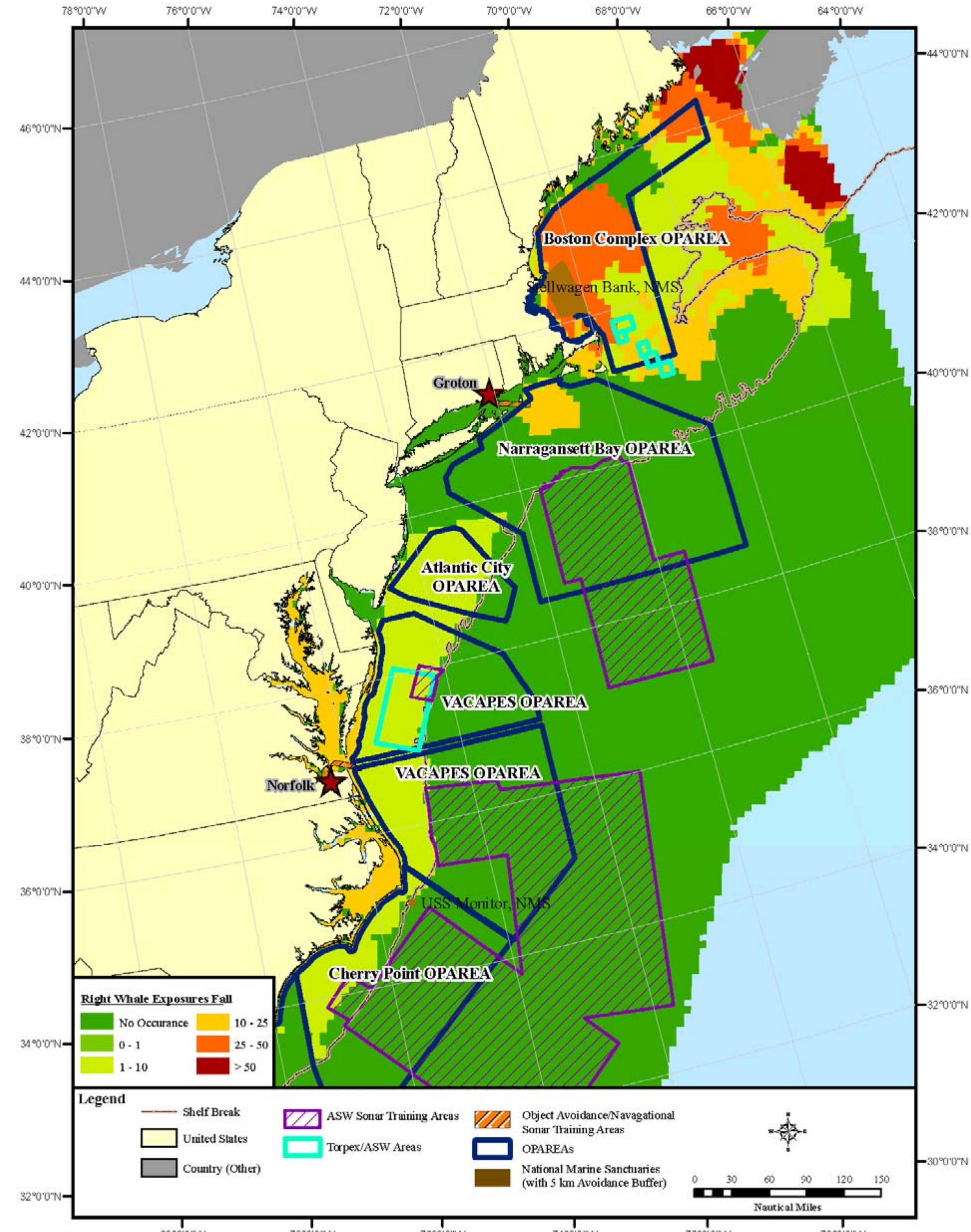

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Figure D-48. Alternative 2, Spring NE Right Whale (Fall)

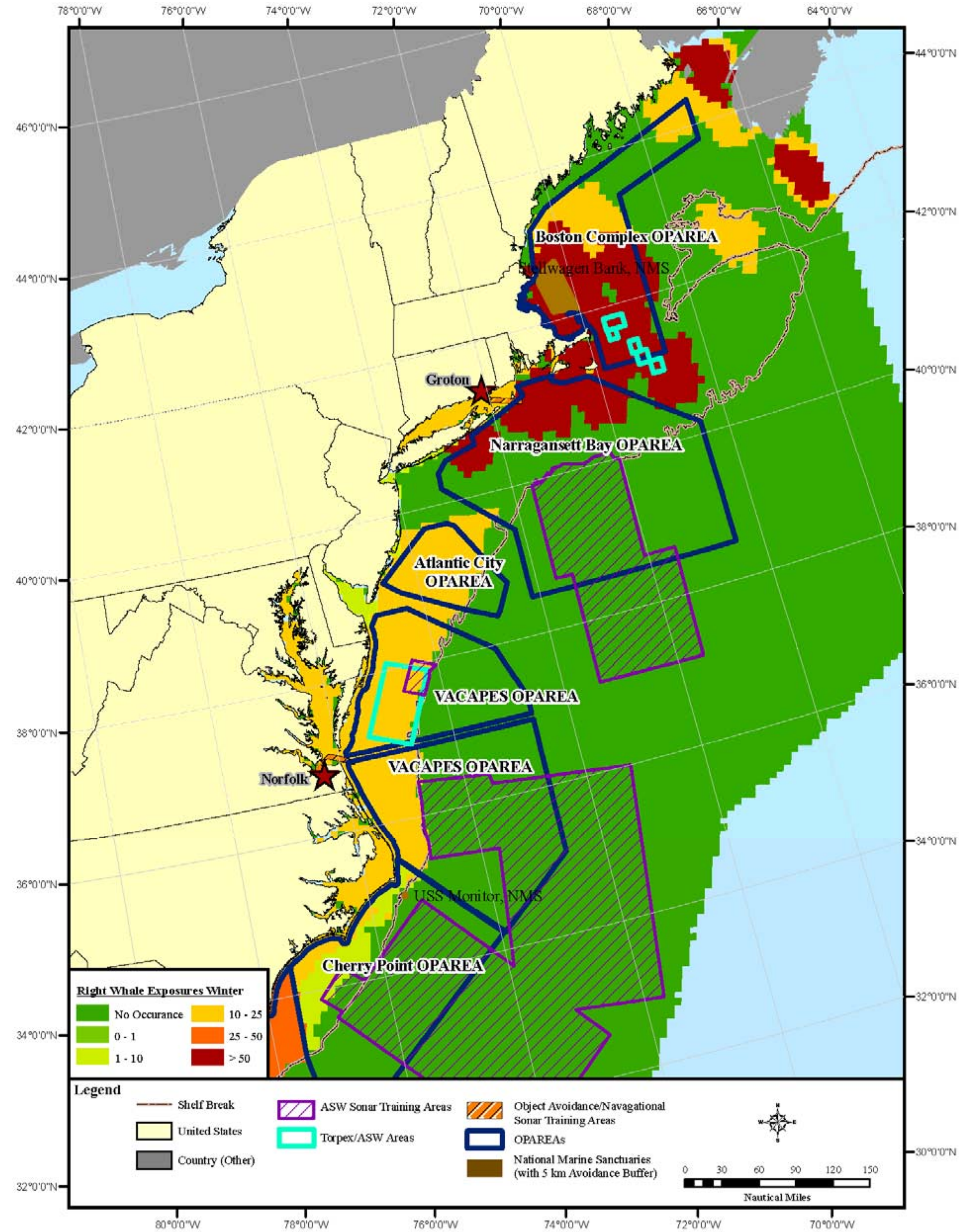

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Figure D-49. Alternative 2, Spring NE Right Whale (Winter)

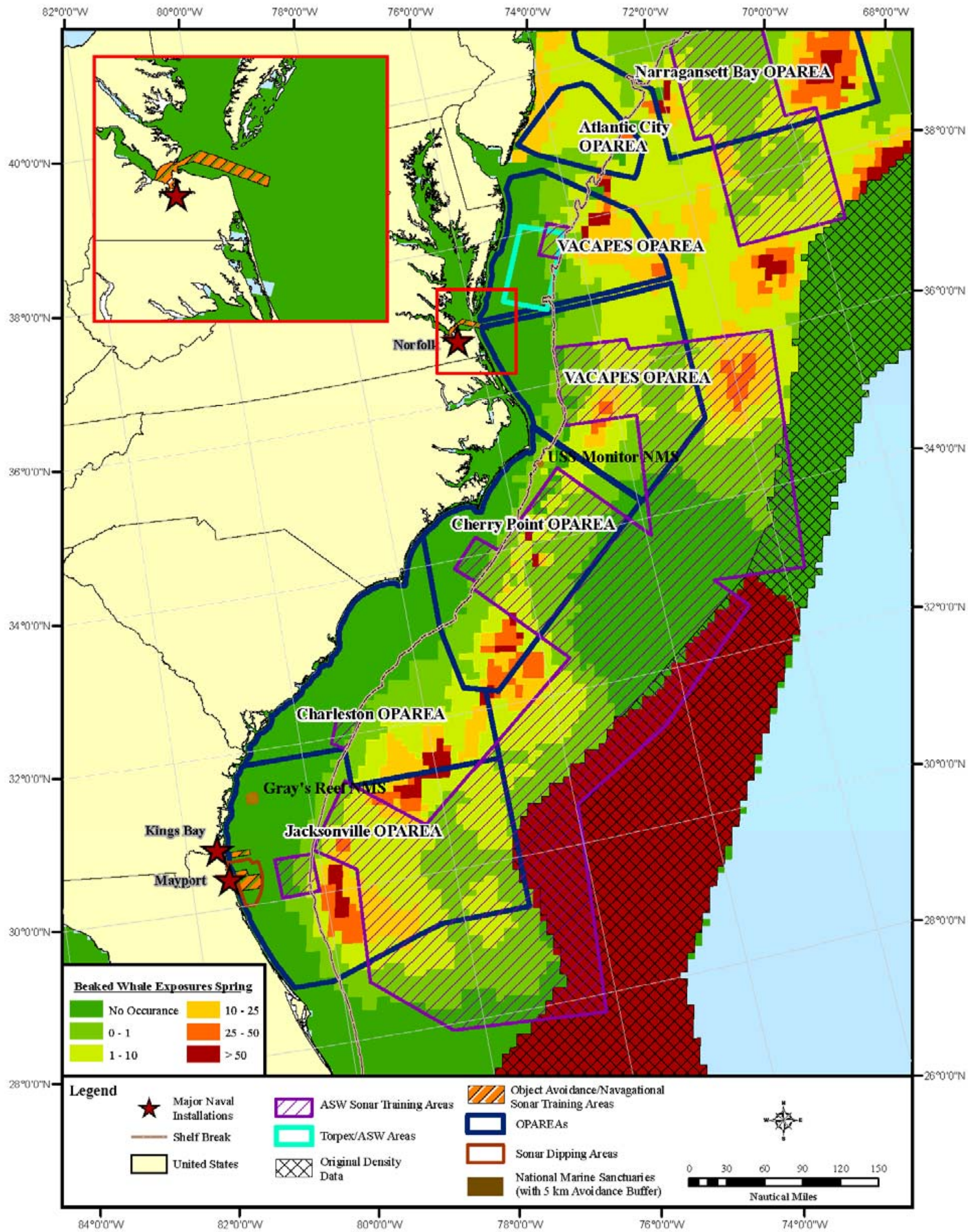

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Figure D-50. Alternative 2, Spring SE Beaked Whale (Spring)

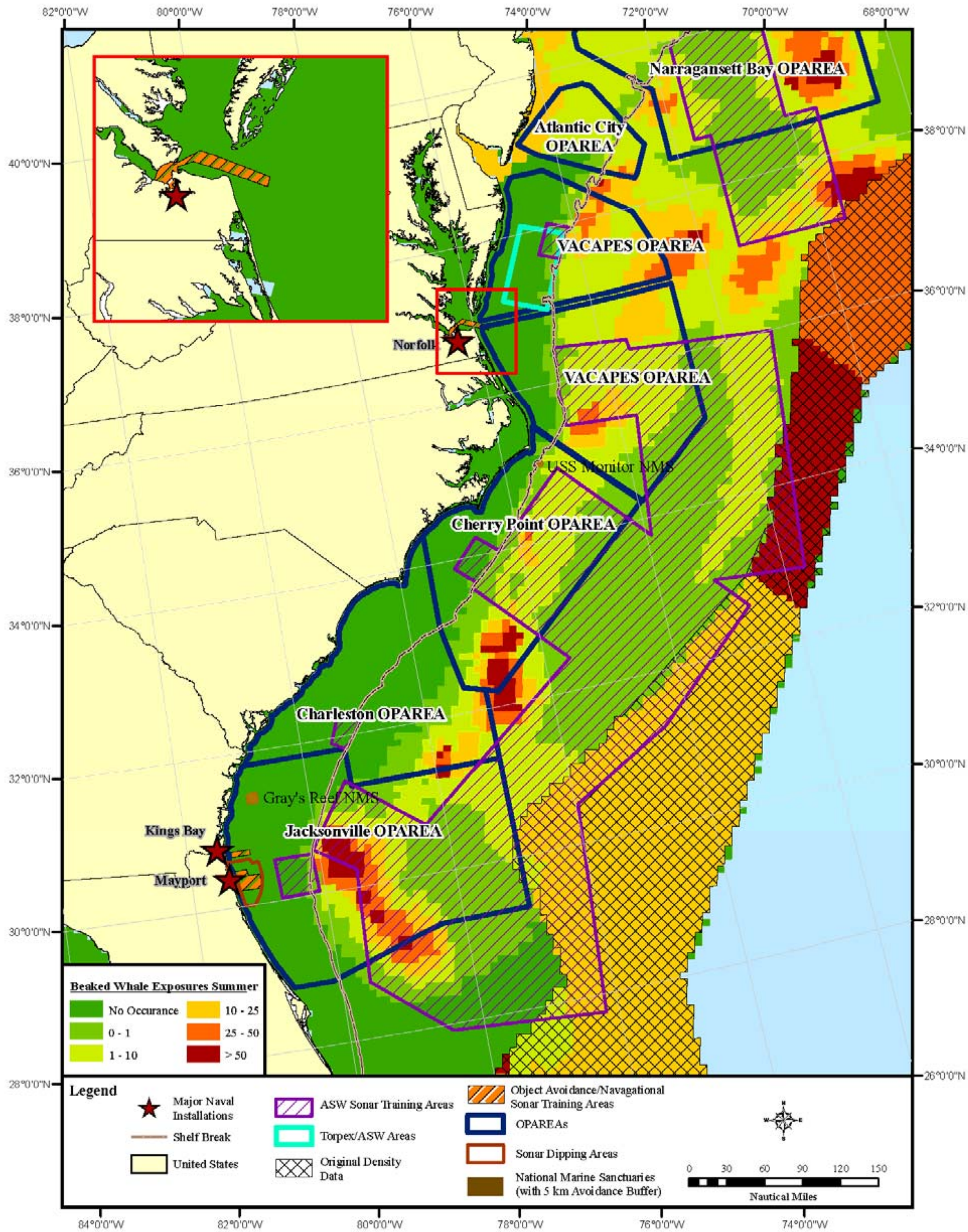

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Figure D-51. Alternative 2, Spring SE Beaked Whale (Summer)

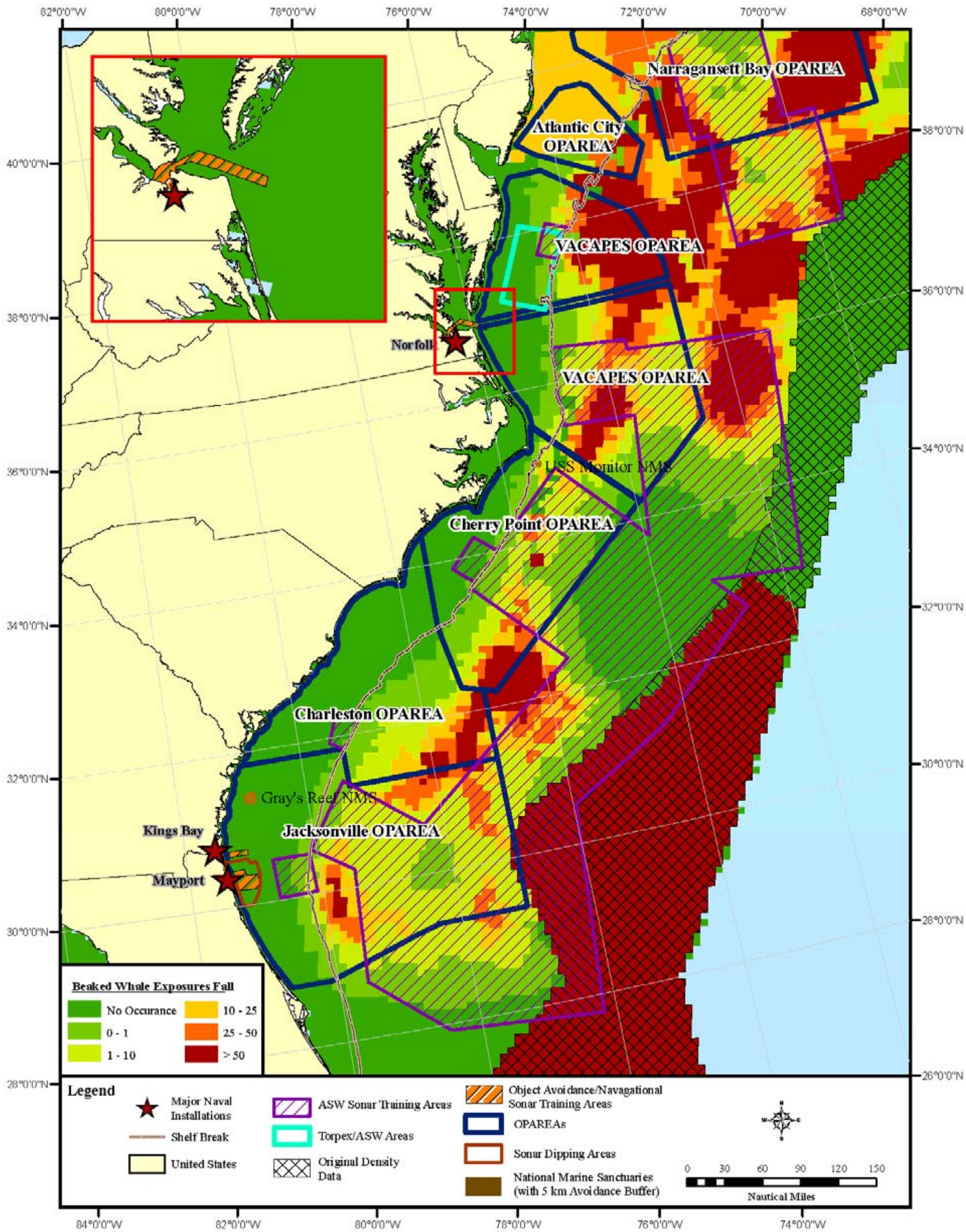

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Figure D-52. Alternative 2, Spring SE Beaked Whale (Fall)

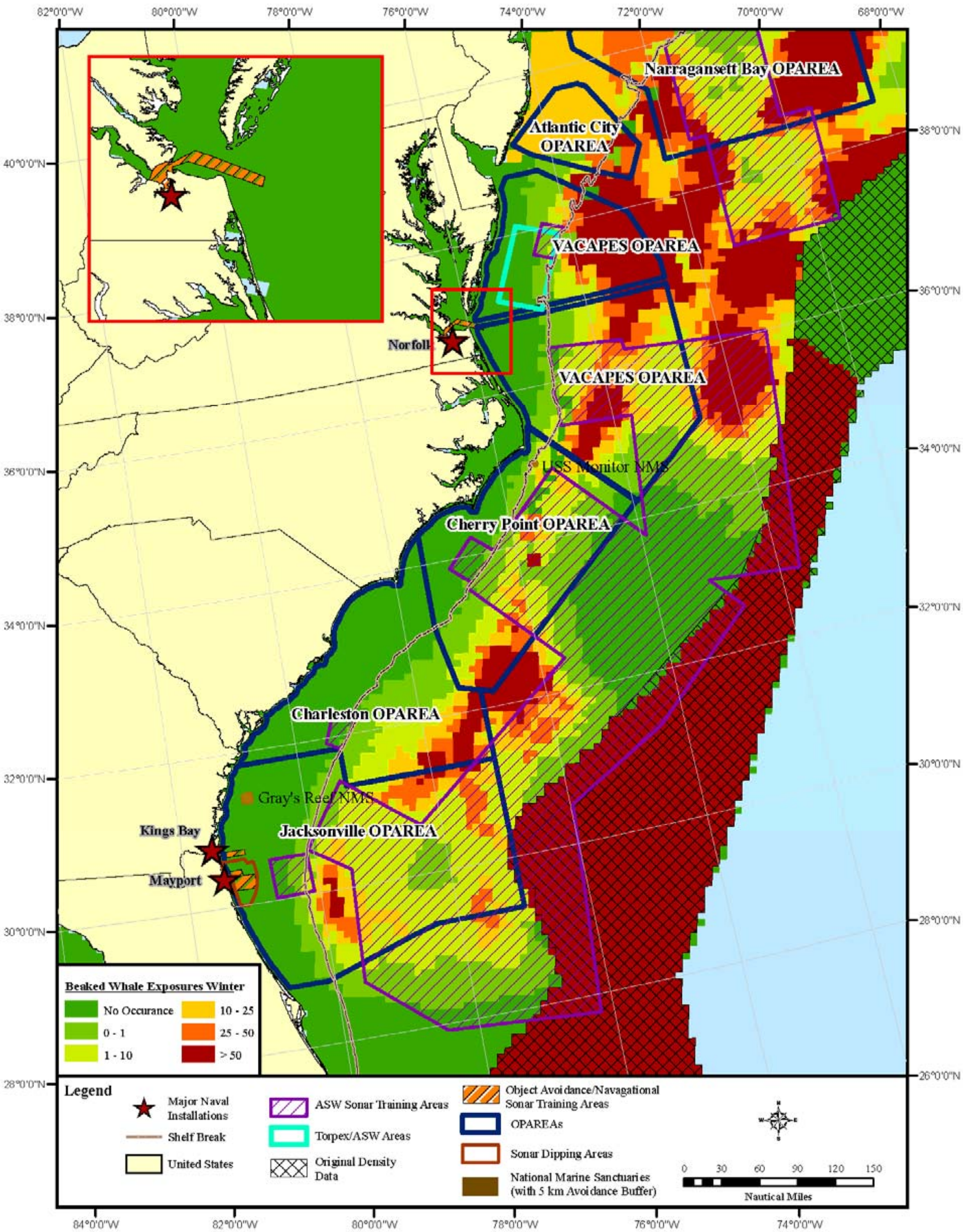

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Figure D-53. Alternative 2, Spring SE Beaked Whale (Winter)

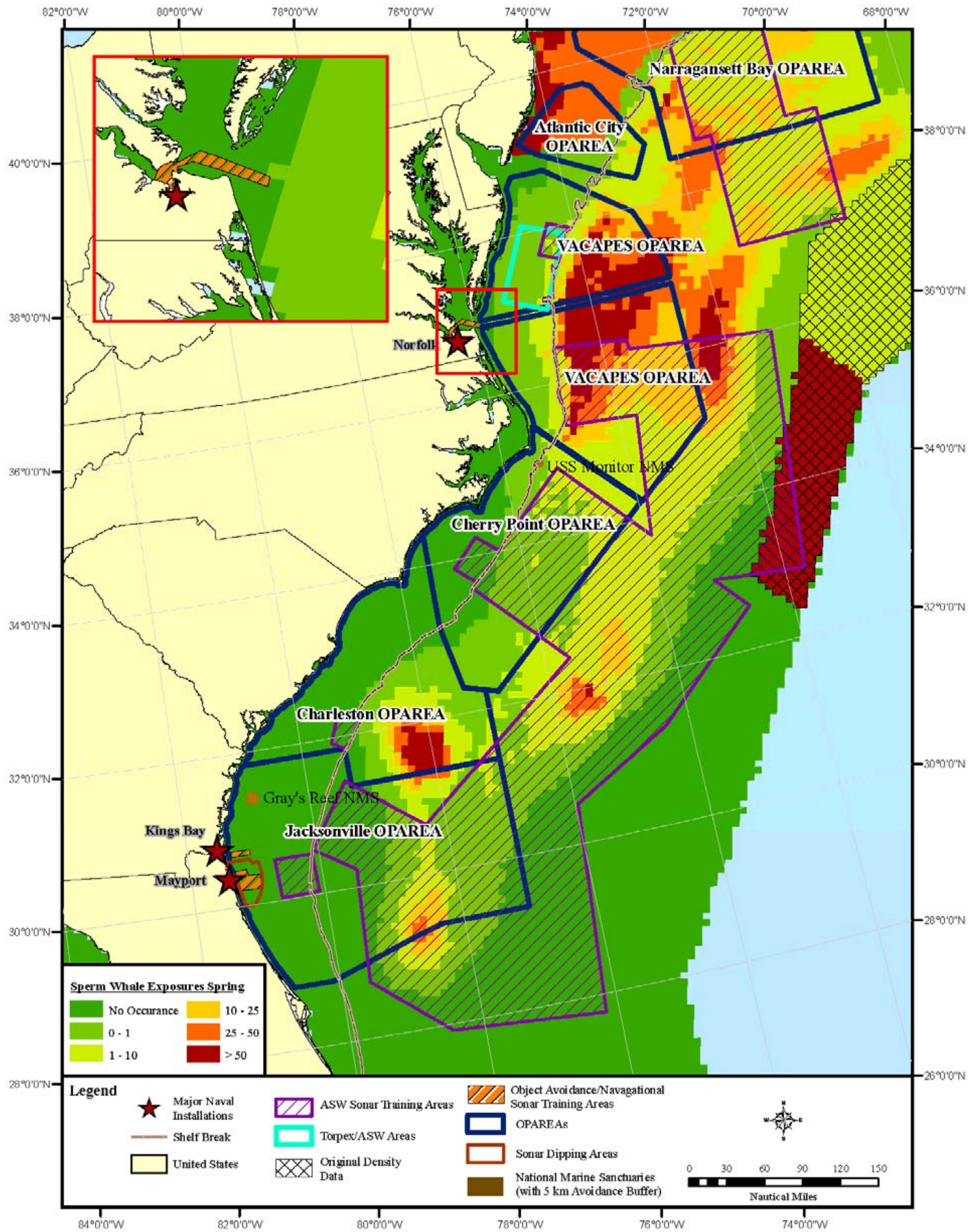

Figure D-54. Alternative 2, Spring SE Sperm Whale, Spring

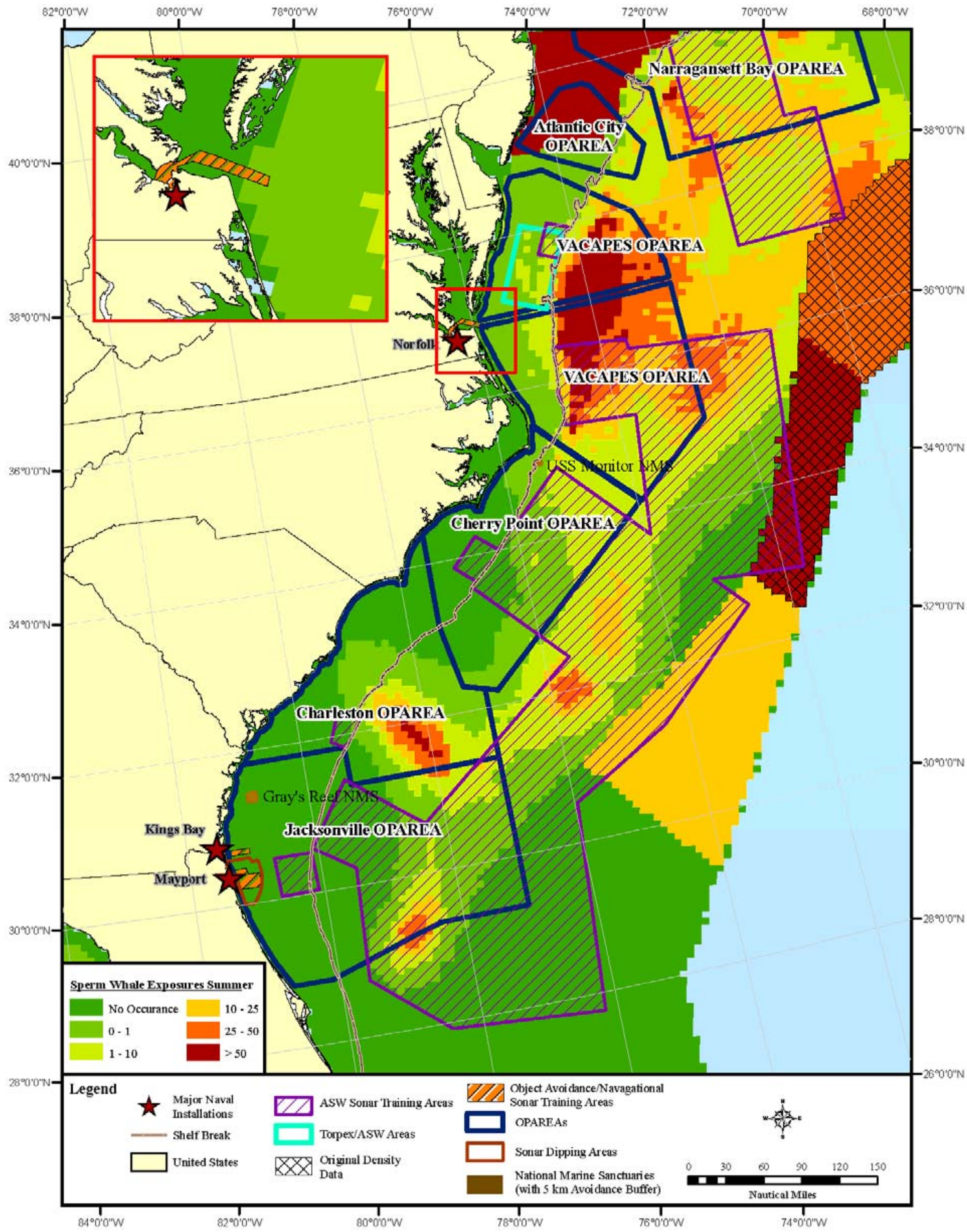

Figure D-55. Alternative 2, Spring SE Sperm Whale (Summer)

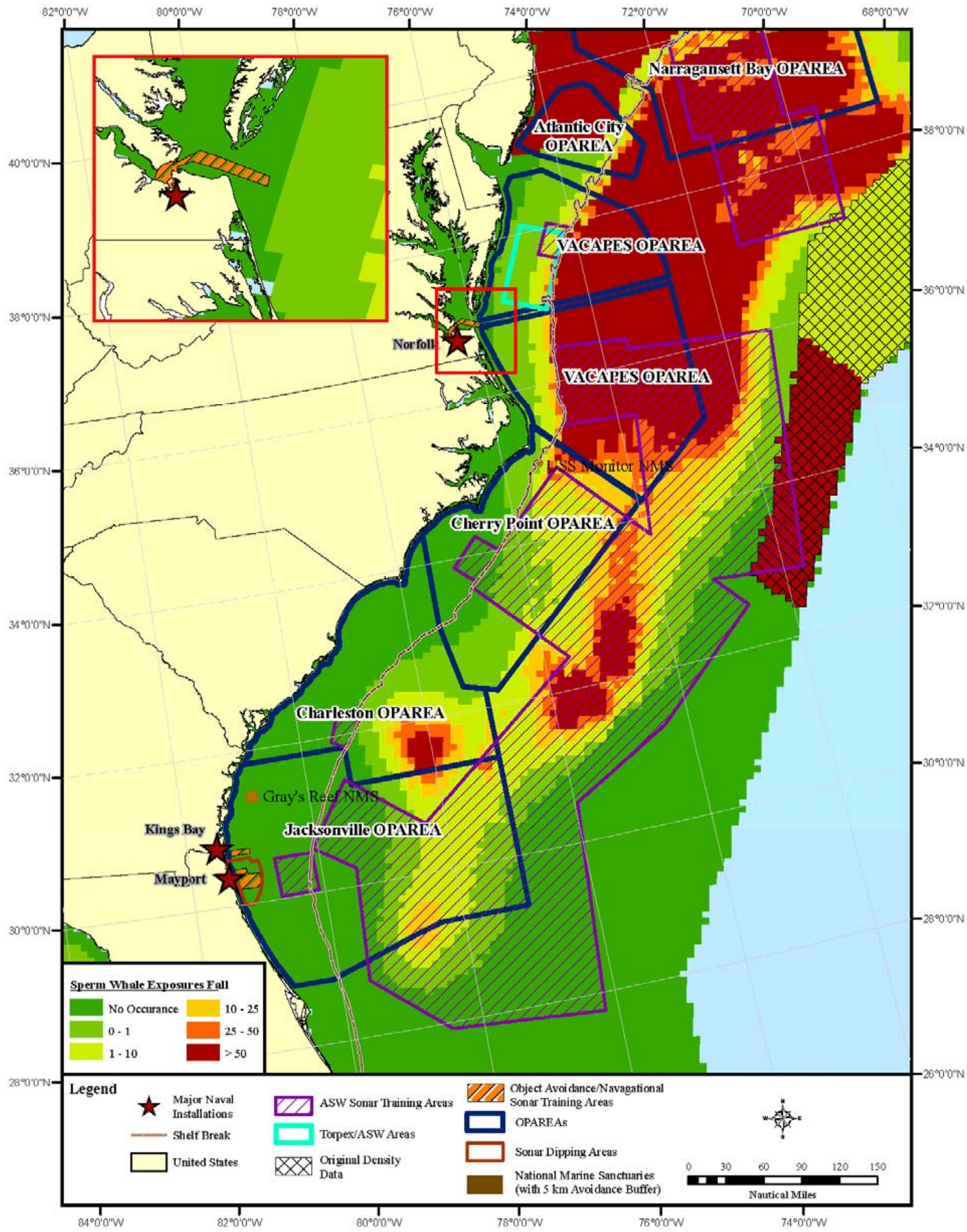

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Figure D-56. Alternative 2, Spring SE Sperm Whale (Fall)

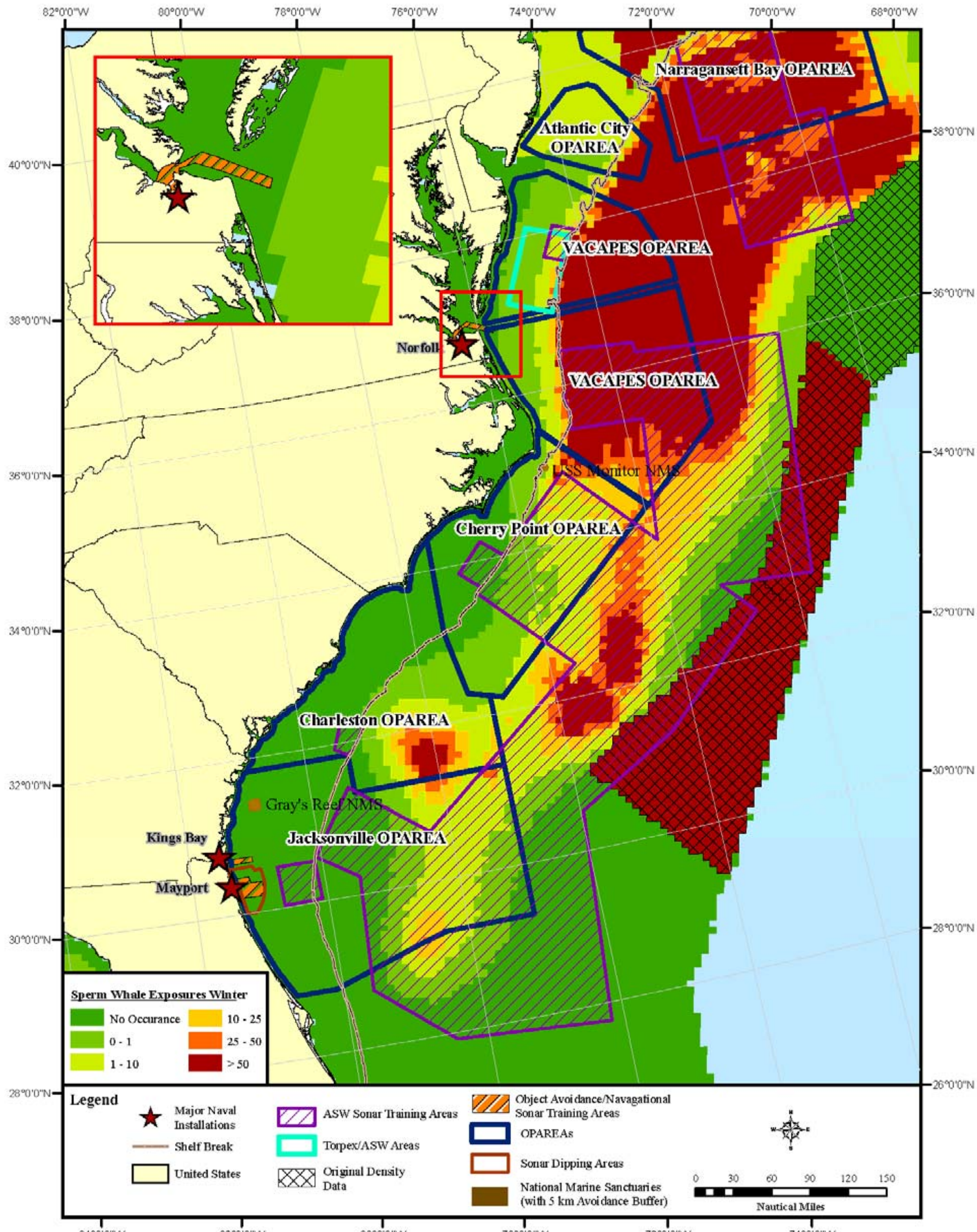

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Figure D-57. Alternative 2, Spring SE Sperm Whale (Winter)

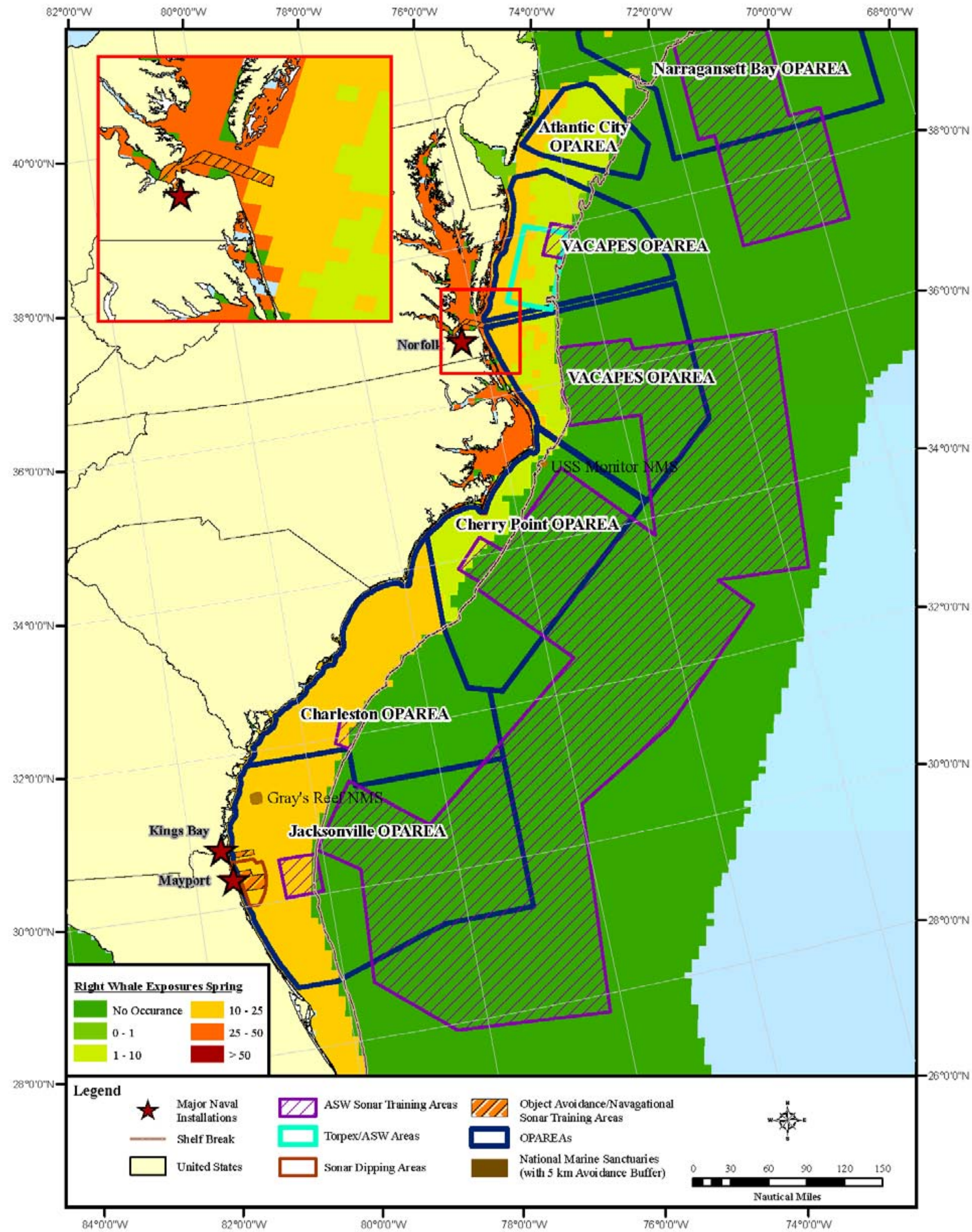

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Figure D-58. Alternative 2, Spring SE Right Whale (Spring)

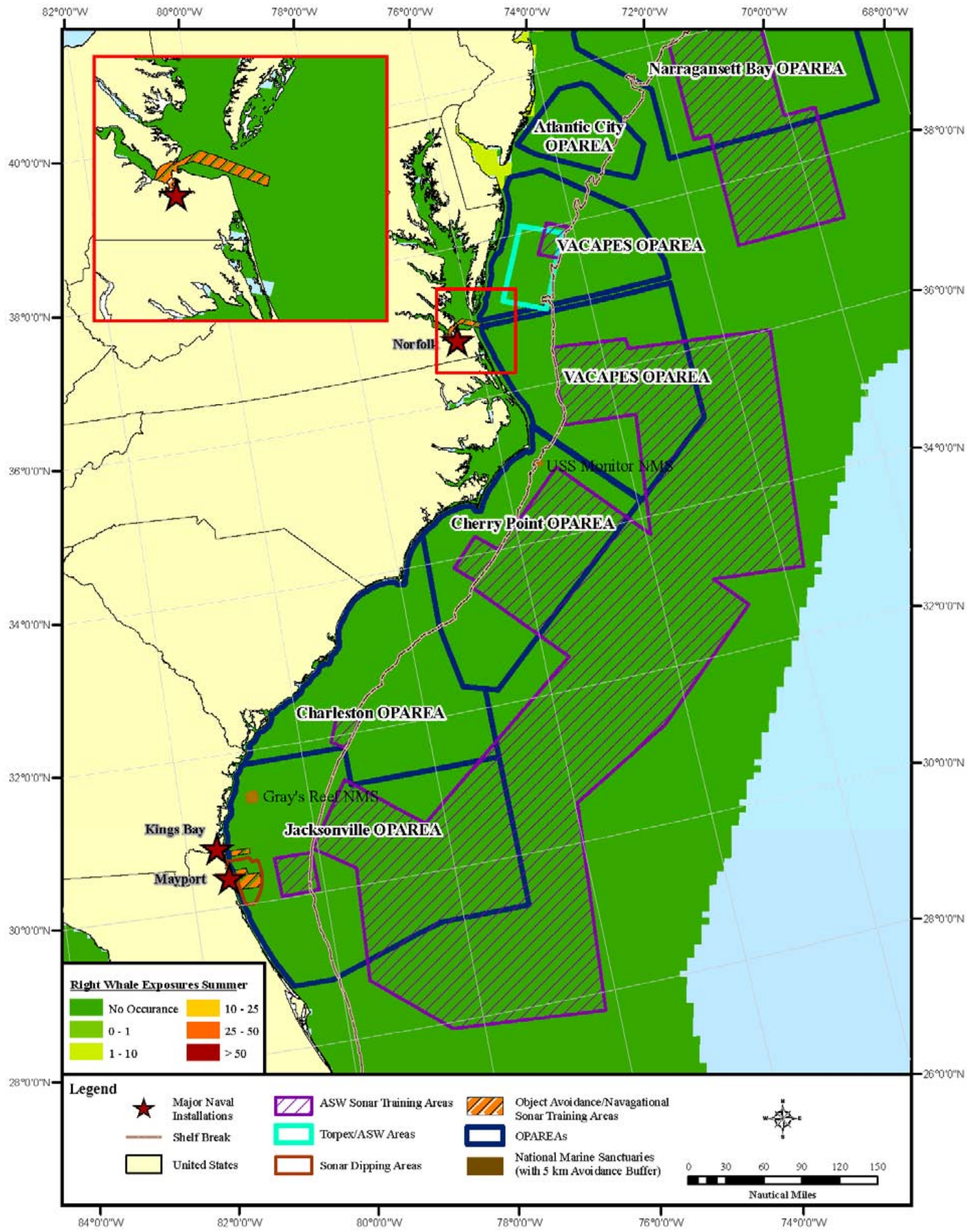

Figure D-59. Alternative 2, Spring SE Right Whale (Summer)

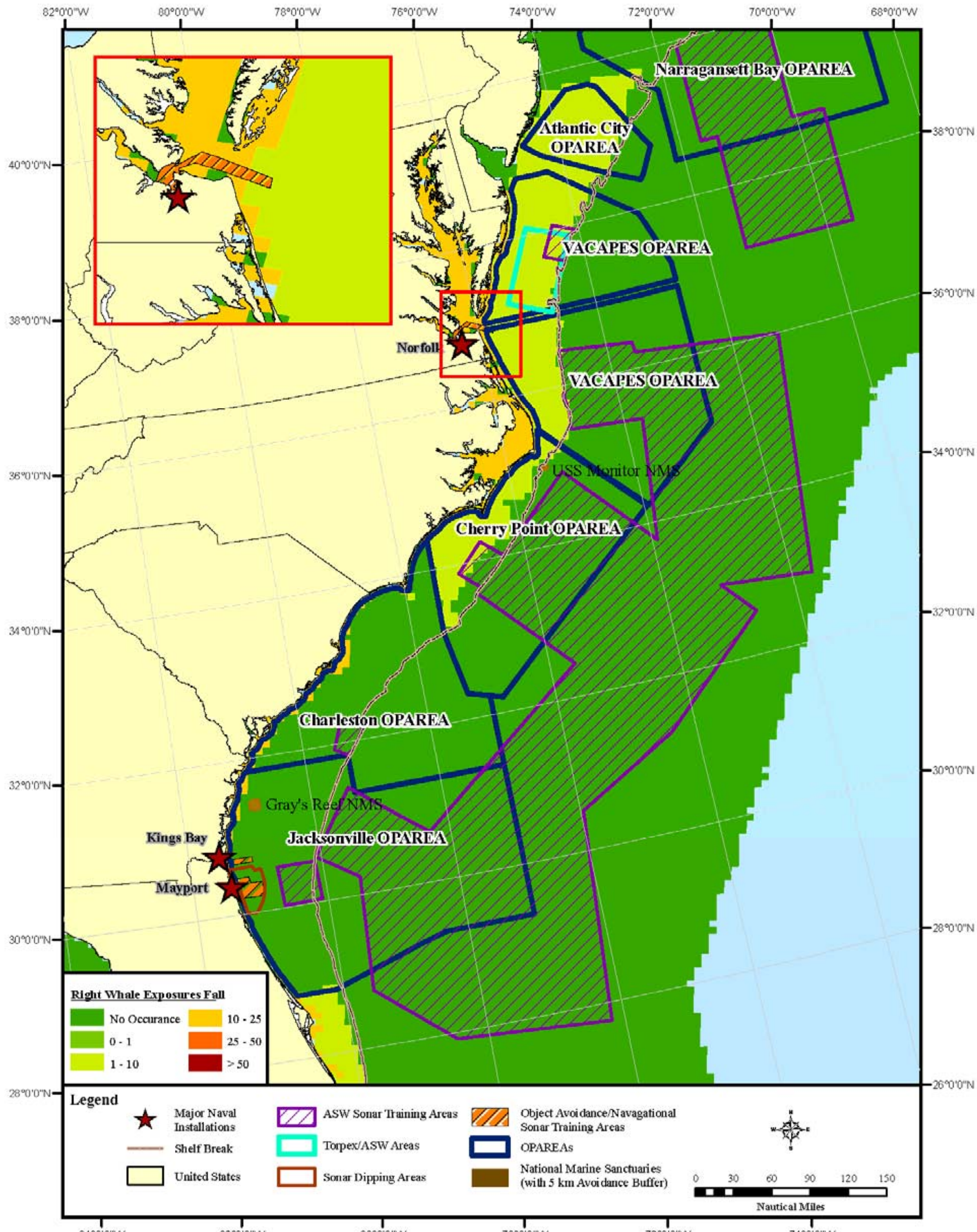

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Figure D-60. Alternative 2, Spring SE Right Whale (Fall)

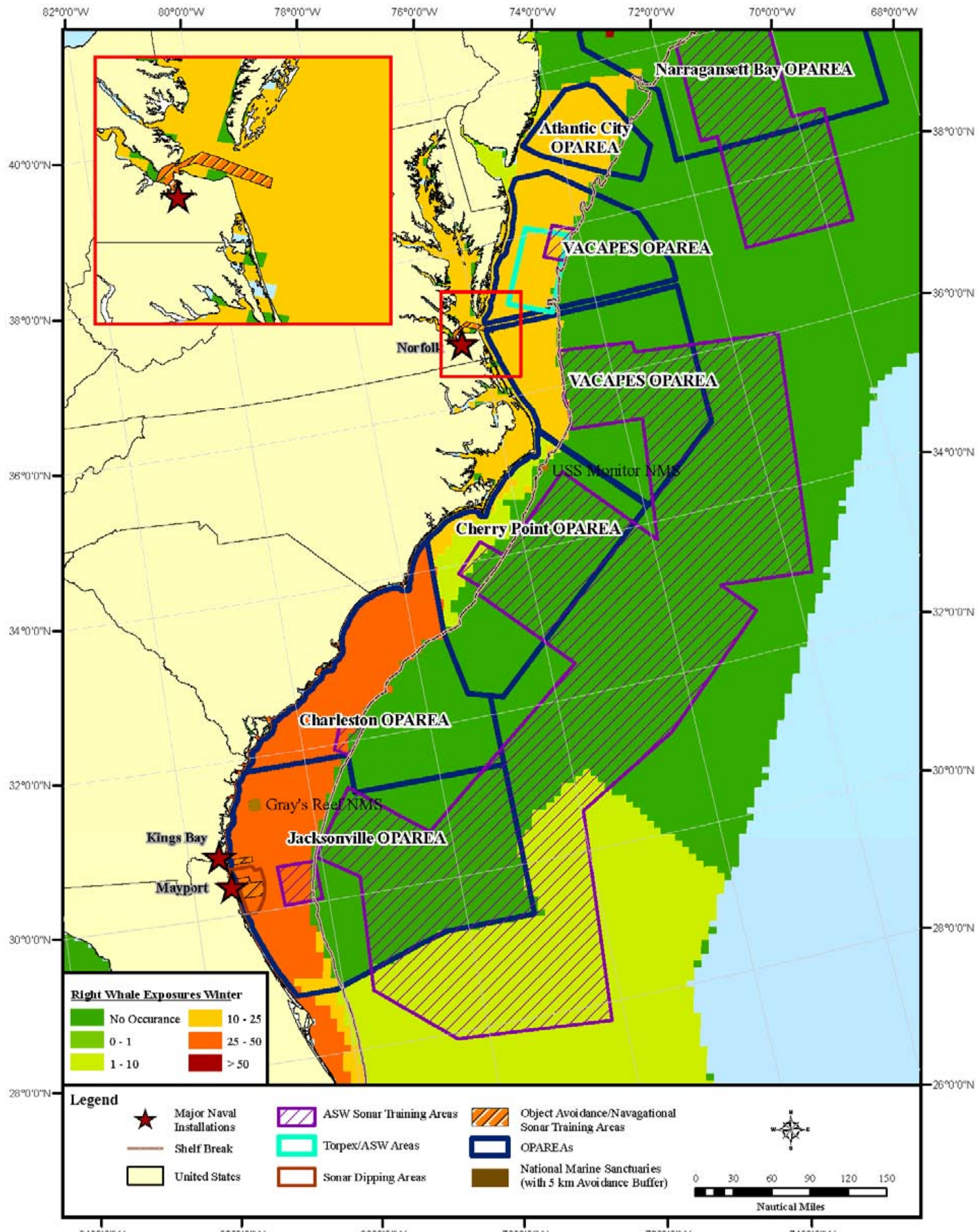

Figure D-61. Alternative 2, Spring SE Right Whale (Winter)

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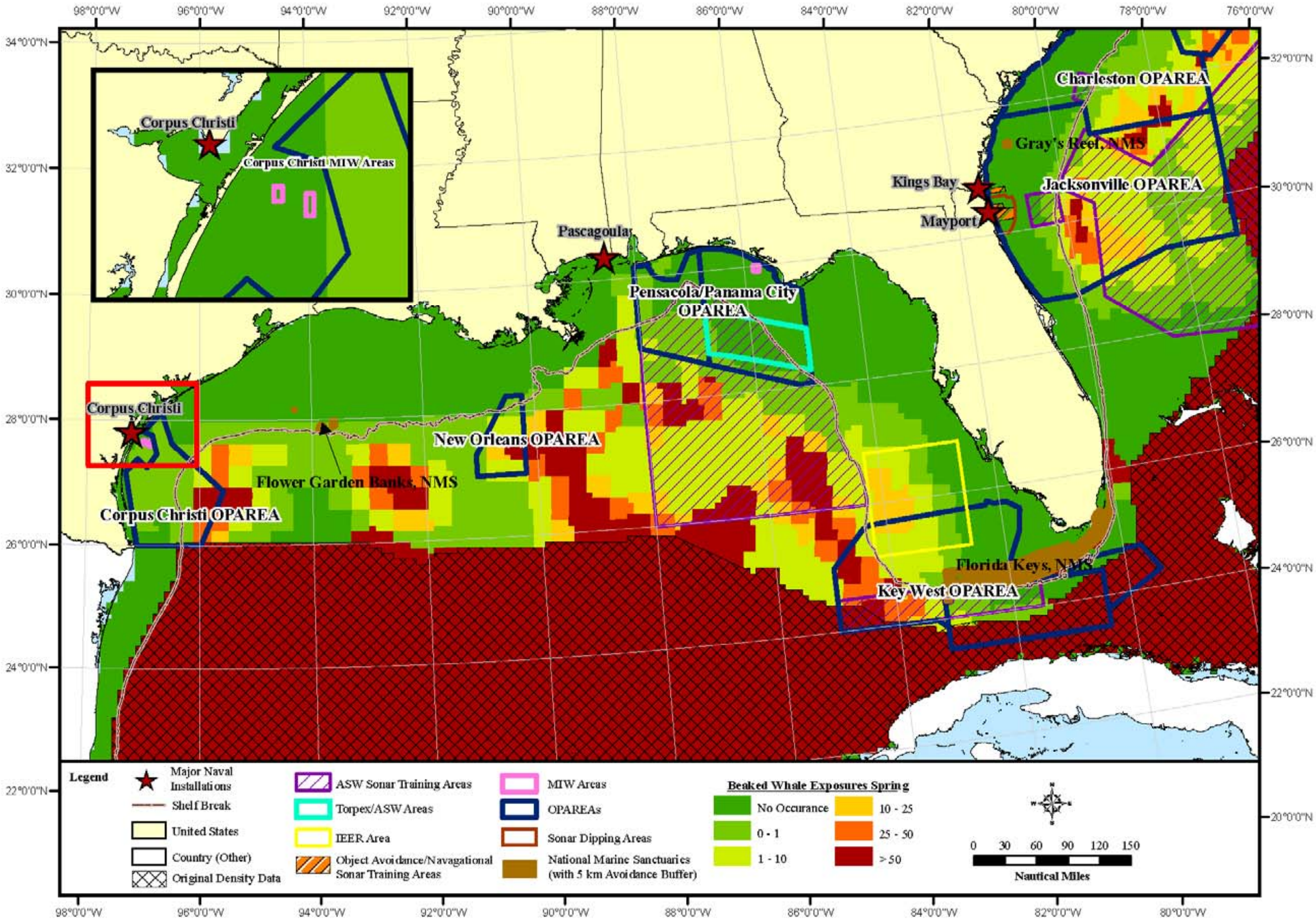


Figure D-62. Alternative 2, Spring GOMEX Beaked Whale (Spring)

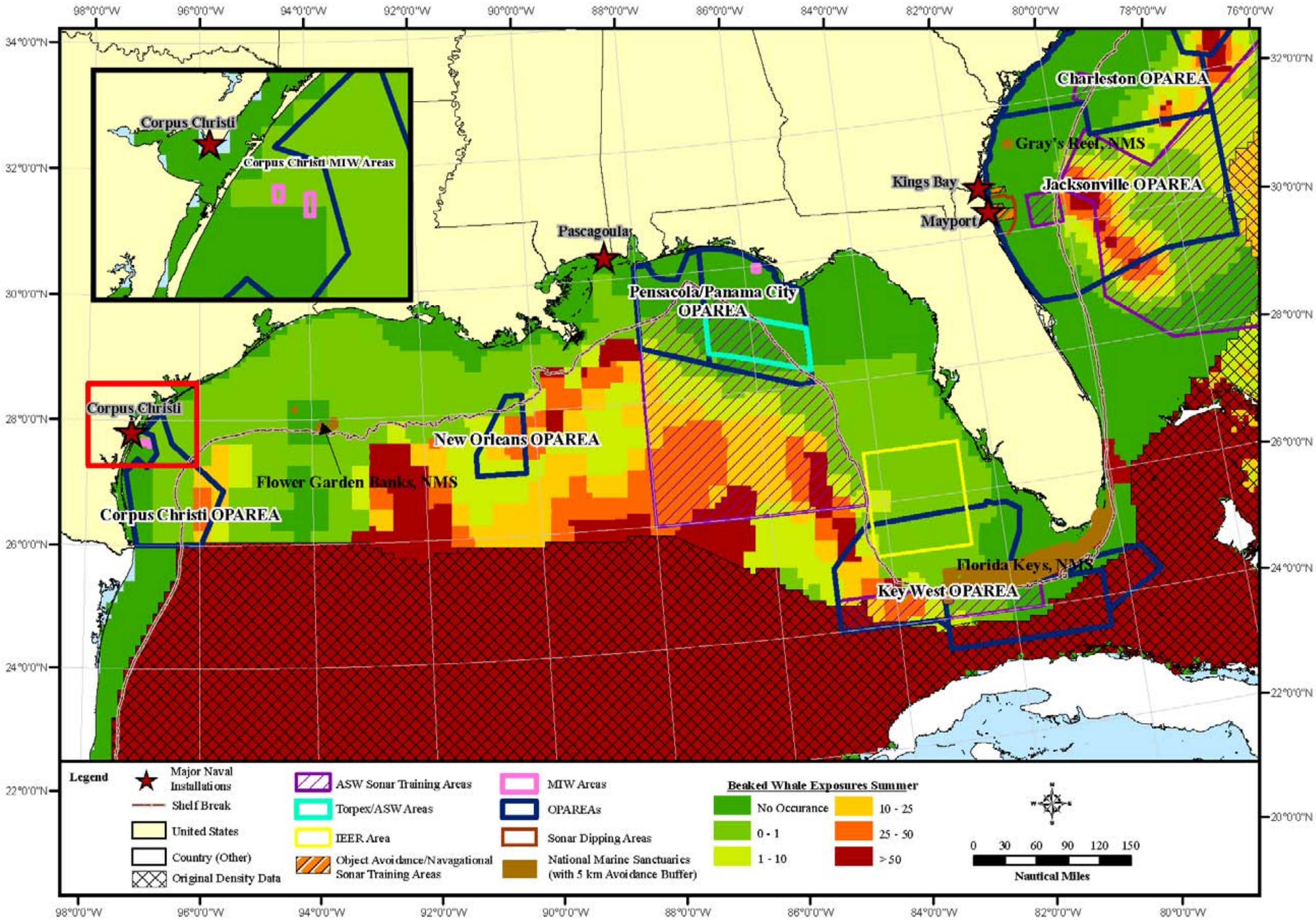


Figure D-63. Alternative 2, Spring GOMEX Beaked Whale (Summer)

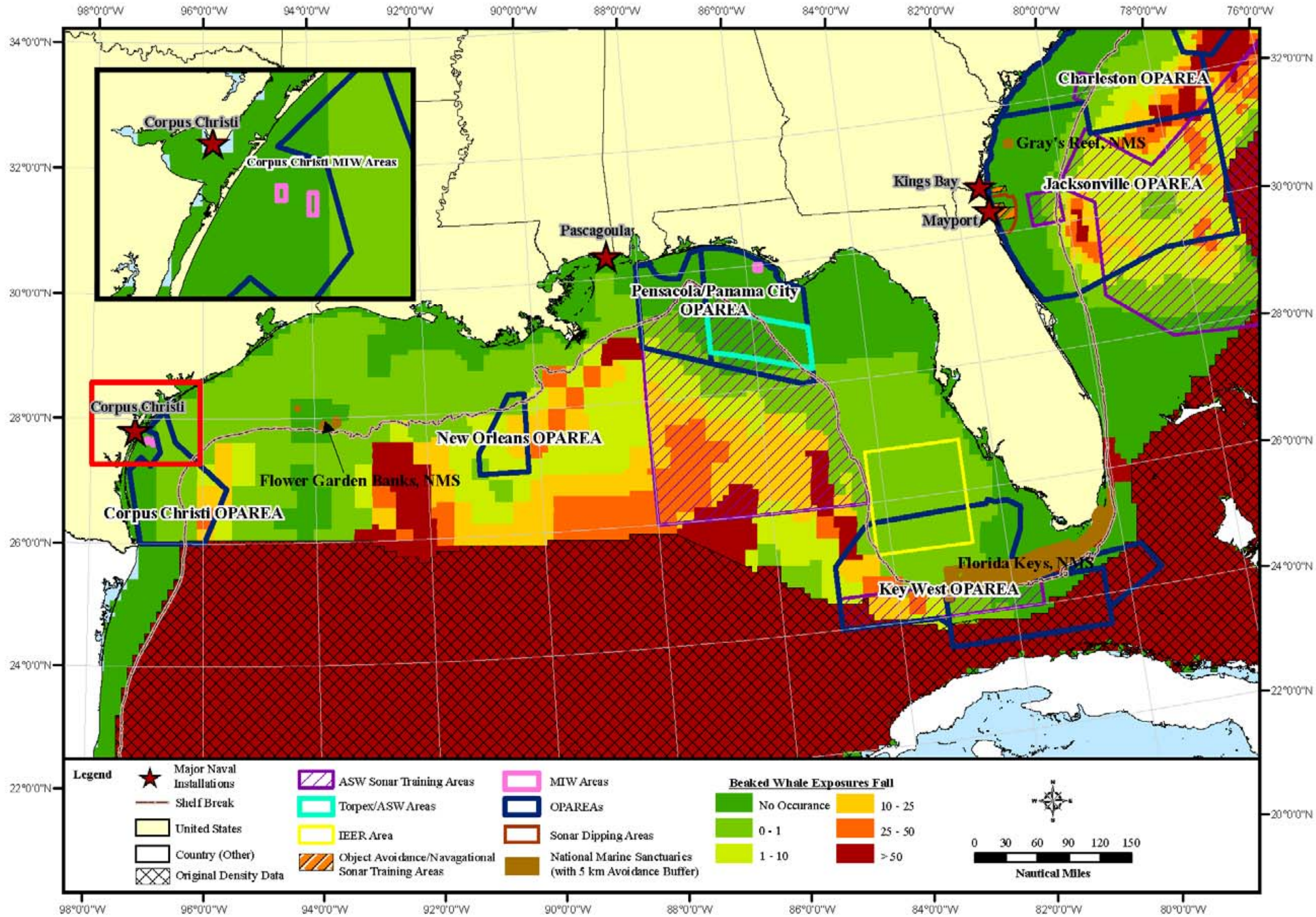


Figure D-64. Alternative 2, Spring GOMEX Beaked Whale (Fall)

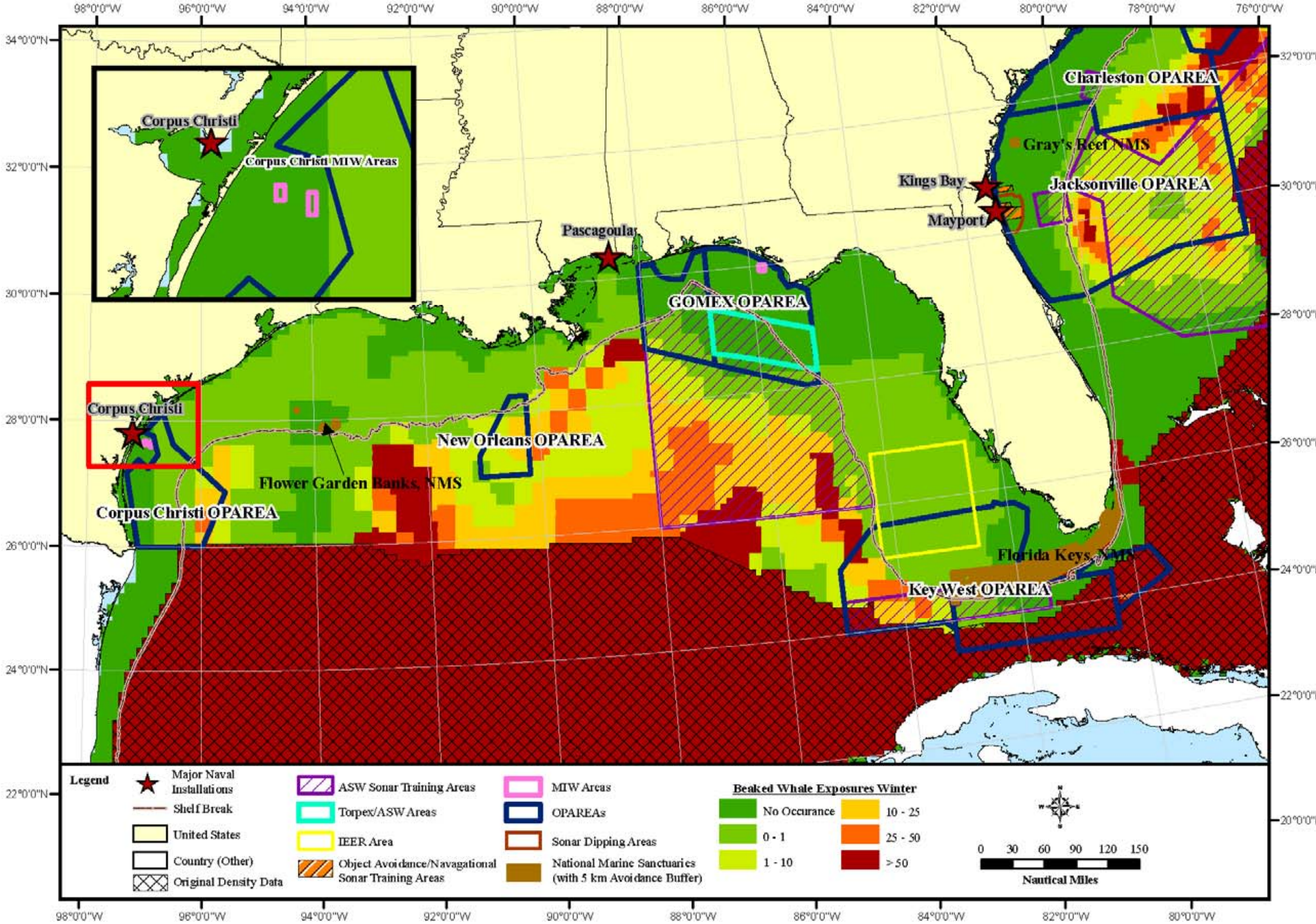


Figure D-65. Alternative 2, Spring GOMEX Beaked Whale (Winter)

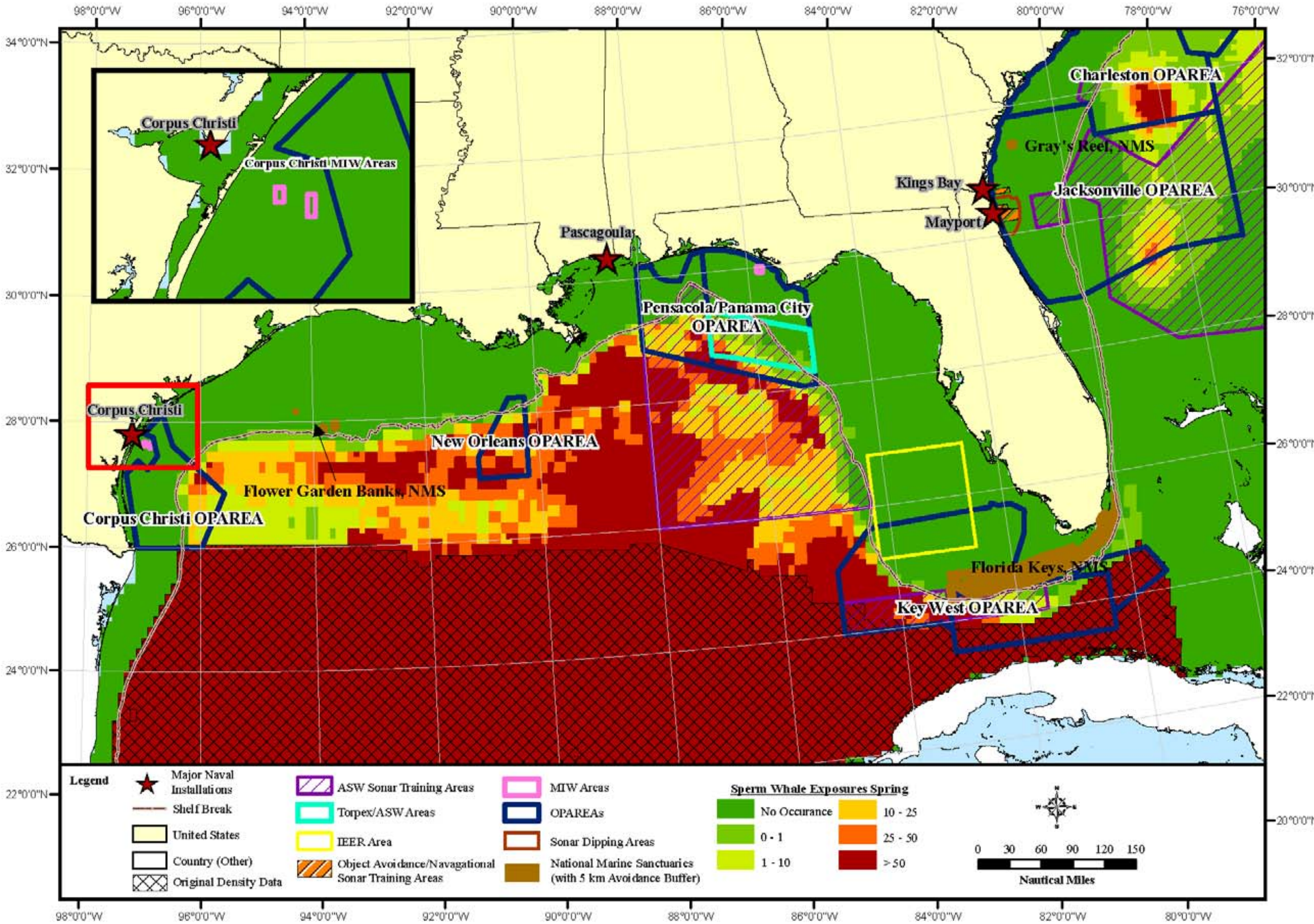


Figure D-66. Alternative 2, Spring GOMEX Sperm Whale (Spring)

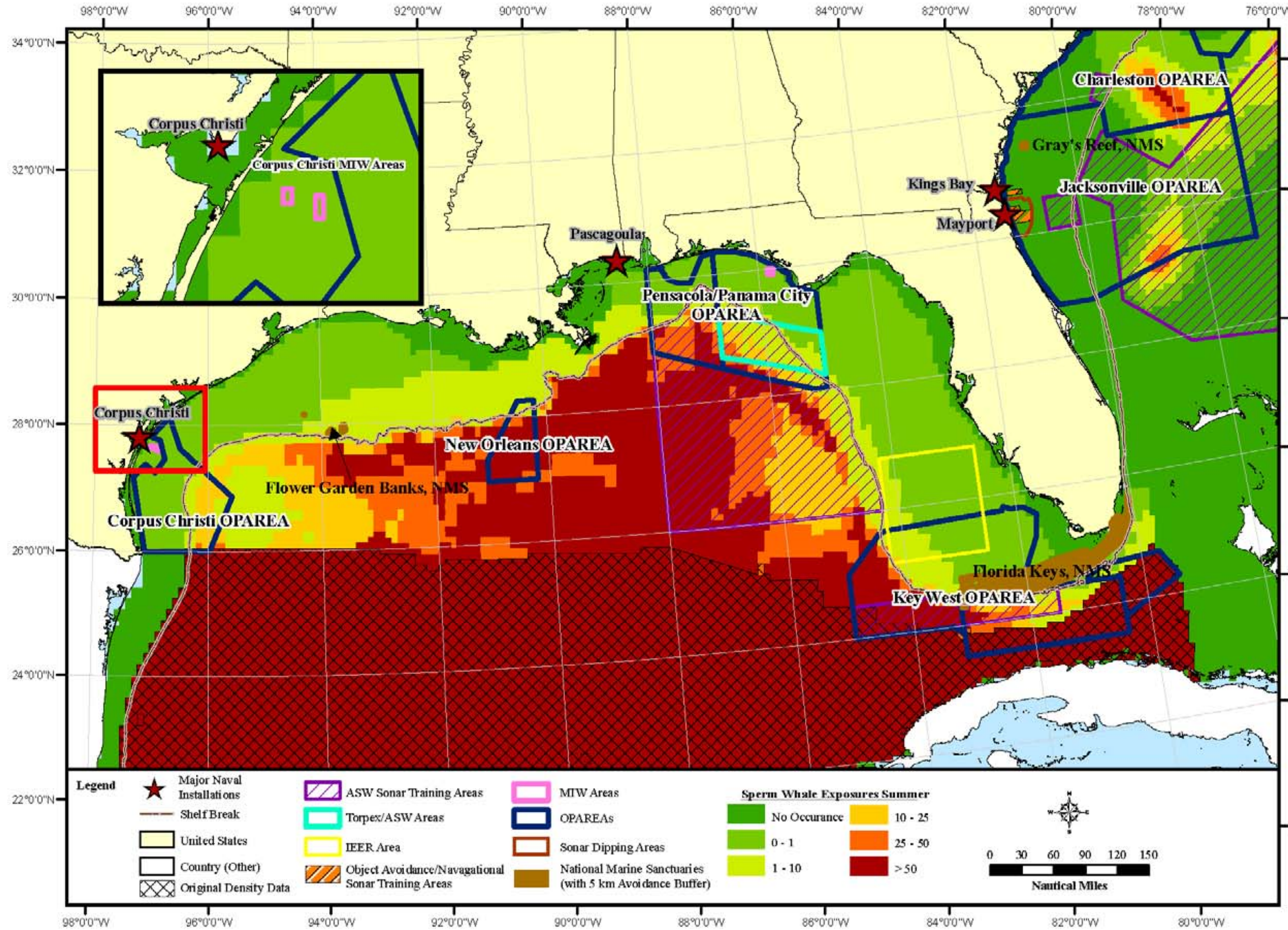


Figure D-67. Alternative 2, Spring GOMEX Sperm Whale (Summer)

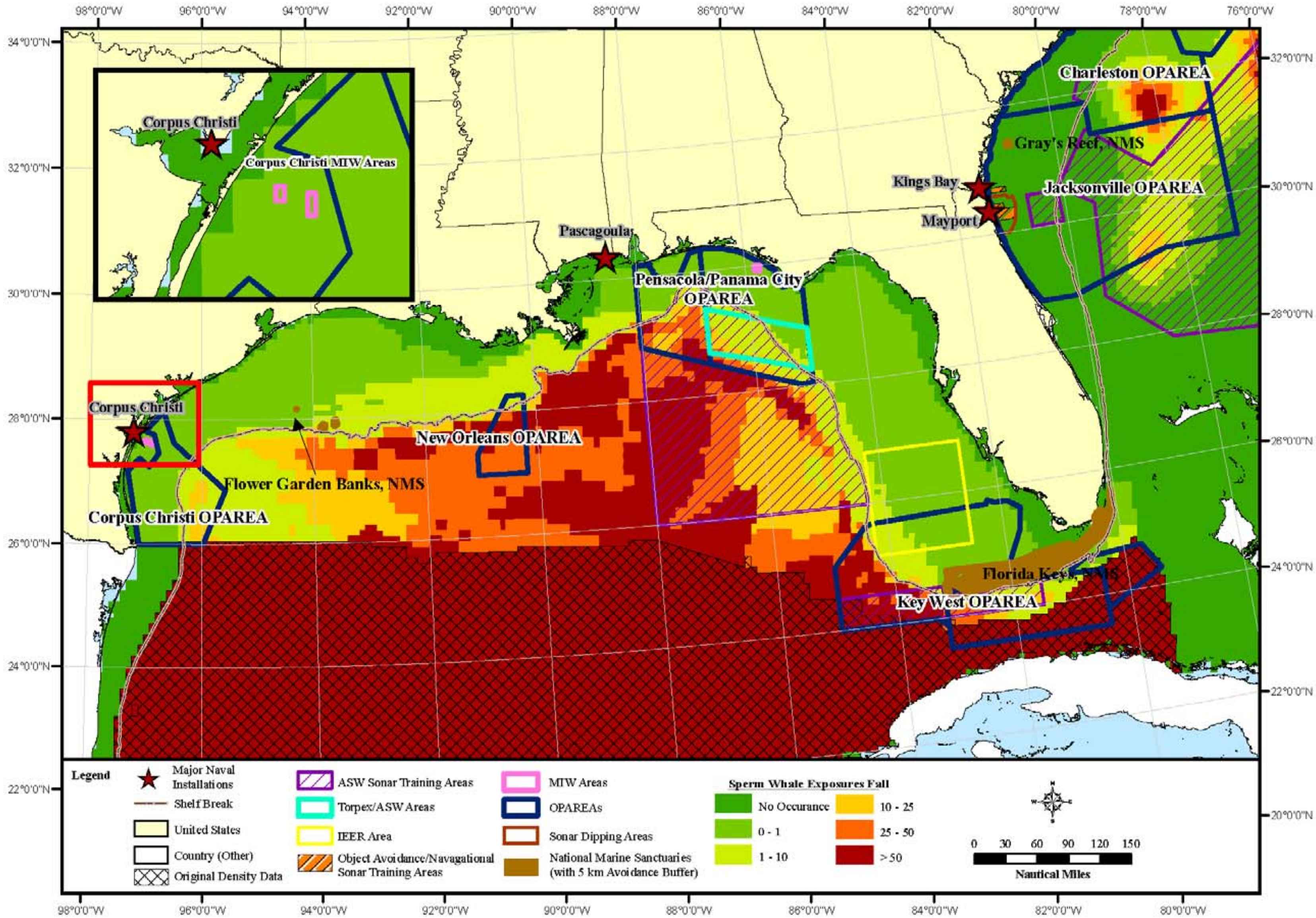
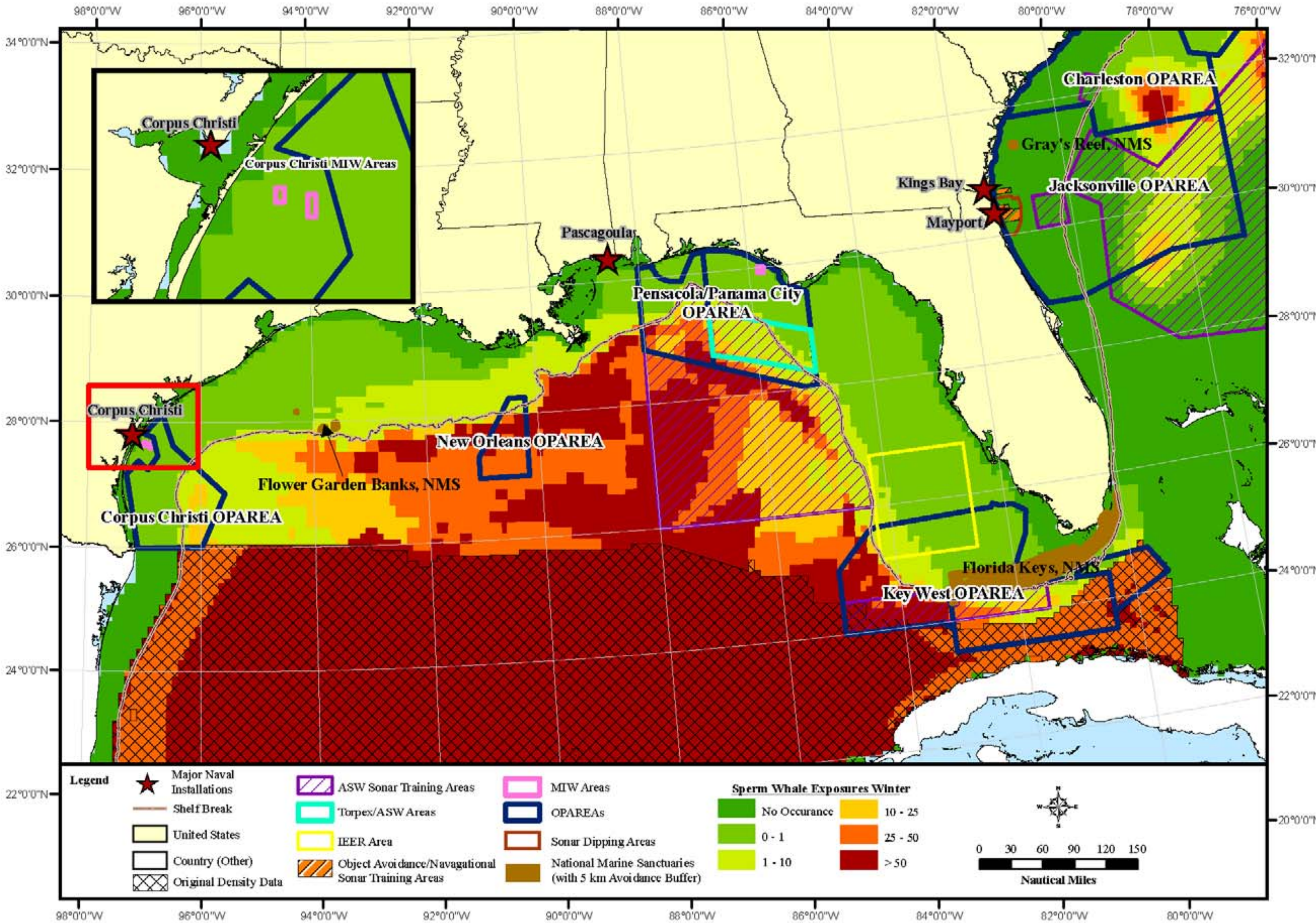


Figure D-68. Alternative 2, Spring GOMEX Sperm Whale (Fall)



1 **Figure D-69. Alternative 2, Spring GOMEX Sperm Whale (Winter)**

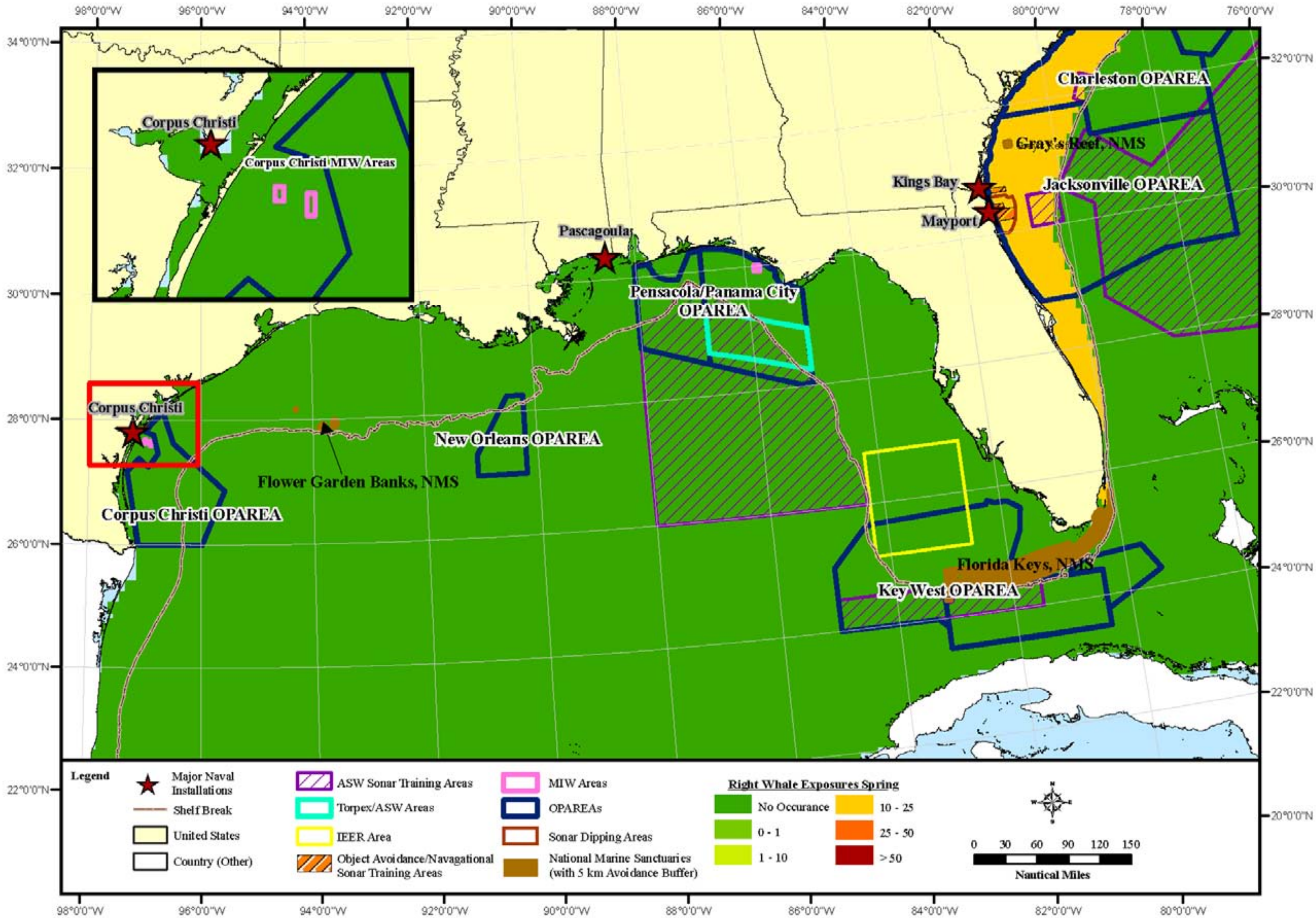


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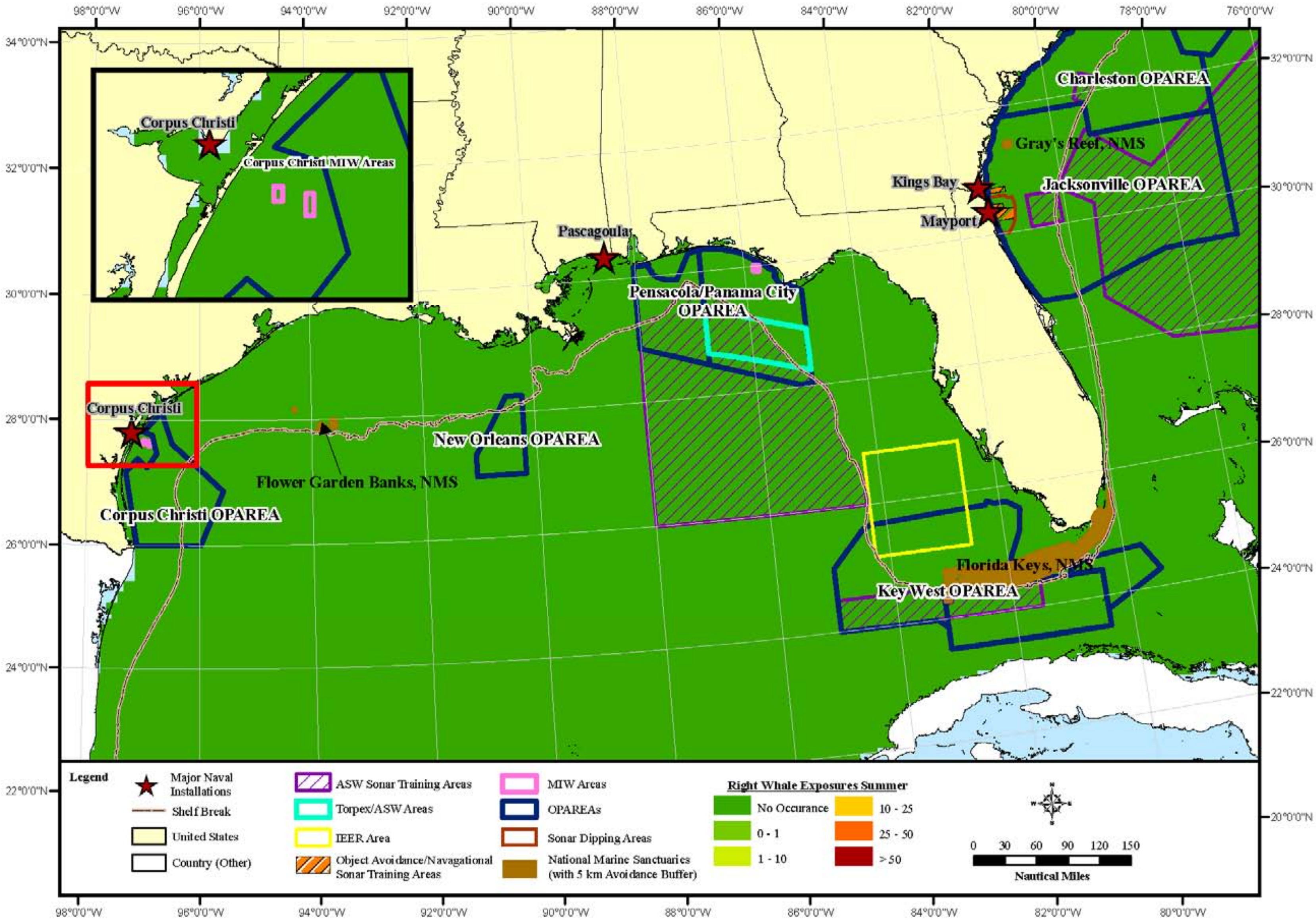
Figure D-70. Alternative 2, Spring GOMEX Right Whale (Spring)



1 **Figure D-71. Alternative 2, Spring GOMEX Right Whale (Summer)**

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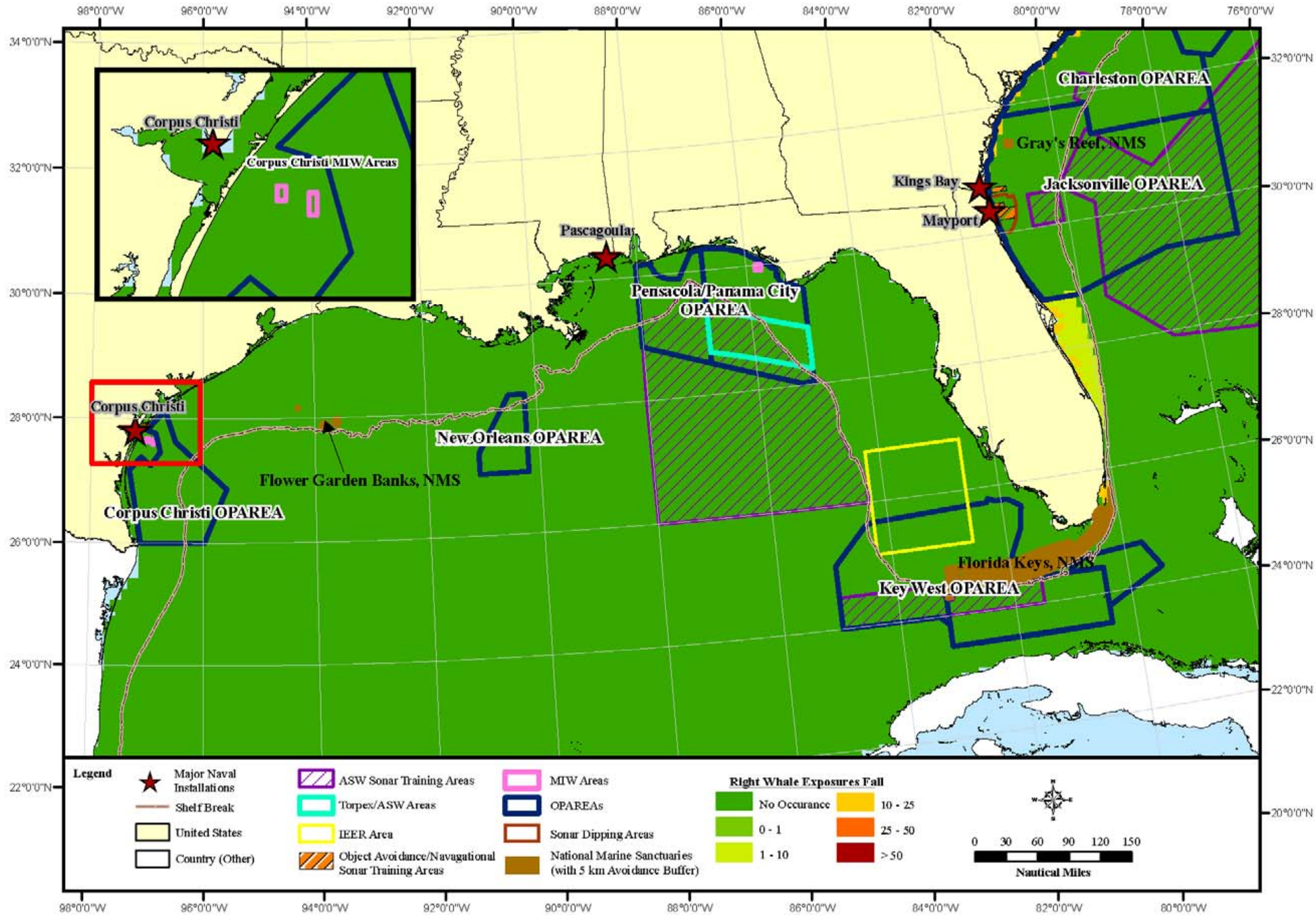

Figure D-72. Alternative 2, Spring GOMEX Right Whale (Fall)

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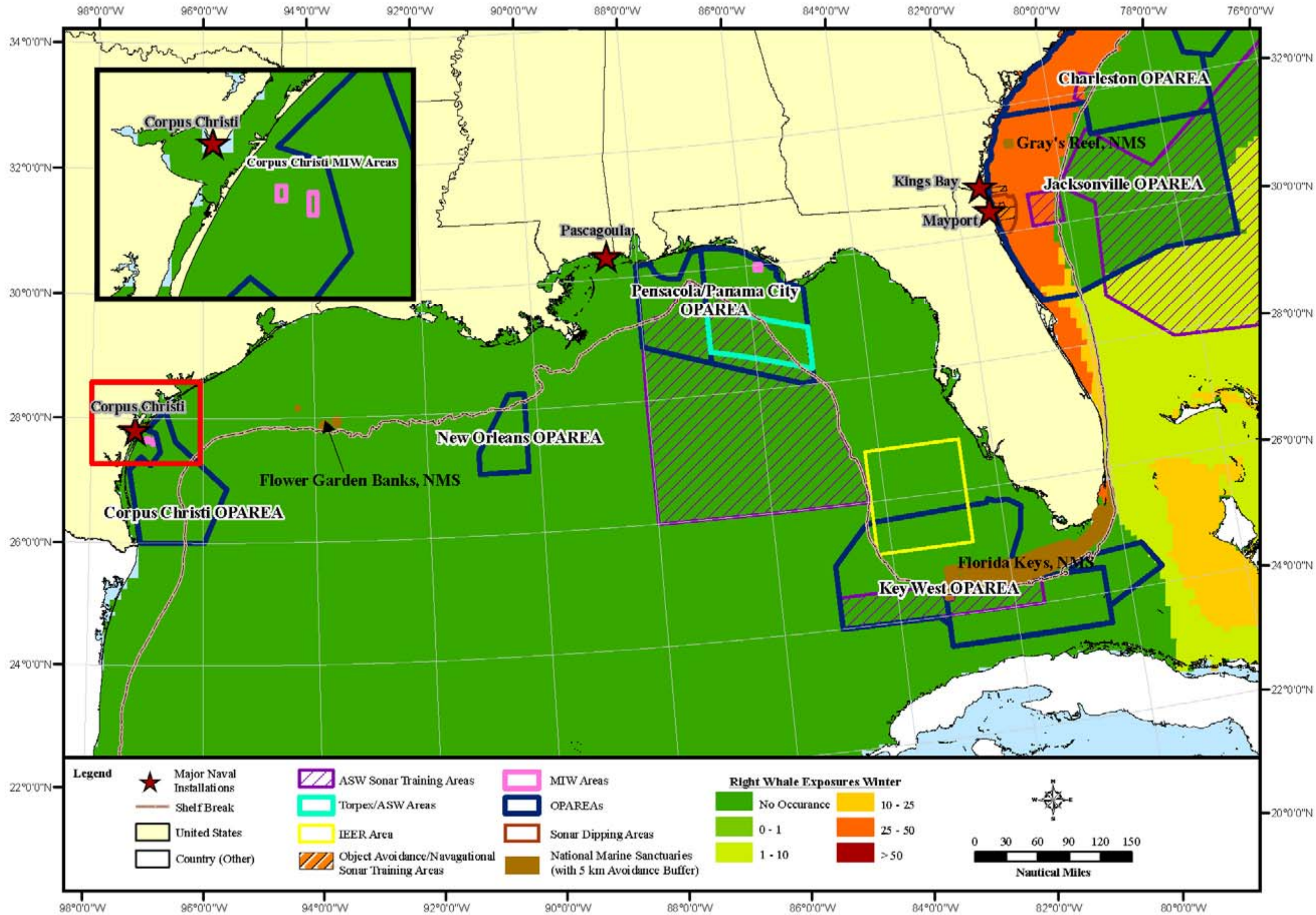
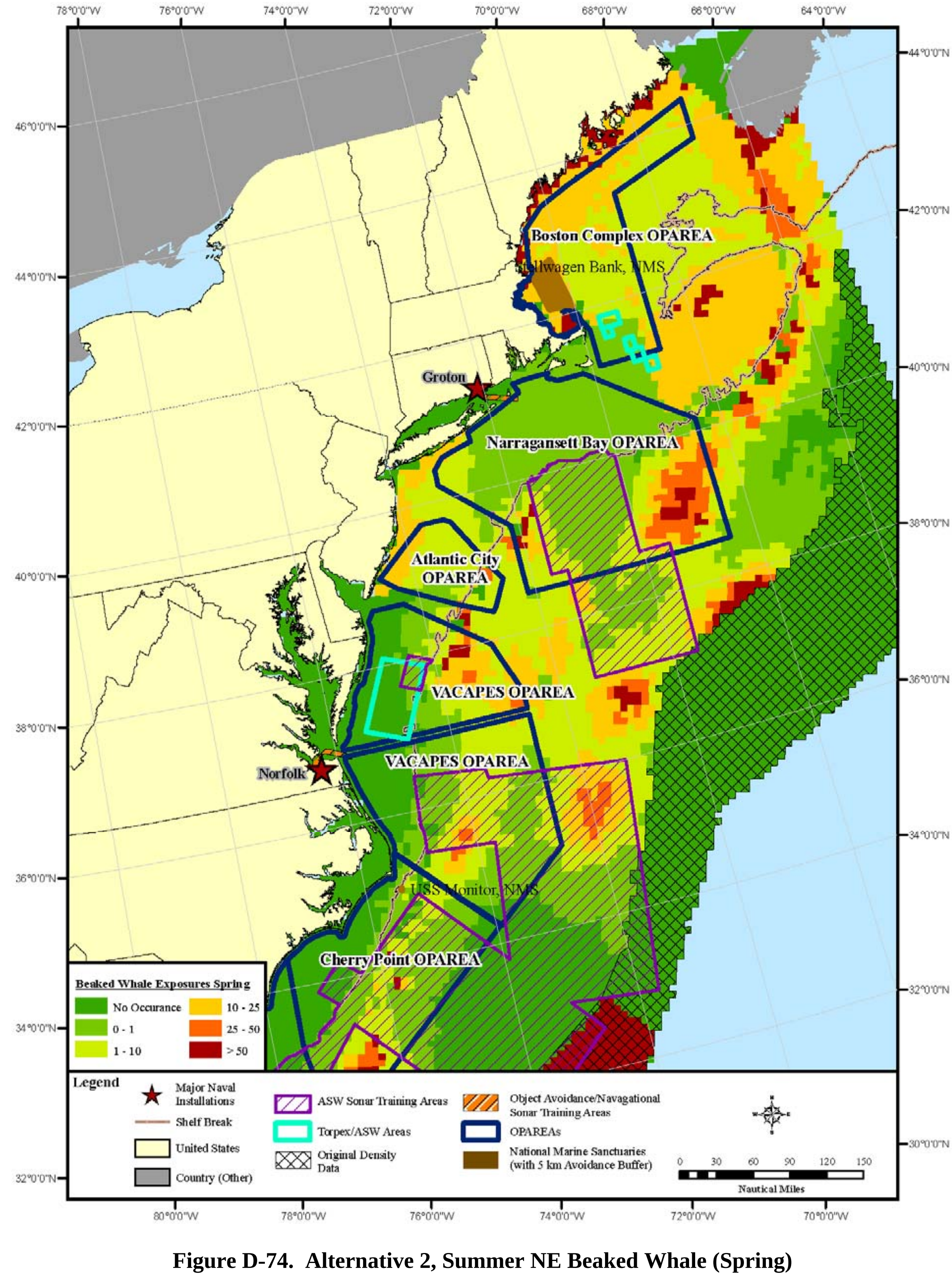


Figure D-73. Alternative 2, Spring GOMEX Right Whale (Winter)



1 **Figure D-74. Alternative 2, Summer NE Beaked Whale (Spring)**

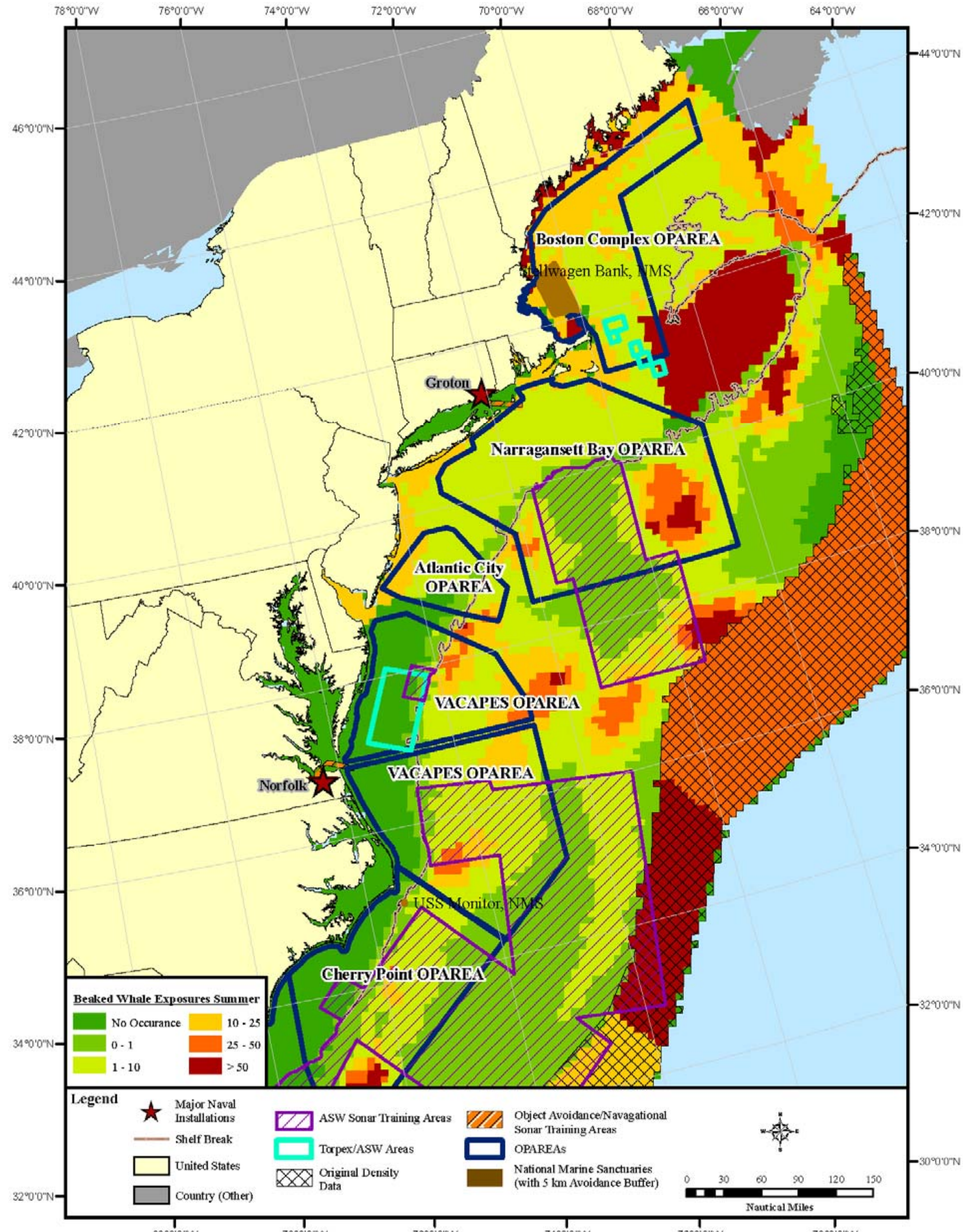


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Figure D-75. Alternative 2, Summer NE Beaked Whale (Summer)

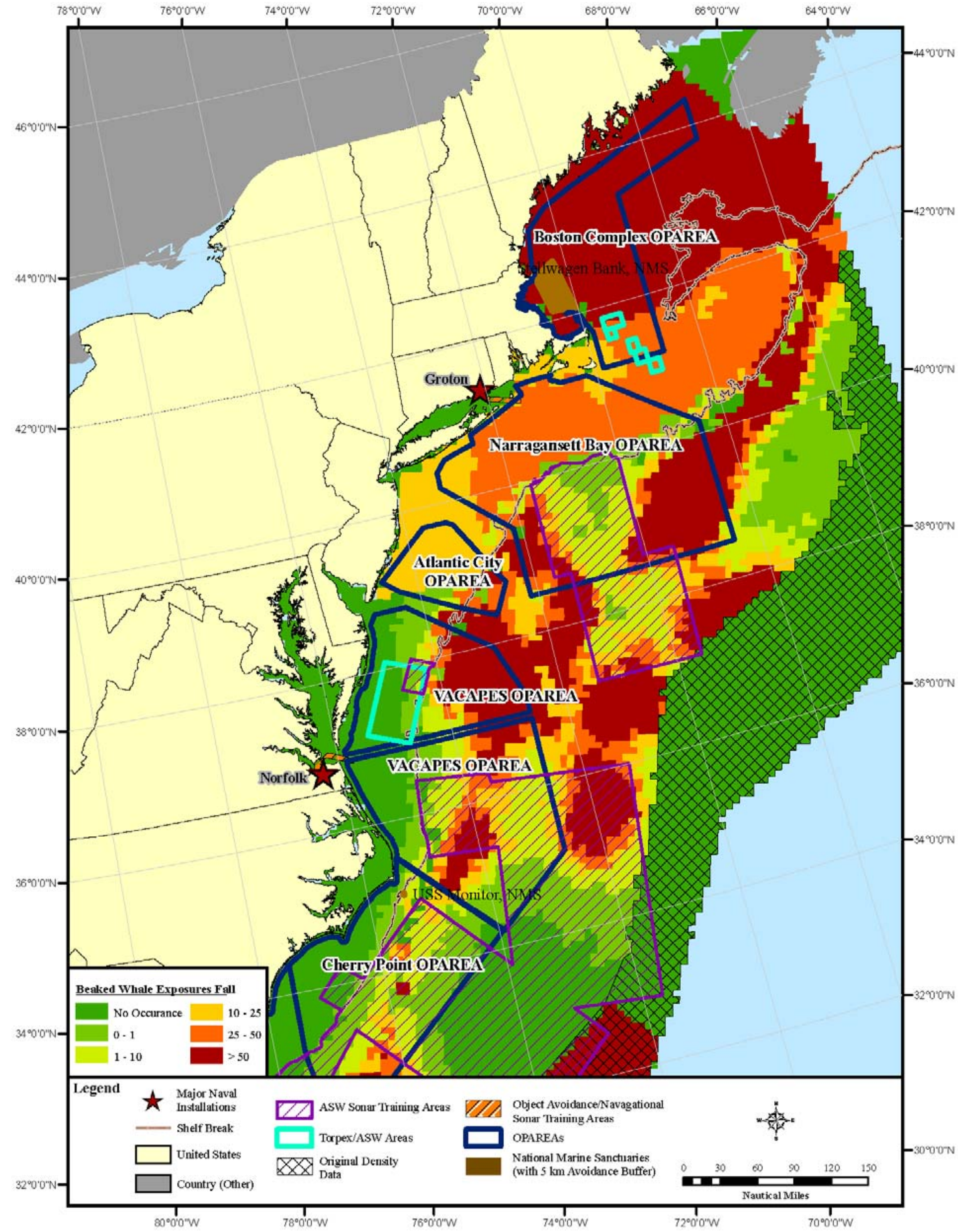

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Figure D-76. Alternative 2, Summer NE Beaked Whale (Fall)

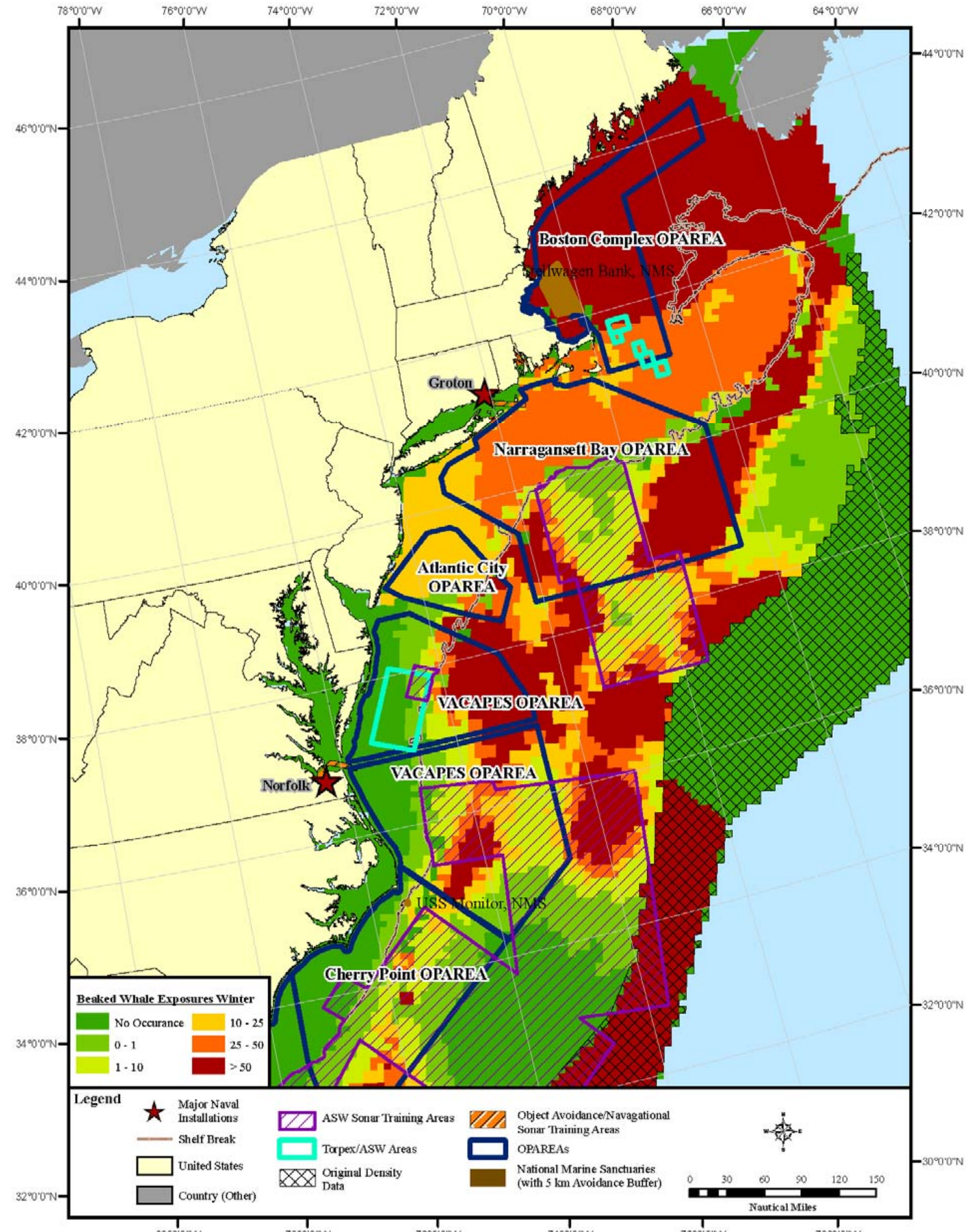

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Figure D-77. Alternative 2, Summer NE Beaked Whale (Winter)

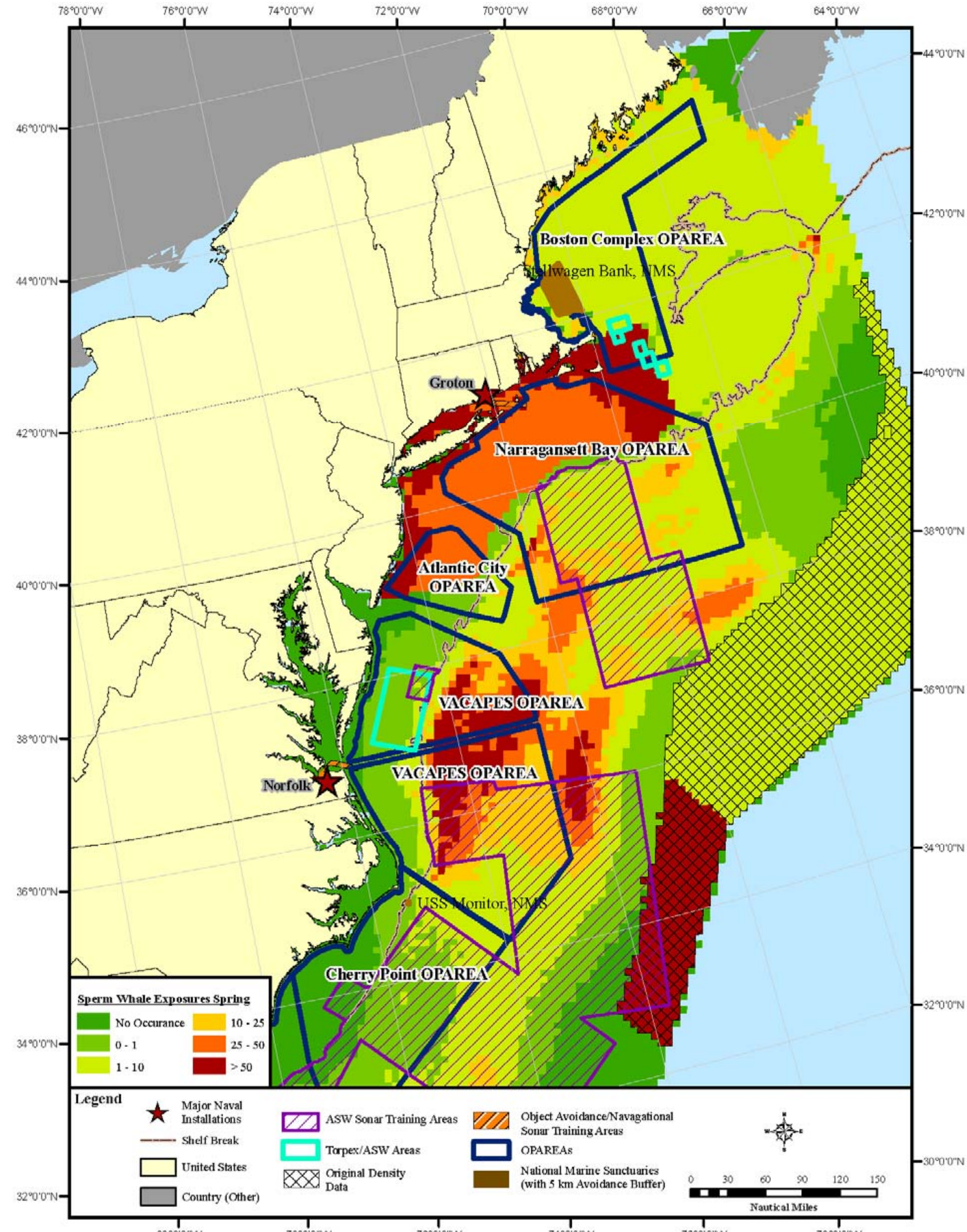

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Figure D-78. Alternative 2, Summer NE Sperm Whale (Spring)

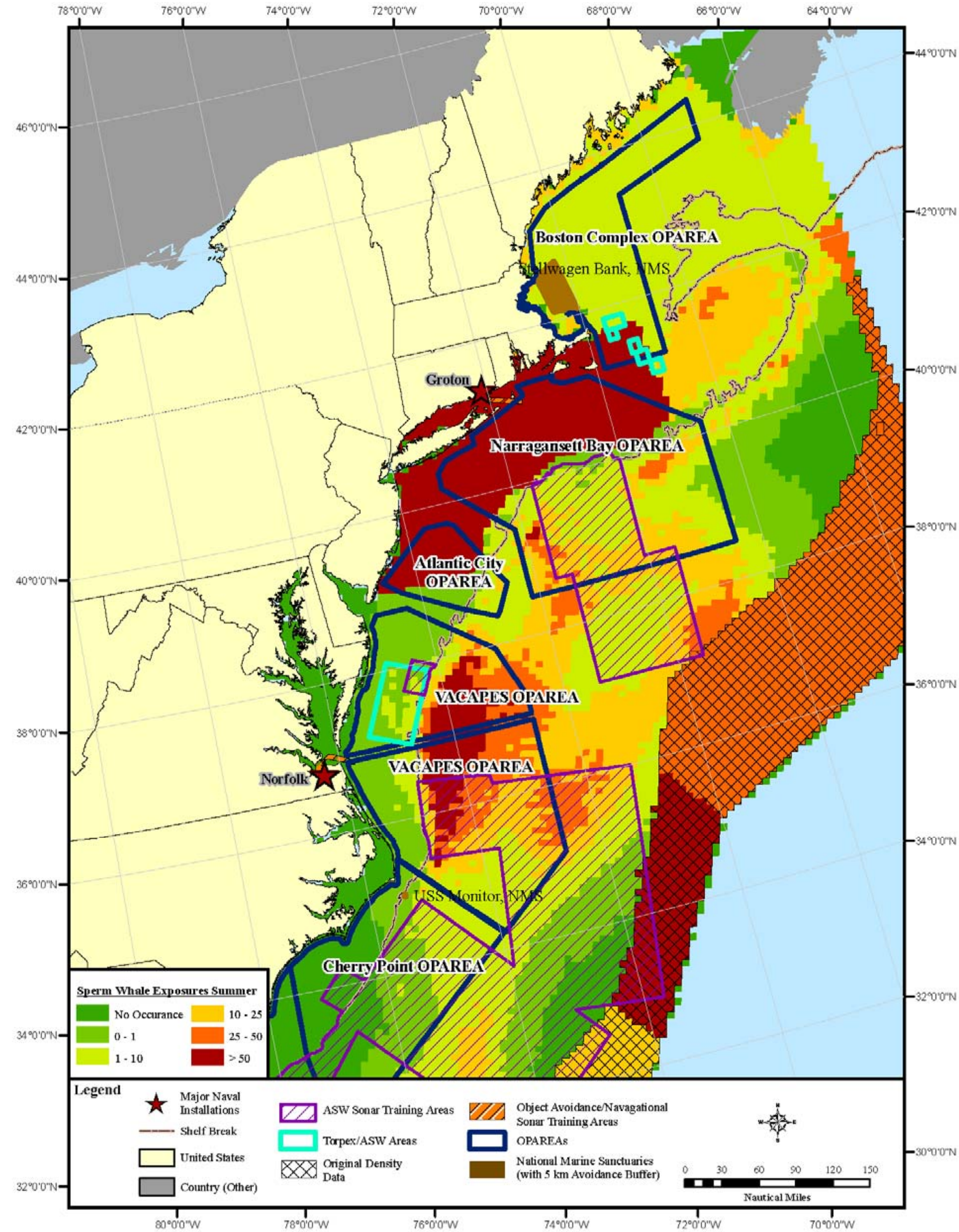

Figure D-79. Alternative 2, Summer NE Sperm Whale (Summer)

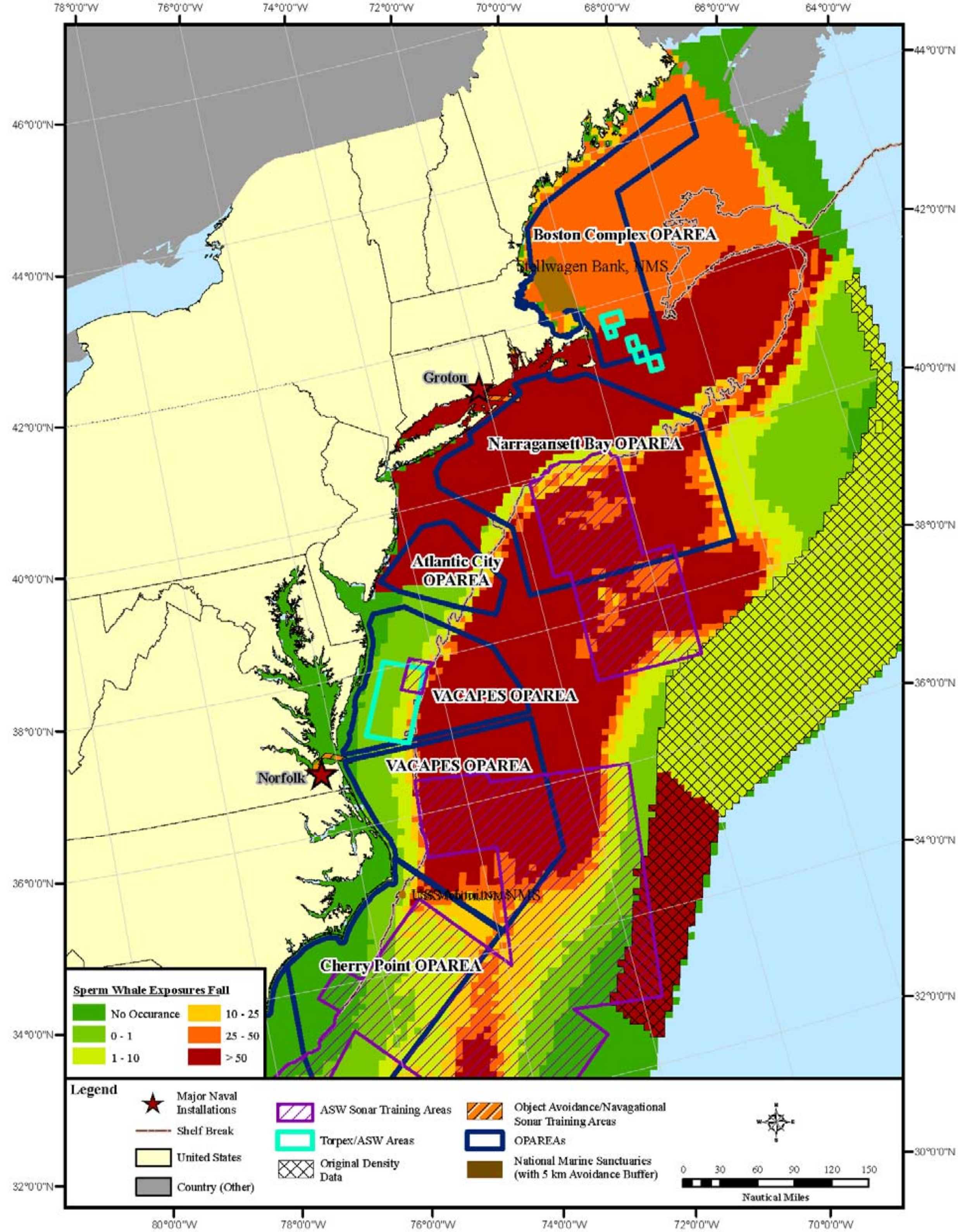

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Figure D-80. Alternative 2, Summer NE Sperm Whale (Fall)

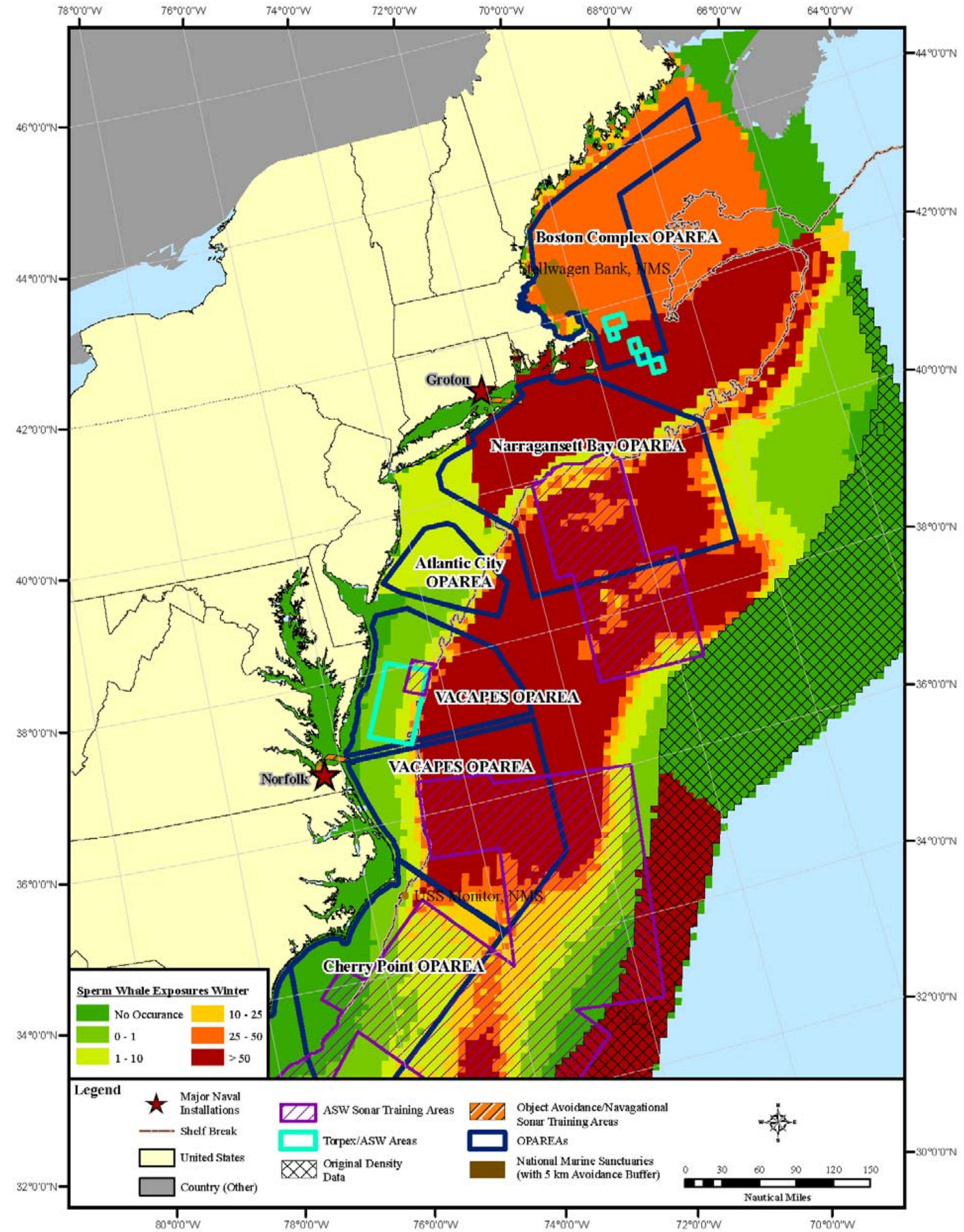

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Figure D-81. Alternative 2, Summer NE Sperm Whale (Winter)

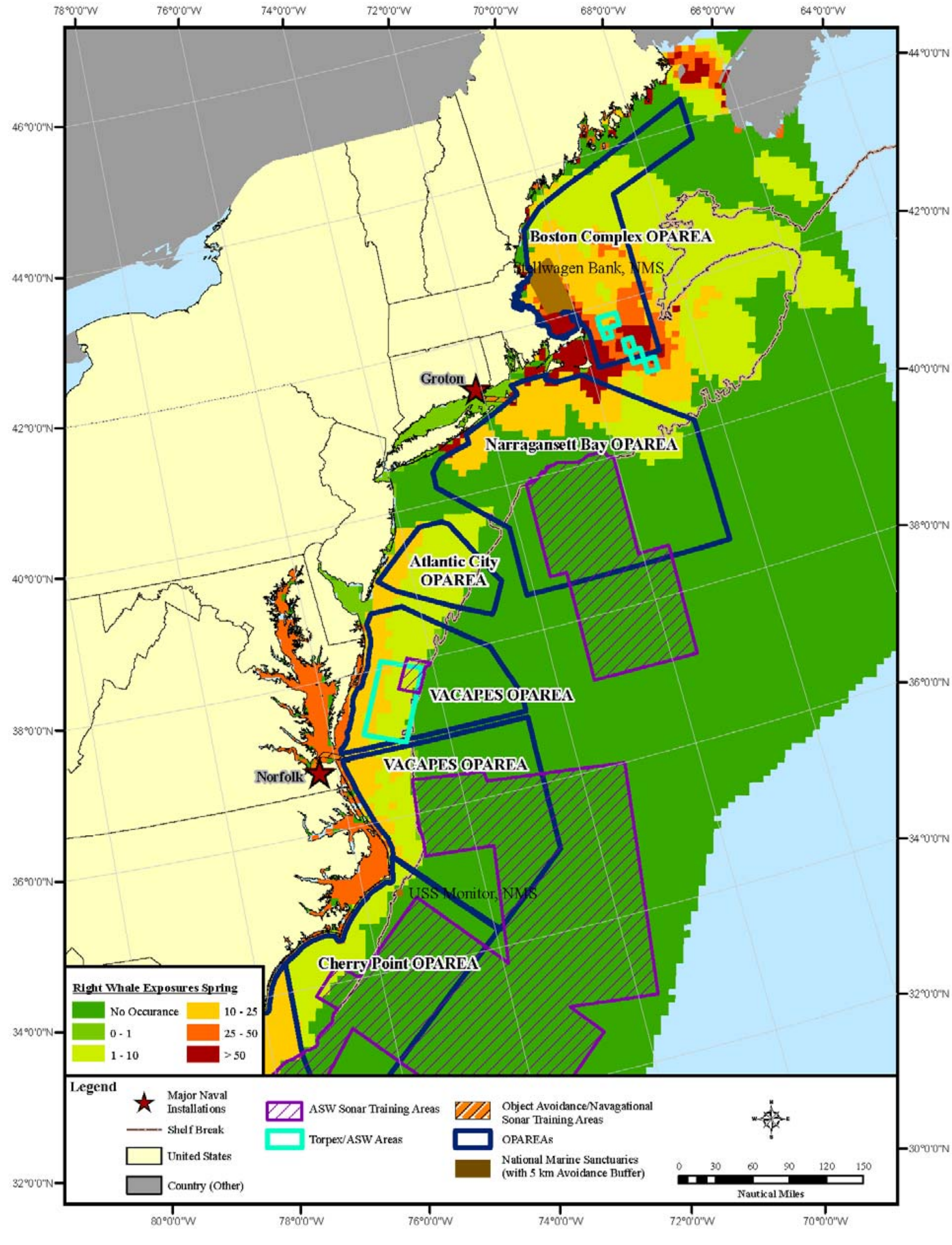

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Figure D-82. Alternative 2, Summer NE Right Whale (Spring)

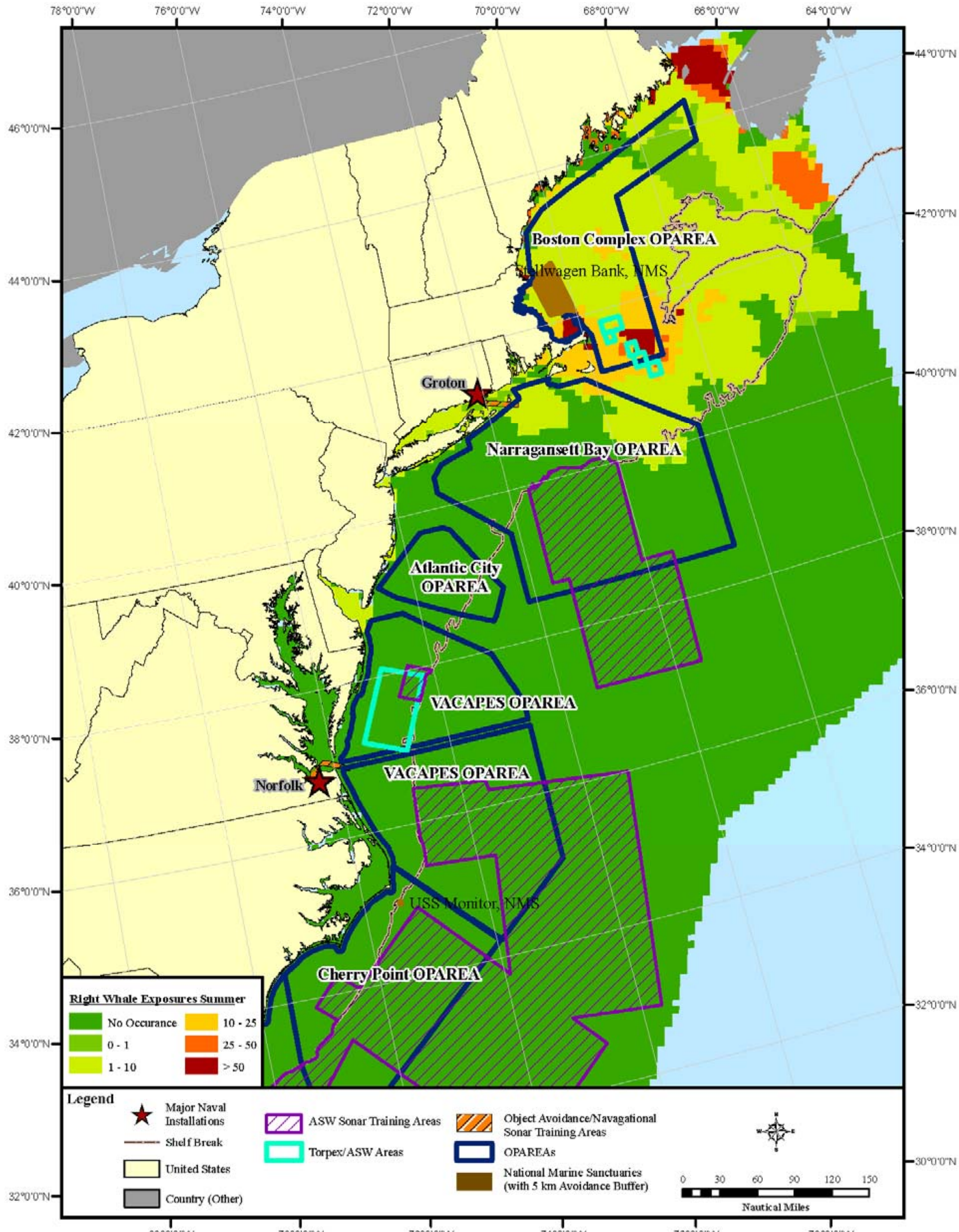

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Figure D-83. Alternative 2, Summer NE Right Whale (Summer)

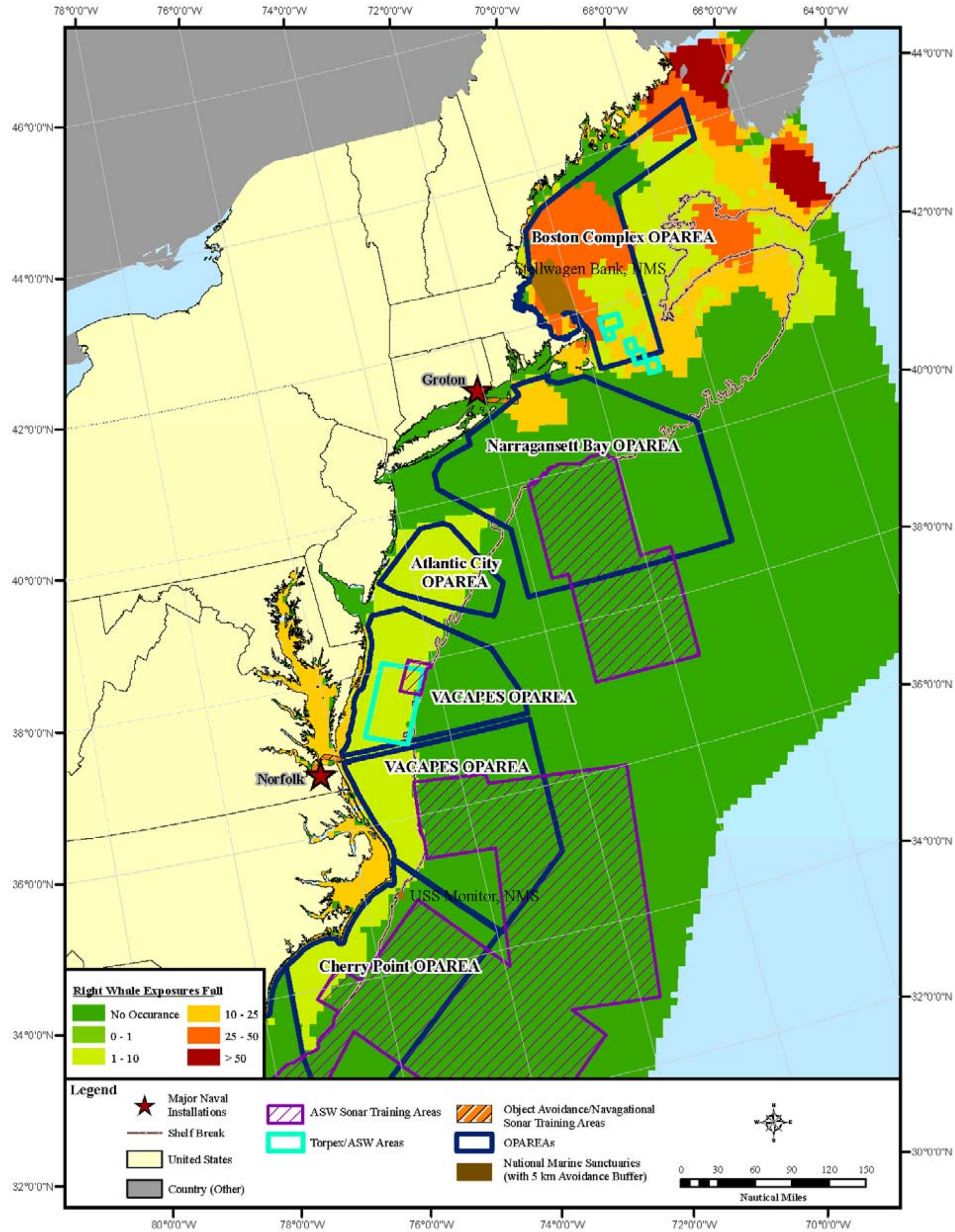

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Figure D-84. Alternative 2, Summer NE Right Whale (Fall)

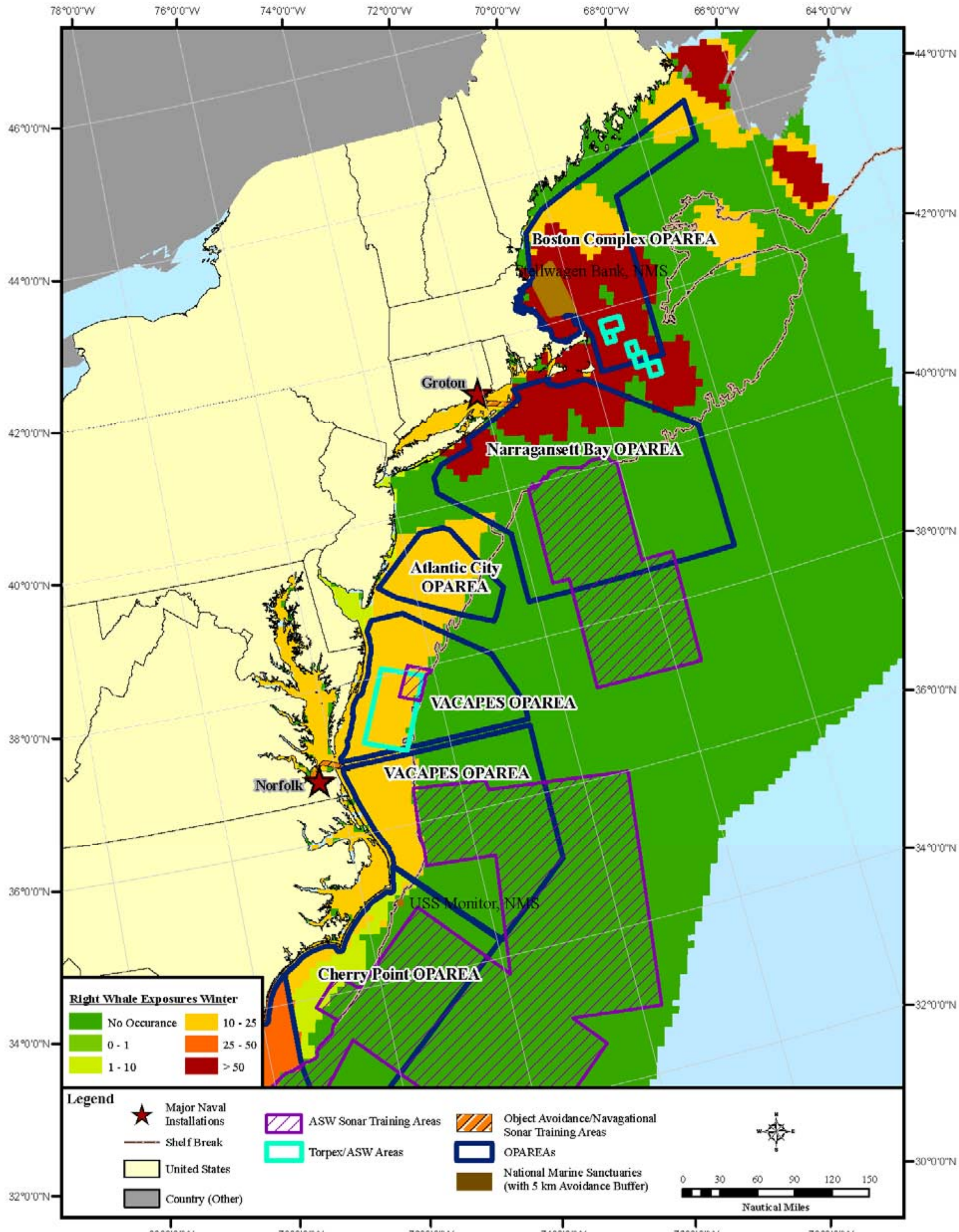

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Figure D-85. Alternative 2, Summer NE Right Whale (Winter)

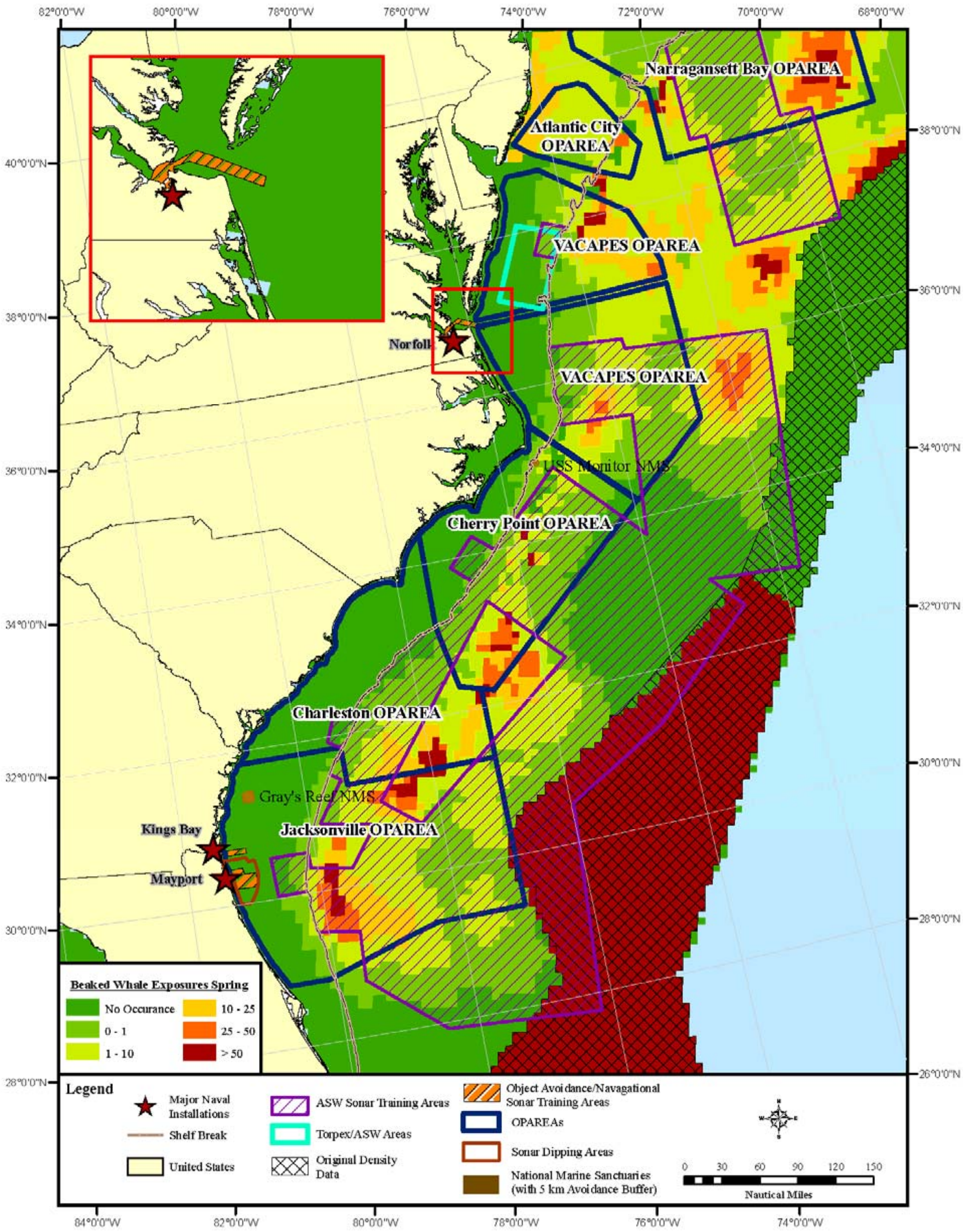

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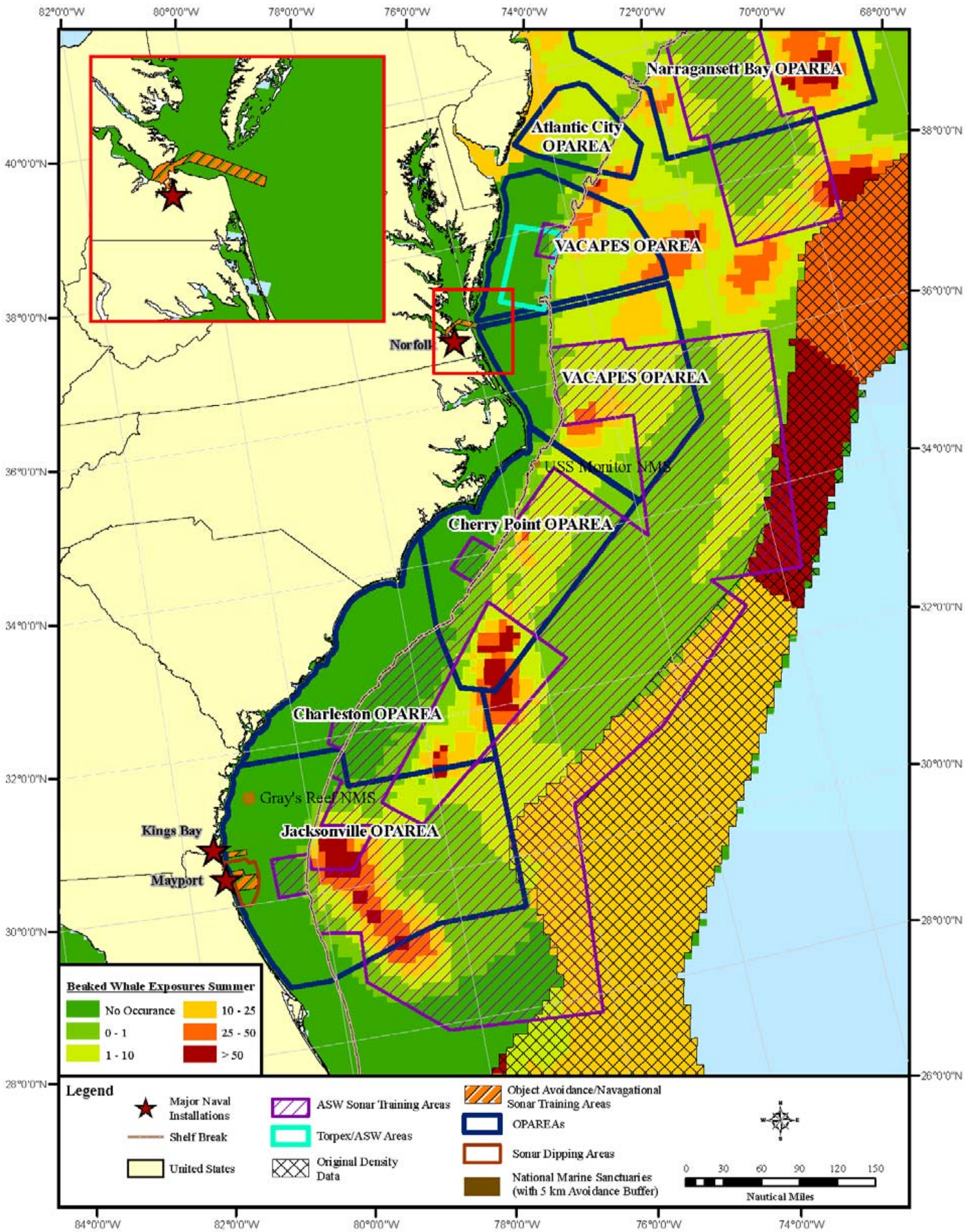
Figure D-86. Alternative 2, Summer SE Beaked Whale (Spring)



1 **Figure D-87. Alternative 2, Summer SE Beaked Whale (Summer)**

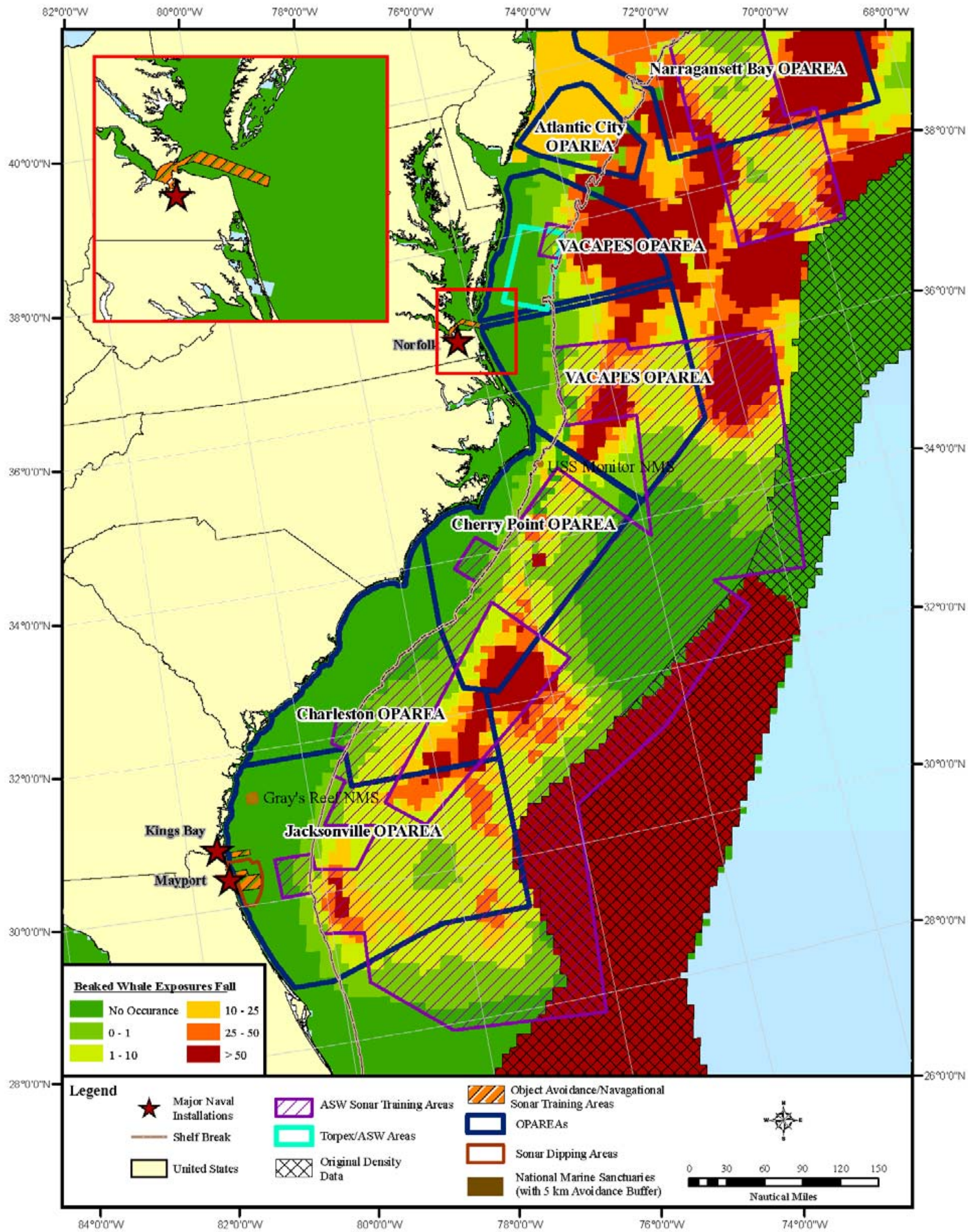


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Figure D-88. Alternative 2, Summer SE Beaked Whale (Fall)

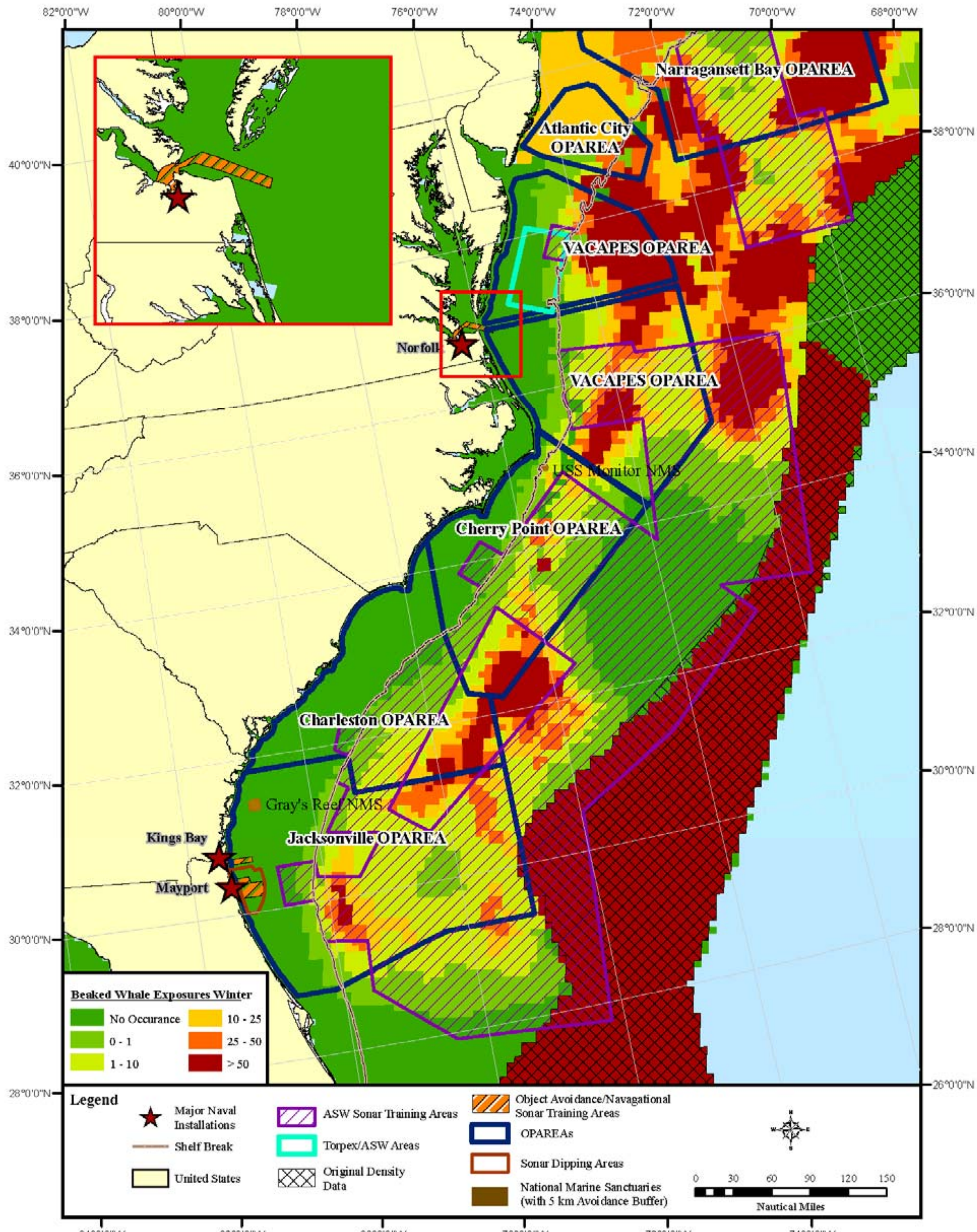

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Figure D-89. Alternative 2, Summer SE Beaked Whale (Winter)

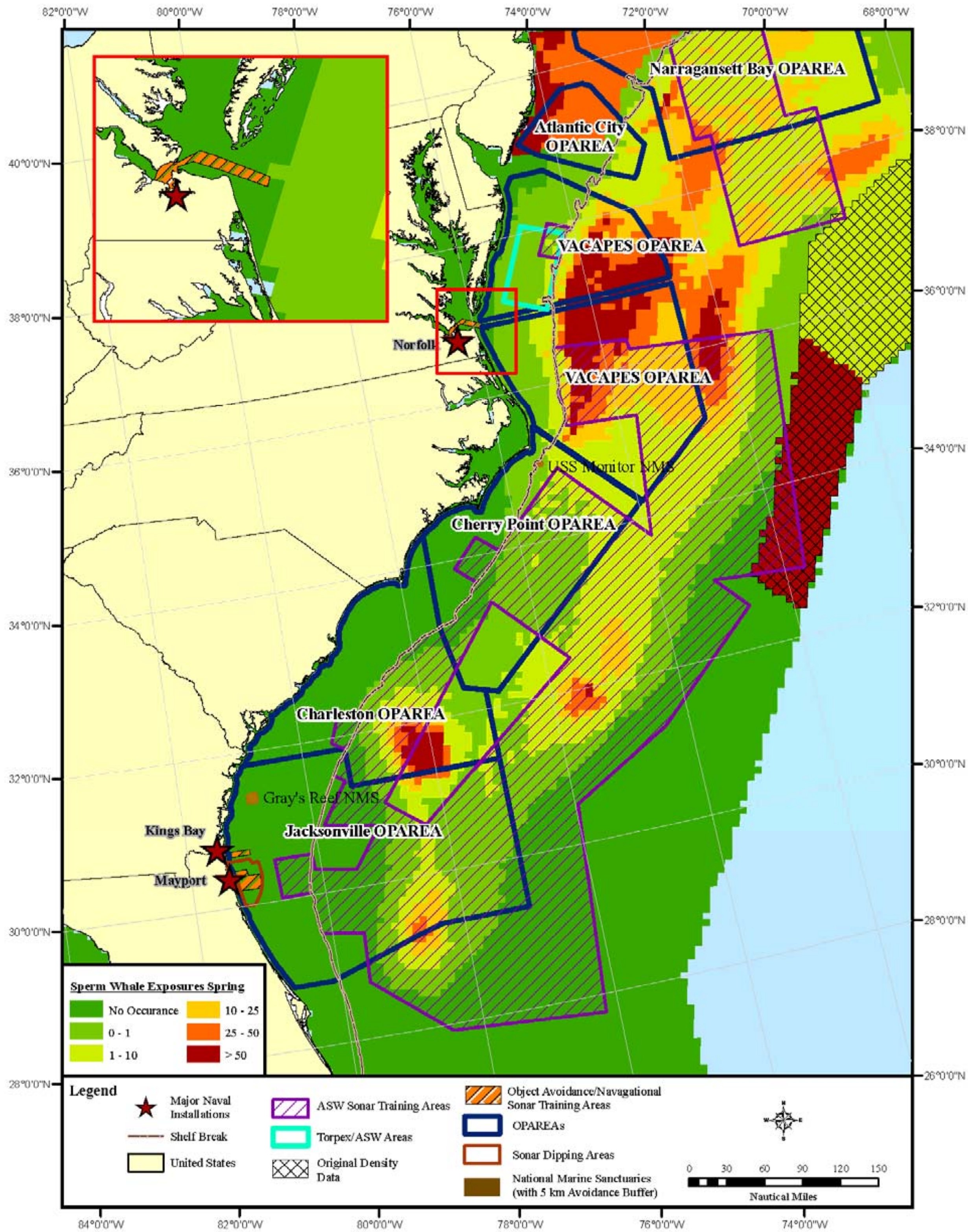

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Figure D-90. Alternative 2, Summer SE Sperm Whale (Spring)

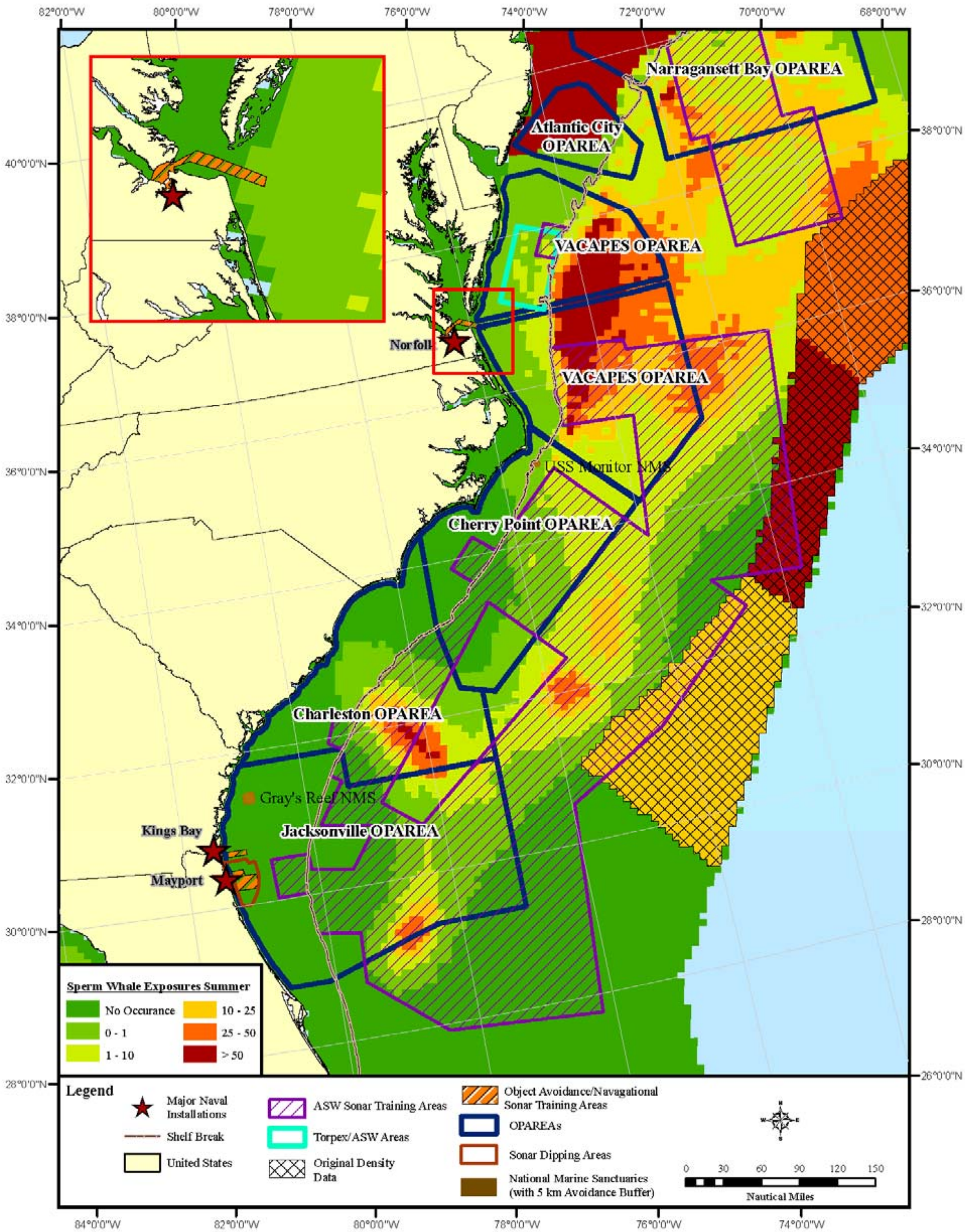
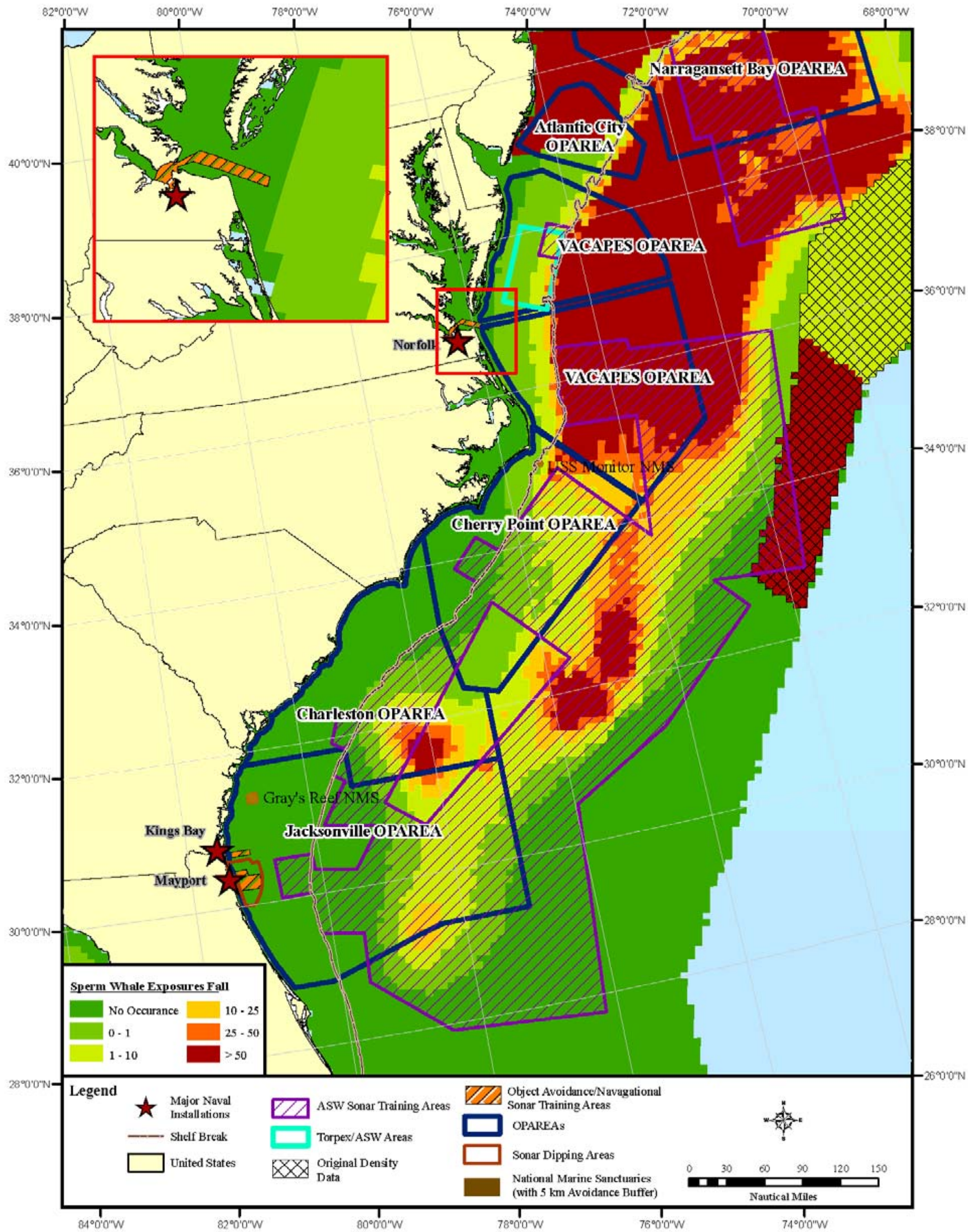


Figure D-91. Alternative 2, Summer SE Sperm Whale (Summer)



1 **Figure D-92. Alternative 2, Summer SE Sperm Whale (Fall)**

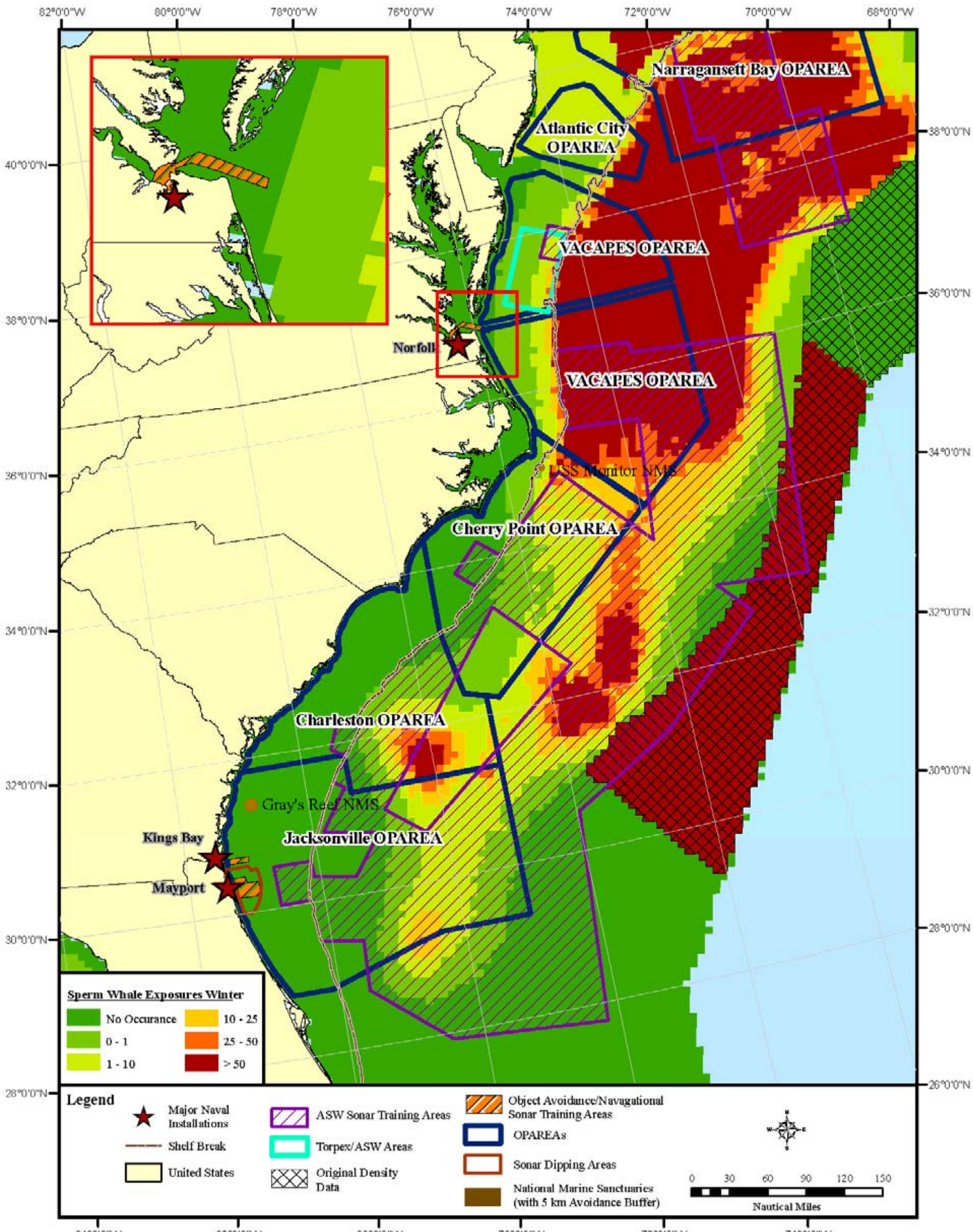


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Figure D-93. Alternative 2, Summer SE Sperm Whale (Winter)

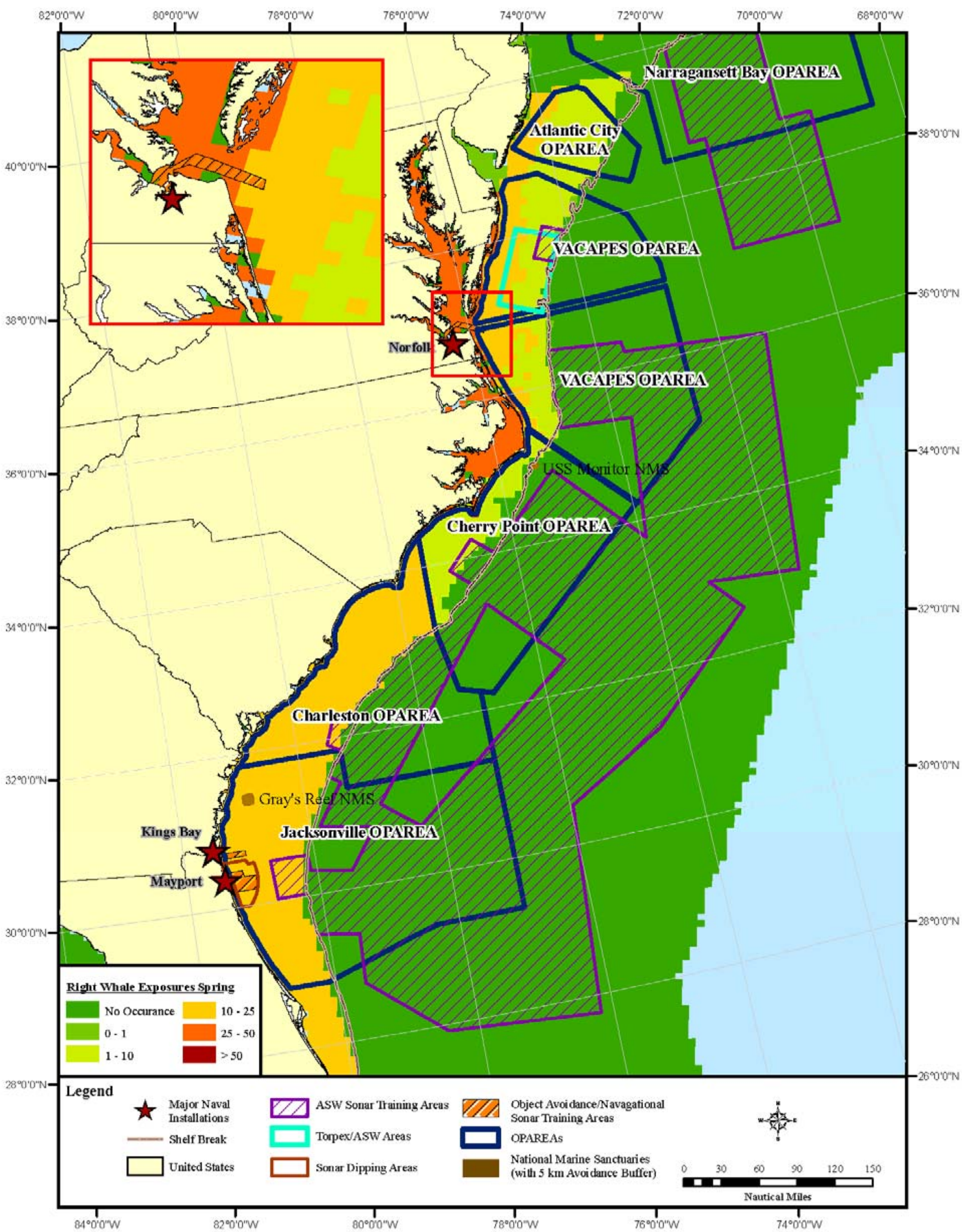

Figure D-94. Alternative 2, Summer SE Right Whale (Spring)

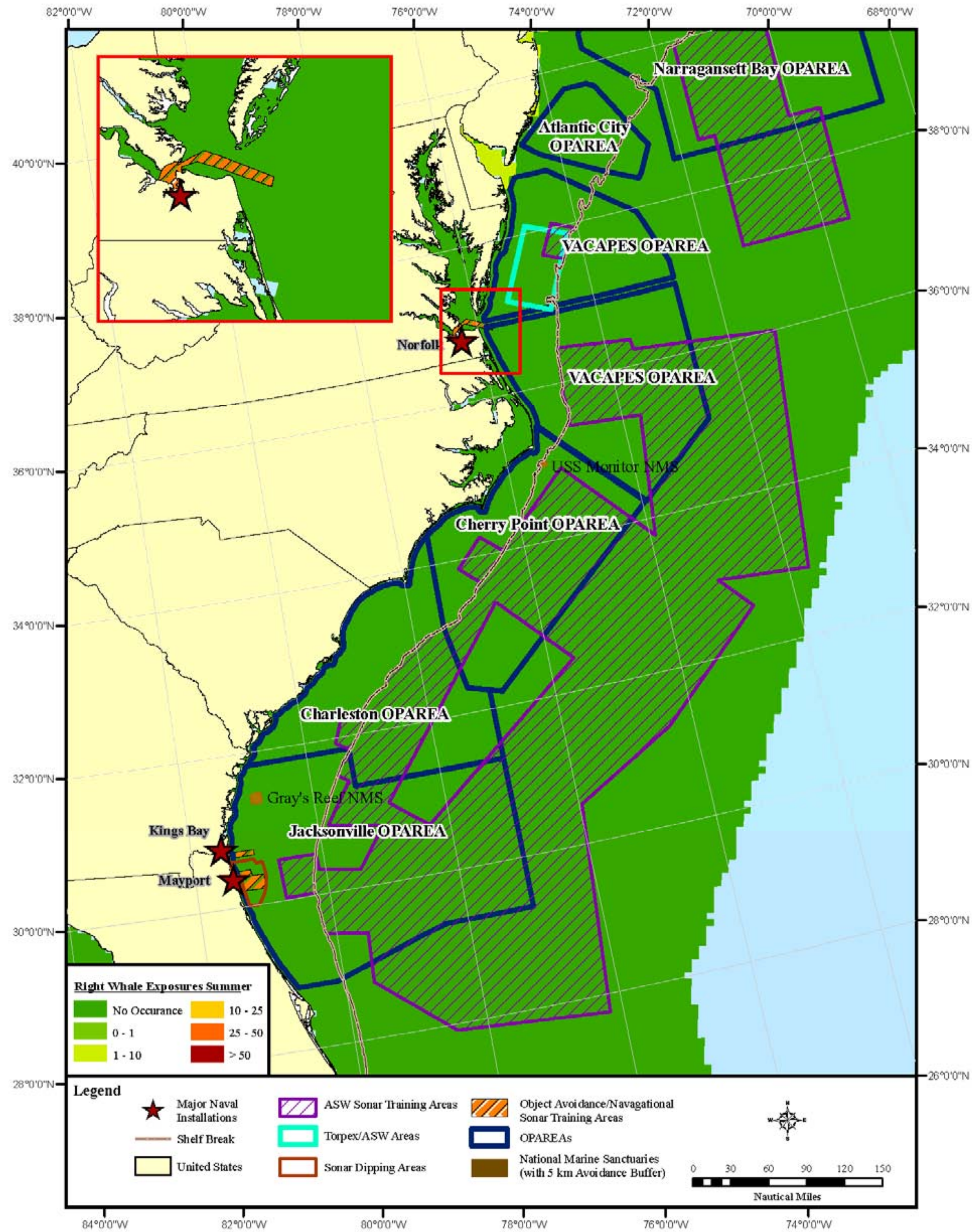

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Figure D-95. Alternative 2, Summer SE Right Whale (Summer)

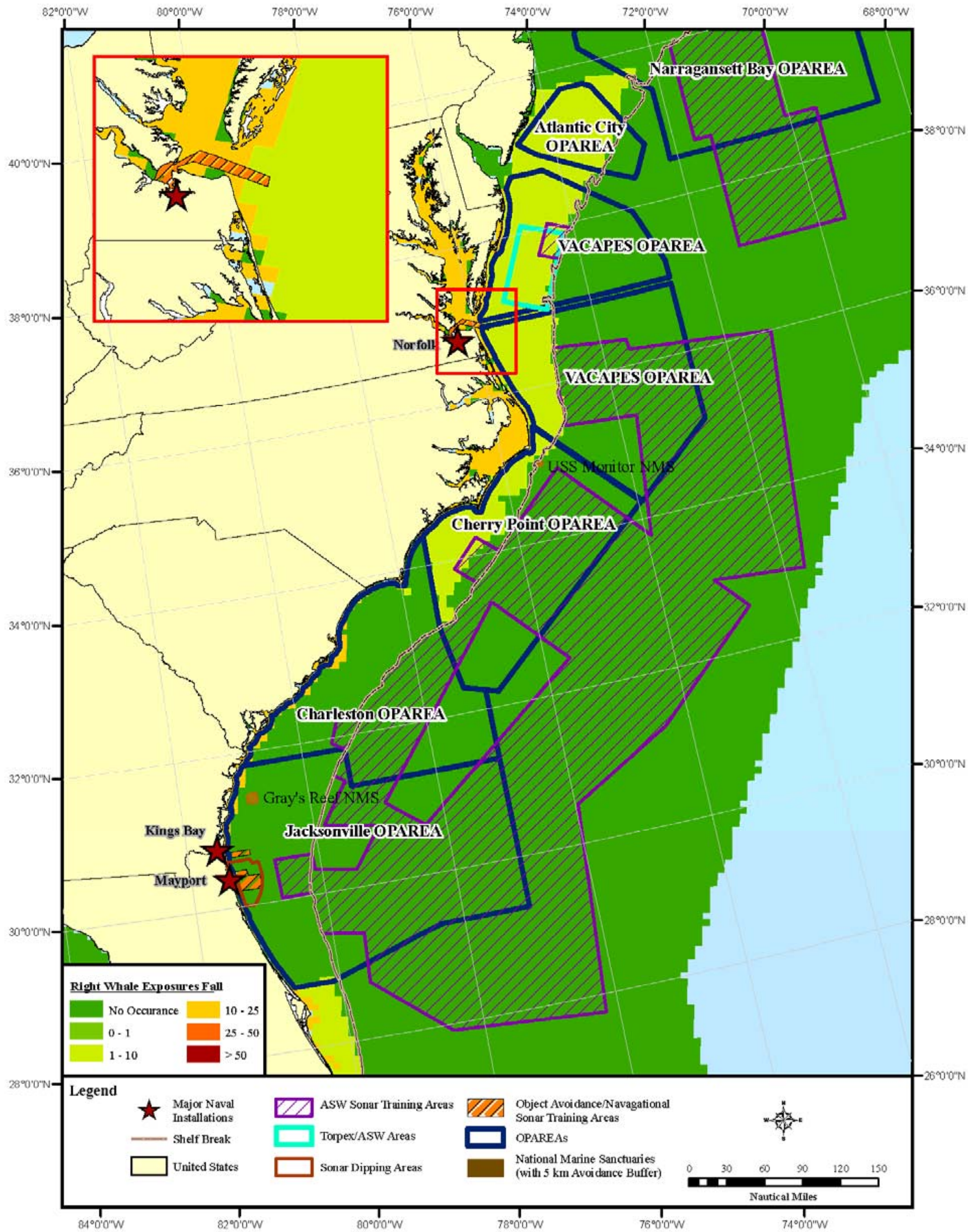

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Figure D-96. Alternative 2, Summer SE Right Whale (Fall)

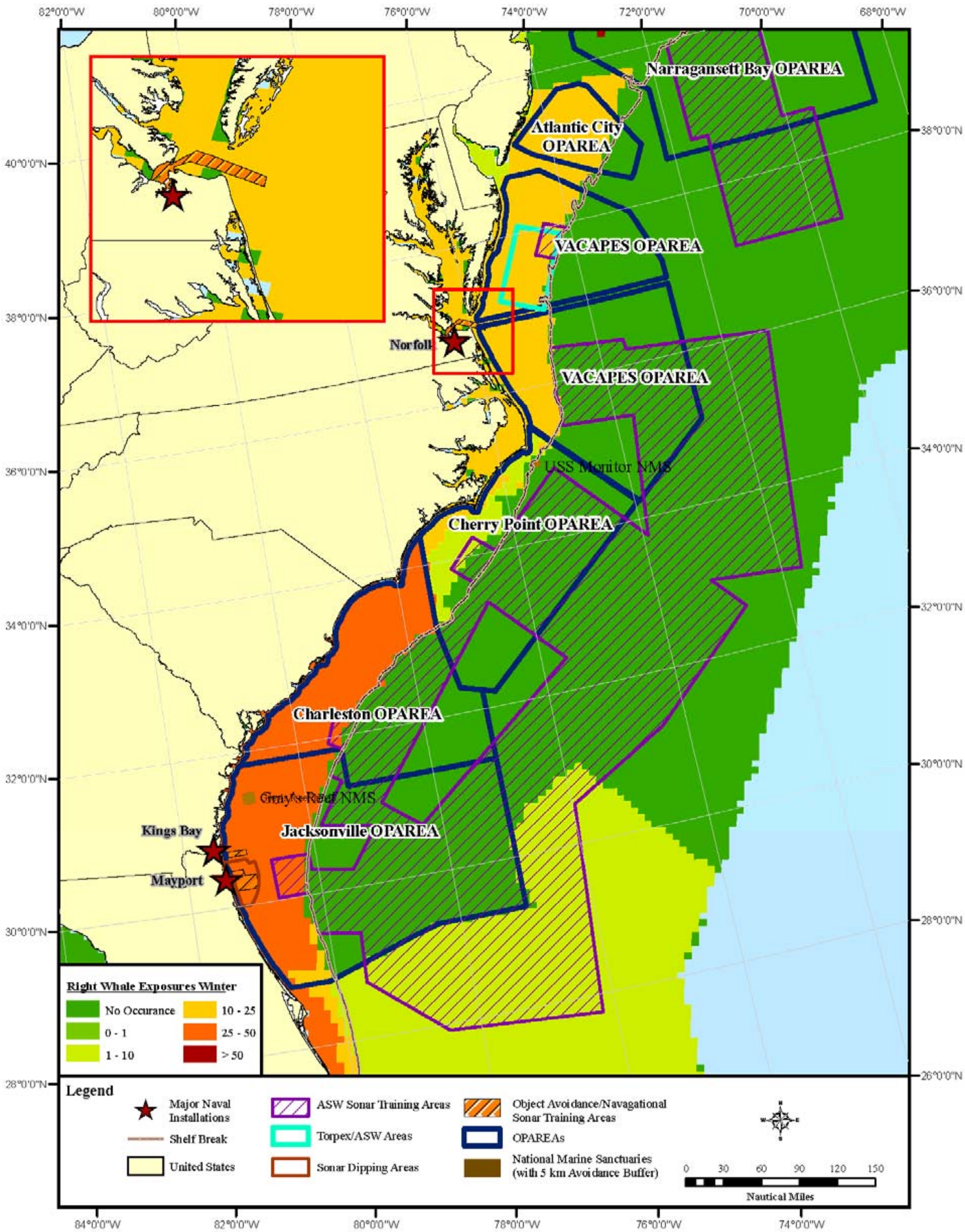

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Figure D-97. Alternative 2, Summer SE Right Whale (Winter)

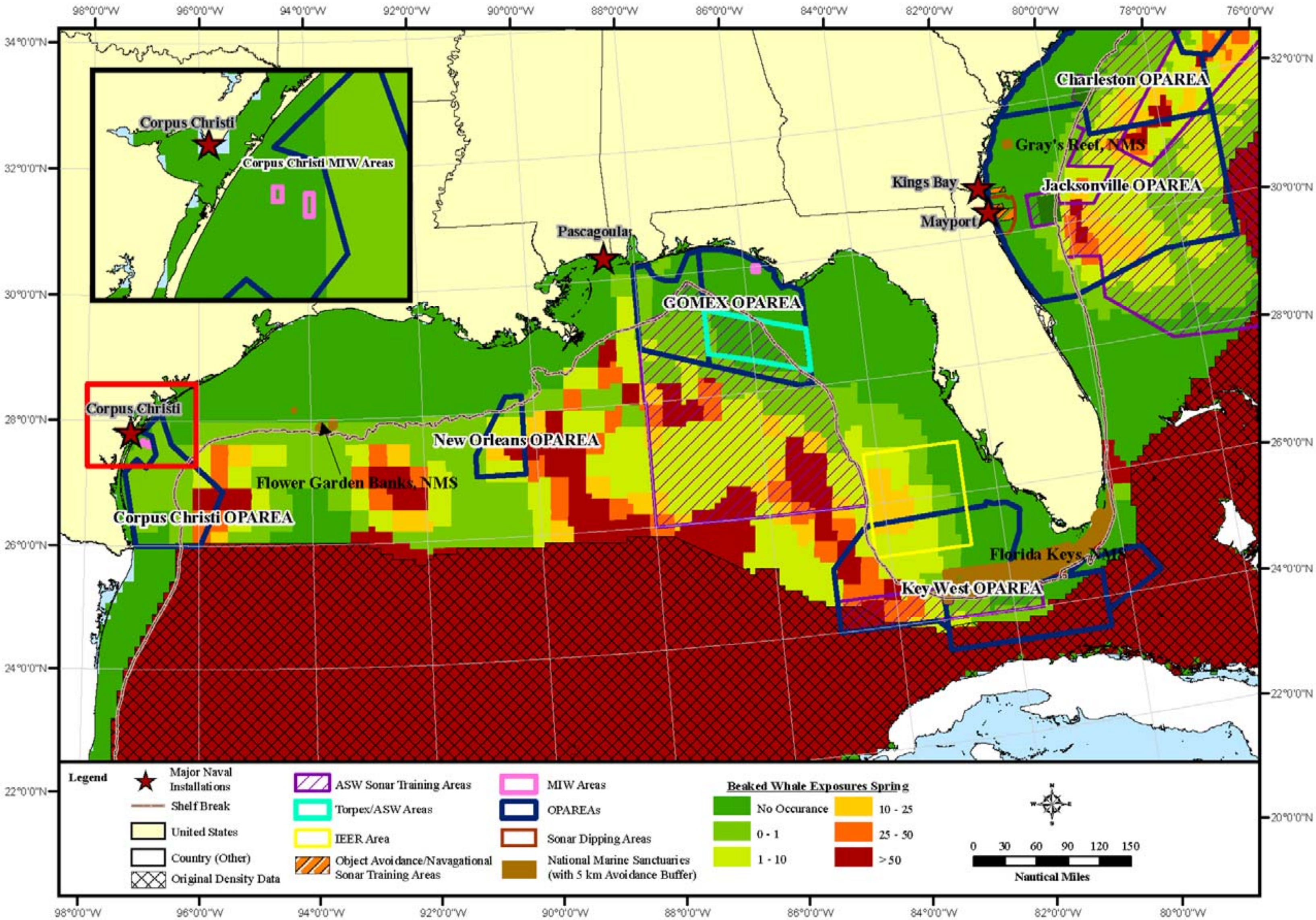
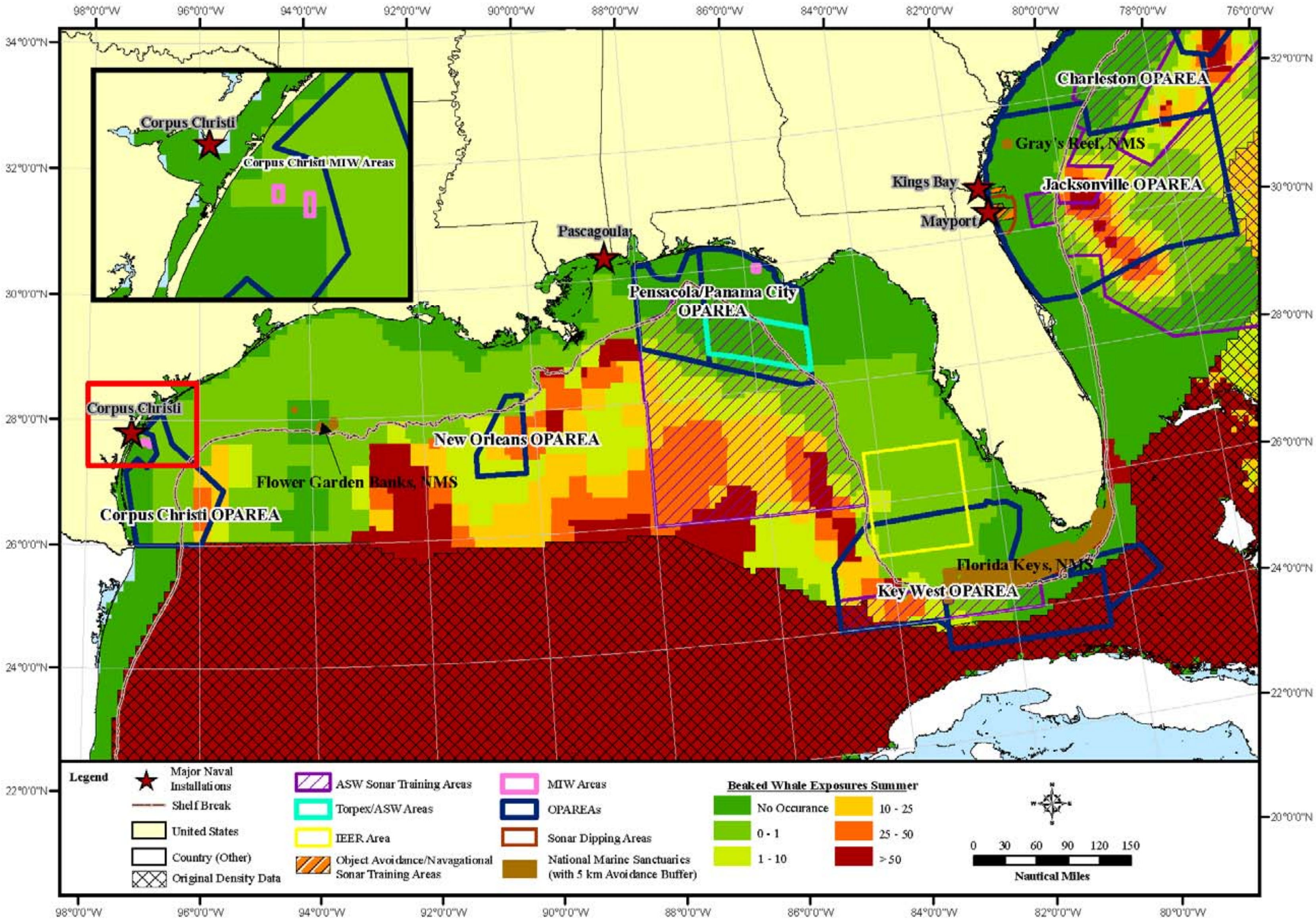


Figure D-98. Alternative 2, Summer GOMEX Beaked Whale (Spring)



1 **Figure D-99. Alternative 2, Summer GOMEX Beaked Whale (Summer)**

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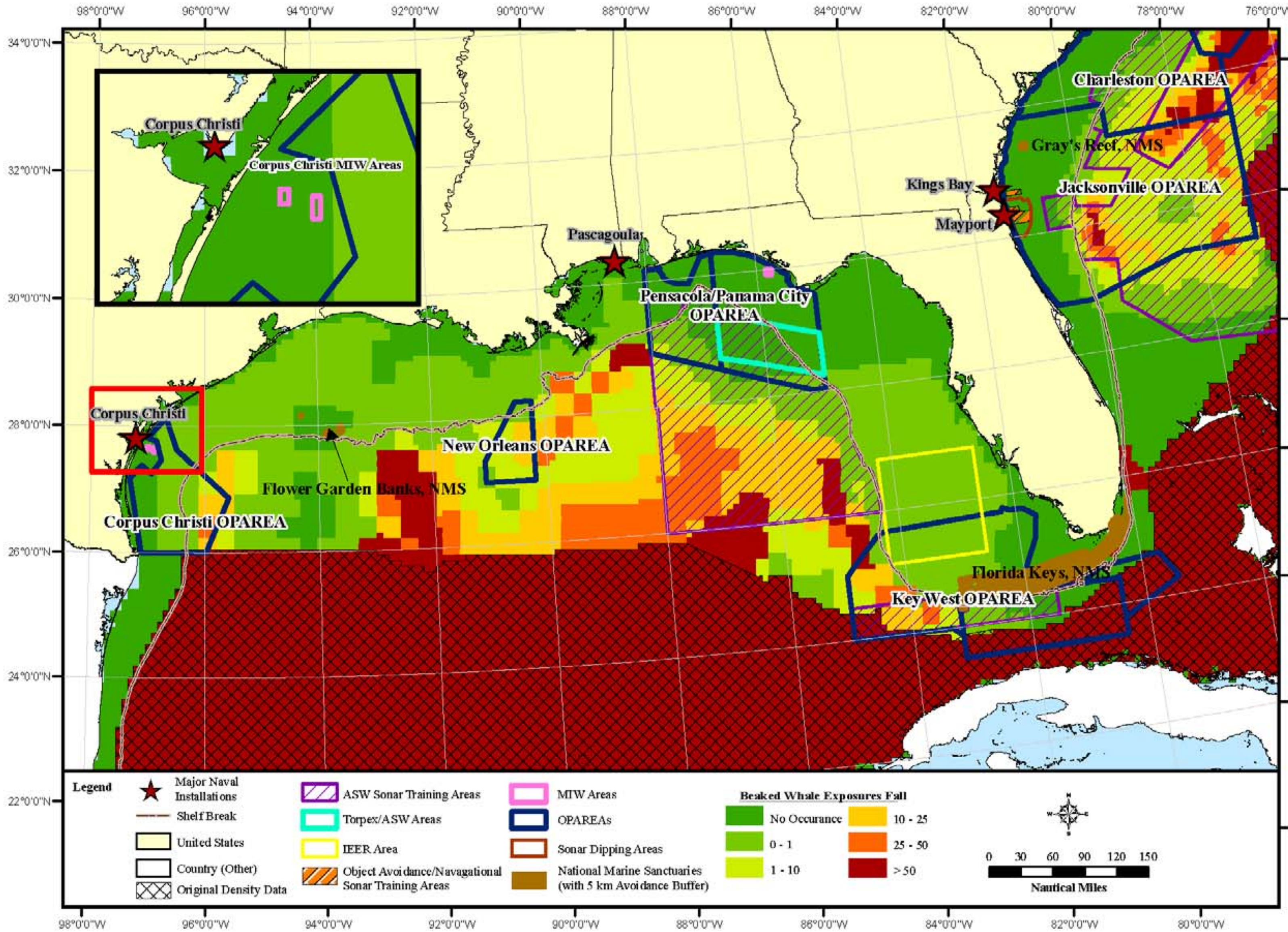
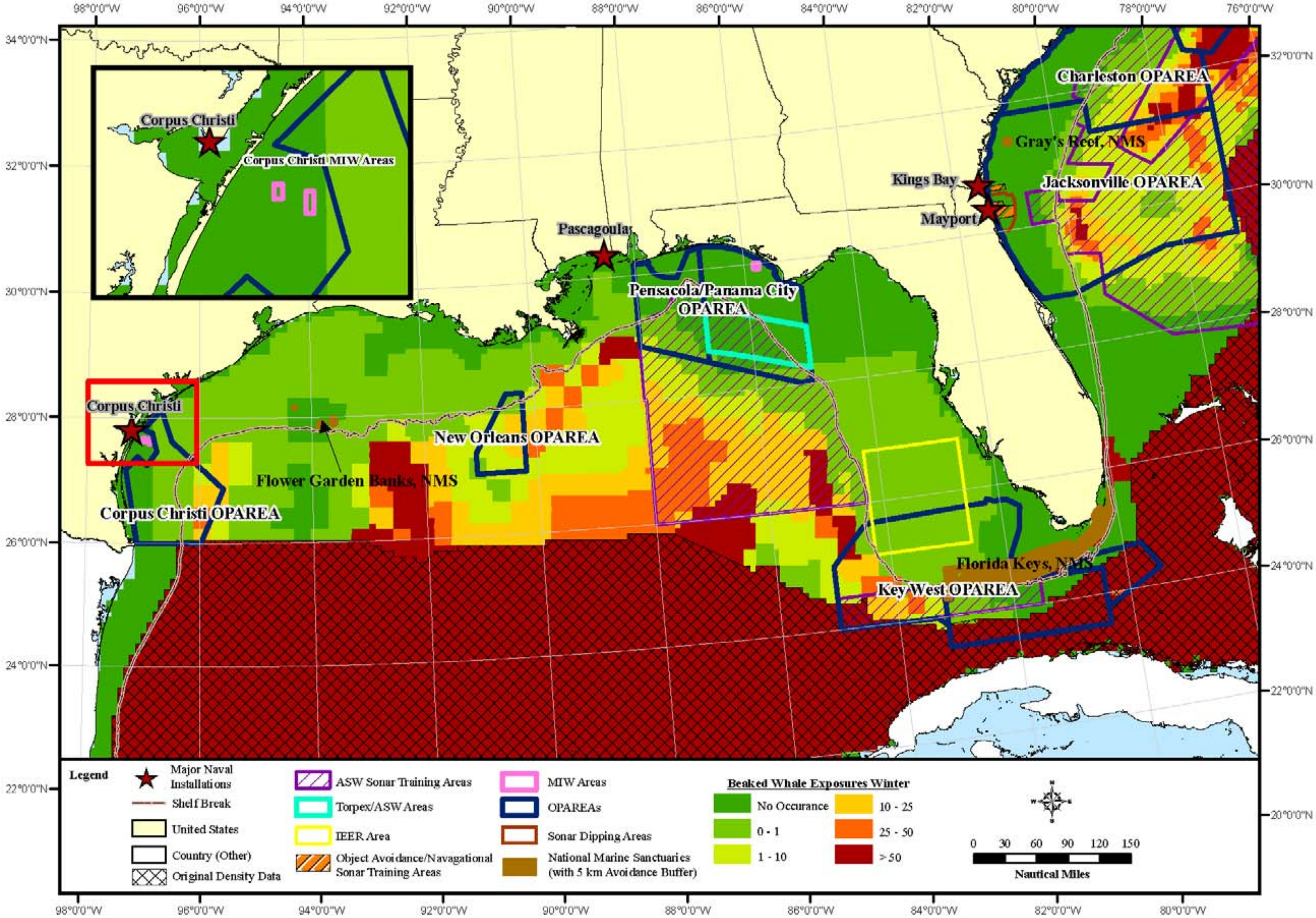


Figure D-100. Alternative 2, Summer GOMEX Beaked Whale (Fall)



1 **Figure D-101. Alternative 2, Summer GOMEX Beaked Whale (Winter)**

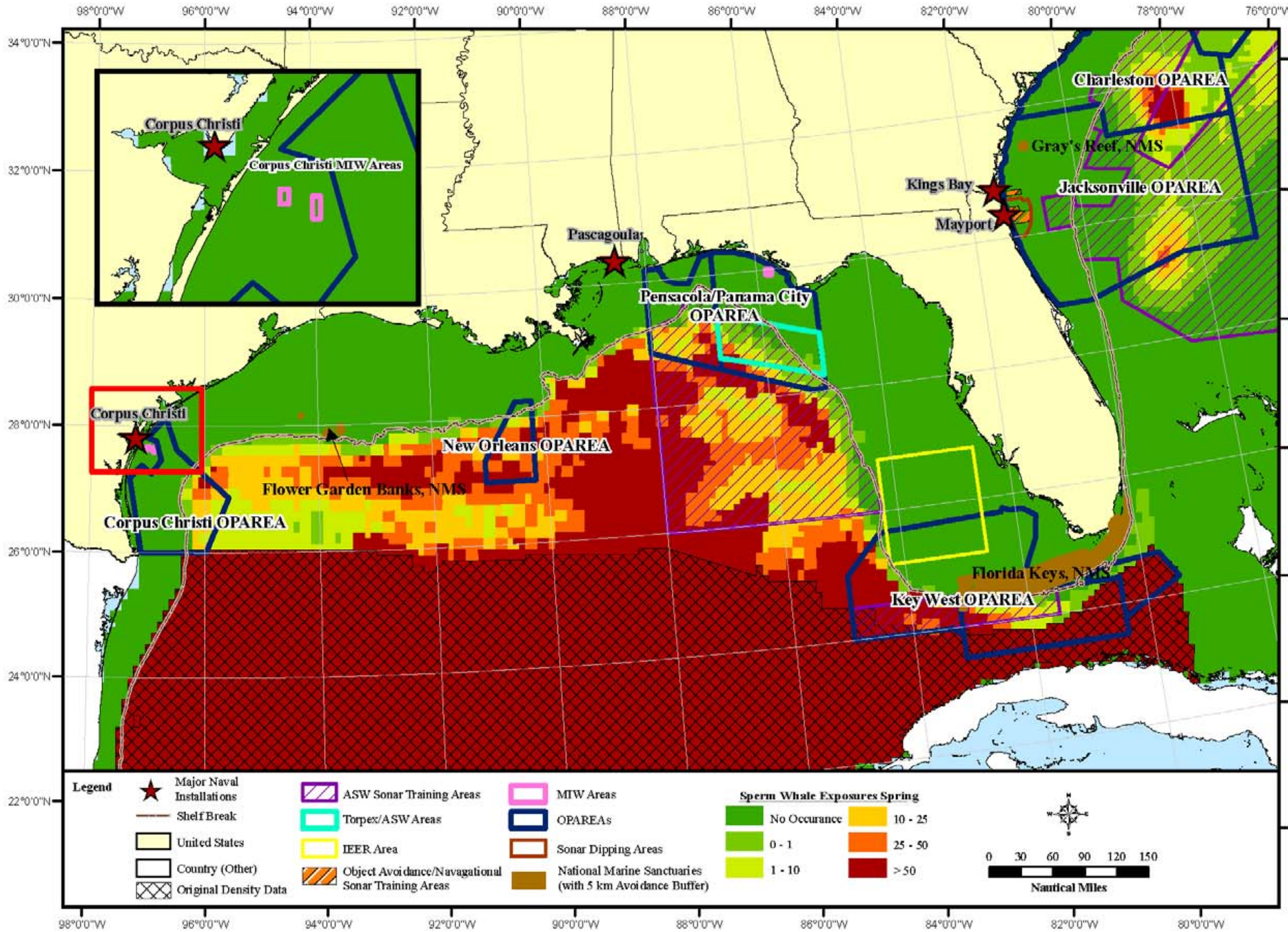


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Figure D-102. Alternative 2, Summer GOMEX Sperm Whale (Spring)

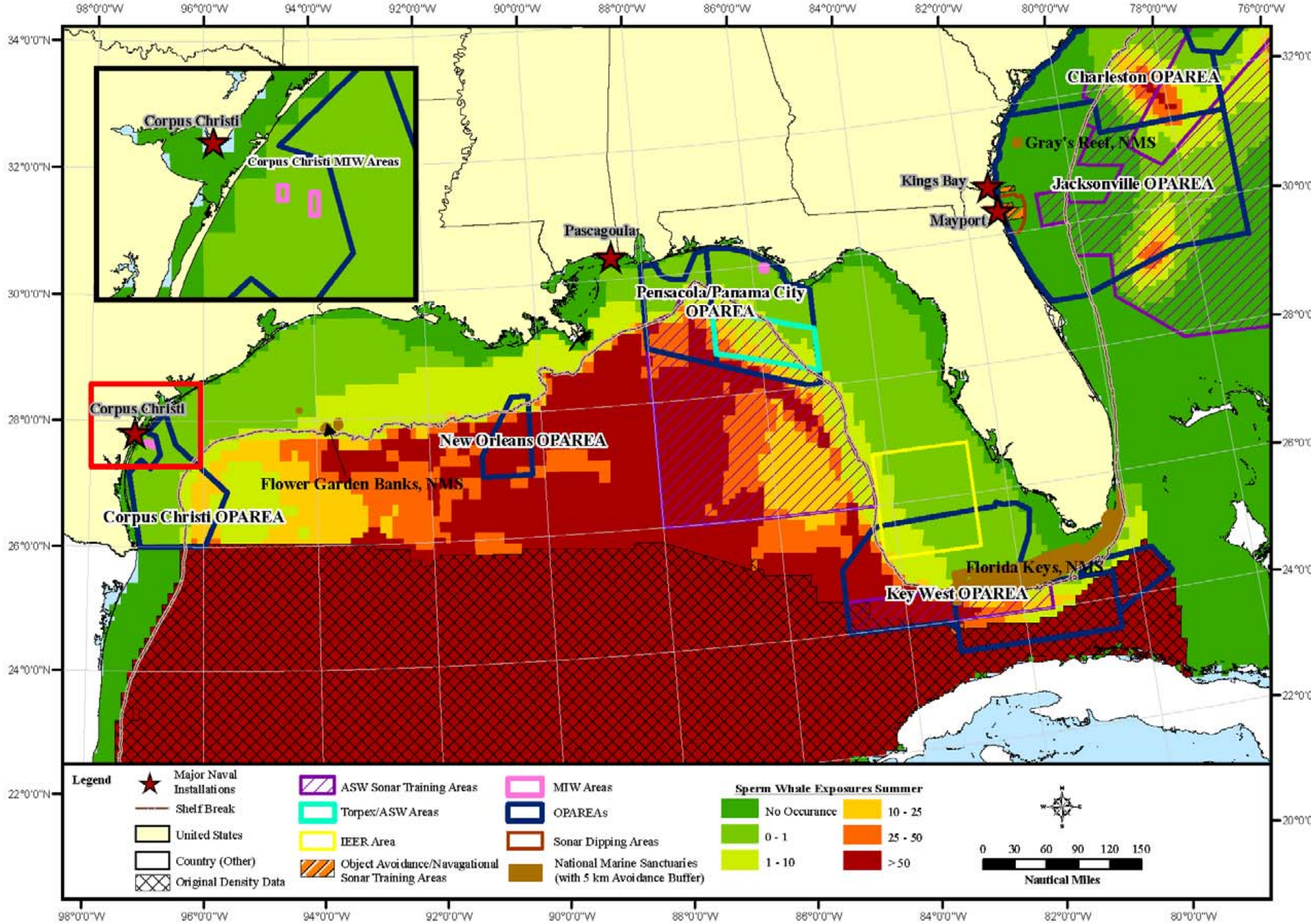

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Figure D-103. Alternative 2, Summer GOMEX Sperm Whale (Summer)

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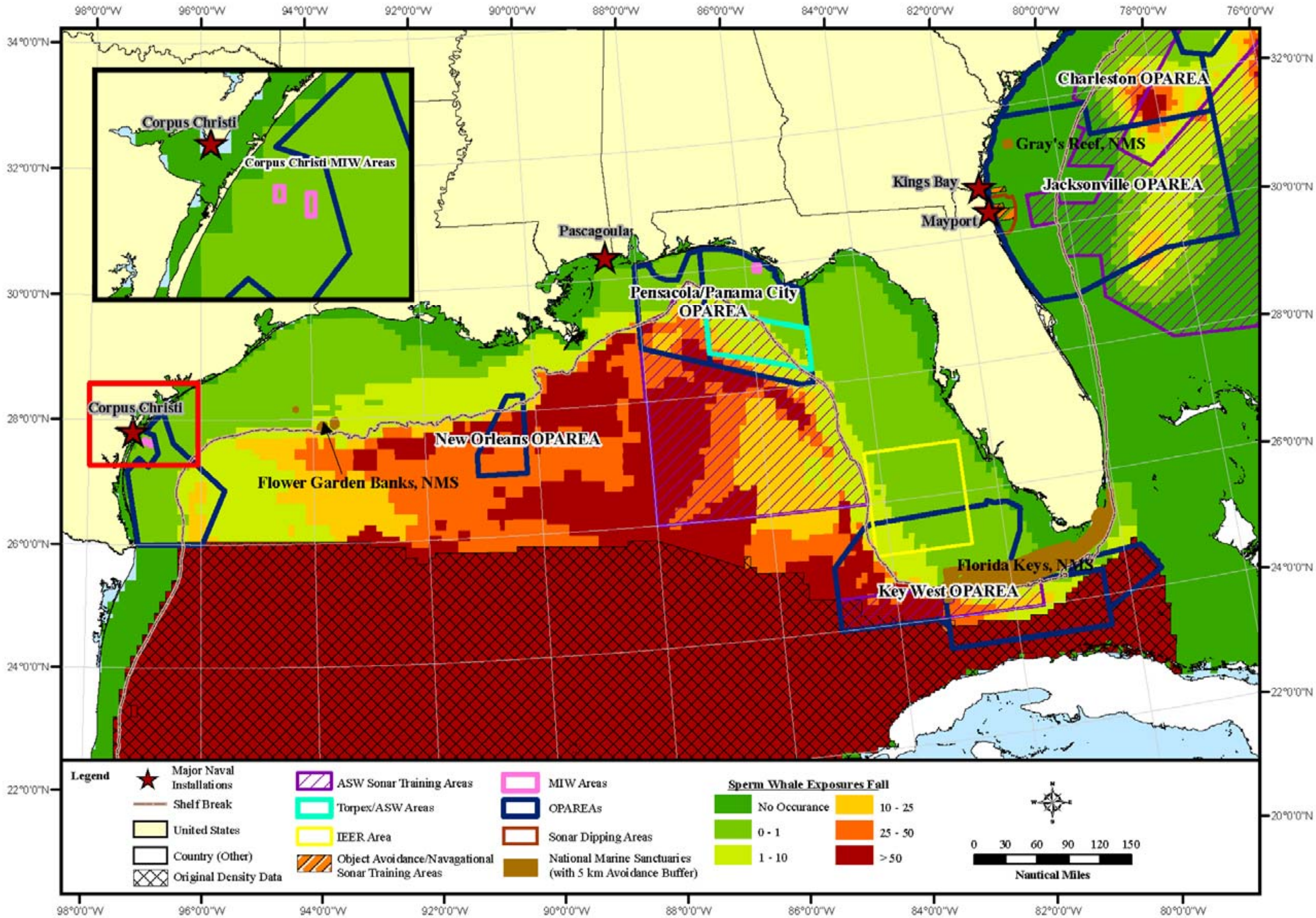
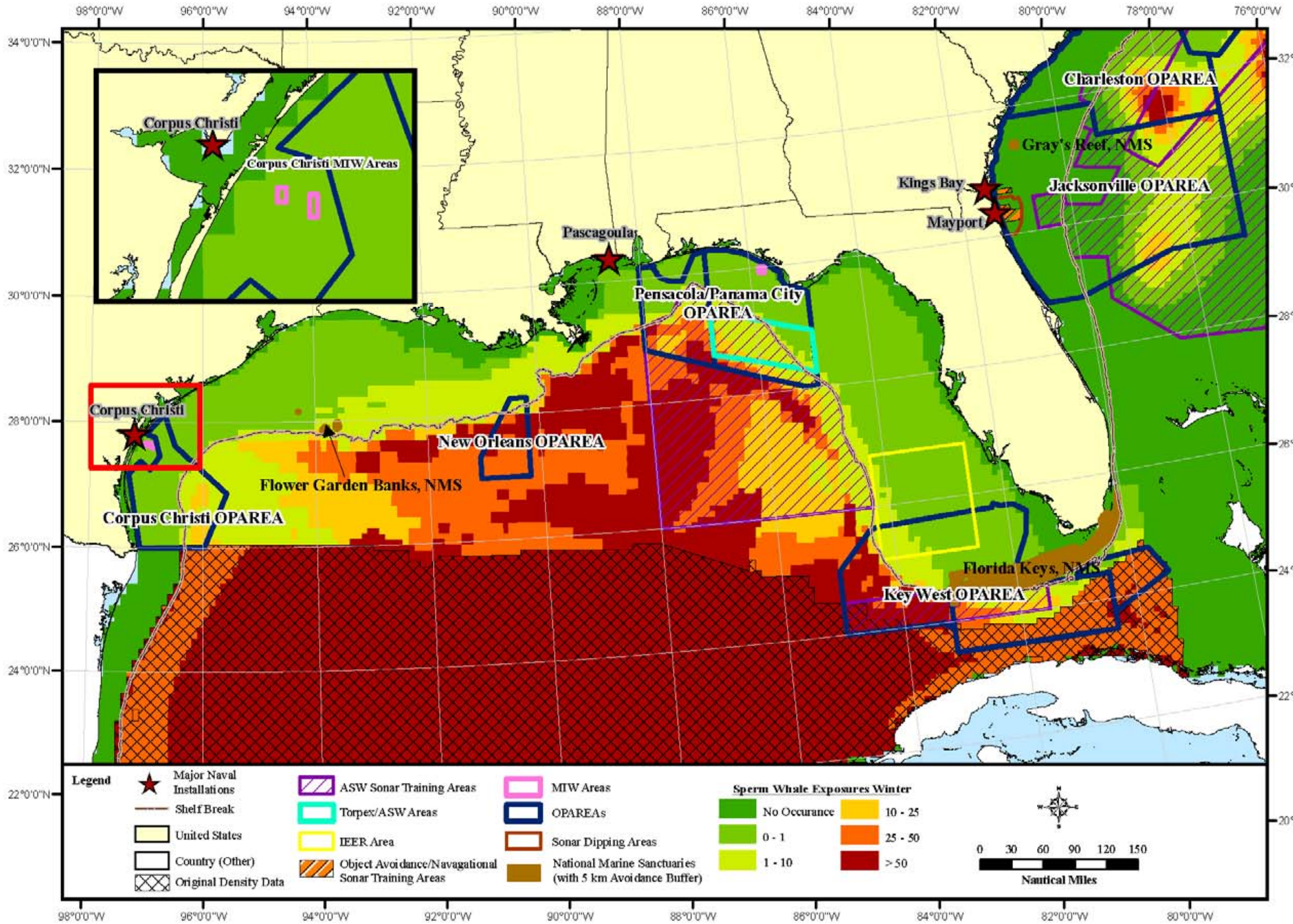
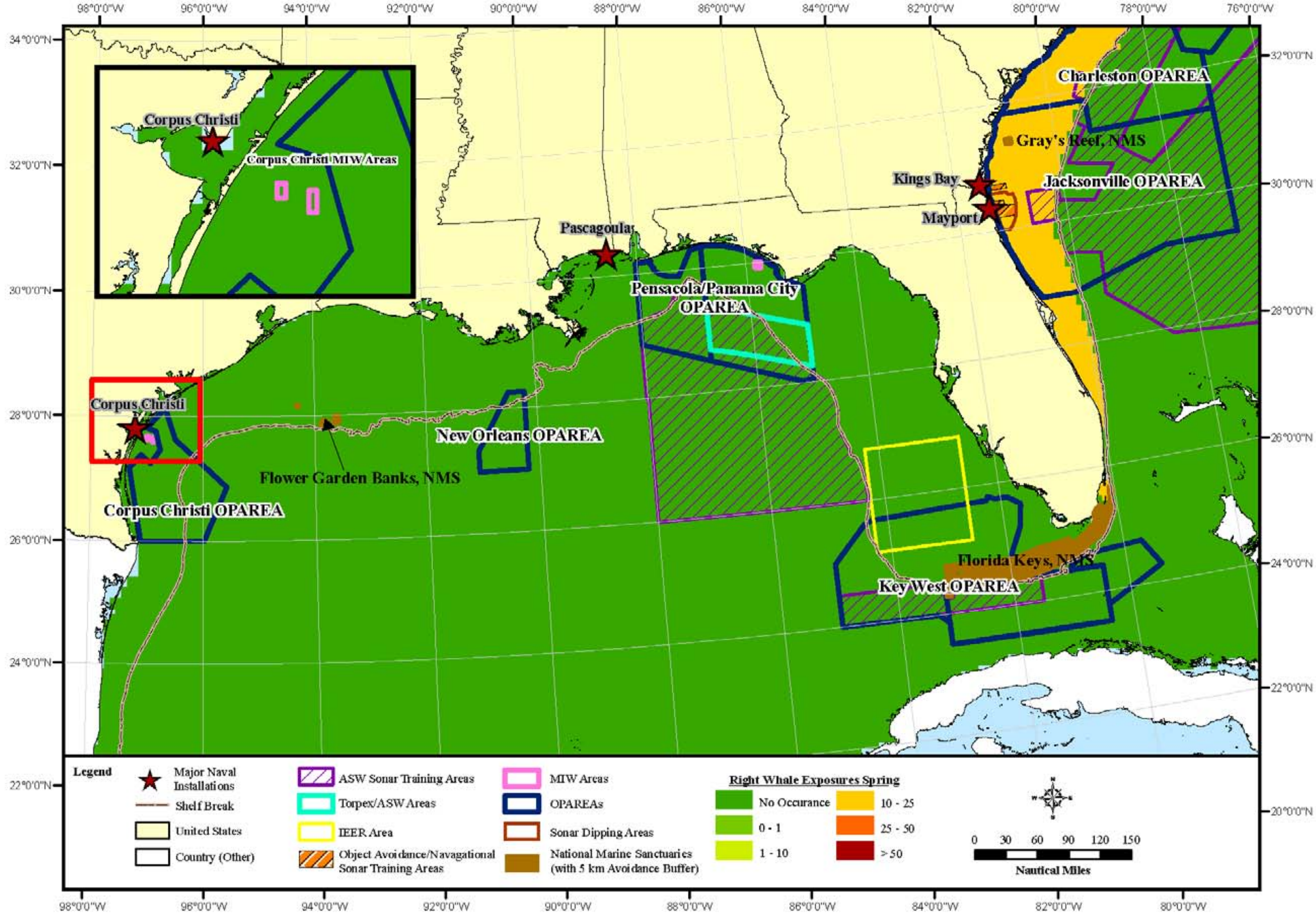


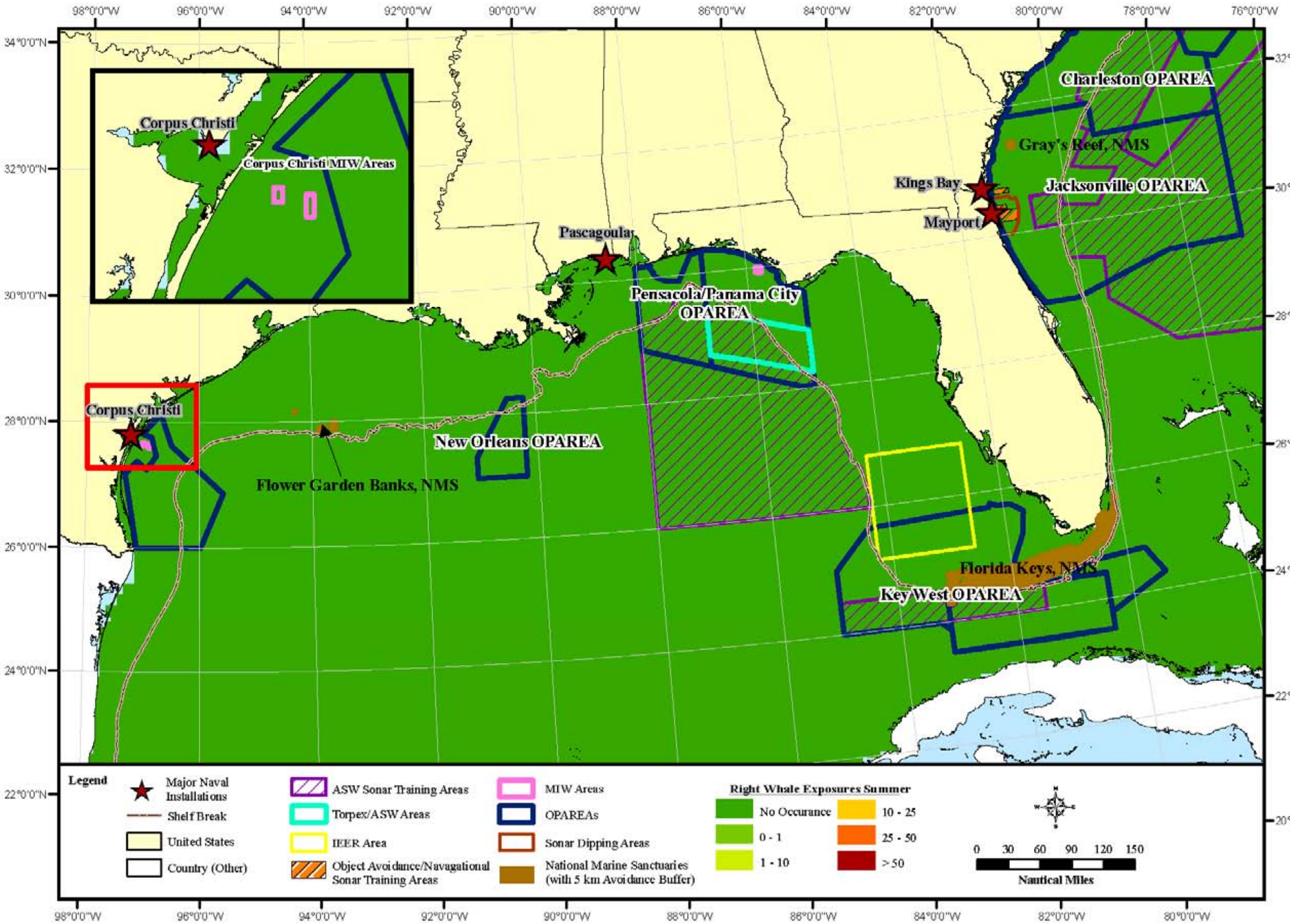
Figure D-104. Alternative 2, Summer GOMEX Sperm Whale (Fall)



1 **Figure D-105. Alternative 2, Summer GOMEX Sperm Whale (Winter)**



1 **Figure D-106. Alternative 2, Summer GOMEX Right Whale (Spring)**



1 **Figure D-107. Alternative 2, Summer GOMEX Right Whale (Summer)**

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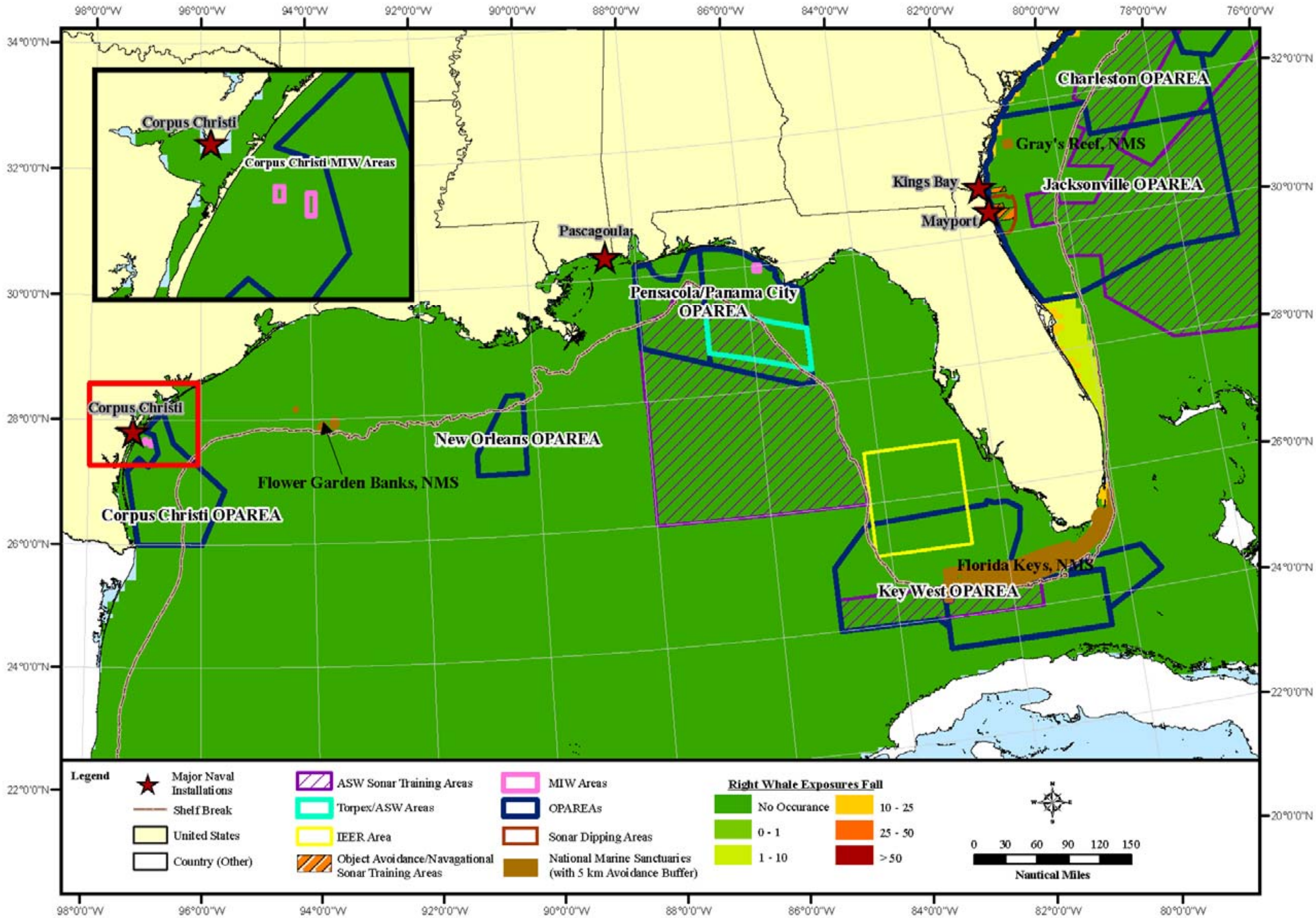
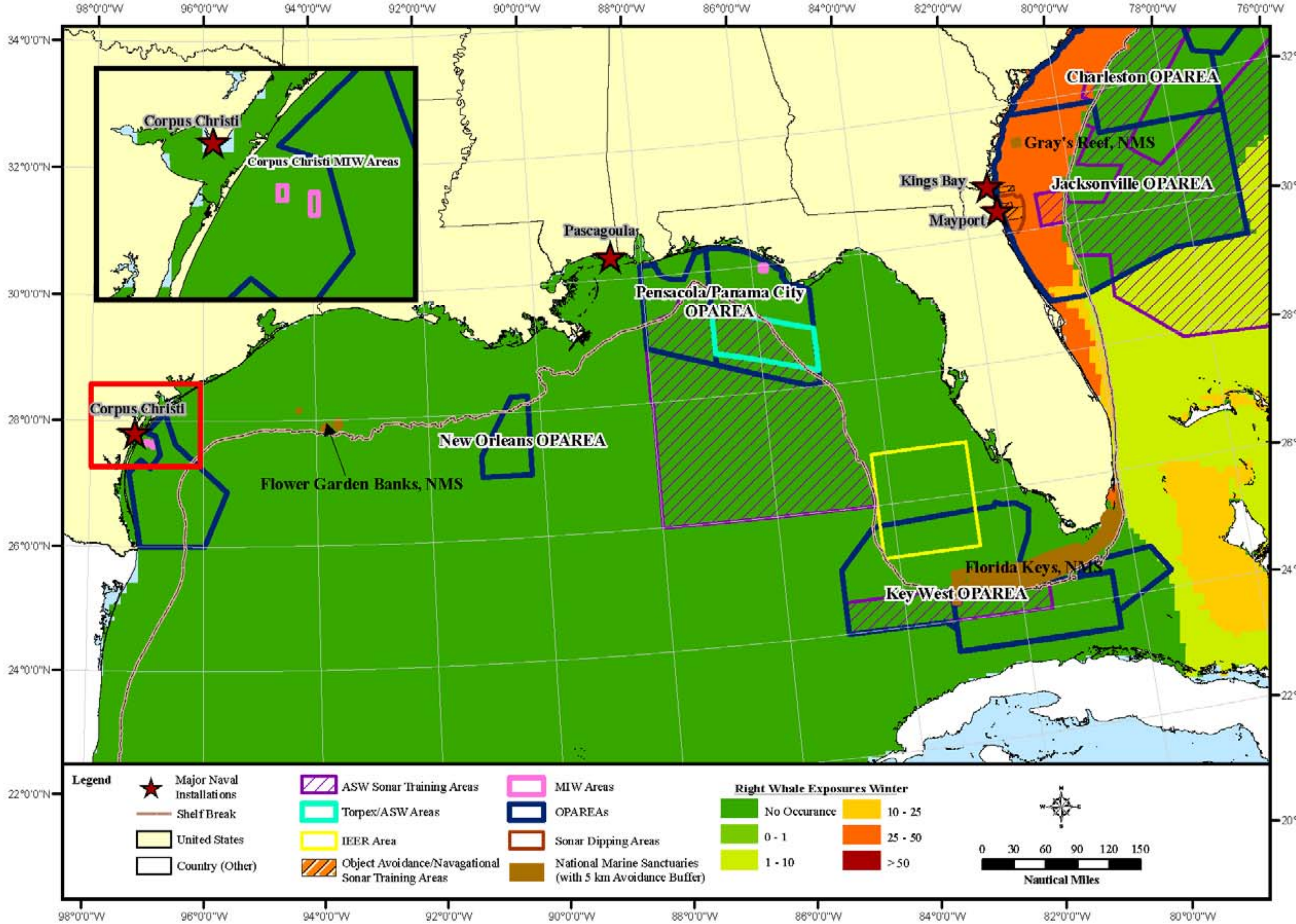


Figure D-108. Alternative 2, Summer GOMEX Right Whale (Fall)



1 **Figure D-109. Alternative 2, Summer GOMEX Right Whale (Winter)**

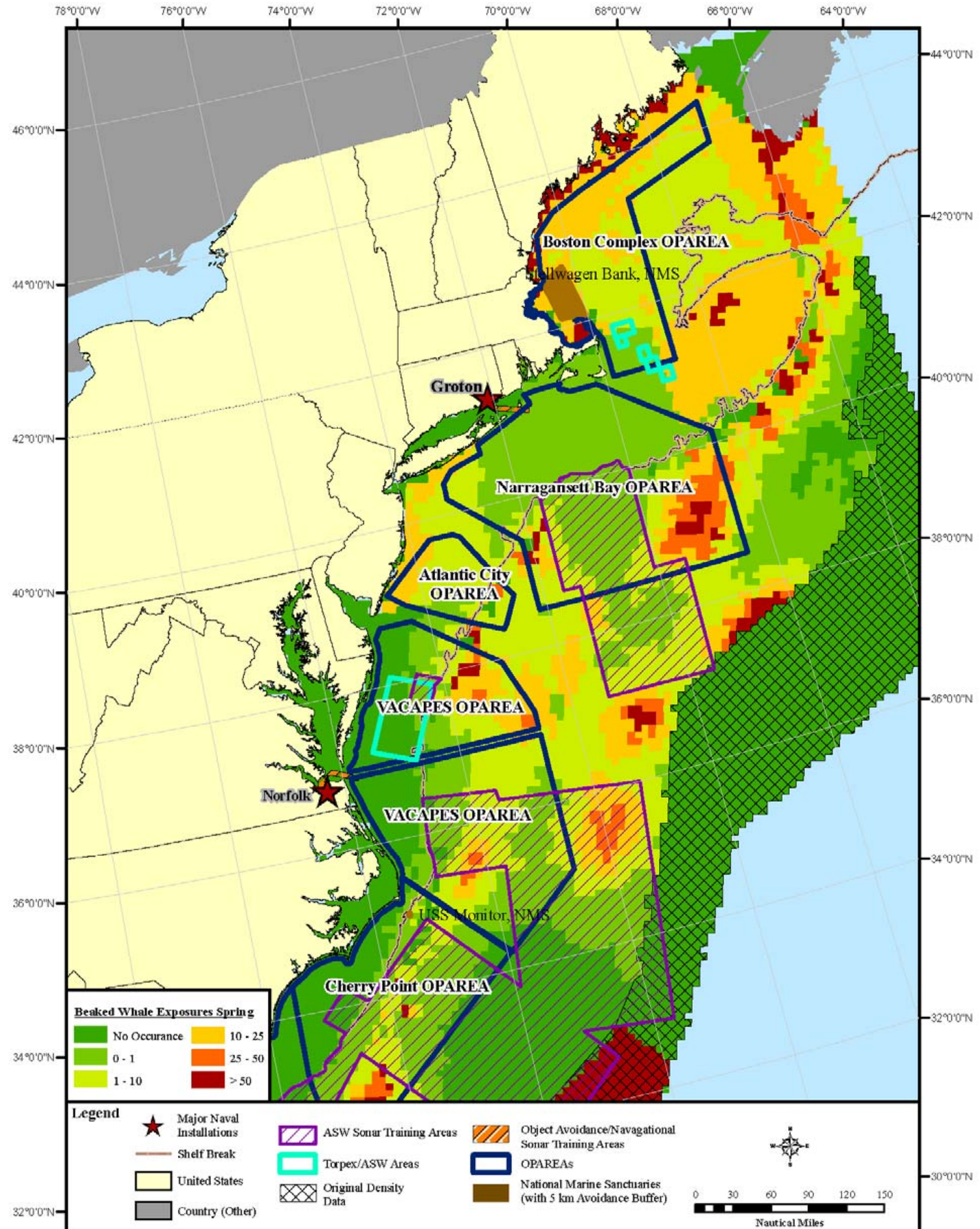


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Figure D-110. Alternative 2, Fall NE Beaked Whale (Spring)

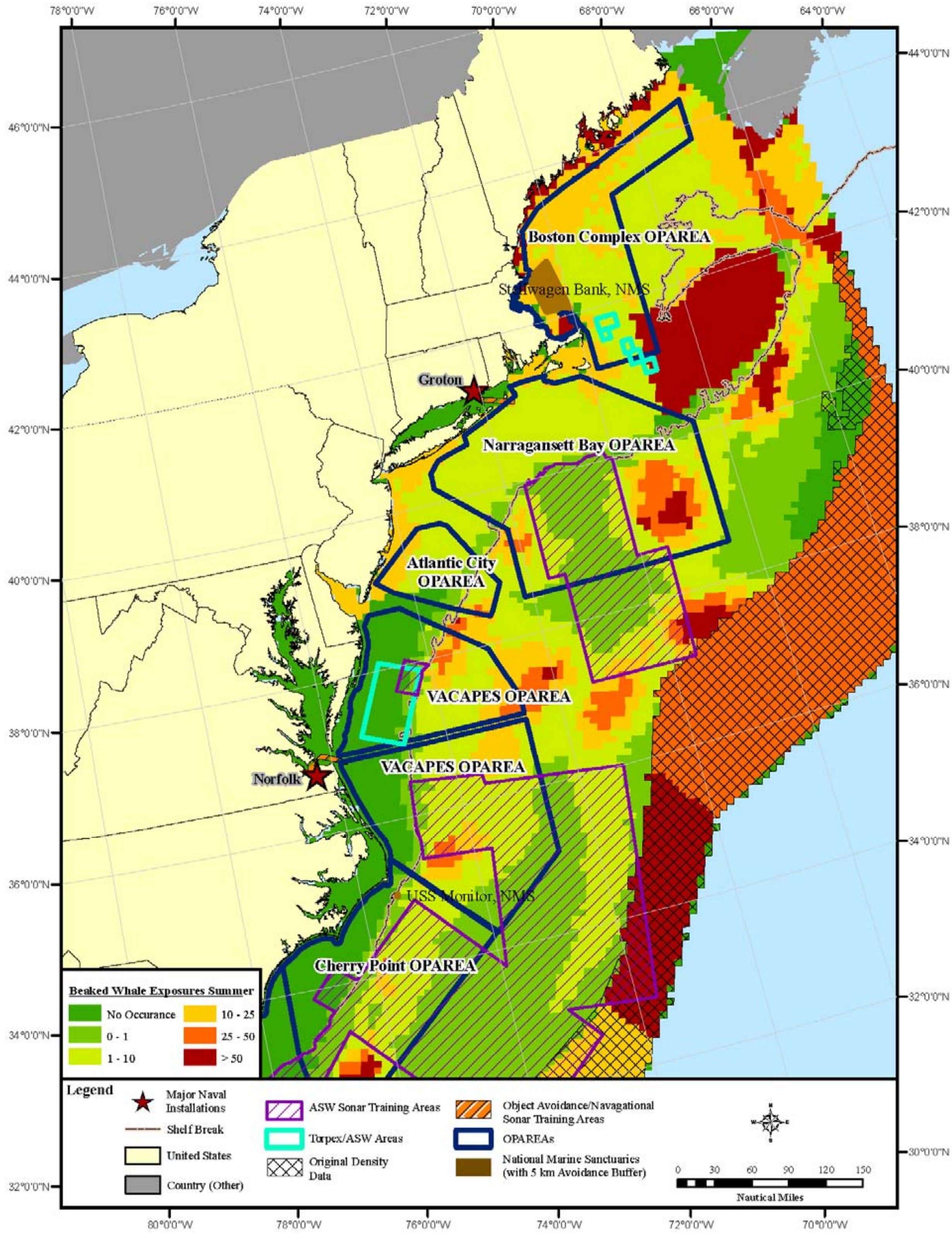

Figure D-111. Alternative 2, Fall NE Beaked Whale (Summer)

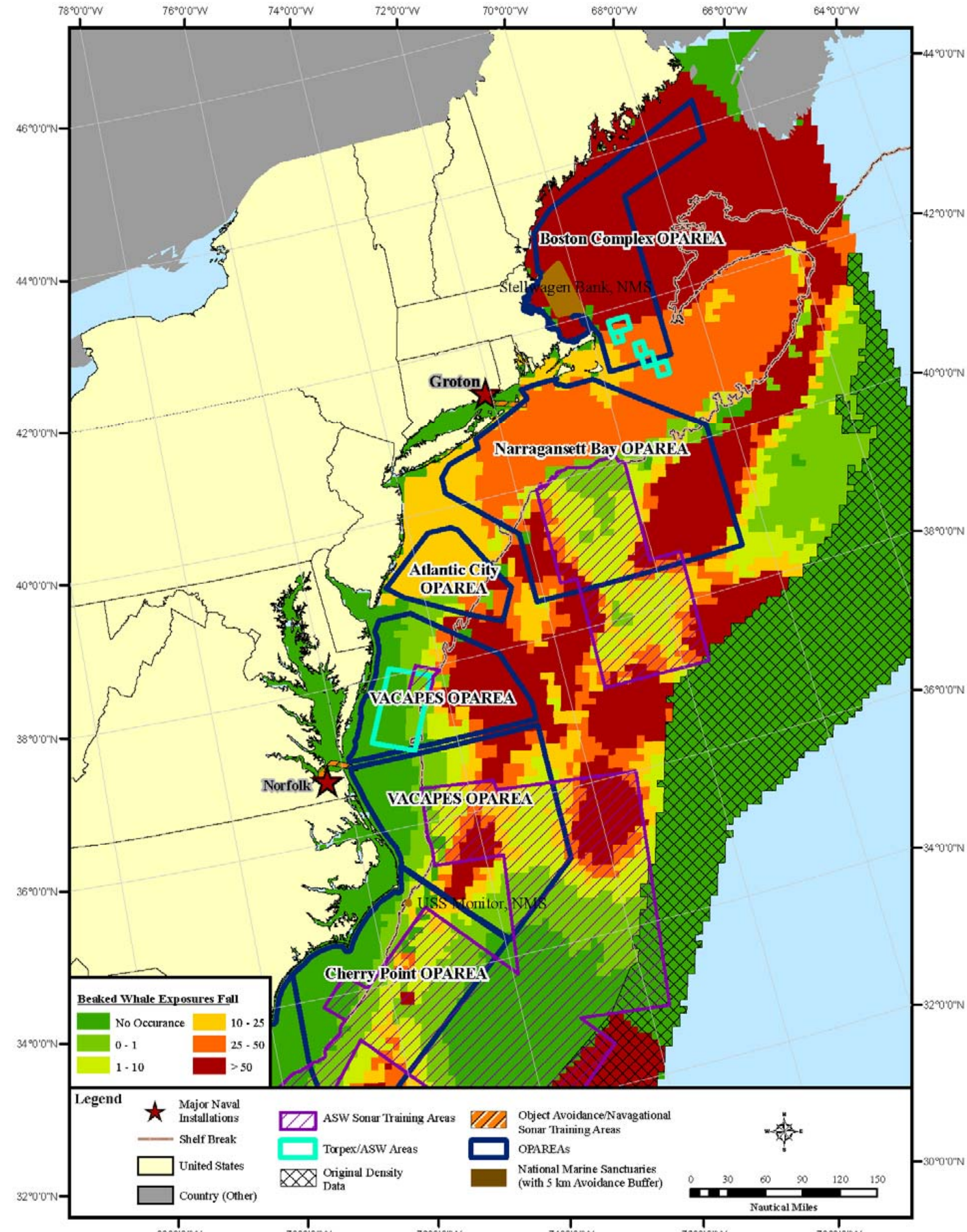

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Figure D-112. Alternative 2, Fall NE Beaked Whale (Fall)

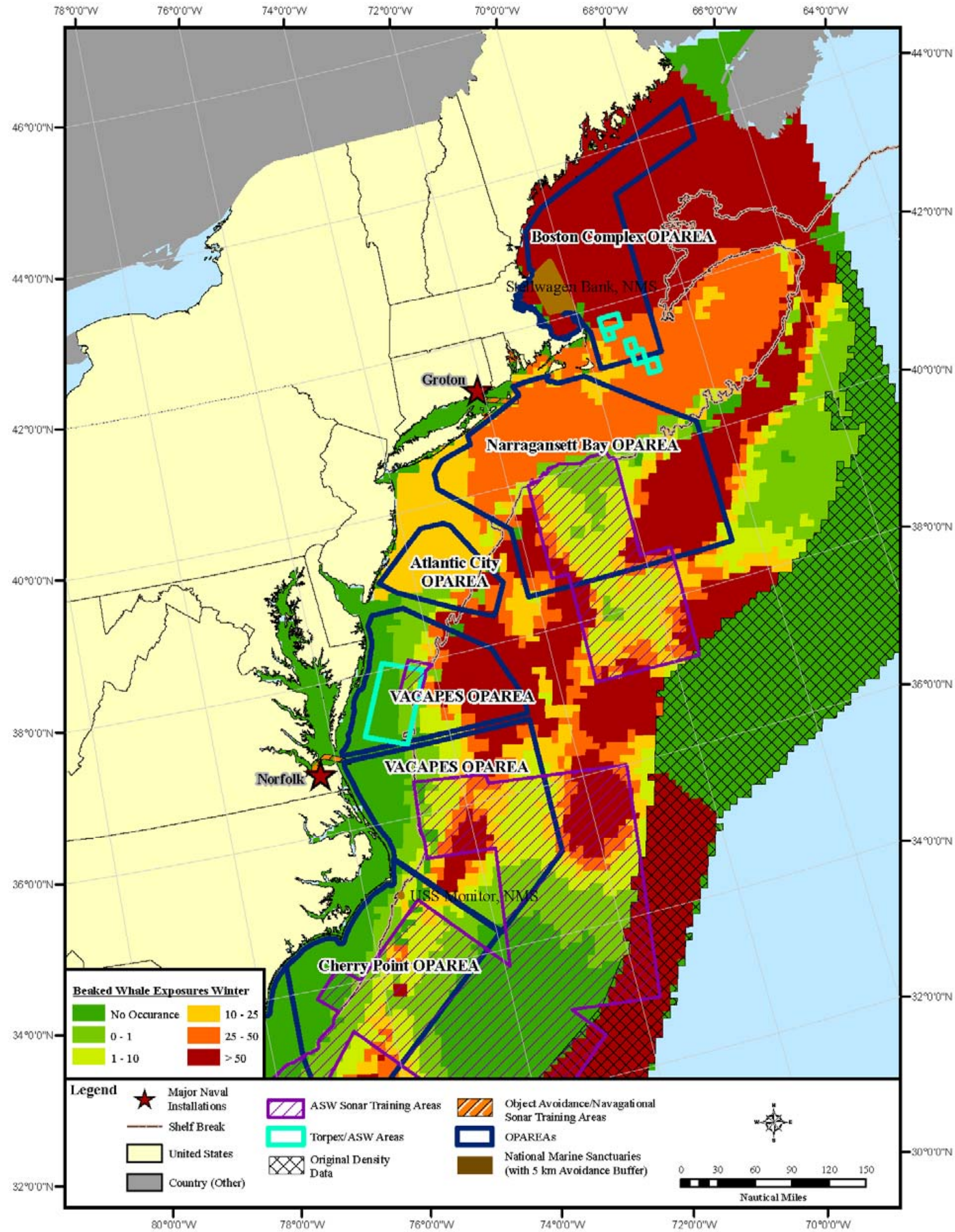

Figure D-113. Alternative 2, Fall NE Beaked Whale (Winter)

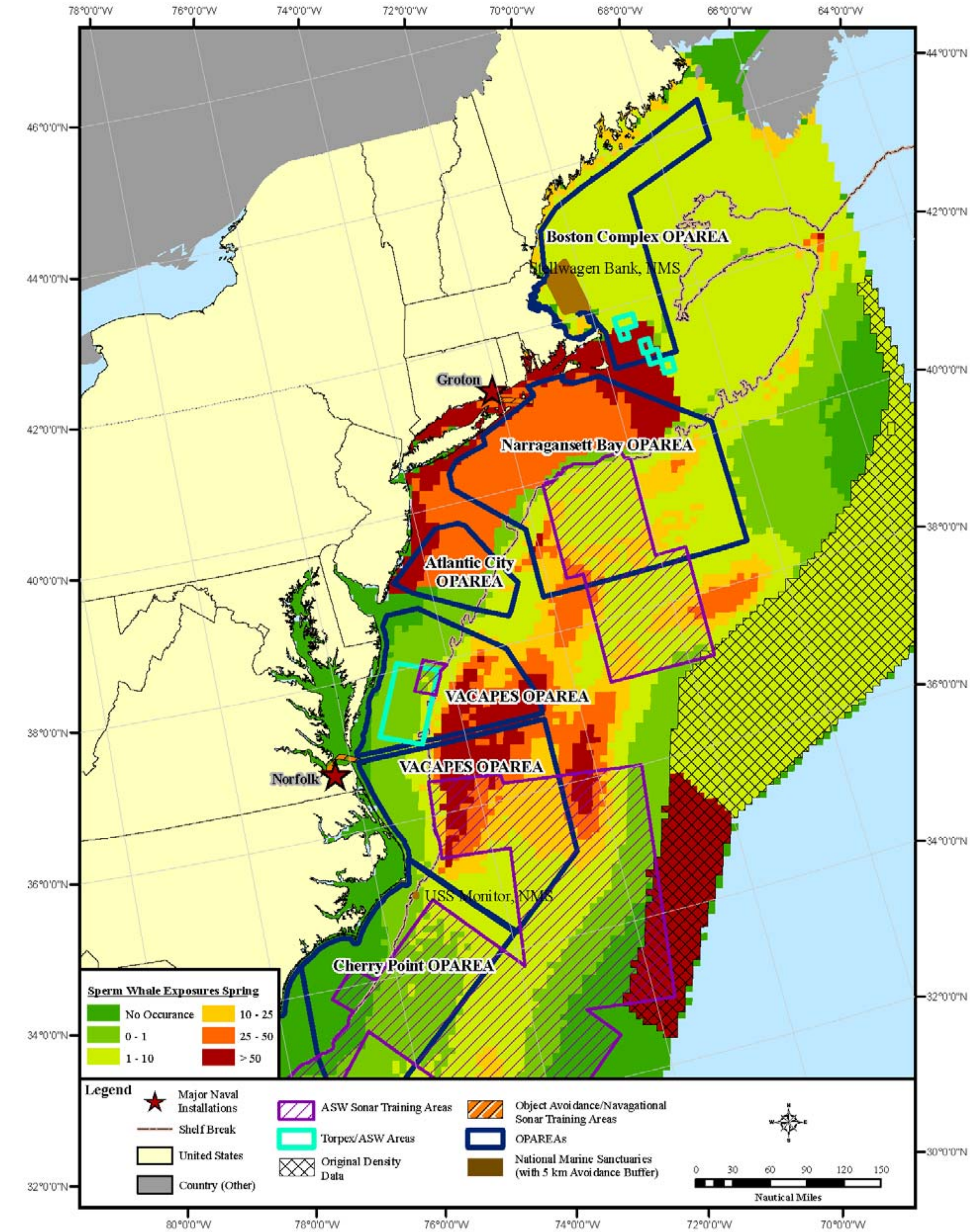

Figure D-114. Alternative 2, Fall NE Sperm Whale (Spring)

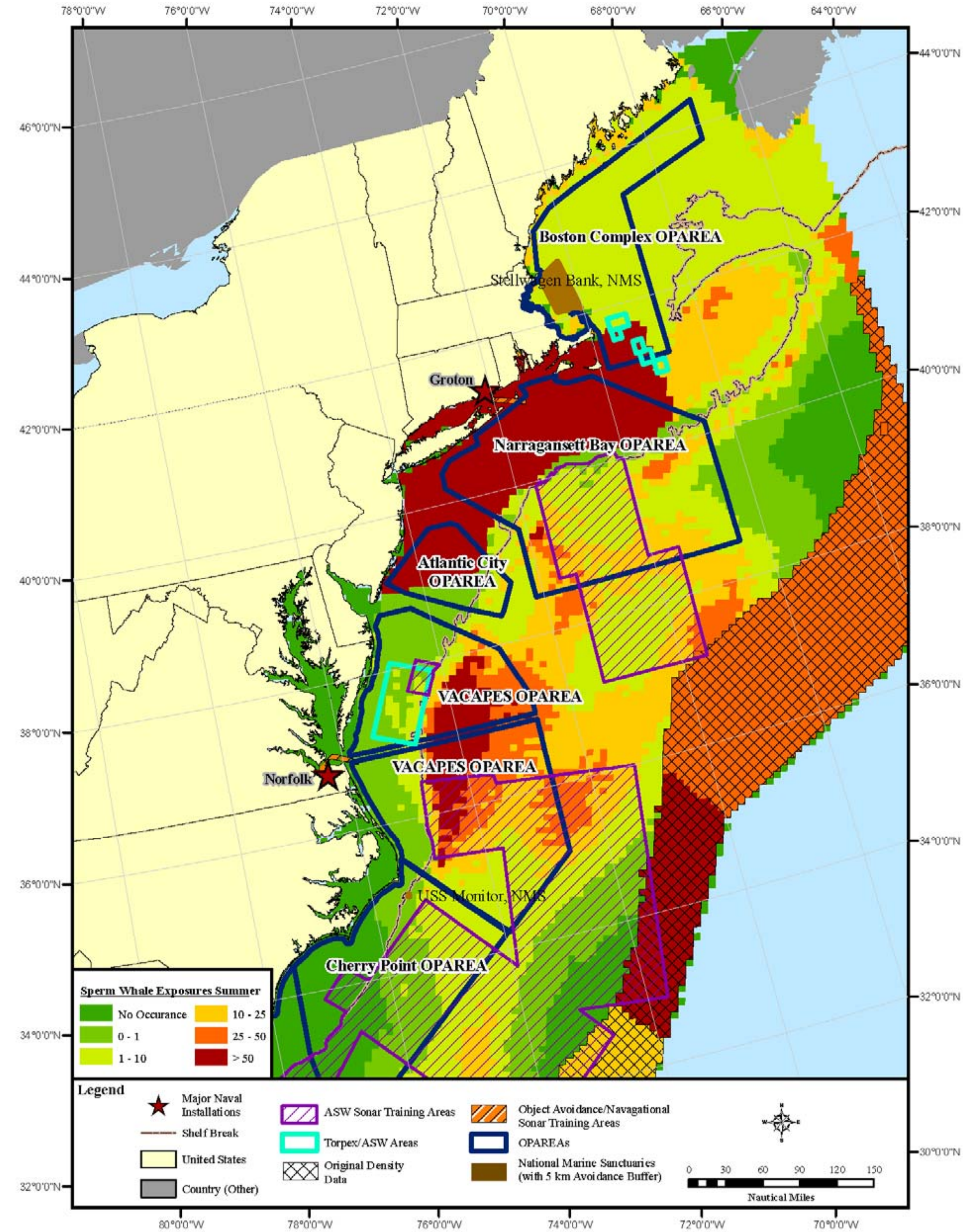

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Figure D-115. Alternative 2, Fall NE Sperm Whale (Summer)

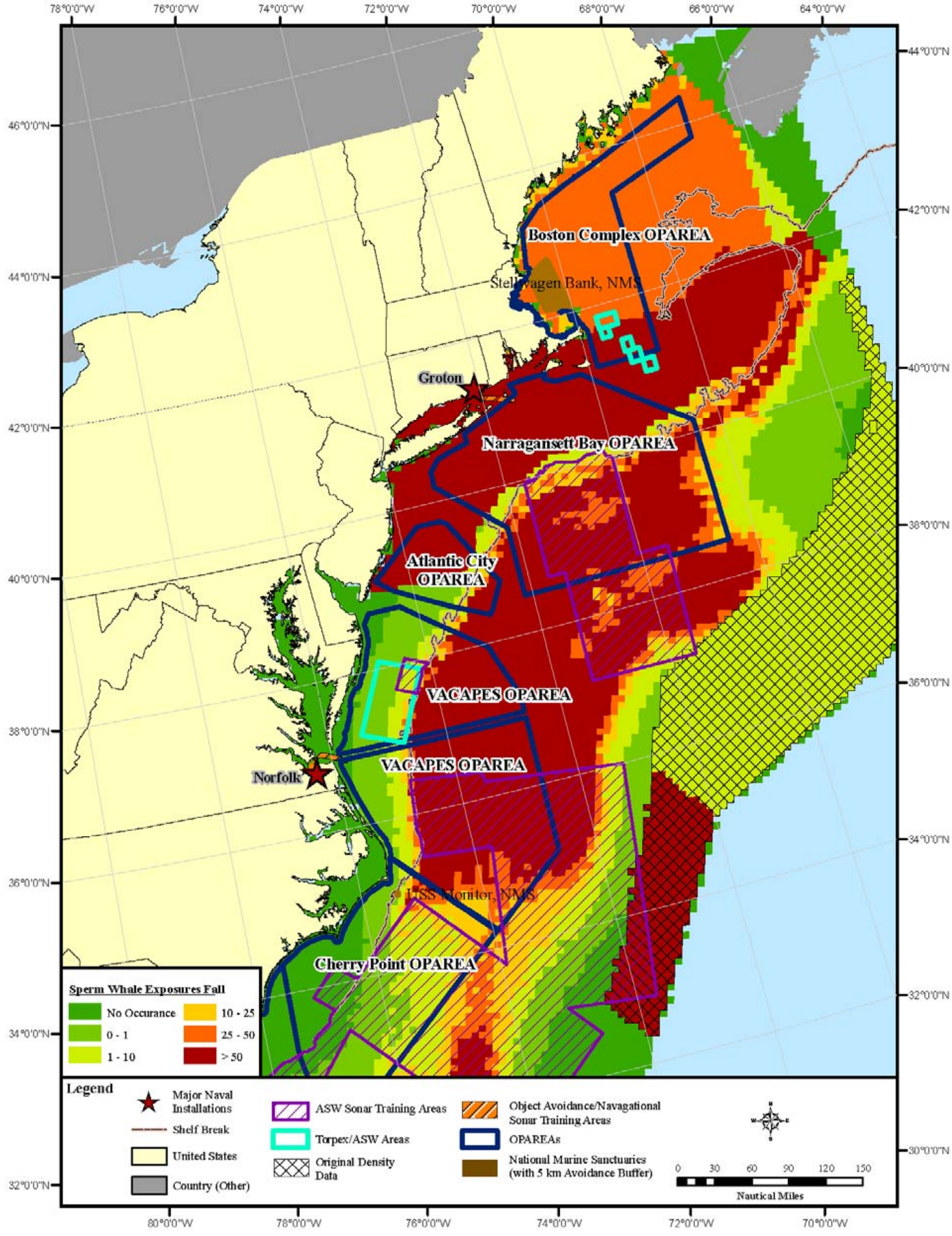

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Figure D-116. Alternative 2, Fall NE Sperm Whale (Fall)

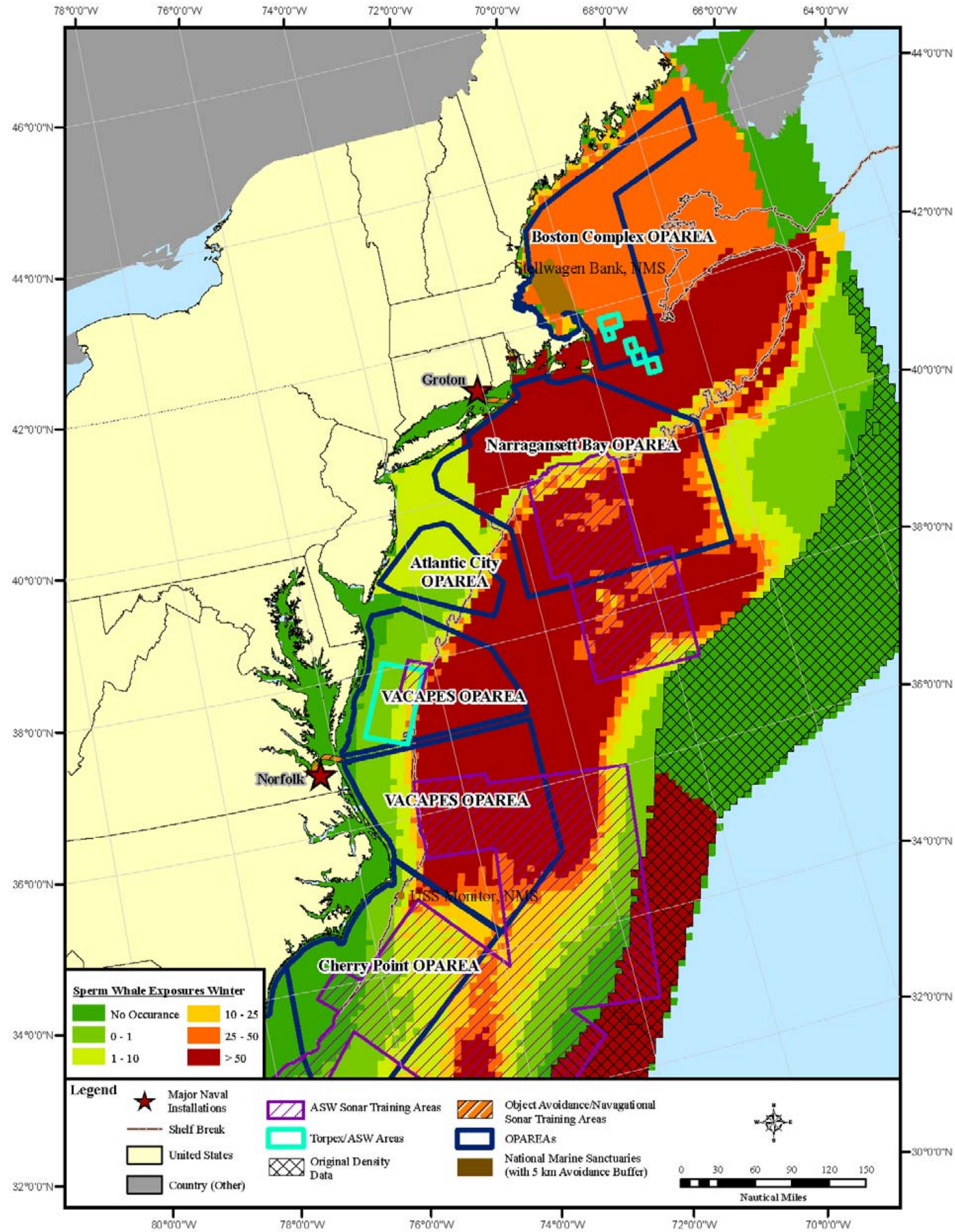

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Figure D-117. Alternative 2, Fall NE Sperm Whale (Winter)

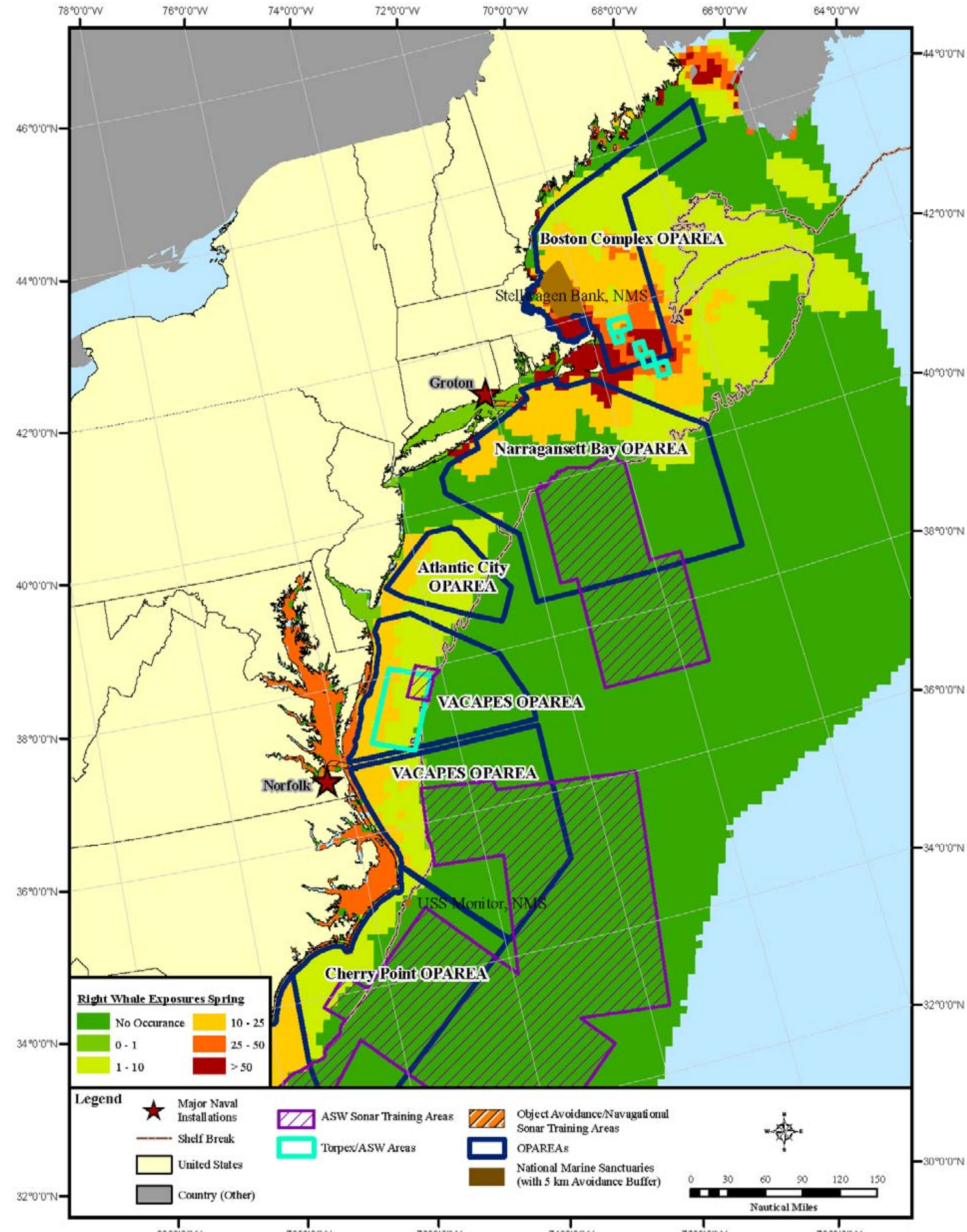

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Figure D-118. Alternative 2, Fall NE Right Whale (Spring)

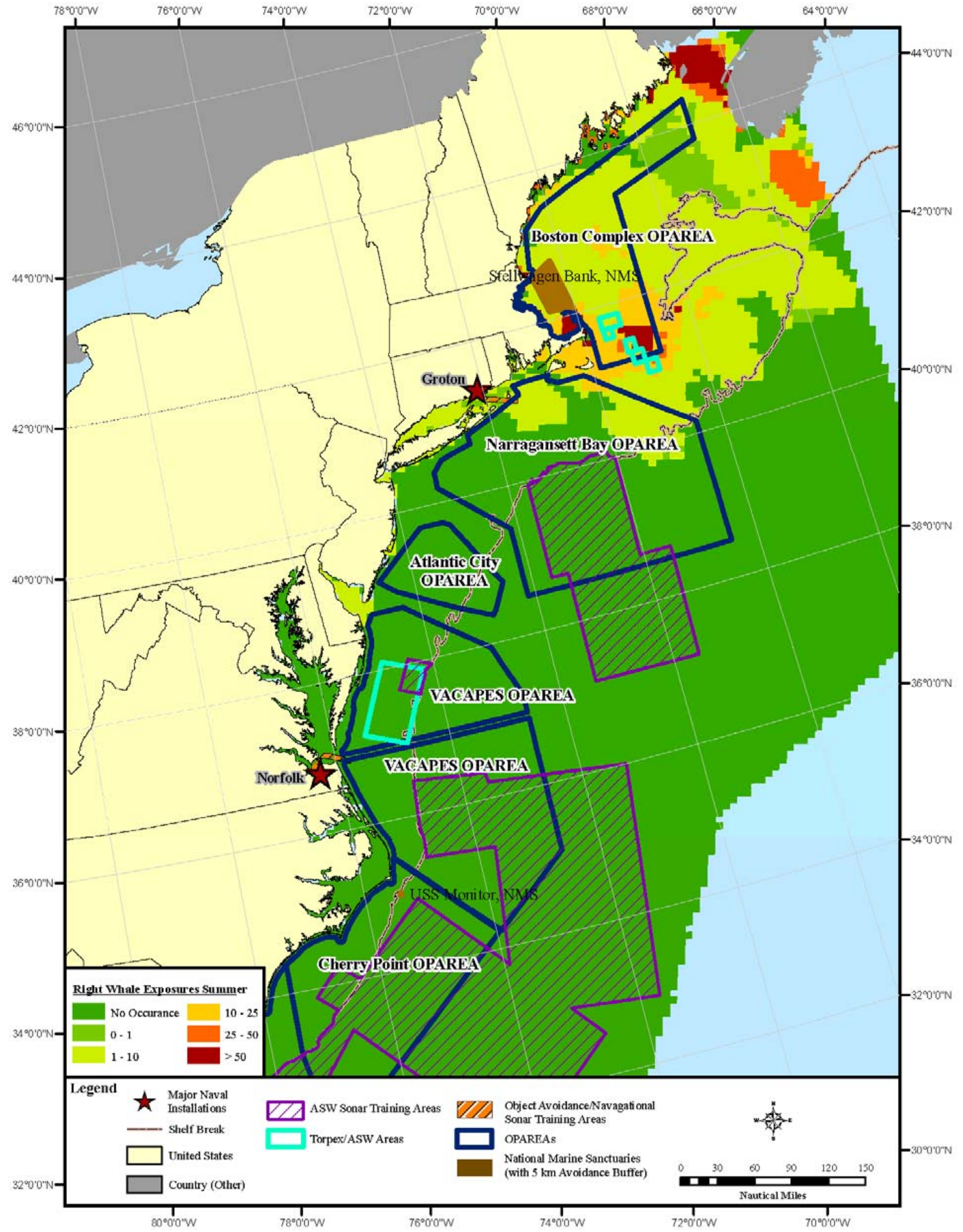

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Figure D-119. Alternative 2, Fall NE Right Whale (Summer)

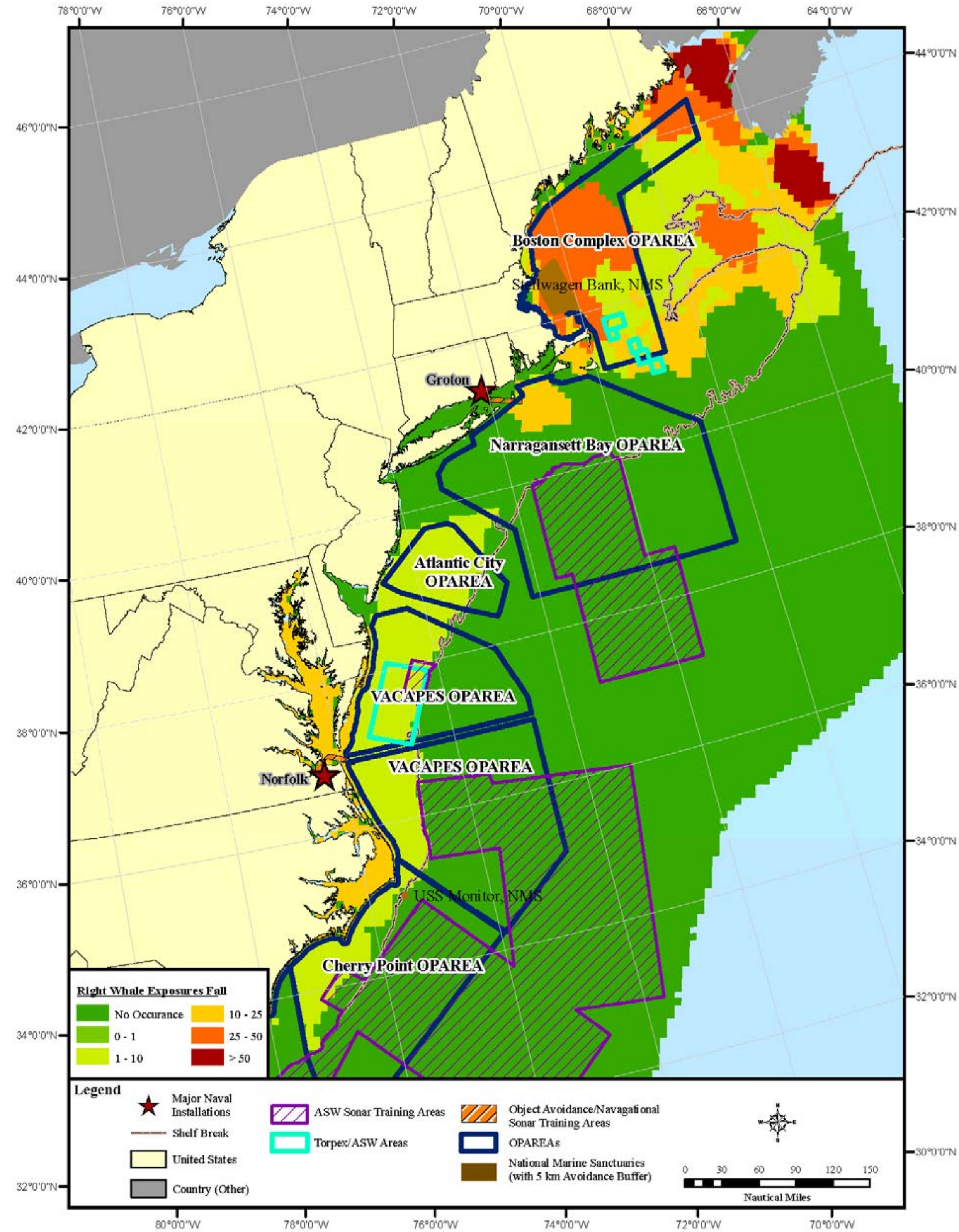

Figure D-120. Alternative 2, Fall NE Right Whale (Fall)

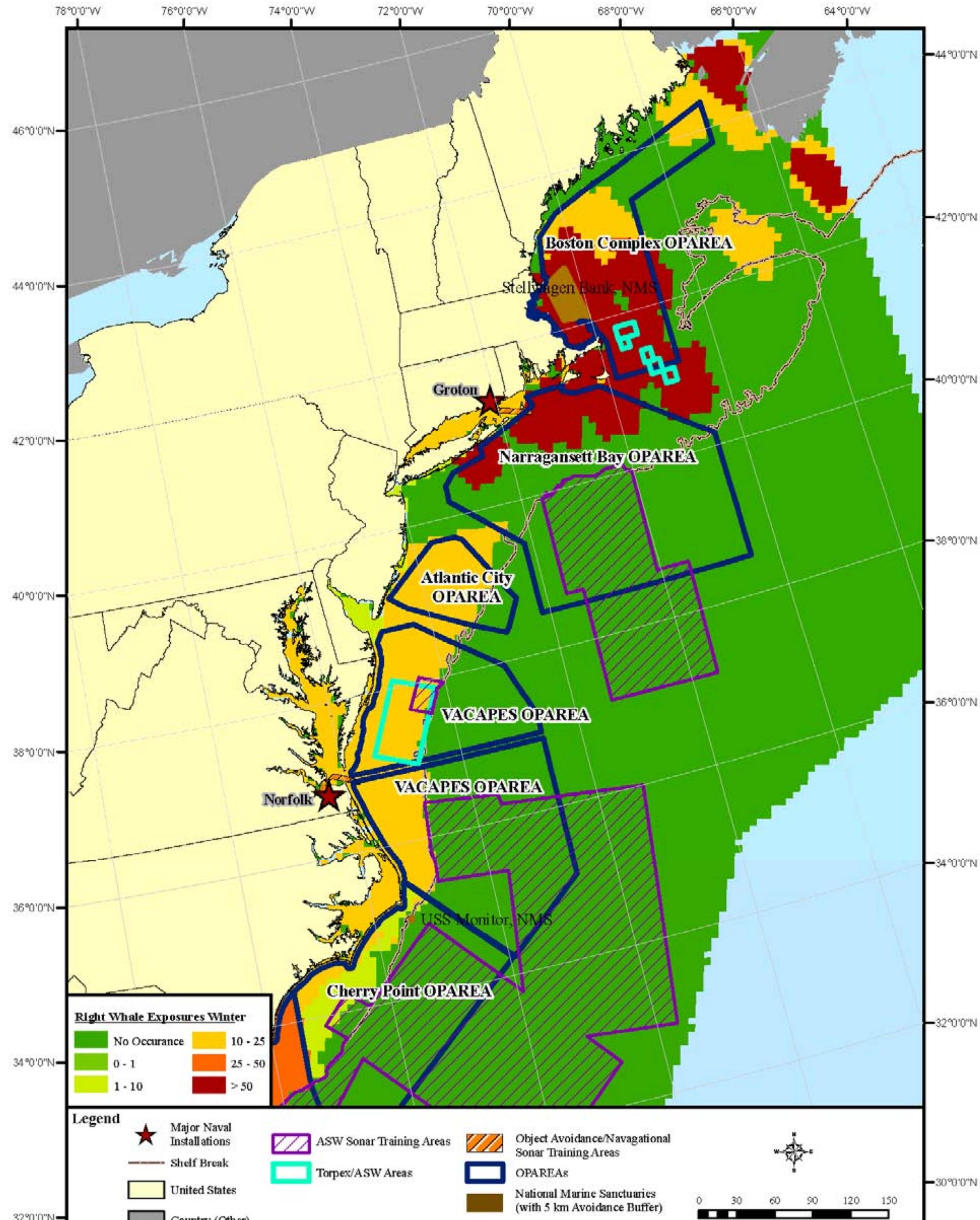

Figure D-121. Alternative 2, Fall NE Right Whale (Winter)

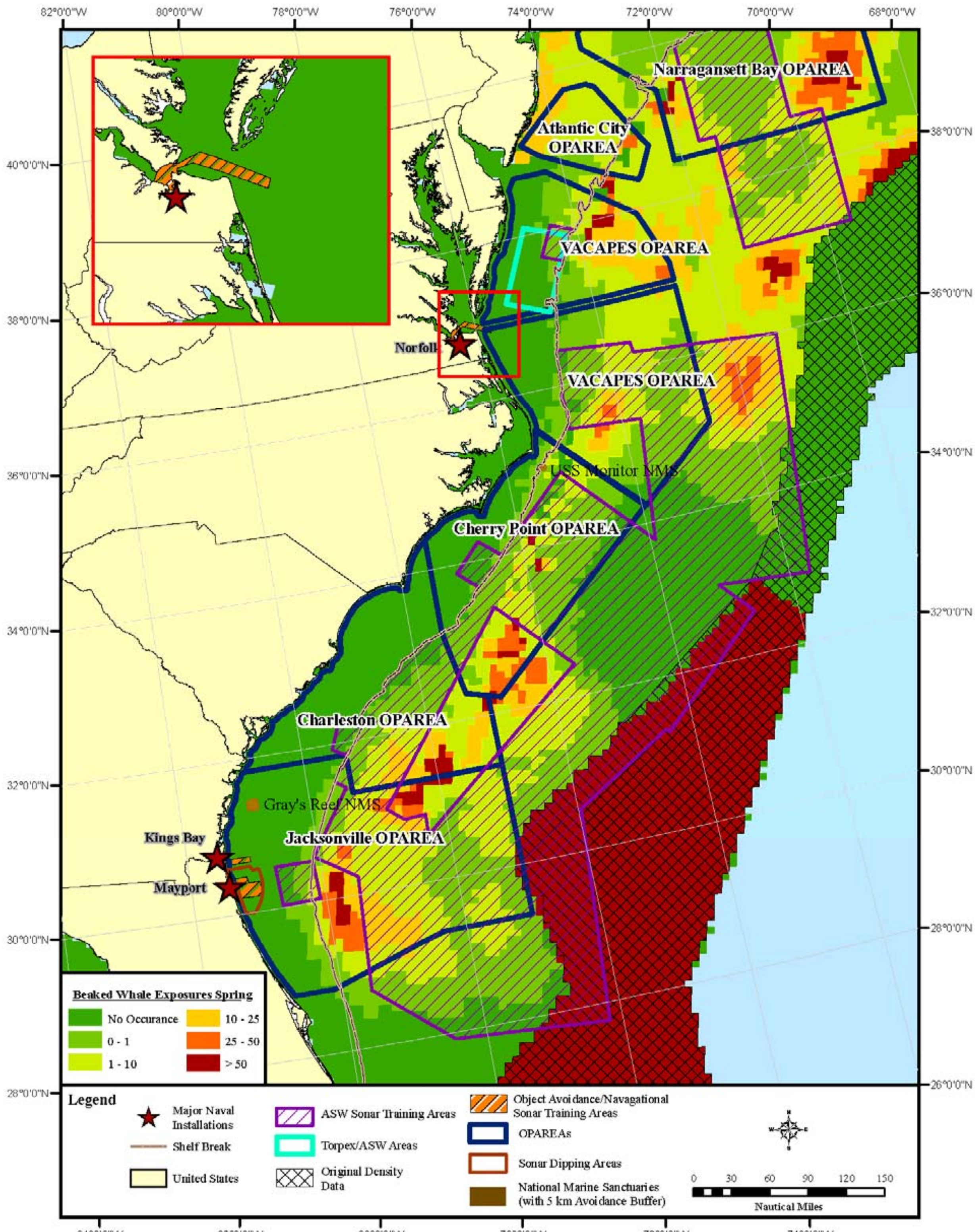

Figure D-122. Alternative 2, Fall SE Beaked Whale (Spring)

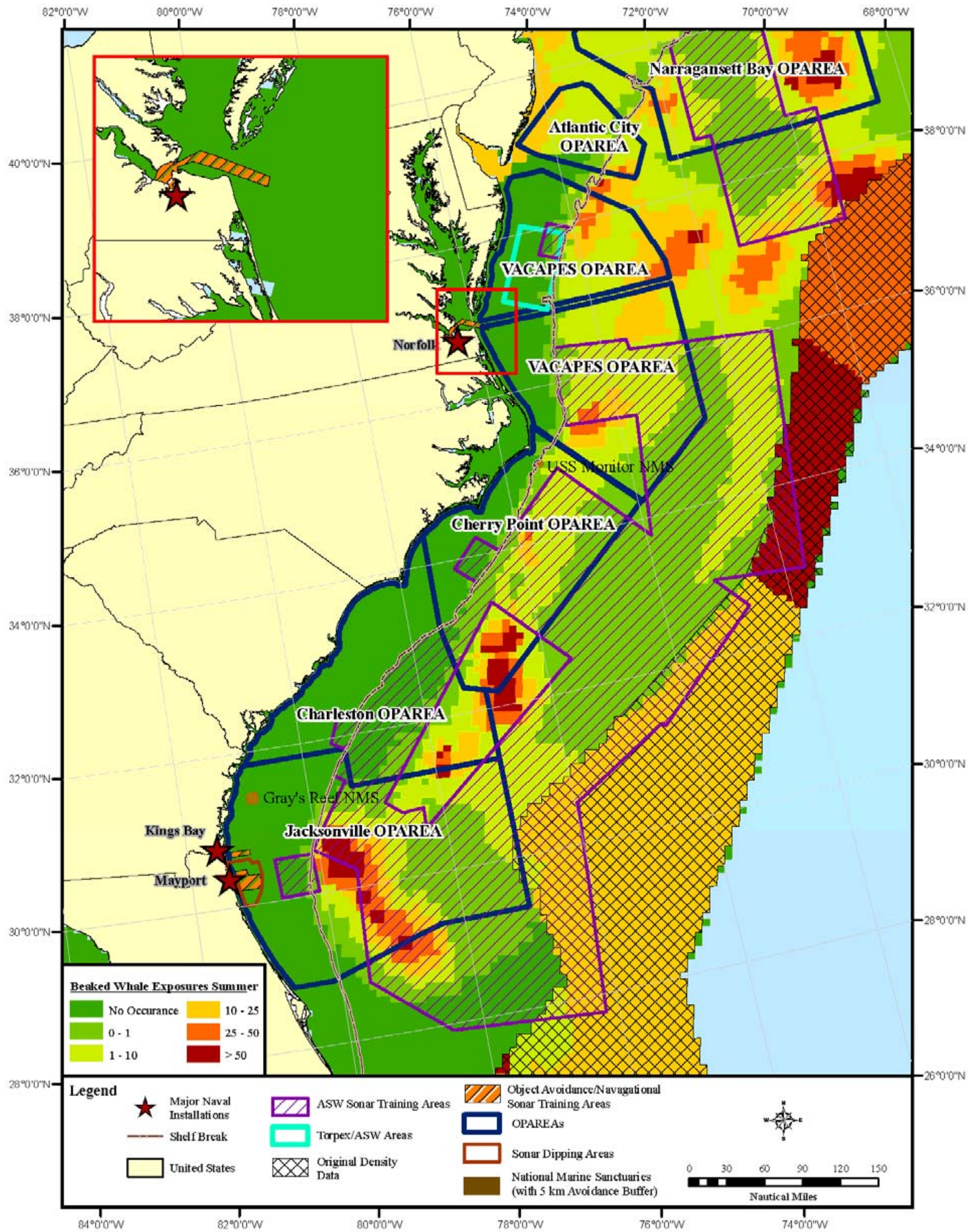

Figure D-123. Alternative 2, Fall SE Beaked Whale (Summer)

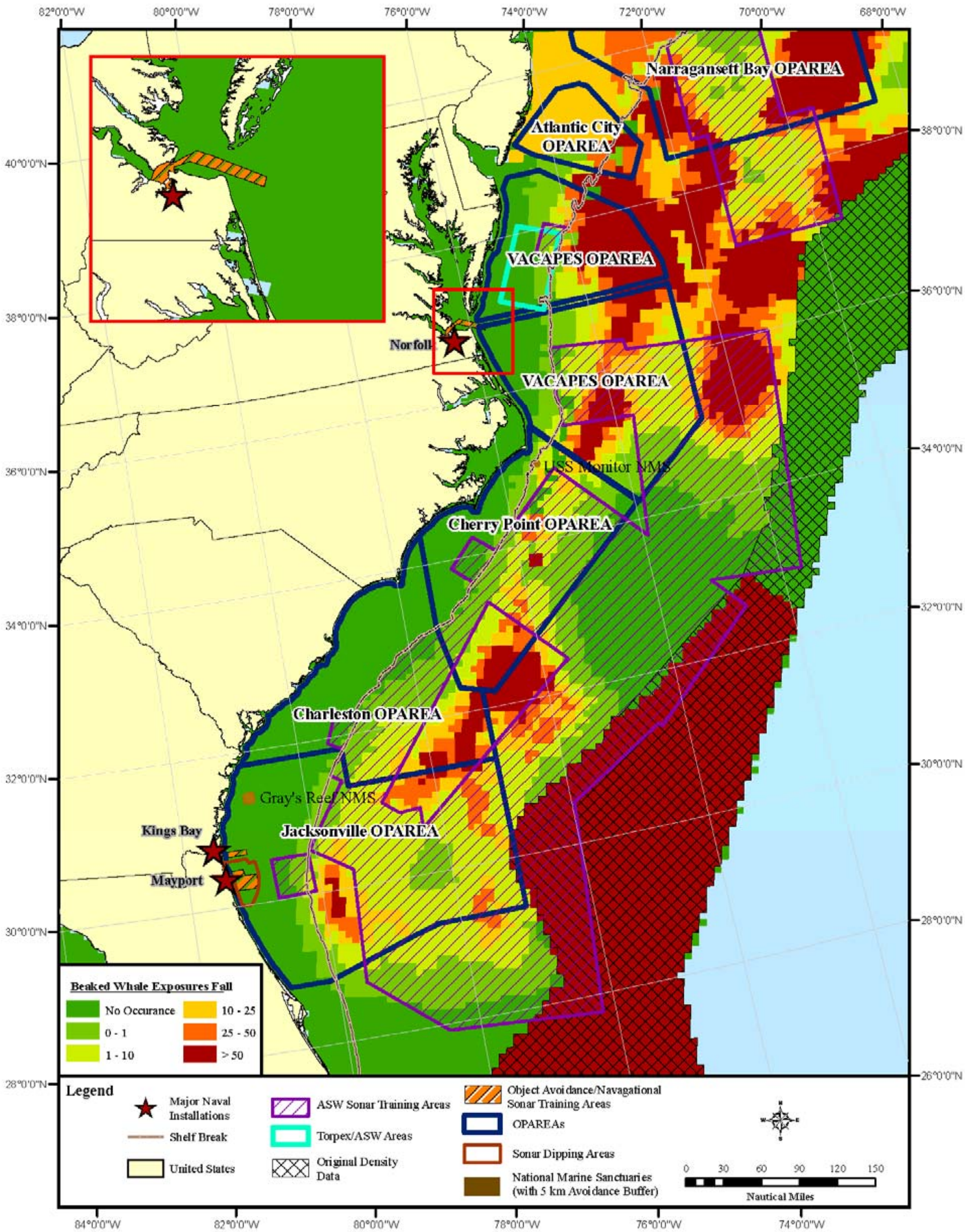

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Figure D-124. Alternative 2, Fall SE Beaked Whale (Fall)

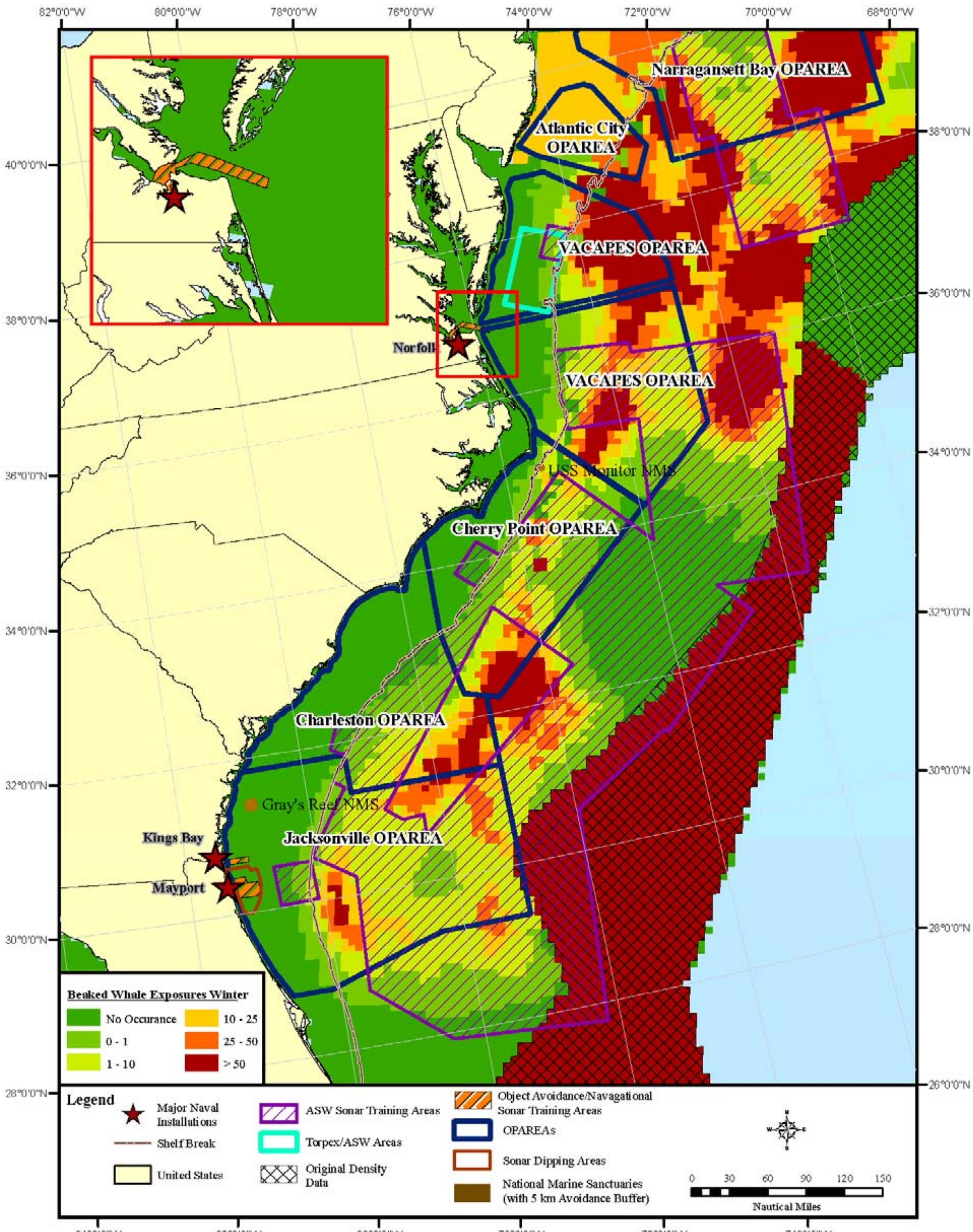

Figure D-125. Alternative 2, Fall SE Beaked Whale (Winter)

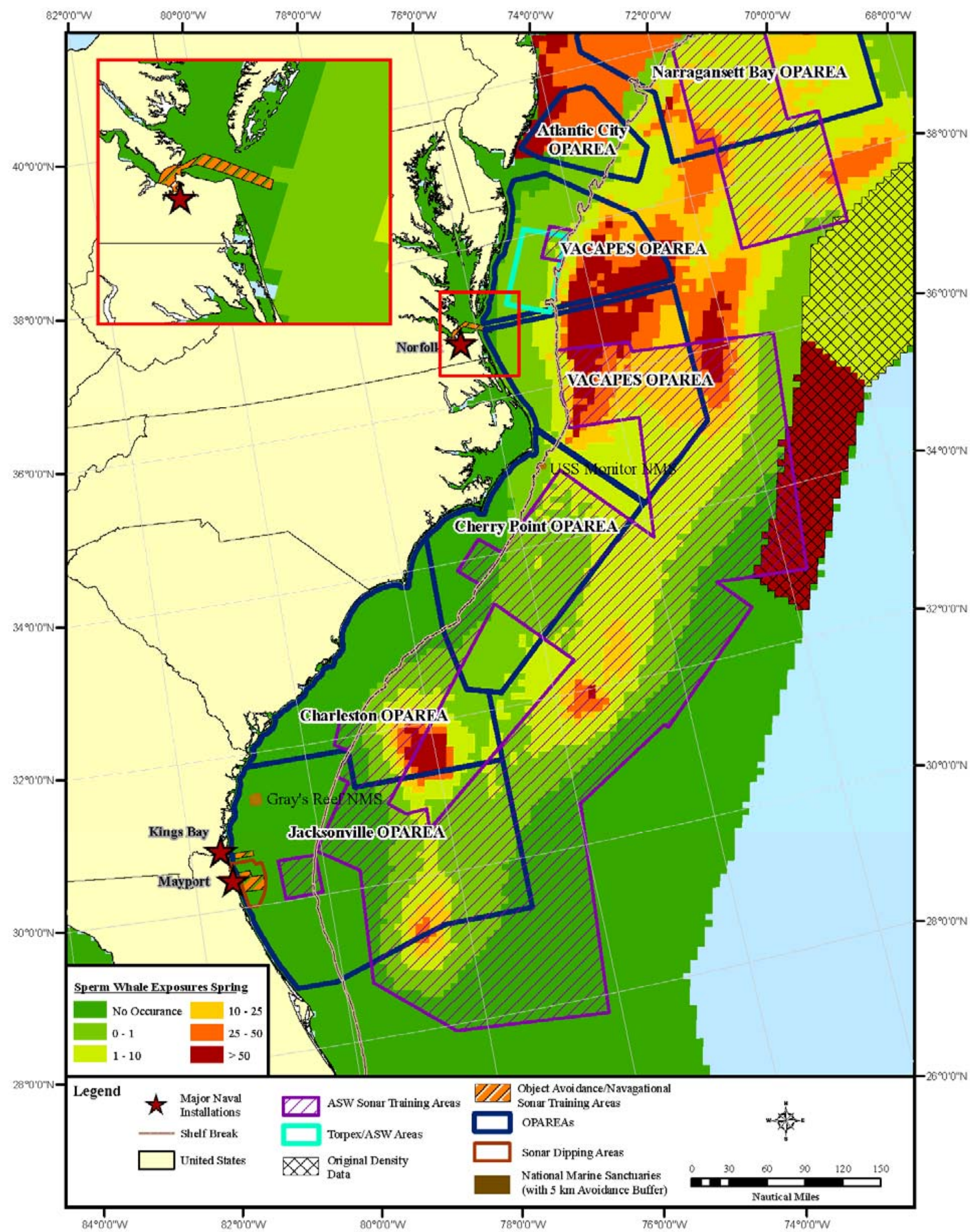

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Figure D-126. Alternative 2, Fall SE Sperm Whale (Spring)

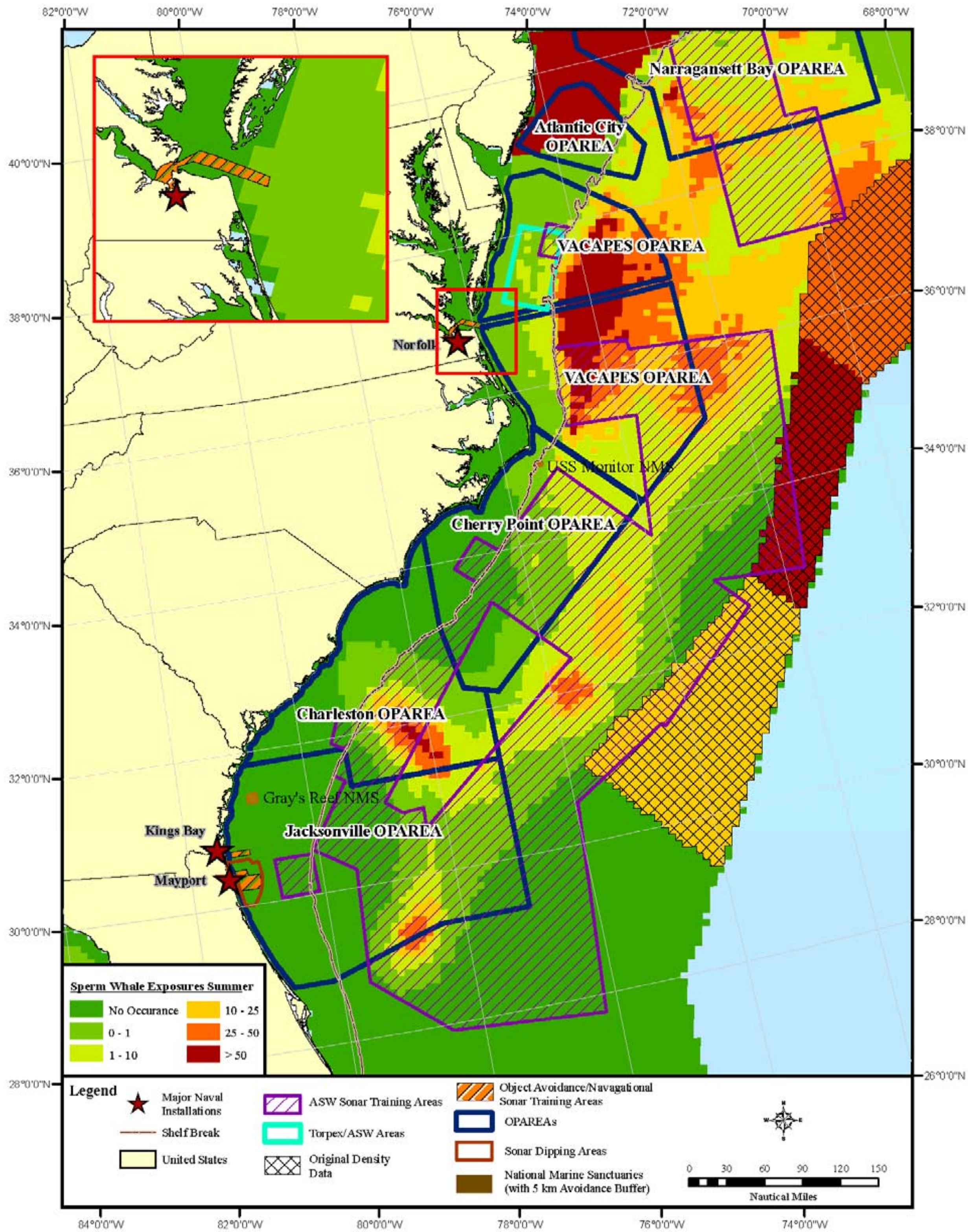

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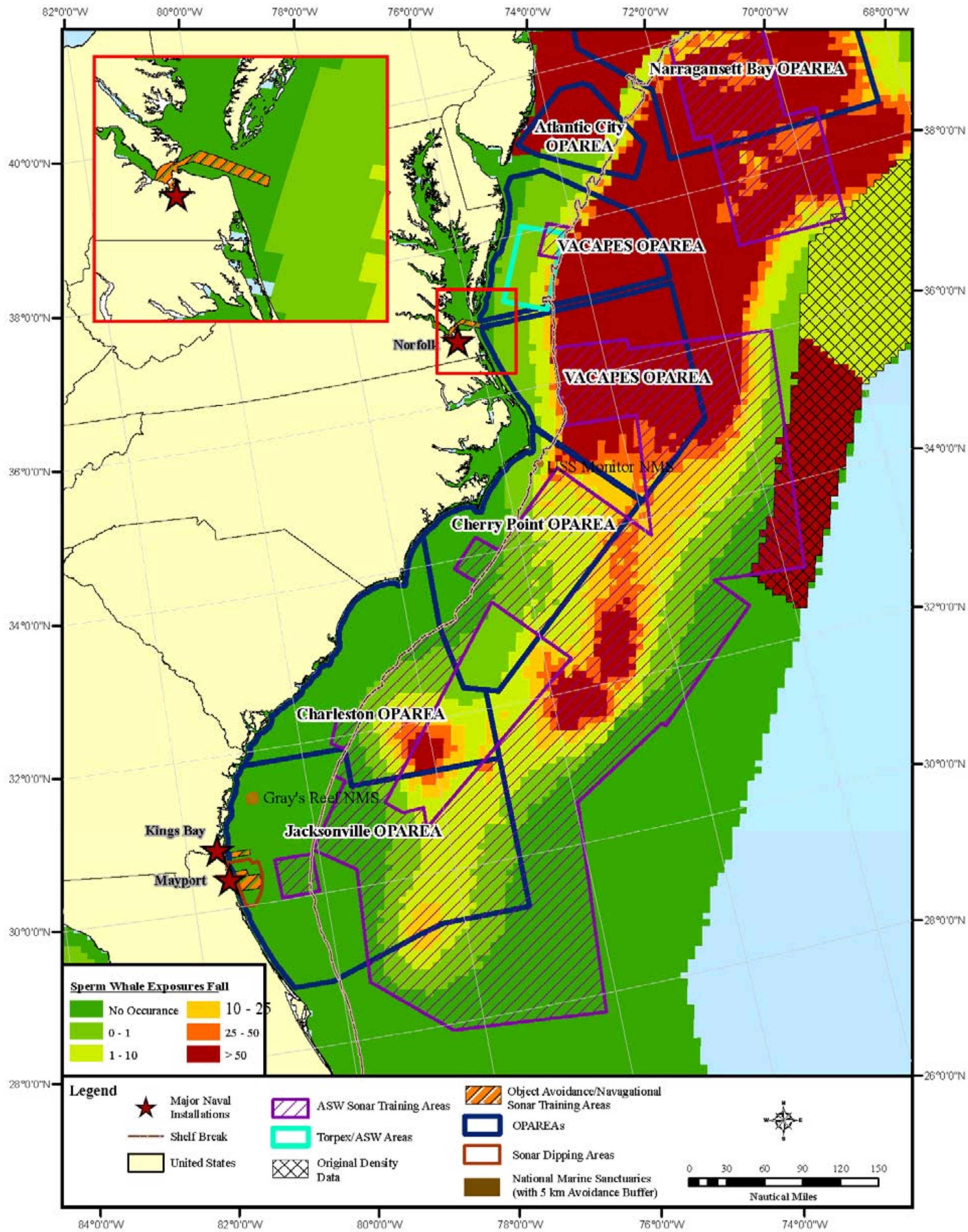
Figure D-127. Alternative 2, Fall SE Sperm Whale (Summer)



1 **Figure D-128. Alternative 2, Fall SE Sperm Whale (Fall)**

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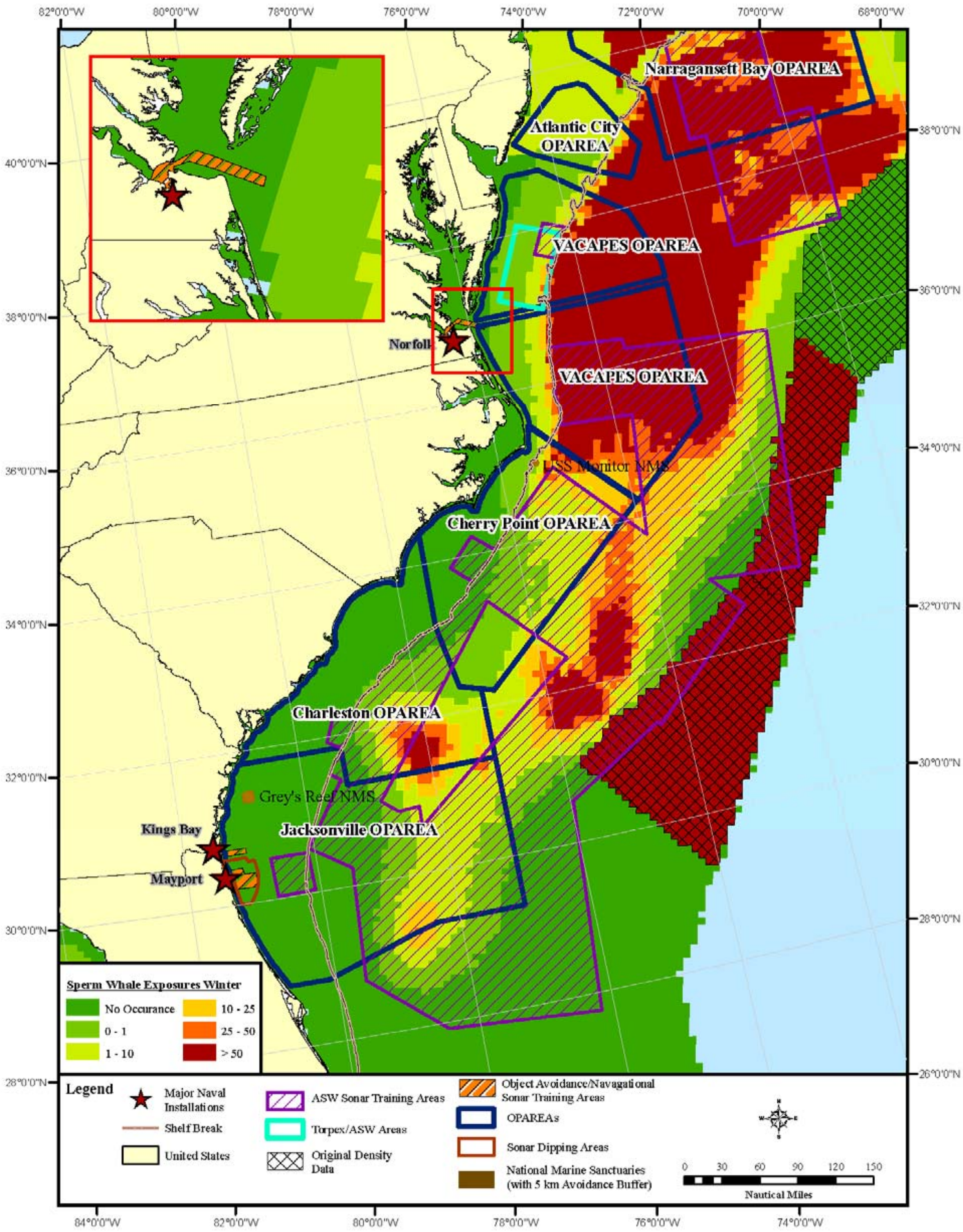

Figure D-129. Alternative 2, Fall SE Sperm Whale (Winter)

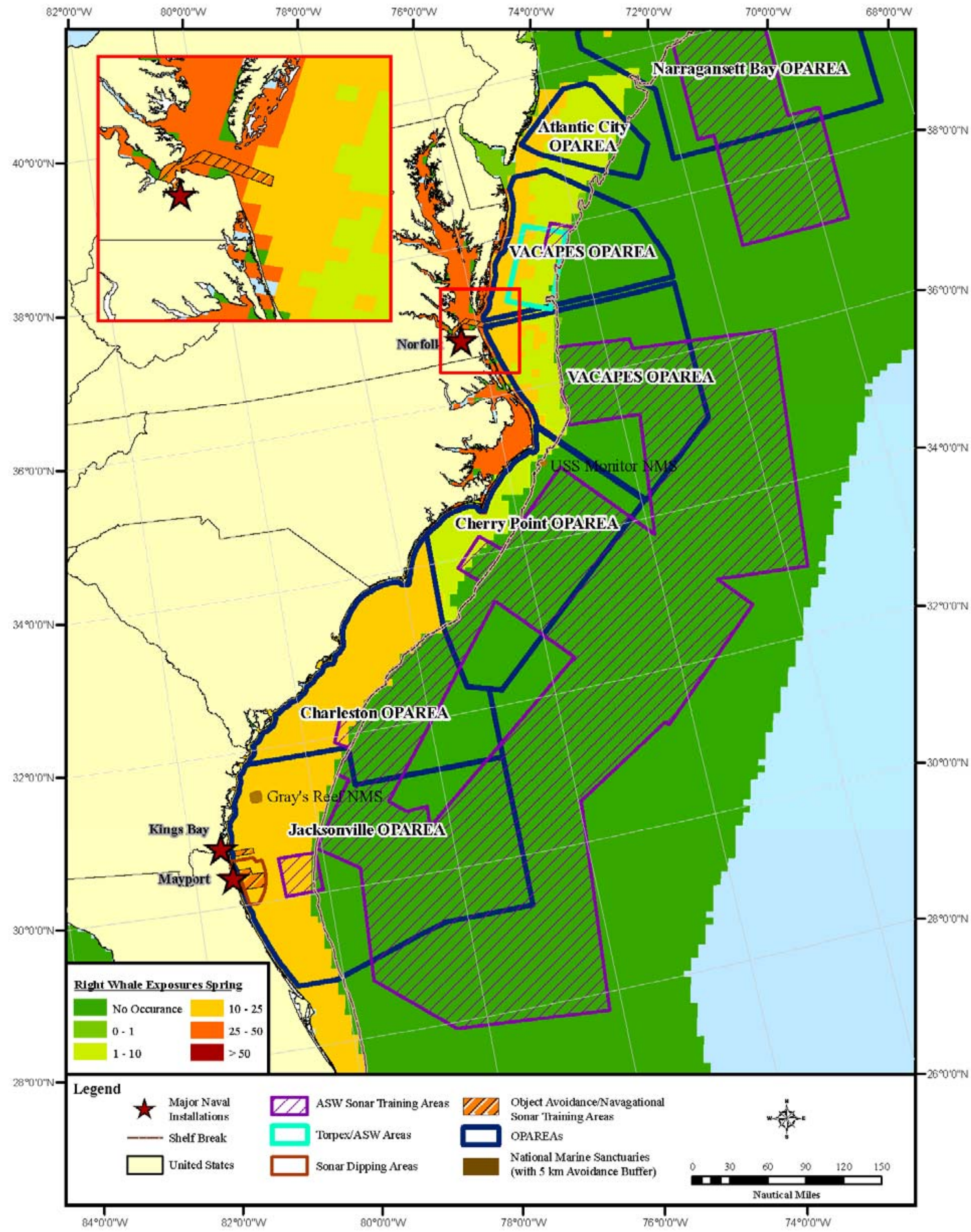

Figure D-130. Alternative 2, Fall SE Right Whale (Spring)

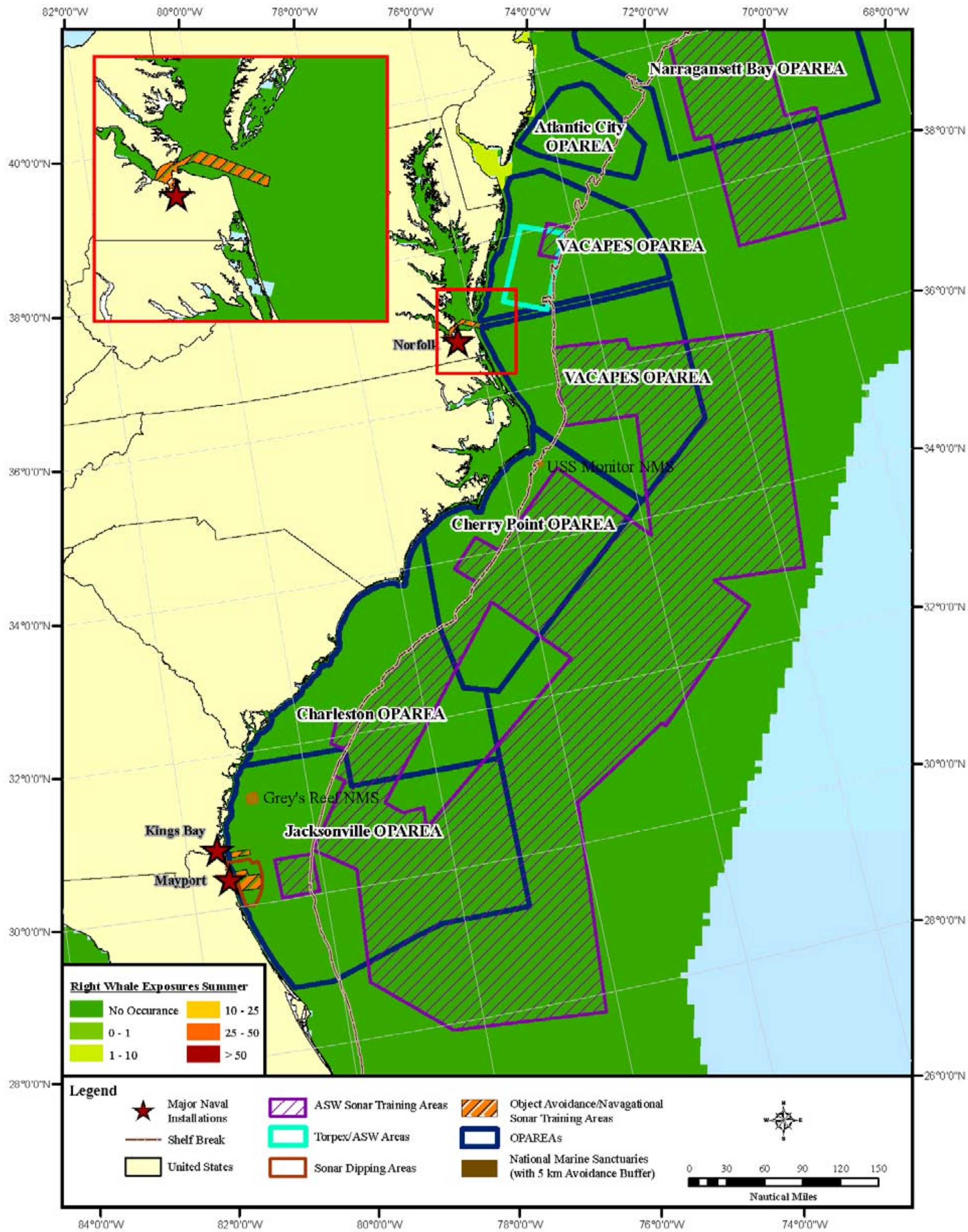

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Figure D-131. Alternative 2, Fall SE Right Whale (Summer)

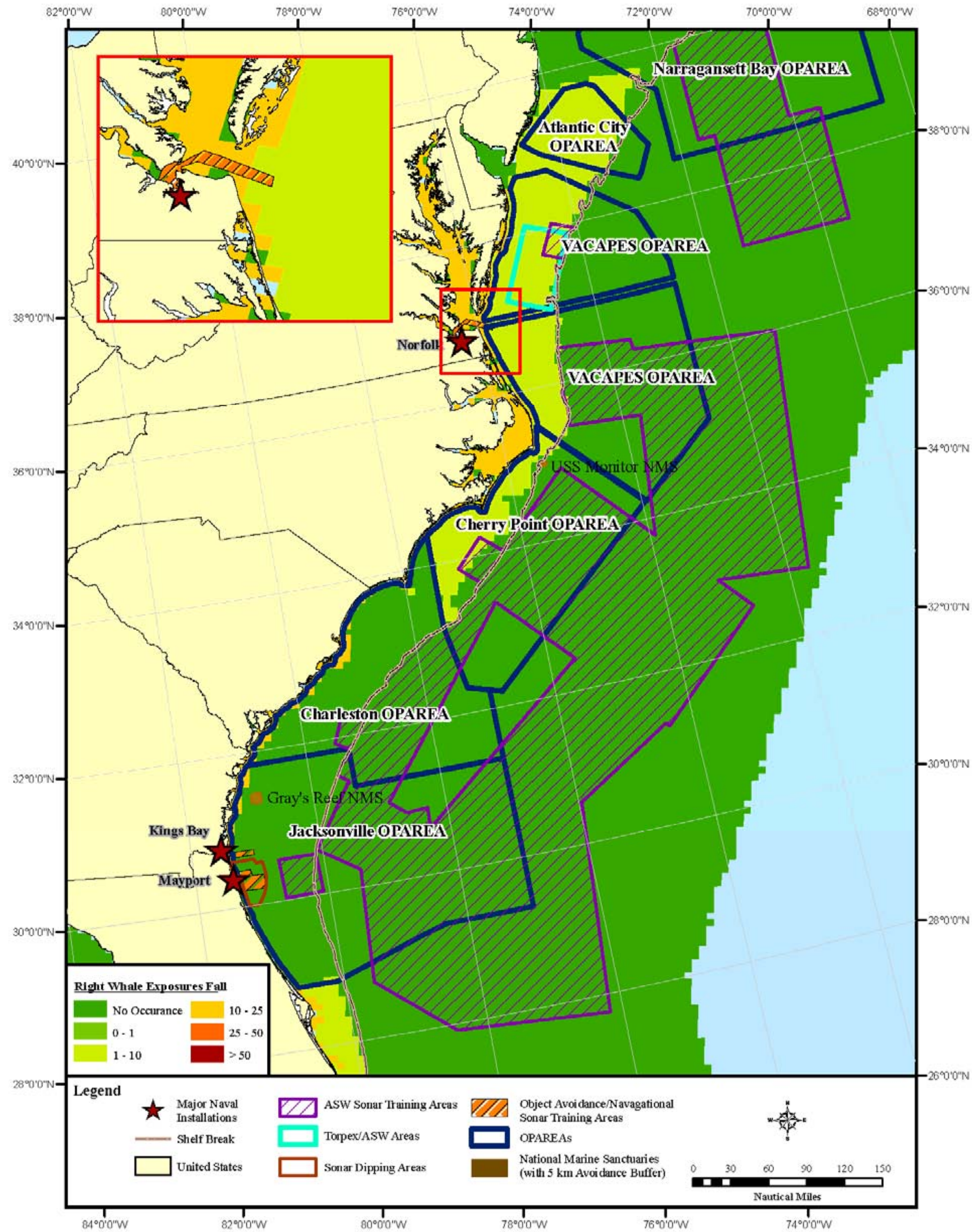

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Figure D-132. Alternative 2, Fall SE Right Whale (Fall)

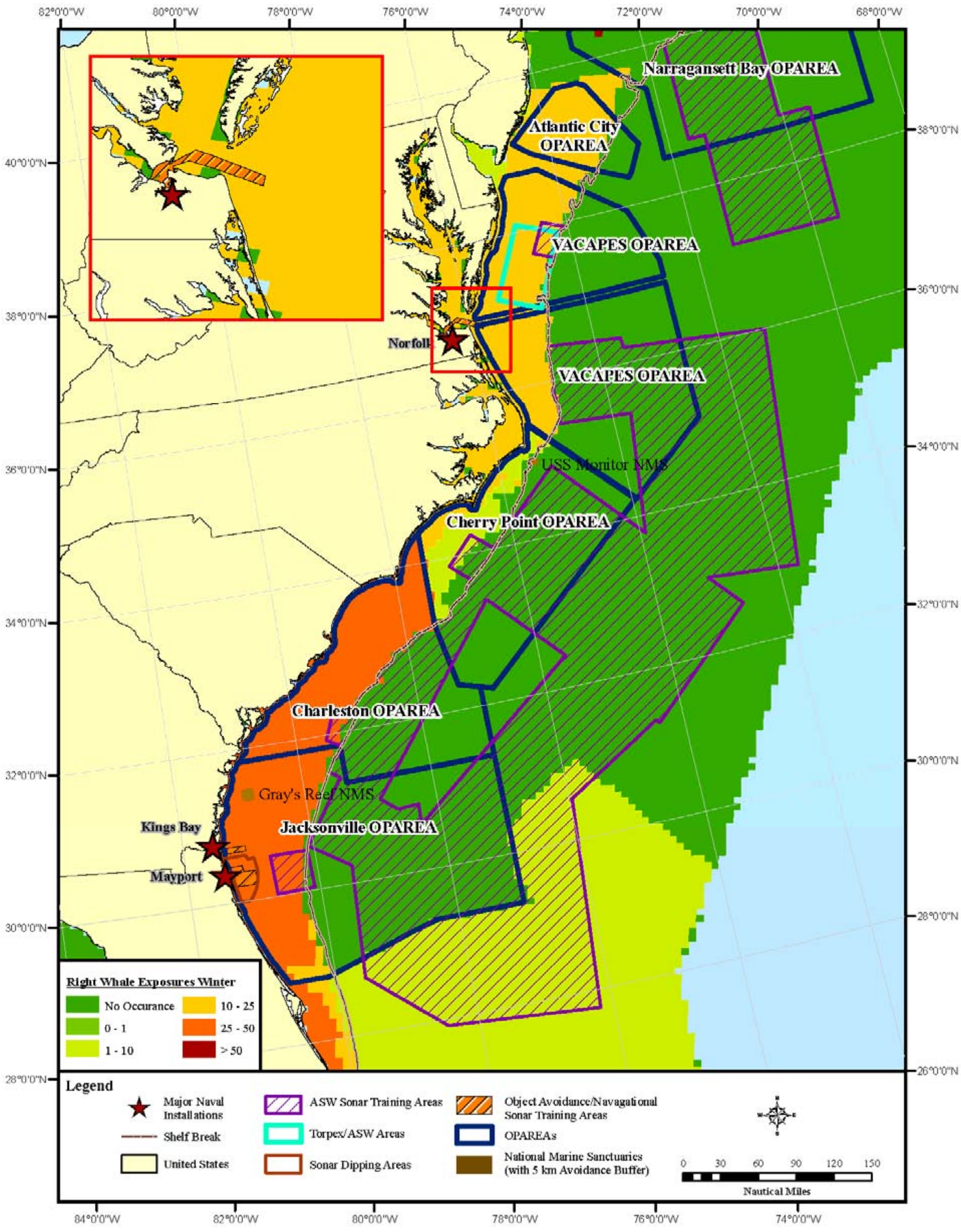

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Figure D-133. Alternative 2, Fall SE Right Whale (Winter)

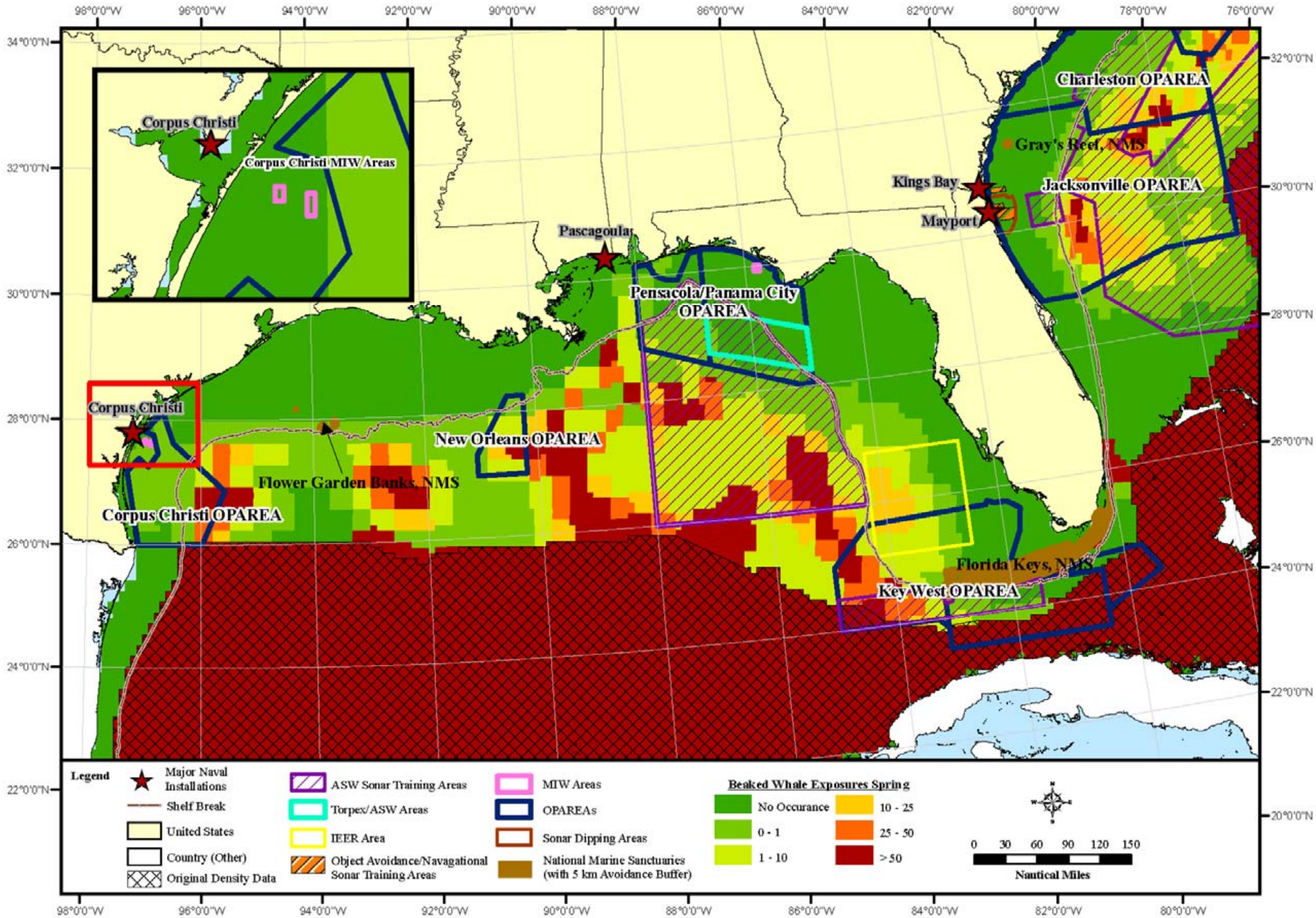

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Figure D-134. Alternative 2, Fall GOMEX Beaked Whale (Spring)

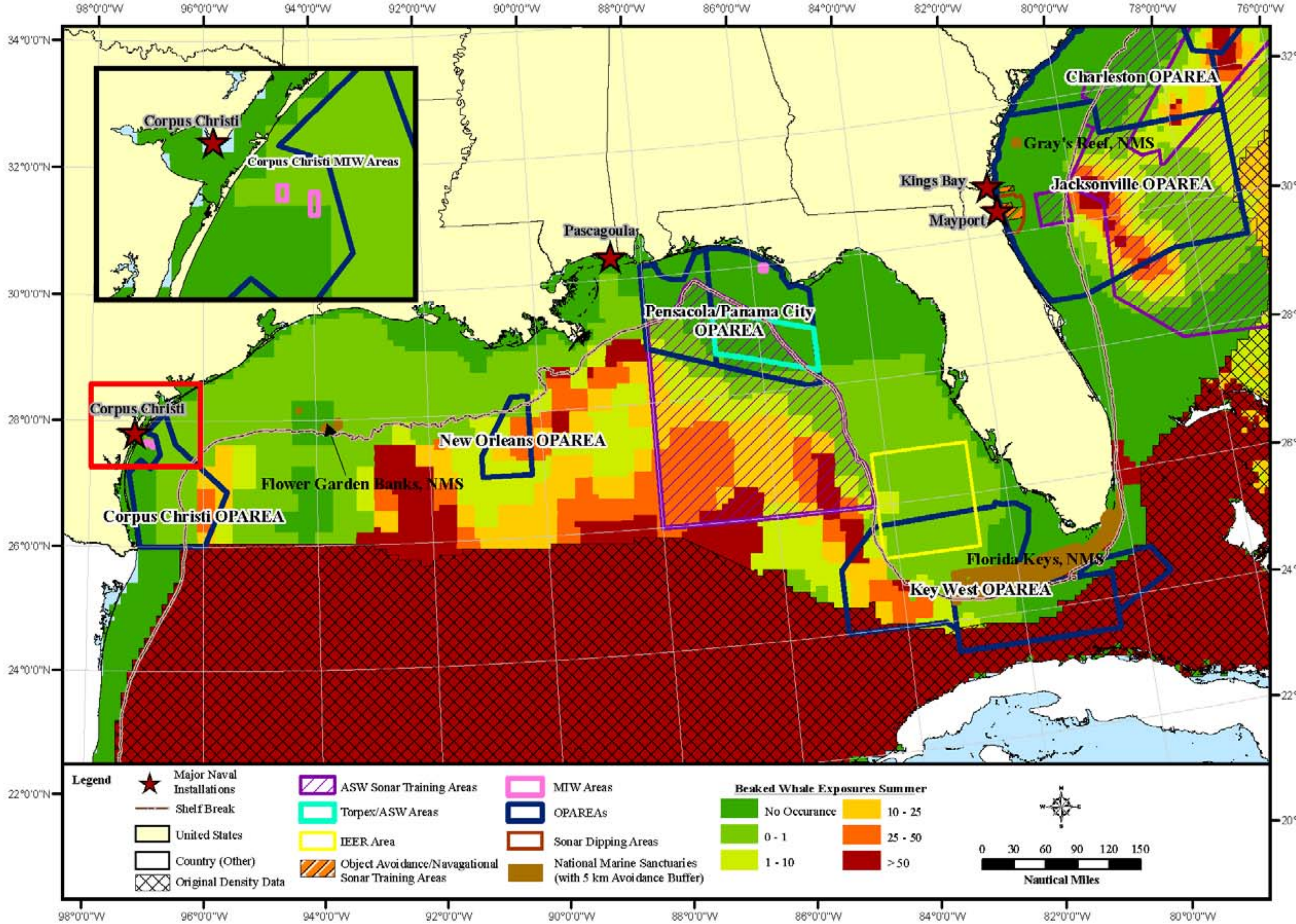

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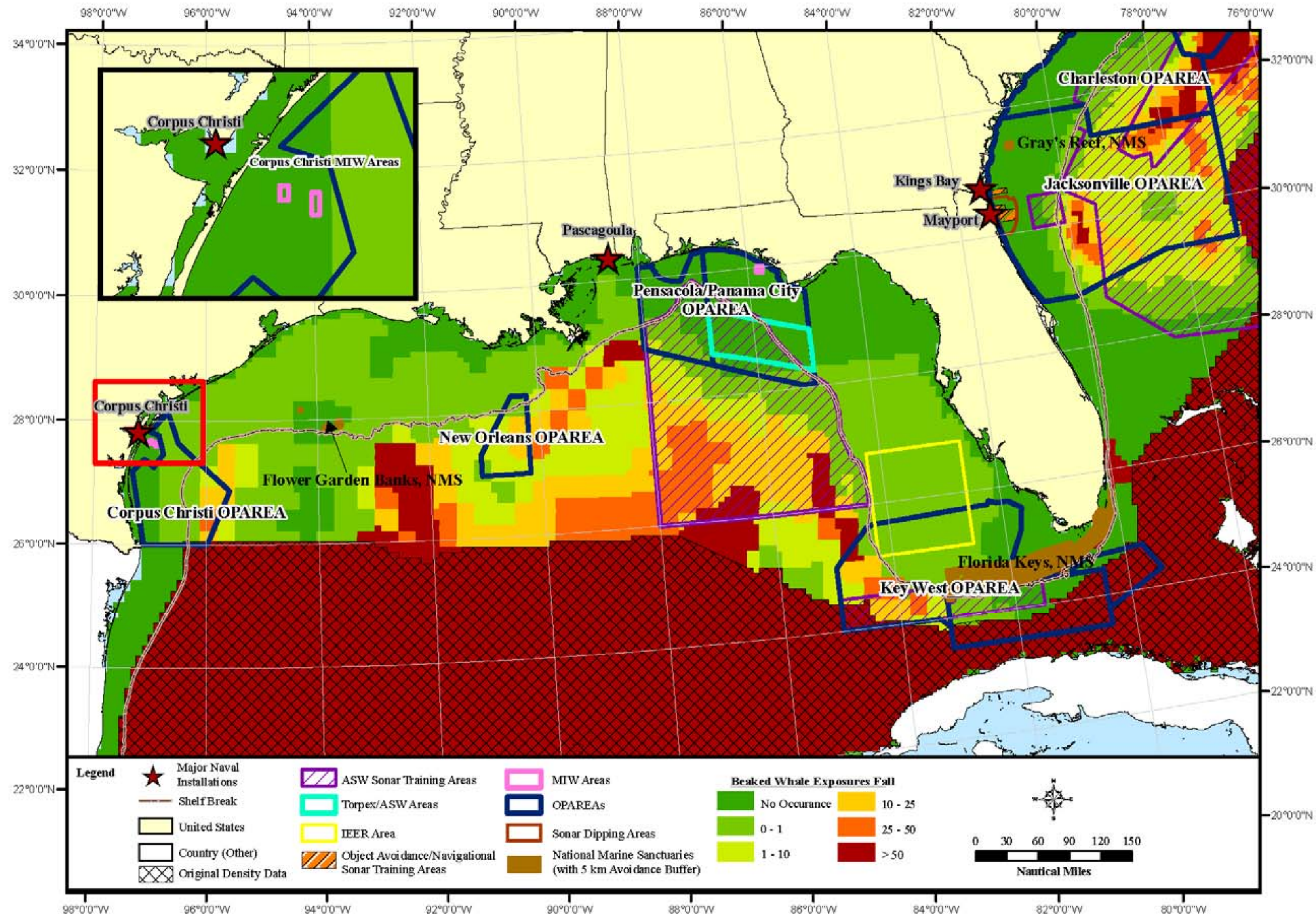
Figure D-135. Alternative 2, Fall GOMEX Beaked Whale (Summer)



1 **Figure D-136. Alternative 2, Fall GOMEX Beaked Whale (Fall)**

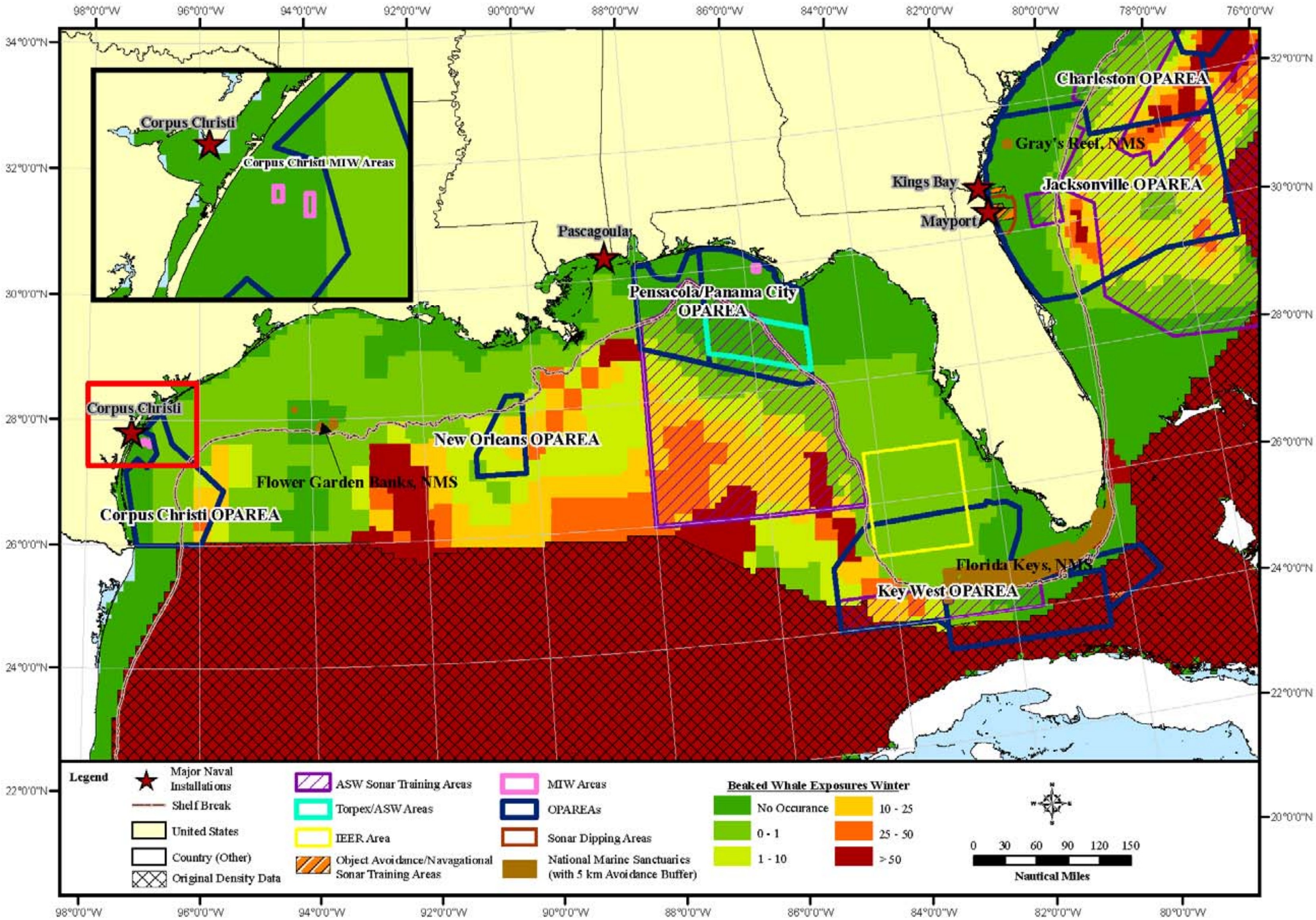


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Figure D-137. Alternative 2, Fall GOMEX Beaked Whale (Winter)

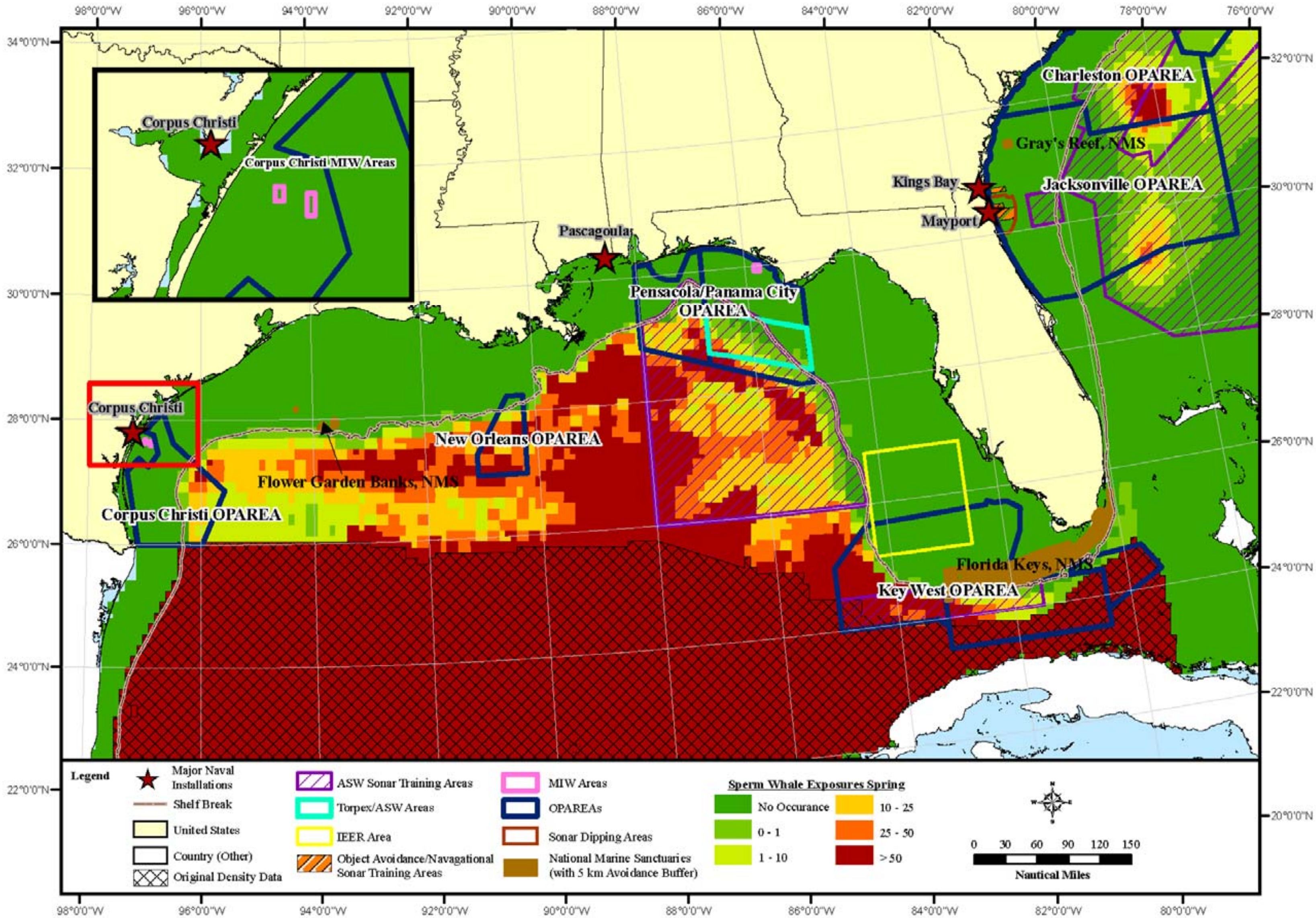

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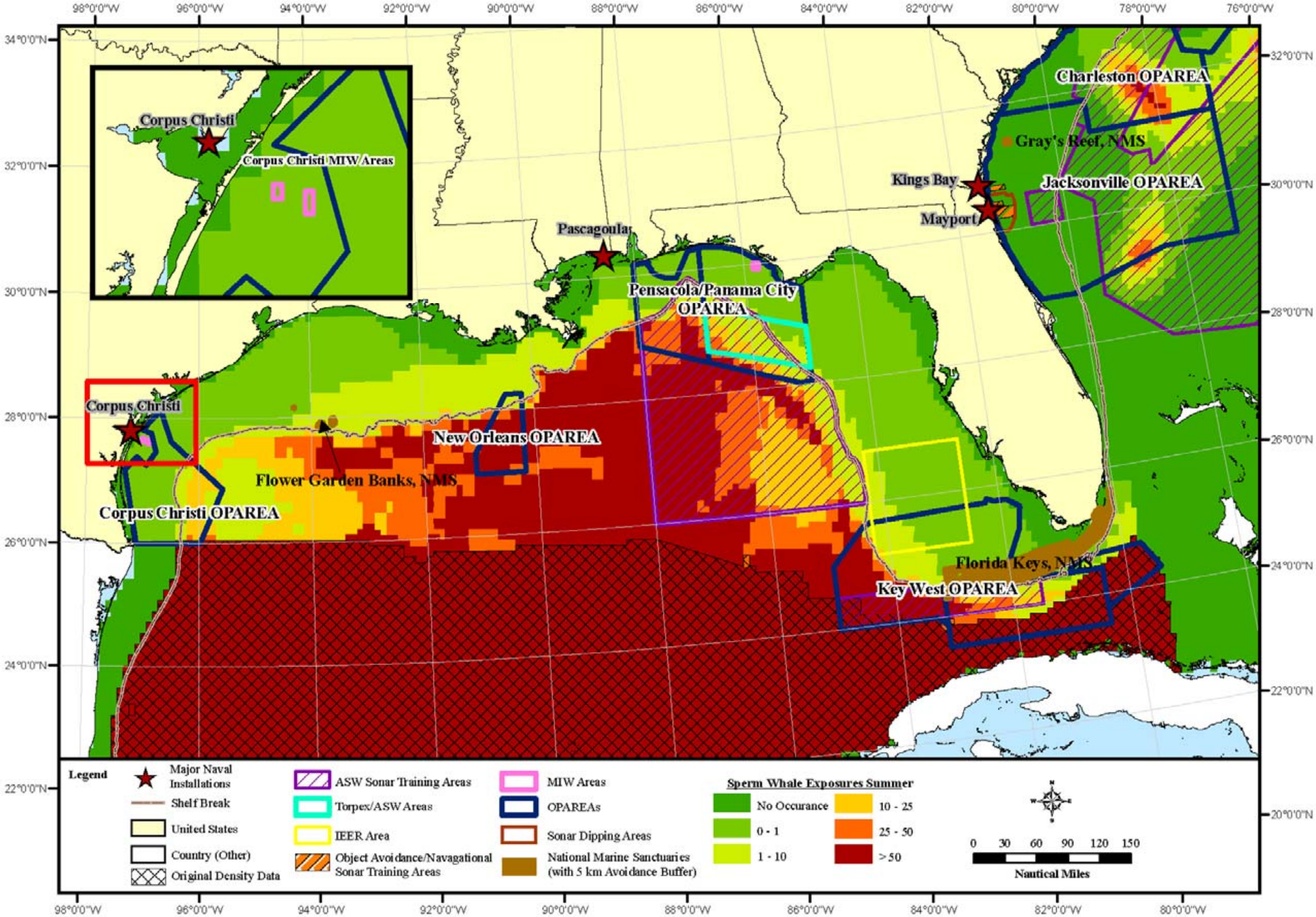
Figure D-138. Alternative 2, Fall GOMEX Sperm Whale (Spring)



1 **Figure D-139. Alternative 2, Fall GOMEX Sperm Whale (Summer)**

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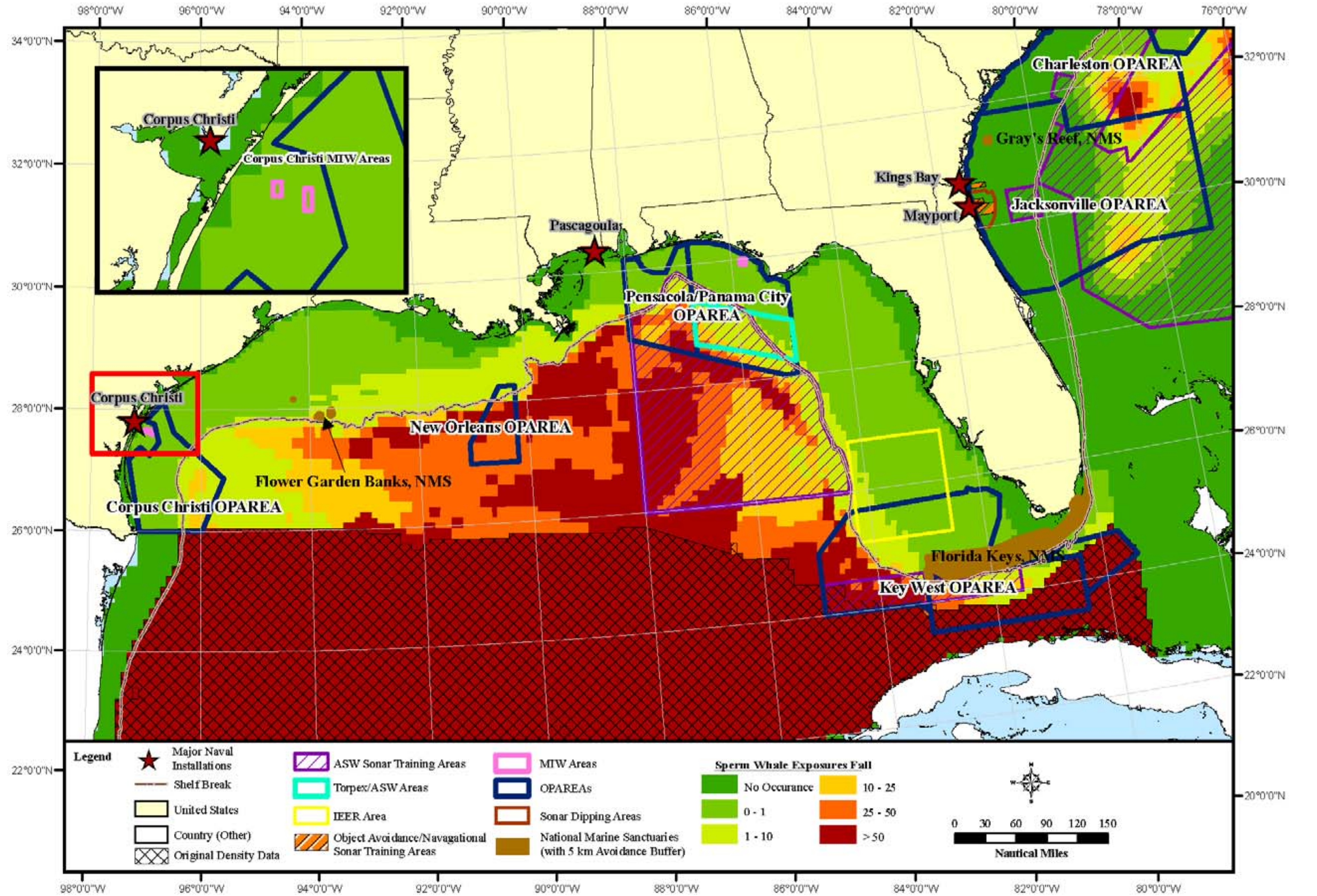
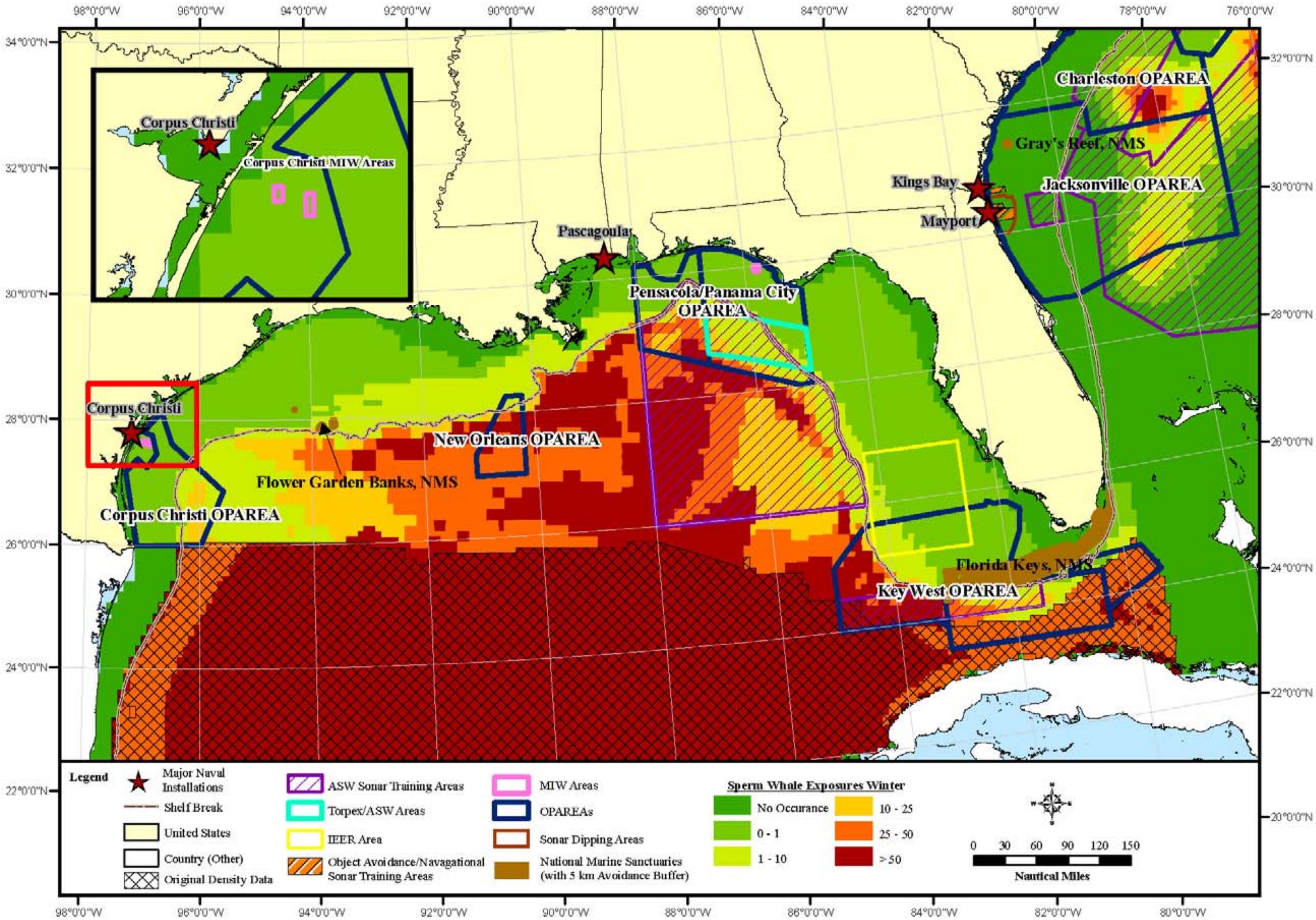


Figure D-140. Alternative 2, Fall GOMEX Sperm Whale (Fall)



1 **Figure D-141. Alternative 2, Fall GOMEX Sperm Whale (Winter)**

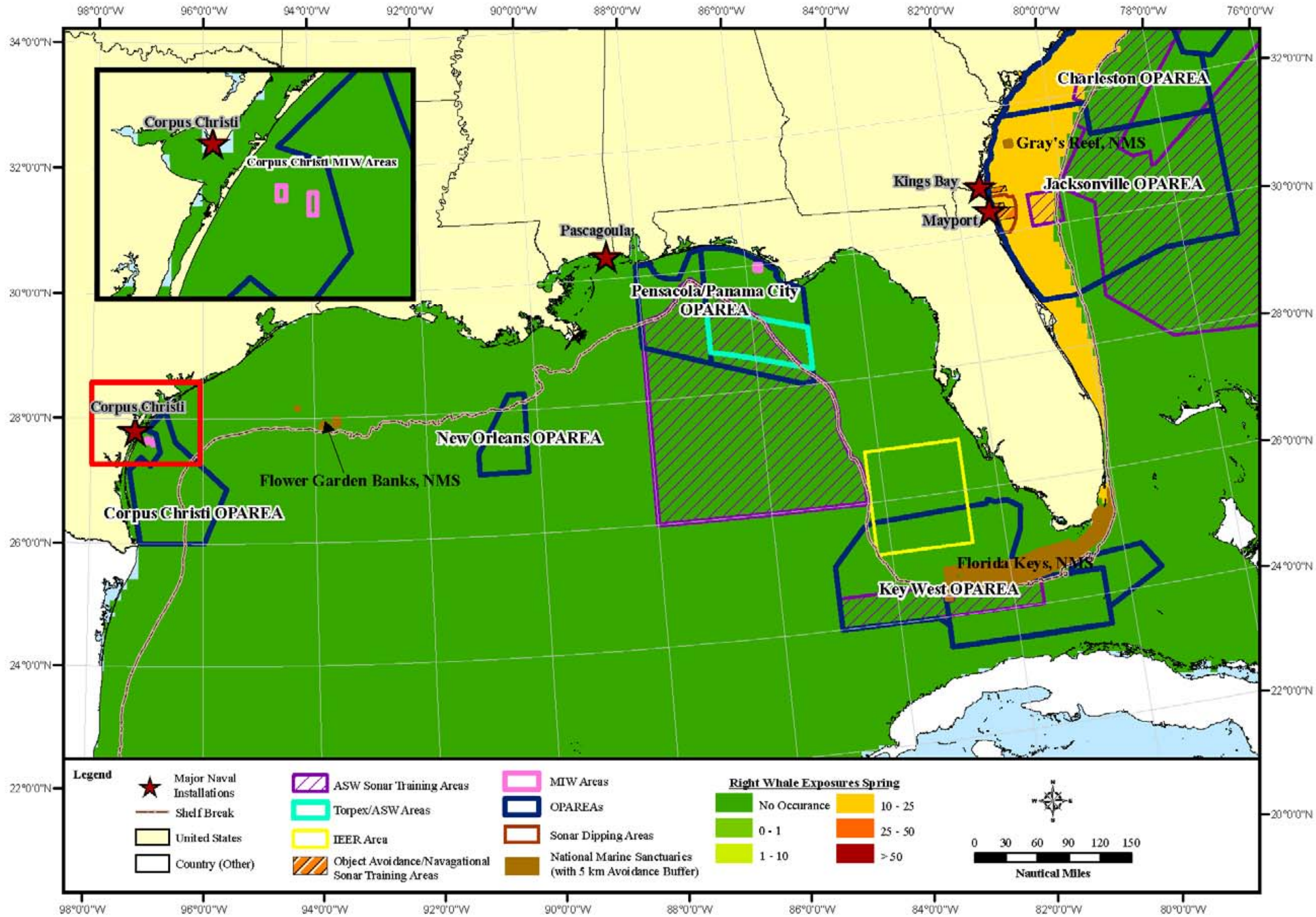


Figure D-142. Alternative 2, Fall GOMEX Right Whale (Spring)

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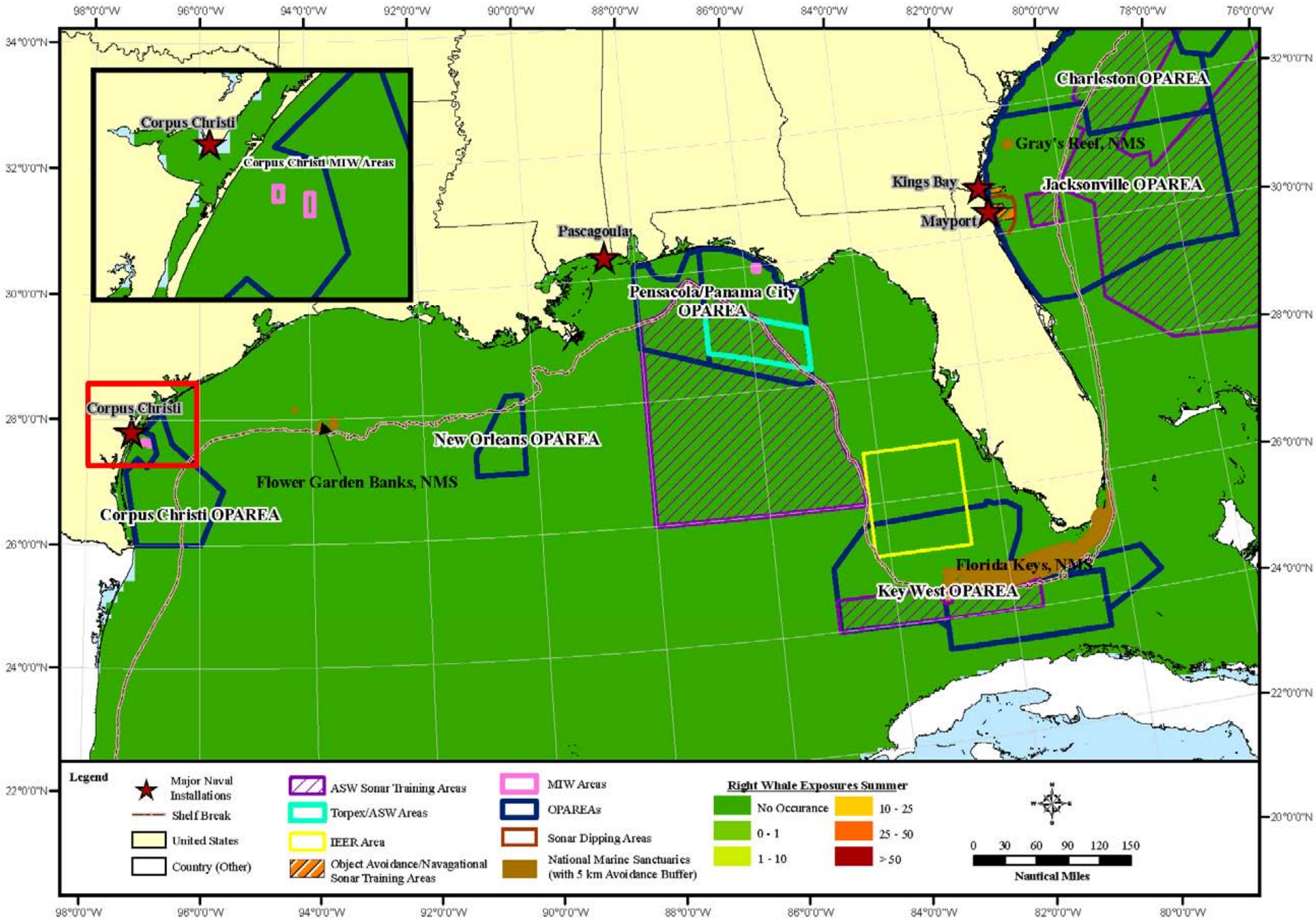

Figure D-143. Alternative 2, Fall GOMEX Right Whale (Summer)

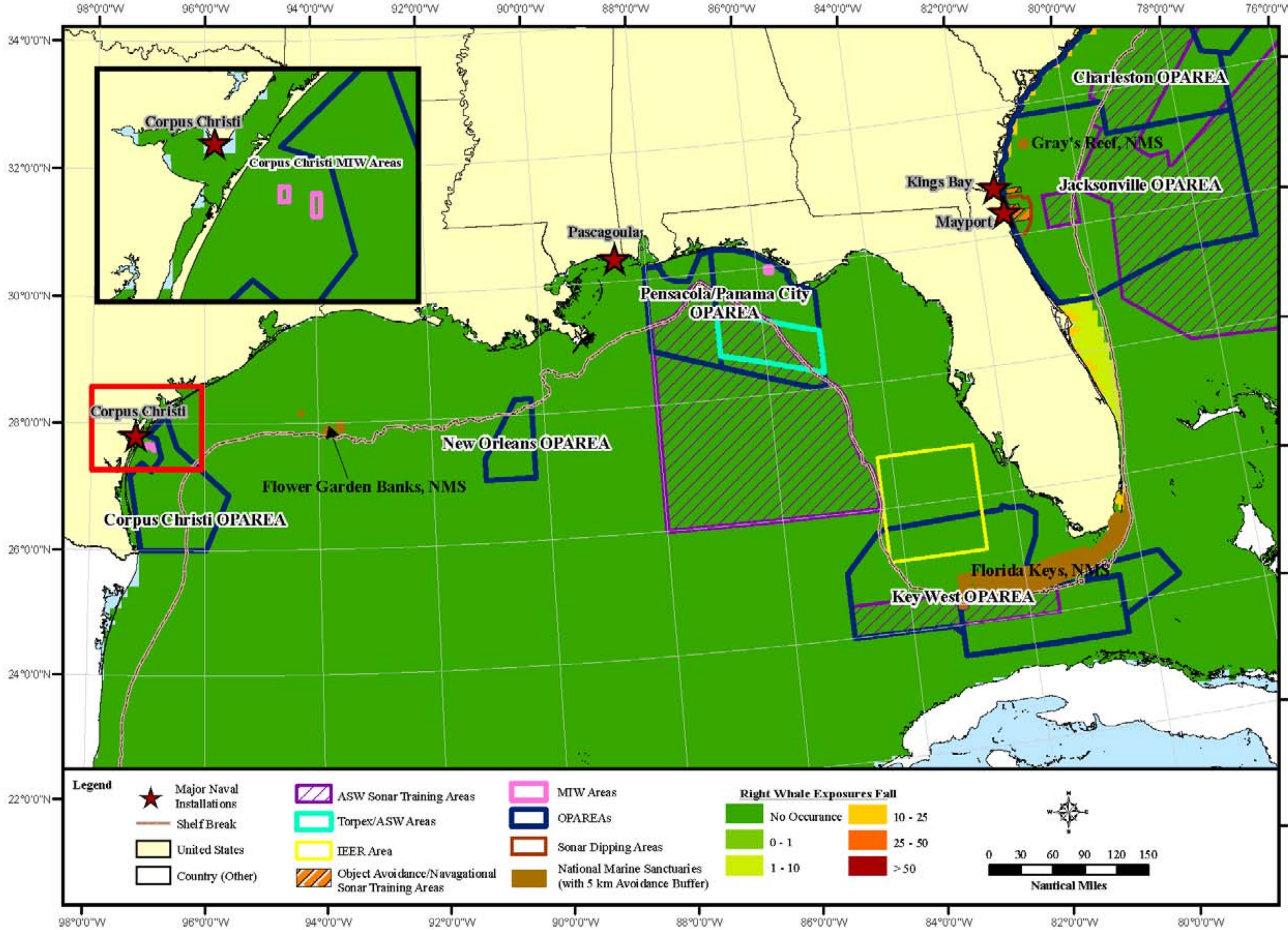

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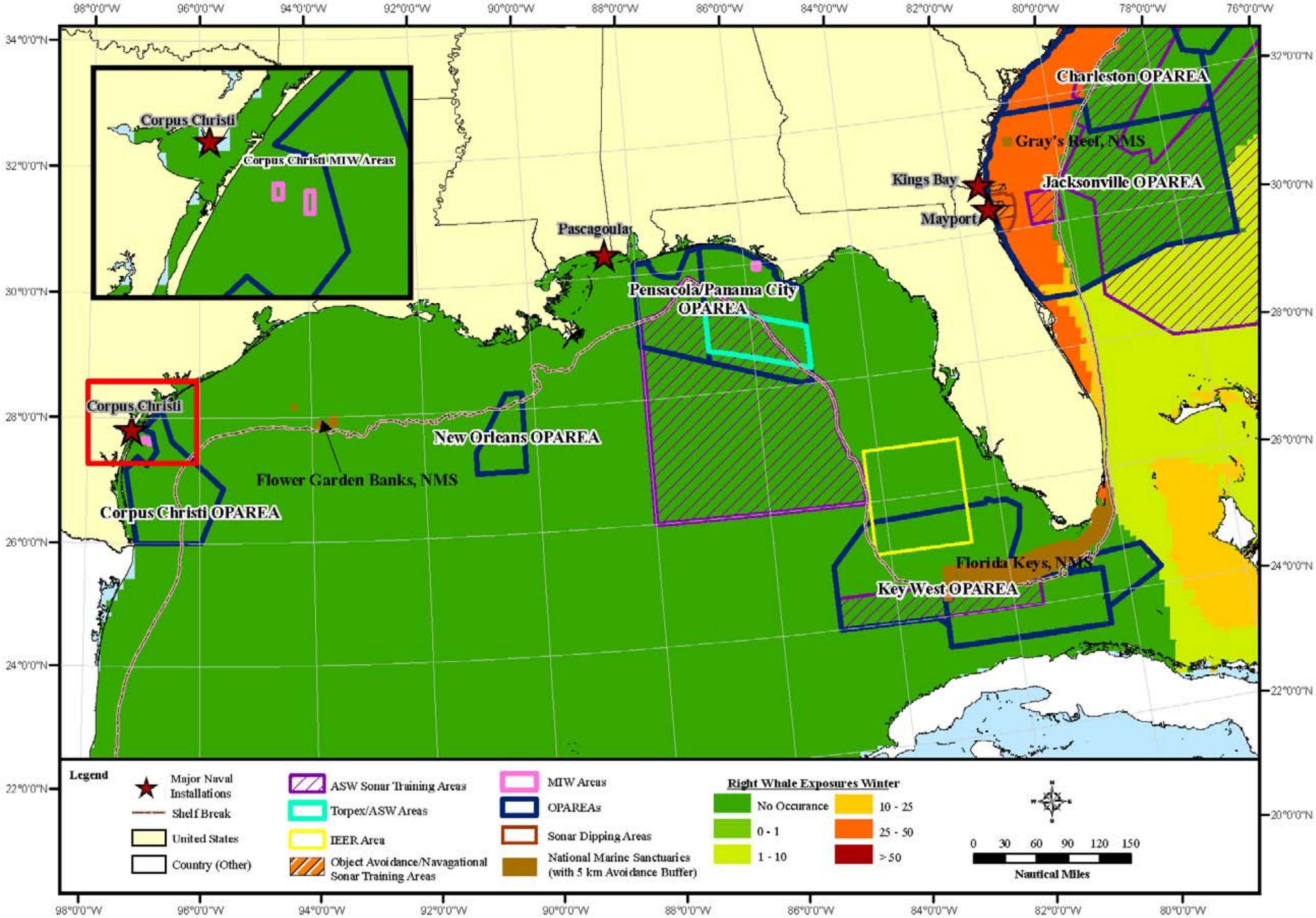
Figure D-144. Alternative 2, Fall GOMEX Right Whale (Fall)



1 **Figure D-145. Alternative 2, Fall GOMEX Right Whale (Winter)**

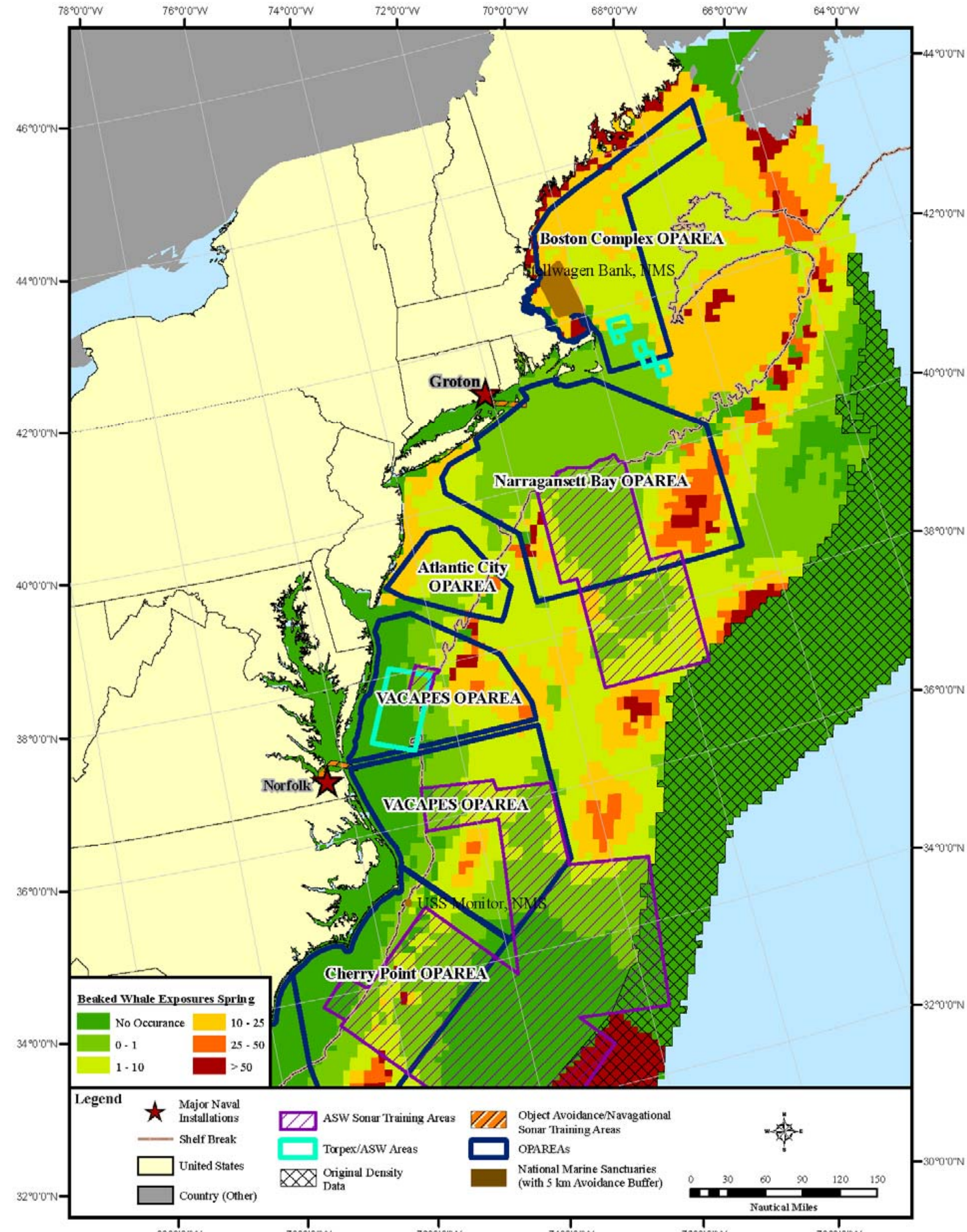


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Figure D-146. Alternative 2, Winter NE Beaked Whale (Spring)

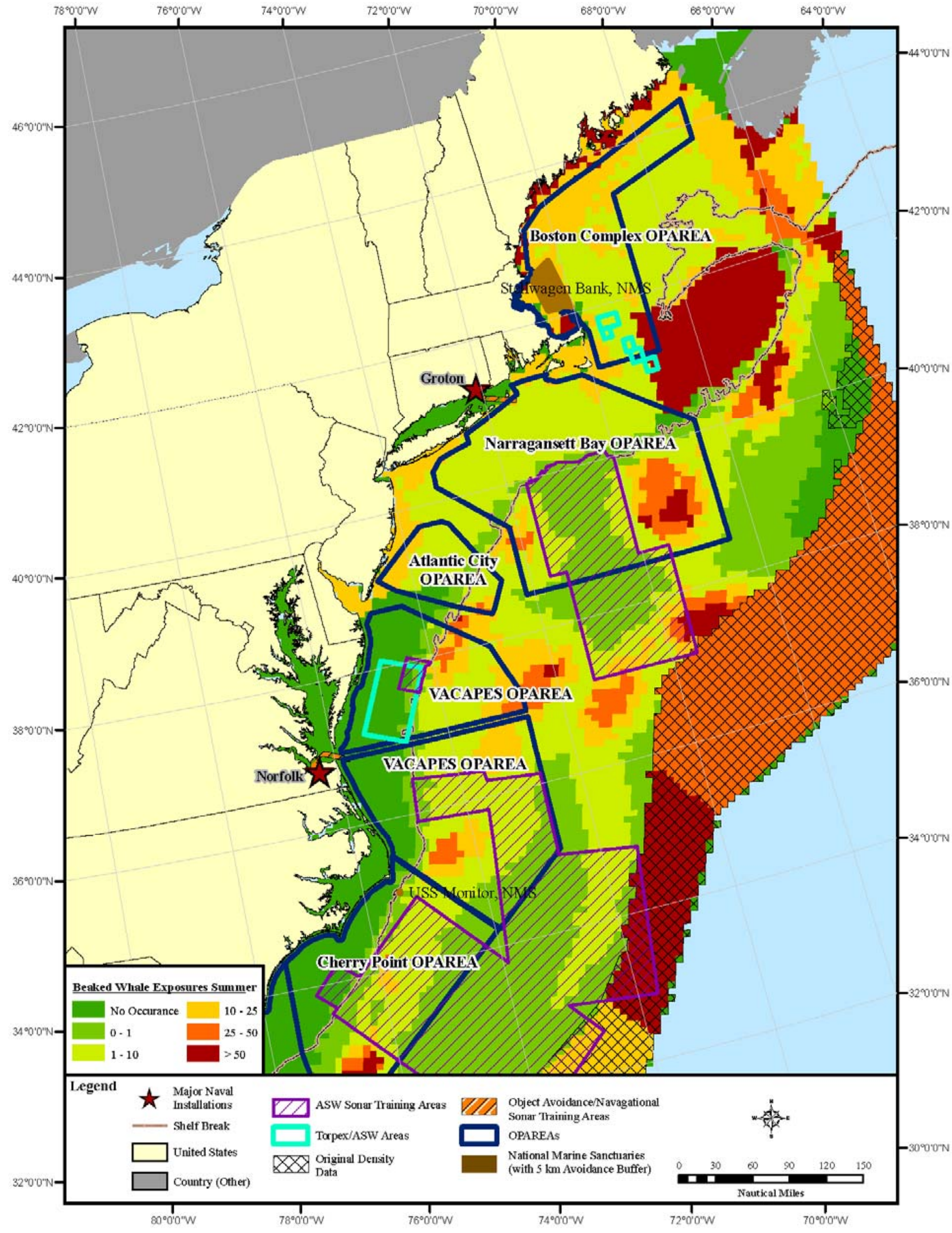

Figure D-147. Alternative 2, Winter NE Beaked Whale (Summer)

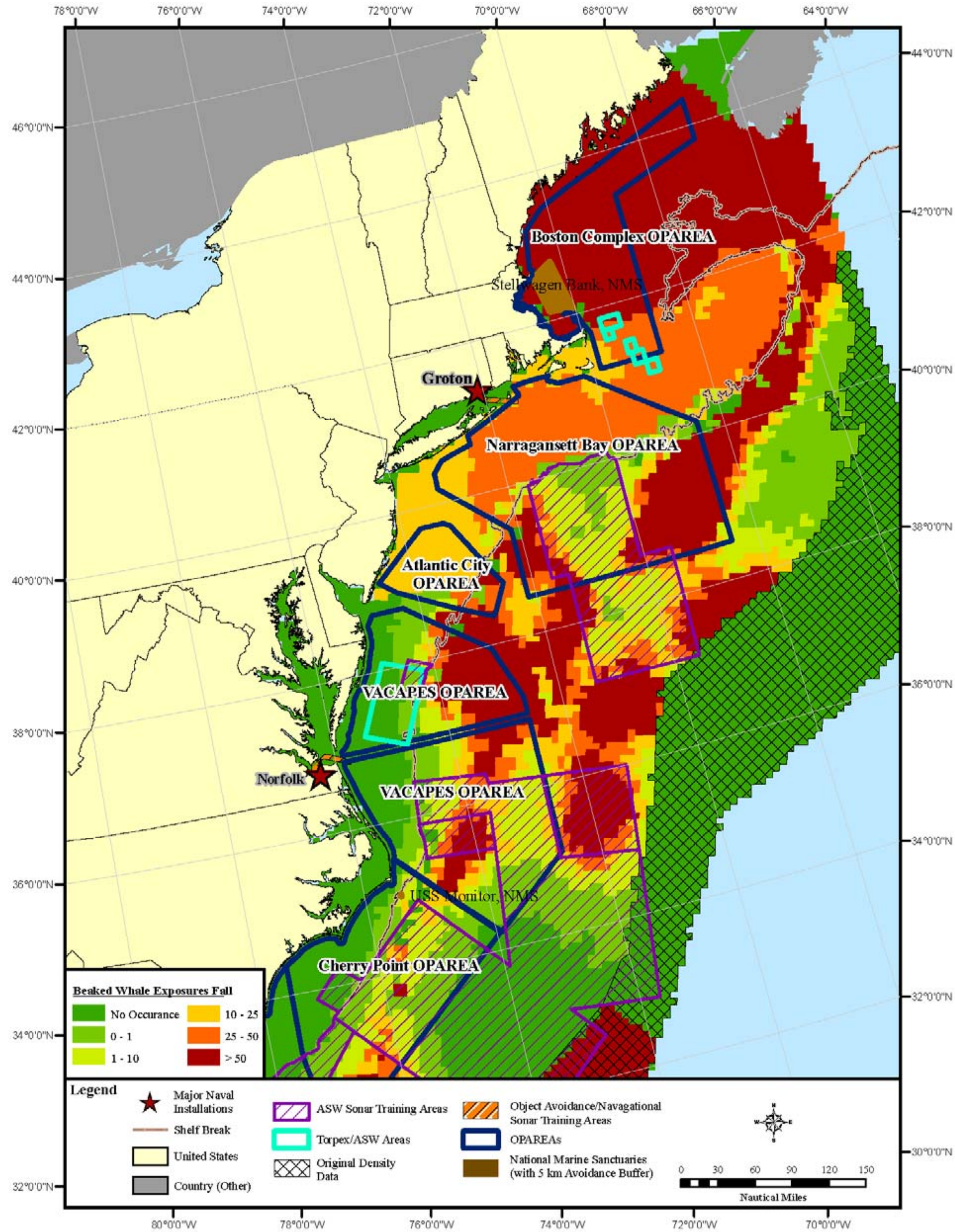

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Figure D-148. Alternative 2, Winter NE Beaked Whale (Fall)

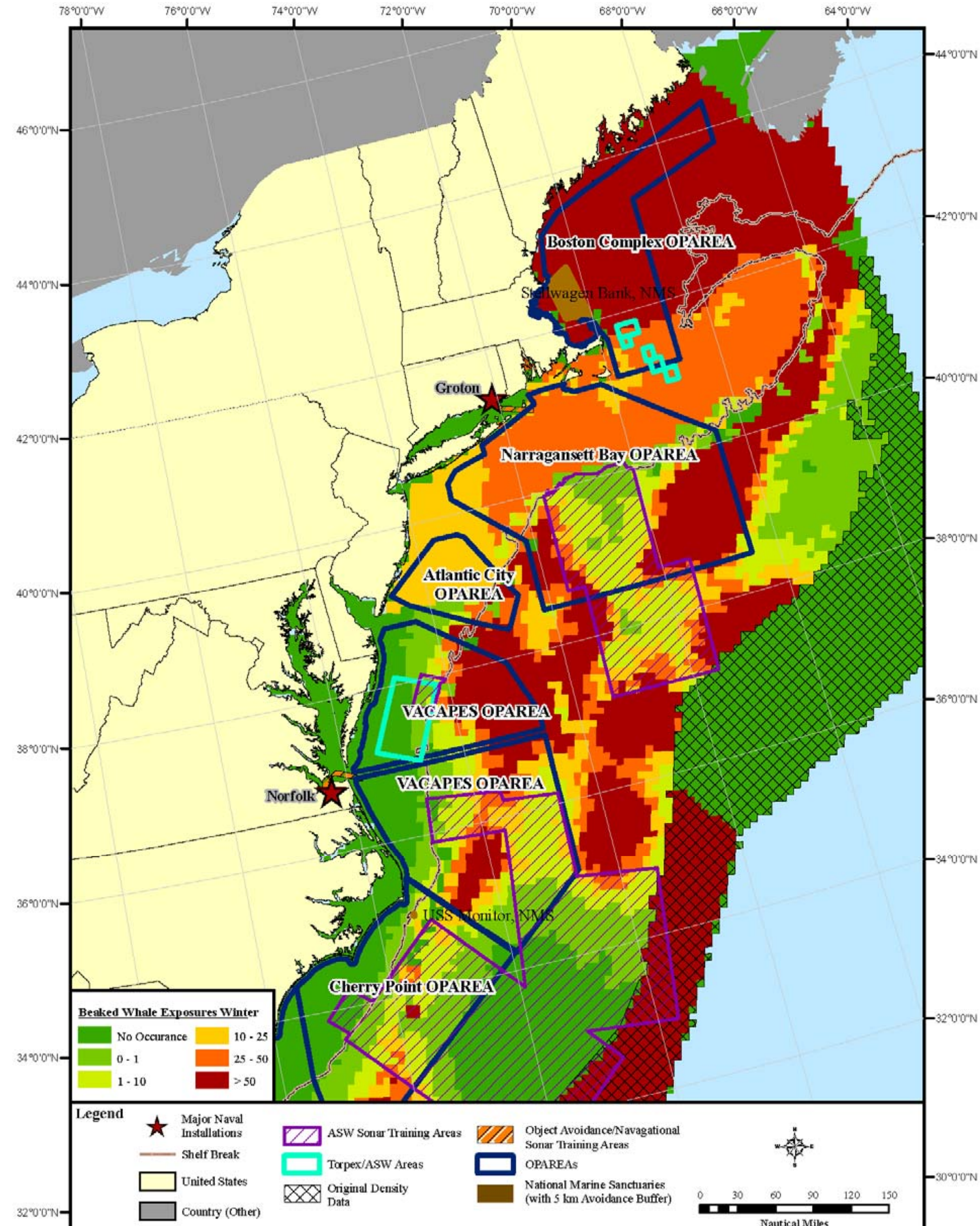

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Figure D-149. Alternative 2, Winter NE Beaked Whale (Winter)

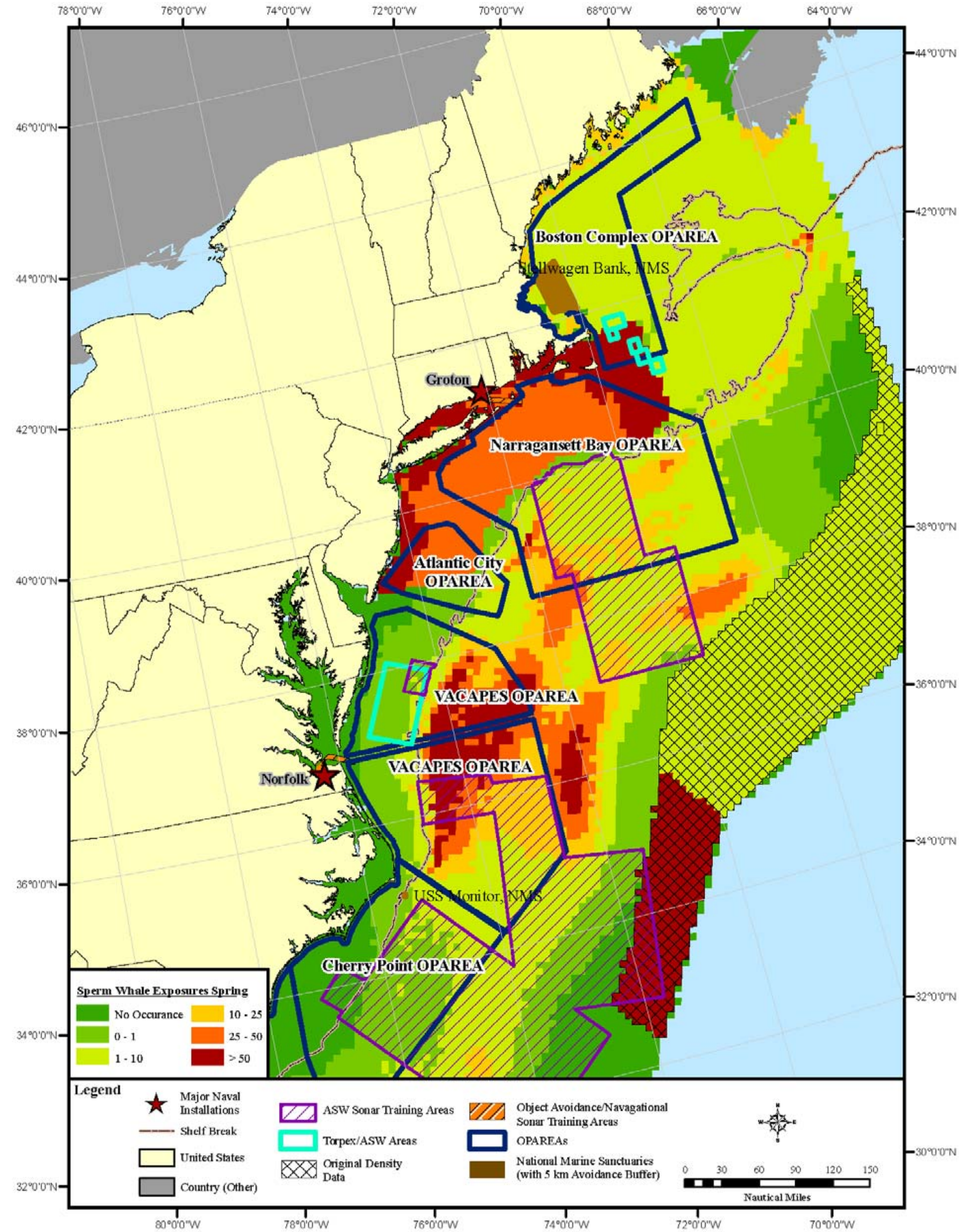

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Figure D-150. Alternative 2, Winter NE Sperm Whale (Spring)

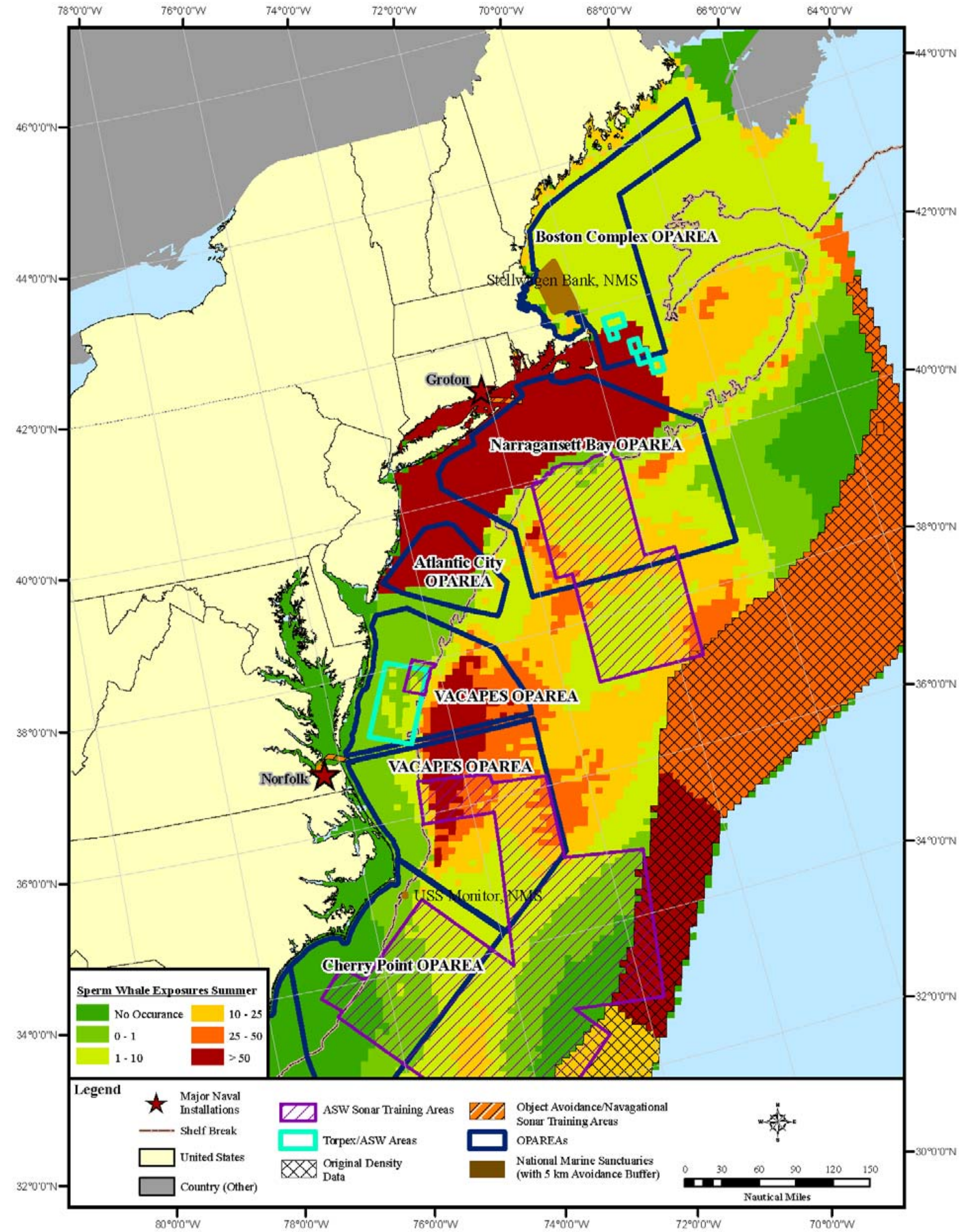

Figure D-151. Alternative 2, Winter NE Sperm Whale (Summer)

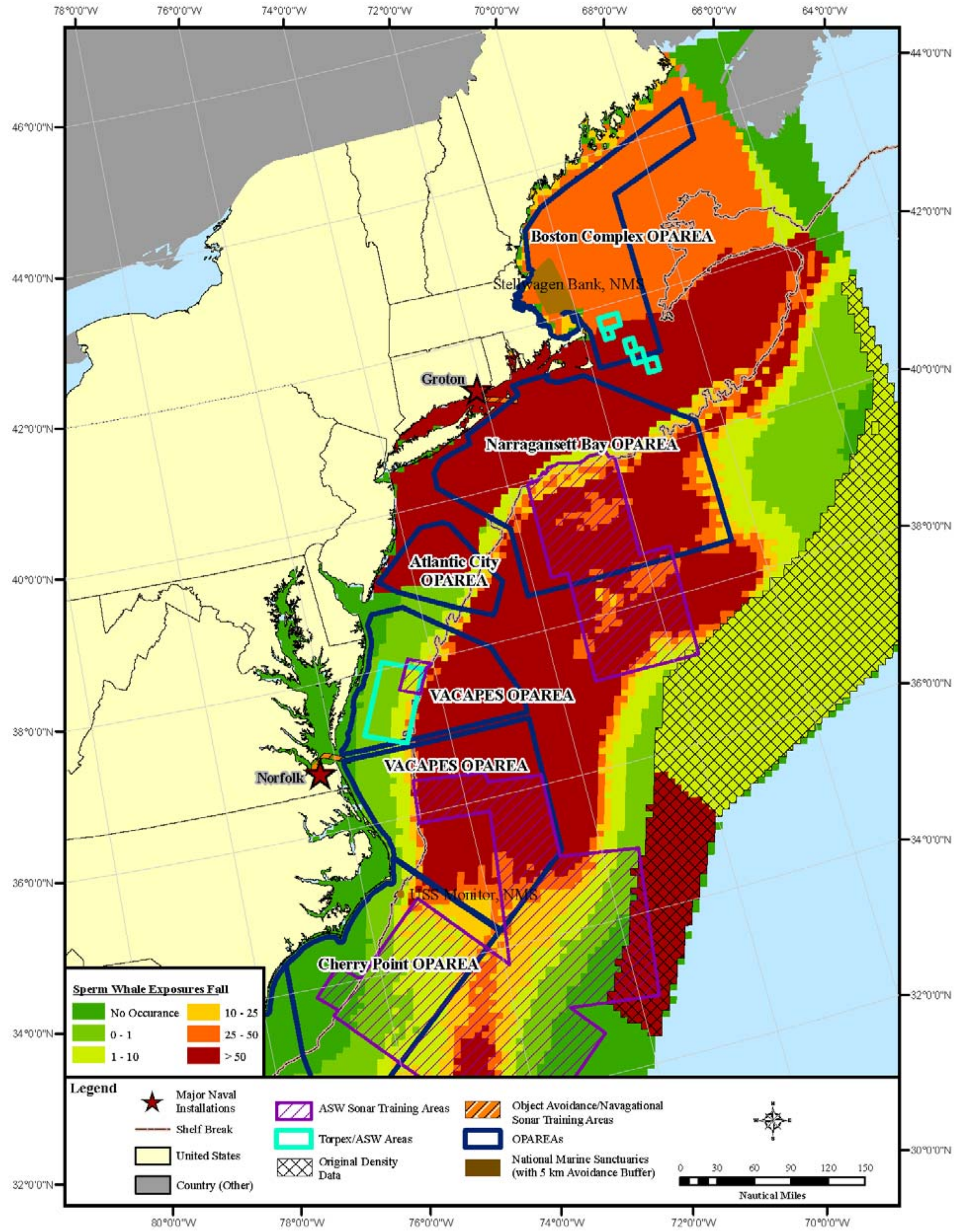

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Figure D-152. Alternative 2, Winter NE Sperm Whale (Fall)

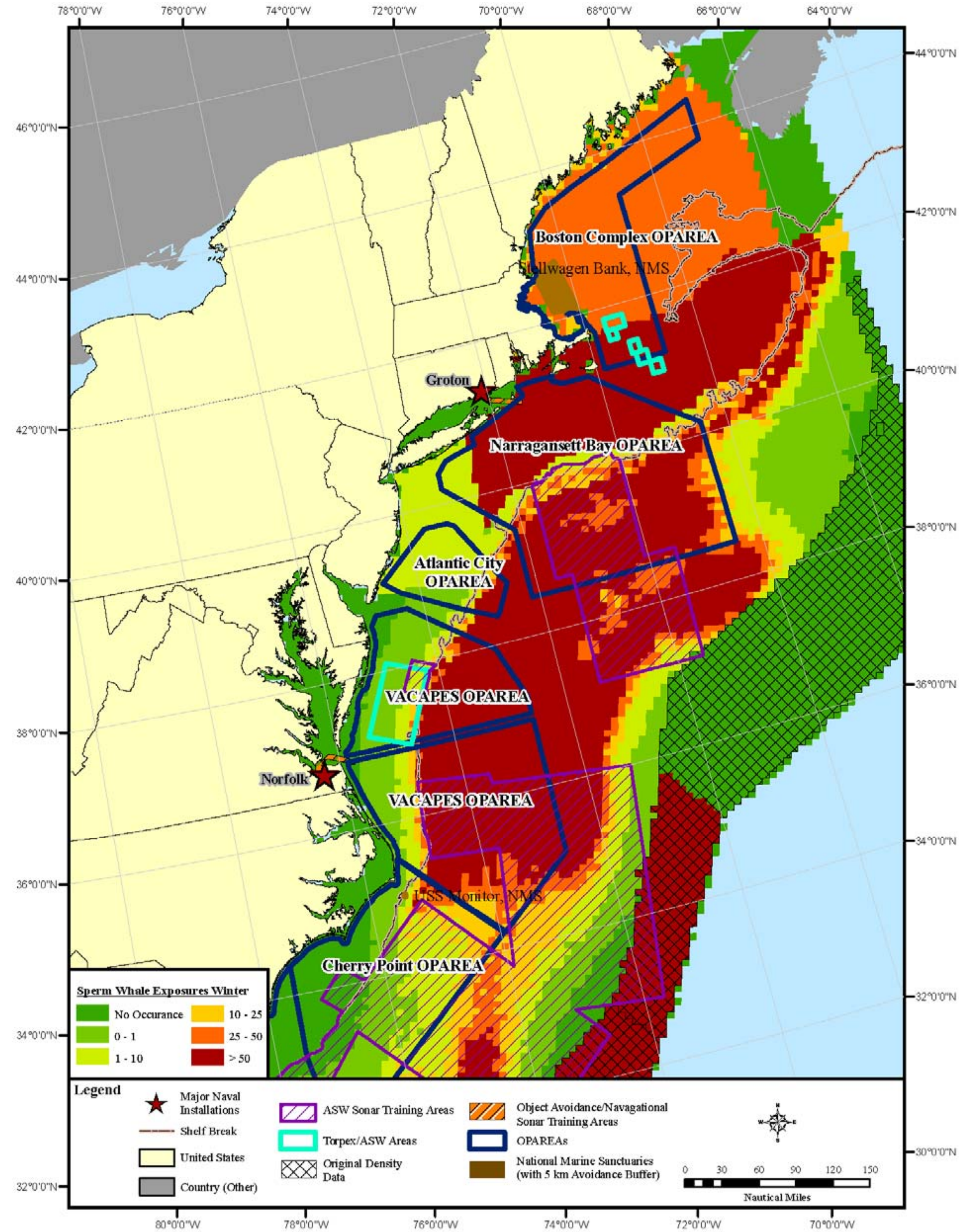

Figure D-153. Alternative 2, Winter NE Sperm Whale (Winter)

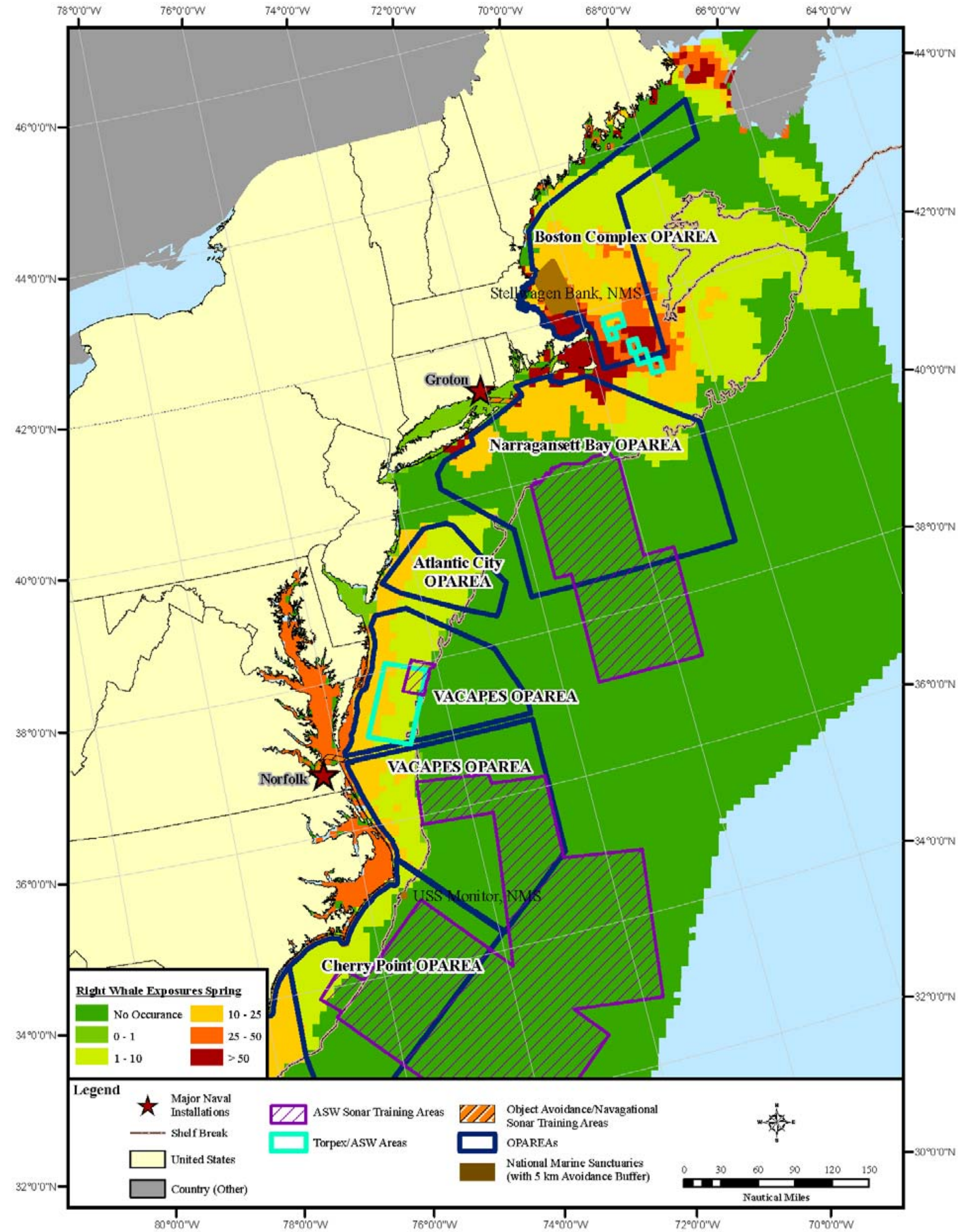

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Figure D-154. Alternative 2, Winter NE Right Whale (Spring)

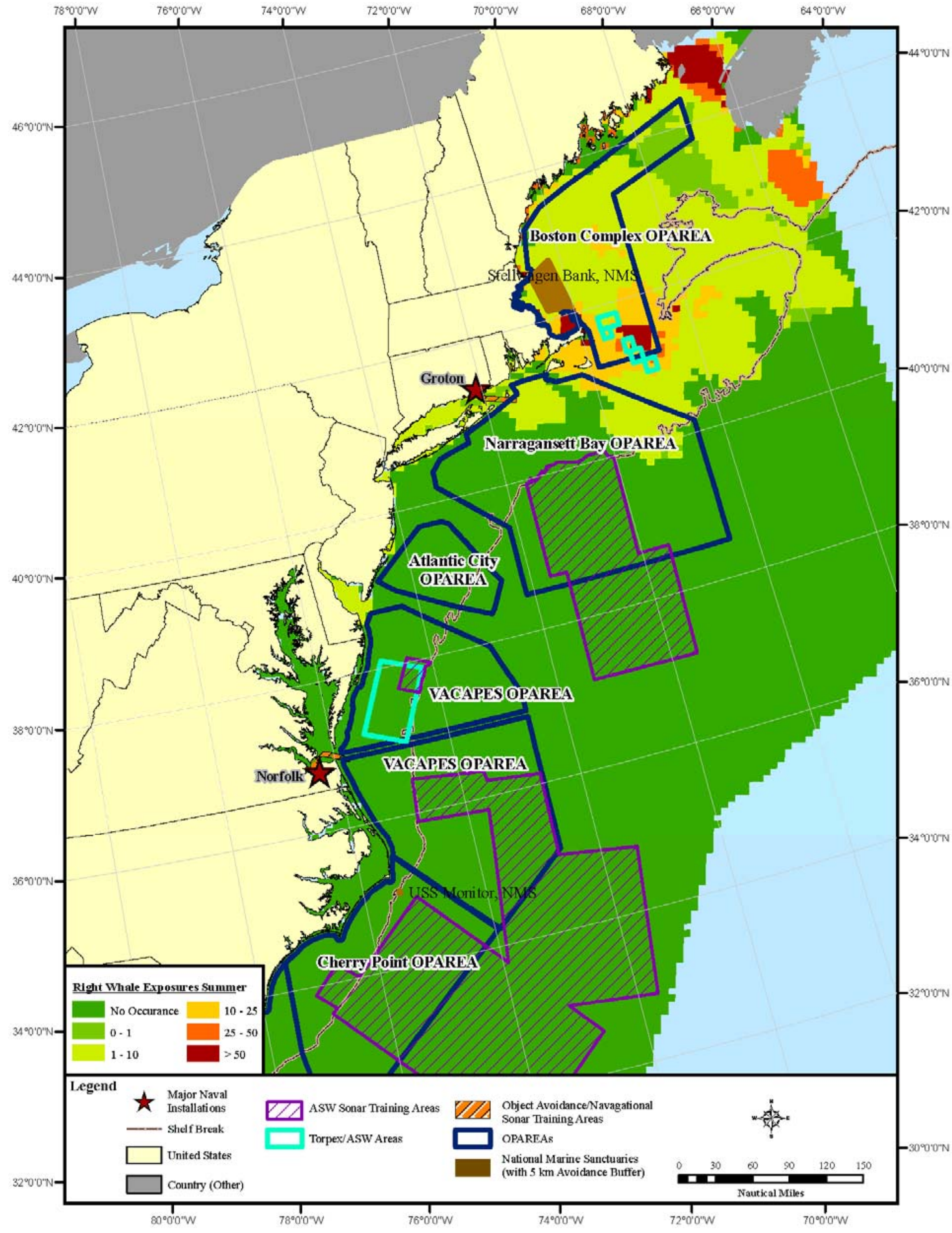

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Figure D-155. Alternative 2, Winter NE Right Whale (Summer)

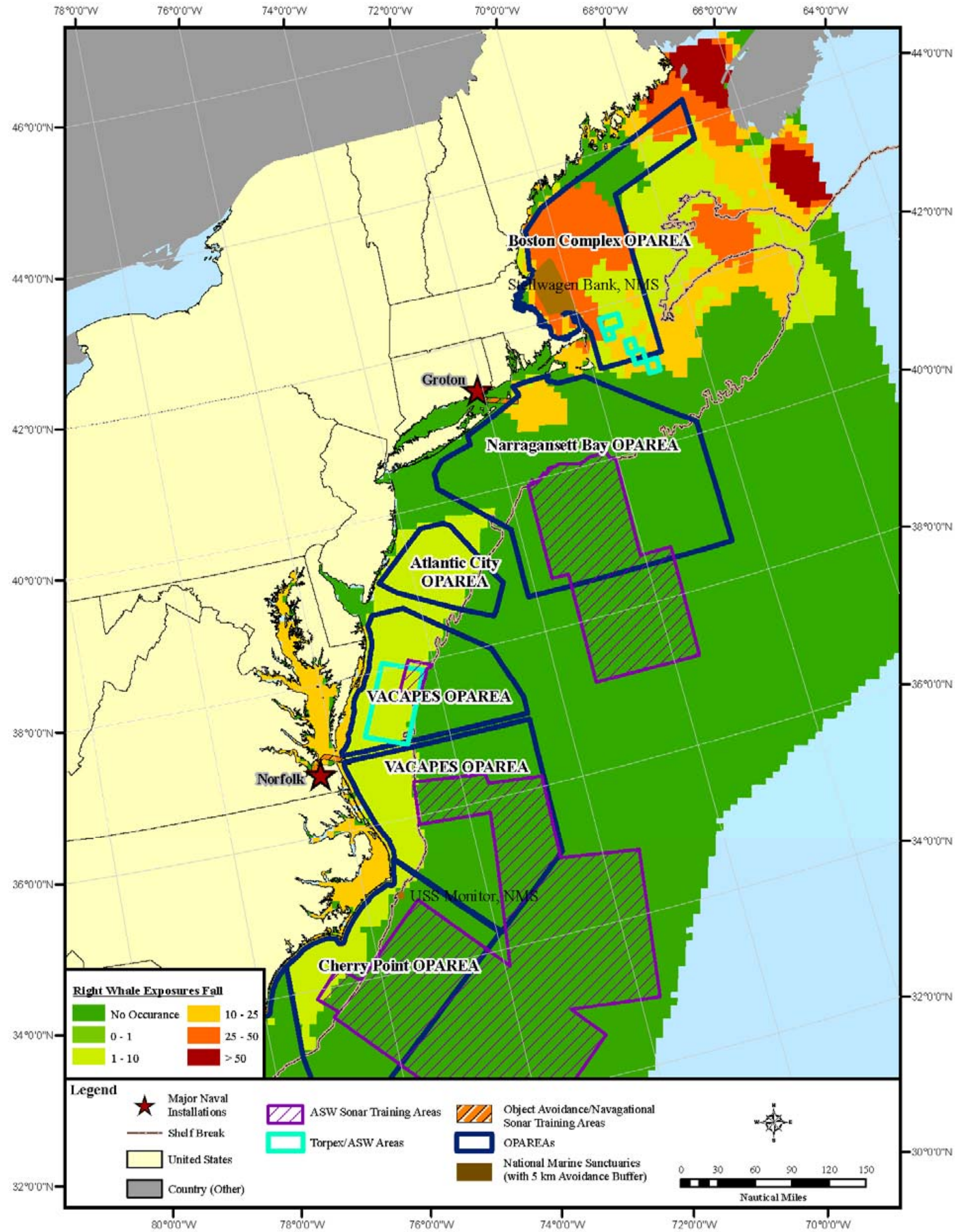

Figure D-156. Alternative 2, Winter NE Right Whale (Fall)

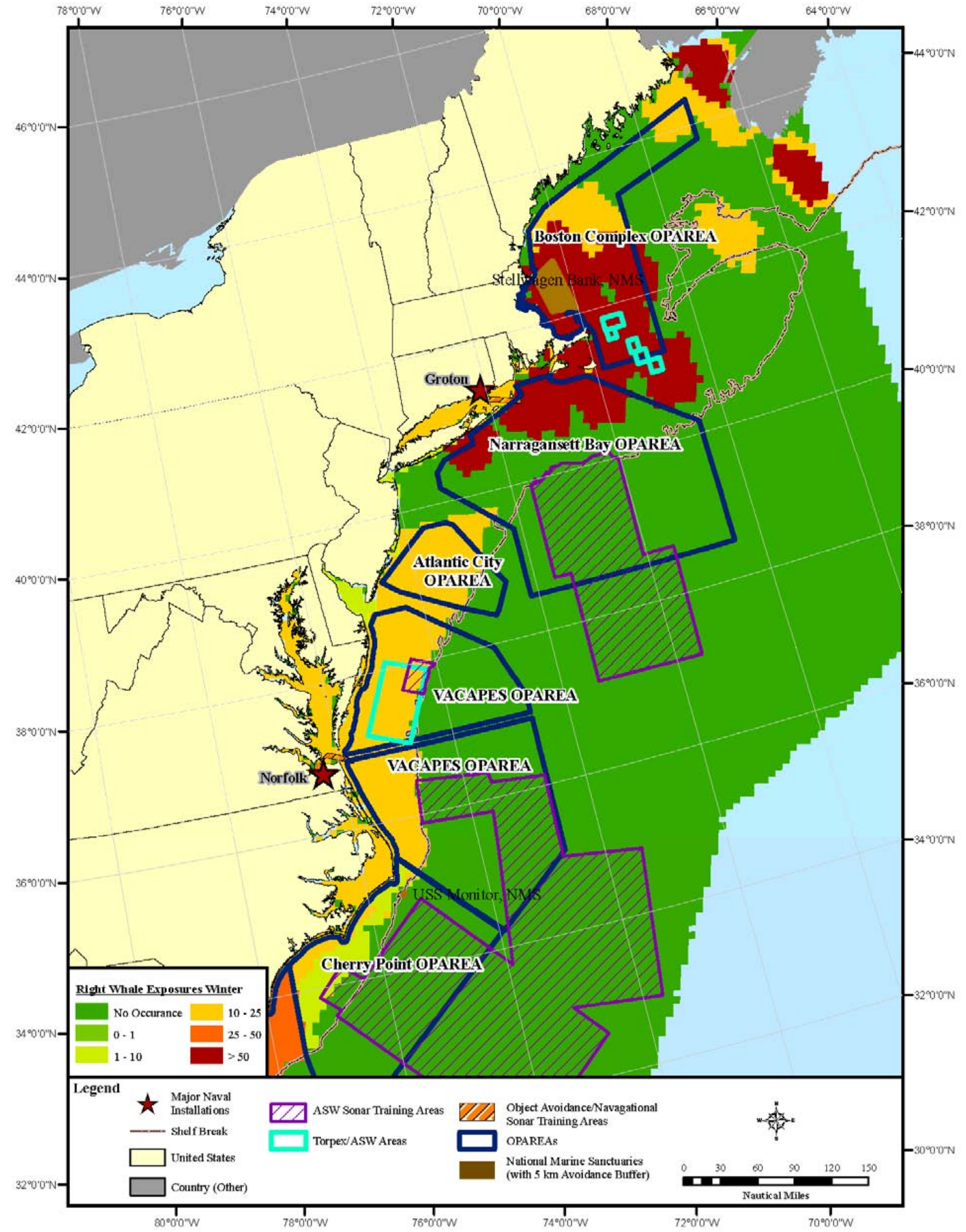

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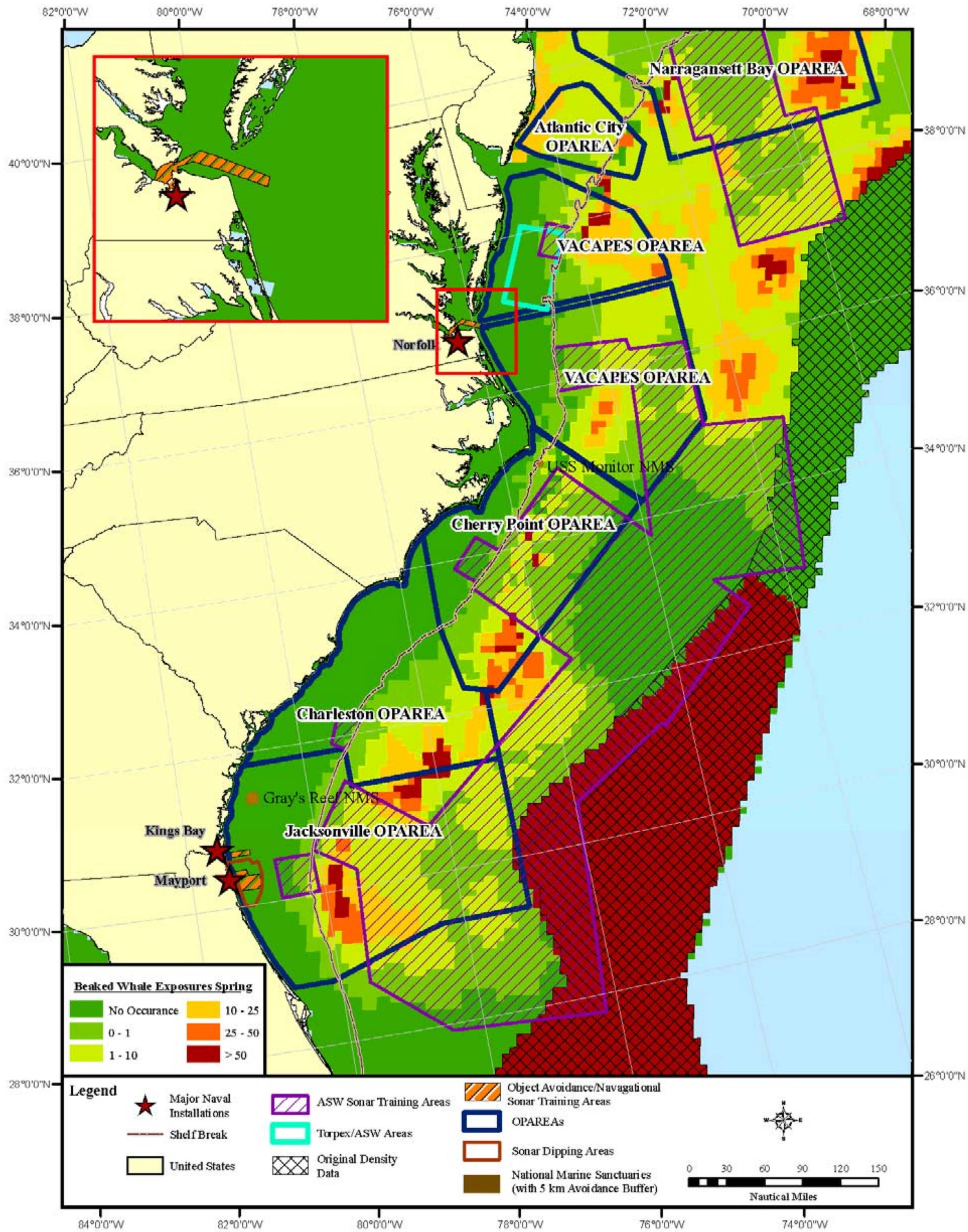
Figure D-157. Alternative 2, Winter NE Right Whale (Winter)



1 **Figure D-158. Alternative 2, Winter SE Beaked Whale (Spring)**

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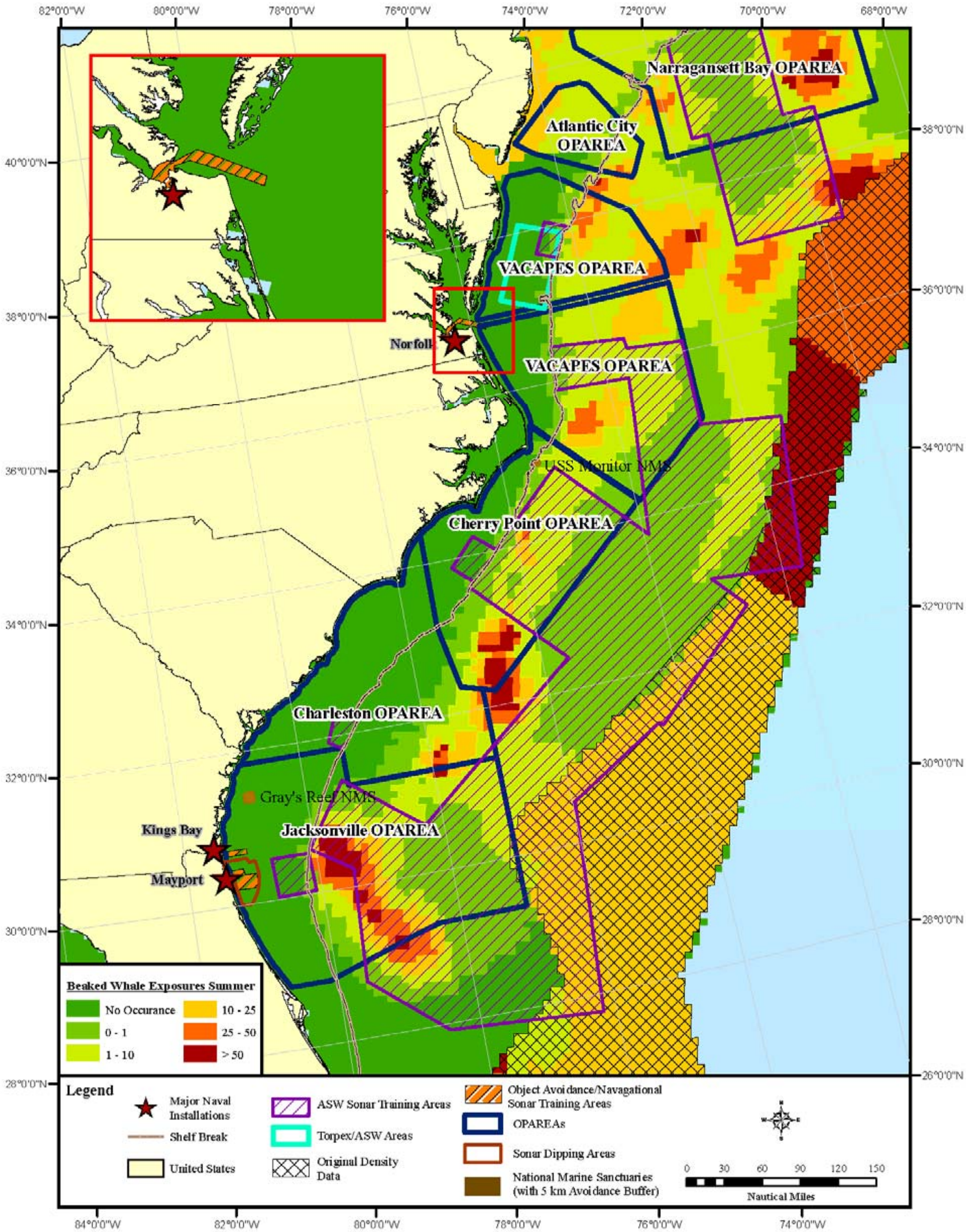

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Figure D-159. Alternative 2, Winter SE Beaked Whale (Summer)

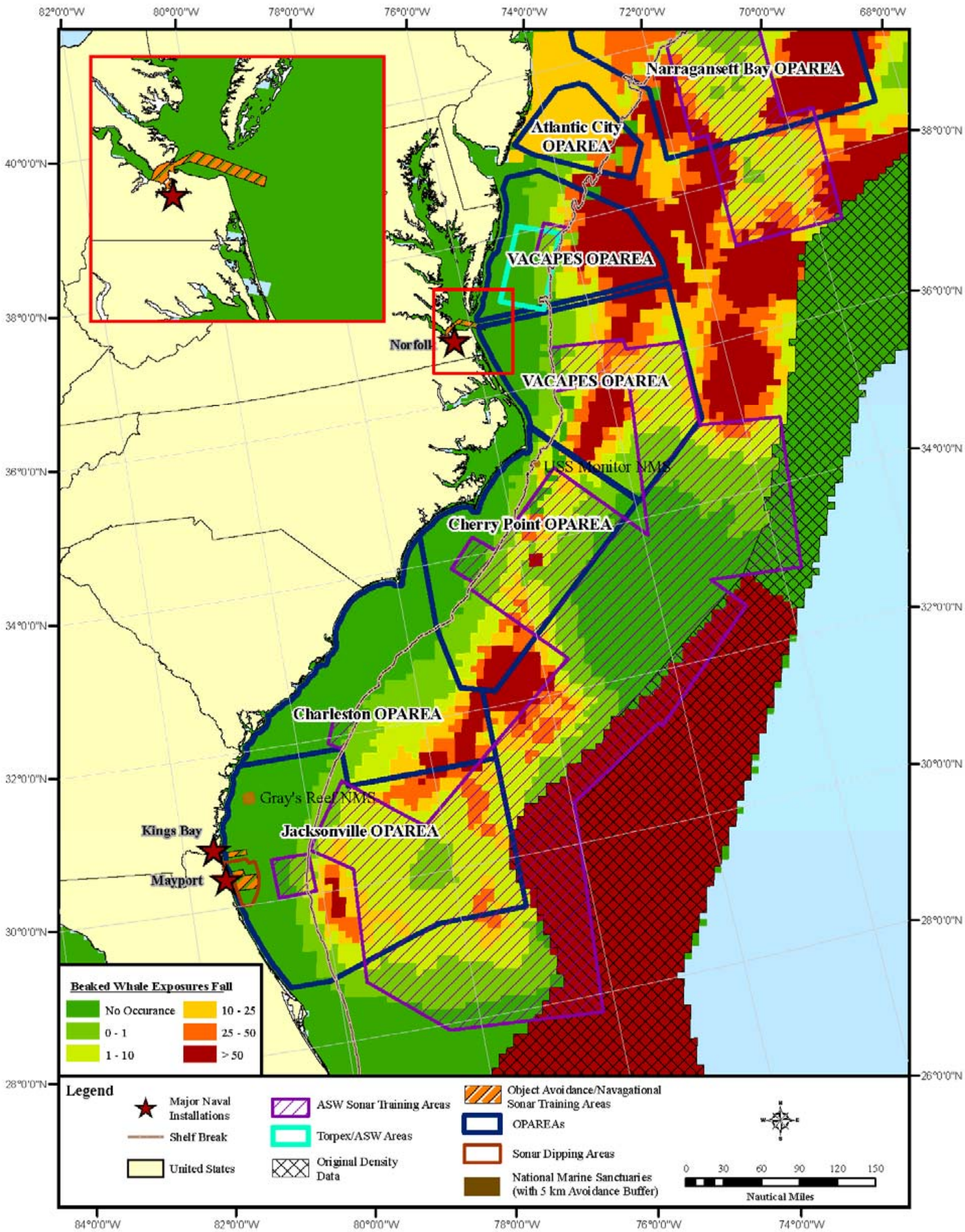

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Figure D-160. Alternative 2, Winter SE Beaked Whale (Fall)

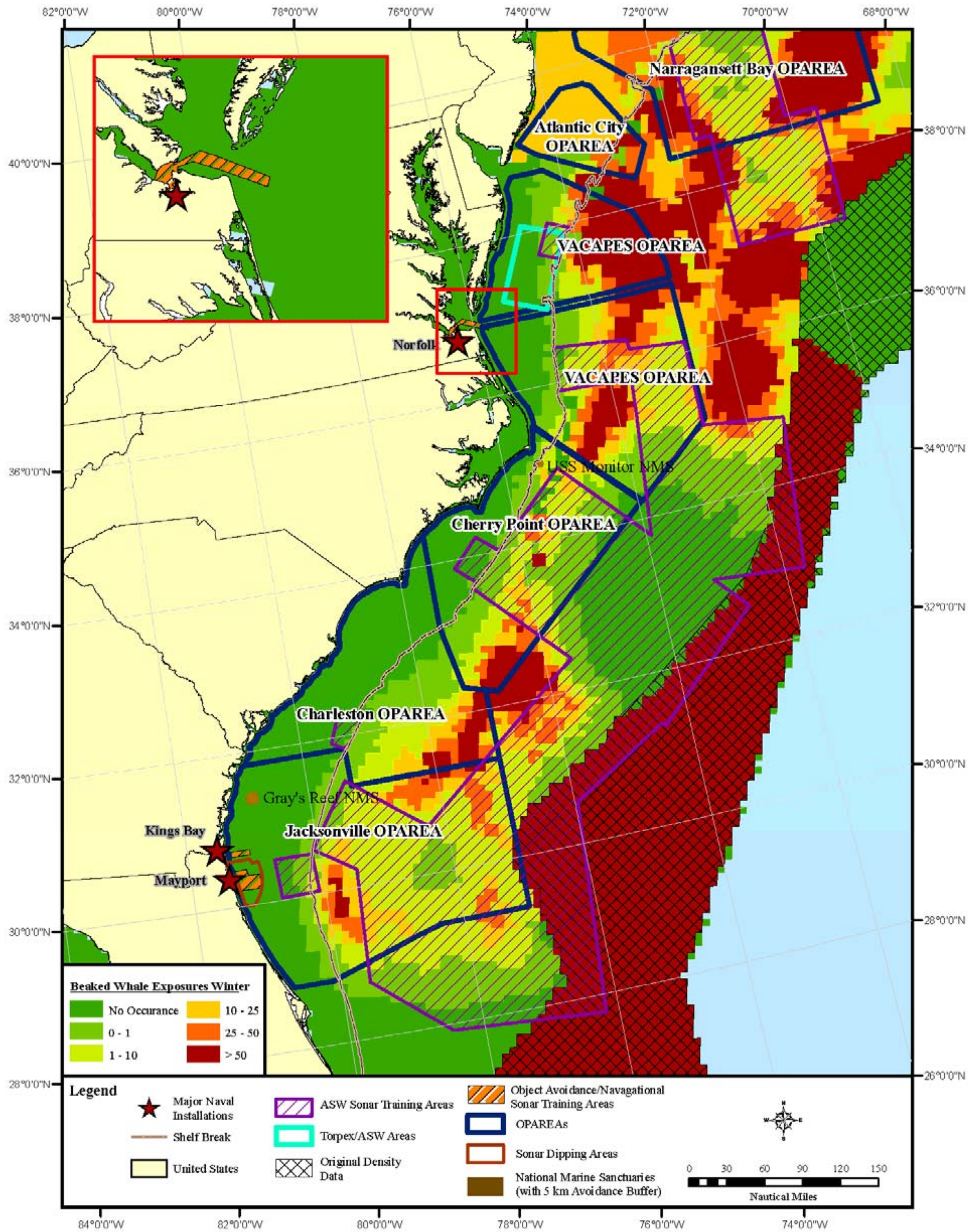

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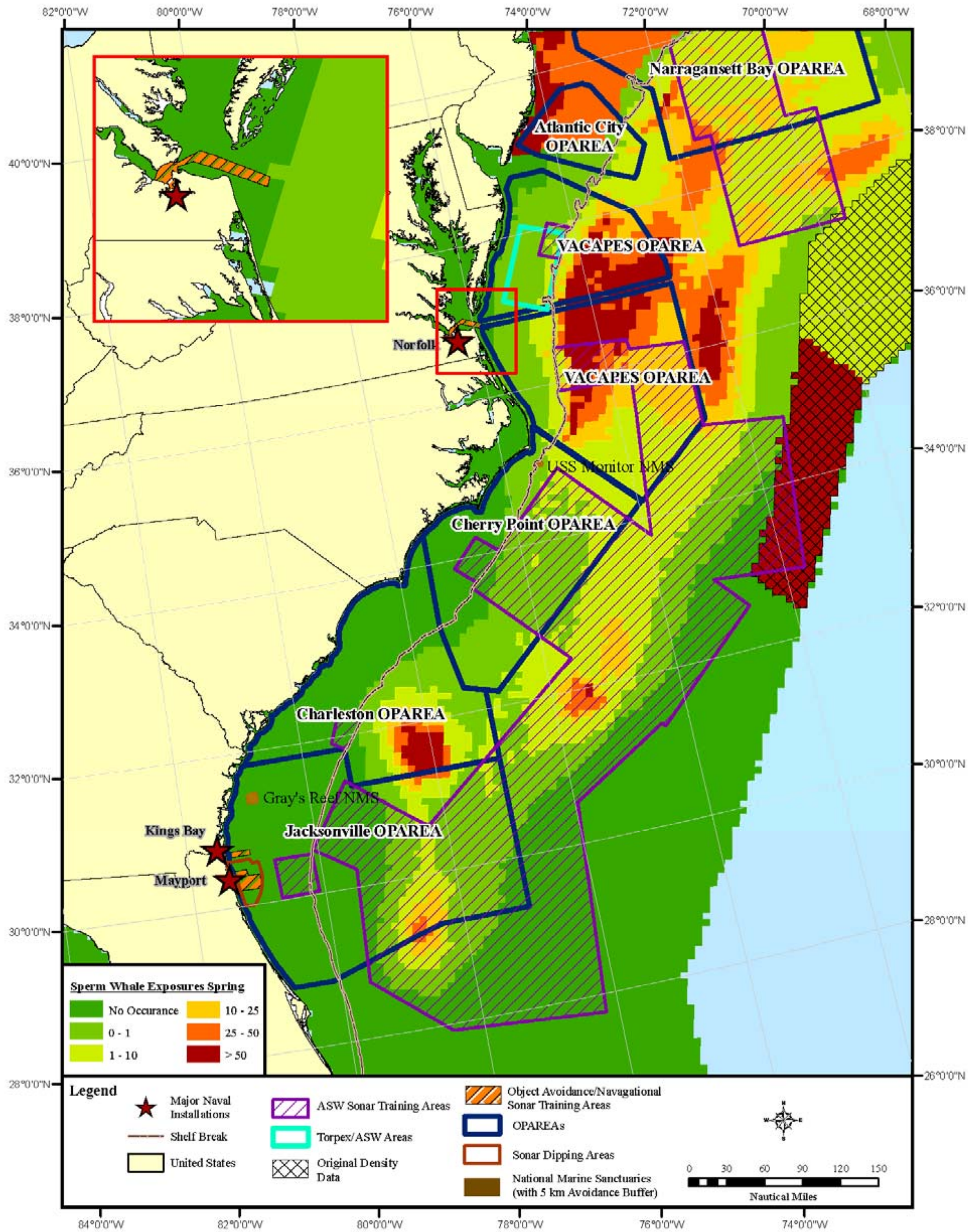
Figure D-161. Alternative 2, Winter SE Beaked Whale (Winter)



1 **Figure D-162. Alternative 2, Winter SE Sperm Whale (Spring)**

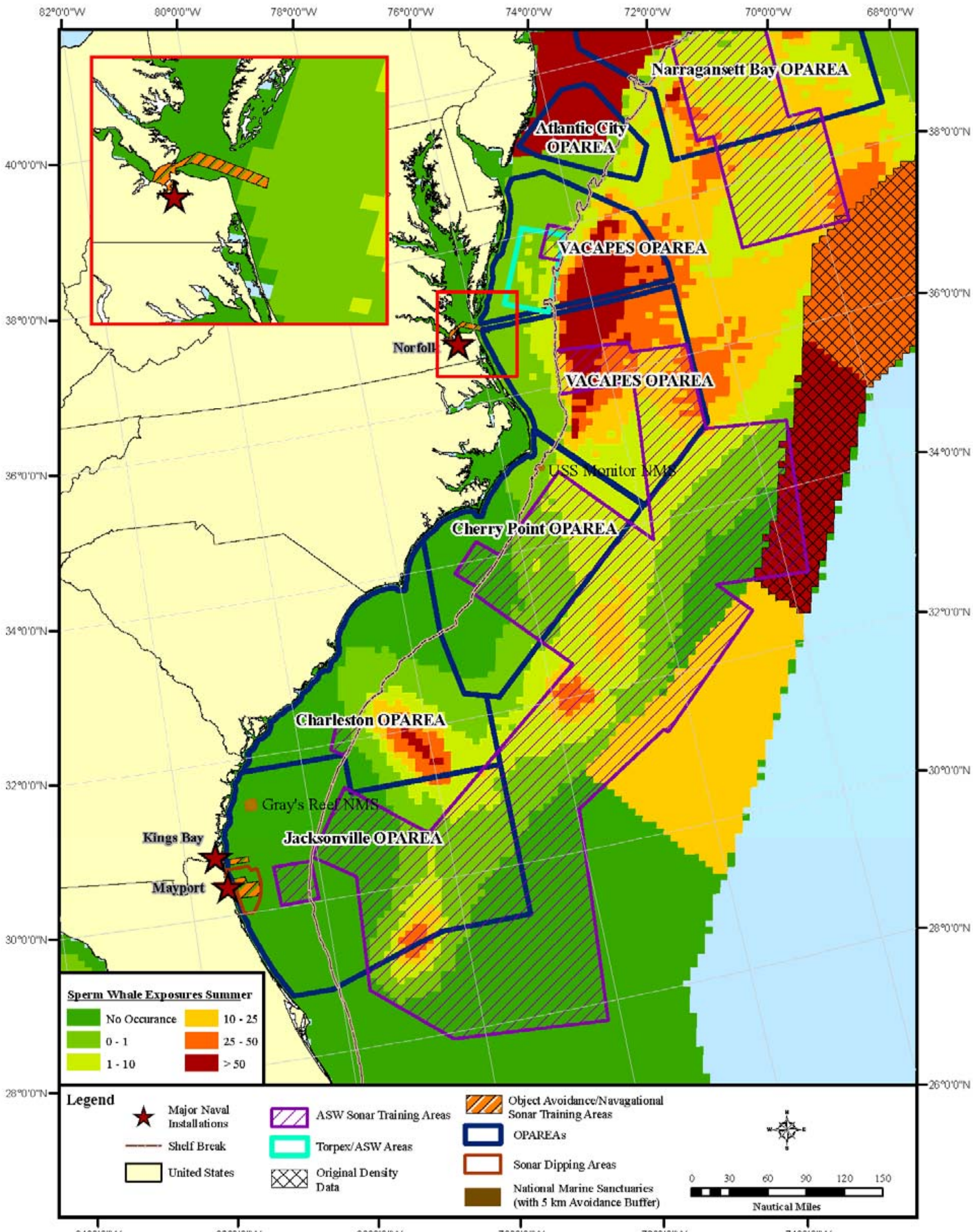


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Figure D-163. Alternative 2, Winter SE Sperm Whale (Summer)

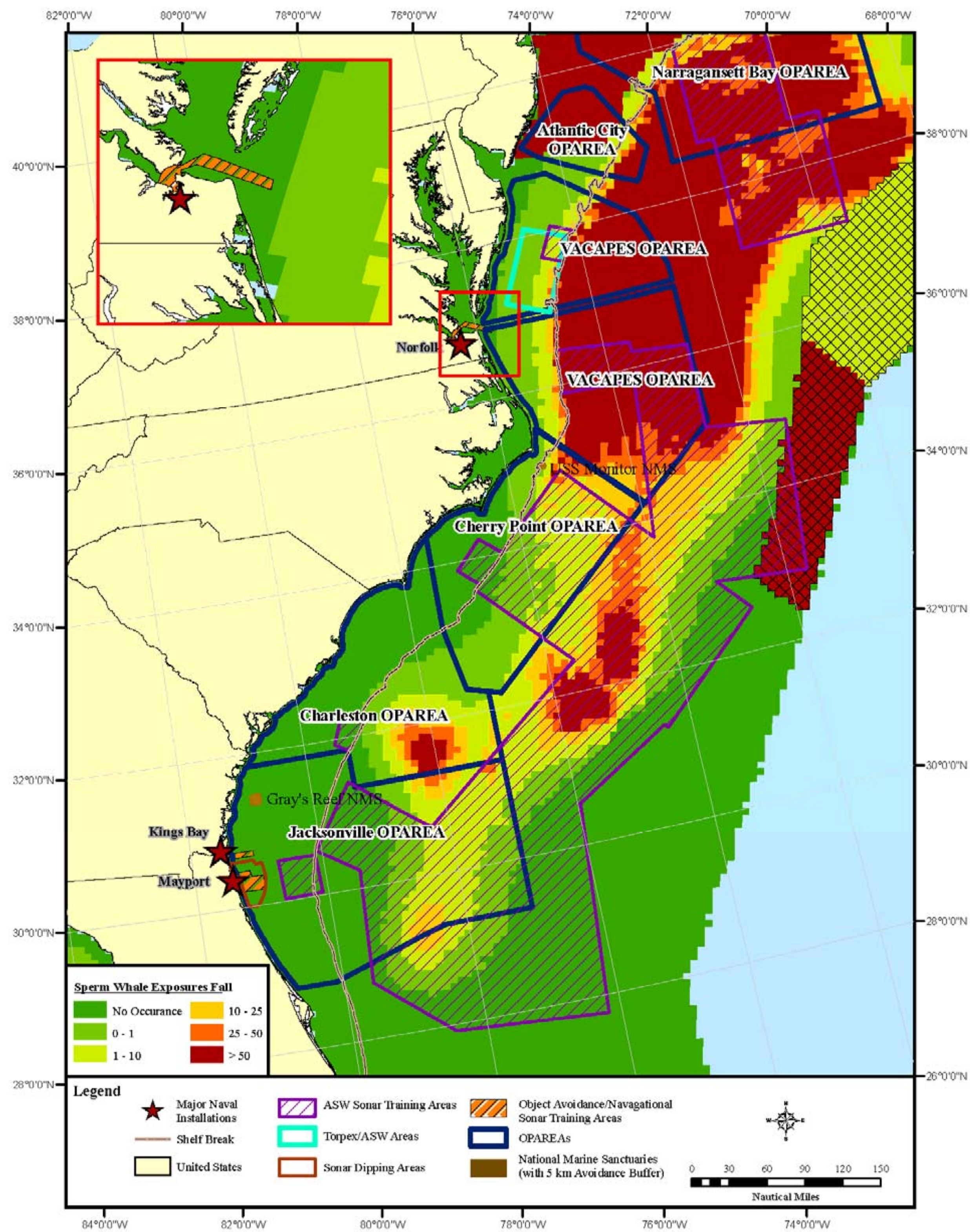

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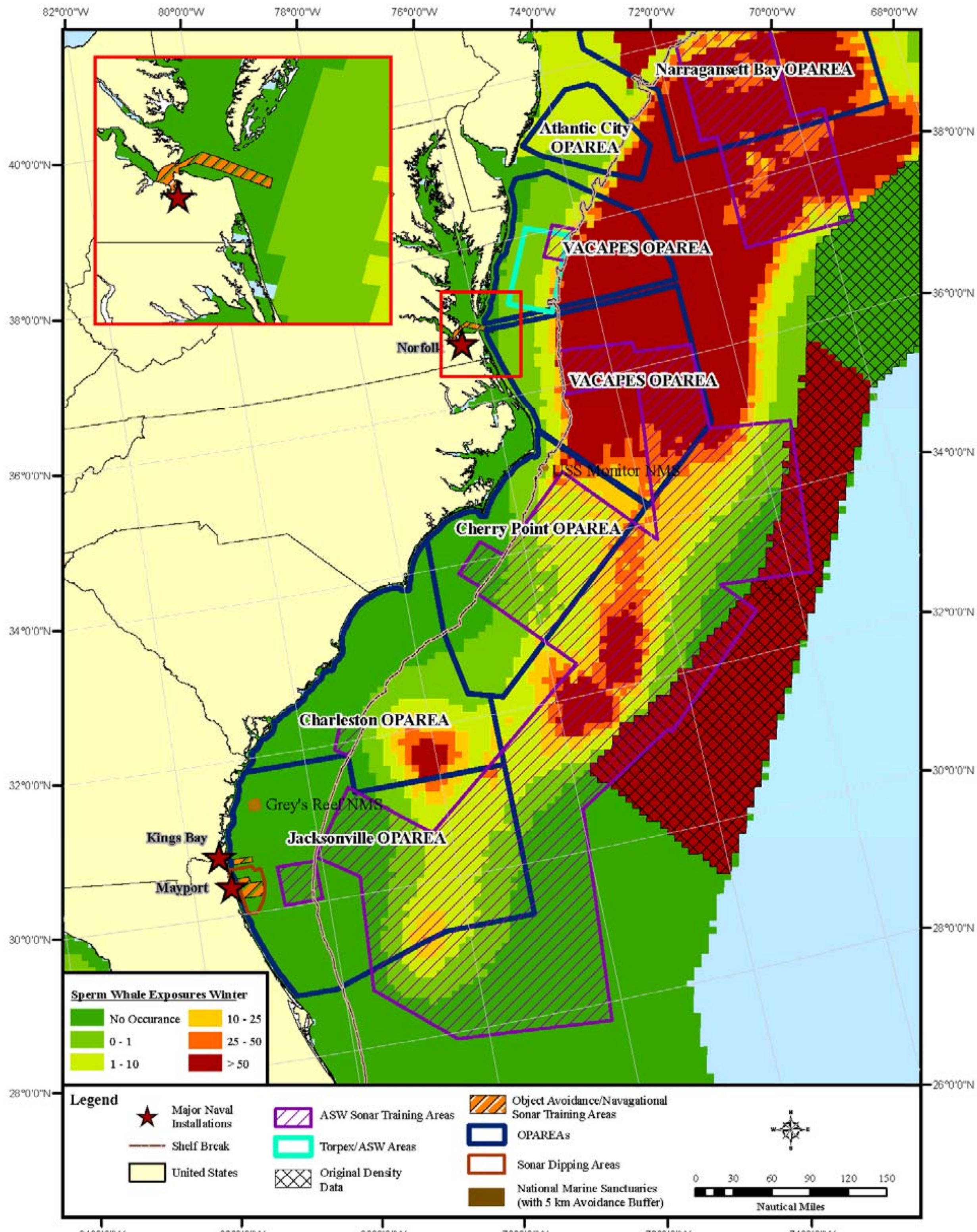
Figure D-164. Alternative 2, Winter SE Sperm Whale (Fall)



1 **Figure D-165. Alternative 2, Winter SE Sperm Whale (Winter)**

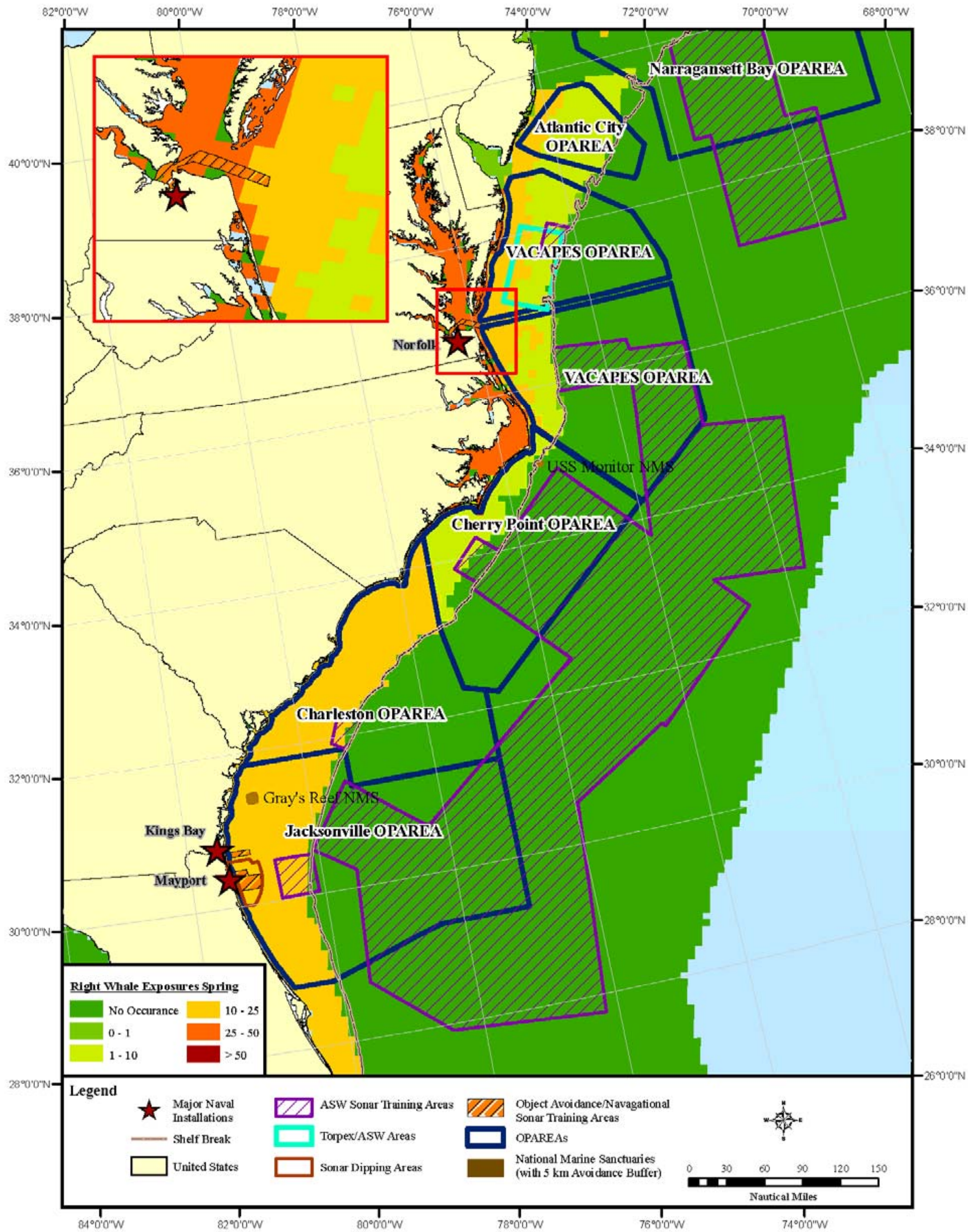


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Figure D-166. Alternative 2, Winter SE Right Whale, Spring

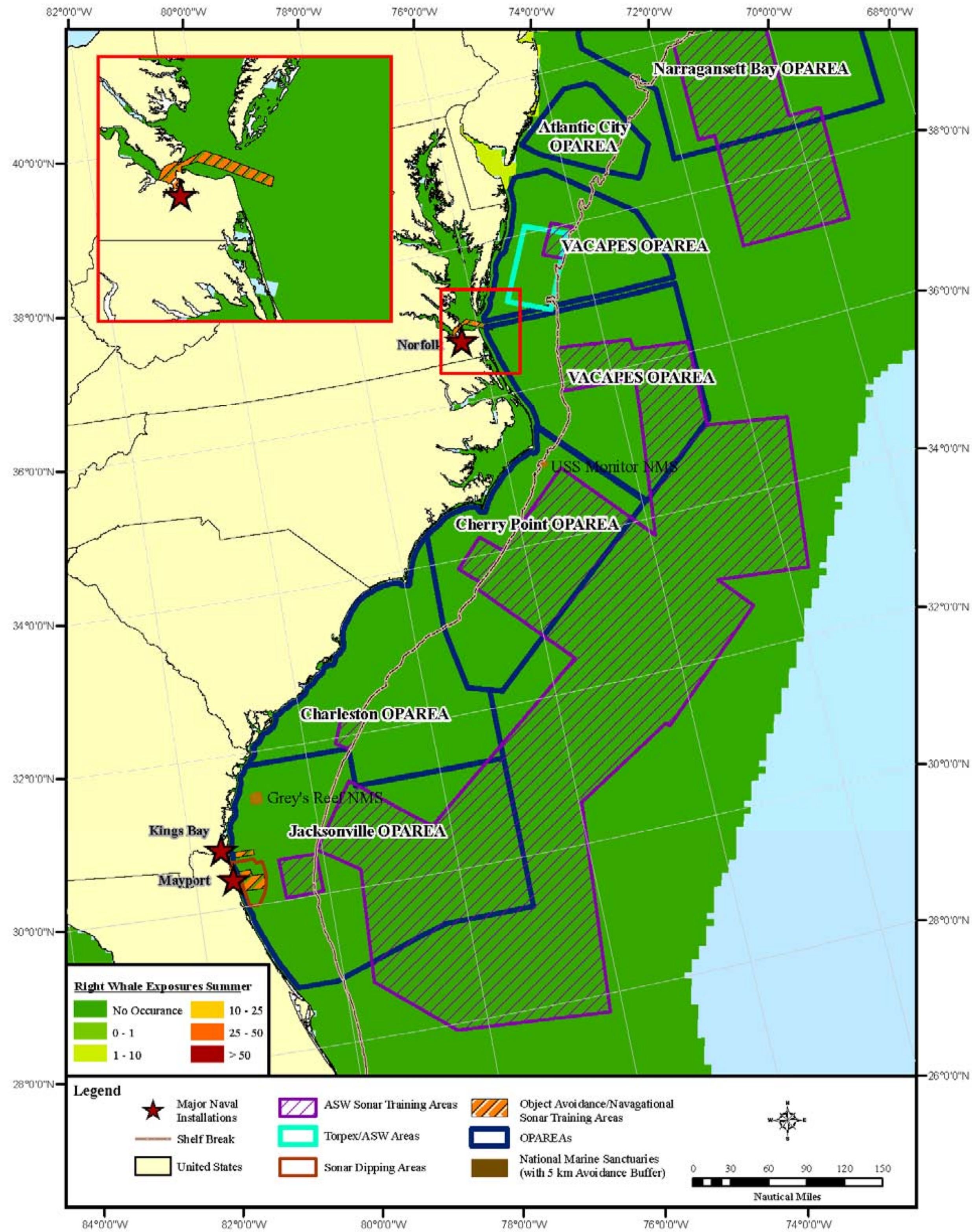

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Figure D-167. Alternative 2, Winter SE Right Whale (Summer)

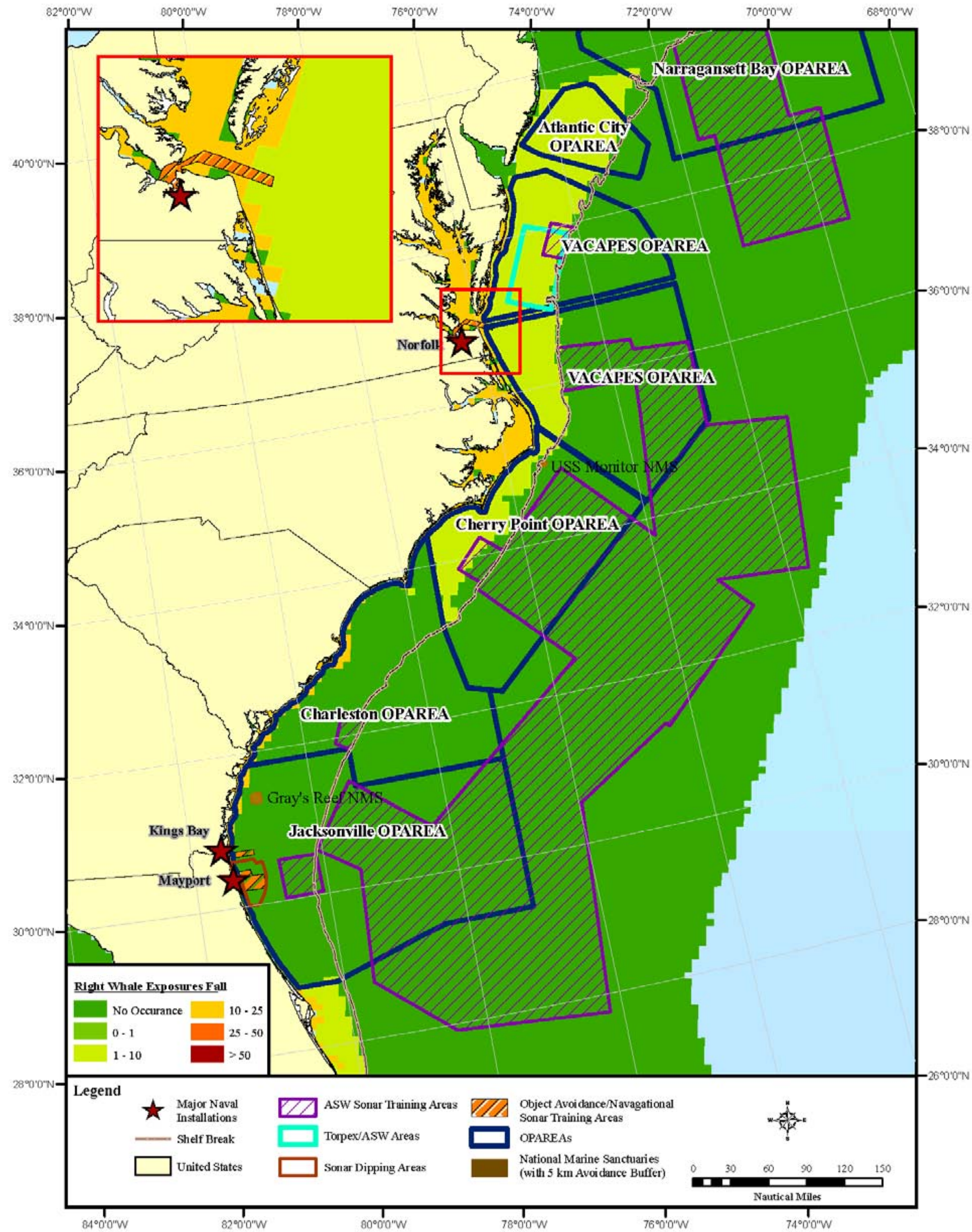

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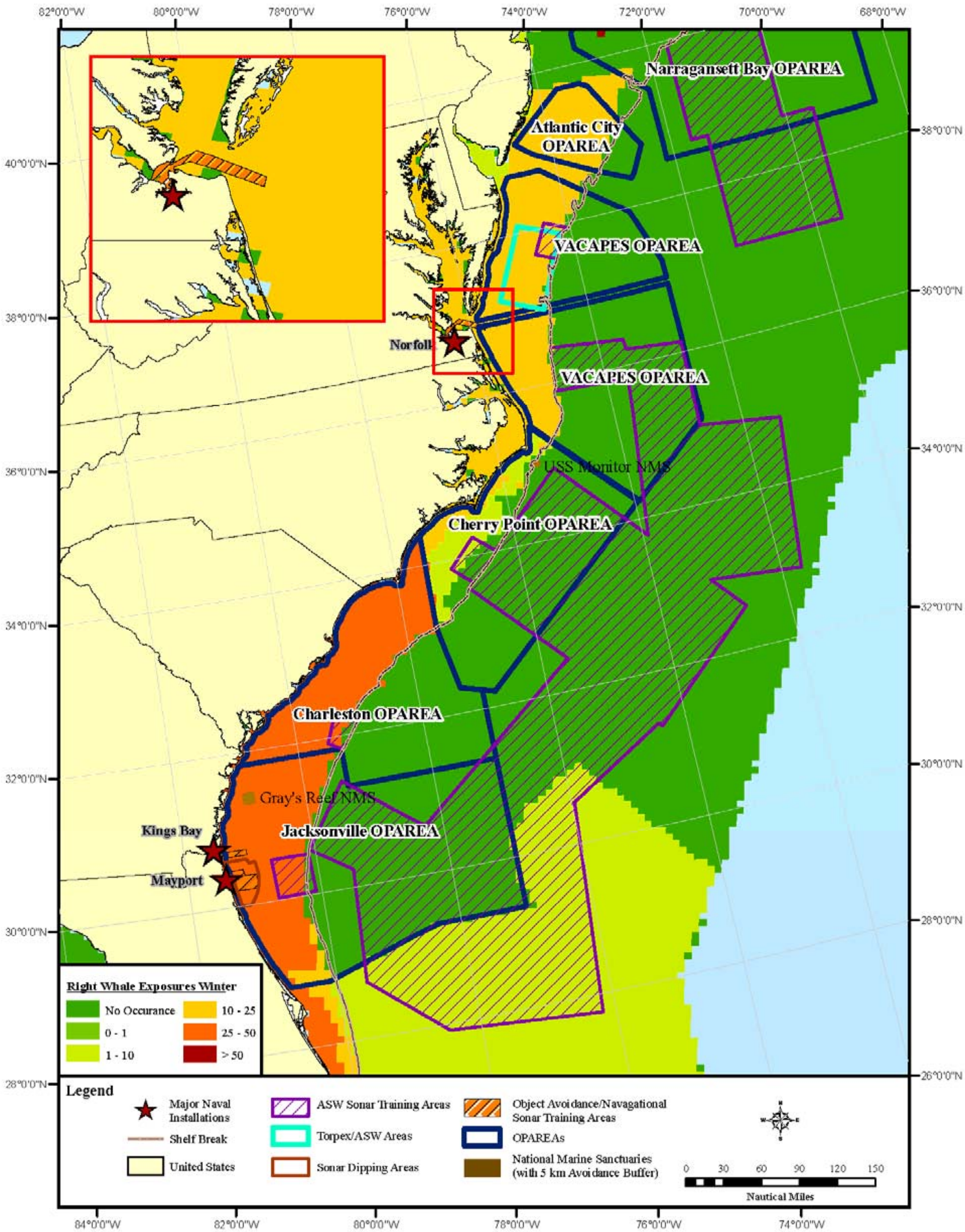
Figure D-168. Alternative 2, Winter SE Right Whale (Fall)



1 **Figure D-169. Alternative 2, Winter SE Right Whale (Winter)**

1

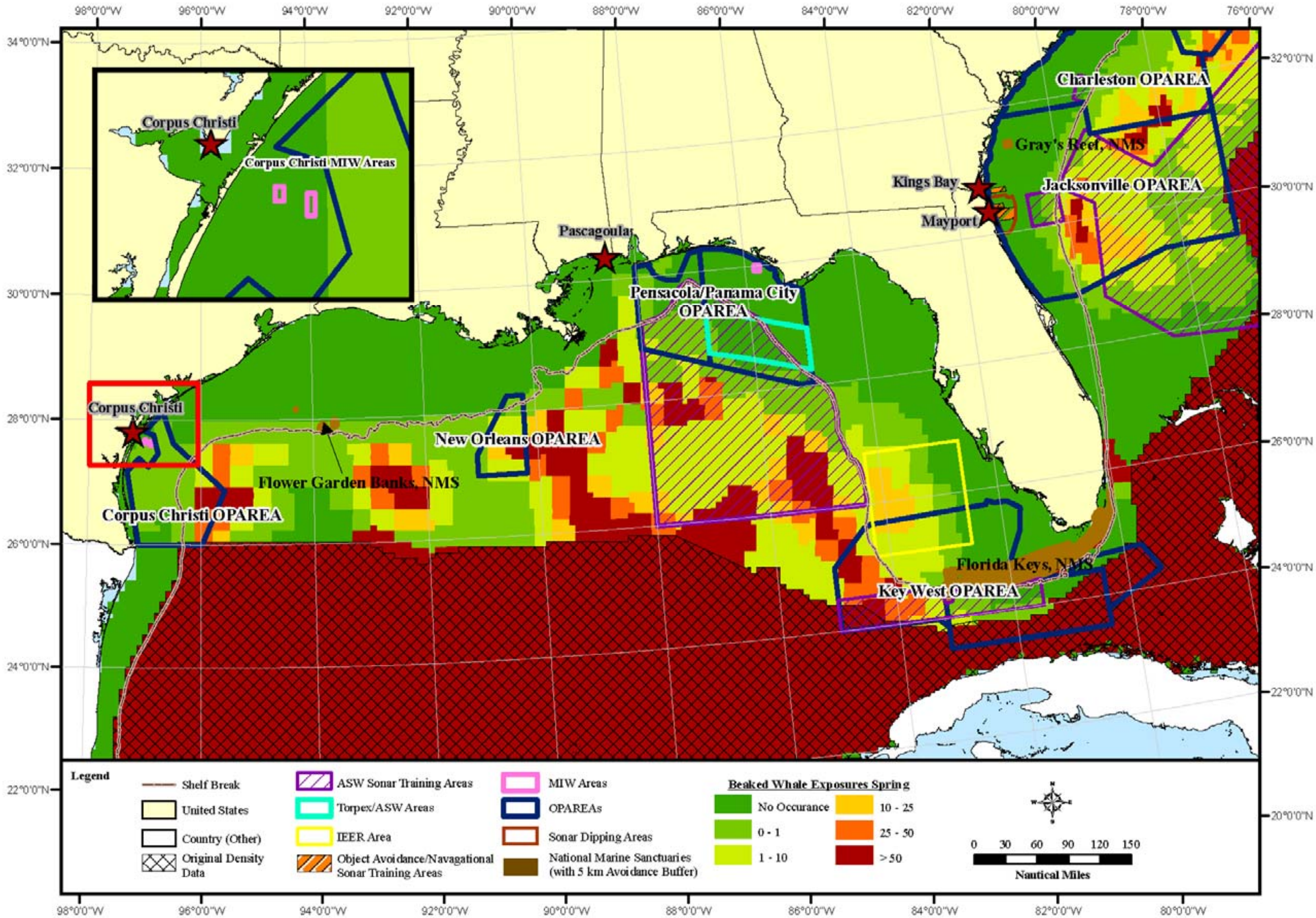


Figure D-170. Alternative 2, Winter GOMEX Beaked Whale (Spring)

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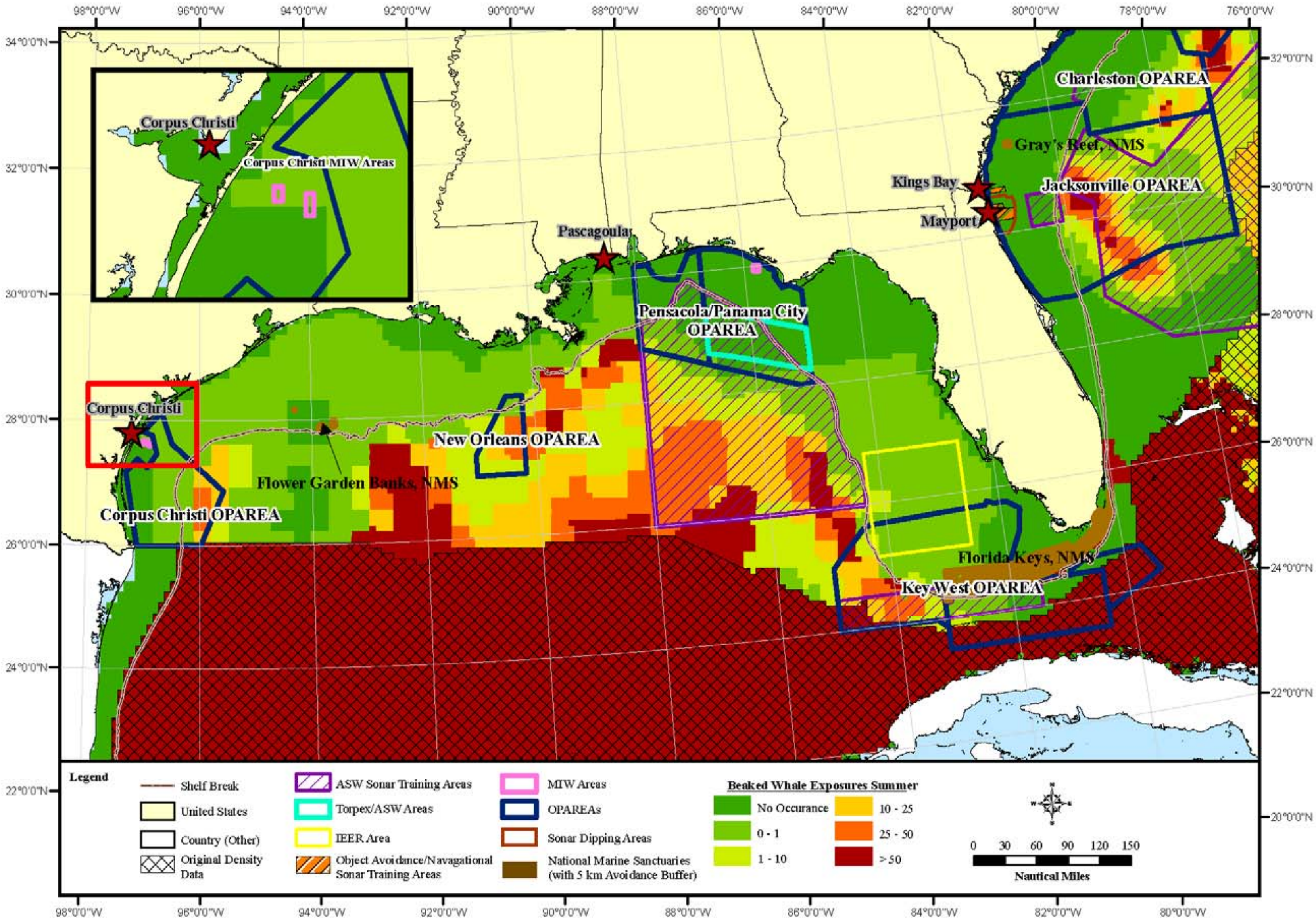
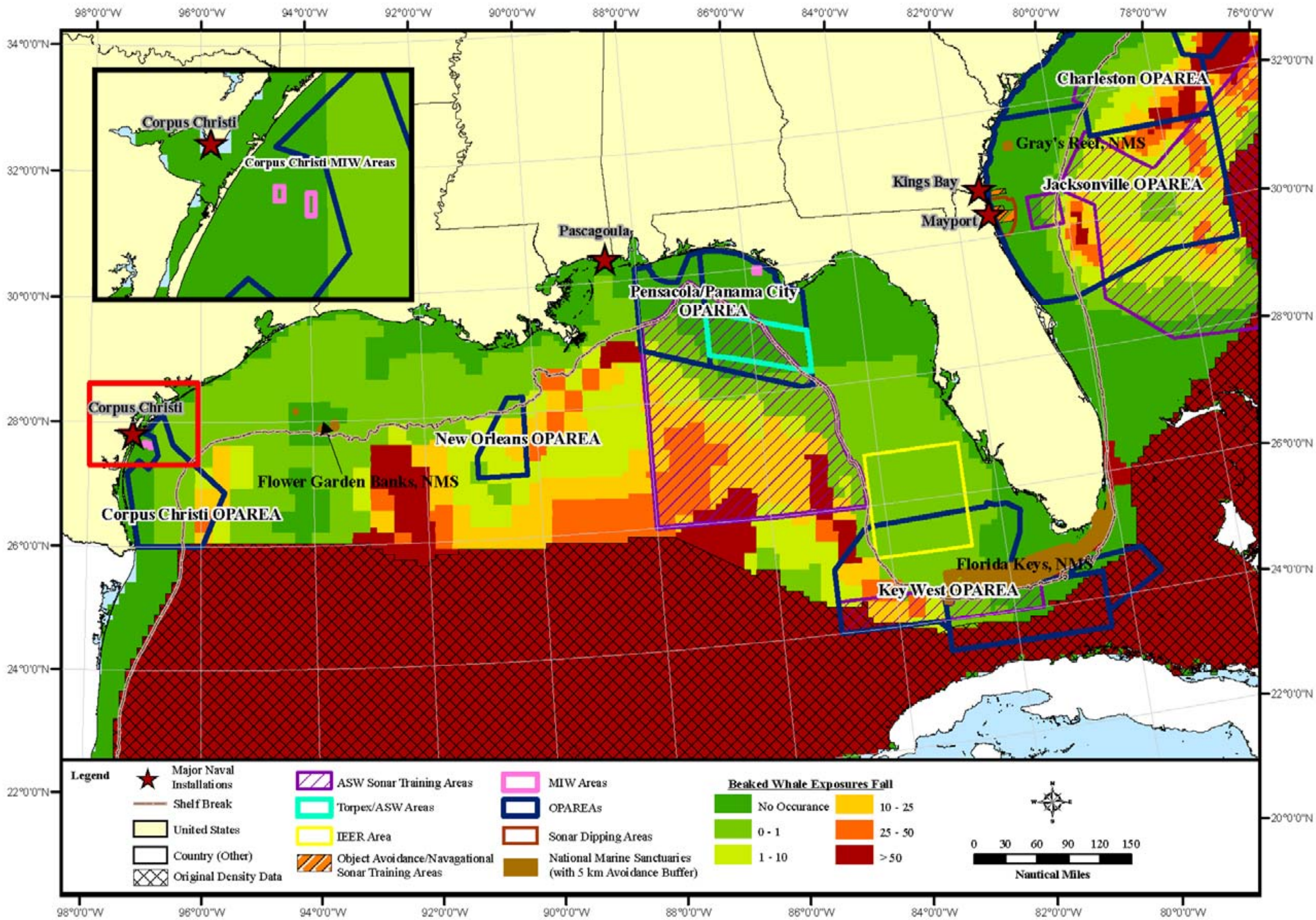


Figure D-171. Alternative 2, Winter GOMEX Beaked Whale (Summer)



1 **Figure D-172. Alternative 2, Winter GOMEX Beaked Whale (Fall)**

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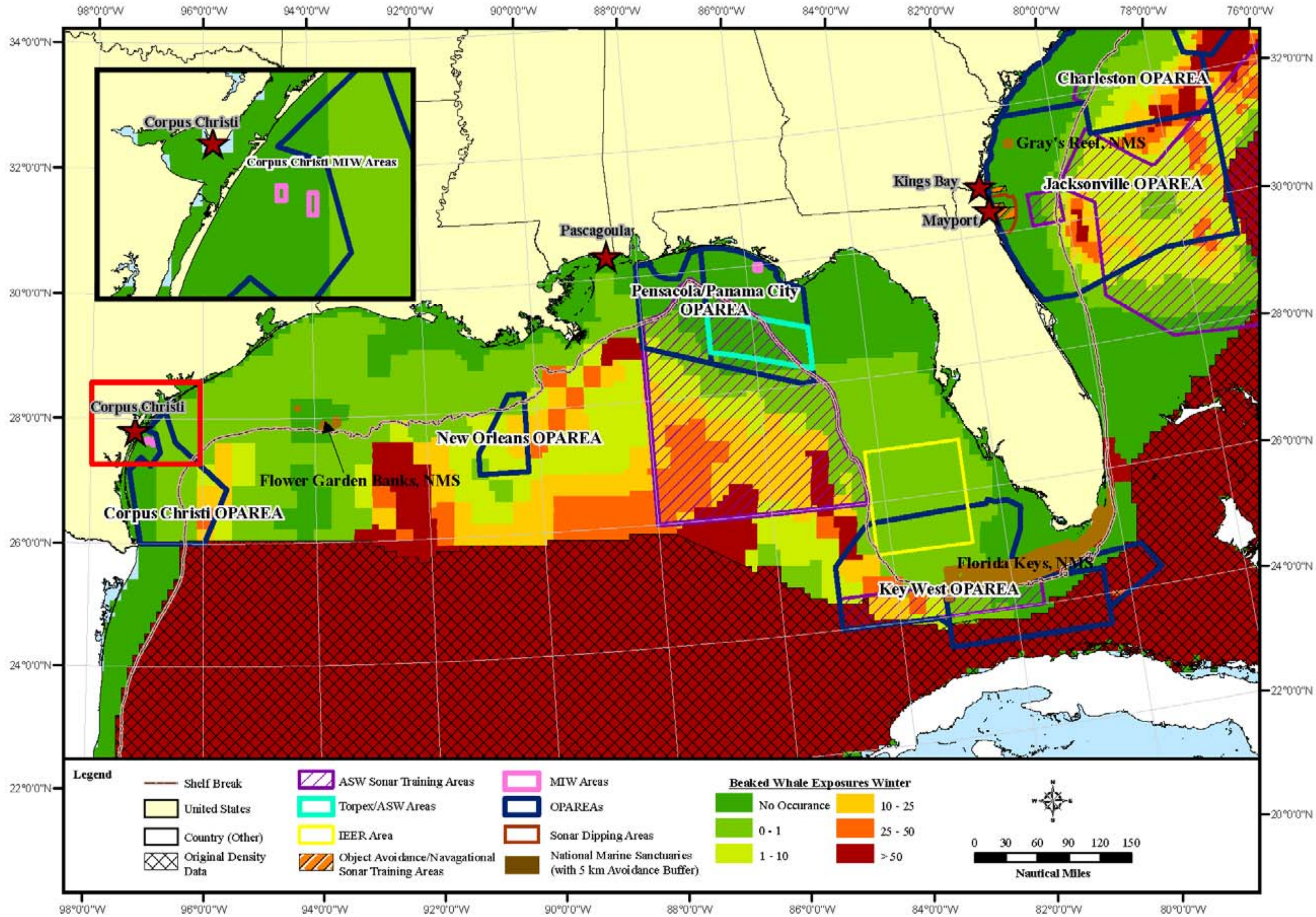
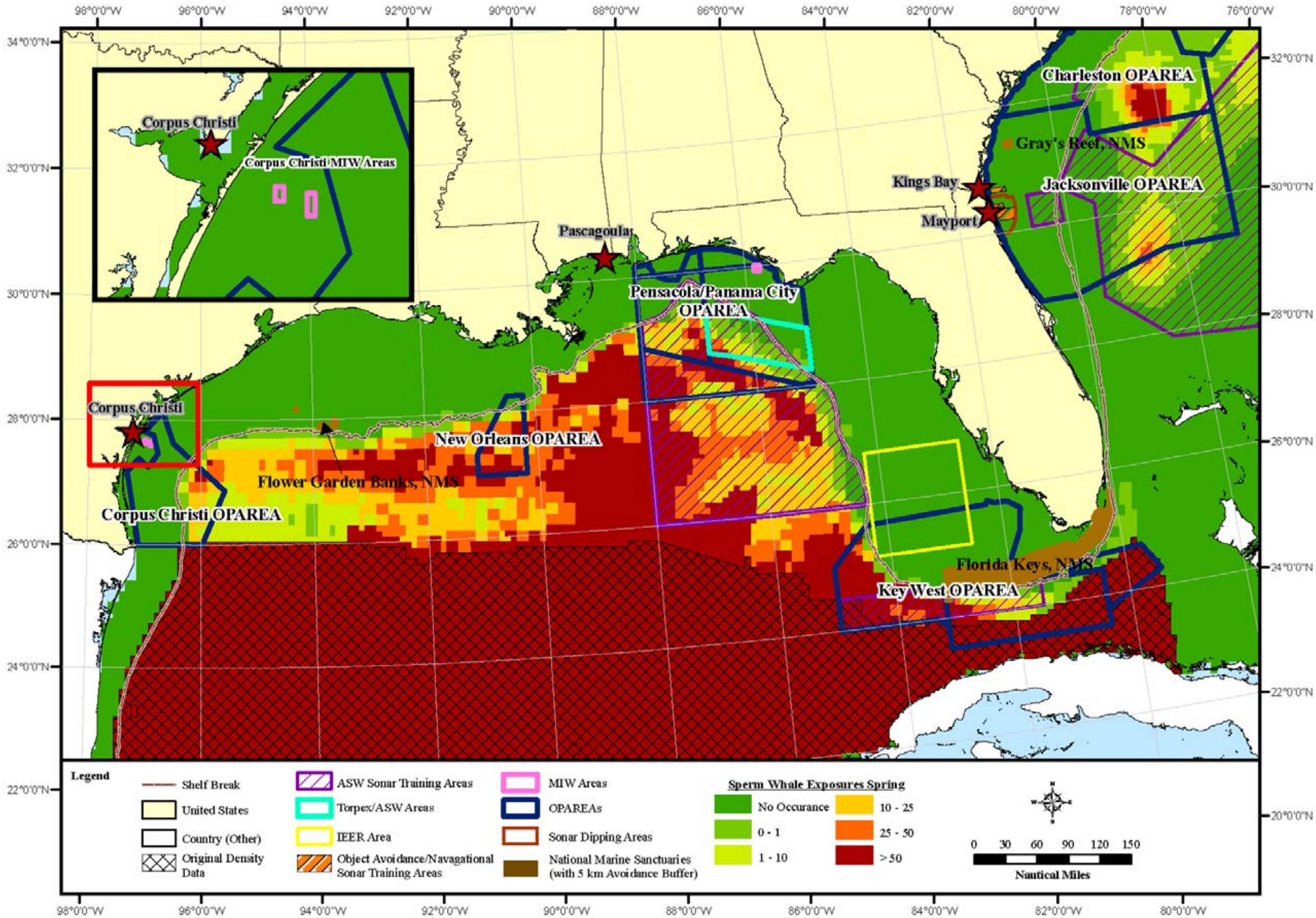


Figure D-173. Alternative 2, Winter GOMEX Beaked Whale (Winter)



1 **Figure D-174. Alternative 2, Winter GOMEX Sperm Whale (Spring)**

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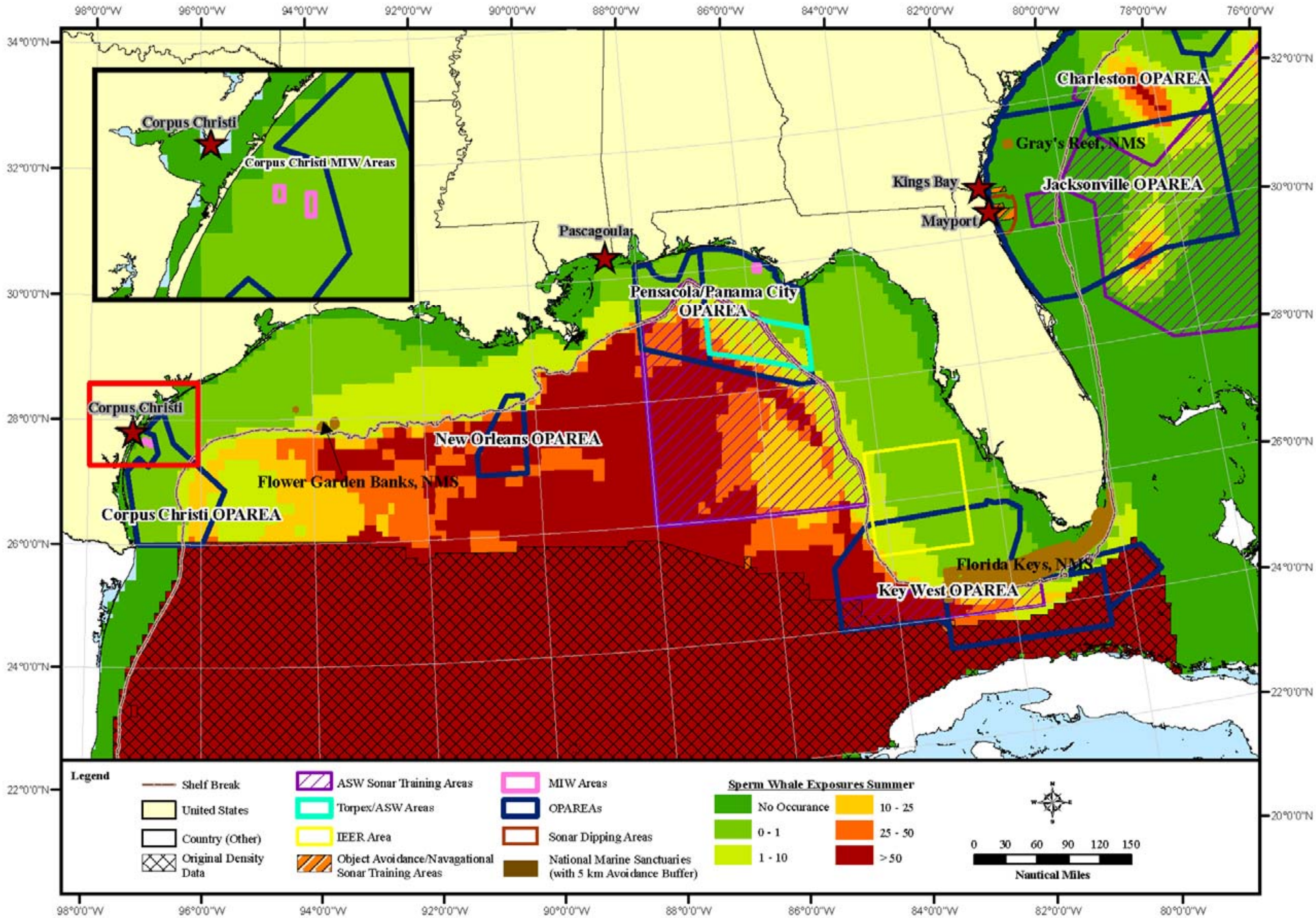
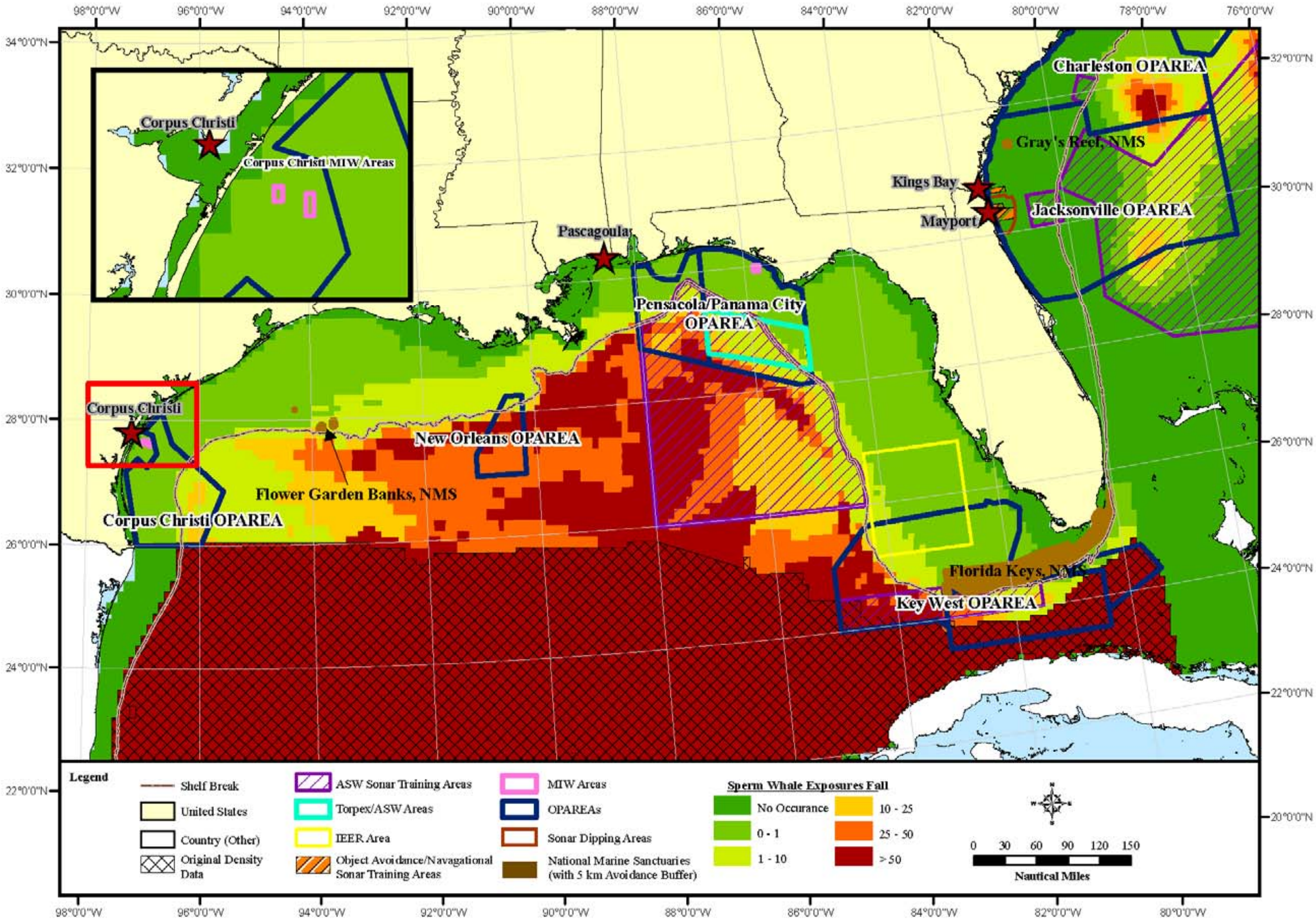


Figure D-175. Alternative 2, Winter GOMEX Sperm Whale (Summer)



1 **Figure D-176. Alternative 2, Winter GOMEX Sperm Whale (Fall)**

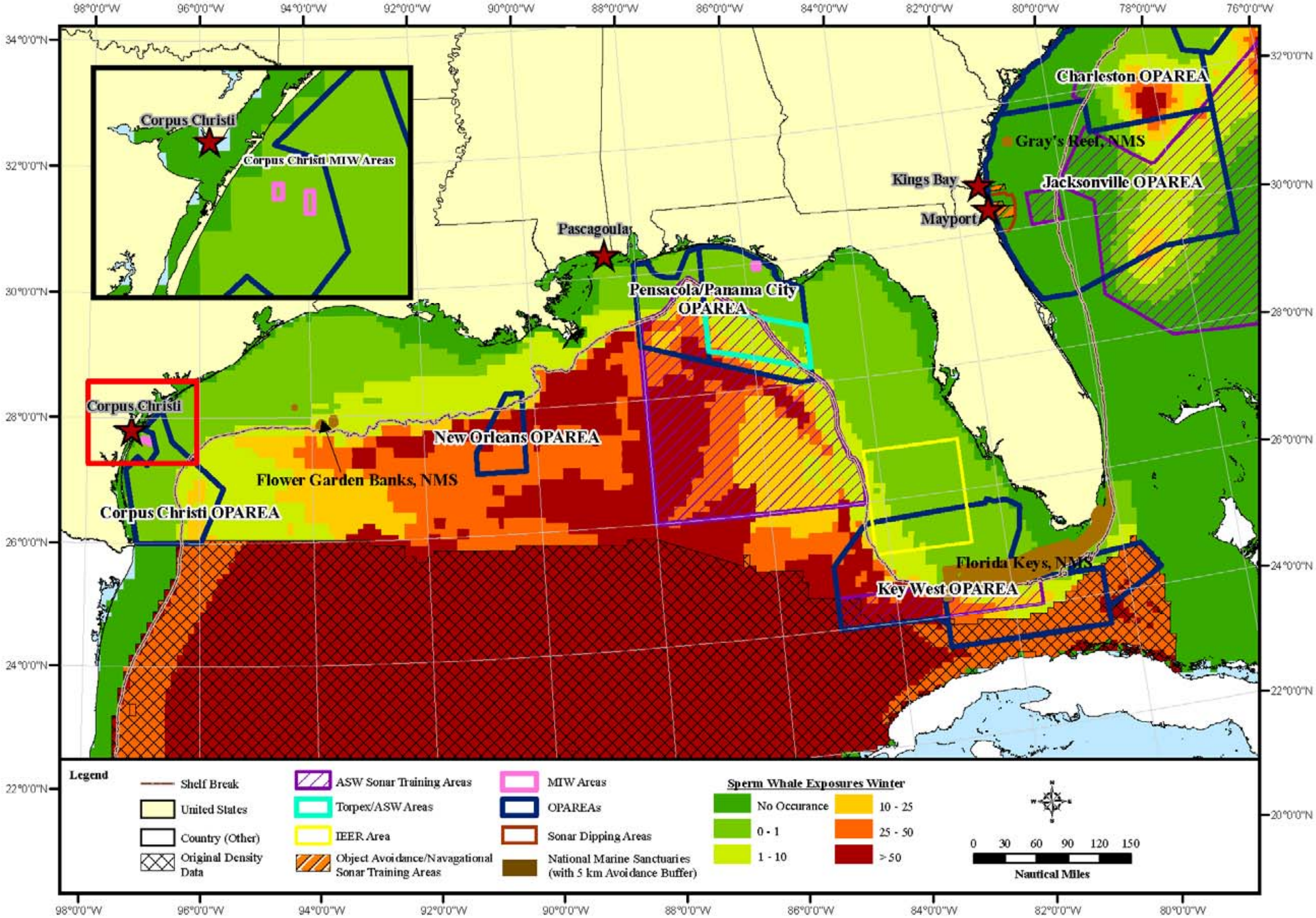


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Figure D-177. Alternative 2, Winter GOMEX Sperm Whale (Winter)

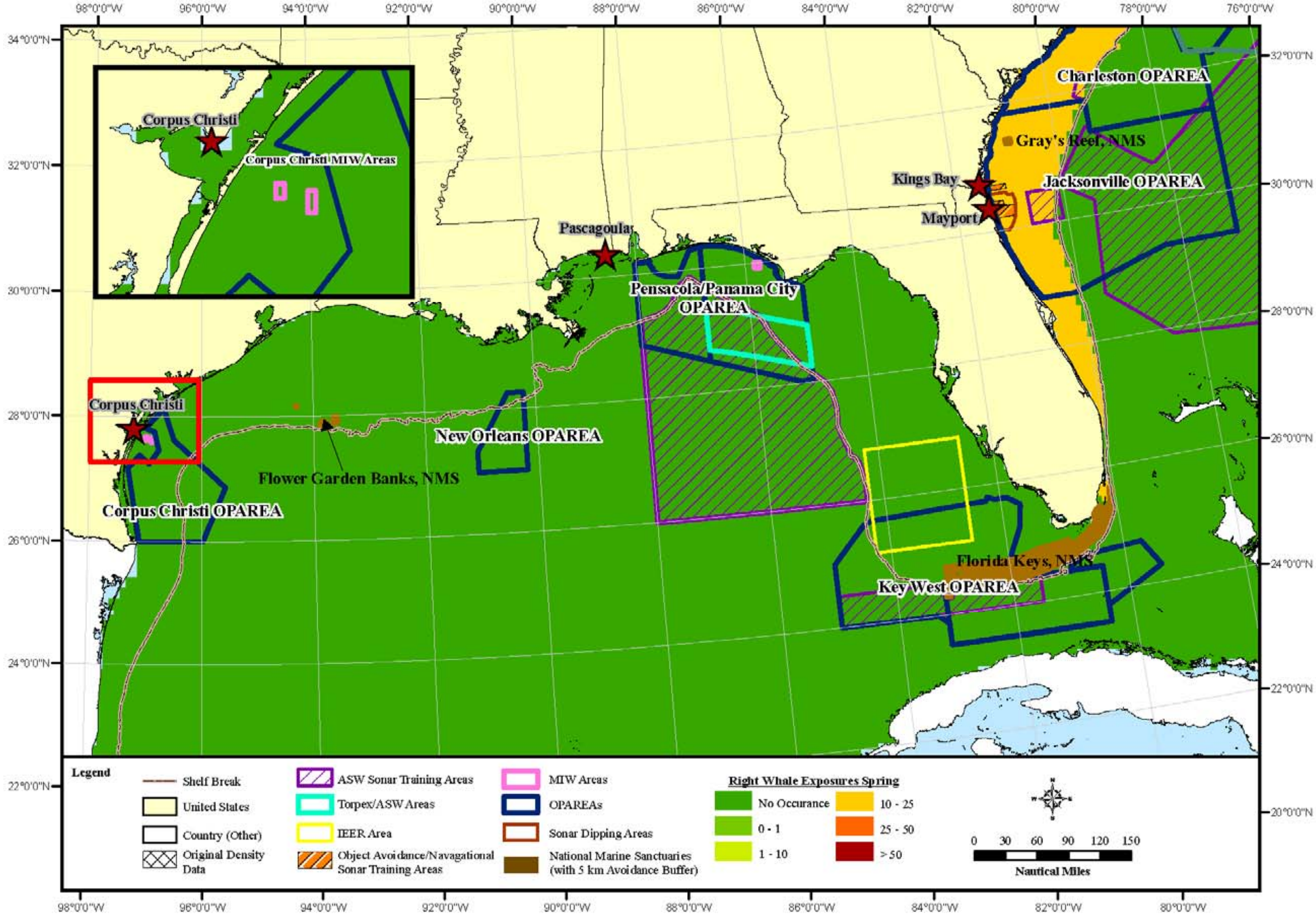

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Figure D-178. Alternative 2, Winter GOMEX Right Whale (Spring)

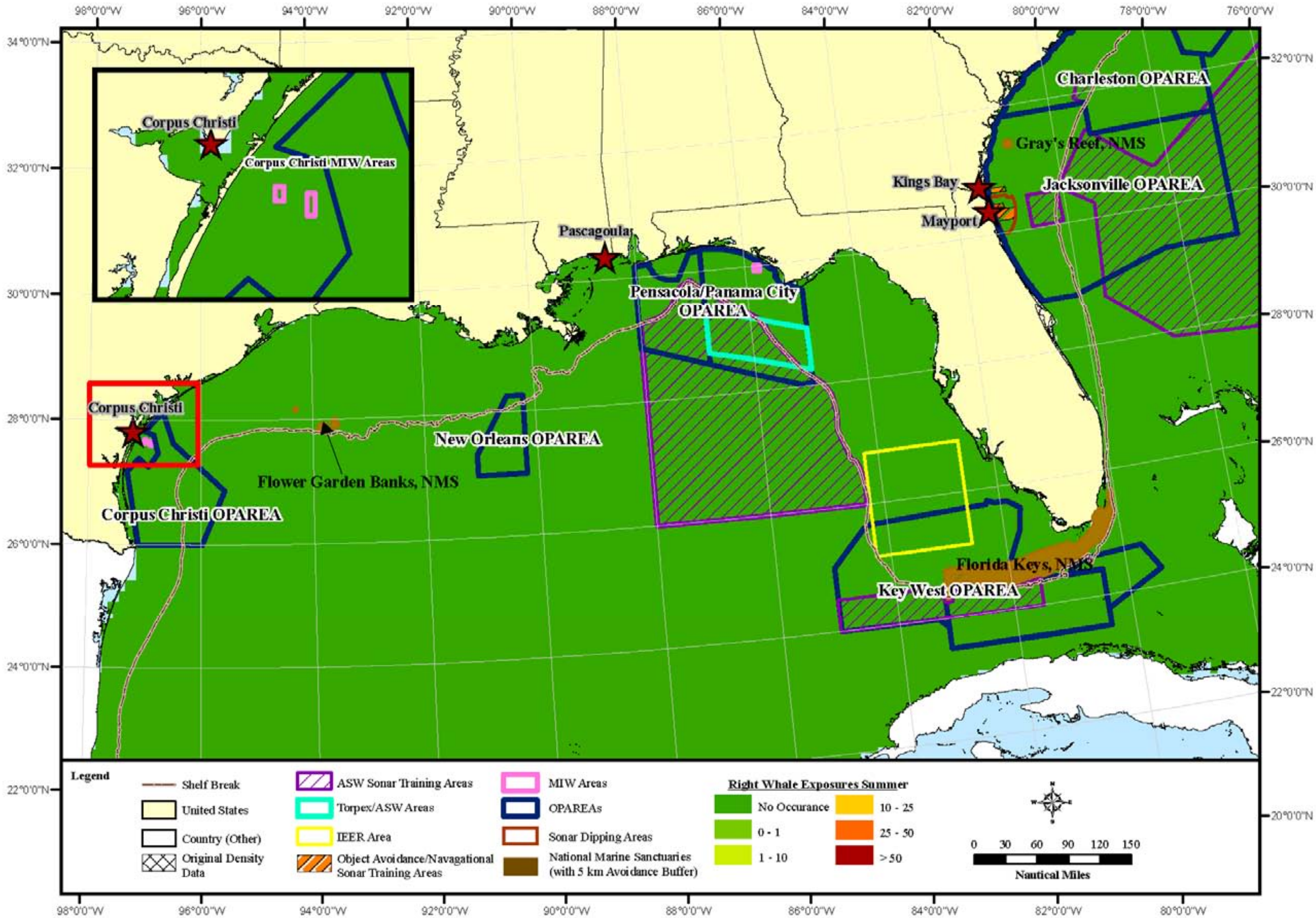

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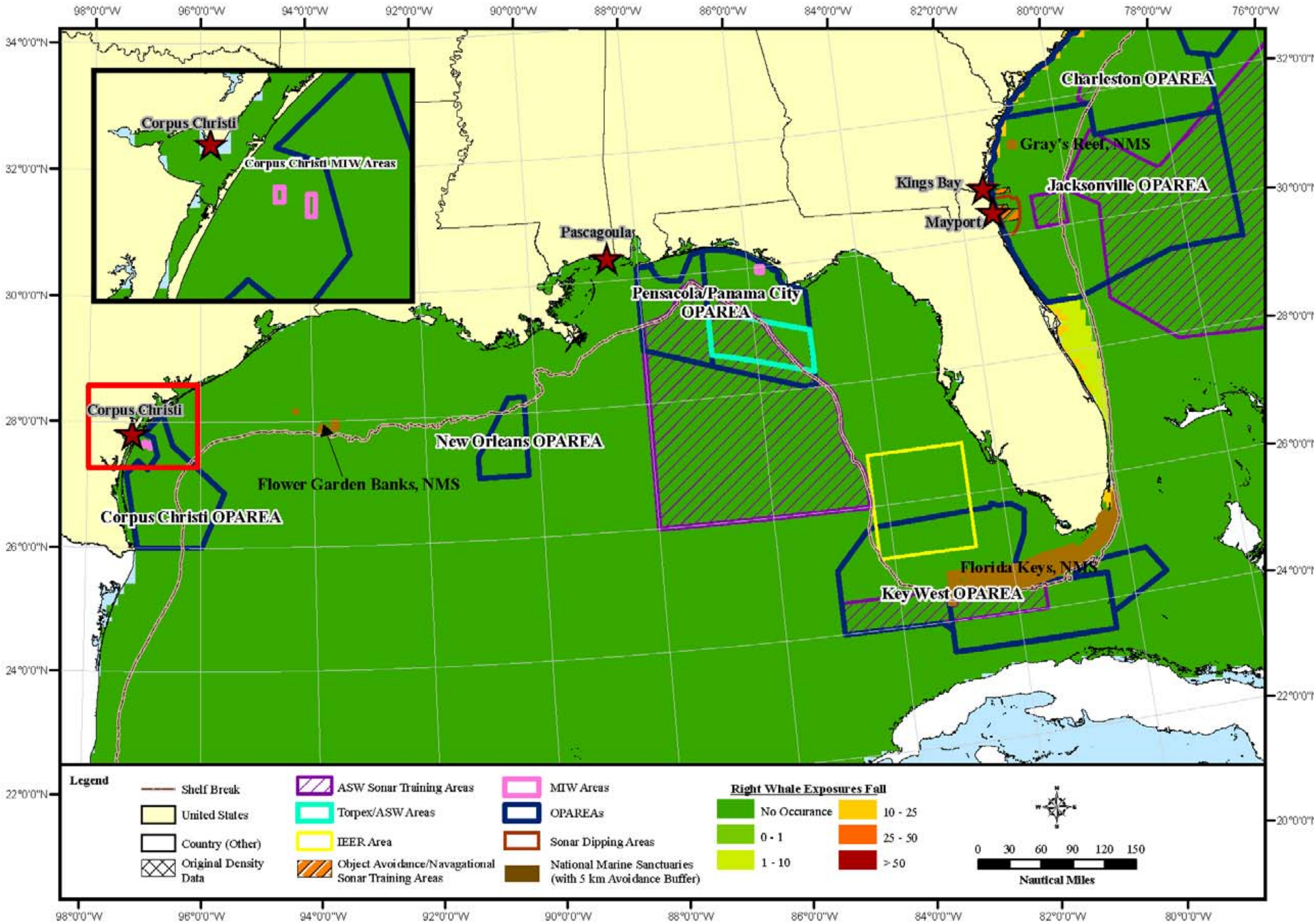
Figure D-179. Alternative 2, Winter GOMEX Right Whale (Summer)



1 **Figure D-180. Alternative 2, Winter GOMEX Right Whale (Fall)**

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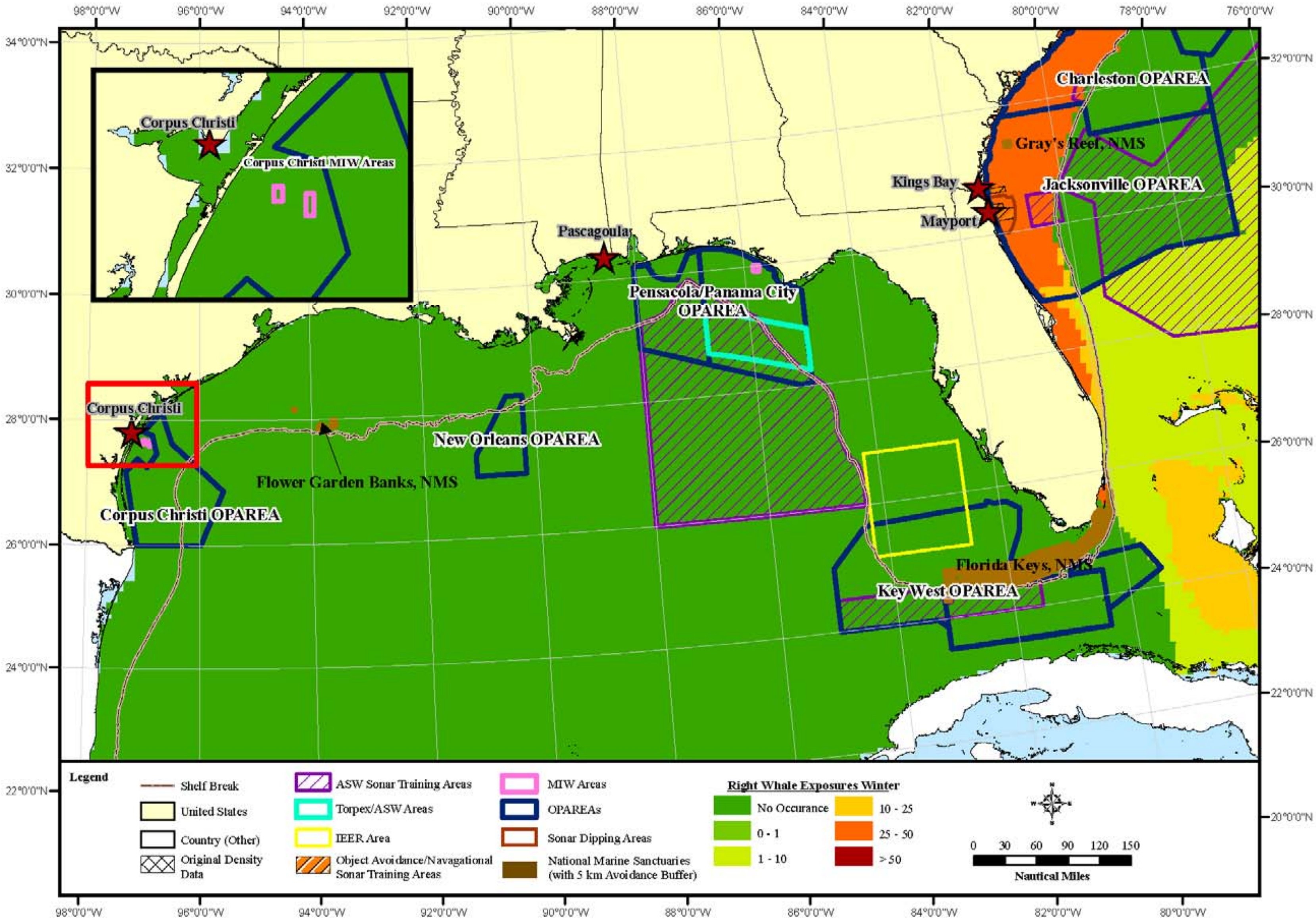

Figure D-181. Alternative 2, Winter GOMEX Right Whale (Winter)

D.4 ALTERNATIVE 3: AREAS OF INCREASED AWARENESS

Under Alternative 3 all marine waters within the AFAST Study Area, but outside the environmentally sensitive areas identified in Figures D-182 through D-217, would be open to active sonar activities. A description of these areas is provided in subsequent sections. Under Alternative 3, the identified environmentally sensitive areas would be avoided to the greatest extent possible while conducting active training activities that involved a mid-frequency acoustic source.

D.4.1 Alternative 3 Development

The development of Alternative 3 involved conducting a qualitative analysis to identify environmentally sensitive areas offshore of the U.S. East Coast and within the Gulf of Mexico. These environmentally sensitive areas typically indicate higher concentrations of marine species and include the following features:

- Bathymetric features such as canyons, steep walls, and sea mounts
- North Atlantic right whale critical habitat areas
- River and bay mouths
- Designated marine sanctuaries (i.e., USS Monitor, Gray's Reef, Stellwagen Bank, Key West Marine Sanctuary, and Flower Gardens). A 5 km buffer was designated around marine sanctuaries within the Study Area to ensure that all training activities occurred outside the designated marine sanctuaries.

In addition, the exposure maps and density graphics generated during Alternative 1 development were reviewed in an effort to identify any additional areas of potential high marine mammal densities that fell outside the identified environmentally sensitive areas. These areas of high marine mammal density were then included as additional areas of environmental awareness. The following sections discuss each of the identified environmentally sensitive areas.

D.4.1.1 Bathymetric Features (i.e., Canyons, Steep Walls, and Seamounts)

Canyon areas and steep walls are very productive areas for marine life and provide the required deep-water habitat required to sustain deep-diving marine mammals such as sperm and beaked whales. Based on sensitivity of the marine mammals known to inhabit these deep-water areas, it was decided that the associated areas of increased awareness for canyons should begin at the shelf break and extend seaward until the outer canyon wall reaches an approximate 2 percent slope.

Thus, it was decided that areas of increased awareness associated with canyons located along the shelf break in the western Atlantic Ocean offshore of the U.S. East Coast would extend from the shelf break seaward to the 1,500-m bathymetry curve and to the 1,600 m bathymetry curve for canyon areas occurring with the Gulf of Mexico. An additional buffer of 10 km (5 NM) shoreward and 5 km (3 NM) seaward was added to the designated canyon areas to delineate the active sonar training avoidance areas. Based on operational requirements, however, a section of the GOMEX OPAREA near DeSoto Canyon is required for Strike Group training.

In addition, the area containing the deep-water trench located along the eastern portion of the Gulf of Mexico was identified as an area of increased awareness. The area of increased awareness associated with this deep-water trench would extend from the shelf break seaward to the 1,600-m bathymetry curve. To remain consistent with the methodology utilized to designate similar areas of increased awareness (i.e., Gulf of Mexico canyon areas), a 10 km (5 NM) buffer was added to the active sonar training avoidance area shoreward of the shelf break and a 5 km (3 NM) buffer was added seaward of the 1,600 m bathymetry curve.

D.4.1.2 Northern Right Whale Critical Habitat Areas

Critical habitat for the North Atlantic population of the North Atlantic right whale exists along the western Atlantic Ocean offshore of the U.S. East Coast. The following three areas occur in U.S. waters and were designated by the National Marine Fisheries Service (NMFS) as critical habitat in June 1994 (NMFS, 2005b).

1. Coastal Florida and Georgia (Sebastian Inlet, Florida, to the Altamaha River, Georgia)
2. The Great South Channel, east of Cape Cod
3. Cape Cod and Massachusetts Bays

It was determined that each of these critical habitat areas would be considered as areas of increased awareness.

D.4.1.3 Areas of Persistent Oceanographic Features

The Gulf Stream Current is part of the larger Gulf Stream System that includes the Loop Current in the Gulf of Mexico and the Florida Current in the Florida Straits. The Gulf Stream is a powerful surface current that carries warm equatorial waters into the cooler North Atlantic. The Gulf Stream flows roughly parallel to the coastline from the Florida Straits to Cape Hatteras, where it is deflected from the North American continent and flows northeastward past the Grand Banks. This front is a watermass boundary separating cooler and fresher shelf waters from saltier and warmer slope waters (Graziano and Gawarkiewicz, 2005). As with other oceanographic fronts, the convergence of the different water masses concentrates prey species such as plankton and zooplankton. Because prey is abundant, predators including larger fish, marine mammals, and birds may also occur in increased numbers (NMFS, 2005a). Haney and McGillavery (1985) suggested increased numbers of Cory’s shearwaters observed along the Gulf Stream western front was a result of increased food availability created by physical conditions of the front. The attraction between predators and prey created by the frontal conditions provide for increased commercial and recreational fishing opportunities (NMFS, 2005a). Thus, the area offshore of North Carolina, beginning at the Cape Hatteras Horn and running south along the shelf break midway through the CHPT OPAREA (as shown in Figure 2-2) was included as an area of increased awareness.

D.4.1.4 River and Bay Mouths

Bay and river mouths are areas where low-salinity waters meet high-salinity ocean waters. These areas are called mixing zones or the convergence zone. Mixing zones occur when the front of the salt wedge meets lower salinity waters flowing out of a bay or river. Mixing zones are typically characterized as areas containing increased levels of suspended particles (i.e., turbidity). The characteristic of increased suspended particles plays a significant role in retaining planktonic organisms, thus creating productive larval fish nursery areas (Chesapeake Biological Laboratory, 2006). This increased production of larval and juvenile fish provides a natural feeding ground for predatory fish. Thus, the increase in predator fish attracts marine mammals that feed on these large species of fish.

Based on the highly productive nature of these mixing zone areas (i.e., convergence zone), a 35-km (19-NM) buffer around the mouth of bays and rivers was utilized in designating these areas of increased awareness. To delineate these areas, a 35 km (19 NM) arc was digitized into the active sonar training avoidance GIS layer (Figure D-182 through D-217) around major river and bay mouths.

D.4.1.5 Designated Marine Sanctuaries

The following marine sanctuaries located within the western Atlantic Ocean offshore of the U.S. East Coast and the Gulf of Mexico fall outside already designated habitat avoidance areas. Based on their ecological, cultural, and conservation importance, these marine sanctuaries would be avoided, including a 5-km buffer zone:

- USS Monitor
- Gray’s Reef
- Stellwagen Bank
- Florida Keys National Marine Sanctuary
- Flower Garden Banks National Marine Sanctuary

The following paragraphs discuss each of the identified marine sanctuaries.

USS Monitor

The Monitor National Marine Sanctuary was established in 1975 in order to preserve the historical and cultural artifacts of one of the most famous ships that have ever been built for naval warfare. The location of the sanctuary is defined by the shipwreck and the surrounding area, which is comprised of a column of water extending from the ocean’s surface to the seabed and is one nautical mile in diameter. The small size of the sanctuary limits the number of marine life that permanently inhabits the area. However, many species pass through the area and a small ecosystem has developed around the wreck site following the permanent establishment of several organisms on the wreck (NMSP, 2007d).

Gray's Reef

Gray's Reef became a national marine sanctuary in 1981 and is one of the three marine sanctuaries that make up the Southeast Region. It is one of the largest nearshore sandstone reefs in the Southeastern United States and is an important calving ground for the endangered Northern right whale. The 17.5 square NM (32 km) that make up Gray's Reef are located 17.5 NM (32 km) off Sapelo Island, Georgia. The area that makes up Gray's Reef is the only natural area protected off the Georgia Coast.

Gray's Reef is popular for recreational fishing and diving because of its "live bottom habitat" that supports an unusual assemblage of organisms and temperate and tropical marine flora and fauna that attach to the rocky platform. The area is characterized by a series of rock ledges and sand expanses that have created deep burrows, troughs, and caves that attract an array of different species including black sea bass, snapper, grouper, and mackerel. Since the reef lies in a transition area between temperate and tropical waters, the composition of the fish population changes seasonally. Dominant invertebrates that inhabit the area include sponges, barnacles, sea fans, hard coral, crabs, lobsters, and snails. The area supports endangered and threatened species such as Loggerhead turtles which are present year round. The reef is also part of the only known winter calving grounds for the Northern right whale (NMSP, 2007c).

Sport fishing and diving occurs year round at Gray's Reef. However, certain types of equipment, such as wire fish traps, bottom trawls, and explosives, are restricted in the area. Commercial fishing, military activities, mineral extraction, and ocean dumping are restricted. Also, any alteration of the seabed is prohibited in the area, including removal or damage to bottom formations and other natural or cultural resources, as well as and disposal of materials or substances (NMSP, 2007c).

Stellwagen Bank

Stellwagen Bank is located on the eastern edge of Massachusetts Bay, which lies between Cape Ann and Cape Cod, in the southwest corner of the Gulf of Maine. The bank is characterized as shallow sandy feature that extends for nearly 19 miles (30.6 km) and is approximately 6 miles (9.7 km) across at is widest point. It is the bay's most prominent feature and the centerpiece of the Stellwagen Bank National Marine Sanctuary.

As a result of the 1992 reauthorization and amendment to Title III of the Marine Protection, Research and Sanctuaries Act (MPRSA), the Stellwagen Bank National Marine Sanctuary was established. Stellwagen Bank is New England's first sanctuary and is the nation's 12th sanctuary. It encompasses a total of 638 nautical miles (842 square miles), and occurs entirely within federal waters. Stellwagen Bank was designated a national marine sanctuary for a variety of reasons, the most notable of which is the two distinct peak productivity periods that result in a complex system of midwater and benthic habitats. The area provides cover and anchoring locations for invertebrates and also provides feeding and nursery grounds for other types of species, particularly a variety of endangered species such as leatherback and Kemp's ridley sea turtles, and the humpback, Northern right, sei, and fin whales (NMSP, 2007e). The abundant variety of species supports a variety of activities, including whale watching, bird watching, boating, and commercial and sport fishing.

Another important feature of the Stellwagen Bank National Marine Sanctuary is the presence of nearly 50 shipwrecks. Major shipping lanes to Boston go through the sanctuary, creating a constant flow of large-vessel traffic. However, a shift in the shipping lanes will take effect on July 1, 2007. The International Maritime Organization approved a 12-degree northward adjustment in shipping lanes through the sanctuary in order to reduce the threat of ship strikes to endangered whales in the sanctuary. The relocation will avoid popular right, fin, and humpback whale feeding grounds. Further, it is expected to reduce the risk of ship strikes to right whales by 58 percent and up to 81 percent for all other large whale species (Smrcina, 2006).

The NOAA's office of Law Enforcement, the U.S. Coast Guard, and the Massachusetts Environmental Police are responsible for enforcing federal laws in the sanctuary. Recreational fishing, whale watching, and diving are regulated activities in the sanctuary. There is no permit required for fishing; however, regulations govern the number and type of species caught. There are three sanctuary-specific regulations for diving, which include no alteration to seabed, no transportation of a historical resource, and no possession of a historical or natural resource (Smrcina, 2006).

Florida Keys National Marine Sanctuary

The Florida Keys National Marine Sanctuary (FKNMS) was designated in 1990 over concerns for the health of the coral reefs. The FKNMS encompasses 2,800 square nautical miles (9,500 square kilometers) which surrounds the entire chain of islands and includes the Florida Bay, the Gulf of Mexico, and the Atlantic Ocean (NMSP, 2007a).

There are sanctuary-wide regulations as well as regulations by zone. Sanctuary-wide regulations focus on reducing direct and indirect threats to the reef by focusing on protecting critical habitats and resources and improving water quality. The zones in the sanctuary include the Western Sambo Ecological Reserve (ER), 18 Sanctuary Preservation Areas (SPA), 27 Wildlife Management Areas (WMA), 4 special use areas, and existing management areas (NMSP, 2007a).

Flower Garden Banks National Marine Sanctuary

The Flower Garden Banks National Marine Sanctuary is located in the northwestern Gulf of Mexico nearly 110 miles (177 km) off the coast of Texas and Louisiana and harbors the northernmost coral reefs in the United States. The area serves as a regional reservoir of shallow-water Caribbean reef fish and invertebrates, making it one of the premier diving destinations around the world.

Designated in 1992, the sanctuary serves to protect the coral reef ecosystem and its associated biological communities from increasing human activities such as oil and gas exploration. The sanctuary is made up of three separate areas, known as East Flower Garden, West Flower Garden, and Stetson Banks. The total area of the sanctuary is approximately 56 square miles (36,000 acres) and supports nearly 280 documented fish species, loggerhead and hawksbill sea turtles, and a variety of shark and ray species (NMSP, 2007b).

The Flower Garden Banks National Marine Sanctuary is internationally recognized as a no-anchoring area which minimizes damage from commercial shipping. The area is also protected by mooring buoys which prevent anchor damage to the habitats. Other activities that are regulated in the area include discharges, taking of marine mammals and sea turtles, injury or possession of sanctuary resources, and fishing and related activities (NMSP, 2007b).

Though the marine sanctuaries have established boundaries, the Navy has would observe a 5-km (5,460-yd) sonar use buffer around these areas to further protect them. In accordance with 15 CFR Part 922, all Department of Defense (DoD) military activities in these areas shall be carried out in a manner that avoids to the maximum extent practicable any adverse impacts on Sanctuary resources and qualities. However, military activities may be exempted from the prohibitions by the Director, NOAA, after consultation between the Director, NOAA and the DoD (NOAA, 2006).

D.4.2 Active Sonar Training Areas

Under Alternative 3 the majority of active sonar activities would occur outside the previously discussed areas of increased awareness. However, there were a few active sonar activities that could not be conducted outside the areas of increased awareness due to less flexible operational training requirements.

D.4.3 Active Sonar Training to Occur within the Areas of Increased Awareness

D.4.3.1 ASW Helicopter Dipping Sonar ULT Areas

The ASW helicopter-dipping sonar ULT activities occurring out of Mayport, Florida, are conducted within the TACAN located within W-158. Based on training requirements, these training activities are typically conducted between 7 and 37 km (4 and 20 NM) off shore.

However, based on the qualitative environmental analysis, the location of the ASW helicopter-dipping sonar ULT activities would be located within an area designated as an area of increased awareness. The ASW helicopter dipping sonar ULT area is currently located near the outflow of the St. Johns River and North Atlantic right whale critical habitat. Based on limited operational flexibility, the current location of the ASW Dipping Sonar ULT area off the shore of Mayport, Florida will remain unchanged under Alternative 3.

D.4.3.2 Object Detection Sonar Training Areas

Under Alternative 3, the Object Detection and Navigational Sonar training areas discussed under the No Action Alternative would remain unchanged, as shown in Figures D-182 through D-217. Even though the qualitative environmental analysis identified the mouth of rivers and bays as areas of increased awareness, the Object Detection and Navigational Sonar training activities are directly tied to the port location of the ship and or submarine. Therefore, no flexibility exists associated with conducting Object Detection and Navigational Sonar training elsewhere without defeating the purpose of the training.

D.4.3.3 Active Sonar Maintenance Areas

Active sonar maintenance areas associated with surface ship and submarine sonars occurring under Alternative 3 would remain consistent with those areas discussed under the No Action Alternative. The majority of active sonar maintenance occurs at pier side. The pier side maintenance areas occur within the homeports of the surface ships or submarines. Thus, Norfolk and Mayport are designated as surface ship sonar (i.e., AN/SQS-53 and AN/SQS-56) maintenance areas. Kings Bay, Norfolk, and Groton ports are identified as the primary maintenance areas for submarine sonars (AN/BQQ-10).

Thus, Under Alternative 3 no flexibility exists associated with conducting required pier side active sonar maintenance elsewhere.

D.4.3.4 TORPEX

ASW training involving torpedo firing would occur within the VACAPES and GOMEX OPAREAs outside of areas of increased awareness, however designated TORPEX boxes within and adjacent to the Northeast OPAREA would reside within areas of increased awareness that are based on North Atlantic right whale critical habitat. These training areas were established during prior consultations with NMFS.

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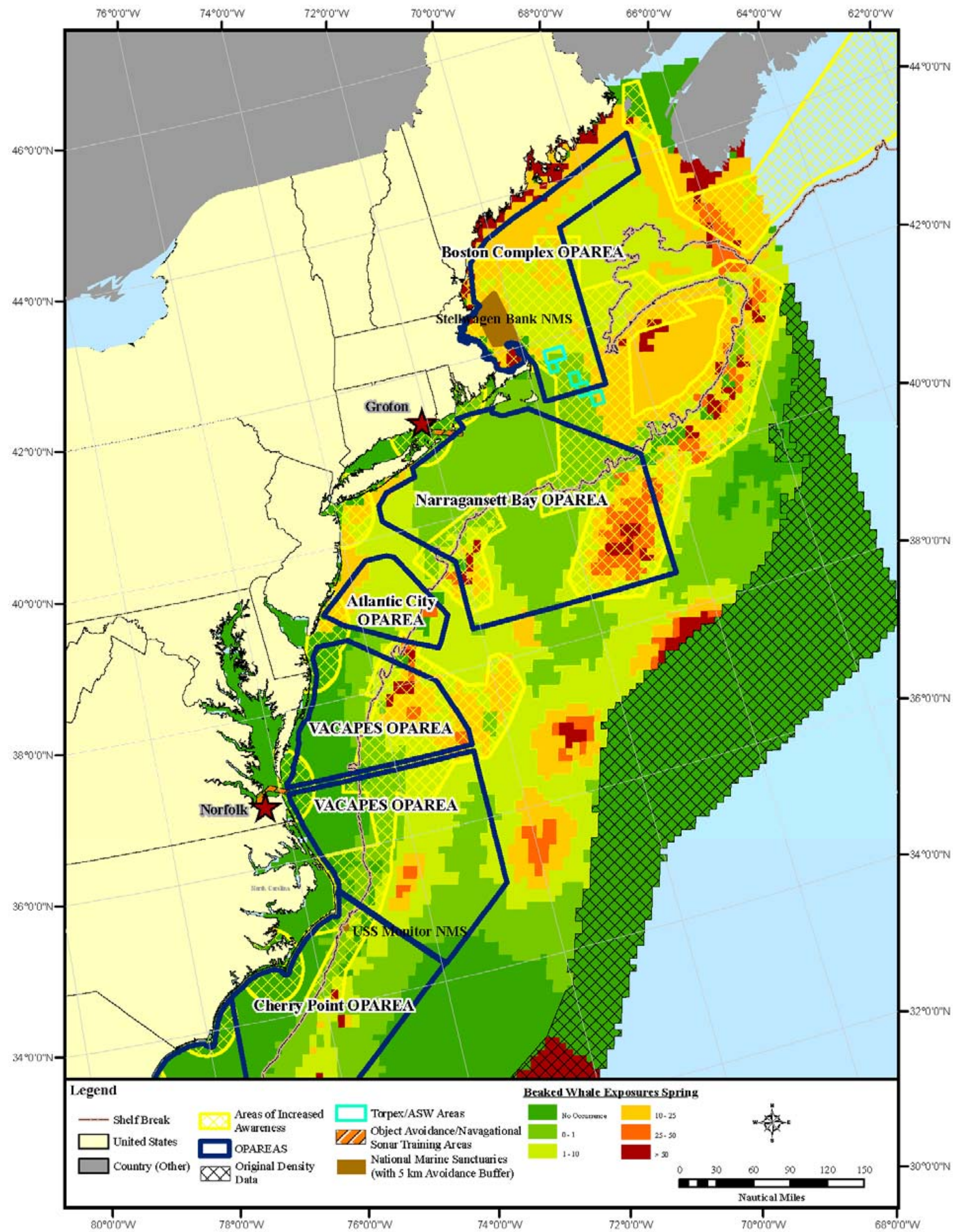

Figure D-182. Alternative 3, NE Beaked Whale-Spring

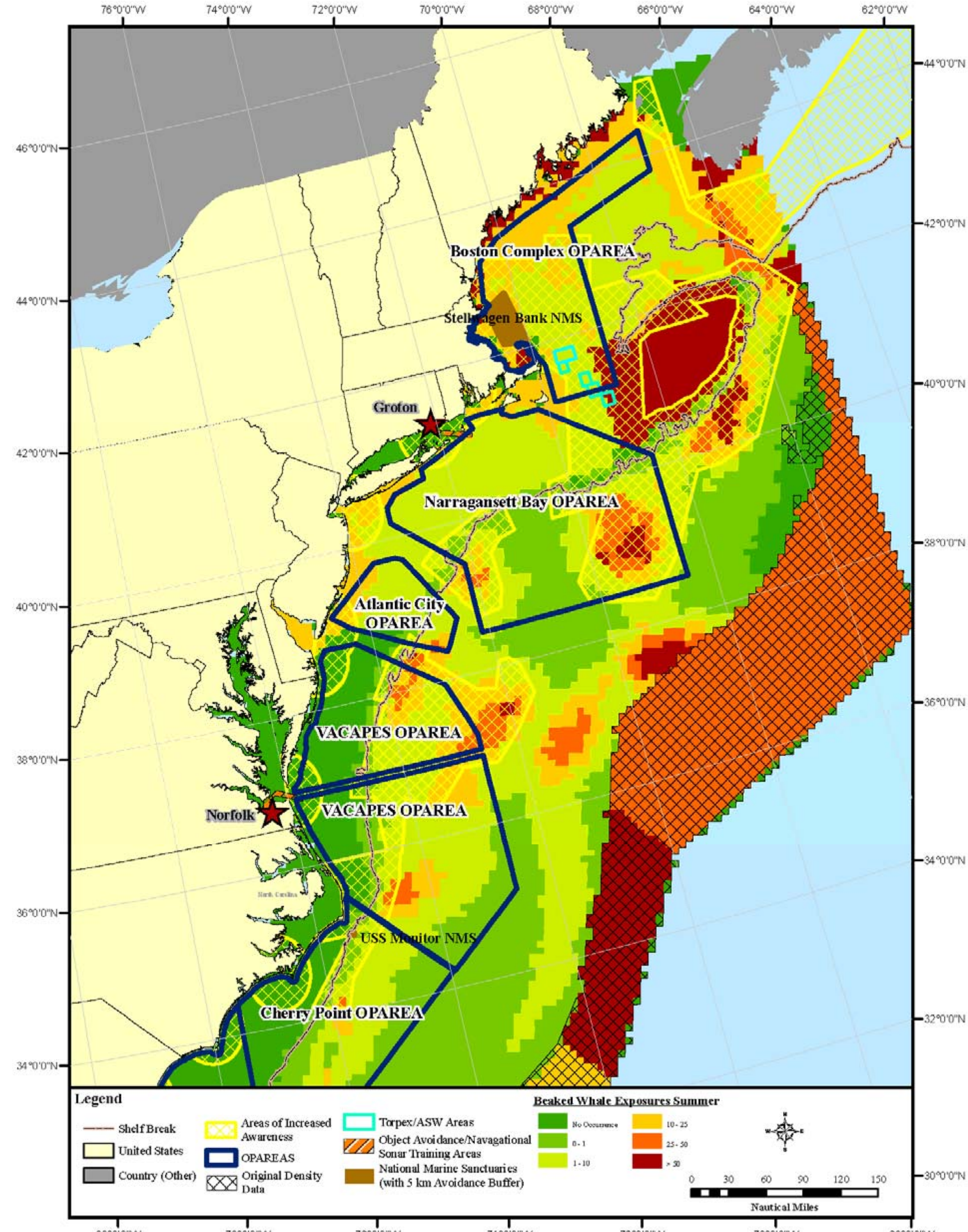

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Figure D-183. Alternative 3, NE Beaked Whale-Summer

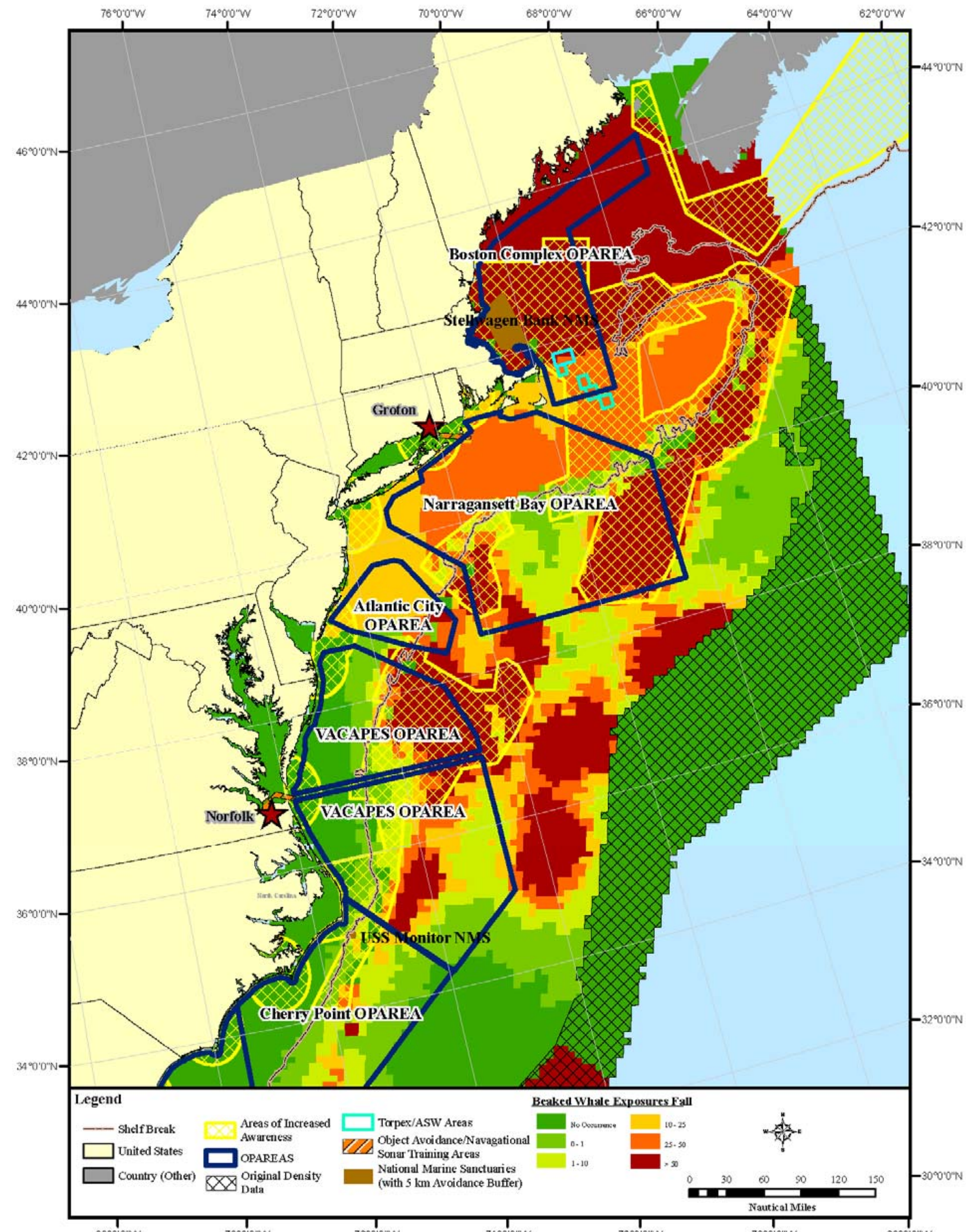

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Figure D-184. Alternative 3, NE Beaked Whale-Fall

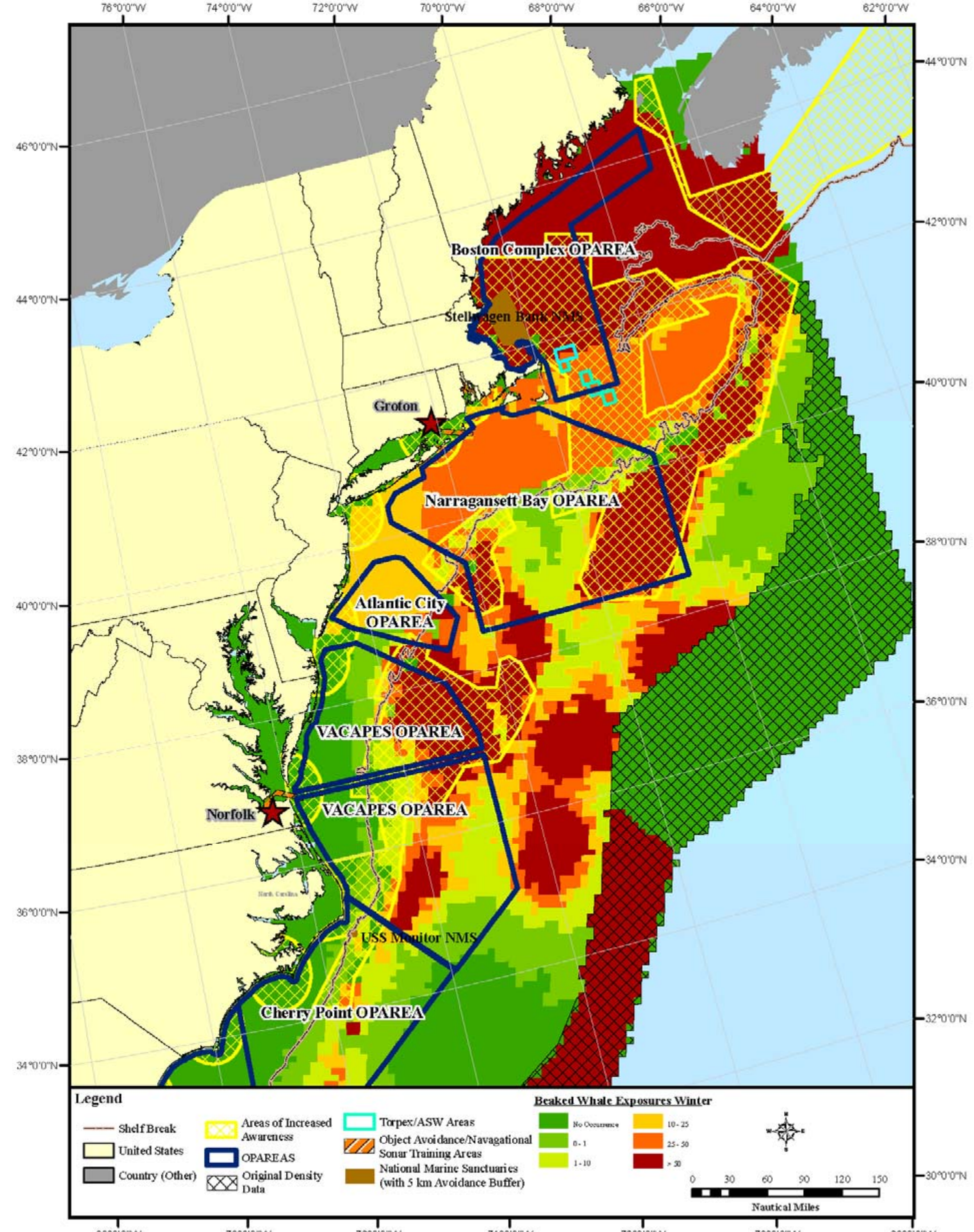


Figure D-185. Alternative 3, NE Beaked Whale-Winter

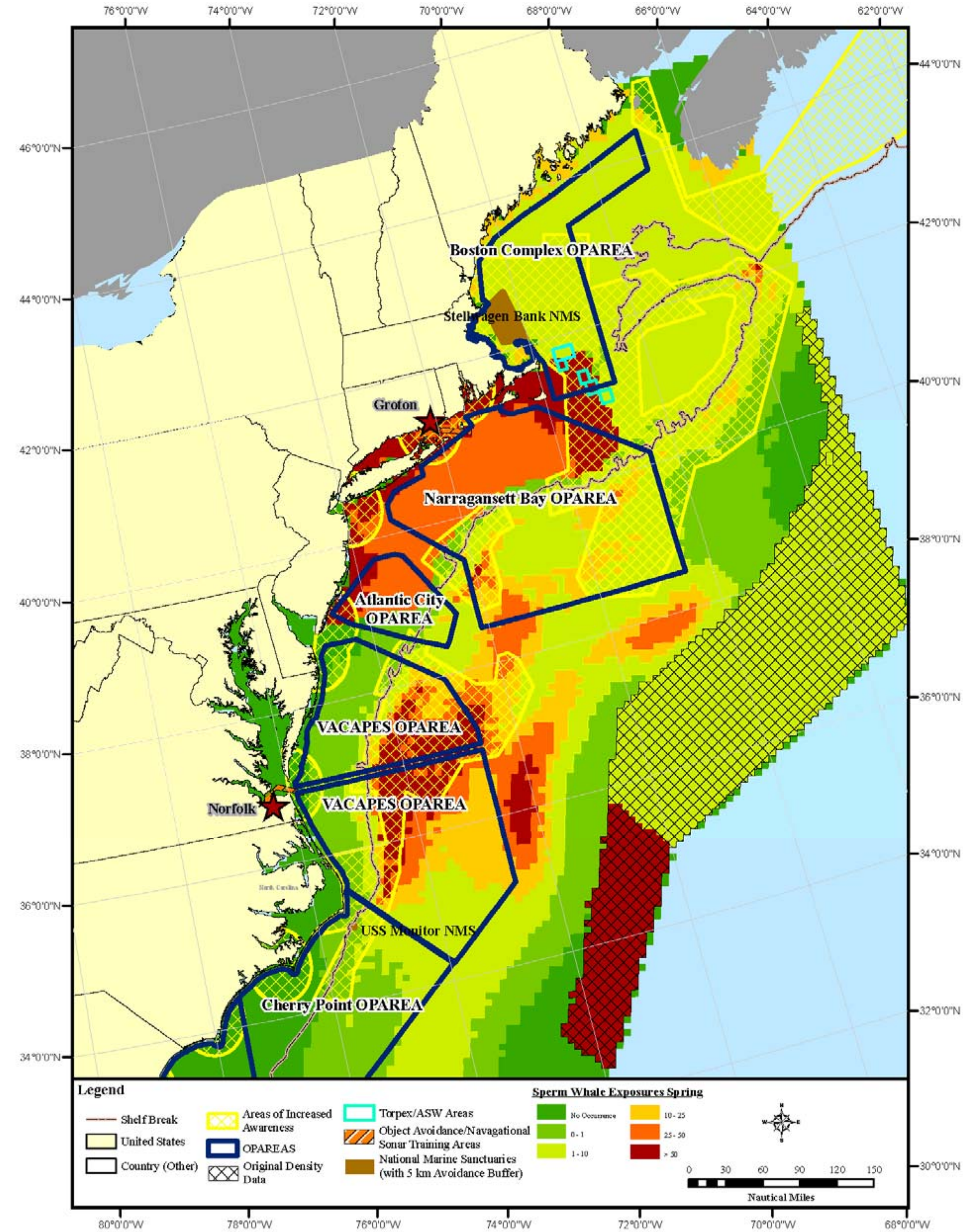


Figure D-186. Alternative 3, NE Sperm Whale-Spring

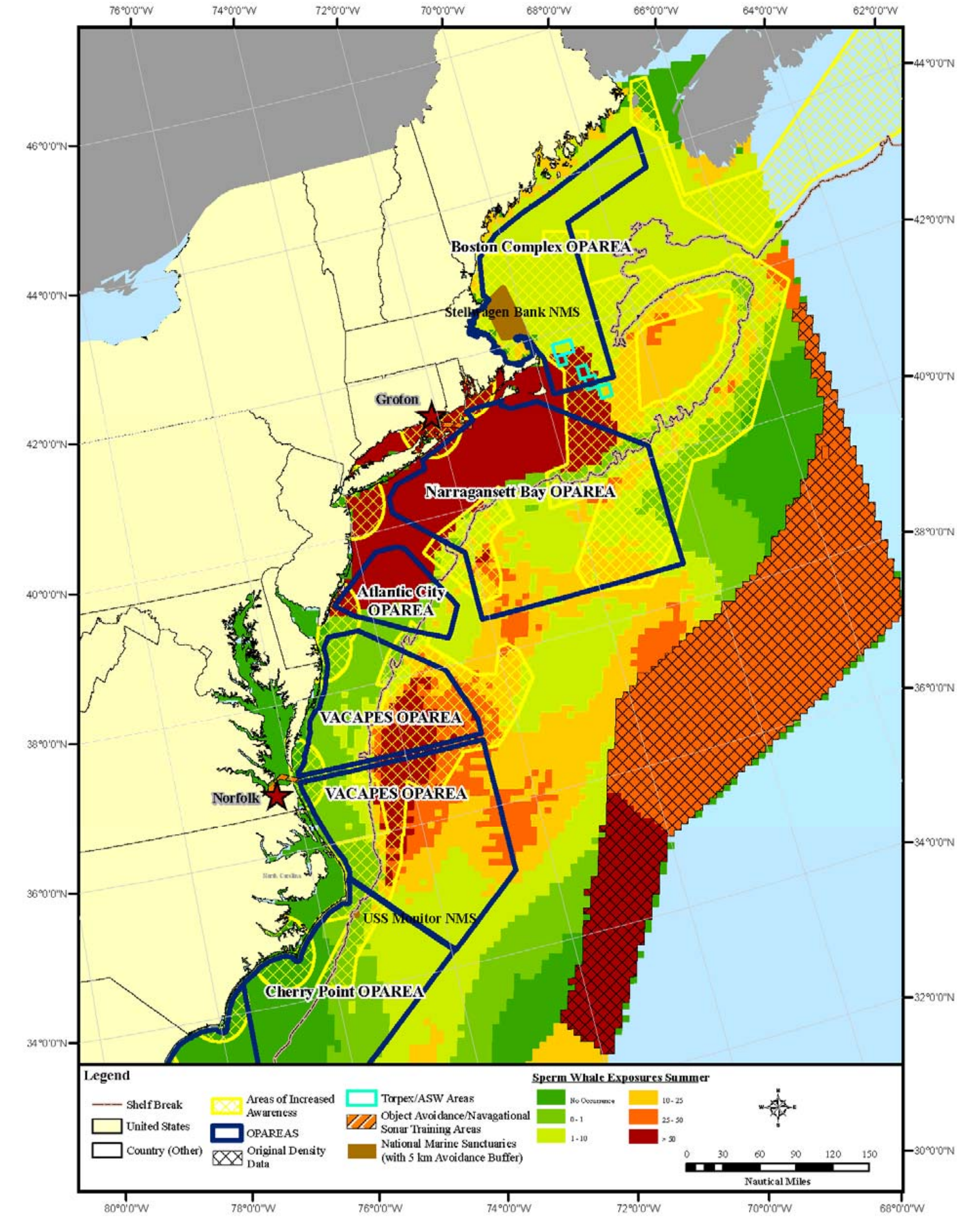


Figure D-187. Alternative 3, NE Sperm Whale-Summer

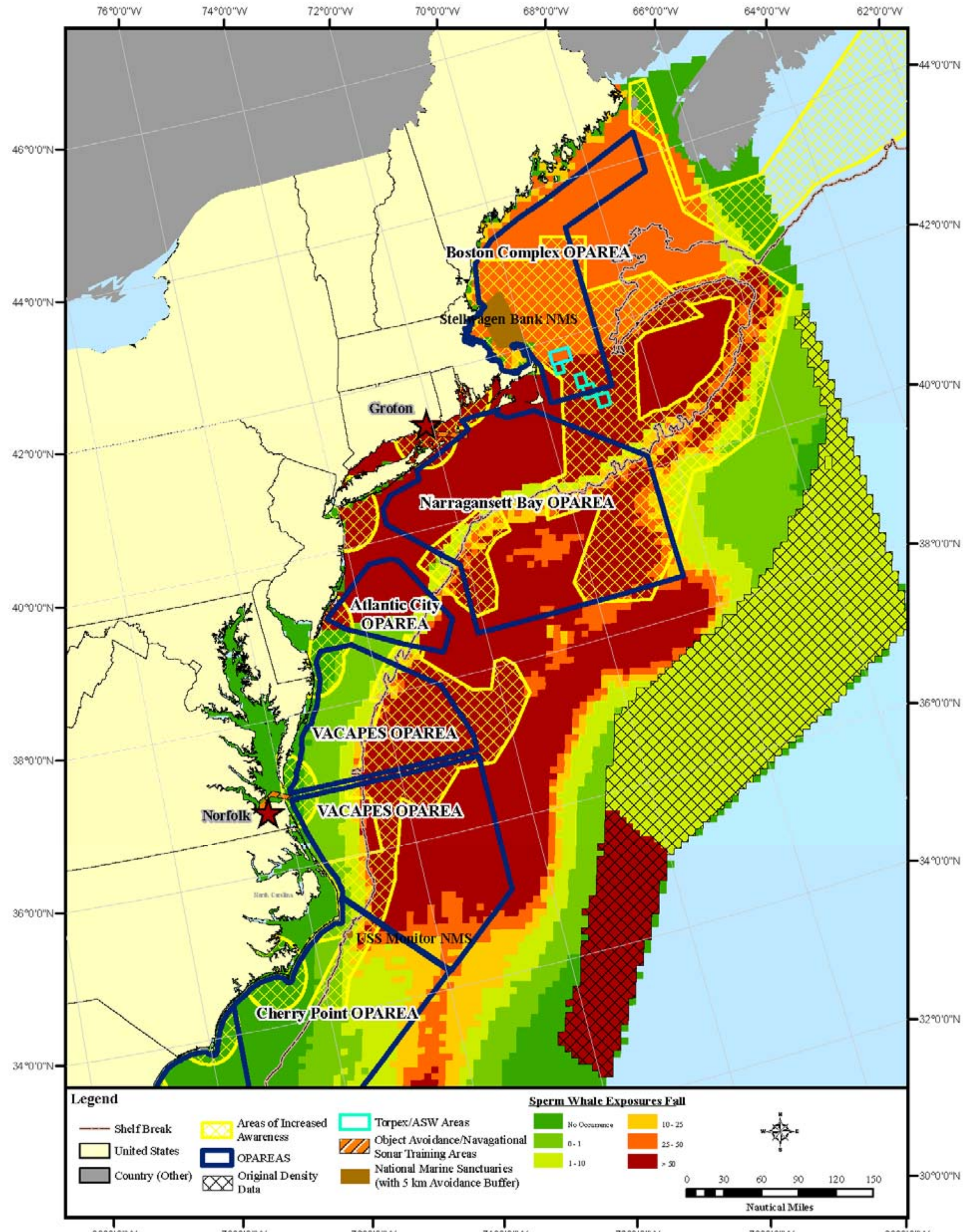
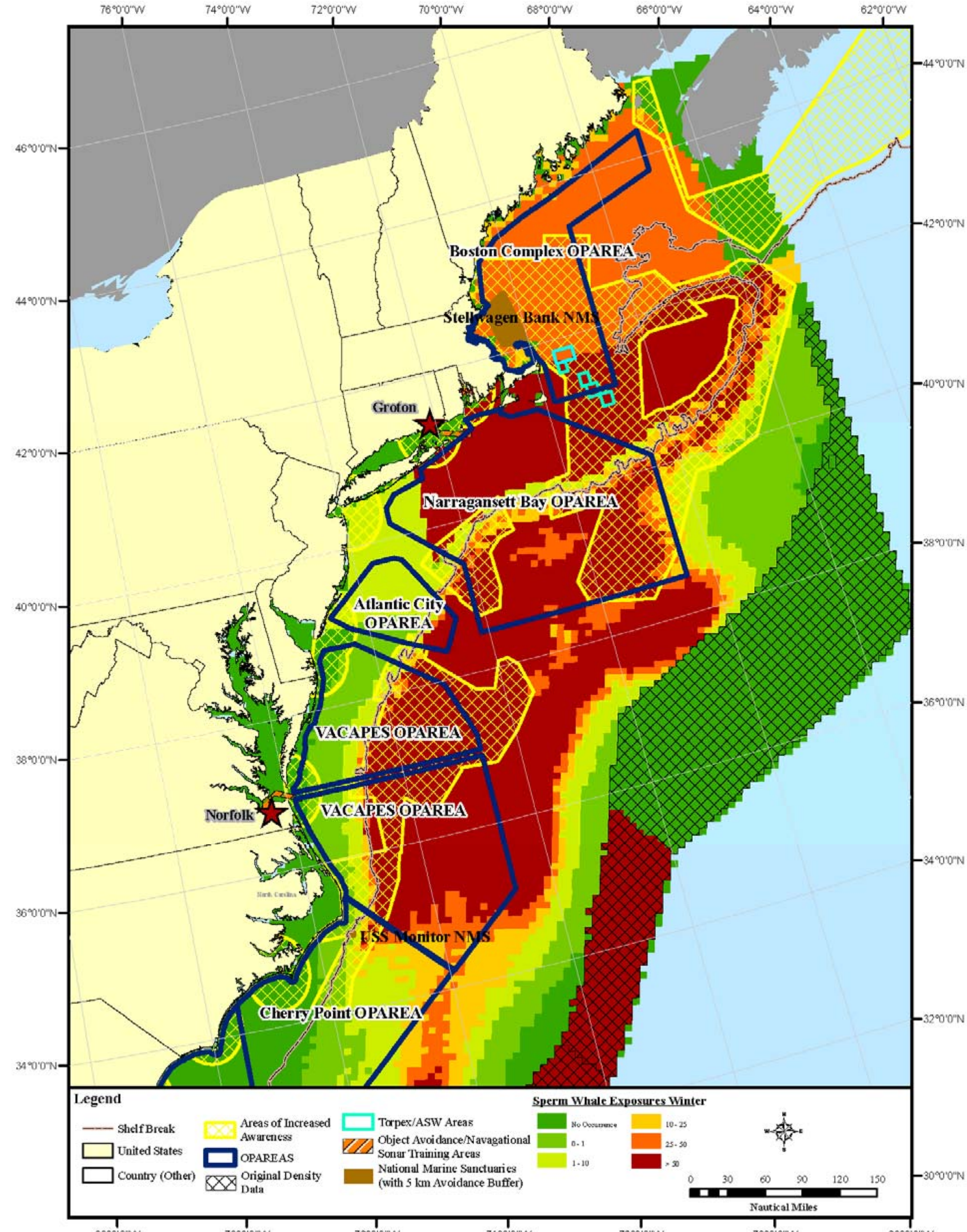


Figure D-188. Alternative 3, NE Sperm Whale-Fall



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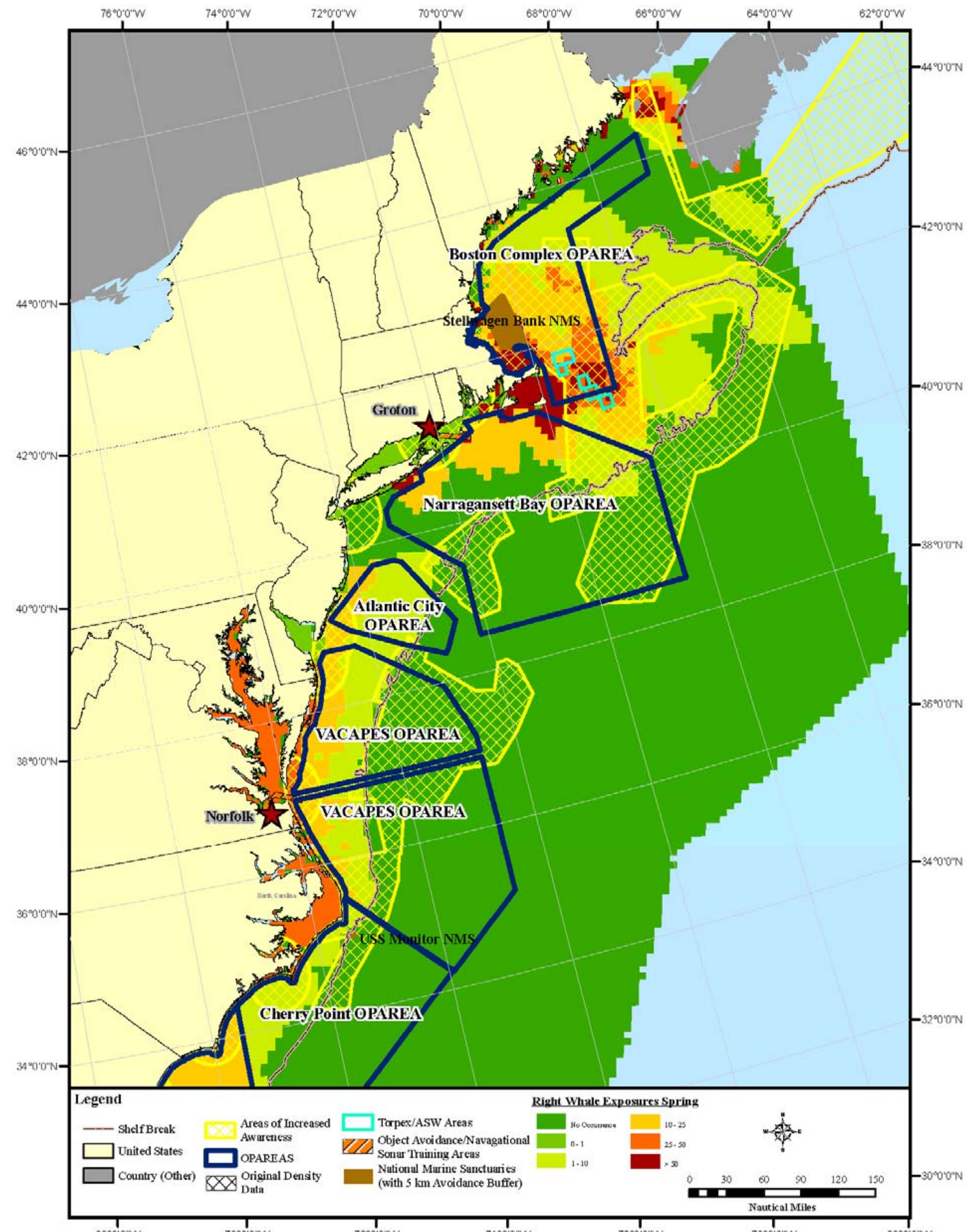

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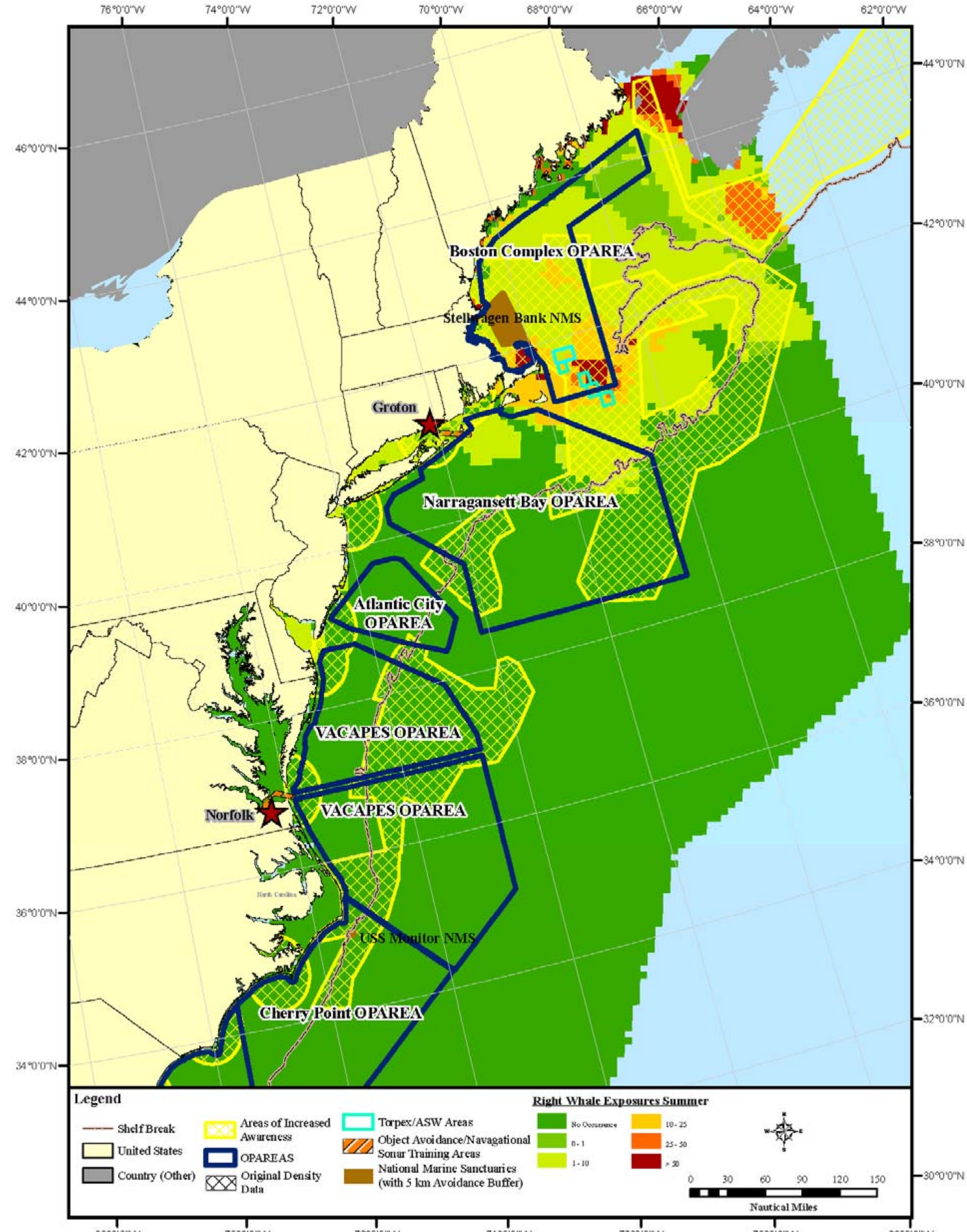
Figure D-190. Alternative 3, NE Right Whale-Spring



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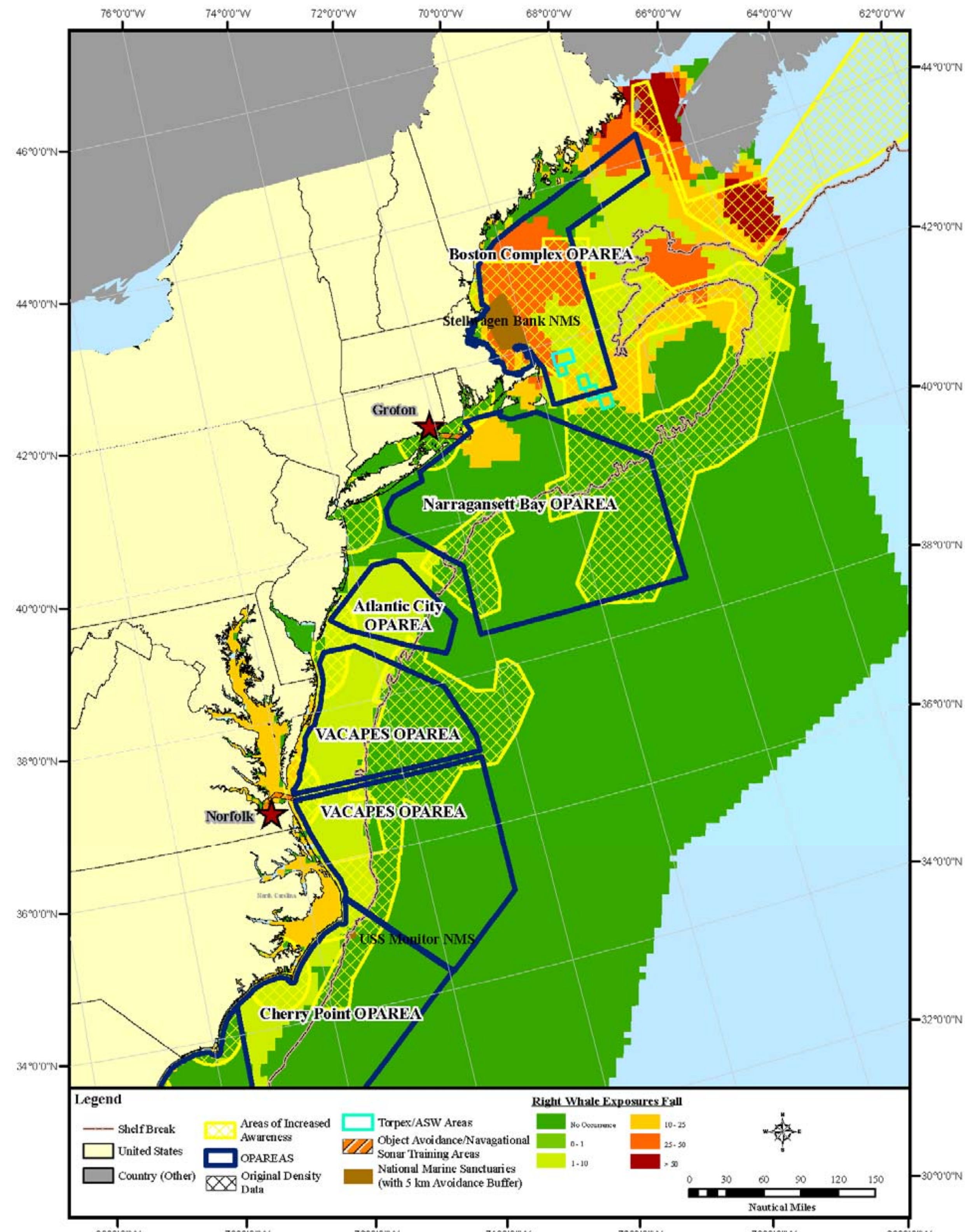

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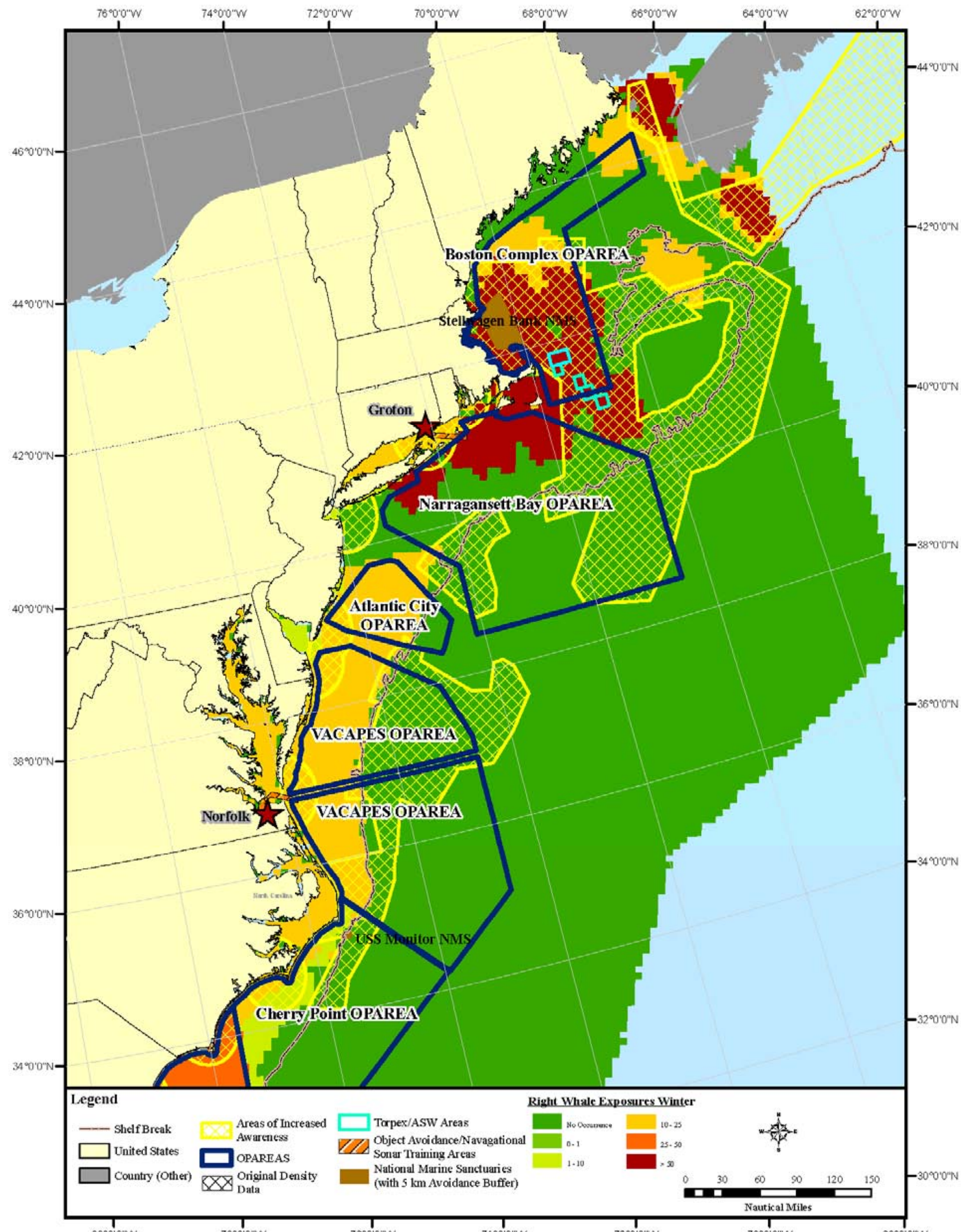
Figure D-192. Alternative 3, NE Right Whale-Fall



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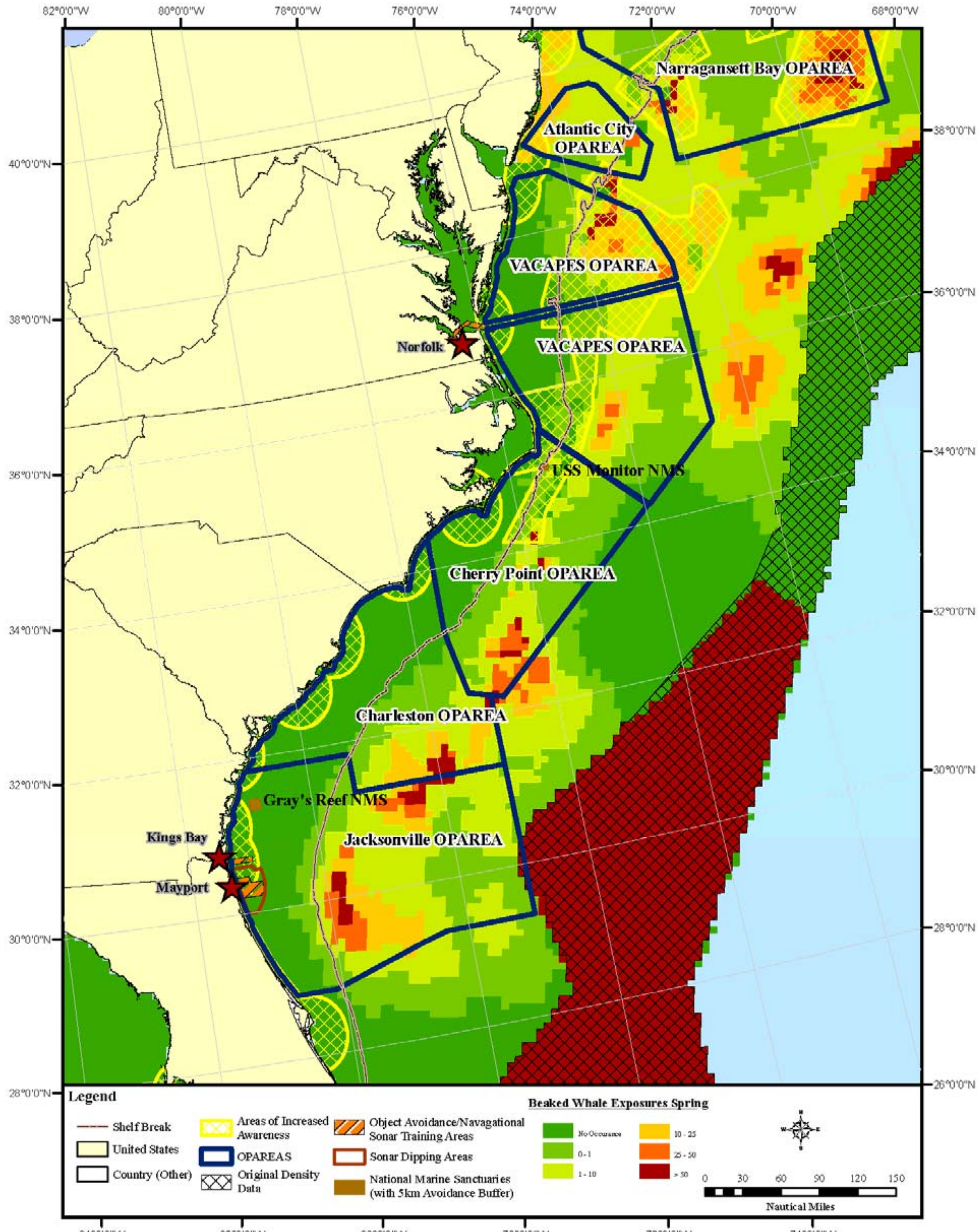

1 **Figure D-194. Alternative 3, SE Beaked Whale-Spring**

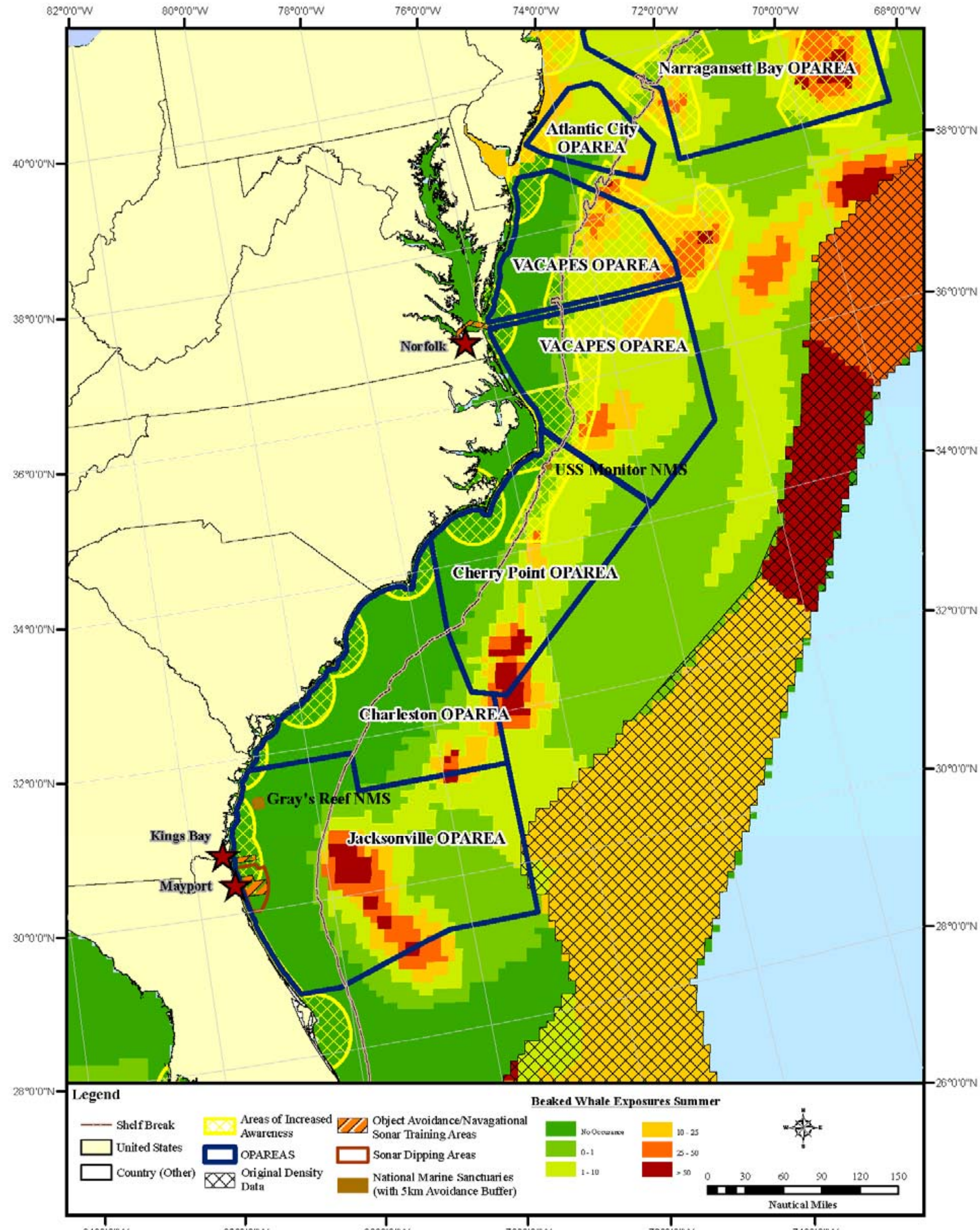

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Figure D-195. Alternative 3, SE Beaked Whale-Summer

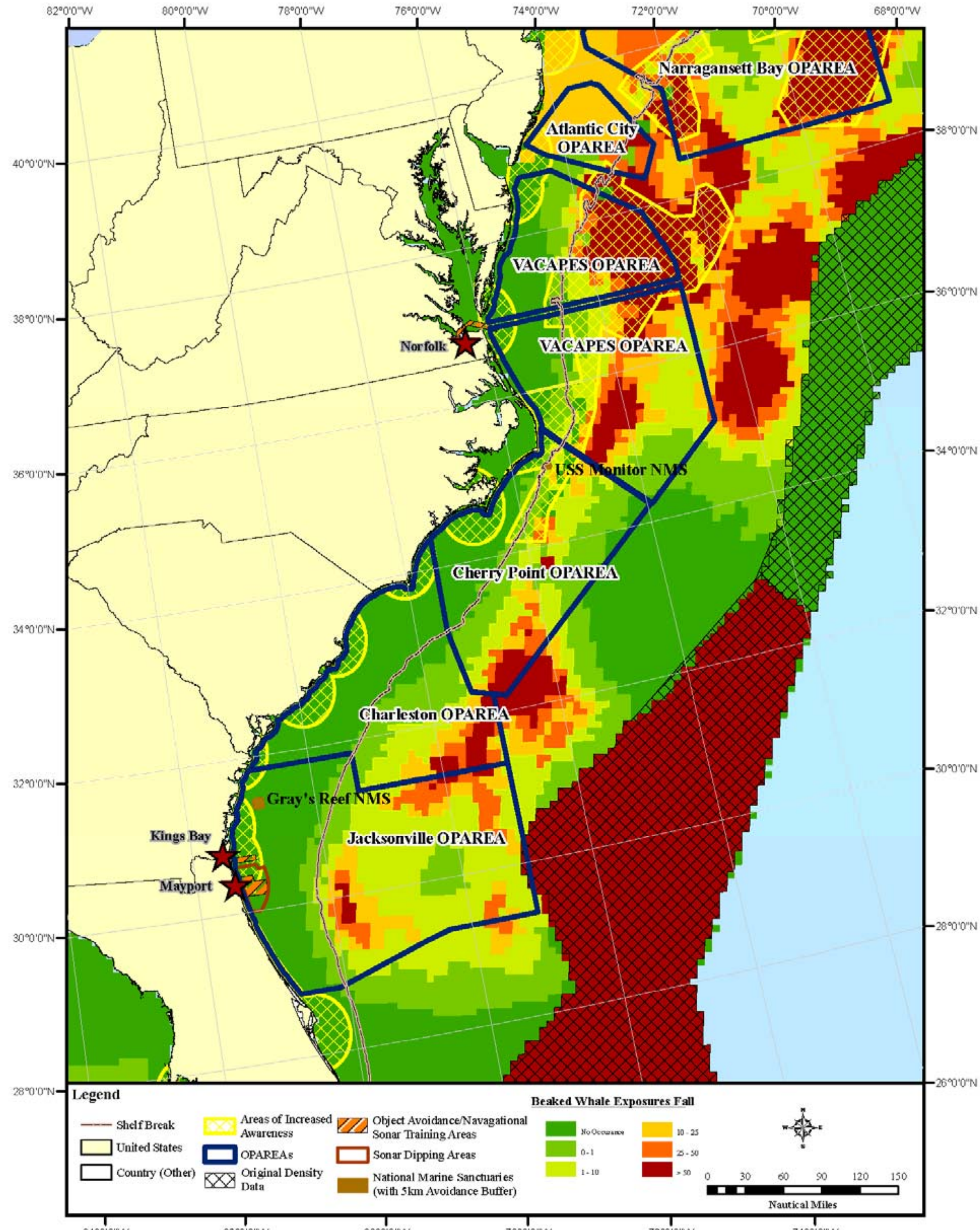

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Figure D-196. Alternative 3, SE Beaked Whale-Fall

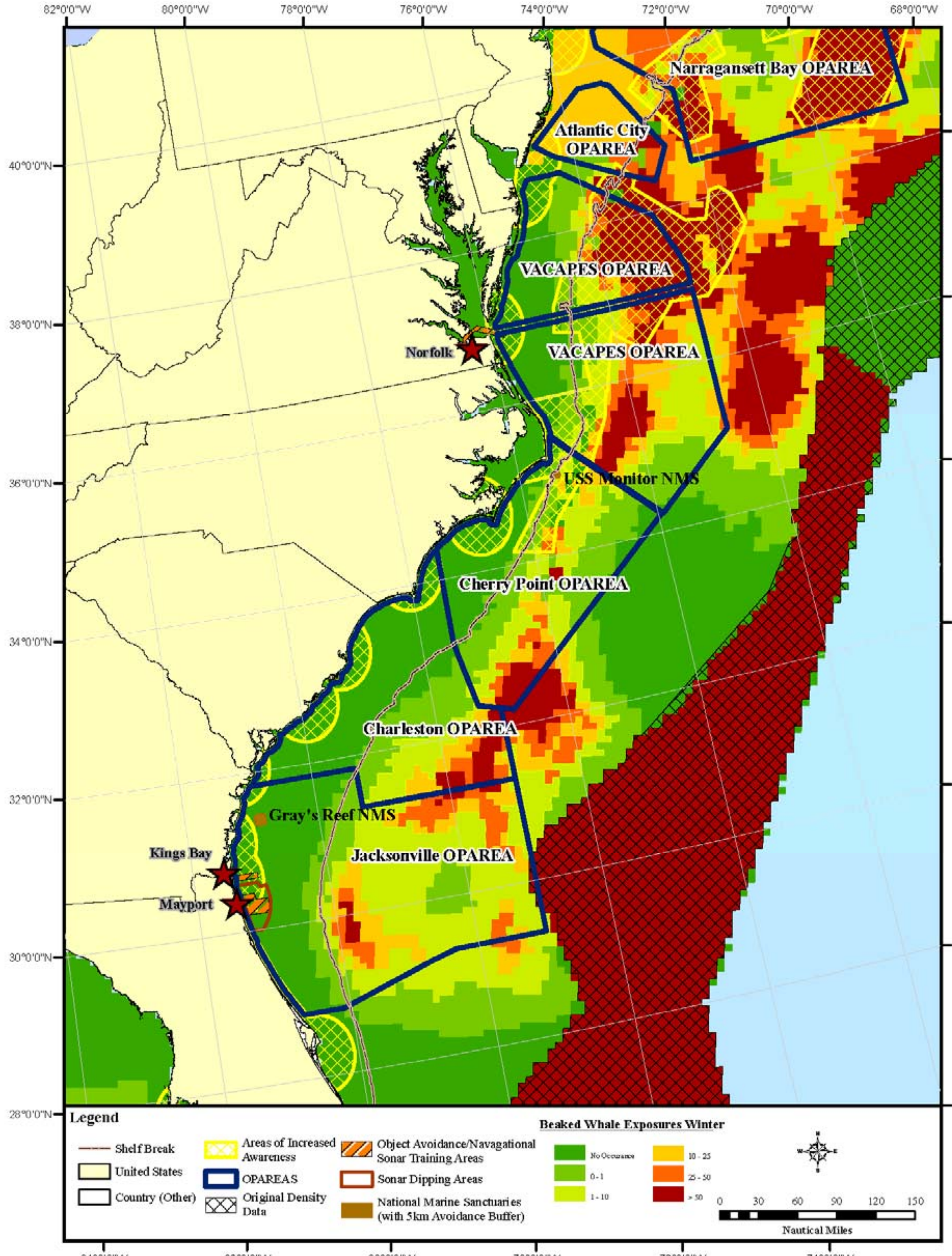

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Figure D-197. Alternative 3, SE Beaked Whale-Winter

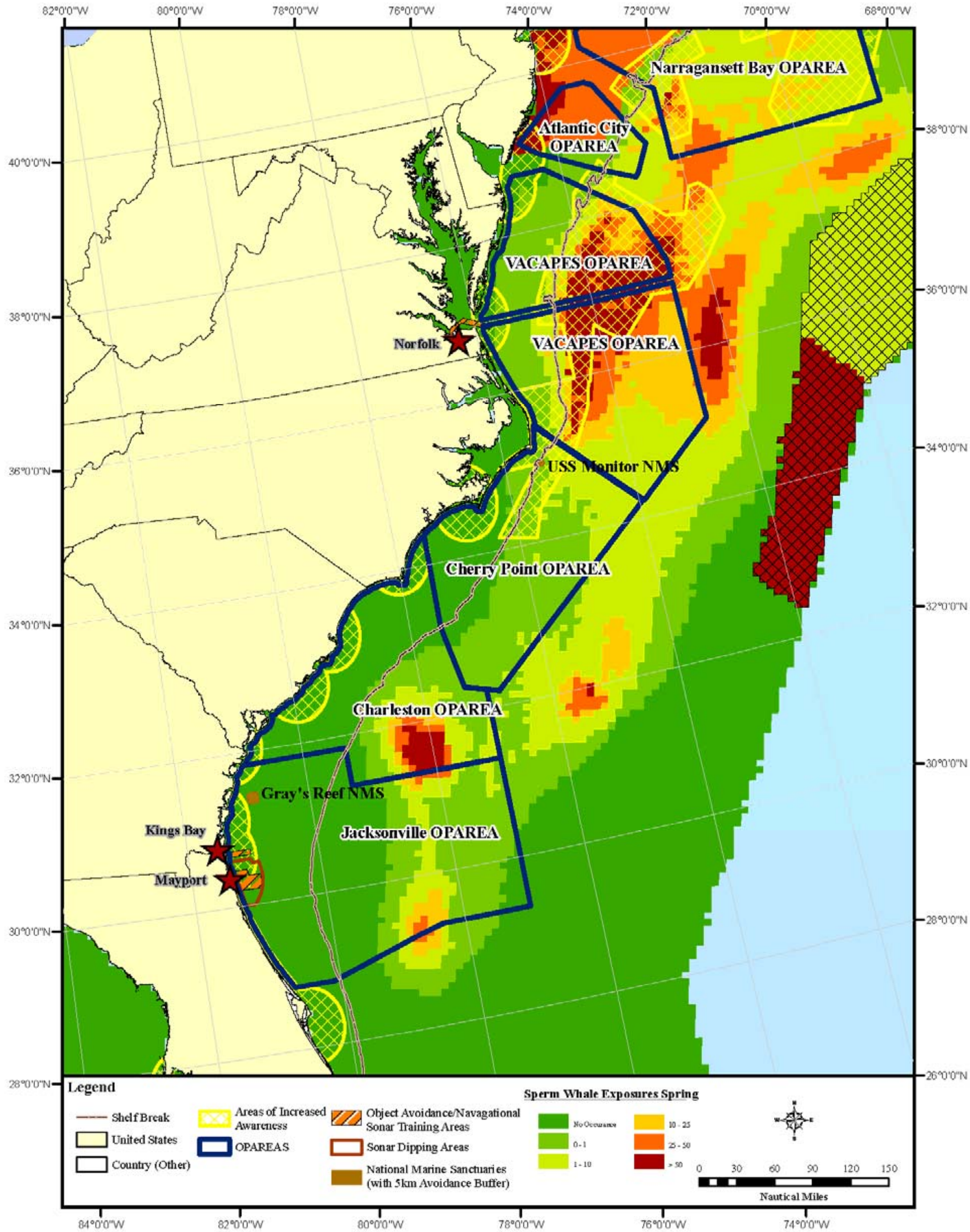
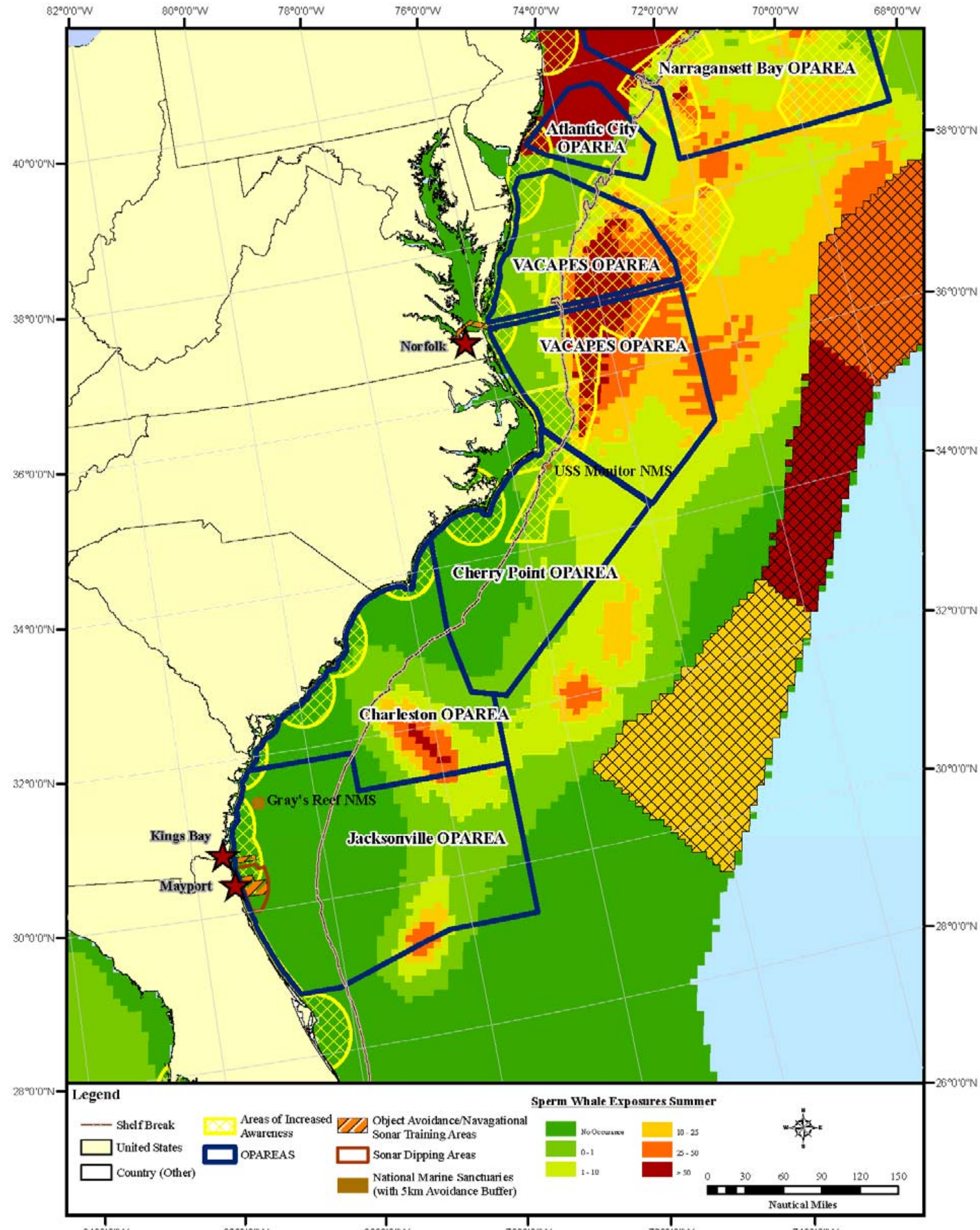


Figure D-198. Alternative 3, SE Sperm Whale-Spring



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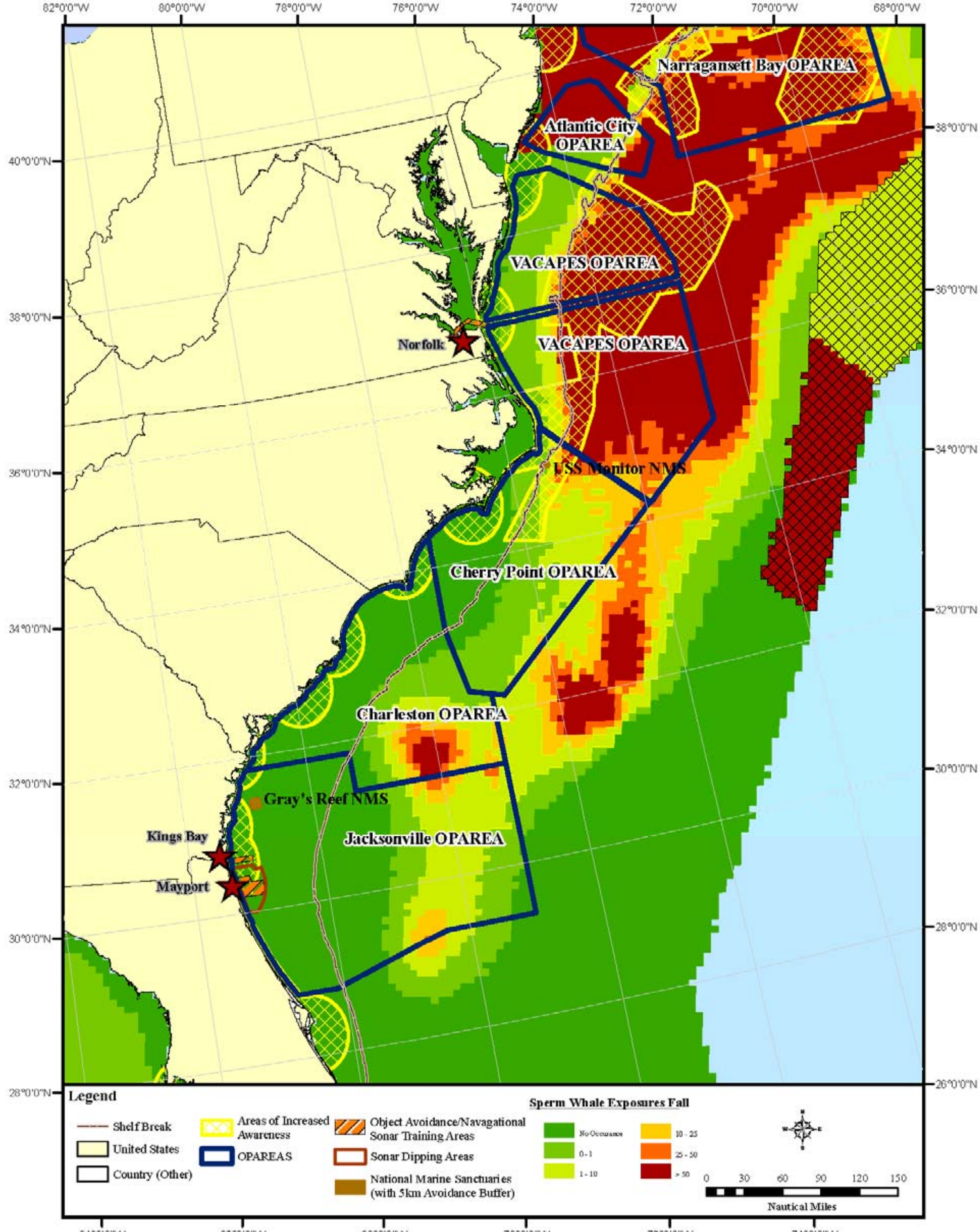

Figure D-200. Alternative 3, SE Sperm Whale-Fall

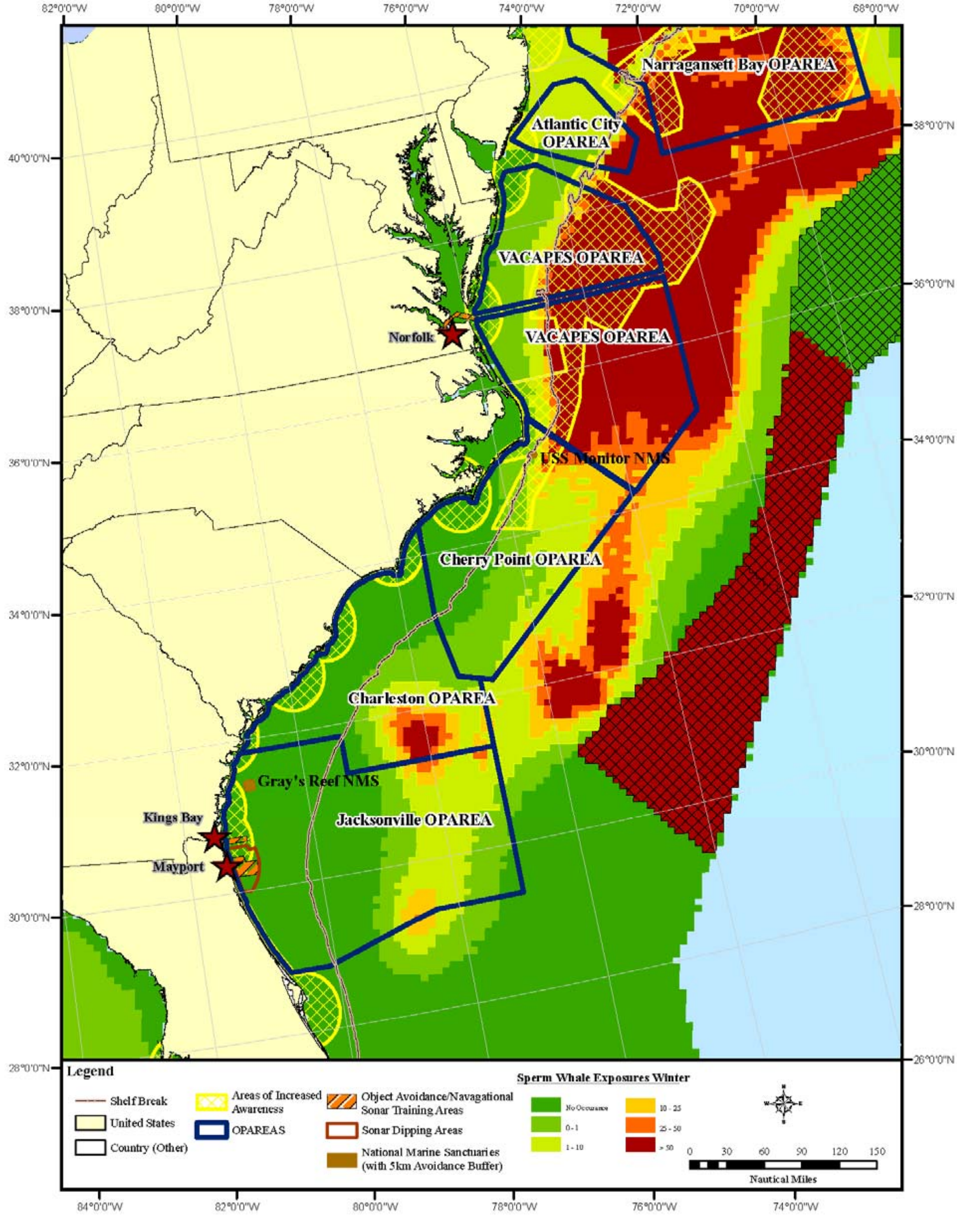

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Figure D-201. Alternative 3, SE Sperm Whale-Winter

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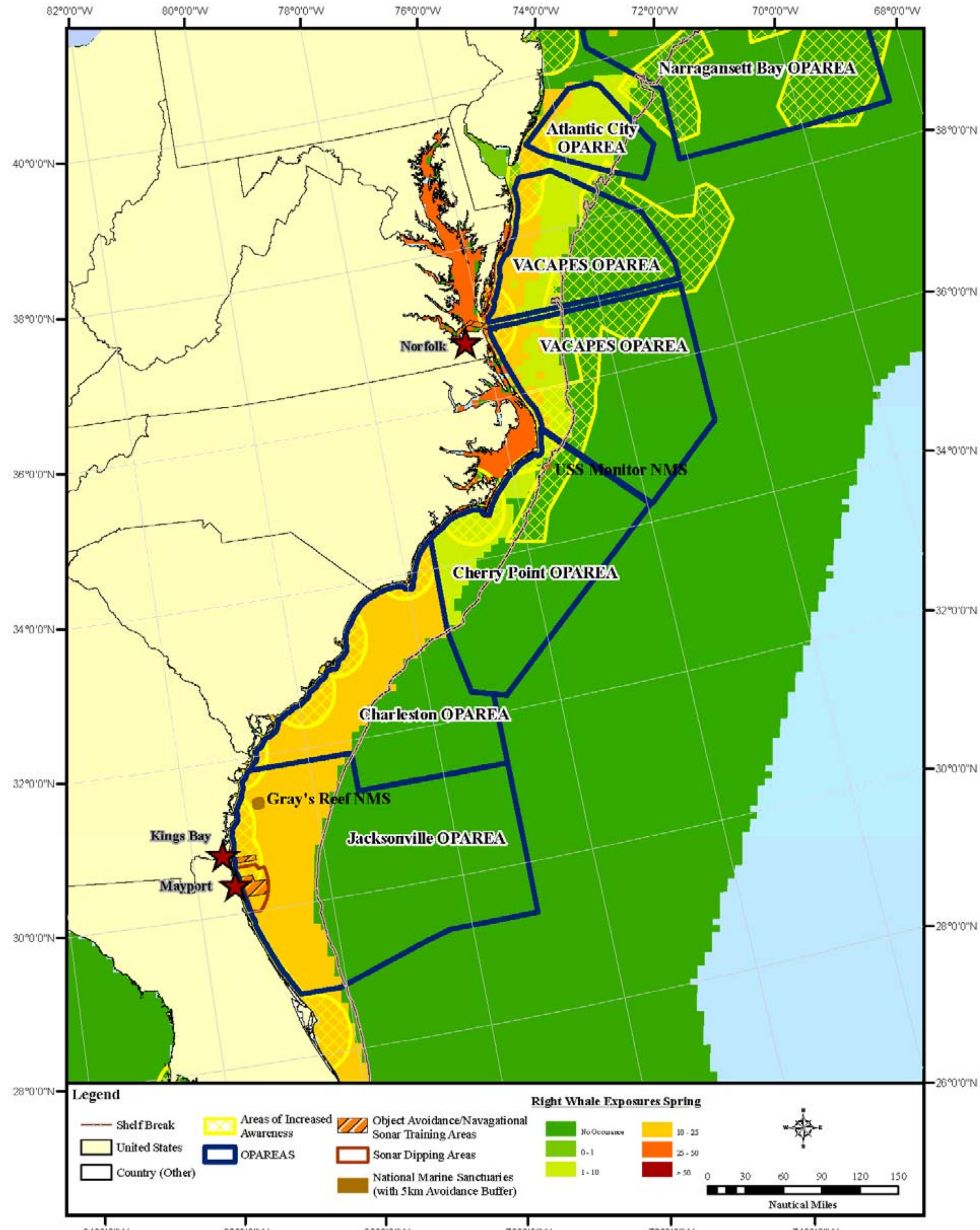

Figure D-202. Alternative 3, SE Right Whale-Spring

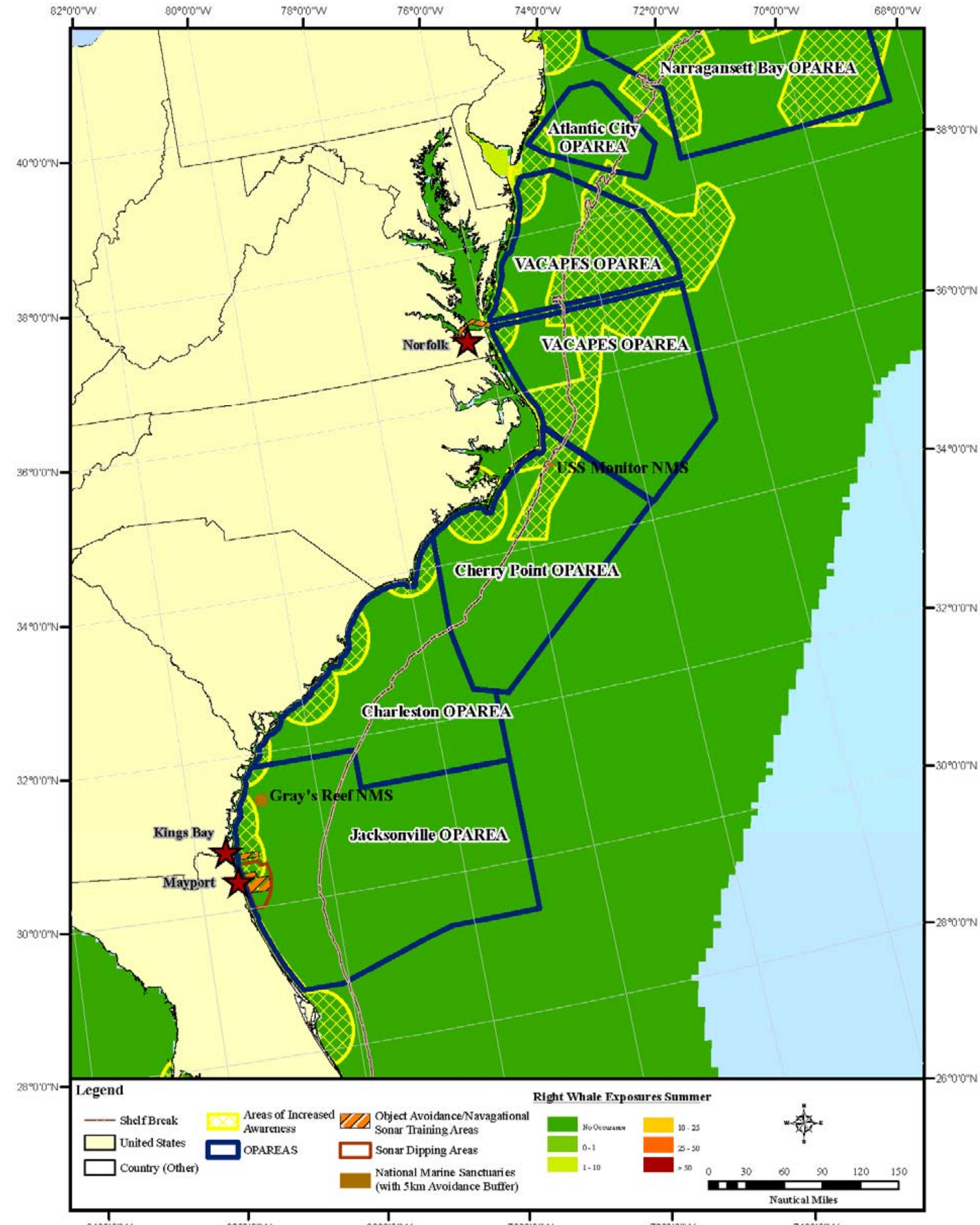

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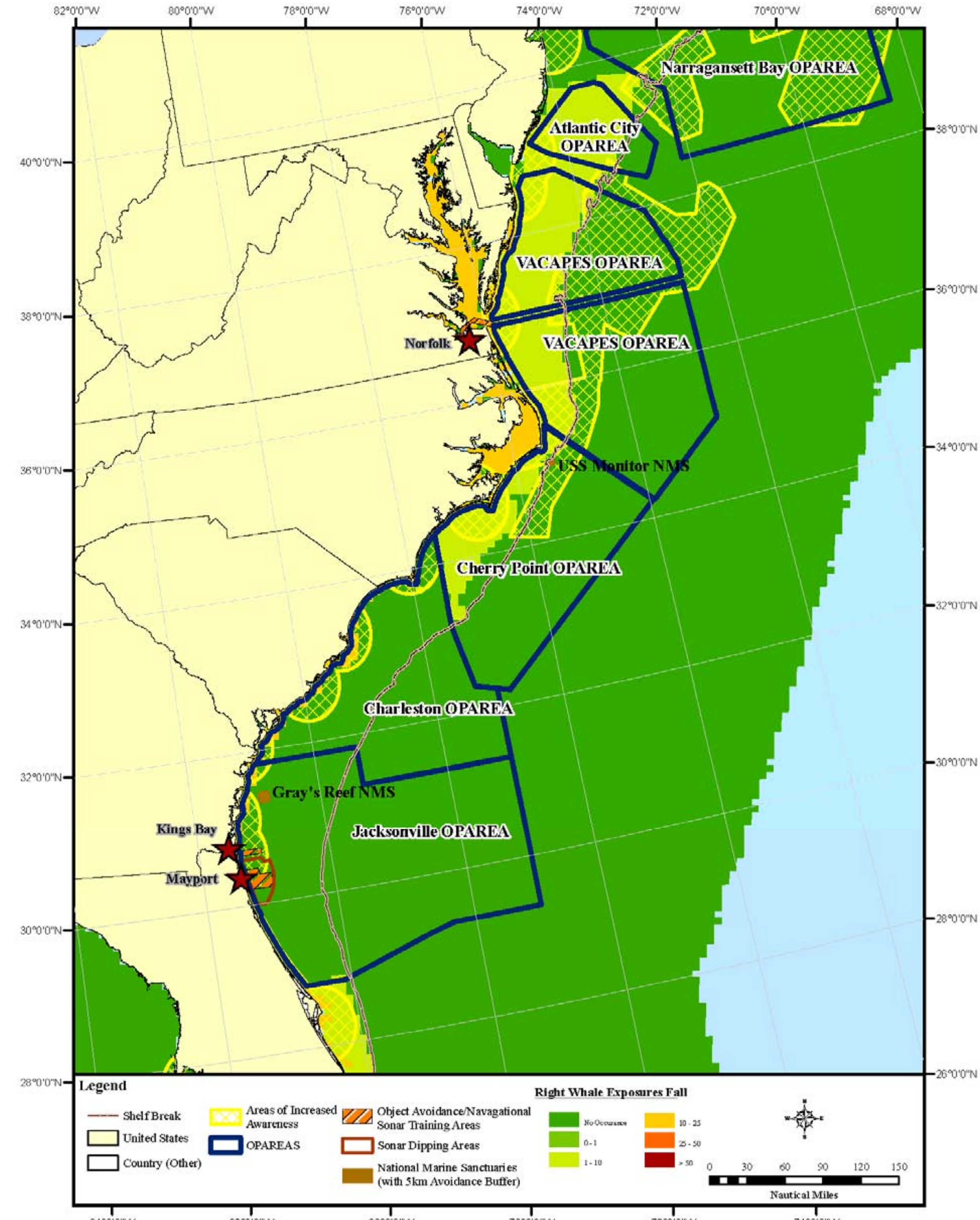
Figure D-203. Alternative 3, SE Right Whale-Summer



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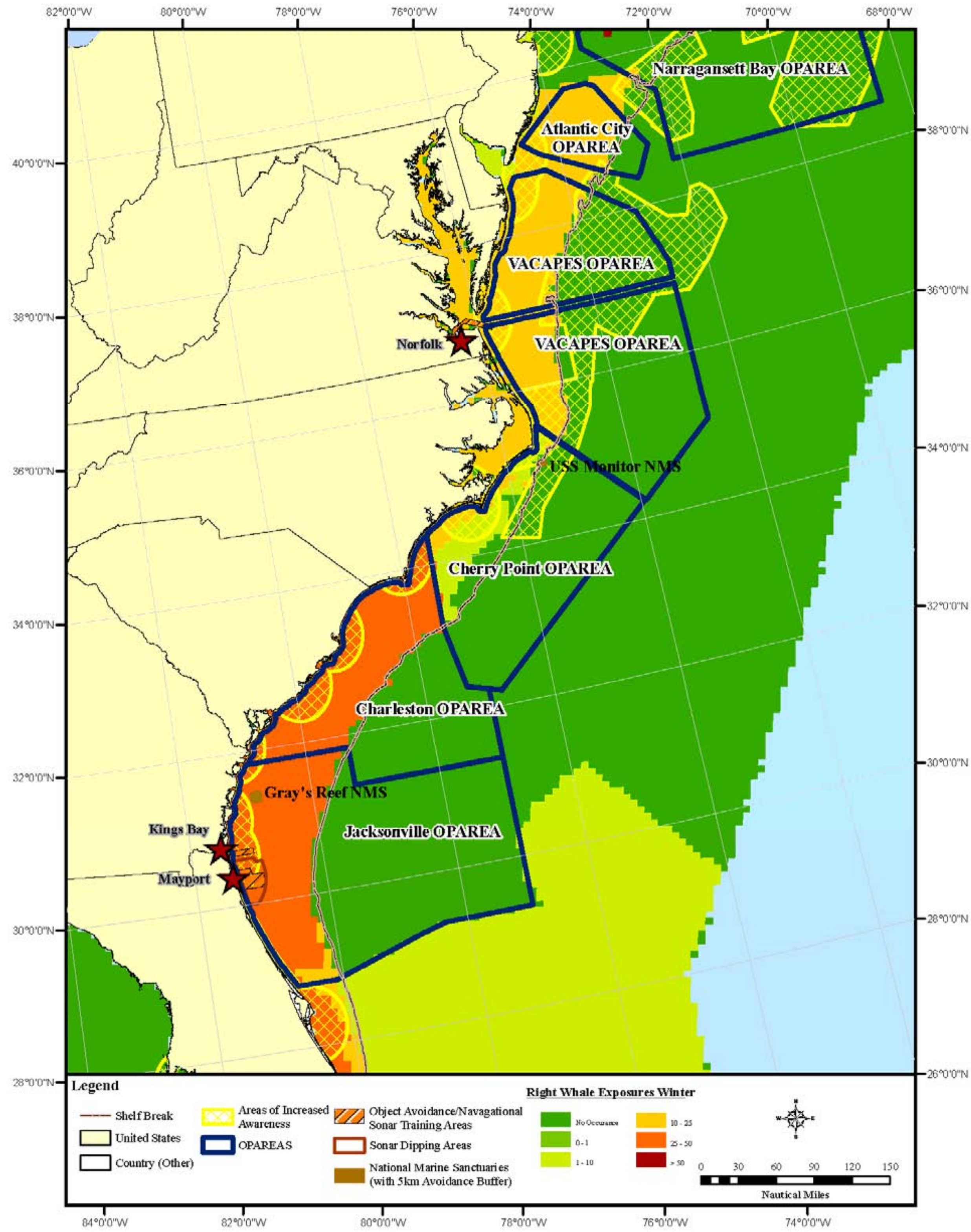


Figure D-205. Alternative 3, SE Right Whale-Winter

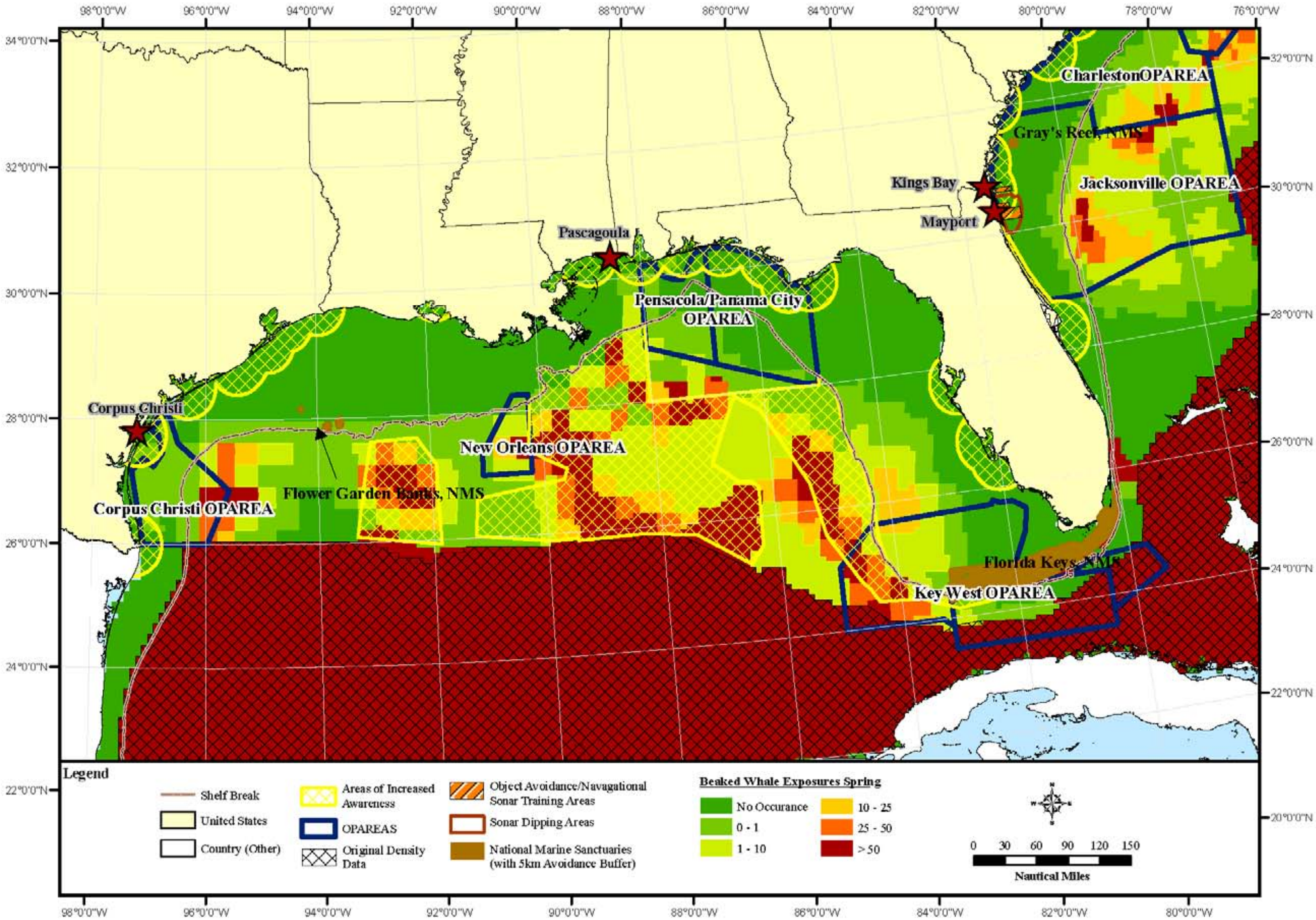


Figure D-206. Alternative 3, GOMEX Beaked Whale-Spring

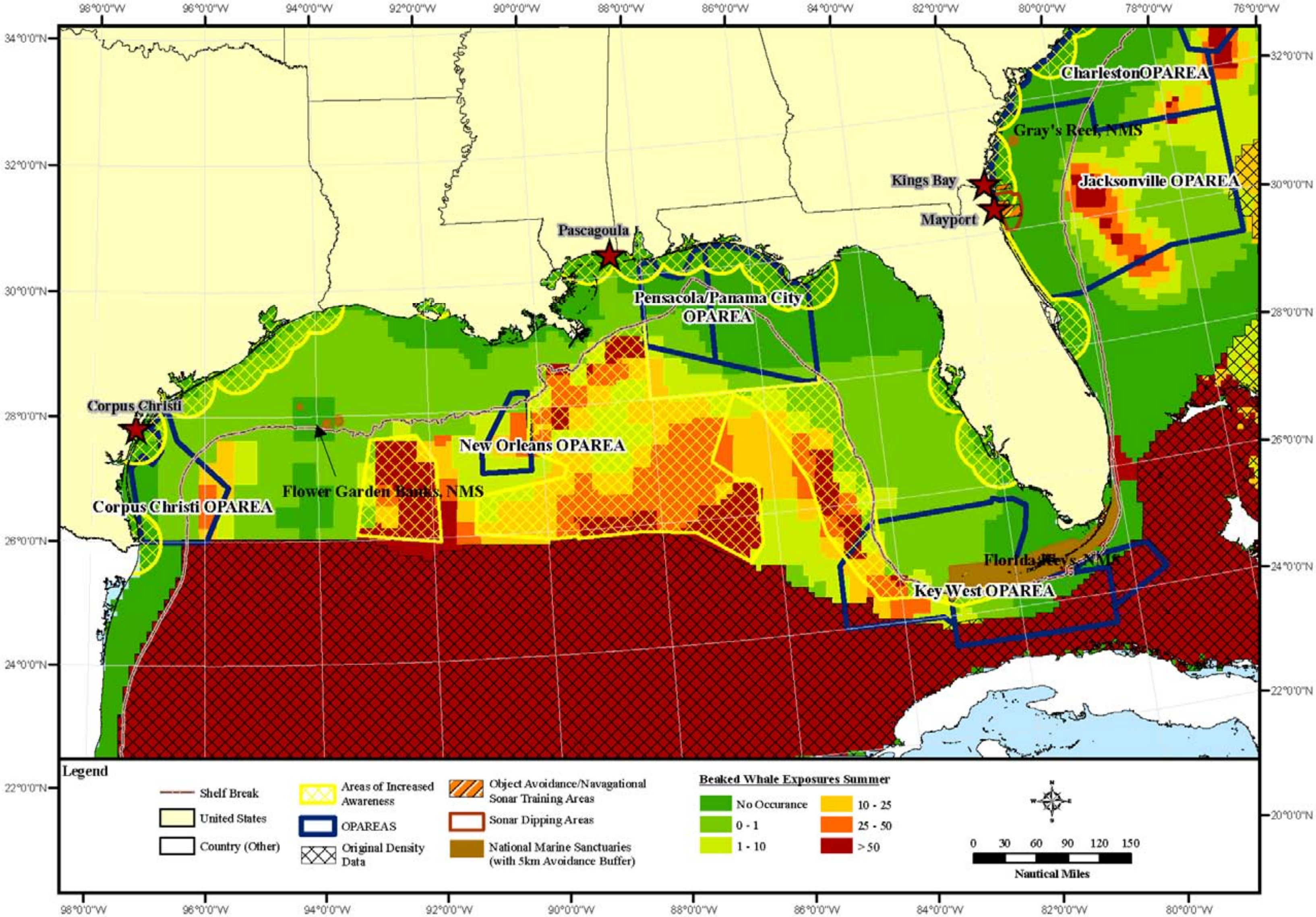
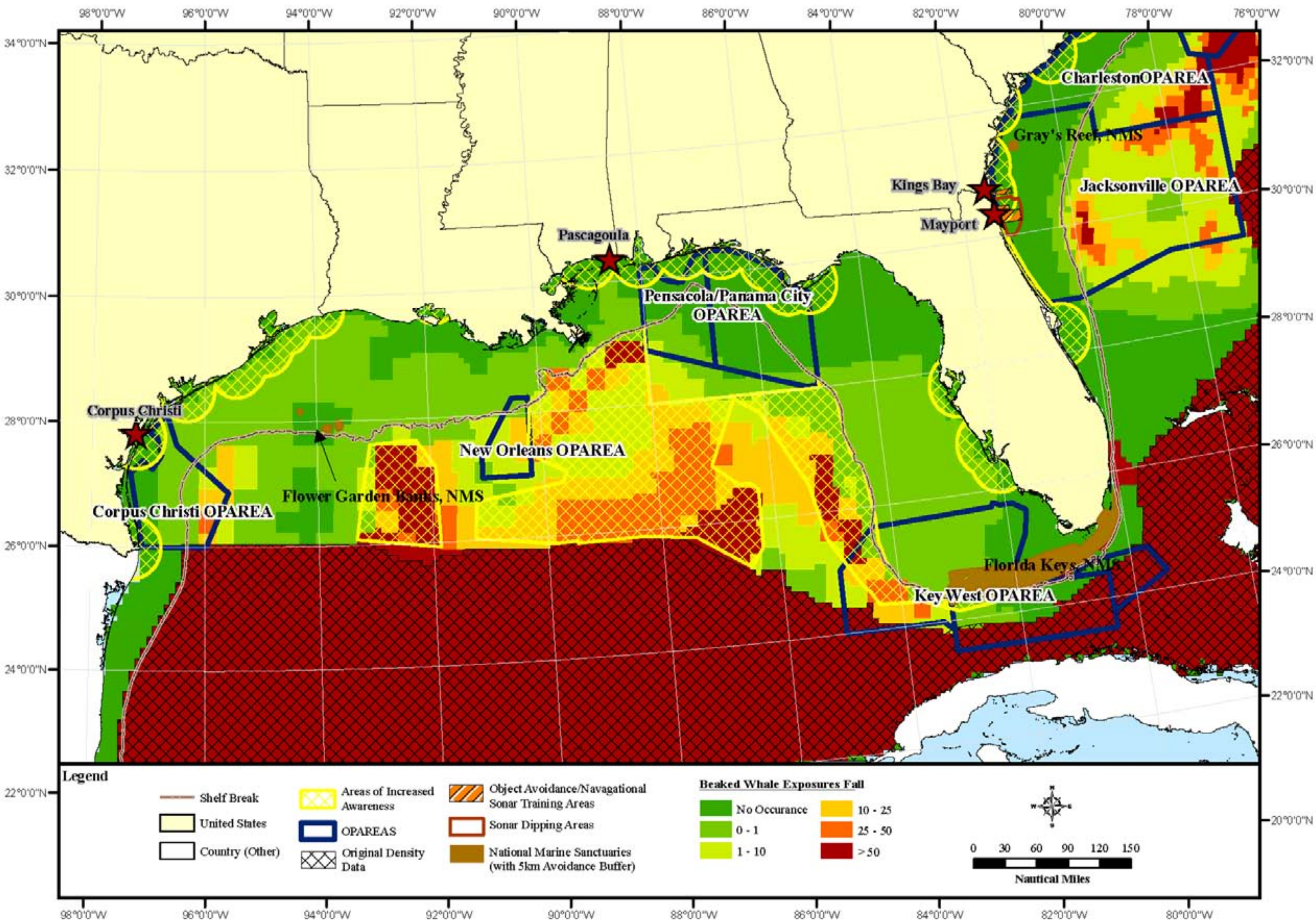


Figure D-207. Alternative 3, GOMEX Beaked Whale-Summer



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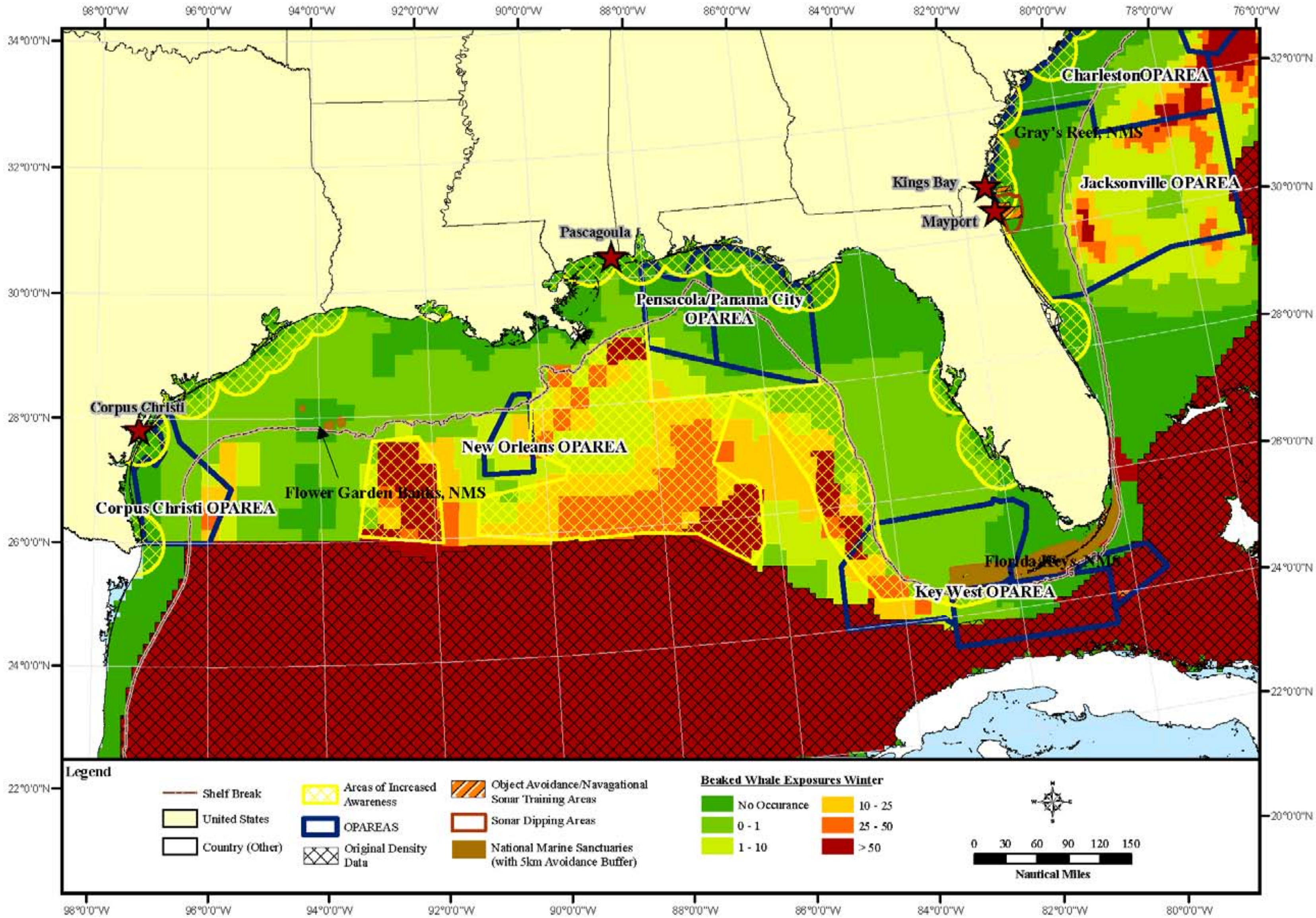


Figure D-209. Alternative 3, GOMEX Beaked Whale-Winter

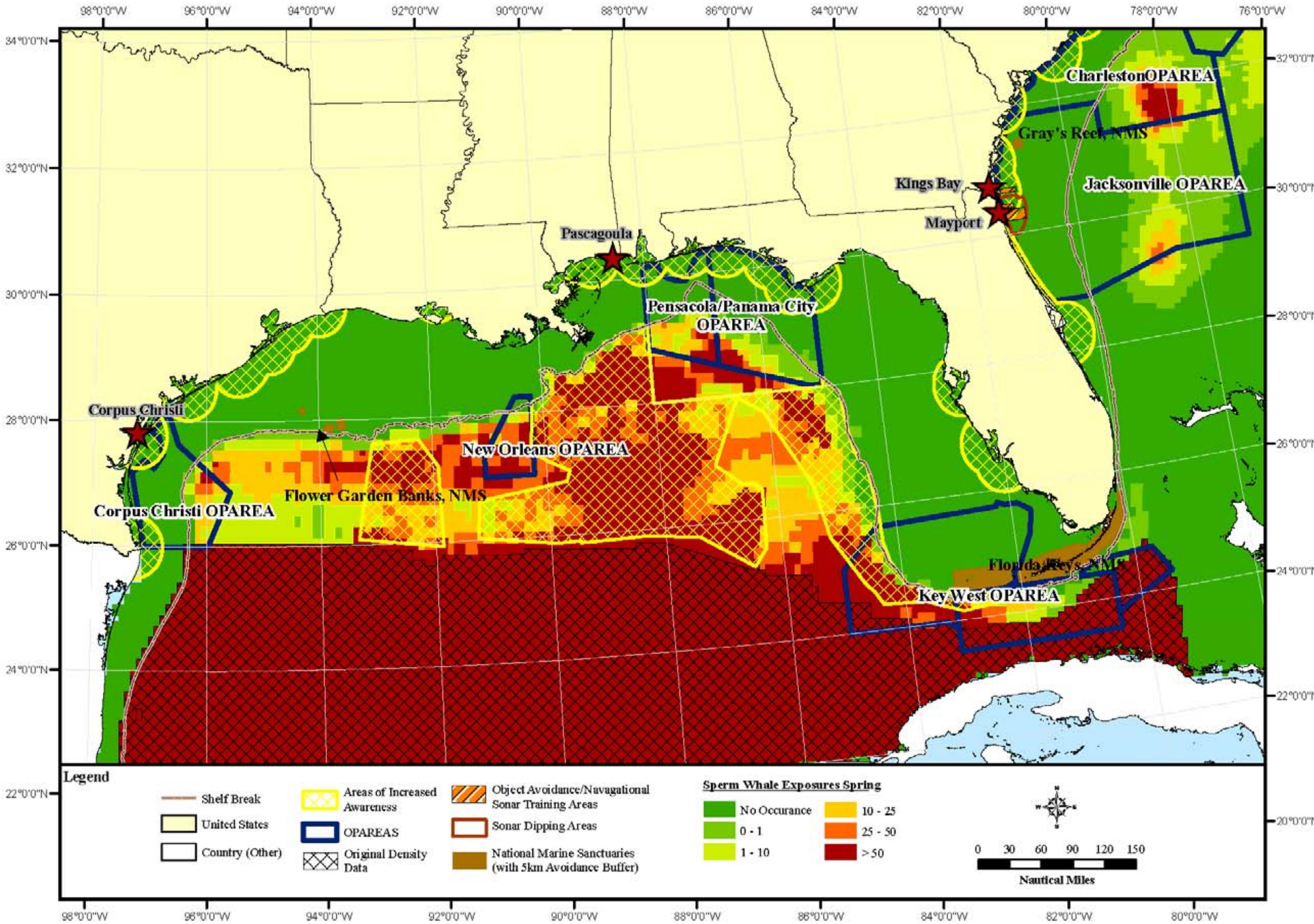
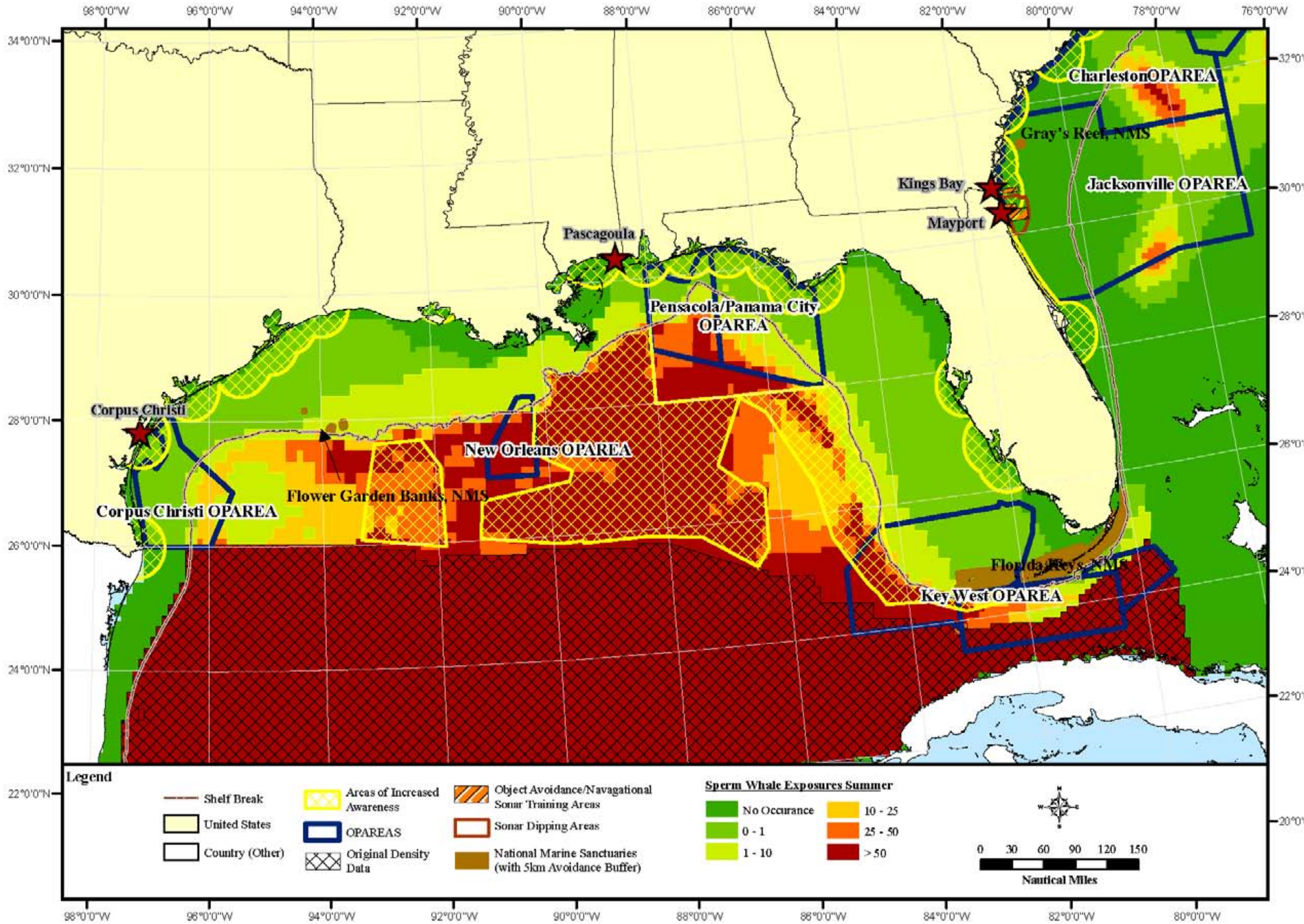


Figure D-210. Alternative 3, GOMEX Sperm Whale-Spring



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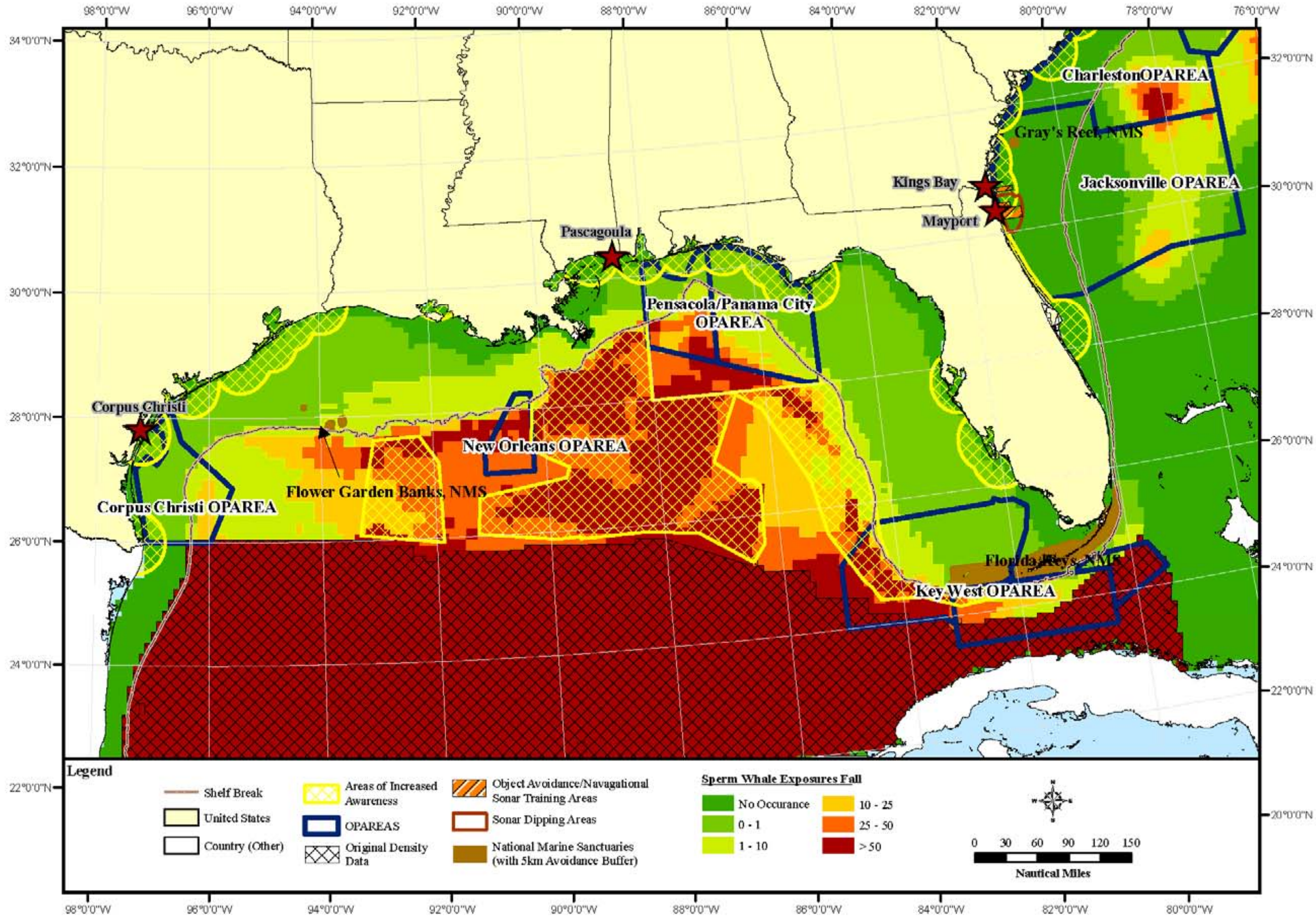

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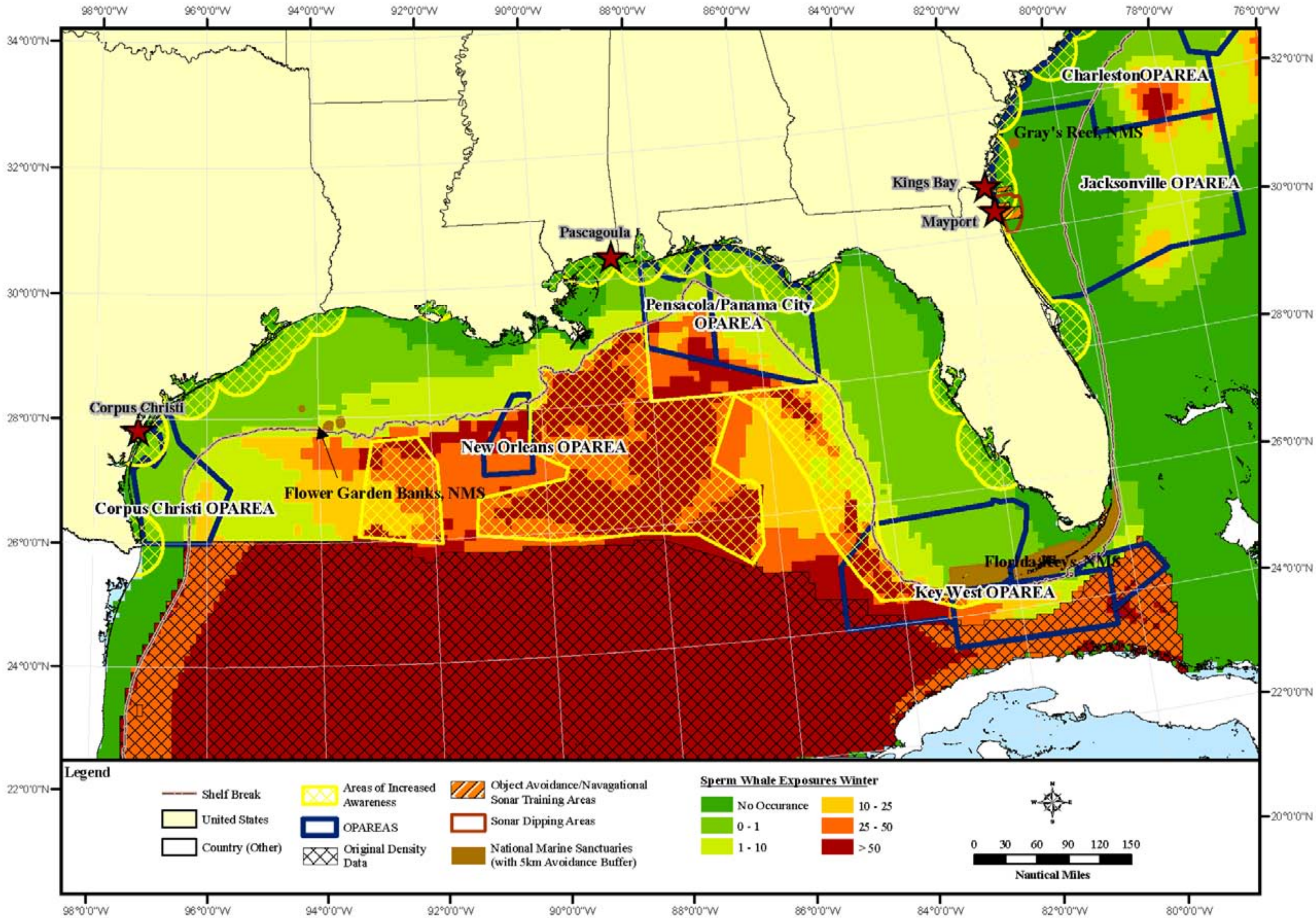

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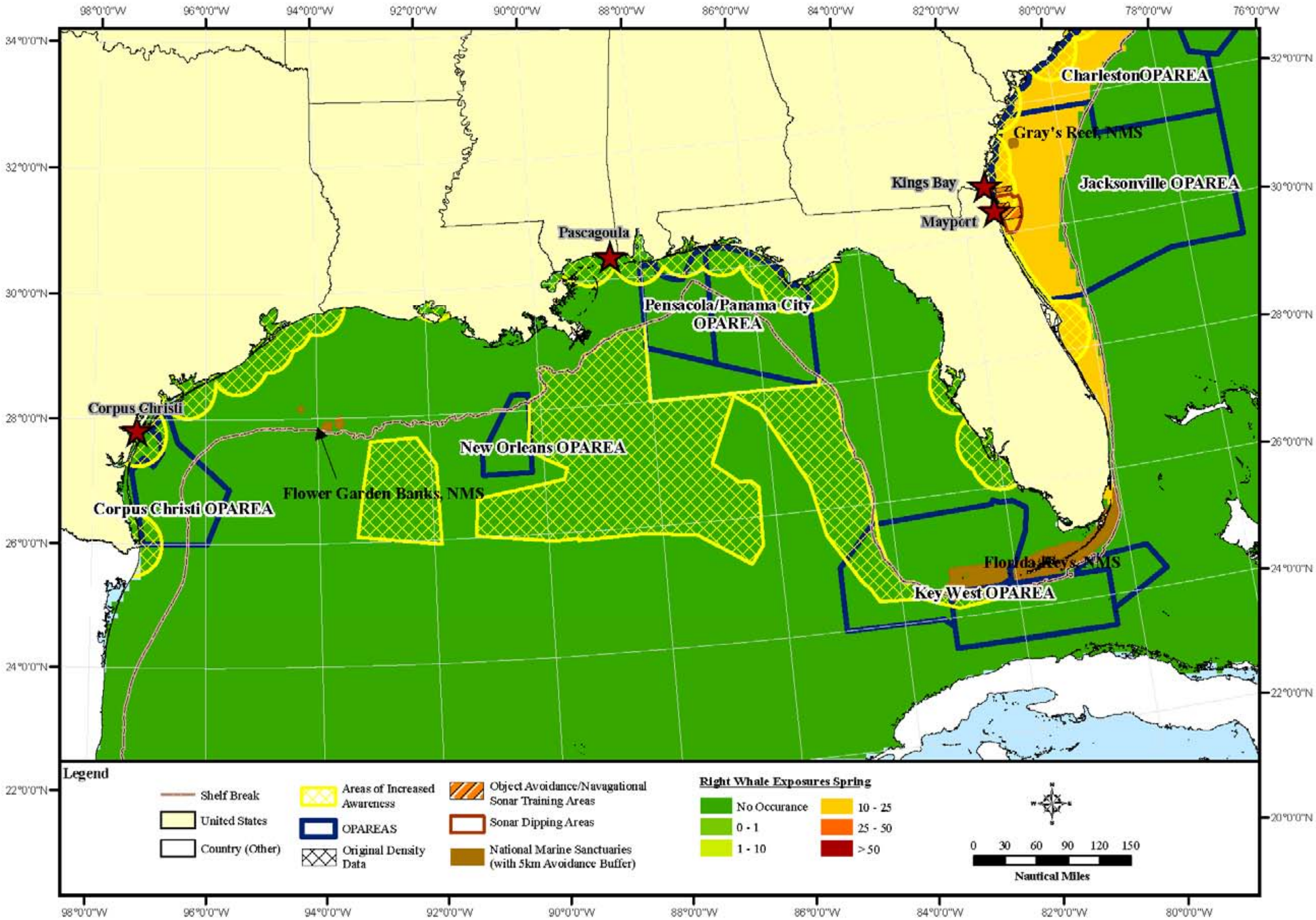
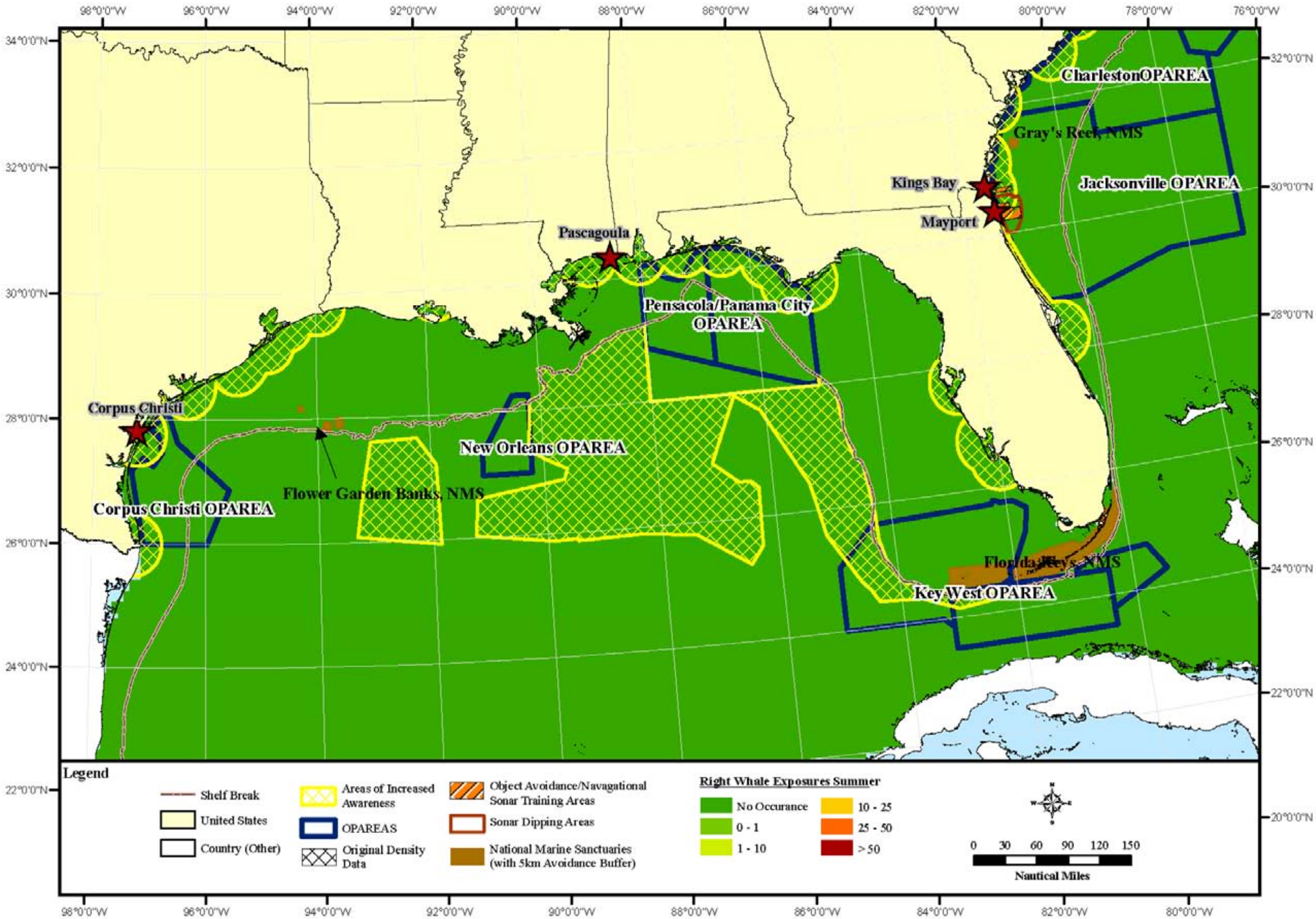


Figure D-214. Alternative 3, GOMEX Right Whale-Spring



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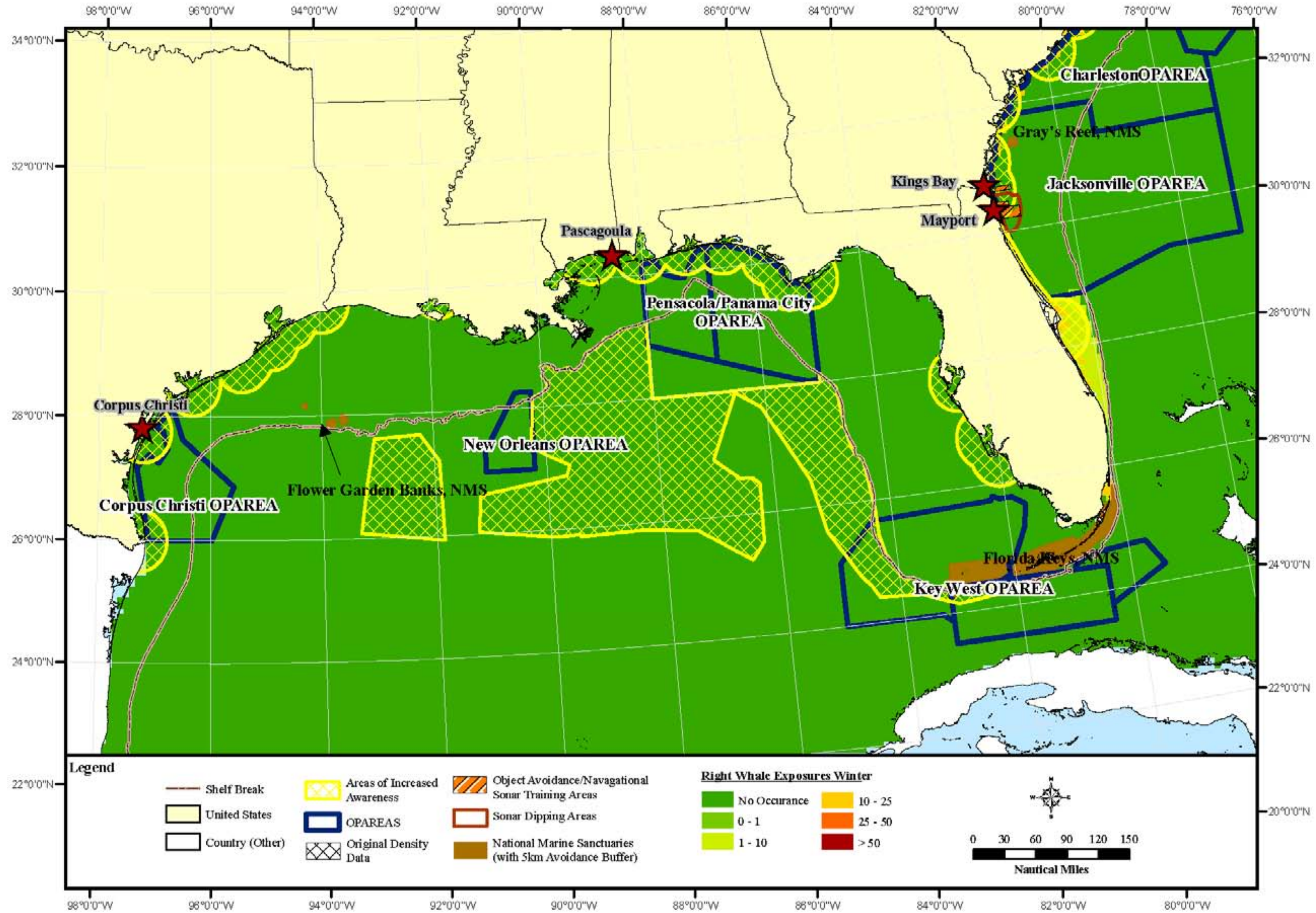

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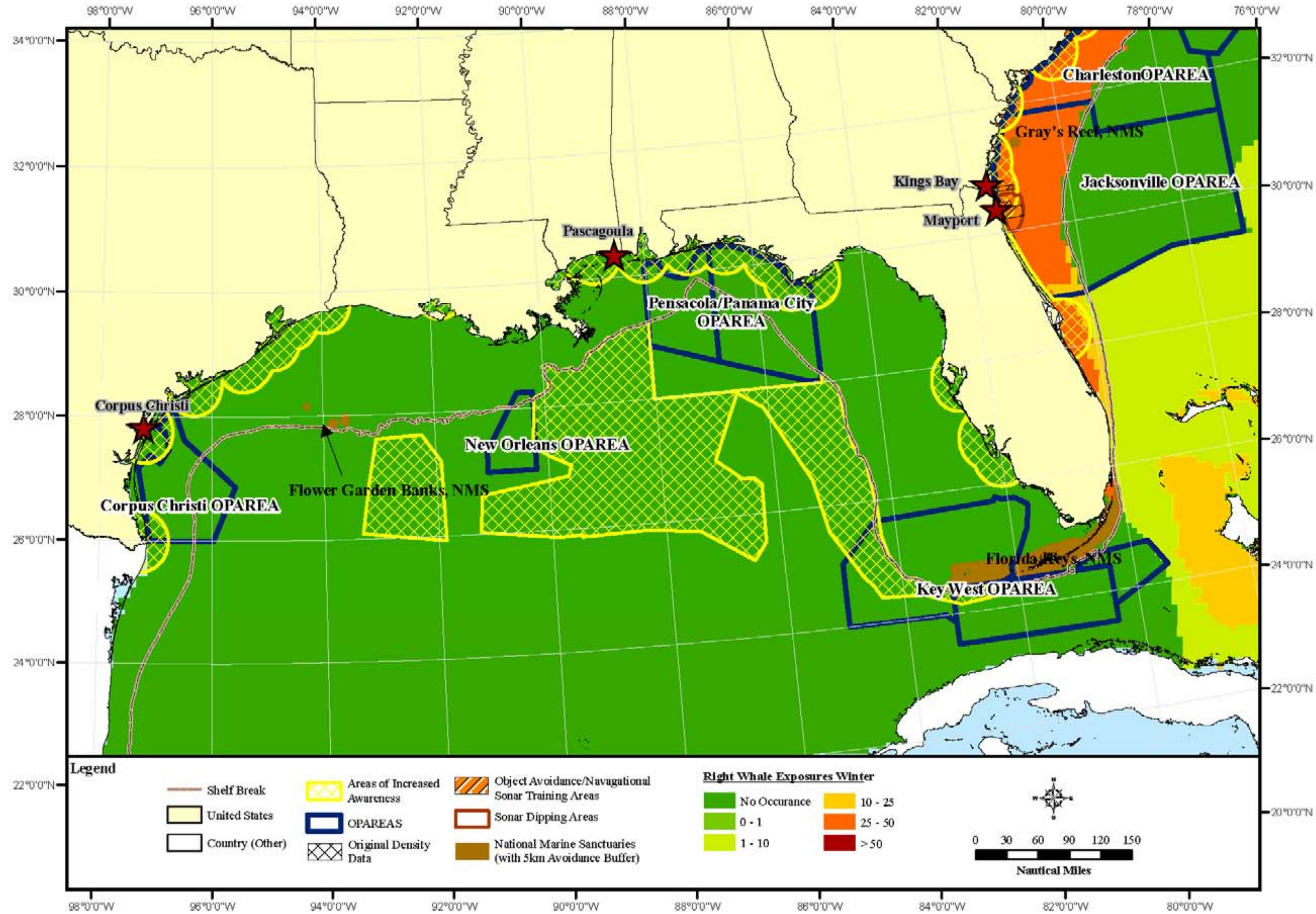

Figure D-217. Alternative 3, GOMEX Right Whale-Winter

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APPENDIX E

CETACEAN STRANDING REPORT

CETACEAN STRANDING REPORT

E.1 WHAT IS A STRANDED MARINE MAMMAL?

When a live or dead marine mammal swims or floats onto shore and becomes "beached" or incapable of returning to sea, the event is termed a "stranding" (Geraci et al., 1999; Perrin and Geraci, 2002; Geraci and Lounsbury, 2005; NMFS, 2007). The legal definition for a stranding within the United States is that "a marine mammal is dead and is (i) on a beach or shore of the United States; or (ii) in waters under the jurisdiction of the United States (including any navigable waters); or (B) a marine mammal is alive and is (i) on a beach or shore of the United States and is unable to return to the water; (ii) on a beach or shore of the United States and, although able to return to the water, is in need of apparent medical attention; or (iii) in the waters under the jurisdiction of the United States (including any navigable waters), but is unable to return to its natural habitat under its own power or without assistance." (16 United States Code [U.S.C.] 1421h).

The majority of animals that strand are dead or moribund (NMFS, 2007). For animals that strand alive, human intervention through medical aid and/or guidance seaward may be required for the animal to return to the sea. If unable to return to sea, rehabilitation at an appropriate facility may be determined as the best opportunity for animal survival. An event where animals are found out of their normal habitat is may be considered a stranding depending on circumstances even though animals do not necessarily end up beaching (Southhall, 2006).

Three general categories can be used to describe strandings: single, mass, and unusual mortality events. The most frequent type of stranding is a single stranding, which involves only one animal (or a mother/calf pair) (NMFS, 2007).

Mass stranding involves two or more marine mammals of the same species other than a mother/calf pair (Wilkinson, 1991), and may span one or more days and range over several miles (Simmonds and Lopez-Jurado, 1991; Frantzis, 1998; Walsh et al., 2001; Freitas, 2004). In North America, only a few species typically strand in large groups of 15 or more and include sperm whales, pilot whales, false killer whales, Atlantic white-sided dolphins, white-beaked dolphins, and rough-toothed dolphins (Odell 1987, Walsh et al. 2001). Some species, such as pilot whales, false-killer whales, and melon-headed whales occasionally strand in groups of 50 to 150 or more (Geraci et al. 1999). All of these normally pelagic off-shore species are highly sociable and usually infrequently encountered in coastal waters. Species that commonly strand in smaller numbers include pygmy killer whales, common dolphins, bottlenose dolphins, Pacific white-sided dolphin Frasier's dolphins, gray whale and humpback whale (West Coast only), harbor porpoise, Cuvier's beaked whales, California sea lions, and harbor seals (Mazzuca et al. 1999, Norman et al. 2004, Geraci and Lounsbury 2005).

Unusual mortality events (UMEs) can be a series of single strandings or mass strandings, or unexpected mortalities (i.e., die-offs) that occur under unusual circumstances (Dierauf and Gulland, 2001; Harwood, 2002; Gulland, 2006; NMFS, 2007). These events may be interrelated: for instance, at-sea die-offs lead to increased stranding frequency over a short period of time, generally within one to two months. As published by the NMFS, revised criteria for defining a UME include (Hohn et al., 2006b):

(1) A marked increase in the magnitude or a marked change in the nature of morbidity, mortality, or strandings when compared with prior records.

(2) A temporal change in morbidity, mortality, or strandings is occurring.

(3) A spatial change in morbidity, mortality, or strandings is occurring.

(4) The species, age, or sex composition of the affected animals is different than that of animals that are normally affected.

(5) Affected animals exhibit similar or unusual pathologic findings, behavior patterns, clinical signs, or general physical condition (e.g., blubber thickness).

(6) Potentially significant morbidity, mortality, or stranding is observed in species, stocks or populations that are particularly vulnerable (e.g., listed as depleted, threatened or endangered or declining). For example, stranding of three or four right whales may be cause for great concern whereas stranding of a similar number of fin whales may not.

(7) Morbidity is observed concurrent with or as part of an unexplained continual decline of a marine mammal population, stock, or species.

UMEs are usually unexpected, infrequent, and may involve a significant number of marine mammal mortalities. As discussed below, unusual environmental conditions are probably responsible for most UMEs and marine mammal die-offs (Vidal and Gallo-Reynoso, 1996; Geraci et al., 1999; Walsh et al., 2001; Gulland and Hall, 2005).

E.2 UNITED STATES STRANDING RESPONSE ORGANIZATION

Stranding events provide scientists and resource managers information not available from limited at-sea surveys, and may be the only way to learn key biological information about certain species such as distribution, seasonal occurrence, and health (Rankin, 1953; Moore et al., 2004; Geraci and Lounsbury, 2005). Necropsies are useful in attempting to determine a reason for the stranding, and are performed on stranded animals when the situation and resources allow.

In 1992, Congress passed the Marine Mammal Health and Stranding Response Act (MMHSRA) which authorized the Marine Mammal Health and Stranding Response Program (MMHSRP) under authority of the Department of Commerce, National Marine Fisheries Service. The MMHSRP was created out of concern started in the 1980s for marine mammal mortalities, to formalize the response process, and to focus efforts being initiated by numerous local stranding organizations and as a result of public concern.

Major elements of the MMHSRP include the following (NMFS, 2007):

- National Marine Mammal Stranding Network
- Marine Mammal UME Program
- National Marine Mammal Tissue Bank (NMMTB) and Quality Assurance Program
- Marine Mammal Health Biomonitoring, Research, and Development
- Marine Mammal Disentanglement Network

- John H. Prescott Marine Mammal Rescue Assistance Grant Program (a.k.a. the Prescott Grant Program)
- Information Management and Dissemination.

The United States has a well-organized network in coastal states to respond to marine mammal strandings. Overseen by the NMFS, the National Marine Mammal Stranding Network is comprised of smaller organizations manned by professionals and volunteers from nonprofit organizations, aquaria, universities, and state and local governments trained in stranding response. Currently, more than 400 organizations are authorized by NMFS to respond to marine mammal strandings (NMFS, 2007). The following is a list of NMFS Regions and Associated States and Territories:

- NMFS Northeast Region- ME, NH, MA, RI, CT, NY, NJ, PA, DE, MD, VA
- NMFS Southeast Region- NC, SC, GA, FL, AL, MS, LA, TX, PR, VI
- NMFS Southwest Region- CA
- NMFS Northwest Region- OR, WA
- NMFS Alaska Region- AK
- NMFS Pacific Islands Region- HI, Guam, American Samoa, Commonwealth of the Northern Mariana Islands (CNMI)

Stranding reporting and response efforts over time have been inconsistent, although effort and data quality within the United States have been improving within the last 20 years (NMFS, 2007). Given the historical inconsistency in response and reporting, however, interpretation of long-term trends in marine mammal stranding is difficult (NMFS, 2007). During the past decade (1995 to 2004) (Figure E-1), approximately 40,000 stranded marine mammals have been reported by the regional stranding networks, averaging 3,600 strandings reported per year (NMFS, 2007). The highest number of strandings was reported between the years 1998 and 2003 (NMFS, 2007). Detailed regional stranding information including most commonly stranded species can be found in Zimmerman (1991), Geraci and Lounsbury (2005), and NMFS (2007).

E.3 POTENTIAL CAUSES OF MARINE MAMMAL STRANDING

Reports of marine mammal strandings can be traced back to ancient Greece (Walsh et al., 2001). Like any wildlife population, there are normal background mortality rates that influence marine mammal population dynamics, including starvation, predation, aging, reproductive success, and disease (Geraci et al., 1999; Carretta et al., 2007). Strandings in and of themselves may be reflective of this natural cycle or, more recently, may be the result of anthropogenic sources (i.e., human impacts). Current science suggests that multiple factors, both natural and man-made, may be acting alone or in combination to cause a marine mammal to strand (Geraci et al., 1999; Culik, 2002; Perrin and Geraci, 2002; Hoelzel, 2003; Geraci and Lounsbury, 2005; NRC, 2006). While post-stranding data collection and necropsies of dead animals are attempted in an effort to find a possible cause for the stranding, it is often difficult to pinpoint exactly one factor that can be blamed for any given stranding. An animal suffering from one ailment becomes susceptible to various other influences because of its weakened condition, making it difficult to determine a primary cause. In many stranding cases, scientists never learn the exact reason for the stranding.

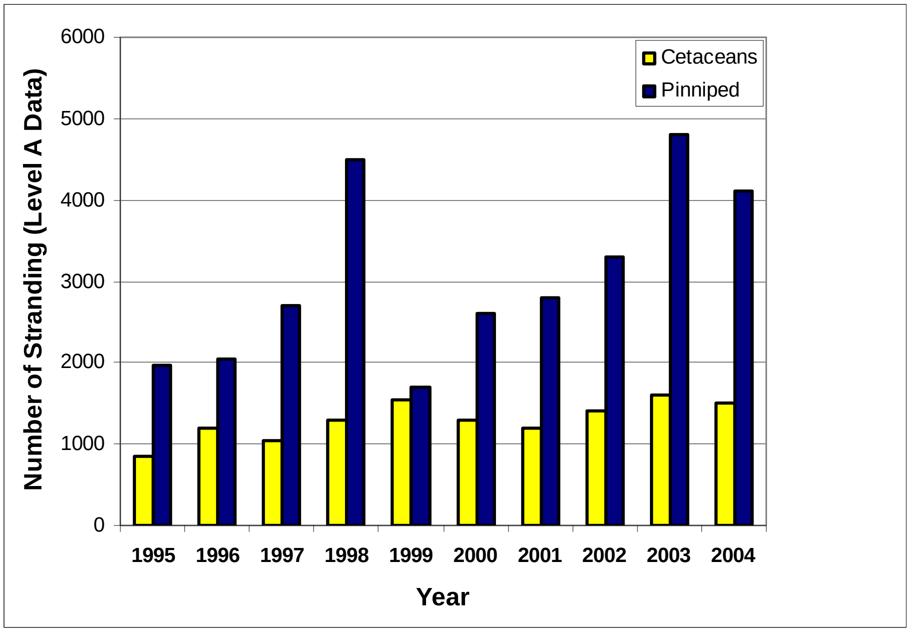

Figure E-1. United States annual cetacean and pinniped stranding events from 1995-2004.
(Source: NMFS 2007)

Specific potential stranding causes can include both natural and human influenced (anthropogenic) causes listed below and described in the following sections:

- Natural Stranding Causes
  - Disease
  - Natural toxins
  - Weather and climatic influences
  - Navigation errors
  - Social cohesion
  - Predation
- Human Influenced (Anthropogenic) Stranding Causes
  - Fisheries interaction
  - Vessel strike
  - Pollution and ingestion
  - Noise

E.4 CAUSES OF NATURAL STRANDING

E.4.1 Overview

Significant natural causes of mortality, die-offs, and stranding discussed below include disease and parasitism; marine neurotoxins from algae; navigation errors that lead to inadvertent stranding; and climatic influences that impact the distribution and abundance of potential food resources (i.e., starvation). Other natural mortality not discussed in detail includes predation by other species such as sharks (Cockcroft et al., 1989; Heithaus, 2001), killer whales (Constantine et al., 1998; Guinet et al., 2000; Pitman et al., 2001), and some species of pinniped (Hiruki et al., 1999; Robinson et al., 1999).

E.4.2 Disease

Like other mammals, marine mammals frequently suffer from a variety of diseases of viral, bacterial, and fungal origin (Visser et al., 1991; Dunn et al., 2001; Harwood, 2002). Gulland and Hall (2005; 2007) provide a more detailed summary of individual and population effects of marine mammal diseases.

Microparasites such as bacteria, viruses, and other microorganisms are commonly found in marine mammal habitats and usually pose little threat to a healthy animal (Geraci et al., 1999). For example, long-finned pilot whales that inhabit the waters off of the northeastern coast of the United States are carriers of the morbillivirus, yet have grown resistant to its usually lethal effects (Geraci et al., 1999). Since the 1980s, however, virus infections have been strongly associated with marine mammal die-offs (Domingo et al., 1992; Geraci and Lounsbury, 2005). Morbillivirus is the most significant marine mammal virus and suppresses a host's immune system, increasing risk of secondary infection (Harwood, 2002). A bottlenose dolphin UME in 1993 and 1994 was caused by morbillivirus. Die-offs ranged from northwestern Florida to Texas, with an increased number of deaths as it spread (NMFS, 2007). A 2004 UME in Florida was also associated with dolphin morbillivirus (NMFS, 2004). Influenza A was responsible for the first reported mass mortality in the U.S., occurring along the coast of New England in 1979-1980 (Geraci et al., 1999; Harwood, 2002). Canine distemper virus has been responsible for large scale pinniped mortalities and die-offs (Grachev et al., 1989; Kennedy et al., 2000; Gulland and Hall, 2005), while a bacteria, *Leptospira pomona*, is responsible for periodic die-offs in California sea lions about every four years (Gulland et al., 1996; Gulland and Hall, 2005). It is difficult to determine whether microparasites commonly act as a primary pathogen, or whether they show up as a secondary infection in an already weakened animal (Geraci et al., 1999). Most marine mammal die-offs from infectious disease in the last 25 years, however, have had viruses associated with them (Simmonds and Mayer, 1997; Geraci et al., 1999; Harwood, 2002).

Macroparasites are usually large parasitic organisms and include lungworms, trematodes (parasitic flatworms), and protozoans (Geraci and St.Aubin, 1987; Geraci et al., 1999). Marine mammals can carry many different types, and have shown a robust tolerance for sizeable infestation unless compromised by illness, injury, or starvation (Morimitsu et al., 1987; Dailey et al., 1991; Geraci et al., 1999). Nasitrema, a usually benign trematode found in the head sinuses of cetaceans (Geraci et al., 1999), can cause brain damage if it migrates (Ridgway and Dailey, 1972). As a result, this worm is one of the few directly linked to stranding in the cetaceans (Dailey and Walker, 1978; Geraci et al., 1999).

Non-infectious disease, such as congenital bone pathology of the vertebral column (osteomyelitis, spondylosis deformans, and ankylosing spondylitis), has been described in several species of cetacean (Paterson, 1984; Alexander et al., 1989; Kompanje, 1995; Sweeny et al., 2005). In humans, bone pathology such as ankylosing spondylitis, can impair mobility and increase vulnerability to further spinal trauma (Resnick and Niwayama, 2002). Bone pathology has been found in cases of single strandings (Paterson, 1984; Kompanje, 1995), and also in cetaceans prone to mass stranding (Sweeny et al., 2005), possibly acting as a contributing or causal influence in both types of events.

E.4.3 Naturally Occurring Marine Neurotoxins

Some single cell marine algae common in coastal waters, such as dinoflagellates and diatoms, produce toxic compounds that can accumulate (termed bioaccumulation) in the flesh and organs of fish and invertebrates (Geraci et al., 1999; Harwood, 2002). Marine mammals become exposed to these compounds when they eat prey contaminated by these naturally produced toxins (Van Dolah, 2005). Figure 2 shows U.S. animal mortalities from 1997-2006 resulting from toxins produced during harmful algal blooms.

In the Gulf of Mexico and mid- to southern Atlantic states, "red tides," a form of harmful algal bloom, are created by a dinoflagellate (*Karenia brevis*). *K. brevis* is found throughout the Gulf of Mexico and sometimes along the Atlantic coast (Van Dolah, 2005; NMFS, 2007). It produces a neurotoxin known as brevetoxin. Brevetoxin has been associated with several marine mammal UMEs within this area (Geraci, 1989; Van Dolah et al., 2003; NMFS, 2004; Flewelling et al., 2005; Van Dolah, 2005; NMFS, 2007). On the U.S. West Coast and in the northeast Atlantic, several species of diatoms produce a toxin called domoic acid which has also been linked to marine mammal strandings (Geraci et al., 1999; Van Dolah et al., 2003; Greig et al., 2005; Van Dolah, 2005; Brodie et al., 2006; NMFS, 2007). Other algal toxins associated with marine mammal strandings include saxitoxins and ciguatoxins and are summarized by Van Dolah (2005).

Figure E-2. Animal Mortalities from harmful algal blooms within the United States from 1997-2006.

(Source: Woods Hole Oceanographic Institute (WHO) http://www.whoi.edu/redtide/HABdistribution/HABmap.html)

Table E-1. Marine mammal unusual mortality events attributed to or suspected from natural causes 1978-2005.

Year	Species and number	Location	Cause
1978	Hawaiian monk seals (50)	NW Hawaiian Islands	Ciguatoxin and maitotoxin
1979-80	Harbor seals (400)	Massachusetts	Influenza A
1982	Harbor seals	Massachusetts	Influenza A
1983	Multiple pinniped species	West coast of U.S., Galapagos	El Nino
1984	California sea lions (226)	California	Leptospirosis
1987	Sea otters (34)	Alaska	Saxitoxin
1987	Humpback whales (14)	Massachusetts	Saxitoxin
1987-88	Bottlenose dolphins (645)	Eastern seaboard (New Jersey to Florida)	Morbillivirus; Brevetoxin
1987-88	Baikal seals (80-100,000)	Lake Baikal, Russia	Canine distemper virus
1988	Harbor seals (approx 18,000)	Northern Europe	Phocine distemper virus
1990	Stripped dolphins (550)	Mediterranean Sea	Dolphin morbillivirus
1990	Bottlenose dolphins (146)	Gulf Coast, U.S.	Unknown; unusual skin lesions observed
1994	Bottlenose dolphins (72)	Texas	Morbillivirus
1995	California sea lions (222)	California	Leptospirosis
1996	Florida manatees (149)	West Coast Florida	Brevetoxin
1996	Bottlenose dolphins (30)	Mississippi	Unknown; Coincident with algal bloom
1997	Mediterranean monk seals (150)	Western Sahara, Africa	Harmful algal bloom; Morbillivirus
1997-98	California sea lions (100s)	California	El Nino
1998	California sea lions (70)	California	Domoic acid
1998	Hooker's sea lions (60% of pups)	New Zealand	Unknown, bacteria likely
1999	Harbor porpoises	Maine to North Carolina	Oceanographic factors suggested
2000	Caspian seals (10,000)	Caspian Sea	Canine distemper virus
1999-2000	Bottlenose dolphins (115)	Panhandle of Florida	Brevetoxin
1999-2001	Gray whales (651)	Canada, U.S. West Coast, Mexico	Unknown; starvation involved
2000	California sea lions (178)	California	Leptospirosis
2000	California sea lions (184)	California	Domoic acid
2000	Harbor seals (26)	California	Unknown; Viral pneumonia suspected
2001	Bottlenose dolphins (35)	Florida	Unknown
2001	Harp seals (453)	Maine to Massachusetts	Unknown
2001	Hawaiian monk seals (11)	NW Hawaiian Islands	Malnutrition
2002	Harbor seals (approx. 25,000)	Northern Europe	Phocine distemper virus
2002	Multispecies (common dolphins, California sea lions, sea otters) (approx. 500)	California	Domoic acid
2002	Hooker's sea lions	New Zealand	Pneumonia
2002	Florida manatee	West Coast of Florida	Brevetoxin
2003	Multispecies (common dolphins, California sea lions, sea otters) (approx. 500)	California	Domoic acid
2003	Beluga whales (20)	Alaska	Ecological factors

Table E-1. Marine mammal unusual mortality events attributed to or suspected from natural causes 1978-2005 Cont'd.

Year	Species and number	Location	Cause
2003	Sea otters	California	Ecological factors
2003	Large whales (16 humpback, 1 fine, 1 minke, 1 pilot, 2 unknown)	Maine	Unknown; Saxitoxin and domoic acid detected in 2 of 3 humpbacks
2003-2004	Harbor seals, minke whales	Gulf of Maine	Unknown
2003	Florida manatees (96)	West Coast of Florida	Brevetoxin
2004	Bottlenose dolphins (107)	Florida Panhandle	Brevetoxin
2004	Small cetaceans (67)	Virginia	Unknown
2004	Small cetaceans	North Carolina	Unknown
2004	California sea lions (405)	Canada, U.S. West Coast	Leptospirosis
2005	Florida manatees, bottlenose dolphins (ongoing Dec 2005)	West Coast of Florida	Brevetoxin
2005	Harbor porpoises	North Carolina	Unknown
2005	California sea lions; Northern fur seals	California	Domoic acid
2005	Large whales	Eastern North Atlantic	Domoic acid suspected
2005-2006	Bottlenose dolphins	Florida	Brevetoxin suspected

Note: Data from Gulland and Hall (2007); citations for each event contained in Gulland and Hall (2007)

E.4.4 Weather events and climate influences

Severe storms, hurricanes, typhoons, and prolonged temperature extremes may lead to localized marine mammal strandings (Geraci et al., 1999; Walsh et al., 2001). Hurricanes may have been responsible for mass strandings of pygmy killer whales in the British Virgin Islands and Gervais' beaked whales in North Carolina (Mignucci-Giannoni et al., 2000; Norman and Mead, 2001). Storms in 1982-1983 along the California coast led to deaths of 2,000 northern elephant seal pups (Le Boeuf and Reiter, 1991). Ice movement along southern Newfoundland has forced groups of blue whales and white-beaked dolphins ashore (Sergeant, 1982). Seasonal oceanographic conditions in terms of weather, frontal systems, and local currents may also play a role in stranding (Walker et al., 2005).

The effect of large scale climatic changes to the world's oceans and how these changes impact marine mammals and influence strandings is difficult to quantify given the broad spatial and temporal scales involved, and the cryptic movement patterns of marine mammals (Moore, 2005; Learmonth et al., 2006). The most immediate, although indirect, effect is decreased prey availability during unusual conditions. This, in turn, results in increased search effort required by marine mammals (Crocker et al., 2006), potential starvation if not successful, and corresponding stranding due directly to starvation or succumbing to disease or predation while in a more weakened, stressed state (Selzer and Payne, 1988; Geraci et al., 1999; Moore, 2005; Learmonth et al., 2006; Weise et al., 2006).

Two recent papers examined potential influences of climate fluctuation on stranding events in southern Australia, including Tasmania, an area with a history of more than 20 mass stranding since the 1920s (Evans et al., 2005; Bradshaw et al., 2006). These authors note that patterns in animal migration, survival, fecundity, population size, and strandings will revolve around the availability and distribution of food resources. In southern Australia, movement of nutrient-rich waters pushed closer to shore by periodic meridinal winds (occurring about every 12 to 14 years) may be responsible for bringing marine mammals closer to land, thus increasing the probability of stranding (Bradshaw et al., 2006). The papers conclude, however, that while an overarching model can be helpful for providing insight into the prediction of strandings, the particular reasons for each one are likely to be quite varied.

E.4.5 Navigational Error

Geomagnetism- It has been hypothesized that, like some land animals, marine mammals may be able to orient to the Earth's magnetic field as a navigational cue, and that areas of local magnetic anomalies may influence strandings (Bauer et al., 1985; Klinowska, 1985; Kirschvink et al., 1986; Klinowska, 1986; Walker et al., 1992; Wartzok and Ketten, 1999). In a plot of live stranding positions in Great Britain with magnetic field maps, Klinowska (1985, 1986) observed an association between live stranding positions and magnetic field levels. In all cases, live strandings occurred at locations where magnetic minima, or lows in the magnetic fields, intersect the coastline. Kirschvink et al. (1986) plotted stranding locations on a map of magnetic data for the East Coast, and were able to develop associations between stranding sites and locations where magnetic minima intersected the coast. The authors concluded that there were highly significant tendencies for cetaceans to beach themselves near these magnetic minima and coastal intersections. The results supported the hypothesis that cetaceans may have a magnetic sensory system similar to other migratory animals, and that marine magnetic topography and patterns may influence long-distance movements (Kirschvink et al., 1986). Walker et al. (1992) examined fin whale swim patterns off the northeastern U.S. continental shelf, and reported that migrating animals aligned with lows in the geometric gradient or intensity. While a similar pattern between magnetic features and marine mammal strandings at New Zealand stranding sites was not seen (Brabyn and Frew, 1994), mass strandings in Hawaii typically were found to occur within a narrow range of magnetic anomalies (Mazzuca et al., 1999).

Echolocation Disruption in Shallow Water- Some researchers believe stranding may result from reductions in the effectiveness of echolocation within shallow water, especially with the pelagic species of odontocetes who may be less familiar with coastline (Dudok van Heel, 1966; Chambers and James, 2005). For an odontocete, echoes from echolocation signals contain important information on the location and identity of underwater objects and the shoreline. The authors postulate that the gradual slope of a beach may present difficulties to the navigational systems of some cetaceans, since it is common for live strandings to occur along beaches with shallow, sandy gradients (Brabyn and McLean, 1992; Mazzuca et al., 1999; Maldini et al., 2005; Walker et al., 2005). A contributing factor to echolocation interference in turbulent, shallow water is the presence of microbubbles from the interaction of wind, breaking waves, and currents. Additionally, ocean water near the shoreline can have an increased turbidity (e.g., floating sand or silt, particulate plant matter, etc.) due to the run-off of fresh water into the ocean, either from rainfall or from freshwater outflows (e.g., rivers and creeks). Collectively, these factors can reduce and scatter the sound energy within echolocation signals and reduce the perceptibility of returning echoes of interest.

E.4.6 Social cohesion

Many pelagic species such as sperm whale, pilot whales, melon-head whales, and false killer whales, and some dolphins occur in large groups with strong social bonds between individuals. When one or more animals strand due to any number of causative events, then the entire pod may follow suit out of social cohesion (Geraci et al., 1999; Conner, 2000; Perrin and Geraci, 2002; NMFS, 2007).

E.5 ANTHROPOGENIC CAUSES OF STRANDING

E.5.1 Overview

With the exception of historic whaling in the 19th and early part of the 20th century, during the past few decades there has been an increase in marine mammal mortalities associated with a variety of human activities (Geraci et al., 1999; NMFS, 2007). These include fisheries interactions (bycatch and directed catch), pollution (marine debris, toxic compounds), habitat modification (degradation, prey reduction), vessel strikes (Laist et al., 2001), and gunshots. Figure 3 shows potential worldwide risk to small-toothed cetaceans by source.

E.5.2 Fisheries Interaction: By-Catch, Directed Catch, And Entanglement

The incidental catch of marine mammals in commercial fisheries is a significant threat to the survival and recovery of many populations of marine mammals (Geraci et al., 1999; Baird, 2002; Culik, 2002; Carretta et al., 2004; Geraci and Lounsbury, 2005; NMFS, 2007). Interactions with fisheries and entanglement in discarded or lost gear continue to be a major factor in marine mammal deaths worldwide (Geraci et al., 1999; Nieri et al., 1999; Geraci and Lounsbury, 2005; Read et al., 2006; Zeeber et al., 2006). For instance, baleen whales and pinnipeds have been found entangled in nets, ropes, monofilament line, and other fishing gear that has been discarded out at sea (Geraci et al., 1999; Campagna et al., 2007).

Bycatch- Bycatch is the catching of non-target species within a given fishing operation and can include non-commercially used invertebrates, fish, sea turtles, birds, and marine mammals (NRC, 2006). Read et al. (2006) attempted to estimate the magnitude of marine mammal bycatch in U.S. and global fisheries. Data on marine mammal bycatch within the United States was obtained from fisheries observer programs, reports of entangled stranded animals, and fishery logbooks, and was then extrapolated to estimate global bycatch by using the ratio of U.S. fishing vessels to the total number of vessels within the world’s fleet (Read et al., 2006). Within U.S. fisheries, between 1990 and 1999 the mean annual bycatch of marine mammals was 6,215 animals, with a standard error of +/- 448 (Read et al., 2006). Eight-four percent of cetacean bycatch occurred in gill-net fisheries, with dolphins and porpoises constituting most of the cetacean bycatch (Read et al., 2006). Over the decade, there was a 40 percent decline in marine mammal bycatch, which was significantly lower from 1995-1999 than it was from 1990-1994 (Read et al., 2006). Read et al. (2006) suggests that this is primarily due to effective conservation measures that were implemented during this time period.

Read et al. (2006) then extrapolated this data for the same time period and calculated an annual estimate of 653,365 of marine mammals globally, with most of the world’s bycatch occurring in gill-net fisheries. With global marine mammal bycatch likely to be in the hundreds of thousands every year, bycatch in fisheries will be the single greatest threat to many marine mammal populations around the world (Read et al., 2006).

Entanglement- Entanglement in active fishing gear is a major cause of death or severe injury among the endangered whales in the action area. Entangled marine mammals may die as a result of drowning, escape with pieces of gear still attached to their bodies, or manage to be set free either of their own accord or by fishermen. Many large whales carry off gear after becoming entangled (Read et al., 2006). Many times when a marine mammal swims off with gear attached, the end result can be fatal. The gear may be become too cumbersome for the animal or it can be wrapped around a crucial body part and tighten over time. Stranded marine mammals frequently exhibit signs of previous fishery interaction, such as scarring or gear attached to their bodies, and the cause of death for many stranded marine mammals is often attributed to such interactions (Baird and Gorgone, 2005). Because marine mammals that die or are injured in fisheries may not wash ashore and not all animals that do wash ashore exhibit clear signs of interactions, stranding data probably underestimate fishery-related mortality and serious injury (NMFS, 2005a).

From 1993 through 2003, 1,105 harbor porpoises were reported stranded from Maine to North Carolina, many of which had cuts and body damage suggestive of net entanglement (NMFS, 2005d). In 1999, it was possible to determine that the cause of death for 38 of the stranded porpoises was from fishery interactions, with one additional animal having been mutilated (right flipper and fluke cut off) (NMFS, 2005d). In 2000, one stranded porpoise was found with monofilament line wrapped around its body (NMFS, 2005d). And in 2003, nine stranded harbor porpoises were attributed to fishery interactions, with an additional three mutilated animals (NMFS, 2005d). An estimated 78 baleen whales were killed annually in the offshore southern California/Oregon drift gillnet fishery during the 1980s (Heyning and Lewis 1990).

E.5.3 Ship Strike

Vessel strikes to marine mammals are another cause of mortality and stranding (Laist et al. 2001; Geraci and Lounsbury, 2005; de Stephanis and Urquiola, 2006). An animal at the surface could be struck directly by a vessel, a surfacing animal could hit the bottom of a vessel, or an animal just below the surface could be cut by a vessel’s propeller. The severity of injuries typically depends on the size and speed of the vessel (Knowlton and Kraus, 2001; Laist et al., 2001; Vanderlaan and Taggart 2007).

An examination of all known ship strikes from all shipping sources (civilian and military) indicates vessel speed is a principal factor in whether a vessel strike results in death (Knowlton and Kraus 2001; Laist et al. 2001, Jensen and Silber 2003; Vanderlaan and Taggart 2007). Jensen and Silber (2003) detailed 292 records of known or probable ship strikes of all large whale species from 1975 to 2002. Of these, vessel speed at the time of collision was reported for 58 cases. Of these cases, 39 (or 67%) resulted in serious injury or death (19 or 33% resulted in serious injury as determined by blood in the water, propeller gashes or severed tailstock, and fractured skull, jaw, vertebrae, hemorrhaging, massive bruising or other injuries noted during necropsy and 20 or 35% resulted in death). Operating speeds of vessels that struck various species of large whales ranged from 2 to 51 knots. The majority (79%) of these strikes occurred at speeds of 13 knots or greater. The average speed that resulted in serious injury or death was 18.6 knots. Pace and Silber (2005) found that the probability of death or serious injury increased rapidly with increasing vessel speed. Specifically, the predicted probability of serious injury or death increased from 45 to 75% as vessel speed increased from 10 to 14 knots, and exceeded 90% at 17 knots. Higher speeds during collisions result in greater force of impact, but higher speeds also appear to increase the chance of severe injuries or death by pulling whales toward the vessel. Computer simulation modeling showed that hydrodynamic forces pulling whales toward the vessel hull increase with increasing speed (Clyne 1999, Knowlton et al. 1995).

The growth in civilian commercial ports and associated commercial vessel traffic is a result in the globalization of trade. The Final Report of the NOAA International Symposium on “Shipping Noise and Marine Mammals: A Forum for Science, Management, and Technology” stated that the worldwide commercial fleet has grown from approximately 30,000 vessels in 1950 to over 85,000 vessels in 1998 (NRC, 2003; Southall, 2005). Between 1950 and 1998, the U.S. flagged fleet declined from approximately 25,000 to less than 15,000 and currently represents only a small portion of the world fleet. From 1985 to 1999, world seaborne trade doubled to 5 billion tons and currently includes 90 percent of the total world trade, with container shipping movements representing the largest volume of seaborne trade. It is unknown how international shipping volumes and densities will continue to grow. However, current statistics support the prediction that the international shipping fleet will continue to grow at the current rate or at greater rates in the future. Shipping densities in specific areas and trends in routing and vessel design are as, or more, significant than the total number of vessels. Densities along existing coastal routes are expected to increase both domestically and internationally. New routes are also expected to develop as new ports are opened and existing ports are expanded. Vessel propulsion systems are also advancing toward faster ships operating in higher sea states for lower operating costs; and container ships are expected to become larger along certain routes (Southall, 2005).

While there are reports and statistics of whales struck by vessels in U.S. waters, the magnitude of the risks of commercial ship traffic poses to marine mammal populations is difficult to quantify or estimate. In addition, there is limited information on vessel strike interactions between ships and marine mammals outside of U.S. waters (de Stephanis and Urquiola, 2006). Laist et al. (2001) concluded that ship collisions may have a negligible effect on most marine mammal populations in general, except for regional based small populations where the significance of low numbers of collisions would be greater given smaller populations or populations segments.

The U.S. Department of Navy (DON) vessel traffic is a small fraction of the overall U.S. commercial and fishing vessel traffic. While DON vessel movements may contribute to the ship strike threat, given the lookout and mitigation measures adopted by the DON, probability of vessel strikes is greatly reduced. Furthermore, actions to avoid close interaction of DON ships and marine mammals and sea turtles, such as maneuvering to keep away from any observed marine mammal and sea turtle are part of existing at-sea protocols and standard operating procedures. Navy ships have up to three or more dedicated and trained lookouts as well as two to three bridge watchstanders during at-sea movements who would be searching for any whales, sea turtles, or other obstacles on the water surface. Such lookouts are expected to further reduce the chances of a collision.

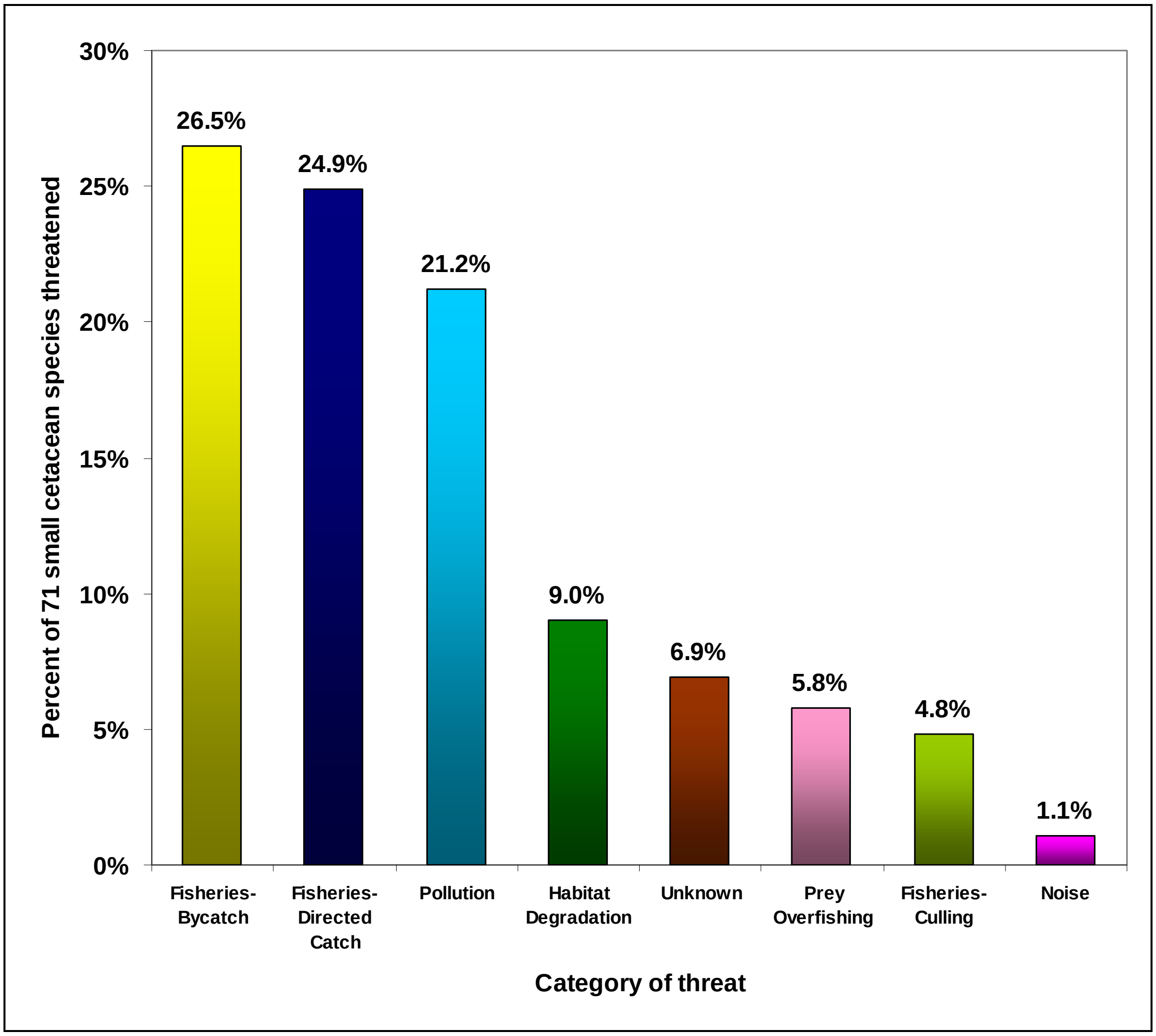

Figure E-3. Human threats to world wide small cetacean populations.
(Source: Culik 2002)

E.5.4 Ingestion of Plastic Objects and Other Marine Debris And Toxic Pollution Exposure

For many marine mammals, debris in the marine environment is a great hazard and can be harmful to wildlife. Not only is debris a hazard because of possible entanglement, animals may mistake plastics and other debris for food (NMFS, 2007b). There are certain species of cetaceans, along with Florida manatees, that are more likely to eat trash, especially plastics, which is usually fatal for the animal (Geraci et al., 1999).

Between 1990 through October 1998, 215 pygmy sperm whales stranded along the U.S. Atlantic coast from New York through the Florida Keys (NMFS, 2005a). Remains of plastic bags and other debris were found in the stomachs of 13 of these animals (NMFS, 2005a). During the same time period, 46 dwarf sperm whale strandings occurred along the U.S. Atlantic coastline between Massachusetts and the Florida Keys (NMFS, 2005c). In 1987, a pair of latex examination gloves was retrieved from the stomach of a stranded dwarf sperm whale (NMFS, 2005c). One hundred twenty-five pygmy sperm whales were reported stranded from 1999 – 2003 between Maine and

Puerto Rico; in one pygmy sperm whale found stranded in 2002, red plastic debris was found in the stomach along with squid beaks (NMFS, 2005a).

Sperm whales have been known to ingest plastic debris, such as plastic bags (Evans and Hindell, 2004; Whitehead 2003). While this has led to mortality, the scale to which this is affecting sperm whale populations is unknown, but Whitehead (2003) suspects it is not substantial at this time.

High concentrations of potentially toxic substances within marine mammals along with an increase in new diseases have been documented in recent years. Scientists have begun to consider the possibility of a link between pollutants and marine mammal mortality events. NMFS takes part in a marine mammal bio-monitoring program not only to help assess the health and contaminant loads of marine mammals, but also to assist in determining anthropogenic impacts on marine mammals, marine food chains and marine ecosystem health. Using strandings and bycatch animals, the program provides tissue/serum archiving, samples for analyses, disease monitoring and reporting, and additional response during disease investigations (NMFS, 2007).

The impacts of these activities are difficult to measure. However, some researchers have correlated contaminant exposure to possible adverse health effects in marine mammals. Contaminants such as organochlorines do not tend to accumulate in significant amounts in invertebrates, but do accumulate in fish and fish-eating animals. Thus, contaminant levels in planktivorous mysticetes have been reported to be one to two orders of magnitude lower compared to piscivorous odontocetes (Borell 1993; O'Shea and Brownell 1994; O'Hara and Rice 1996; O'Hara et al. 1999).

The manmade chemical PCB (polychlorinated biphenyl), and the pesticide DDT (dichlorodiphyenyltrichloroethane), are both considered persistent organic pollutants that are currently banned in the United States for their harmful effects in wildlife and humans (NMFS, 2007a). Despite having been banned for decades, the levels of these compounds are still high in marine mammal tissue samples taken along U.S. coasts (NMFS, 2007a). Both compounds are long-lasting, reside in marine mammal fat tissues (especially in the blubber), and can be toxic, causing effects such as reproductive impairment and immunosuppression (NMFS, 2007a).

Both long-finned and short-finned pilot whales have a tendency to mass strand throughout their range. Short-finned pilot whales have been reported as stranded as far north as Rhode Island, and long-finned pilot whales as far south as South Carolina (NMFS, 2005b). For U.S. East Coast stranding records, both species are lumped together and there is rarely a distinction between the two because of uncertainty in species identification (NMFS, 2005b). Since 1980, within the Northeast region alone, between 2 and 120 pilot whales have stranded annually either individually or in groups (NMFS, 2005b). Between 1999 and 2003 from Maine to Florida, 126 pilot whales were reported to be stranded, including a mass stranding of 11 animals in 2000 and another mass stranding of 57 animals in 2002, both along the Massachusetts coast (NMFS, 2005b).

It is unclear how much of a role human activities play in these pilot whale strandings, and toxic poisoning may be a potential human-caused source of mortality for pilot whales (NMFS, 2005b). Moderate levels of PCBs and chlorinated pesticides (such as DDT, DDE, and dieldrin) have been found in pilot whale blubber (NMFS, 2005b). Bioaccumulation levels have been found to be more similar in whales from the same stranding event than from animals of the same age or sex

(NMFS, 2005b). Numerous studies have measured high levels of toxic metals (mercury, lead, and cadmium), selenium, and PCBs in pilot whales in the Faroe Islands (NMFS, 2005b). Population effects resulting from such high contamination levels are currently unknown (NMFS, 2005b).

Habitat contamination and degradation may also play a role in marine mammal mortality and strandings. Some events caused by man have direct and obvious effects on marine mammals, such as oil spills (Geraci et al., 1999). But in most cases, effects of contamination will more than likely be indirect in nature, such as effects on prey species availability, or by increasing disease susceptibility (Geraci et al., 1999).

DON vessel operation between ports and exercise locations has the potential for release of small amounts of pollutant discharges into the water column. DON vessels are not a typical source, however, of either pathogens or other contaminants with bioaccumulation potential such as pesticides and PCBs. Furthermore, any vessel discharges such as bilge water and deck runoff associated with the vessels would be in accordance with international and U.S. requirements for eliminating or minimizing discharges of oil, garbage, and other substances, and not likely to contribute significant changes to ocean water quality.

E.5.5 Anthropogenic Sound

As one of the potential stressors to marine mammal populations, noise and acoustic influences may disrupt marine mammal communication, navigational ability, and social patterns, and may or may not influence stranding. Many marine mammals use sound to communicate, navigate, locate prey, and sense their environment. Both anthropogenic and natural sounds may cause interference with these functions, although comprehension of the type and magnitude of any behavioral or physiological responses resulting from man-made sound, and how these responses may contribute to strandings, is rudimentary at best (NMFS, 2007). Marine mammals may respond both behaviorally and physiologically to anthropogenic sound exposure (e.g., Richardson et al., 1995; Finneran et al., 2000; Finneran et al., 2003; Finneran et al., 2005, NRC, 2005); however, the range and magnitude of the behavioral response of marine mammals to various sound sources is highly variable (Richardson et al., 1995; NRC 2005) and appears to depend on the species involved, the experience of the animal with the sound source, the motivation of the animal (e.g., feeding, mating), and the context of the exposure.

The marine mammals are regularly exposed to several sources of natural and anthropogenic sounds. Anthropogenic noise that could affect ambient noise arise from the following general types of activities in and near the sea, any combination of which, can contribute to the total noise at any one place and time. These noises include: transportation; dredging; construction; oil, gas, and mineral exploration in offshore areas; geophysical (seismic) surveys; sonar; explosions; and ocean research activities (Richardson et al., 1995). Commercial fishing vessels, cruise ships, transport boats, recreational boats, and aircraft, all contribute sound into the ocean (NRC, 2003; NRC, 2006). Several investigators have argued that anthropogenic sources of noise have increased ambient noise levels in the ocean over the last 50 years (NRC 1994, 1996, 2000, 2003, 2005; Richardson et al., 1995; Jasny et al., 2005; McDonald et al., 2006). Much of this increase is due to increased shipping due to ships becoming more numerous and of larger tonnage (NRC, 2003; McDonald et al., 2006). Andrew et al. (2002) compared ocean ambient sound from the 1960s with the 1990s for a receiver off the California coast. The data showed an increase in ambient noise of approximately 10 dB in the frequency range of 20 to 80 Hz and 200 and 300 Hz, and about 3 dB at 100 Hz over a 33-year period.

Urick (1983) provided a discussion of the ambient noise spectrum expected in the deep ocean. Shipping, seismic activity, and weather, are the primary causes of deep-water ambient noise. The ambient noise frequency spectrum can be predicted fairly accurately for most deep-water areas based primarily on known shipping traffic density and wind state (wind speed, Beaufort wind force, or sea state) (Urick, 1983). For example, for frequencies between 100 and 500 Hz, Urick (1983) estimated the average deep water ambient noise spectra to be 73 to 80 dB for areas of heavy shipping traffic and high sea states, and 46 to 58 dB for light shipping and calm seas. In contrast to deep water, ambient noise levels in shallow waters (i.e., coastal areas, bays, harbors, etc.) are subject to wide variations in level and frequency depending on time and location. The primary sources of noise include distant shipping and industrial activities, wind and waves, marine animals (Urick, 1983). At any give time and place, the ambient noise is a mixture of all of these noise variables. In addition, sound propagation is also affected by the variable shallow water conditions, including the depth, bottom slope, and type of bottom. Where the bottom is reflective, the sounds levels tend to be higher, then when the bottom is absorptive.

Most observations of behavioral responses of marine mammals to the sounds produced have been limited to short-term behavioral responses, which included the cessation of feeding, resting, or social interactions. Carretta et al. (2001) and Jasny et al. (2005) identified increasing levels of anthropogenic noise as a habitat concern for whales and other marine mammals because of its potential effect in their ability to communicate. Acoustic devices have also been used in fisheries nets to prevent marine mammal entanglement (Goodson 1997; NMFS 1997; MMC 1999) and to deter seals from salmon cages (Johnson and Woodley 1998); little is known about their effects on non-target species

Noise from Aircraft and Vessel Movement- Surface shipping is the most widespread source of anthropogenic, low frequency (0 to 1,000 Hz) noise in the oceans and may contribute to over 75% of all human sound in the sea (Simmonds and Hutchinson 1996, ICES, 2005b). The Navy estimated that the 60,000 vessels of the world’s merchant fleet annually emit low frequency sound into the world’s oceans for the equivalent of 21.9 million days, assuming that 80 percent of the merchant ships are at sea at any one time (U.S. Department of Navy 2001). Ross (1976) has estimated that between 1950 and 1975, shipping had caused a rise in ambient noise levels of 10 dB. He predicted that this would increase by another 5 dB by the beginning of the 21st century. The National Resource Council (1997) estimated that the background ocean noise level at 100 Hz has been increasing by about 1.5 dB per decade since the advent of propeller-driven ships. Michel et al. (2001) suggested an association between long-term exposure to low frequency sounds from shipping and an increased incidence of marine mammal mortalities caused by collisions with ships.

Airborne sound from a low-flying helicopter or airplane may be heard by marine mammals and turtles while at the surface or underwater. Due to the transient nature of sounds from aircraft involved in at-sea operations, such sounds would not likely cause physical effects but have the potential to affect behaviors. Responses by mammals and turtles could include hasty dives or turns, or decreased foraging (Soto et al., 2006). Whales may also slap the water with flukes or flippers, swim away from the aircraft track.

Sound emitted from large vessels, particularly in the course of transit, is the principal source of noise in the ocean today, primarily due to the properties of sound emitted by civilian cargo vessels (Richardson et al., 1995; Arveson and Vendittis, 2000). Ship propulsion and electricity generation engines, engine gearing, compressors, bilge and ballast pumps, as well as hydrodynamic flow surrounding a ship's hull and any hull protrusions contribute to a large vessels' noise emission into the marine environment. Prop-driven vessels also generate noise through cavitation, which accounts much of the noise emitted by a large vessel depending on its travel speed. Military vessels underway or involved in naval operations or exercises, also introduce anthropogenic noise into the marine environment. Noise emitted by large vessels can be characterized as low-frequency, continuous, and tonal. The sound pressure levels at the vessel will vary according to speed, burden, capacity and length (Richardson et al., 1995; Arveson and Vendittis, 2000). Vessels ranging from 135 to 337 meters generate peak source sound levels from 169- 200 dB between 8 Hz and 430 Hz, although Arveson and Vendittis (2000) documented components of higher frequencies (10-30 kHz) as a function of newer merchant ship engines and faster transit speeds.

Whales have variable responses to vessel presence or approaches, ranging from apparent tolerance to diving away from a vessel. Unfortunately, it is not always possible to determine whether the whales are responding to the vessel itself or the noise generated by the engine and cavitation around the propeller. Apart from some disruption of behavior, an animal may be unable to hear other sounds in the environment due to masking by the noise from the vessel. Any masking of environmental sounds or conspecific sounds is expected to be temporary, as noise dissipates with a vessel transit through an area.

Vessel noise primarily raises concerns for masking of environmental and conspecific cues. However, exposure to vessel noise of sufficient intensity and/or duration can also result in temporary or permanent loss of sensitivity at a given frequency range, referred to as temporary or permanent threshold shifts (TTS or PTS). Threshold shifts are assumed to be possible in marine mammal species as a result of prolonged exposure to large vessel traffic noise due to its intensity, broad geographic range of effectiveness, and constancy.

Collectively, significant cumulative exposure to individuals, groups, or populations can occur if they exhibit site fidelity to a particular area; for example, whales that seasonally travel to a regular area to forage or breed may be more vulnerable to noise from large vessels compared to transiting whales. Any permanent threshold shift in a marine animal's hearing capability, especially at particular frequencies for which it can normally hear best, can impair its ability to perceive threats, including ships. Whales have variable responses to vessel presence or approaches, ranging from apparent tolerance to diving away from a vessel. It is not possible to determine whether the whales are responding to the vessel itself or the noise generated by the engine and cavitation around the propeller. Apart from some disruption of behavior, an animal may be unable to hear other sounds in the environment due to masking by the noise from the vessel.

Most observations of behavioral responses of marine mammals to human-generated sounds have been limited to short-term behavioral responses, which included the cessation of feeding, resting, or social interactions. Nowacek et al. (2007) provide a detailed summary of cetacean response to underwater noise.

Given the sound propagation of low frequency sounds, a large vessel in this sound range can be heard 139-463 kilometers away (Ross 1976 in Polefka 2004). DON vessels, however, have incorporated significant underwater ship quieting technology to reduce their acoustic signature (as compared to a similarly-sized vessel) in order to reduce their vulnerability to detection by enemy passive acoustics (Southall, 2005). Therefore, the potential for TTS or PTS from DON vessel and aircraft movement is extremely low given that the exercises and training events are transitory in time, with vessels moving over large area of the ocean. A marine mammal or sea turtle is unlikely to be exposed long enough at high levels for TTS or PTS to occur. Any masking of environmental sounds or conspecific sounds is expected to be temporary, as noise dissipates with a DON vessel transiting through an area. If behavioral disruptions result from the presence of aircraft or vessels, it is expected to be temporary. Animals are expected to resume their migration, feeding, or other behaviors without any threat to their survival or reproduction. However, if an animal is aware of a vessel and dives or swims away, it may successfully avoid being struck.

Navy Sonar- Naval sonars are designed for three primary functions: submarine hunting, mine hunting, and shipping surveillance. There are two classes of sonars employed by the DON: active sonars and passive sonars. Most active military sonars operate in a limited number of areas, and are most likely not a significant contributor to a comprehensive global ocean noise budget (ICES 2005b).

The effects of mid-frequency active naval sonar on marine wildlife have not been studied as extensively as the effects of air-guns used in seismic surveys (Madsen et al., 2006; Stone and Tasker, 2006; Wilson et al., 2006; Palka and Johnson, 2007; Parente et al., 2007). Maybaum (1989, 1993) observed changes in behavior of humpbacks during playback tapes of the M-1002 system (using 203 dB re 1 µPa-m for study); specifically, a decrease in respiration, submergence, and aerial behavior rates; and an increase in speed of travel and track linearity. Direct comparisons of Maybaum's results, however, with U.S Navy mid-frequency active sonar are difficult to make. Maybaum's signal source, the commercial M-1002, is not similar to how naval mid-frequency sonar operates. In addition, behavioral responses were observed during playbacks of a control tape, (i.e. a tape with no sound signal) so interpretation of Maybaum's results are inconclusive.

Research by Nowacek, et al. (2004) on North Atlantic right whales using a whale alerting signal designed to alert whales to human presence suggests that received sound levels of only 133 to 148 pressure level (decibel [dB] re 1 microPascals per meter [µPa-m]) for the duration of the sound exposure may disrupt feeding behavior. The authors did note, however, that within minutes of cessation of the source, a return to normal behavior would be expected. Direct comparison of the Nowacek et al. (2004) sound source to MFA sonar, however, is not possible given the radically different nature of the two sources. Nowacek et al.'s source was a series of non-sonar like sounds designed to purposely alert the whale, lasting several minutes, and covering a broad frequency band. Direct differences between Nowacek et al. (2004) and MFA sonar is summarized below from Nowacek et al. (2004) and Nowacek et al. (2007):

(1) Signal duration: Time difference between the two signals is significant, 18-minute signal used by Nowacek et al. verses < 1-sec for MFA sonar.

(2) Frequency modulation: Nowacek et al. contained three distinct signals containing frequency modulated sounds:

1st - alternating 1-sec pure tone at 500 and 850 Hz

2nd - 2-sec logarithmic down-sweep from 4500 to 500 Hz

3rd - pair of low-high (1500 and 2000 Hz) sine wave tones amplitude modulated at 120 Hz

(3) Signal to noise ratio: Nowacek et al.'s signal maximized signal to noise ratio so that it would be distinct from ambient noise and resist masking.

(4) Signal acoustic characteristics: Nowacek et al.'s signal comprised of disharmonic signals spanning northern right whales' estimated hearing range.

Given these differences, therefore, the exact cause of apparent right whale behavior noted by the authors can not be attributed to any one component since the source was such a mix of signal types.

E.6 STRANDING ANALYSIS

Over the past two decades, several mass stranding events involving beaked whales have been documented. While beaked whale strandings have occurred since the 1800s (Geraci and Lounsbury, 1993; Cox et al., 2006; Podesta et al., 2006), several mass strandings since have been associated with naval operations that may have included mid-frequency sonar (Simmonds and Lopez-Jurado, 1991; Frantzis, 1998; Jepson et al., 2003; Cox et al., 2006). As Cox et al. (2006) concludes, the state of science can not yet determine if a sound source such as mid-frequency sonar alone causes beaked whale strandings, or if other factors (acoustic, biological, or environmental) must co-occur in conjunction with a sound source.

A review of historical data (mostly anecdotal) maintained by the Marine Mammal Program in the National Museum of Natural History, Smithsonian Institution reports 49 beaked whale mass stranding events between 1838 and 1999. The largest beaked whale mass stranding occurred in the 1870s in New Zealand when 28 Gray's beaked whales (*Mesoplodon grayi*) stranded. Blainsville's beaked whale (*Mesoplodon densirostris*) strandings are rare, and records show that they were involved in one mass stranding in 1989 in the Canary Islands. Cuvier's beaked whales (*Ziphius cavirostris*) are the most frequently reported beaked whale to strand, with at least 19 stranding events from 1804 through 2000 (DoC and DoN, 2001; Smithsonian Institution, 2000). By the nature of the data, much of the historic information on strandings over the years is anecdotal, which has been condensed in various reports, and some of the data have been altered or possibly misquoted.

The discussion below centers on those worldwide stranding events that may have some association with naval operations, and global strandings that the DON feels are either inconclusive or can not be associated with naval operations.

E.7 NAVAL ASSOCIATION

In the following sections, specific stranding events that have been putatively linked to potential sonar operations are discussed. Of note, these events represent a small overall number of animals over an 11 year period (40 animals) and not all worldwide beaked whale strandings can be linked to naval activity (ICES, 2005a; 2005b; Podesta et al., 2006). Four of the five events occurred during NATO exercises or events where DON presence was limited (Greece, Portugal, Spain). One of the five events involved only DON ships (Bahamas).

Beaked whale stranding events associated with potential naval operations.

1996	May	Greece (NATO/US)
2000	March	Bahamas (US)
2000	May	Portugal, Madeira Islands (NATO/US)
2002	September	Spain, Canary Islands (NATO/US)
2006	January	Spain, Mediterranean Sea coast (NATO/US)

Stranding Events Case Studies

1996 Greece Beaked Whale Mass Stranding (May 12 – 13, 1996)

Description: Twelve Cuvier's beaked whales (*Ziphius cavirostris*) stranded along a 38.2-kilometer strand of the coast of the Kyparissiakos Gulf on May 12 and 13, 1996 (Frantzis, 1998). From May 11 through May 15, the NATO research vessel Alliance was conducting sonar tests with signals of 600 Hz and 3 kHz and root-mean-squared (rms) sound pressure levels (SPL) of 228 and 226 dB re: 1μPa, respectively (D'Amico and Verboom, 1998; D'Spain et al., 2006). The timing and the location of the testing encompassed the time and location of the whale strandings (Frantzis, 1998).

Findings: Partial necropsies of eight of the animals were performed, including external assessments and the sampling of stomach contents. No abnormalities attributable to acoustic exposure were observed, but the stomach contents indicated that the whales were feeding on cephalods soon before the stranding event. No unusual environmental events before or during the stranding event could be identified (Frantzis, 1998).

Conclusions: The timing and spatial characteristics of this stranding event were atypical of stranding in Cuvier's beaked whale, particularly in this region of the world. No natural phenomenon that might contribute to the stranding event coincided in time with the mass stranding. Because of the rarity of mass strandings in the Greek Ionian Sea, the probability that the sonar tests and stranding coincided in time and location, while being independent of each other, was estimated as being extremely low (Frantzis, 1998). However, because information for the necropsies was incomplete and inconclusive, the cause of the stranding cannot be precisely determined.

2000 Bahamas Marine Mammal Mass Stranding (March 15-16, 2000)

Description: Seventeen marine mammals comprised of Cuvier's beaked whales, Blainville's beaked whales (*Mesoplodon densirostris*), minke whale (*Balaenoptera acutorostrata*), and one spotted dolphin (*Stenella frontalis*), stranded along the Northeast and Northwest Providence Channels of the Bahamas Islands on March 15-16, 2000 (Evans and England, 2001). The strandings occurred over a 36-hour period and coincided with DON use of mid-frequency active sonar within the channel. Navy ships were involved in tactical sonar exercises for approximately 16 hours on March 15. The ships, which operated the AN/SQS-53C and AN/SQS-56, moved through the channel while emitting sonar pings approximately every 24 seconds. The timing of pings was staggered between ships and average source levels of pings varied from a nominal 235 dB SPL (AN/SQS-53C) to 223 dB SPL (AN/SQS-56). The center frequency of pings was 3.3 kHz and 6.8 to 8.2 kHz, respectively.

Seven of the animals that stranded died, while ten animals were returned to the water alive. The animals known to have died included five Cuvier's beaked whales, one Blainville's beaked whale, and the single spotted dolphin. Six necropsies were performed and three of the six necropsied whales (one Cuvier's beaked whale, one Blainville's beaked whale, and the spotted dolphin) were fresh enough to permit identification of pathologies by computerized tomography (CT). Tissues from the remaining three animals were in a state of advanced decomposition at the time of inspection.

Findings: All five necropsied beaked whales were in good body condition and did not show any signs of external trauma or disease. In the two best preserved whale specimens, hemorrhage was associated with the brain and hearing structures. Specifically, subarachnoid hemorrhage within the temporal region of the brain and intraochlear hemorrhages were noted. Similar findings of bloody effusions around the ears of two other moderately decomposed whales were consistent with the same observations in the freshest animals. In addition, three of the whales had small hemorrhages in their acoustic fats, which are fat bodies used in sound production and reception (i.e., fats of the lower jaw and the melon). The best-preserved whale demonstrated acute hemorrhage within the kidney, inflammation of the lung and lymph nodes, and congestion and mild hemorrhage in multiple other organs. The post-mortem analyses of stranded beaked whales lead to the conclusion that the immediate cause of death resulted from overheating, cardiovascular collapse and stresses associated with being stranded on land. However, the presence of subarachnoid and intracochlear hemorrhages were believed to have occurred prior to stranding and were hypothesized as being related to an acoustic event.

Other findings were consistent with stresses and injuries associated with the stranding process. These consisted of external scrapes, pulmonary edema and congestion. The spotted dolphin demonstrated poor body condition and evidence of a systemic debilitating disease. In addition, since the dolphin stranding site was isolated from the acoustic activities of Navy ships, it was determined that the dolphin stranding was unrelated to the presence of Navy active sonar.

Conclusions: The Bahamas review was a comprehensive investigation in that all possible causes of the stranding event were considered whether they seemed likely at the outset or not. Sixteen possible causes of the beaked whale strandings were unequivocally ruled out by this or previous reports. The only possible contributory cause to the strandings and cause of the lesions seen in these animals, and the only one that cannot be ruled out is acoustic signals. Based on the environmental acoustic records and activities reported by the U.S. Navy, the only source of intense acoustic signals in the Bahamas on March 15, 2000 was tactical mid-range frequency sonars. The temporal and spatial pattern in which the sonars were operated is in agreement with the temporal and spatial pattern in which individual whales stranded.

The standard approach used in risk management is to consider the full range of biological and environmental variables that modify the expression of a given trigger agent. The mechanism by which sonar could have caused the observed traumas or caused the animals to strand was undetermined. Focusing on the interplay among factors gives more options for risk-reduction than focusing on the trigger agent in isolation from the environment. The comprehensive approach referred to is the best way to identify the variables to be considered in managing future risk from tactical mid-range sonar. The variables identified are sound propagation characteristics (in this case a surface duct), unusual underwater bathymetry, intensive use of multiple sonar units, a constricted channel with limited egress avenues, and the presence of beaked whales that appear to be sensitive to the frequencies produced by these sonars. Some of these variables may be more important than others, and it should be cautioned, however, that the degree of contribution that any one or combination of particular variables has not been scientifically determined.

The NMFS-U.S. Navy investigation concluded that the cause of this beaked whale stranding event was the confluence of the Navy tactical mid-range frequency sonar and the contributory factors described above acting together.

No similar conclusion as to the potential cause of stranding could be reached for the spotted dolphin and minke whale. The spotted dolphin was in overall poor condition for examination, but showed indications of long-term disease. Although, no analysis of the minke whale was conducted, baleen whale stranding events have not been associated with either low-frequency or mid-frequency sonar use (ICES, 2005a, 2005b).

2000 Madeira Island, Portugal Beaked Whale Strandings (May 10 – 14, 2000)

<u>Description</u>: Three Cuvier's beaked whales stranded on two islands in the Madeira Archipelago, Portugal, from May 10 – 14, 2000 (Cox et al., 2006). A joint NATO amphibious training exercise, named "Linked Seas 2000," which involved participants from 17 countries, took place in Portugal during May 2 – 15, 2000. The timing and location of the exercises overlapped with that of the stranding incident.

<u>Findings</u>: Two of the three whales were necropsied. Two heads were taken to be examined. One head was intact and examined grossly and by CT; the other was only grossly examined because it was partially flensed and had been seared from an attempt to dispose of the whale by fire (Ketten, 2005).

No blunt trauma was observed in any of the whales. Consistent with prior CT scans of beaked whales stranded in the Bahamas 2000 incident, one whale demonstrated subarachnoid and peribullar hemorrhage and blood within one of the brain ventricles. Post-cranially, the freshest whale demonstrated renal congestion and hemorrhage, which was also consistent with findings in the freshest specimens in the Bahamas incident.

<u>Conclusions</u>: The pattern of injury to the brain and auditory system were similar to those observed in the Bahamas strandings, as were the kidney lesions and hemorrhage and congestion in the lungs (Ketten, 2005). The similarities in pathology and stranding patterns between these two events suggested a similar causative mechanism. Although the details about whether or how sonar was used during "Linked Seas 2000" is unknown, the presence of naval activity within the region at the time of the strandings suggested a possible relationship to Navy activity.

2002 Canary Islands Beaked Whale Mass Stranding (24 September 2002)

Description: On September 24, 2002, 14 beaked whales stranded on Fuerteventura and Lanzaote Islands in the Canary Islands (Jepson et al., 2003). Seven of the 14 whales died on the beach and the 7 were returned to the ocean. Four beaked whales were found stranded dead over the next three days either on the coast or floating offshore (Fernández et al., 2005). At the time of the strandings, an international naval exercise called Neo-Tapon, involving numerous surface warships and several submarines was being conducted off the coast of the Canary Islands. Tactical mid-frequency active sonar was utilized during the exercises, and strandings began within hours of the onset of the use of mid-frequency sonar (Fernández et al., 2005).

Findings: Eight Cuvier's beaked whales, one Blainville's beaked whale, and on Gervais' beaked whale were necropsied; six of them within 12 hours of stranding (Fernández et al., 2005). The stomachs of the whales contained fresh and undigested prey contents. No pathogenic bacteria were isolated from the whales, although parasites were found in the kidneys of all of the animals. The head and neck lymph nodes were congested and hemorrhages were noted in multiple tissues and organs, including the kidney, brain, ears, and jaws. Widespread fat emboli were found throughout the carcasses, but no evidence of blunt trauma was observed in the whales. In addition, the parenchyma of several organs contained macroscopic intravascular bubbles and lesions, putatively associated with nitrogen off-gassing.

Conclusions: The association of NATO mid-frequency sonar use close in space and time to the beaked whale strandings, and the similarity between this stranding event and previous beaked whale mass strandings coincident with sonar use, suggests that a similar scenario and causative mechanism of stranding may be shared between the events. Beaked whales stranded in this event demonstrated brain and auditory system injuries, hemorrhages, and congestion in multiple organs, similar to the pathological findings of the Bahamas and Madeira stranding events. In addition, the necropsy results of Canary Islands stranding event lead to the hypothesis that the presence of disseminated and widespread gas bubbles and fat emboli were indicative of nitrogen bubble formation, similar to what might be expected in decompression sickness (Jepson et al., 2003; Fernández et al., 2005). Whereas gas emboli would develop from the nitrogen gas, fat emboli would enter the blood stream from ruptured fat cells (presumably where nitrogen bubble formation occurs) or through the coalescence of lipid bodies within the blood stream.

The possibility that the gas and fat emboli found by Fernández et al. (2005) was due to nitrogen bubble formation has been hypothesized to be related to either direct activation of the bubble by sonar signals or to a behavioral response in which the beaked whales flee to the surface following sonar exposure. The first hypothesis is related to rectified diffusion (Crum and Mao, 1996), the process of increasing the size of a bubble by exposing it to a sound field. This process is facilitated if the environment in which the ensonified bubbles exist is supersaturated with gas. Repetitive diving by marine mammals can cause the blood and some tissues to accumulate gas to a greater degree than is supported by the surrounding environmental pressure (Ridgway and Howard, 1979). Deeper and longer dives of some marine mammals, such as those conducted by beaked whales, are theoretically predicted to induce greater levels of supersaturation (Houser et al., 2001). If rectified diffusion were possible in marine mammals exposed to high-level sound, conditions of tissue supersaturation could theoretically speed the rate and increase the size of bubble growth. Subsequent effects due to tissue trauma and emboli would presumably mirror those observed in humans suffering from decompression sickness. It is unlikely that the short duration of sonar pings would be long enough to drive bubble growth to any substantial size, if such a phenomenon occurs. However, an alternative but related hypothesis has also been suggested: stable bubbles could be destabilized by high-level sound exposures such that bubble growth then occurs through static diffusion of gas out of the tissues. In such a scenario the marine mammal would need to be in a gas-supersaturated state for a long enough period of time for bubbles to become of a problematic size. The second hypothesis speculates that rapid ascent to the surface following exposure to a startling sound might produce tissue gas saturation sufficient for the evolution of nitrogen bubbles (Jepson et al., 2003; Fernández et al., 2005). In this scenario, the rate of ascent would need to be sufficiently rapid to compromise behavioral or physiological protections against nitrogen bubble formation.

Although theoretical predictions suggest the possibility for acoustically mediated bubble growth, there is considerable disagreement among scientists as to its likelihood (Piantadosi and Thalmann, 2004). Sound exposure levels predicted to cause in vivo bubble formation within diving cetaceans have not been evaluated and are suspected as needing to be very high (Evans, 2002; Crum et al., 2005). Moore and Early (2004) reported that in analysis of sperm whale bones spanning 111 years, gas embolism symptoms were observed indicating that sperm whales may be susceptible to decompression sickness due to natural diving behavior. Further, although it has been argued that traumas from recent beaked whale strandings are consistent with gas emboli and bubble-induced tissue separations (Jepson et al., 2003), there is no conclusive evidence supporting this hypothesis and there is concern that at least some of the pathological findings (e.g., bubble emboli) are artifacts of the necropsy. Currently, stranding networks in the United States have agreed to adopt a set of necropsy guidelines to determine, in part, the possibility and frequency with which bubble emboli can be introduced into marine mammals during necropsy procedures (Arruda et al., 2007).

2006 Spain, Gulf of Vera Beaked Whale Mass Stranding (26-27 January 2006)

Description: The Spanish Cetacean Society reported an atypical mass stranding of four beaked whales that occurred January 26 to 28, 2006, on the southeast coast of Spain near Mojacar (Gulf of Vera) in the Western Mediterranean Sea. According to the report, two of the whales were discovered the evening of January 26 and were found to be still alive. Two other whales were discovered during the day on January 27, but had already died. A following report stated that the first three animals were located near the town of Mojacar and were examined by a team from the University of Las Palmas de Gran Canarias, with the help of the stranding network of Ecologistas en Acción Almería-PROMAR and others from the Spanish Cetacean Society. The fourth animal was found dead on the afternoon of May 27, a few kilometers north of the first three animals.

From January 25-26, 2006, a NATO surface ship group (seven ships including one U.S. ship under NATO operational command) conducted active sonar training against a Spanish submarine within 50 nm of the stranding site.

Findings: Veterinary pathologists necropsied the two male and two female beaked whales (*Z. cavirostris*).

Conclusions: According to the pathologists, a likely cause of this type of beaked whale mass stranding event may have been anthropogenic acoustic activities. However, no detailed pathological results confirming this supposition have been published to date, and no positive acoustic link was established as a direct cause of the stranding.

Even though no causal link can be made between the stranding event and naval exercises, certain conditions may have existed in the exercise area that, in their aggregate, may have contributed to the marine mammal strandings (Freitas, 2004):

- Operations were conducted in areas of at least 1,000 meters in depth near a shoreline where there is a rapid change in bathymetry on the order of 1,000 – 6,000 meters occurring a cross a relatively short horizontal distance (Freitas, 2004).
- Multiple ships, in this instance, five MFA sonar equipped vessels, were operating in the same area over extended periods of time (20 hours) in close proximity.
- Exercises took place in an area surrounded by landmasses, or in an embayment. Operations involving multiple ships employing mid-frequency active sonar near land may produce sound directed towards a channel or embayment that may cut off the lines of egress for marine mammals (Freitas, 2004).

E.8 OTHER GLOBAL STRANDING DISCUSSIONS

In the following sections, stranding events that have been linked to DON activity in popular press are presented. As detailed in the individual case study conclusions, the DON believes that there is enough to evidence available to refute allegations of impacts from mid-frequency sonar, or at least indicate that a substantial degree of uncertainty in time and space that preclude a meaningful scientific conclusion.

Stranding Events Case Studies

2003 Washington State Harbor Porpoise Strandings (May 2 – June 2, 2003)

<u>Description:</u> At 1040 hours on May 5, 2003, the USS Shoup began the use of mid-frequency tactical active sonar as part of a naval exercise. At 1420, the USS Shoup entered the Haro Strait and terminated active sonar use at 1438, thus limiting active sonar use within the strait to less than 20 minutes. Between May 2 and June 2, 2003, approximately 16 strandings involving 15 harbor porpoises (*Phocoena phocoena*) and one Dall's porpoise (*Phocoenoides dalli*) were reported to the Northwest Marine Mammal Stranding Network. A comprehensive review of all strandings and the events involving USS Shoup on May 5, 2003, were presented in U.S. Department of Navy (2004). Given that the USS Shoup was known to have operated sonar in the strait on May 5, and that supposed behavioral reactions of killer whales (*Orcinus orca*) had been putatively linked to these sonar operations (NMFS Office of Protected Resources, 2005), the NMFS undertook an analysis of whether sonar caused the strandings of the harbor porpoises.

Whole carcasses of ten of harbor porpoises and the head of an additional porpoise were collected for analysis. Necropsies were performed on ten of the harbor porpoises and six whole carcasses and two heads were selected for CT imaging. Gross examination, histopathology, age determination, blubber analysis, and various other analyses were conducted on each of the carcasses (Norman et al., 2004).

Findings: Post-mortem findings and analysis details are found in Norman et al. (2004). All of the carcasses suffered from some degree of freeze-thaw artifact that hampered gross and histological evaluations. At the time of necropsy, three of the porpoises were moderately fresh, whereas the remainder of the carcasses was considered to have moderate to advanced decomposition. None of the 11 harbor porpoises demonstrated signs of acoustic trauma. In contrast, a putative cause of death was determined for 5 of the porpoises; 2 animals had blunt trauma injuries and 3 animals had indication of disease processes (fibrous peritonitis, salmonellosis, and necrotizing pneumonia). A cause of death could not be determined in the remaining animals, which is consistent with expected percentage of marine mammal necropsies conducted within the northwest region. It is important to note, however, that these determinations were based only on evidence from the necropsy so as not to be biased with regard to determinations of the potential presence or absence of acoustic trauma. The result was that other potential causal factors, such as one animal (Specimen 33NWR05005) found tangled in a fishing net, was unknown to the investigators in their determination regarding the likely cause of death.

Conclusions: The NMFS concluded from a retrospective analysis of stranding events that the number of harbor porpoise stranding events in the approximate month surrounding the USS Shoup use of sonar was higher than expected based on annual strandings of harbor porpoises (Norman et al., 2004). In this regard, it is important to note that the number of strandings in the May-June timeframe in 2003 was also higher for the outer coast, indicating a much wider phenemona than use of sonar by USS Shoup in Puget Sound for one day in May. The conclusion by NMFS that the number of strandings in 2003 was higher is also different from that of The Whale Museum, which has documented and responded to harbor porpoise strandings since 1980 (Osborne, 2003). According to The Whale Museum, the number of strandings as of May 15, 2003, was consistent with what was expected based on historical stranding records and was less than that occurring in certain years. For example, since 1992 the San Juan Stranding Network has documented an average of 5.8 porpoise strandings per year. In 1997, there were 12 strandings in the San Juan Islands with more than 30 strandings throughout the general Puget Sound area. Disregarding the discrepancy in the historical rate of porpoise strandings and its relation to the USS Shoup, NMFS acknowledged that the intense level of media attention focused on the strandings likely resulted in an increased reporting effort by the public over that which is normally observed (Norman et al., 2004). NMFS also noted in its report that the "sample size is too small and biased to infer a specific relationship with respect to sonar usage and subsequent strandings."

Seven of the porpoises collected and analyzed died prior to Shoup departing to sea on May 5, 2003. Of these seven, one, discovered on May 5, 2003, was in a state of moderate decomposition, indicating it died before May 5; the cause of death was determined to be due, most likely, to salmonella septicemia. Another porpoise, discovered at Port Angeles on May 6, 2003, was in a state of moderate decomposition, indicating that this porpoise also died prior to May 5. One stranded harbor porpoise discovered fresh on May 6 is the only animal that could potentially be linked in time to the USS Shoup's May 5 active sonar use. Necropsy results for this porpoise found no evidence of acoustic trauma. The remaining eight strandings were discovered one to three weeks after the USS Shoup's May 5 transit of the Haro Strait, making it difficult to causally link the sonar activities of the USS Shoup to the timing of the strandings. Two of the eight porpoises died from blunt trauma injury and a third suffered from parasitic infestation, which possibly contributed to its death (Norman et al., 2004). For the remaining five porpoises, NMFS was unable to identify the causes of death.

The speculative association of the harbor porpoise strandings to the use of sonar by the USS Shoup is inconsistent with prior stranding events linked to the use of mid-frequency sonar. Specifically, in prior events, the stranding of whales occurred over a short period of time (less than 36 hours), stranded individuals were spatially co-located, traumas in stranded animals were consistent between events, and active sonar was known or suspected to be in use. Although mid-frequency active sonar was used by the USS Shoup, the distribution of harbor porpoise strandings by location and with respect to time surrounding the event do not support the suggestion that mid-frequency active sonar was a cause of harbor porpoise strandings. Rather, a complete lack of evidence of any acoustic trauma within the harbor porpoises, and the identification of probable causes of stranding or death in several animals, further supports the conclusion that harbor porpoise strandings were unrelated to the sonar activities of the USS Shoup.

Additional allegations regarding USS Shoup use of sonar having caused behavioral effects to Dall's porpoise, orca, and a minke whale also arose in association with this event (see U.S. Department of Navy 2004 for a complete discussion).

Dall's porpoise: Information regarding the observation of Dall's porpoise on May 5, 2003, came from the operator of a whale watch boat at an unspecified location. This operator reported Dall's porpoise were seen "going north" when the Shoup was estimated by him to be 10 miles away. Potential reasons for the Dall's movement include the pursuit of prey, the presence of harassing resident orca or predatory transient orca, vessel disturbance from one of many whale watch vessels, or multiple other unknowable reasons, including the use of sonar by USS Shoup. In short, there was nothing unusual in the observed behavior of the Dall's porpoise on May 5, 2003, and no way to assess if the otherwise normal behavior was in reaction to the use of sonar by USS Shoup, any other potential causal factor, or a combination of factors.

Orca: Observer opinions regarding orca J-Pod behaviors on May 5, 2003, were inconsistent, ranging from the orca being "at ease with the sound" or "resting" to their being "annoyed." One witness reported observing "low rates of surface active behavior" on behalf of the orca J-Pod, which is in conflict with that of another observer who reported variable surface activity, tail slapping and spyhopping. Witnesses also expressed the opinion that the behaviors displayed by the orca on May 5, 2003, were "extremely unusual," although those same behaviors are observed and reported regularly on the Orca Network Website, and are behaviors listed in general references as being part of the normal repertoire of orca behaviors. Given the contradictory nature of the reports on the observed behavior of the J-Pod orca, it is impossible to determine if any unusual behaviors were present. In short, there is no way to assess if any unusual behaviors were present or if present they were in reaction to vessel disturbance from one of many nearby whale watch vessels, use of sonar by USS Shoup, any other potential causal factor, or a combination of factors.

Minke whale: A minke whale was reported porpoising in Haro Strait on May 5, 2003, which is a rarely observed behavior. The cause of this behavior is indeterminate given multiple potential causal factors, including but not limited to, the presence of predatory transient orca, possible interaction with whale watch boats, other vessels, or Shoup's use of sonar. The behavior of the minke whale was the only unusual behavior clearly present on May 5, 2003; however, given the existing information there is no way to tell if the unusual behavior observed was in reaction to the use of sonar by USS Shoup, any other potential causal factor, or a combination of factors.

2004 Hawai'i Melon-Headed Whale Mass Stranding (July 3-4, 2004)

Description: The majority of the following information is taken from the NMFS report on the stranding event (Southall et al., 2006). On the morning of July 3, 2004, between 150-200 melon-headed whales (*Peponocephala electra*) entered Hanalei Bay, Kauai. Individuals attending a canoe blessing ceremony observed the animals entering the bay at approximately 7:00 a.m. The whales were reported entering the bay in a "wave as if they were chasing fish" (Braun 2005). At 6:45 a.m. on July 3, 2004, approximately 25 nm north of Hanalei Bay, active sonar was tested briefly prior to the start of an anti-submarine warfare exercise.

The whales stopped in the southwest portion of the bay, grouping tightly, and displayed spy-hopping and tail-slapping behavior. As people went into the water among the whales, the pod separated into as many as four groups, with individual animals moving among the clusters. This continued through most of the day, with the animals slowly moving south and then southeast within the bay. By about 3 p.m., police arrived and kept people from interacting with the animals. At 4:45 p.m. on July 3, 2004, the RIMPAC Battle Watch Captain received a call from a National Marine Fisheries representative in Honolulu, Hawaii, reporting the sighting of as many as 200 melon-headed whales in Hanalei Bay. At 4:47 p.m. the Battle Watch Captain directed all ships in the area to cease active sonar transmissions.

At 7:20 p.m. on July 3, 2004, the whales were observed in a tight single pod 75 yards from the southeast side of the bay. The pod was circling in a group and displayed frequent tail slapping and whistle vocalizations and some spy hopping. No predators were observed in the bay and no animals were reported as having fresh injuries. The pod stayed in the bay through the night of July 3, 2004. On the morning of July 4, 2004, the whales were observed to still be in the bay and collected in a tight group. A decision was made at that time to attempt to herd the animals out of the bay. A 700-to-800-foot rope was constructed by weaving together beach morning glory vines. This vine rope was tied between two canoes and with the assistance of 30 to 40 kayaks, was used to herd the animals out of the bay. By approximately 11:30 a.m. on July 4, 2004, the pod was coaxed out of the bay.

A single neonate melon-headed whale was observed in the bay on the afternoon of July 4, after the whale pod had left the bay. The following morning on July 5, 2004, the neonate was found stranded on Lumahai Beach. It was pushed back into the water but was found stranded dead between 9 and 10 a.m. near the Hanalei pier. NMFS collected the carcass and had it shipped to California for necropsy, tissue collection, and diagnostic imaging.

Following the stranding event, NMFS undertook an investigation of possible causative factors of the stranding. This analysis included available information on environmental factors, biological factors, and an analysis of the potential for sonar involvement. The latter analysis included vessels that utilized mid-frequency active sonar on the afternoon and evening of July 2. These vessels were to the southeast of Kauai, on the opposite side of the island from Hanalei Bay.

<u>Findings</u>: NMFS concluded from the acoustic analysis that the melon-headed whales would have had to have been on the southeast side of Kauai on July 2 to have been exposed to sonar from naval vessels on that day (Southall et al., 2006). There was no indication whether the animals were in that region or whether they were elsewhere on July 2. NMFS concluded that the animals would have had to swim from 1.4-4.0 m/s for 6.5 to 17.5 hours after sonar transmissions ceased to reach Hanalei Bay by 7:00 a.m. on July 3. Sound transmissions by ships to the north of Hanalei Bay on July 3 were produced as part of exercises between 6:45 a.m. and 4:47 p.m. Propagation analysis conducted by the 3rd Fleet estimated that the level of sound from these transmissions at the mouth of Hanalei Bay could have ranged from 138-149 dB re: 1 μPa.

NMFS was unable to determine any environmental factors (e.g., harmful algal blooms, weather conditions) that may have contributed to the stranding. However, additional analysis by Navy investigators found that a full moon occurred the evening before the stranding and was coupled with a squid run. In addition, a group of 500-700 melon-headed whales were observed to come close to shore and interact with humans in Sasanhaya Bay, Rota, on the same morning as the whales entered Hanalei Bay (Jefferson et al., 2006). Previous records further indicated that, though the entrance of melon-headed whales into the shallows is rare, it is not unprecedented. A pod of melon-headed whales entered Hilo Bay in the 1870s in a manner similar to that which occurred at Hanalei Bay in 2004.

The necropsy of the melon-headed whale calf suggested that the animal died from a lack of nutrition, possibly following separation from its mother. The calf was estimated to be approximately one week old. Although the calf appeared not to have eaten for some time, it was not possible to determine whether the calf had ever nursed after it was born. The calf showed no signs of blunt trauma or viral disease and had no indications of acoustic injury.

<u>Conclusions</u>: Although it is not impossible, it is unlikely that the sound level from the sonar caused the melon-headed whales to enter Hanalei Bay. This conclusion is based on a number of factors:

1. The speculation that the whales may have been exposed to sonar the day before and then fled to the Hanalei Bay is not supported by reasonable expectation of animal behavior and swim speeds. The flight response of the animals would have had to persist for many hours following the cessation of sonar transmissions. Such responses have not been observed in marine mammals and no documentation of such persistent flight response after the cessation of a frightening stimulus has been observed in other mammals. The swim speeds, though feasible for the species, are highly unlikely to be maintained for the durations proposed, particularly since the pod was a mixed group containing both adults and neonates. Whereas adults may maintain a swim speed of 4.0 m/s for some time, it is improbable that a neonate could achieve the same for a period of many hours.

2. The area between the islands of Oahu and Kauai and the PMRF training range have been used in RIMPAC exercises for more than 20 years, and are used year-round for ASW training using mid frequency active sonar. Melon-headed whales inhabiting the waters around Kauai are likely not naive to the sound of sonar and there has never been another

stranding event associated in time with ASW training at Kauai or in the Hawaiian Islands. Similarly, the waters surrounding Hawaii contain an abundance of marine mammals, many of which would have been exposed to the same sonar operations that were speculated to have affected the melon-headed whales. No other strandings were reported coincident with the RIMPAC exercises. This leaves it uncertain as to why melon-headed whales, and no other species of marine mammal, would respond to the sonar exposure by stranding.

3. At the nominal swim speed for melon-headed whales, the whales had to be within 1.5 to 2 nm of Hanalei Bay before sonar was activated on July 3. The whales were not in their open ocean habitat but had to be close to shore at 6:45 a.m. when the sonar was activated to have been observed inside Hanalei Bay from the beach by 7:00 am (Hanalei Bay is very large area). This observation suggests that other potential factors could be causative of the stranding event (see below).

4. The simultaneous movement of 500-700 melon-headed whales and Risso's dolphins into Sasanhaya Bay, Rota, in the Northern Marianas Islands on the same morning as the 2004 Hanalei stranding (Jefferson et al., 2006) suggests that there may be a common factor which prompted the melon-headed whales to approach the shoreline. A full moon occurred the evening before the stranding and a run of squid was reported concomitant with the lunar activity. Thus, it is possible that the melon-headed whales were capitalizing on a lunar event that provided an opportunity for relatively easy prey capture. A report of a pod entering Hilo Bay in the 1870s indicates that on at least one other occasion, melon-headed whales entered a bay in a manner similar to the occurrence at Hanalei Bay in July 2004. Thus, although melon-headed whales entering shallow embayments may be an infrequent event, and every such event might be considered anomalous, there is precedent for the occurrence.

5. The received noise sound levels at the bay were estimated to range from roughly 95 – 149 dB re: 1 μPa. Received levels as a function of time of day have not been reported, so it is not possible to determine when the presumed highest levels would have occurred and for how long. However, received levels in the upper range would have been audible by human participants in the bay. The statement by one interviewee that he heard "pings" that lasted an hour and that they were loud enough to hurt his ears is unreliable. Received levels necessary to cause pain over the duration stated would have been observed by most individuals in the water with the animals. No other such reports were obtained from people interacting with the animals in the water.

Although NMFS concluded that sonar use was a "plausible, if not likely, contributing factor in what may have been a confluence of events (Southall et al., 2006)," this conclusion was based primarily on the basis that there was an absence of any other compelling explanation. The authors of the NMFS report on the incident were unaware, at the time of publication, of the simultaneous event in Rota. In light of the simultaneous Rota event, the Hanalei stranding does not appear as anomalous as initially presented and the speculation that sonar was a causative factor is weakened. The Hanalei Bay incident does not share the characteristics observed with other mass strandings of whales coincident with sonar activity (e.g., specific traumas, species composition, etc.). In addition, the inability to conclusively link or exclude the impact of other environmental factors makes a causal link between sonar and the melon-headed whale strandings highly speculative at best.

1980- 2004 Beaked Whale Strandings in Japan (Brownell et al. 2004)

Description: Brownell et al. (2004) compare the historical occurrence of beaked whale strandings in Japan (where there are U.S. Naval bases) with strandings in New Zealand (which lacks a U.S. Naval base) and concluded the higher number of strandings in Japan may be related to the presence of the US. Navy vessels using mid-frequency sonar. While the dates for the strandings were well documented, the authors of the study did not attempt to correlate the dates of any navy activities or exercises with the dates of the strandings.

To fully investigate the allegation made by Brownell et al. (2004), the Center for Naval Analysis (CNA) looked at the past U.S. Naval exercise schedules from 1980 to 2004 for the water around Japan in comparison to the dates for the strandings provided by Brownell et al. (2004). None of the strandings occurred during or within weeks after any DON exercises. While the CNA analysis began by investigating the probabilistic nature of any co-occurrences, the results were a 100% probability the strandings and sonar use were not correlated by time. Given there was no instance of co-occurrence in over 20 years of stranding data, it can be reasonably postulated that sonar use in Japanese waters by DON vessels did not lead to any of the strandings documented by Brownell et al. (2004).

2004 Alaska Beaked Whale Strandings (June 7-16, 2004)

Description: In the timeframe between June 7 and 16, 2004, five beaked whales were discovered at various locations along 1,600 miles of the Alaskan coastline, and one was found floating (dead) at sea. Because the DON exercise Alaska Shield/Northern Edge 2004 occurred within the approximate timeframe of these strandings, it has been alleged that sonar may have been the probable cause of these strandings.

The Alaska Shield/Northern Edge 2004 exercise consisted of a vessel tracking event followed by a vessel boarding search and seizure event. There was no ASW component to the exercise, no use of mid-frequency sonar, and no use of explosives in the water. There were no events in the Alaska Shield/Northern Edge exercise that could have caused any of the strandings over this 33 day period covering 1,600 miles of coastline.

2005 North Carolina Marine Mammal Mass Stranding Event (January 15-16, 2005)

Description: On January 15 and 16, 2005, 36 marine mammals consisting of 33 short-finned pilot whales, 1 minke whale, and 2 dwarf sperm whales stranded alive on the beaches of North Carolina (Hohn et al., 2006a). The animals were scattered across a 111-km area from Cape Hatteras northward. Because of the live stranding of multiple species, the event was classified as a UME (Unusual Mortality Event). It is the only stranding on record for the region in which multiple offshore species were observed to strand within a two- to three-day period.

The DON indicated that from January 12-14, some unit level training with mid-frequency active sonar was conducted by vessels that were 93 to 185 km from Oregon Inlet. An expeditionary strike group was also conducting exercises to the southeast, but the closest point of active sonar transmission to the inlet was 650 km away. The unit level operations were not unusual for the area or time of year and the vessels were not involved in antisubmarine warfare exercises. Marine mammal observers on board the vessels did not detect any marine mammals during the period of unit level training. No sonar transmissions were made on January 15-16.

The National Weather Service reported that a severe weather event moved through North Carolina on January 13 and 14 (Figure 4). The event was caused by an intense cold front that moved into an unusually warm and moist air mass that had been persisting across the eastern United States for about a week. The weather caused flooding in the western part of the state, considerable wind damage in central regions of the state, and at least three tornadoes that were reported in the north central part of the state. Severe, sustained (one to four days) winter storms are common for this region.

Over a two-day period (January 16-17), 2 dwarf sperm whales, 27 pilot whales, and the minke whale were necropsied and tissue samples collected. Twenty-five of the stranded cetacean heads were examined; two pilot whale heads and the heads of the dwarf sperm whales were analyzed by CT.

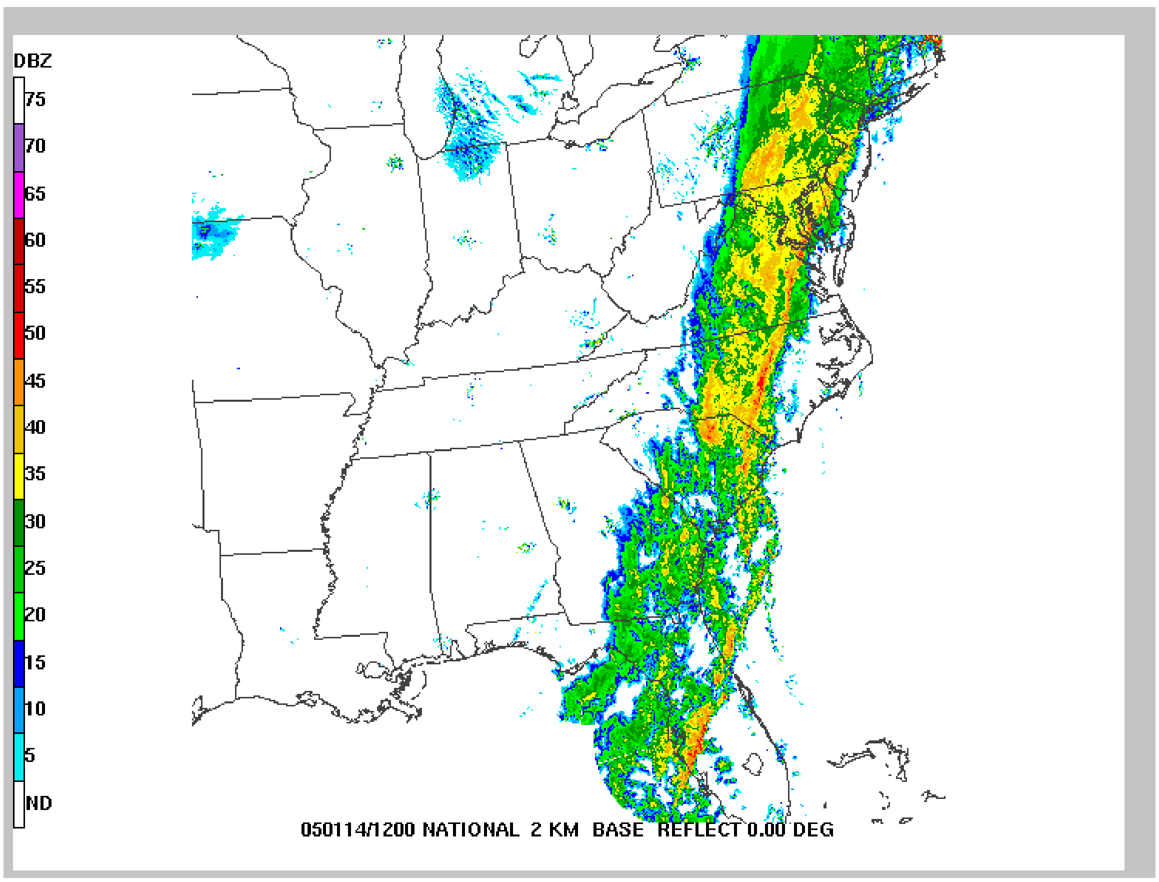

Figure E-4. Regional radar imagery for the East Coast (including North Carolina) on July 14. The time of the image is approximately 7:00 a.m.

Findings: The pilot whales and dwarf sperm whale were not emaciated, but the minke whale, which was believed to be a dependent calf, was emaciated. Many of the animals were on the beach for an extended period of time prior to necropsy and sampling, and many of the biochemical abnormalities noted in the animals were suspected of being related to the stranding and prolonged time on land. Lesions were observed in all of the organs, but there was no consistency across species. Musculoskeletal disease was observed in two pilot whales and cardiovascular disease was observed in one dwarf sperm whale and one pilot whale. Parasites were a common finding in the pilot whales and dwarf sperm whales but were considered consistent with the expected parasite load for wild odontocetes. None of the animals exhibited traumas similar to those observed in prior stranding events associated with mid-frequency sonar activity. Specifically, there was an absence of auditory system trauma and no evidence of distributed and widespread bubble lesions or fat emboli, as was previously observed (Fernández et al., 2005).

Sonar transmissions prior to the strandings were limited in nature and did not share the concentration identified in previous events associated with mid-frequency active sonar use (Evans and England, 2001). The operational/environmental conditions were also dissimilar (e.g., no constrictive channel and a limited number of ships and sonar transmissions). NMFS noted that environmental conditions were favorable for a shift from up-welling to down-welling conditions, which could have contributed to the event. However, other severe storm conditions existed in the days surrounding the strandings and the impact of these weather conditions on at-sea conditions is unknown. No harmful algal blooms were noted along the coastline.

Conclusions: All of the species involved in this stranding event are known to occasionally strand in this region. Although the cause of the stranding could not be determined, several whales had preexisting conditions that could have contributed to the stranding. Cause of death for many of the whales was likely due to the physiological stresses associated with being stranded. A consistent suite of injuries across species, which was consistent with prior strandings where sonar exposure is expected to be a causative mechanism, was not observed.

NMFS was unable to determine any causative role that sonar may have played in the stranding event. The acoustic modeling performed, as in the Hanalei Bay incident, was hampered by uncertainty regarding the location of the animals at the time of sonar transmissions. However, as in the Hanalei Bay incident, the response of the animals following the cessation of transmissions would imply a flight response that persisted for many hours after the sound source was no longer operational. In contrast, the presence of a severe weather event passing through North Carolina during January 13 and 14 is a possible, if not likely, contributing factor to the North Carolina UME of January 15.

E.9 STRANDING SECTION CONCLUSIONS

Marine mammal strandings have been a historic and ongoing occurrence attributed to a variety of causes. Over the last fifty years, increased awareness and reporting has lead to more information about species effected and raised concerns about anthropogenic sources of stranding. While there has been some marine mammal mortalities potentially associated with mid-frequency sonar effects to a small number of species (primarily limited numbers of certain species of beaked whales), the significance and actual causative reason for any impacts is still subject to continued investigation.

By comparison and as described previously, potential impacts to all species of cetaceans worldwide from fishery related mortality can be orders of magnitude more significant (100,000s of animals versus 10s of animals) (Culik, 2002; ICES, 2005b; Read et al., 2006). This does not negate the influence of any mortality or additional stressor to small, regionalized sub-populations which may be at greater risk from human related mortalities (fishing, vessel strike, sound) than populations with larger oceanic level distribution or migrations. ICES (2005a) noted, however, that taken in context of marine mammal populations in general, sonar is not a major threat, or significant portion of the overall ocean noise budget.

In conclusion, a constructive framework and continued research based on sound scientific principles is needed in order to avoid speculation as to stranding causes, and to further our understanding of potential effects or lack of effects from military mid-frequency sonar (Bradshaw et al., 2006; ICES 2005b; Barlow and Gisiner, 2006; Cox et al. 2006).

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APPENDIX F

COASTAL CONSISTENCY DETERMINATIONS

FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR CONNECTICUT

FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR FLORIDA

FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR GEORGIA

FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR TEXAS

FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR VIRGINIA

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FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR CONNECTICUT

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FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR CONNECTICUT

This document provides the State of Connecticut with the Department of the Navy's (DON) Consistency Determination under CZMA 16 U.S.C. § 1456 Section 307 (c) (1) [or (2)] and 15 Code of Federal Regulations (CFR) § 930 (c), for the Atlantic Fleet Active Sonar Training (AFAST) activities proposed for the United States (U.S.) Atlantic East Coast and the Gulf of Mexico. The information in this Consistency Determination is provided pursuant to 15 CFR § 930.39.

The location of AFAST activities that have the potential to affect Connecticut's coastal zone resources are described in detail under the Proposed Federal Agency Action summary of this CZMA Consistency Determination.

The following information is based on the Coastal Management Consistency Review Form for Federal Activities published by the State of Connecticut's Department of Environmental Protection (DEP), Office of Long Island Sound Programs.

The State of Connecticut requires that federal agencies conduct a CZMA Consistency Determination for certain direct federal actions, federal permits and licenses, and federal assistance programs that occur within the state's designated coastal zone and have the potential to affect the state's coastal zone resources.

As defined in Connecticut General Statute § 22a-94(b), the State of Connecticut's coastal zone seaward boundary is 5.6 km (3 nautical miles [NM}) into the Atlantic Ocean. The shoreward boundary is defined within 36 counties as a continuous line delineated by a 1,000-foot linear setback measured from the mean high water mark in coastal waters, or a 1,000-foot linear setback measured from the inland boundary of state regulated tidal wetlands, or the continuous interior contour elevation of the 100-year frequency coastal flood zone, whichever is farthest inland.

The Navy AFAST activities encompass direct federal activities that would take place inside the State of Connecticut's coastal zone and at the Navy's submarine homeport in Groton, Connecticut. Based on analysis in the EIS/OEIS, the Proposed Action requires a CZMA Consistency Determination because the activities have the potential to impact coastal resources as defined in Connecticut General Statute (CGS) § 22a-93(7), which are defined as "*coastal waters of the state, their natural resources, related marine and wildlife habitat and adjacent shorelands, both developed and undeveloped, that together form an integrated terrestrial and estuarine ecosystem*".

Therefore, because of the potential that sonar activities associated with AFAST could impact sea turtles and marine mammals, and because the State of Connecticut considers sea turtles and mammals to be coastal resources, these activities must be consistent to the maximum extent practicable with the enforceable policies of the Connecticut Coastal Management Program (CMP).

Activities that have the Potential to Impact Connecticut's Coastal Zone

Under the Proposed Action, the only activities that have the potential to impact Connecticut's coastal zone are the submarine object detection/navigational training and submarine maintenance activities. The submarine object detection/navigational training would occur in the established submarine transit lanes entering/exiting Groton, Connecticut. Active sonar maintenance activities would occur pierside in Groton, Connecticut.

Proposed Federal Agency Action

The Proposed Action is for the Navy to designate areas where mid- and high-frequency active sonar and improved extended echo ranging (IEER) system training, maintenance, and RDT&E activities will occur within and adjacent to existing operating areas (OPAREAs), and to conduct these activities. These areas are located in the ocean along the East Coast and within the Gulf of Mexico (refer to Chapter 2 of the AFAST EIS/OEIS for specific locations of Navy OPAREAs). Navy OPAREAs include designated ocean areas near fleet concentration areas (i.e., homeports). OPAREAs are where the majority of routine Navy training and RDT&E takes place. However, Navy training exercises are not confined to the OPAREAs. Some training exercises or portions of exercises are conducted seaward of the OPAREAs and a limited amount of active sonar use is conducted in water areas shoreward of the OPAREAs.

The purpose of the Proposed Action is to support the requirements of the Fleet Readiness Training Plan (FRTP) and stay proficient in Anti-Submarine Warfare (ASW) and Mine Warfare (MIW) skills. The FRTP is the Navy's training cycle that requires naval forces to build up in preparation for operational deployment and to maintain a high level of proficiency and readiness while deployed. Basic combat skills are learned and practiced during Independent Unit Level Training (ULT) activities. These basic skills are then refined at the Coordinated ULT and Strike Group training activities as progressively more difficult, complex, and larger-scale "integrated training" exercises are conducted at an increasing tempo.

Surface ships and submarines participating in the training also must conduct active sonar maintenance pier side and during transit to the training exercise location. Active sonar maintenance is required to ensure that the sonar system is operating properly before engaging in the training exercise or when the sonar systems are suspected of operating at levels below optimal performance. Active sonar maintenance includes both pier-side and at-sea activities. These activities are required before deployment, after major sonar array maintenance, and when the systems are suspected of not operating at optimal levels. Submarine sonar maintenance activities are generally conducted in shallow water near the submarine's homeport of either Groton, Connecticut; Norfolk, Virginia; or Kings Bay, Georgia. Surface ship sonar maintenance activities are generally conducted in shallow water near the homeports of Mayport, Florida or Norfolk, Virginia.

Under the Navy's Preferred Alternative described in the EIS/OEIS, the No Action Alternative, the Navy would continue conducting active sonar activities year-round within and adjacent to existing OPAREAs, rather than designate active sonar areas or areas of increased awareness. Locations where AFAST activities could occur are summarized below.

ASW Training Areas

ASW activities for all platforms could occur within and adjacent to existing East Coast OPAREAS beyond 22.2 km (12 NM) with the exception of sonar dipping activities: however, most ASW training involving submarines or submarine targets would occur in waters greater than 183 m (600 ft) deep due to safety concerns about running aground at shallower depths. ASW active sonar activities occurring in specific locations are discussed below.

Helicopter ASW ULT Areas

The helicopter ASW ULTs are the only ASW activity that could occur within 22 km (12 NM) of shore. This activity would be conducted in the waters of the East Coast OPAREAs while embarked on a surface ship. Helicopter ASW ULT events are also conducted by helicopters deployed from shore-based Jacksonville, Florida, units. These helicopter units use established sonar dipping areas offshore Mayport (Jacksonville), Florida, which are located in territorial waters and within the southeast North Atlantic right whale critical habitat.

SEASWITI Areas

This training exercise generally occurs in deep water off the coast of Jacksonville, Florida.

Group Sail Areas

These events typically take place within and seaward of the VACAPES, CHPT, and JAX/CHASN OPAREAs.

Submarine Command Course Operations Areas

This training exercise typically occurs in the JAX/CHASN and Northeast OPAREAs in deep ocean areas.

Torpedo Exercise Areas

TORPEX can occur anywhere within and adjacent to East Coast and GOMEX OPAREAs. The exception is in the Northeast OPAREA where the North Atlantic right whale critical habitat is located. TORPEX areas that meet current operational requirements for proximity to torpedo and target recovery support facilities were established during previous consultations. Therefore, TORPEX activities in the northeast North Atlantic right whale critical habitat are limited to these established areas.

MIW Training Areas

MIW Training could occur in territorial or non-territorial waters. Independent and Coordinated MIW ULT activities would be conducted within and adjacent to the Pensacola and Panama City OPAREAs in the northern Gulf of Mexico and off the east coast of Texas in the Corpus Christi OPAREA.

The Squadron Exercise (RONEX) or GOMEX Exercise would be conducted in both deep and shallow water training areas.

Object Detection/Navigational Training Areas

Surface Ship training would be conducted primarily in the shallow water port entrance and exit lanes for Norfolk, Virginia and Mayport, Florida. The transit lane servicing Mayport, FL crosses through the southeast North Atlantic right whale critical habitat.

Submarine training would occur primarily in the established submarine transit lanes entering/exiting Groton, Connecticut, Norfolk, Virginia, and Kings Bay, Georgia. The transit lane servicing Kings Bay, GA crosses through the southeast North Atlantic right whale critical habitat.

Maintenance Areas

Maintenance activities could occur in homeports located in territorial waters, or in the open ocean within non-territorial waters.

Surface Ship Sonar Maintenance Areas

Surface ships would be operating their active sonar systems for maintenance while pierside within their homeports, located in either Norfolk, Virginia or Mayport, Florida. Additionally open ocean sonar maintenance could occur anywhere within the non-territorial waters of the AFAST Study Area as the system's performance may warrant.

Submarine Sonar Maintenance Areas

Submarines would conduct maintenance to their sonar systems pierside in their homeports of either Groton, Connecticut; Norfolk, Virginia; or Kings Bay, Georgia. Additionally, sonar maintenance could occur anywhere within the non-territorial waters of the AFAST Study Area as the system's performance may warrant.

RDT&E Areas

For RDT&E activities included in this analysis, active sonar activities occur in similar locations as representative training events.

Federal Consistency Review

Connecticut's CMP is composed of 28 state goals and policies, which constitute the enforceable policies of the CMP. Statutes and policies addressed as part of the Connecticut CMP Consistency review and considered in the analysis of the Proposed Action are discussed in Table F-1. The U.S. Navy has determined that the AFAST activities are consistent to the maximum extent practicable with the enforceable policies of the Connecticut CMP based on the following information, data, and analysis (given as a summary in the table and presented as comprehensive analysis in Chapter 4 of the EIS/OEIS).

Pursuant to 15 CFR § 930.41, the Connecticut DEP has 60 days from the receipt of this letter in which to concur with or object to this Consistency Determination, or to request an extension under 15 CFR § 930.41(b). Connecticut's concurrence will be presumed if its response is not received by the U.S. Navy (Atlantic Fleet) by the 60th-day from receipt of this determination.

Connecticut's response should be sent to Naval Facilities Engineering Command, Atlantic, Attn: Code EV22 (AFAST Project Manager), 6506 Hampton Blvd., Norfolk, Virginia 23508-1278.

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Table F-1. Connecticut Coastal Management Program Consistency Review

Enforceable Policies (Connecticut General Statute)	Consistency	Scope
Coastal Resources and Associated Enforceable Policies		
CGS 22a-92(a)(2) *General Coastal Resources*	The Proposed Action would not take place on land and therefore, no effects would occur to wetlands, beaches, dunes, islands, public recreation areas, tidal wetlands, or bluffs and escarpments. No effects to any terrestrial species would occur as a result of the Proposed Action. Effects to endangered wildlife resources (sea turtles and marine mammals) would be addressed through the federal consultation processes (a Biological Evaluation [Appendix I of the EIS/OEIS] and Letter of Authorization) with the National Marine Fisheries Service. The Proposed Action would not impact historical resources of the state. Additionally, the Navy will avoid all known cultural resources; however, if effects to cultural resources are anticipated, consultation with the applicable agencies, including the SHPO, would be initiated as required by Section 106 of the National Historic Preservation Act and in accordance with CGS 22a-92(b)(1)(J) of Connecticut's Coastal Management Program.	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 447 (State Parks and Forests) • Chapter 474 (Pollution) • Chapter 477 (Flood Control and Beach Erosion)
CGS 22a-92(b)(2)(C) and CGS 22a-92(c)(1)(K) *Beaches and Dunes*	The Proposed Action would not take place on land. Therefore, no significant effect would occur to beaches and dunes.	Preserves the dynamics of the form and integrity of the natural beach systems in order to provide critical wildlife habitats, a reservoir for sand supply, a buffer for coastal flooding and erosion, and valuable recreational opportunities. Also ensures that costal uses are compatible with the capabilities of the system and do not unreasonably interfere with natural processes of erosion and sedimentation, and requires as a condition in permitting for new coastal structures that could potentially obstruct passage along public beaches.

Table F-1. Connecticut Coastal Management Program Consistency Review Cont'd

Enforceable Policies (Connecticut General Statute)	Consistency	Scope
CGS 22a-92(b)(2)(A) *Bluffs and Escarpments*	The Proposed Action would not take place on land. Therefore, no significant effect would occur to bluffs and escarpments.	Manages and preserves coastal bluffs and escarpments so as to preserve their slope and toe. Discourages uses which do not permit continued natural rates of erosion, that accelerate slope erosion, and that alter essential patterns and supply of sediments to the littoral transport system.
CGS 22a-92(a)(2), CGS 22a-92(b)(2)(F), CGS 22a-92(b)(2)(J), and CGS 22a-92(c)(2)(B) *Coastal Hazard Area*	The Proposed Action would not require any activities to occur within the Coastal Hazard Area as defined by CGS section 22a-93(7)(H), nor would it include the construction of any new infrastructure.	Considers effect of coastal flooding and erosion on coastal development, manages coastal hazard areas, and minimizes the effects of erosion and sedimentation on coastal land uses. Maintains, enhances, or restores natural patterns of water circulation and fresh/saltwater exchange.
CGS 22a-92(a)(2) and CGS 22a-92(c)(2)(A) *Coastal Waters, Estuarine Embayments, Nearshore Waters, and Offshore Waters*	No effects to any terrestrial species would occur as a result of the Proposed Action. Effects to endangered wildlife resources (sea turtles and ESA-listed marine mammals) would be addressed through the federal consultation processes (a Biological Evaluation [Appendix I of the EIS/OEIS] and a Letter of Authorization) with the National Marine Fisheries Service. No effects to water quality are anticipated as a result of AFAST activities	Protects, enhances, and manages estuarine embayments to insure 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 insure consistency with the federal Water Pollution Control Act (Clean Water Act). Prohibits the discharge of wastes into waters of the state without having first received treatment available and necessary for elimination of pollution.
CGS 22a-92(b)(2)(G) *Developed Shorefront*	The Proposed Action would not involve the use of shorelines nor require any activities along shorelines. NOTAM and NOTMAR would be provided as required prior to AFAST exercises.	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.
CGS 22a-92(a)(2) *Freshwater Wetlands and Watercourses*	The Proposed Action would not take place on land; therefore no significant effect would occur to wetlands. AFAST activities are not anticipated to occur in freshwater watercourses, as defined in CGS 22a-38(16).	Preserves and enhances freshwater wetlands and watercourses in accordance with the policies established by Chapter 440.
CGS 22a-92(b)(2)(D) and CGS 22a-92(c)(1)(K) *Intertidal Flats*	The Proposed Action would not take place within any intertidal flats. Therefore, no significant effects would occur to intertidal flats.	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.

Table F-1. Connecticut Coastal Management Program Consistency Review Cont'd

Enforceable Policies (Connecticut General Statute)	Consistency	Scope
CGS 22a-92(b)(2)(H) *Islands*	No effects to any terrestrial species, or species indigenous to islands would occur as a result of the Proposed Action. The Proposed Action would not result in any effects to recreational activities.	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.
CGS 22a-92(b)(2)(B) *Rocky Shorefront*	No effects to any terrestrial species would occur as a result of the Proposed Action.	Manages rocky shorefronts to insure that development proceeds do 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, and to dissipate and absorb storm and wave energies.
CGS 22a-92(c)(1)(I), 19a-98(a), 19a-96, and 19a-101 *Shellfish Concentration Areas*	The Proposed Action would not affect shellfish harvesting areas or commercial fishery operations. A NOTAM and NOTMAR would be provided as required prior to AFAST exercises. Temporary disruptions to recreational and commercial fisheries could occur, but would be localized and for a short duration. No long-term effects to these resources would occur.	Manages the state's fisheries to promote the economic benefits of commercial and recreational fishing, enhance recreational fishing opportunities, optimize the yield of all species, prevent the depletion or extinction of indigenous species, maintain and enhance the productivity of natural estuarine resources, and preserve healthy fisheries resources for future generations.
CGS 22a-92(b)(2)(I) *Shorelands*	The Proposed Action would not take place on land. Therefore, no significant effect would occur to shorelands.	Regulates shore land use and development which minimizes effects upon adjacent coastal systems and resources.
CGS 22a-92(a)(2), CGS 22a-92(b)(2)(E), and CGS 22a-92(c)(1)(B) *Tidal Wetlands*	The Proposed Action would not take place within tidal wetlands, therefore no effects would occur.	Preserves tidal wetlands and prevents the despoliation and destruction thereof to maintain their vital natural functions. Encourages the rehabilitation and restoration of degraded tidal wetlands, the creation of wetlands for the purposes of shellfish and finfish management, habitat creation and dredge spoil disposal. Regulates any filling of tidal wetlands and nearshore, offshore and intertidal waters to create new land from existing wetlands and coastal waters.

Coastal Uses and Associated Enforceable Policies		
CGS 22a-92(a)(1) and CGS 22a-92(a)(4) *General Development*	The Proposed Action would not affect general development coordination and planning.	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.

Table F-1. Connecticut Coastal Management Program Consistency Review Cont'd

CGS 22a-92(b)(1)(G), CGS 22a-92(b)(1)(H), and CGS 22a-92(b)(1)(I) *Boating*	The proposed Navy AFAST activities would not impact recreational access to coastal areas. A NOTAM and NOTMAR would be provided as required prior to AFAST exercises. Temporary disruptions to recreational and commercial fisheries could occur, but would be localized and for a short duration. No long-term effects to these resources would occur.	Encourages increased recreational boating use of coastal waters and protects coastal resources by requiring that such 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.
CGS 22a-92(a)(2), CGS 22a-92(a)(6), CGS 22a-92(c)(1)(J), and CGS 22a-92(c)(1)(K) *Coastal Recreation and Access*	The Proposed Action would not affect coastal recreation and access. No activities would take place on land; therefore, there would be no effect to public beaches.	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.
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) *Coastal Structures and Filling*	The Proposed Action does not include the construction of any new infrastructure. There would be no fill placed in any tidal wetlands or nearshore, offshore, and intertidal waters. No significant effects to these resources would occur.	Requires that the design, construction, and maintenance of structures in tidal wetlands and coastal waters minimize effects to coastal resources, circulation and sedimentation patterns, water quality, and 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.
CGS 22a-92(b)(1)(J) *Cultural Resources*	The Proposed Action would not impact historical resources of the state. Additionally, the Navy would avoid all known cultural resources; however, if effects to cultural resources are anticipated, consultation with the applicable agencies, including the State Historic Preservation Officer (SHPO) would be initiated as required by Section 106 of the National Historic Preservation Act and in accordance with CGS 22a-92(b)(1)(J) of Connecticut's Coastal Management Program.	Requires mitigation measures where development would impact historical, archaeological, or paleontological resources that have been designated by the SHPO.
CGS 22a-92(a)(2) *Dams, Dikes, and Reservoirs*	The Proposed Action would not take place on land. Therefore, no significant effect would occur to dams, dikes, or reservoirs.	Preserves and enhances coastal resources in accordance with the policies established by chapters 439, 440, 446i, 446k, 447, 474 and 477.

Table F-1. Connecticut Coastal Management Program Consistency Review Cont'd

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. *Dredging and Navigation*	The Proposed Action would not involve dredging activities. No effects would occur.	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.
CGS 16-50g and CGS 16-50p(a) *Energy Facilities*	The Proposed Action would not have an effect on energy facilities or future advances toward alternative energy development.	Addresses legislative findings and purposes for energy facilities as well as addresses the certification proceeding decisions.
CGS 22a-92(c)(1)(I), and CGS section 26-302, Article 1. *Fisheries*	The Proposed Action would not affect federally-listed fish species and would not impact management of fishery resources, particularly stocking, protection, and management of the Atlantic salmon.	Manages the state's fisheries to promote the economic benefits of commercial and recreational fishing, enhance recreational fishing opportunities, optimize the yield of all species, prevent the depletion or extinction of indigenous species, maintain and enhance the productivity of natural estuarine resources, and preserve healthy fisheries resources for future generations.

Table F-1. Connecticut Coastal Management Program Consistency Review Cont'd

CGS 22a-92(a)(2), CGS 22a-92(b)(1)(C), CGS 22a-92(b)(1)(E), and CGS 22a-92(c)(1)(A) *Fuel, Chemicals, and Hazardous Materials*	There would be no significant effect from fuels, chemicals, or hazardous materials as a result of the Proposed Action. The U.S. Navy follows the standards for incidental liquid discharges from vessels of the Armed Forced, effective 9 June 1999. An NPDES permit is not required for: • Effluent from properly functioning oil/water separators. • Sewage (when discharge is necessary). • Graywater. • Cooling water. • Boiler and steam generator blowdown. • Weather deck runoff, including fresh water washdowns. • Ballast water. Furthermore, no effect to water quality would occur from the use of batteries, torpedoes, or explosive packages of IEERs based on their properties (i.e., solubility, slow corrosion rates). AFAST activities would not result in significant quantities of hazardous materials. Small quantities of standard maintenance and repair materials (e.g., solder flux, flux remover, isopropyl alcohol, and petroleum products) may be used as needed and would be disposed of in accordance with all applicable regulations.	Promotes the development, reuse or redevelopment of existing urban and commercial fishing ports. Regulates uses which 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, to provide effective containment and cleanup facilities for accidental spills.
CGS 22a-92(a)(2) and CGS 12-107a *Open Space and Agricultural Lands*	The Proposed Action would not take place on land. Therefore, no significant effect would occur to open space and agricultural lands.	Preserves and enhances coastal resources in accordance with the policies established by chapters 439, 440, 446i, 446k, 447, 474 and 477.
CGS 22a-92(b)(1)(C) *Ports and Harbors*	The Proposed Action would not affect ports and harbors.	Promotes the development, reuse or redevelopment of existing urban and commercial fishing ports.

Table F-1. Connecticut Coastal Management Program Consistency Review Cont'd

CGS 22a-92(b)(1)(B) *Sewer and Water Lines*	The Proposed Action would not take place on land. Therefore, no significant effect would occur to sewer and water lines. The Navy would not construct any new infrastructure under the AFAST activities.	Locates and phases sewer and water lines so as to encourage concentrated development in areas which are suitable for development. Disapproves extension of sewer and water services into developed and undeveloped beaches, barrier beaches and tidal wetlands.
CGS 22a-92(a)(2) *Solid Waste*	The Proposed Action would not involve the generation of solid waste within the state's coastal zone. All solid waste disposals would be conducted in accordance with U.S. Navy policies and procedures.	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 which are toxic or hazardous.
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) *Transportation*	The Proposed Action would not affect the upgrading and improvement of transportation facilities.	Regulates use of rehabilitation, upgrading, and improvement of existing transportation facilities as the primary means of meeting transportation needs in the coastal area.
CGS 22a-92(a)(3) and CGS 22a-92(b)(1)(A) *Water-dependent Uses*	The Proposed Action would not affect the planning and zoning of water-dependent uses.	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.

CGS = Connecticut General Statute; AFAST = Atlantic Fleet Active Sonar Training; ESA = Endangered Species Act; IEER = Improved Extended Echo Ranging; NOTAM = Notice to Airmen; NOTMAR = Notice to Mariners ; SHPO = State Historic Preservation Officer; U.S. = United States; NPDES = National Pollutant Discharge Elimination System

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FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR FLORIDA

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FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR FLORIDA

INTRODUCTION

This document provides the State of Florida with the Department of the Navy's (DON) Consistency Determination under CZMA 16 U.S.C. § 1456 Section 307 (c) (1) [or (2)] and 15 Code of Federal Regulations (CFR) § 930 (c), for the Atlantic Fleet Active Sonar Training (AFAST) activities proposed for the United States (U.S.) Atlantic East Coast and the Gulf of Mexico. The information in this Consistency Determination is provided pursuant to 15 CFR § 930.39.
The location of AFAST activities that have the potential to affect Florida's coastal zone resources are described in detail under the Proposed Action summary of this CZMA Consistency Determination.

The following information is based upon a review of the Florida Coastal Management Program (FCMP) and its associated enforceable policies, and information provided by the Florida Department of Environmental Protection (FDEP).

The State of Florida requires that federal agencies conduct a CZMA Consistency Determination for certain direct federal actions, federal permits and licenses, and federal assistance programs that occur within the state's designated coastal zone and have the potential to affect the state's coastal zone resources.

Section 304(1) of the CZMA defines the seaward extent of a state's coastal zone as "*to the outer limit of state title and ownership under the Submerged Lands Act (43 United States Code [USC] 1301 et. seq.)*." Under the Submerged Lands Act, Florida's title and ownership extends 5.6 km (3 nautical miles [NM]) into the Atlantic Ocean and, in accordance with United States vs. Louisiana, et. al., 364 U.S. 502 (1960), approximately 16.7 km (9 NM) into the Gulf of Mexico. The entire state of Florida and the waters therein are also considered a part of the coastal zone.
The Navy AFAST activities encompass direct federal activities that would take place inside the State of Florida's coastal zone and at the Navy's surface ship homeport in Mayport, Florida. Based on analysis in the EIS/OEIS, the scope of activities requires a CZMA Consistency Determination because the activities have the potential to impact coastal resources within the State of Florida's coastal zone. Florida Statute (FS) Chapter 372.072(b) and (c), an enforceable policy of the FCMP, defines an endangered/threatened species as "*any species of fish and wildlife naturally occurring in Florida, whose prospects of survival are in jeopardy due to modification or loss of habitat; overutilization for commercial, sporting, scientific, or educational purposes; disease; predation; inadequacy of regulatory mechanisms; or other natural or man-made factors affecting its continued existence.*"

Therefore, because of the potential that active sonar activities associated with AFAST could impact sea turtles and marine mammals, and because sea turtles and marine mammals are threatened/endangered species found within the State of Florida, these activities must be consistent to the maximum extent practicable with the enforceable policies of the FCMP.

Activities that have the Potential to Impact Florida's Coastal Zone

Under the Proposed Action, the following activities have the potential to impact Florida's coast:

- Helicopter ASW ULT events offshore of Mayport, Florida.
- Surface ship object detection/navigational training in the water port entrance and exit lanes for Mayport, Florida.
- Surface ship maintenance activities Pierside within Mayport, Florida.

Proposed Federal Agency Action

The Proposed Action is for the Navy to designate areas where mid- and high-frequency active sonar and improved extended echo ranging (IEER) system training, maintenance, and RDT&E activities will occur within and adjacent to existing operating areas (OPAREAs), and to conduct these activities. These areas are located in the ocean along the East Coast and within the Gulf of Mexico (refer to Chapter 2 of the AFAST EIS/OEIS for specific locations of Navy OPAREAs). Navy OPAREAs include designated ocean areas near fleet concentration areas (i.e., homeports). OPAREAs are where the majority of routine Navy training and RDT&E takes place. However, Navy training exercises are not confined to the OPAREAs. Some training exercises or portions of exercises are conducted seaward of the OPAREAs and a limited amount of active sonar use is conducted in water areas shoreward of the OPAREAs.

The purpose of the Proposed Action is to support the requirements of the Fleet Readiness Training Plan (FRTP) and stay proficient in Anti-Submarine Warfare (ASW) and Mine Warfare (MIW) skills. The FRTP is the Navy's training cycle that requires naval forces to build up in preparation for operational deployment and to maintain a high level of proficiency and readiness while deployed. Basic combat skills are learned and practiced during Independent Unit Level Training (ULT) activities. These basic skills are then refined at the Coordinated ULT and Strike Group training activities as progressively more difficult, complex, and larger-scale "integrated training" exercises are conducted at an increasing tempo.

Surface ships and submarines participating in the training also must conduct active sonar maintenance pier side and during transit to the training exercise location. Active sonar maintenance is required to ensure that the sonar system is operating properly before engaging in the training exercise or when the sonar systems are suspected of operating at levels below optimal performance. Active sonar maintenance includes both pier-side and at-sea activities. These activities are required before deployment, after major sonar array maintenance, and when the systems are suspected of not operating at optimal levels. Submarine sonar maintenance activities are generally conducted in shallow water near the submarine's homeport of either Groton, Connecticut; Norfolk, Virginia; or Kings Bay, Georgia. Surface ship sonar maintenance activities are generally conducted in shallow water near the homeports of Mayport, Florida or Norfolk, Virginia.

Under the Navy's Preferred Alternative described in the EIS/OEIS, the No Action Alternative, the Navy would continue conducting active sonar activities year-round within and adjacent to existing OPAREAs, rather than designate active sonar areas or areas of increased awareness.

Locations where AFAST activities could occur are summarized below.

ASW Training Areas

ASW activities for all platforms could occur within and adjacent to existing East Coast OPAREAS beyond 22.2 km (12 NM) with the exception of sonar dipping activities: however, most ASW training involving submarines or submarine targets would occur in waters greater than 183 m (600 ft) deep due to safety concerns about running aground at shallower depths. ASW active sonar activities occurring in specific locations are discussed below.

Helicopter ASW ULT Areas

The helicopter ASW ULTs are the only ASW activity that could occur within 22 km (12 NM) of shore. This activity would be conducted in the waters of the East Coast OPAREAs while embarked on a surface ship. Helicopter ASW ULT events are also conducted by helicopters deployed from shore-based Jacksonville, Florida, units. These helicopter units use established sonar dipping areas offshore Mayport (Jacksonville), Florida, which are located in territorial waters and within the southeast North Atlantic right whale critical habitat.

SEASWITI Areas

This training exercise generally occurs in deep water off the coast of Jacksonville, Florida.

Group Sail Areas

These events typically take place within and seaward of the VACAPES, CHPT, and JAX/CHASN OPAREAs.

Submarine Command Course Operations Areas

This training exercise typically occurs in the JAX/CHASN and Northeast OPAREAs in deep ocean areas.

Torpedo Exercise Areas

TORPEX can occur anywhere within and adjacent to East Coast and GOMEX OPAREAs. The exception is in the Northeast OPAREA where the North Atlantic right whale critical habitat is located. TORPEX areas that meet current operational requirements for proximity to torpedo and target recovery support facilities were established during previous consultations. Therefore, TORPEX activities in the northeast North Atlantic right whale critical habitat are limited to these established areas.

MIW Training Areas

MIW Training could occur in territorial or non-territorial waters. Independent and Coordinated MIW ULT activities would be conducted within and adjacent to the Pensacola and Panama City OPAREAs in the northern Gulf of Mexico and off the east coast of Texas in the Corpus Christi OPAREA.

The Squadron Exercise (RONEX) or GOMEX Exercise would be conducted in both deep and shallow water training areas.

Object Detection/Navigational Training Areas

Surface Ship training would be conducted primarily in the shallow water port entrance and exit lanes for Norfolk, Virginia and Mayport, Florida. The transit lane servicing Mayport, FL crosses through the southeast North Atlantic right whale critical habitat.

Submarine training would occur primarily in the established submarine transit lanes entering/exiting Groton, Connecticut, Norfolk, Virginia, and Kings Bay, Georgia. The transit lane servicing Kings Bay, GA crosses through the southeast North Atlantic right whale critical habitat.

Maintenance Areas

Maintenance activities could occur in homeports located in territorial waters, or in the open ocean within non-territorial waters.

Surface Ship Sonar Maintenance Areas

Surface ships would be operating their active sonar systems for maintenance while pierside within their homeports, located in either Norfolk, Virginia or Mayport, Florida. Additionally open ocean sonar maintenance could occur anywhere within the non-territorial waters of the AFAST Study Area as the system's performance may warrant.

Submarine Sonar Maintenance Areas

Submarines would conduct maintenance to their sonar systems pierside in their homeports of either Groton, Connecticut; Norfolk, Virginia; or Kings Bay, Georgia. Additionally, sonar maintenance could occur anywhere within the non-territorial waters of the AFAST Study Area as the system's performance may warrant.

RDT&E Areas

For RDT&E activities included in this analysis, active sonar activities occur in similar locations as representative training events.

Federal Consistency Review

Florida's Coastal Management Program (FCMP) is comprised of 23 state statutes, which constitute the enforceable policies of the CMP. Statutes addressed as part of the FCMP consistency review and considered in the analysis of the Proposed Action are discussed in Table F-2. The U.S. Navy has determined that the AFAST activities are consistent to the maximum extent practicable with the enforceable policies of the FCMP based on the following information, data, and analysis (given as a summary in the table and presented as comprehensive analysis in Chapter 4 of the EIS/OEIS).

Pursuant to 15 CFR § 930.41, the Florida State Clearinghouse has 60 days from receipt of this document in which to concur with or object to this Consistency Determination, or to request an extension, in writing, under 15 CFR § 930.41(b). Florida's concurrence will be presumed if the Navy (Atlantic Fleet) does not receive its response by the 60th-day from receipt of this determination. Florida's response should be sent to Naval Facilities Engineering Command, Atlantic, Attn: Code EV22 (AFAST Project Manager), 6506 Hampton Blvd., Norfolk, Virginia 23508-1278.

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Table F-2. Florida Coastal Management Program Consistency Review

Statute (Florida Statute)	Consistency	Scope
Chapter 161 *Beach and Shore Preservation*	The Proposed Action would not adversely affect beach and shore management, specifically as it pertains to: • The Coastal Construction Permit Program. • The CCCCL Permit Program. • The Coastal Zone Protection Program. No land activities or construction would occur.	Authorizes the Bureau of Beaches and Coastal Systems within the FDEP to regulate construction on or seaward of the state's beaches.
Chapter 163, Part II *Growth Policy; County and Municipal Planning; Land Development Regulation*	The Proposed Action would not affect local government comprehensive plans.	Requires local governments to prepare, adopt, and implement comprehensive plans that encourage the most appropriate use of land and natural resources in a manner consistent with the public interest.
Chapter 186 *State and Regional Planning*	The Proposed Action would not affect state-level planning requirements.	Details state-level planning requirements. Requires the development of special statewide plans governing water use, land development, and transportation.
Chapter 252 *Emergency Management*	The Proposed Action would not have an effect on the ability of the state to respond to or recover from natural or man-made disasters.	Provides for planning and implementation of the state's response to, efforts to recover from, and the mitigation of natural and manmade disasters.
Chapter 253 *State Lands*	The Proposed Action would not impact submerged lands. No operations would occur on the sea bottom and the IEER explosions would occur within the water column. There may be some debris from scuttling; however, no significant impact to sediment quality from expended components is anticipated.	Addresses the state's administration of public lands and property of this state and provides direction regarding the acquisition, disposal, and management of all state lands.
Chapter 258 *State Parks and Preserves*	The Proposed Action would not impact the administration or management of state parks and preserves.	Addresses administration and management of state parks and preserves.
Chapter 259 *Land Acquisition for Conservation or Recreation*	The Proposed Action would not have an effect on the acquisition of environmentally endangered and outdoor recreation lands.	Authorizes acquisition of environmentally endangered lands and outdoor recreation lands.
Chapter 260 *Recreational Trails System*	The Proposed Action would not have an effect on the acquisition of land to create a recreational trails system.	Authorizes acquisition of land to create a recreational trails system and to facilitate management of the system.

Table F-2. Florida Coastal Management Program Consistency Review, Cont'd

Statute (Florida Statute)	Consistency	Scope
Chapter 267 *Historical Resources*	The Proposed Action would not impact historical resources of the state. Additionally, the Navy would avoid all known cultural resources; however, if effects to cultural resources are anticipated, consultation with the applicable agencies, including the Florida SHPO would be initiated in accordance with Section 106 of the National Historic Preservation Act and Chapter 267, Florida Statute.	Addresses management and preservation of the state's archaeological and historical resources.
Chapter 288 *Commercial Development and Capital Improvements*	The Proposed Action would not have an effect on commercial development or capital improvements.	Provides the framework for promoting and developing the general business, trade, and tourism components of the state economy.
Chapter 334 *Transportation Administration*	The Proposed Action would not have an effect on the state's policy concerning transportation administration.	Addresses the state's policy concerning transportation administration.
Chapter 339 *Transportation Finance and Planning*	The Proposed Action would not have an effect on the finance and planning needs of the state's transportation system.	Addresses the finance and planning needs of the state's transportation system.
Chapter 370 *Saltwater Fisheries*	The Proposed Action would not affect federally-listed fish species. Temporary disruptions to recreational and commercial fisheries could occur, but would be localized and for a short duration. No long-term effects to these resources would occur.	Addresses management and protection of the state's saltwater fisheries.
Chapter 372 *Wildlife*	No effects to any terrestrial species would occur as a result of the Proposed Action. Effects to endangered marine wildlife resources (sea turtles and marine mammals) would be addressed through the federal consultation processes (a Biological Evaluation [Appendix I of the EIS/OEIS] and a Letter of Authorization) with the National Marine Fisheries Service. No significant impact to the Florida Keys National Marine Sanctuary is anticipated.	Addresses the management of the wildlife resources of the state.
Chapter 373 *Water Resources*	The Proposed Action would not have a significant impact on water quality from expended components.	Addresses the state's policy concerning water resources.
Chapter 375 *Multipurpose Outdoor Recreation; Land Acquisition, Management, and Conservation*	The Proposed Action would not impact the state's development or evaluation of multipurpose outdoor recreation plans.	Develops comprehensive multipurpose outdoor recreation plan to document recreational supply and demand, describe current recreational opportunities, estimate need for additional recreational opportunities, and propose means to meet the identified needs (Chapter 375).

Table F-2. Florida Coastal Management Program Consistency Review, Cont'd

Statute (Florida Statute)	Consistency	Scope
Chapter 376 *Pollutant Discharge Prevention and Removal*	There would be no significant effect from pollutant discharges as a result of the Proposed Action. The U.S. Navy follows the standards for incidental liquid discharges from vessels of the Armed Forces, effective 9 June 1999. An NPDES permit is not required for: • Effluent from properly functioning oil/water separators. • Sewage (when discharge is necessary). • Graywater. • Cooling water. • Boiler and steam generator blowdown. • Weather deck runoff, including fresh water washdowns. • Ballast water. Furthermore, no effect to water quality would occur from the use of batteries, torpedoes, or explosive packages of IEERs based on their properties (i.e., solubility, slow corrosion rates). AFAST activities would not result in significant quantities of hazardous materials. Small quantities of standard maintenance and repair materials (e.g., solder flux, flux remover, isopropyl alcohol, and petroleum products) may be used as needed and would be disposed of in accordance with all applicable regulations.	Regulates transfer, storage, and transportation of pollutants, and cleanup of pollutant discharges.
Chapter 377 *Energy Resources*	The Proposed Action would not have a significant effect on energy exploration from activities involving active sonar or IEER sonobuoys.	Addresses regulation, planning, and development of energy resources of the state.

Table F-2. Florida Coastal Management Program Consistency Review, Cont'd

Statute (Florida Statute)	Consistency	Scope
Chapter 380 *Land and Water Management*	Under the Proposed Action, development of state lands with regional (i.e., more than one county) effects would not occur. Activities would avoid Areas of Critical State Concern and areas with approved state resource management plans, such as aquatic preserves, national estuarine research reserves, and national marine sanctuaries. Changes to coastal infrastructure such as bridge construction, capacity increases of existing coastal infrastructure, or use of state funds for infrastructure planning, designing, or construction would not occur. The Proposed Action would not involve the generation of solid waste within the state's coastal zone. All solid waste disposals would be conducted in accordance with U.S. Navy policies and procedures.	Establishes land and water management policies to guide and coordinate local decisions relating to growth and development.
Chapter 381 *Public Health, General Provisions*	The Proposed Action does not involve the construction of an on-site sewage treatment and disposal system.	Establishes public policy concerning the state's public health system.
Chapter 388 *Mosquito Control*	The Proposed Action would not affect mosquito control efforts.	Addresses mosquito control efforts in the state.
Chapter 403 *Environmental Control*	The Proposed Action would not impact air quality. The use of active sonar has no potential for effects to air quality. Potential air quality effects associated with airborne transportation (i.e., airplanes or helicopters) is being analyzed under the individual TAP EIS/OEISs.	Establishes public policy concerning environmental control in the state.
Chapter 582 *Soil and Water Conservation*	The Proposed Action would not require any preventative measures against soil erosion because no land activities would occur.	Provides for the control and prevention of soil erosion.

CCCL = Coastal Construction Control Line; DEP = Department of Environmental Protection; EIS = Environmental Impact Statement; IEER = Improved Extended Echo Ranging; NOTAM = Notice to Airmen; NOTMAR = Notice to Mariners; AFAST = Atlantic Fleet Active Sonar Training; NPDES = National Pollutant Discharge Elimination System; OEIS = Overseas Environmental Impact Statement; SHPO = State Historic Preservation Officer; U.S. = United States; TAP = Theater Assessment Program

FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR GEORGIA

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FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR GEORGIA

This document provides the State of Georgia with the Department of the Navy's (DON) Consistency Determination under CZMA 16 U.S.C. § 1456 Section 307 (c) (1) [or (2)] and 15 Code of Federal Regulations (CFR) § 930 (c), for the Atlantic Fleet Active Sonar Training (AFAST) activities proposed for the United States (U.S.) Atlantic East Coast and the Gulf of Mexico. The information in this Consistency Determination is provided pursuant to 15 CFR § 930.39.

The location of AFAST activities that have the potential to affect Georgia's coastal zone resources are described in detail under the Proposed Federal Agency Action summary of this CZMA Consistency Determination.

The following information is based on review of the Georgia Coastal Management Program (CMP) and associated enforceable policies, as well as review of information provided by the Georgia Department of Natural Resources (GDNR) Coastal Resources Division (CRD).
The State of Georgia requires that federal agencies conduct a Coastal Zone Consistency Determination pursuant to the enforceable policies of the Georgia CMP for certain direct federal projects, federal permits and licenses, and federal assistance programs that occur within the state's designated coastal zone.

The Georgia Shore Protection Act (Official Code of Georgia Annotated [OCGA] 2-5-230, "et seq.") is the primary legal authority for protection and management of Georgia's shoreline. It designates the State of Georgia's coastal zone as the 11 coastal counties and all waters of the state within those counties including the coastal ocean to the limit of state jurisdiction, which is 5.6 km (3 nautical miles [NM} into the Atlantic Ocean), and all submerged lands within.
The Navy AFAST activities encompass direct federal activities that would take place inside the State of Georgia's coastal zone and at the Navy's submarine homeport in Kings Bay, Georgia. Based on analysis in EIS/OEIS, the scope of activities requires a CZMA Consistency Determination because the activities have the potential to impact coastal resources, in particular endangered aquatic wildlife. As defined in OCGA 27-3-130 entitled *Endangered Wildlife, "The Endangered Wildlife Act provides for identification, inventory, and protection of animal species that are rare, unusual, or in danger of extinction. The protection offered to these species is limited to those that are found on public lands of the State"*.

Therefore, because of the potential that active sonar training and maintenance activities associated with AFAST could impact sea turtles and marine mammals and because the protection of sea turtles and marine mammals are addressed under OCGA 27-3-130, the AFAST activities must be consistent to the maximum extent practicable with the enforceable policies of the Georgia CMP.

Activities that have the Potential to Impact Georgia's Coastal Zone

Under the Proposed Action, the following activities have the potential to impact Georgia's coast:

- Submarine object detection/navigational training in the established shallow waters near Kings Bay, Georgia.
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- Submarine ship maintenance activities pier side in Kings Bay, Georgia.

Proposed Federal Agency Action

The Proposed Action is for the Navy to designate areas where mid- and high-frequency active sonar and improved extended echo ranging (IEER) system training, maintenance, and RDT&E activities will occur within and adjacent to existing operating areas (OPAREAs), and to conduct these activities. These areas are located in the ocean along the East Coast and within the Gulf of Mexico (refer to Chapter 2 of the AFAST EIS/OEIS for specific locations of Navy OPAREAs). Navy OPAREAs include designated ocean areas near fleet concentration areas (i.e., homeports). OPAREAs are where the majority of routine Navy training and RDT&E takes place. However, Navy training exercises are not confined to the OPAREAs. Some training exercises or portions of exercises are conducted seaward of the OPAREAs and a limited amount of active sonar use is conducted in water areas shoreward of the OPAREAs.

The purpose of the Proposed Action is to support the requirements of the Fleet Readiness Training Plan (FRTP) and stay proficient in Anti-Submarine Warfare (ASW) and Mine Warfare (MIW) skills. The FRTP is the Navy's training cycle that requires naval forces to build up in preparation for operational deployment and to maintain a high level of proficiency and readiness while deployed. Basic combat skills are learned and practiced during Independent Unit Level Training (ULT) activities. These basic skills are then refined at the Coordinated ULT and Strike Group training activities as progressively more difficult, complex, and larger-scale "integrated training" exercises are conducted at an increasing tempo.

Surface ships and submarines participating in the training also must conduct active sonar maintenance pier side and during transit to the training exercise location. Active sonar maintenance is required to ensure that the sonar system is operating properly before engaging in the training exercise or when the sonar systems are suspected of operating at levels below optimal performance. Active sonar maintenance includes both pier-side and at-sea activities. These activities are required before deployment, after major sonar array maintenance, and when the systems are suspected of not operating at optimal levels. Submarine sonar maintenance activities are generally conducted in shallow water near the submarine's homeport of either Groton, Connecticut; Norfolk, Virginia; or Kings Bay, Georgia. Surface ship sonar maintenance activities are generally conducted in shallow water near the homeports of Mayport, Florida or Norfolk, Virginia.

Under the Navy's Preferred Alternative described in the EIS/OEIS, the No Action Alternative, the Navy would continue conducting active sonar activities year-round within and adjacent to existing OPAREAs, rather than designate active sonar areas or areas of increased awareness. Locations where AFAST activities could occur are summarized below.

ASW Training Areas

ASW activities for all platforms could occur within and adjacent to existing East Coast OPAREAS beyond 22.2 km (12 NM) with the exception of sonar dipping activities: however, most ASW training involving submarines or submarine targets would occur in waters greater than 183 m (600 ft) deep due to safety concerns about running aground at shallower depths. ASW active sonar activities occurring in specific locations are discussed below.

Helicopter ASW ULT Areas

The helicopter ASW ULTs are the only ASW activity that could occur within 22 km (12 NM) of shore. This activity would be conducted in the waters of the East Coast OPAREAs while

embarked on a surface ship. Helicopter ASW ULT events are also conducted by helicopters deployed from shore-based Jacksonville, Florida, units. These helicopter units use established sonar dipping areas offshore Mayport (Jacksonville), Florida, which are located in territorial waters and within the southeast North Atlantic right whale critical habitat.

SEASWITI Areas

This training exercise generally occurs in deep water off the coast of Jacksonville, Florida.

Group Sail Areas

These events typically take place within and seaward of the VACAPES, CHPT, and JAX/CHASN OPAREAs.

Submarine Command Course Operations Areas

This training exercise typically occurs in the JAX/CHASN and Northeast OPAREAs in deep ocean areas.

Torpedo Exercise Areas

TORPEX can occur anywhere within and adjacent to East Coast and GOMEX OPAREAs. The exception is in the Northeast OPAREA where the North Atlantic right whale critical habitat is located. TORPEX areas that meet current operational requirements for proximity to torpedo and target recovery support facilities were established during previous consultations. Therefore, TORPEX activities in the northeast North Atlantic right whale critical habitat are limited to these established areas.

MIW Training Areas

MIW Training could occur in territorial or non-territorial waters. Independent and Coordinated MIW ULT activities would be conducted within and adjacent to the Pensacola and Panama City OPAREAs in the northern Gulf of Mexico and off the east coast of Texas in the Corpus Christi OPAREA.

The Squadron Exercise (RONEX) or GOMEX Exercise would be conducted in both deep and shallow water training areas.

Object Detection/Navigational Training Areas

Surface Ship training would be conducted primarily in the shallow water port entrance and exit lanes for Norfolk, Virginia and Mayport, Florida. The transit lane servicing Mayport, FL crosses through the southeast North Atlantic right whale critical habitat.
Submarine training would occur primarily in the established submarine transit lanes entering/exiting Groton, Connecticut, Norfolk, Virginia, and Kings Bay, Georgia. The transit lane servicing Kings Bay, GA crosses through the southeast North Atlantic right whale critical habitat.

Maintenance Areas

Maintenance activities could occur in homeports located in territorial waters, or in the open ocean within non-territorial waters.

Surface Ship Sonar Maintenance Areas

Surface ships would be operating their active sonar systems for maintenance while pierside within their homeports, located in either Norfolk, Virginia or Mayport, Florida. Additionally open ocean sonar maintenance could occur anywhere within the non-territorial waters of the AFAST Study Area as the system's performance may warrant.

Submarine Sonar Maintenance Areas

Submarines would conduct maintenance to their sonar systems pierside in their homeports of either Groton, Connecticut; Norfolk, Virginia; or Kings Bay, Georgia. Additionally, sonar maintenance could occur anywhere within the non-territorial waters of the AFAST Study Area as the system's performance may warrant.

RDT&E Areas

For RDT&E activities included in this analysis, active sonar activities occur in similar locations as representative training events.

Federal Consistency Review

Georgia's CMP is comprised of 33 state codes, which constitute the enforceable policies of the CMP. State codes addressed as part of the Georgia CMP consistency review and considered in the analysis of the Proposed Action are discussed in Table F-3. The U.S. Navy has determined that the AFAST activities are consistent to the maximum extent practicable with the enforceable policies of the Georgia CMP based on the following information, data, and analysis (given as a summary in the table and presented as comprehensive analysis in Chapter 4 of the EIS/OEIS).

Pursuant to 15 CFR § 930.41, the State of Georgia has 60 days from receipt of this document in which to concur with or object to this Consistency Determination, or to request an extension, in writing, under 15 CFR § 930.41(b). Georgia's concurrence will be presumed if the Navy (Atlantic Fleet) does not receive its response by the 60th-day from receipt of this determination. Georgia's response should be sent to Naval Facilities Engineering Command, Atlantic, Attn:

Code EV22 (AFAST Project Manager), 6506 Hampton Blvd., Norfolk, Virginia 23508-1278.

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Table F-3. Georgia Coastal Management Program Consistency Review

Enforceable Policies (Official Code of Georgia)	Consistency	Scope
OCGA 12-9-1 *Air Quality*	The Proposed Action would not impact air quality. The use of active sonar has no potential for effects to air quality. Potential air quality effects associated with airborne transportation (i.e., airplanes or helicopters) is being analyzed under the individual TAP EIS/OEISs.	Establishes the state standards and programs, where necessary, for air quality, air emissions, construction, and release of hazardous air contaminants.
OCGA 27-4-251 *Aquaculture Development*	The Proposed Action would not impact procedures of the Aquaculture Development Commission.	Establishes the commission to study development of aquaculture.
OCGA 52-7-1 *Boat Safety*	The proposed Navy AFAST activities would not impact the safety of recreational or commercial vessels. A NOTAM and NOTMAR would be provided as required prior to AFAST exercises. Temporary disruptions to recreational and commercial fisheries could occur, but would be localized and for a short duration. No long-term effects to these resources would occur.	Provides safe boating standards on lakes, rivers, and coastal waters. Prohibits boating except at piers and marinas in waters 1,000 feet or less from Jekyll Island, Tybee Island, St. Simons Island, and Sea Island.
OCGA 12-5-320 *Coastal Management*	The Proposed Action would not impact planning activities within the coastal zone or the implementation of development requirements.	Addresses the requirements for development and implementation of coastal resource protection and their sustainable development. Requires the coordination of agencies when planning activities in the coastal zone.
OCGA 12-5-280 *Coastal Marshlands Protection*	The Proposed Action would not take place on land. Therefore, no significant impacts would occur to tidal marshes, mudflats, and marshlands. Training activities would not impact estuaries.	Provides for protection of tidal wetlands through limitations and permitting of activities in these areas. Identifies exempted actions. Includes activities that take place in marshland, intertidal area, mudflats, tidal water bottoms, and salt marsh area within estuarine areas.
OCGA 12-5-370 *Safe Dams*	The Proposed Action would not impact inspections and permitting for dams.	Protects public health, safety, and welfare through inspections and permitting for dams.
OCGA 12-5-170 *Safe Drinking Water*	The Proposed Action would not impact the quality of drinking water in the state.	Addresses the state's policy concerning water resources.

Table F-3. Georgia Coastal Management Program Consistency Review, Cont'd

Enforceable Policies (Official Code of Georgia)	Consistency	Scope
OCGA 27-3-130 *Endangered Wildlife*	No effects to any terrestrial species would occur as a result of the Proposed Action. Effects to endangered marine wildlife resources (sea turtles and marine mammals) would be addressed through the federal consultation processes (a Biological Evaluation [Appendix I of the EIS/OEIS] and a Letter of Authorization) with the National Marine Fisheries Service.	Provides for protection of species that are rare, unusual, or in danger of extinction. Extends only to species on public lands.
OCGA 12-16-1 *Environmental Policy*	The Proposed Action is a federal agency activity.	Requires state agencies to prepare environmental impact reports.
OCGA 12-7-1 *Erosion and Sedimentation Control*	The Proposed Action does not include any construction activities and would not take place on land.	Requires counties and municipalities to establish procedures for land-disturbance activities. Identifies permit requirements, exemptions, and best management practices.
OCGA 27-1-3 *Game and Fish Code*	The proposed Navy training would not impact terrestrial wildlife or freshwater wildlife resources. No activities would take place on land or in any freshwater rivers, creek, streams, or lakes.	Provides regulations for protection, management and conservation of terrestrial and fresh water wildlife resources. Identifies responsible agencies for licensing and permitting recreational and commercial fish and wildlife activities.
OCGA 12-5-90 *Groundwater Use*	The Proposed Action would not require a permit related to the Groundwater Use Act. There would be no effect to water quality or in particular, to groundwater.	Establishes regulations for development and implementation of water conservation plans. Includes coastal groundwater management plan for water conservation, protection from saltwater encroachment, reasonable uses, future development and economic development.
OCGA 12-8-60 *Hazardous Waste Management*	AFAST activities would not result in significant quantities of hazardous materials. Small quantities of standard maintenance and repair materials (e.g., solder flux, flux remover, isopropyl alcohol, and petroleum products) may be used as needed and would be disposed of in accordance with all applicable regulations.	Regulates all aspects of hazardous waste including generation, transport, storage, treatment, and disposal.
OCGA 12-3-70 *Heritage Trust*	The Proposed Action would not impact historical resources of the state and would avoid significant natural areas.	Preserves certain property with unique characteristics, historical significance, or recreational value. Most of the Heritage 2000 Program replaces the administration of the act.

Table F-3. Georgia Coastal Management Program Consistency Review, Cont'd

Enforceable Policies (Official Code of Georgia)	Consistency	Scope
OCGA 12-3-50 *Historic Areas*	The Proposed Action would not impact historical resources of the state. Additionally, the Navy would avoid all known cultural resources; however, if effects to cultural resources are anticipated, consultation with the applicable agencies, including the SHPO would be initiated as required in accordance with Section 106 of the National Historic Preservation Act and in accordance with OGCA 12-3-50.	Addresses management and preservation of the state's archaeological and historical resources.
OCGA 12-3-90 *Natural Areas*	The Proposed Action would not have a significant impact to natural areas including estuarine research reserves, and aquatic preserves. There would be no effect to the Gray's Reef National Marine Sanctuary as a result of the Proposed Action.	Identifies and preserves areas with unusual ecological significance. The goals of the act are to preserve natural plant or animal communities, rare or valuable members, and other natural features of significant scientific, educational, geologic, ecological, or scenic value.
OCGA 12-4-40 *Oil and Gas and Deep Drilling*	The Proposed Action would not affect oil or gas drilling activities or involve any deep-water drilling.	Protects underground freshwater supplies and certain environmentally sensitive areas. Sets forth standards to prevent pollution, waste, fire, and spillage related to oil, gas, or mineral exploration.
OCGA 12-4-100 *Phosphate Mining*	The Proposed Action would not take place on land; therefore, no effects would occur to phosphate mining.	Oversees licenses for mining phosphate deposits.
OCGA 50-16-61 *Revocable License Program*	The Proposed Action does not involve construction or land activities.	Allows for the issuance of revocable licenses for recreational docks on state-owned tidal water bottoms.
OCGA 52-1-30 *Right of Passage*	The Proposed Action would not result in the closure of public access areas in state waters. A NOTAM and NOTMAR would be provided as required prior to AFAST exercises. Temporary disruptions to recreational and commercial fisheries could occur, but would be localized and for a short duration. No long-term effects to these resources would occur.	Provides for the use of all waterways by citizens.
OCGA 12-2-1 *River Corridor Protection*	The Proposed Action would not affect river corridors, mountains, watersheds, or wetlands. No activities associated with AFAST would create sedimentation or erosion.	Protects river corridors, mountains, watersheds, and wetlands. Provides protective measures for erosion and sedimentation and inclusion in management plans.
OCGA 12-5-350 *Scenic Rivers*	The Proposed Action would not impact any scenic rivers.	Designates rivers with valuable scenic, recreational, or natural characteristics for present and future generations.
OCGA 12-3-110 *Scenic Trails*	The Proposed Action would not take place on land; therefore, no effects to scenic trails would occur.	Establishes a scenic trails program.

Table F-3. Georgia Coastal Management Program Consistency Review, Cont'd

Enforceable Policies (Official Code of Georgia)	Consistency	Scope
OCGA 31-2-7 and OCGA 31-3-5.1 *Septic Tank Law*	The Proposed Action would not impact shoreline sanitation and does not include any construction or installation activities.	Regulates septic tanks including safe placement, installation, and maintenance.
OCGA 27-4-190 *Shellfish*	The Proposed Action would not result in any effects to shellfish harvesting areas and would not affect the management of shellfish resources.	Provides the regulations to harvest shellfish including licensing, approving areas for commercial harvest, and water quality monitoring.
OCGA 2-5-230 *Shore Protection*	The Proposed Action would not adversely affect the shoreline or access to the beach as no land activities would occur.	Provides for protection and management of sand dunes, beaches, sandbars, and shoals. Identifies limitations and permitting requirements related to construction, storage, parking, vehicle operation and related activities. Provides for public access and recreation at or near the beach.
OCGA 12-8-21 *Solid Waste Management*	The Proposed Action would not involve the generation of solid waste within the state's coastal zone. All solid waste disposals would be conducted in accordance with U.S. Navy policies and procedures.	Sets forth the rules for solid waste handling facilities and processes to site new facilities.
O.G.C. 12-4-70 *Surface Mining*	The Proposed Action would not impact surface mining.	Regulates surface mining in the state and coastal zone.
O.G.C. 52-1-1 *Protection of Tidewaters*	The Proposed Action would not result in the closure of areas within state tidewaters. No removal of structures or construction activities would occur.	Provides for the use of all tidewaters by citizens. Allows for removal of structures.
O.G.C. 12-13-1 *Underground Storage Tank*	The Proposed Action does not include any construction or operation of landside facilities. There would be no landside activities.	Provides regulations to operate, detect releases, take corrective actions, and enforce the use of underground storage tanks. Ensures the protection of human health and safety and protection and maintenance of groundwater quality and surface water resources from contamination
OCGA 12-5-20 *Water Quality Control*	There would be no significant impact to water quality and no significant harm to water quality from expended components associated with the Proposed Action.	Ensures that water uses are prudent, maintains or restores purity, and provides an adequate supply. Regulates the use of rivers, streams, lakes, and subsurface waters for public and private water supply; and agricultural, industrial, and recreational uses is provided. Requires compliance with the Georgia Water Quality Control Act for activities in the coastal zone including tourism and recreation, manufacturing and transportation, and other activities here.

Table F-3. Georgia Coastal Management Program Consistency Review, Cont'd

Enforceable Policies (Official Code of Georgia)	Consistency	Scope
OCGA 12-5-120 *Water Wells Standards*	The Proposed Action would not include the construction, operation, or maintenance of water wells.	Requires compliance with the Water Wells Standards Act and regulates the siting, construction operation, maintenance, and abandon of wells and boreholes. Authorizes a council to adopt and amend rules to govern the licensing of well contractors.
OCGA 12-6-170 *Wildflower Preservation*	The Proposed Action would not occur on land.	Designates and protects plant species that are rare, unusual, or in danger of extinction on public lands.

1 OCGA = Official Code of Georgia; AFAST = Atlantic Fleet Active Sonar Training; CMP = Coastal Management Program; EIS = Environmental Impact Statement;
2 ESA = Endangered Species Act; IEER = Improved Extended Echo Ranging; NOTAM = Notice to Airmen; NOTMAR = Notice to Mariners; OEIS = Overseas
3 Environmental Impact Statement; SHPO = State Historic Preservation Officer; TAP = Theater Assessment Program; U.S. = United States

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FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR TEXAS

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FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR TEXAS

This document provides the State of Texas with the Department of the Navy's (DON) Consistency Determination under CZMA 16 U.S.C. § 1456 Section 307 (c) (1) [or (2)] and 15 Code of Federal Regulations (CFR) § 930 (c), for the Atlantic Fleet Active Sonar Training (AFAST) activities proposed for the United States (U.S.) Atlantic East Coast and the Gulf of Mexico. The information in this Consistency Determination is provided pursuant to 15 CFR § 930.39.

The location of AFAST activities that have the potential to affect Texas's coastal zone resources are described in detail under the Proposed Federal Agency Action summary of this CZMA Consistency Determination.

The following information is based on review of the Texas Coastal Management Program (CMP) as well as information published by the State of Texas's, General Land Office (GLO).

The State of Texas requires that federal agencies conduct a CZMA Consistency Determination for certain direct federal actions, federal permits and licenses, and federal assistance programs that occur within the state's designated coastal zone and have the potential to affect the state's coastal zone resources.

Texas's Coastal Zone is defined in Texas Administrative Code (T.A.C.) § 503.1 as the area seaward of the Texas coastal facility designation line which roughly follows roads that are parallel to coastal waters and wetlands generally within one mile of tidal rivers. The boundary encompasses all or portions of 18 coastal counties. The seaward boundary is 16.7 km (9 nautical miles [NM]) into the Gulf of Mexico.

The Navy AFAST activities encompass direct federal activities that would take place inside the State of Texas's coastal zone. Based on analysis within the EIS/OEIS, the scope of activities requires a CZMA Consistency Determination because they have the potential to occur within and the potential to impact the waters of the open Gulf of Mexico, Coastal Natural Resources Areas (CNRA's) of the State of Texas, **Texas Natural Resources Code, §33.203(1).**

Activities that have the Potential to Impact Texas' Coastal Zone

Under the Proposed Action, the following activities have the potential to impact Texas' coast:

- Independent and Coordinated MIW ULT activities off the east coast of Texas in the Corpus Christi OPAREA.

Proposed Federal Agency Action

The Proposed Action is for the Navy to designate areas where mid- and high-frequency active sonar and improved extended echo ranging (IEER) system training, maintenance, and RDT&E

activities will occur within and adjacent to existing operating areas (OPAREAs), and to conduct these activities. These areas are located in the ocean along the East Coast of the U.S. and within the Gulf of Mexico (refer to Chapter 2 of the AFAST EIS/OEIS for specific locations of Navy OPAREAs). Navy OPAREAs include designated ocean areas near fleet concentration areas (i.e., homeports). OPAREAs are where the majority of routine Navy training and RDT&E takes place. However, Navy training exercises are not confined to the OPAREAs. Some training exercises or portions of exercises are conducted seaward of the OPAREAs and a limited amount of active sonar use is conducted in water areas shoreward of the OPAREAs.

The purpose of the Proposed Action is to support the requirements of the Fleet Readiness Training Plan (FRTP) and stay proficient in Anti-Submarine Warfare (ASW) and Mine Warfare (MIW) skills. The FRTP is the Navy's training cycle that requires naval forces to build up in preparation for operational deployment and to maintain a high level of proficiency and readiness while deployed. Basic combat skills are learned and practiced during Independent Unit Level Training (ULT) activities. These basic skills are then refined at the Coordinated ULT and Strike Group training activities as progressively more difficult, complex, and larger-scale "integrated training" exercises are conducted at an increasing tempo.

Surface ships and submarines participating in the training also must conduct active sonar maintenance pier side and during transit to the training exercise location. Active sonar maintenance is required to ensure that the sonar system is operating properly before engaging in the training exercise or when the sonar systems are suspected of operating at levels below optimal performance. Active sonar maintenance includes both pier-side and at-sea activities. These activities are required before deployment, after major sonar array maintenance, and when the systems are suspected of not operating at optimal levels. Submarine sonar maintenance activities are generally conducted in shallow water near the submarine's homeport of either Groton, Connecticut; Norfolk, Virginia; or Kings Bay, Georgia. Surface ship sonar maintenance activities are generally conducted in shallow water near the homeports of Mayport, Florida or Norfolk, Virginia.

Under the Navy's Preferred Alternative described in the EIS/OEIS, the No Action Alternative, the Navy would continue conducting active sonar activities year-round within and adjacent to existing OPAREAs, rather than designate active sonar areas or areas of increased awareness. Locations where AFAST activities could occur are summarized below.

ASW Training Areas

ASW activities for all platforms could occur within and adjacent to existing East Coast OPAREAS beyond 22.2 km (12 NM) with the exception of sonar dipping activities: however, most ASW training involving submarines or submarine targets would occur in waters greater than 183 m (600 ft) deep due to safety concerns about running aground at shallower depths. ASW active sonar activities occurring in specific locations are discussed below.

Helicopter ASW ULT Areas

The helicopter ASW ULTs are the only ASW activity that could occur within 22 km (12 NM) of shore. This activity would be conducted in the waters of the East Coast OPAREAs while embarked on a surface ship. Helicopter ASW ULT events are also conducted by helicopters deployed from shore-based Jacksonville, Florida, units. These helicopter units use established sonar dipping areas offshore Mayport (Jacksonville), Florida, which are located in territorial waters and within the southeast North Atlantic right whale critical habitat.

SEASWITI Areas

This training exercise generally occurs in deep water off the coast of Jacksonville, Florida.

Group Sail Areas

These events typically take place within and seaward of the VACAPES, CHPT, and JAX/CHASN OPAREAs.

Submarine Command Course Operations Areas

This training exercise typically occurs in the JAX/CHASN and Northeast OPAREAs in deep ocean areas.

Torpedo Exercise Areas

TORPEX can occur anywhere within and adjacent to East Coast and GOMEX OPAREAs. The exception is in the Northeast OPAREA where the North Atlantic right whale critical habitat is located. TORPEX areas that meet current operational requirements for proximity to torpedo and target recovery support facilities were established during previous consultations. Therefore, TORPEX activities in the northeast North Atlantic right whale critical habitat are limited to these established areas.

MIW Training Areas

MIW Training could occur in territorial or non-territorial waters. Independent and Coordinated MIW ULT activities would be conducted within and adjacent to the Pensacola and Panama City OPAREAs in the northern Gulf of Mexico and off the east coast of Texas in the Corpus Christi OPAREA.
The Squadron Exercise (RONEX) or GOMEX Exercise would be conducted in both deep and shallow water training areas.

Object Detection/Navigational Training Areas

Surface Ship training would be conducted primarily in the shallow water port entrance and exit lanes for Norfolk, Virginia and Mayport, Florida. The transit lane servicing Mayport, FL crosses through the southeast North Atlantic right whale critical habitat.
Submarine training would occur primarily in the established submarine transit lanes

entering/exiting Groton, Connecticut, Norfolk, Virginia, and Kings Bay, Georgia. The transit lane servicing Kings Bay, GA crosses through the southeast North Atlantic right whale critical habitat.

Maintenance Areas

Maintenance activities could occur in homeports located in territorial waters, or in the open ocean within non-territorial waters.

Surface Ship Sonar Maintenance Areas

Surface ships would be operating their active sonar systems for maintenance while pierside within their homeports, located in either Norfolk, Virginia or Mayport, Florida. Additionally open ocean sonar maintenance could occur anywhere within the non-territorial waters of the AFAST Study Area as the system's performance may warrant.

Submarine Sonar Maintenance Areas

Submarines would conduct maintenance to their sonar systems pierside in their homeports of either Groton, Connecticut; Norfolk, Virginia; or Kings Bay, Georgia. Additionally, sonar maintenance could occur anywhere within the non-territorial waters of the AFAST Study Area as the system's performance may warrant.

RDT&E Areas

For RDT&E activities included in this analysis, active sonar activities occur in similar locations as representative training events.

Federal Consistency Review

The Texas CMP is divided into three components, all of which constitute the enforceable policies of the state's coastal management program. Part One of the Texas CMP addresses the goals of the Texas CMP that guide interpretation and implementation of the program in accordance with 31 T.A.C. § 501.12. Part Two of the Texas CMP identifies the 16 CNRA's that the goals and policies are designed to protect (31 T.A.C. § 501.3). Finally, Part Three lists the 21 policy categories of the Texas CMP. Federal agencies must demonstrate consistency to the maximum extent practicable with all three components of the Texas CMP.

Goals and policies addressed as part of the Texas CMP Consistency review and considered in the analysis of the Proposed Action are discussed in Table F-5. The U.S. Navy has determined that the AFAST activities are consistent to the maximum extent practicable with the enforceable policies of the Texas CMP based on the following information, data, and analysis (given as a summary in the table and presented as comprehensive analysis Chapter 4 of the AFAST EIS/OEIS).

Pursuant to 15 CFR § 930.41, the State of Texas has 60 days from the receipt of this letter in which to concur with or object to this Consistency Determination, or to request an extension under 15 CFR § 930.41(b). Texas's concurrence will be presumed if its response is not received by the U.S. Navy (Atlantic Fleet) by the 60th-day from receipt of this determination. Texas's response should be sent to Naval Facilities Engineering Command, Atlantic, Attn: Code EV22 (AFAST Project Manager), 6506 Hampton Blvd., Norfolk, Virginia 23508-1278.

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1 **Table F-5. Texas Coastal Management Program Consistency Review**

Part I, Goals of the TCMP		
Goals ***Title 31, Part 16, Chapter 501, Subsection B, §501.12***	***Consistency***	***Scope***
Goal 1	The Proposed Action would not affect the goals and policies of the TCMP.	To preserve, protect, restore, and enhance the diversity, quality, quantity, functions and values of CNRAs.
Goal 2	The Proposed Action would not affect the goals and policies of the TCMP.	To ensure sound management of all coastal resources by allowing for compatible economic development and multiple human uses of the coastal zone
Goal 3	The Proposed Action would not affect the goals and policies of the TCMP.	To minimize loss of human life and property due to the impairment and loss of protective features of CNRAs.
Goal 4	The Proposed Action would not affect the goals and policies of the TCMP.	To ensure and enhance planned public access to and enjoyment of the coastal zone in a manner that is compatible with private property rights and other uses of the coastal zone.
Goal 5	The Proposed Action would not affect the goals and policies of the TCMP.	To balance the benefits from economic development and multiple human uses of the coastal zone, the benefits from protecting, preserving, restoring, and enhancing CNRAs, the benefits from minimizing loss of human life and property, and the benefits from public access to and enjoyment of the coastal zone.
Goal 6	The Proposed Action would not affect the goals and policies of the TCMP.	To coordinate agency and subdivision decision-making affecting CNRAs by establishing clear, objective policies for the management of CNRAs.
Goal 7	The Proposed Action would not affect the goals and policies of the TCMP.	To make agency and subdivision decision-making affecting CNRAs efficient by identifying and addressing duplication and conflicts among local, state, and federal regulatory and other programs for the management of CNRAs.
Goal 8	The Proposed Action would not affect the goals and policies of the TCMP.	To make agency and subdivision decision-making affecting CNRAs more effective by employing the most comprehensive, accurate, and reliable information and scientific data available and by developing, distributing for public comment, and maintaining a coordinated, publicly accessible geographic information system of maps of the coastal zone and CNRAs at the earliest possible date.

Table F-5. Texas Coastal Management Program Consistency Review, Cont'd

Goal 9	The Proposed Action would not affect the goals and policies of the TCMP.	To make coastal management processes visible, coherent, accessible, and accountable to the people of Texas by providing for public participation in the ongoing development and implementation of the Texas CMP.
Goal 10	The Proposed Action would not affect the goals and policies of the TCMP.	To educate the public about the principle coastal problems of state concern and technology available for the protection and improved management of the CNRAs.
Part II, Coastal Natural Resource Areas (CNRAs)		
Identification of Area	***Consistency***	***Definition of Area*** ***Texas Natural Resources Code, §33.203(1)***
Waters of the Open Gulf of Mexico	The Proposed Action would occur within the open waters of the Gulf of Mexico. Effects to endangered wildlife resources (sea turtles and ESA-listed marine mammals) would be addressed through the federal consultation process (a Biological Evaluation [Appendix I of the EIS/OEIS] with the National Marine Fisheries Service. A Notice to Airmen (NOTAM) and Notice to Mariners (NOTMAR) would be provided as required prior to AFAST exercises. Temporary disruptions to recreational and commercial fisheries could occur, but would be localized and for a short duration. No long-term effects to these resources would occur. The Texas Parks and Wildlife Department would be provided a copy of this consistency determination and would have an opportunity to provide comments pertaining to the Proposed Action.	Waters seaward of costal barrier islands and bays and estuaries and extending to the territorial limits of the state.
Waters under Tidal Influence	The Proposed Action would not occur within the state's bays, estuaries, and rivers.	Those waters in the state that are contained behind coastal barrier islands and within bays and estuaries and rivers to the inland extent of tidal influence are considered "coastal waters".
Submerged Lands	The Proposed Action is not anticipated to impact submerged lands.	Those lands underlying waters under tidal influence or waters of the open Gulf of Mexico that are owned by an agency or subdivision of the state, or by a person other than the state.

Table F-5. Texas Coastal Management Program Consistency Review, Cont'd

Coastal Wetlands	The Proposed Action would not occur on land and therefore, no coastal wetlands would be impacted.	Coastal wetlands are those areas having a predominance of hydric soils that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, the growth and regeneration of hydrophytic vegetation, as defined in the Texas Water Code, Chapter 11, Subsection J.
Submerged Aquatic Vegetation	The Proposed Action would not impact rooted aquatic vegetation.	Rooted aquatic vegetation growing in permanently inundated areas in estuarine and marine systems.
Tidal Sands and Mud Flats	The Proposed Action would not occur within tidal sands or mud flats.	Silt, clay, or sand substrates, unvegetated or vegetated by algal mats that occur in the intertidal zone and are regularly or intermittently exposed and flooded by tides.
Oyster Reefs	The Proposed Action would not impact oyster reefs.	Natural or artificial formations in intertidal or subtidal areas that are composed of oyster shell, live oysters, and other organisms and that are discrete, contiguous, and clearly distinguishable from scattered oysters.
Hard substrate reefs	The Proposed Action would not impact hard substrate reefs.	Naturally occurring hard substrate formations, such as rock outcrops or serpulid worm reefs (living or dead), in intertidal or subtidal areas that are discrete and contiguous.
Coastal Barriers	The Proposed Action would not impact coastal barriers of the state of Texas.	Undeveloped areas on barrier islands and peninsulas or otherwise protected areas, as mapped by the U.S. Fish and Wildlife Service. Barrier islands are Galveston, Matagorda, San Jose, Mustang, and North and South Padre islands.
Coastal Shore Areas	The Proposed Action would not occur on land.	All areas within 100 feet landward of the high water mark on submerged land.
Gulf Beaches	The Proposed Action would not impact Gulf beaches.	Beaches bordering the Gulf of Mexico that extends inland from the line of mean low tide to the natural line of vegetation bordering on the seaward shore of the Gulf of Mexico.
Critical Dune Areas	The Proposed Action would not occur on land and therefore, would not impact critical dune areas.	Protected sand dune complexes on the Gulf shoreline within 1,000 feet of mean high tide.
Special Hazard Areas	The Proposed Action would not occur on land and therefore would not impact special hazards areas as defined on Flood Insurance Rate Maps.	Areas designated by the administrator of the Federal Insurance Administration under the National Flood Insurance Act as having special flood, mudslide, and/or flood-related erosion hazards, and shown on a Flood Hazard Boundary Map or Flood Insurance Rate Map as Zone A, AO, A1-30, AE, A99, AH, VO, V1-30, VE, V, M, or E.

Table F-5. Texas Coastal Management Program Consistency Review, Cont'd

Critical Erosion Areas	The Proposed Action would not facilitate the erosion of Gulf and Bay shorelines.	Those Gulf and Bay shorelines that are undergoing erosion and are designated by the commissioner of the GLO under Texas Natural Resources Code, 33.601(b).
Coastal Historic Areas	The Proposed Action would not impact historical resources of the state. Additionally, the Navy would avoid all known cultural resources; however, if effects to cultural resources are anticipated, consultation with the applicable agencies, including the State Historic Preservation Officer (SHPO) would be initiated in accordance with Section 106 of the National Historic Preservation Act and in accordance with the TCMP.	Sites in the National Register of Historic Places on public land and state archaeological landmarks that are identified by the Texas Historical Commission as being coastal in character.
Coastal Preserves	The Proposed Action would not occur within any state parks, recreation areas, wildlife refuges, or wildlife management areas. The Proposed Action would not impact historical resources of the state. Additionally, the Navy would avoid all known cultural resources; however, if effects to cultural resources are anticipated, consultation with the applicable agencies, including the State Historic Preservation Officer (SHPO) would be initiated in accordance with Section 106 of the National Historic Preservation Act and in accordance with the TCMP.	Any lands owned by the state that are designated and used as parks, recreation areas, scientific areas, wildlife management areas, wildlife refuges, or historic sites and that are designated by the Texas Parks and Wildlife Department as being coastal in character.
Part III, Policies of the Texas CMP		
Policies Texas Administrative Code Title 31, Part 16, Chapter 501, Subsection B	***Consistency***	***Scope***
§ 501.13 *Administrative Policies*	The Proposed Action is a federal agency action.	Provides directives for agency and subdivision rules and ordinances subject to the TCMP goals and policies, as provided in 31 TAC 501.10 (relating to Compliance with Goals and Policies).
§ 501.15 *Policy for Major Actions*	The Proposed Action is a federal agency action and is consistent to the maximum extent practicable with the goals and policies of this chapter. The state of Texas will be provided the opportunity to review and comment on the AFAST EIS.	States that prior to taking a major action, the agencies and subdivisions having jurisdiction over the activity shall meet and coordinate their major actions relating to the activity. No agency or subdivision shall take a major action that is inconsistent with the goals and policies of the chapter.
§ 501.16 *Construction of Electric Generating and Transmission Facilities*	The Proposed Action would not involve the construction of any facilities.	Regulates the construction of electric generating facilities and electric transmission lines in the coastal zone.

Table F-5. Texas Coastal Management Program Consistency Review, Cont'd

§ 501.17 *Construction, Operation, and Maintenance of Oil and Gas Exploration and Production Facilities*	The Proposed Action would not involve the construction or operation of oil and gas facilities or involve any exploration for oil and gas.	Regulates oil and gas exploration and production on submerged lands.
§ 501.18 *Discharges of Wastewater and Disposal of Waste from Oil and Gas Exploration and Production Activities*	The Proposed Action would not involve the discharge of any oil and gas wastewater.	Regulates the disposal of oil and gas waste in the coastal zone and the discharge of oil and gas exploration and production wastewater in the coastal zone.
§ 501.19 *Construction and Operation of Solid Waste Treatment, Storage, and Disposal Facilities*	The Proposed Action would not involve construction or operation of solid waste facilities. No hazardous waste would be placed within the coastal zone. All solid and hazardous waste generated during AFAST activities will be disposed of in accordance with U.S. Navy regulations and policies and would not affect the state of Texas's CNRAs.	Regulates the construction and operation of new and existing solid waste facilities and hazardous waste facilities located within the coastal zone.
§ 501.20 *Prevention, Response, and Remediation of Spills*	The Proposed Action would not involve the discharge of oil.	Governs the prevention of, response to and remediation of coastal oil spills and provides for measures to prevent coastal oil spills and to ensure adequate response and removal actions. Also governs the assessment of damages to natural resources injured as the result of an unauthorized discharge of oil into coastal waters.
§ 501.21 *Discharge of Municipal and Industrial Wastewater to Coastal Waters*	The U.S. Navy follows the standards for incidental liquid discharges from vessels of the Armed Forces, effective 9 June 1999. A National Pollutant Discharge Elimination System (NPDES) permit is not required for: ● Effluent from properly functioning oil/water separators; ● Sewage (when discharge is necessary); ● Graywater; ● Cooling water; ● Boiler and steam generator blowdown; ● Weather deck runoff, including fresh water washdowns, and, ● Ballast water. No significant effect to water quality would occur from batteries, torpedoes, or explosive packages of IEERs based on their properties (i.e., solubility, slow corrosion rates).	Requires compliance with the Clean Water Act, 33 United States Code Annotated, §§1251 et seq, and its implementing regulations at Code of Federal Regulations, Title 40. Includes establishing surface water quality standards in order to protect designated uses of coastal waters, including the protection of uses for water supply, recreational purposes, and propagation and protection of terrestrial and aquatic life, and establishing water-quality-based effluent limits, including toxicity monitoring and specific toxicity or chemical limits as necessary to protect designated uses of coastal waters.

Table F-5. Texas Coastal Management Program Consistency Review, Cont'd

§ 501.22 *Nonpoint Source (NPS) Water Pollution*	The Proposed Action would not involve underground storage tanks as all activities would occur in water. No significant effects to coastal waters would occur as a result of AFAST activities.	Calls for the development and implementation of a coordinated program to reduce NPS pollution in order to restore and protect coastal waters. Requires that on-site disposal systems and underground storage tanks be located, designed, operated, inspected, and maintained so as to prevent releases of pollutants that may adversely affect coastal waters.
§ 501.23 *Development in Critical Areas*	There would be no development or construction activities within critical areas. No dredging or filling would occur as a result of the Proposed Action.	Regulates the dredging and construction of structures in, or the discharge of dredged or fill material into, critical areas. Provides framework for compensatory mitigation and includes restoring adversely affected critical areas or replacing adversely affected critical areas by creating new critical areas.
§ 501.24 *Construction of Waterfront Facilities and Other Structures on Submerged Lands*	The Proposed Action would not involve construction of any waterfront facilities.	Regulates the construction of waterfront facilities such as docks, marinas, piers, wharves, and artificial reefs on submerged lands of the state.
§ 501.25 *Dredging and Dredged Material and Placement*	The Proposed Action would not involve dredging activities.	Provides policies for the dredging and disposal and placement of dredged material to avoid and otherwise minimize adverse effects to coastal waters, submerged lands, critical areas, coastal shore areas, and Gulf beaches.
§ 501.26 *Construction in the Beach/Dune System*	The Proposed Action would not involve the construction of facilities within the beach/dune system.	Regulates the construction of facilities within the beach/dune system.
§ 501.27 *Development in Coastal Hazard Areas*	The Proposed Action would not involve development or construction within any coastal hazard areas.	Provides construction regulations and provisions for adopting ordnances for residential subdivisions participating in the National Flood Insurance Program. Also requires the Texas General Land Office (GLO) to adopt or issue rules, recommendations, standards, and guidelines for erosion avoidance and remediation and for prioritizing critical erosion areas.
§ 501.28 *Development Within Coastal Barrier Resource System Units and Otherwise Protected Areas on Coastal Barriers*	The Proposed Action would not involve the development of any new infrastructure or construction.	Provides policies for the development of new infrastructure or major repair of existing infrastructure within or supporting development within Coastal Barrier Resource System Units and Otherwise Protected Areas.
§ 501.29 *Development in State Parks, Wildlife Management Areas or Preserves*	The Proposed Action would not involve any development within state lands.	Provides that the development by a person other than the Texas Parks and Wildlife Department that requires the use or taking of any public land in such areas shall comply with Texas Parks and Wildlife Code, Chapter 26.

Table F-5. Texas Coastal Management Program Consistency Review, Cont'd

§ 501.30 *Alteration of Coastal Historic Areas*	The Proposed Action would not impact historical resources of the state. Additionally, the Navy would avoid all known cultural resources; however, if effects to cultural resources are anticipated, consultation with the applicable agencies, including the State Historic Preservation Officer (SHPO) would be initiated as required by Section 106 of the National Historic Preservation Act and in accordance with Texas Administrative Code §501.30.	Development affecting a coastal historic area shall avoid and otherwise minimize alteration or disturbance of the site unless the site's excavation will promote historical, archaeological, educational, or scientific understanding. Also requires the Texas Historical Commission (THC) comply with the policies in this section when adopting rules and issuing permits under the Texas Natural Resources Code, Chapter 191, and governing alteration of coastal historic areas. The THC shall comply with the policies in this section when issuing reviews under the National Historic Preservation Act, §106 (16 United States Code Annotated, §470f).
§ 501.31 *Transportation Projects*	The Proposed Action would not involve the construction of any transportation infrastructure.	Requires transportation projects located within the coastal zone to comply with specific policies pertaining to pollution prevention, minimization of development within wetland areas, and effects to recreational areas.
§ 501.32 *Emission of Air Pollutants*	The Proposed Action would not impact air quality. The use of active sonar has no potential for effects to air quality. Potential air quality effects associated with airborne transportation (i.e., airplanes or helicopters) is being analyzed under the individual Theater Assessment Program (TAP) EIS/OEISs.	Governs emissions of air pollutants, and requires compliance with regulations at Code of Federal Regulations, Title 40, adopted pursuant to the Clean Air Act, 42 United States Code Annotated, §§7401, et seq, to protect and enhance air quality in the coastal area so as to protect CNRAs and promote the public health, safety, and welfare.
§ 501.33 *Appropriations of Water*	The Proposed Action would not require the diversion or impoundment of any state waters.	Provides policies for the impoundment and diversion of state water within 200 stream miles of the coast.
§ 501.34 *Levee and Flood Control Projects*	The Proposed Action would not involve any land activities.	Regulates the drainage, reclamation, channelization, levee construction or modification, or flood- or floodwater-control infrastructure of projects.

CNRA = Coastal Natural Resource Areas; GLO = General Land Office; NOTAM; Notice to Airmen; NOTMAR; Notice to Mariners; NPS = Non Point Source; T.A.C. = Texas Administrative Code; TAP = Theater Assessment Program; THC = Texas Historical Commission

Table F-5. Texas Coastal Management Program Consistency Review, Cont'd

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FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR VIRGINIA

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FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT (CZMA) CONSISTENCY DETERMINATION FOR VIRGINIA

This document provides the Commonwealth of Virginia with the Department of the Navy's (DON) Consistency Determination under CZMA 16 U.S.C. § 1456 Section 307 (c) (1) [or (2)] and 15 Code of Federal Regulations (CFR) § 930 (c), for the Atlantic Fleet Active Sonar Training (AFAST) activities proposed for the United States (U.S.) Atlantic East Coast and the Gulf of Mexico. The information in this Consistency Determination is provided pursuant to 15 CFR § 930.39.

The location of AFAST activities that have the potential to affect Virginia's coastal zone resources are described in detail under the Proposed Federal Agency Action summary of this CZMA Consistency Determination.

The following information is based upon review of the Virginia Coastal Resources Management Program (VCP), its enforceable policies, and information provided by the Virginia Department of Environmental Quality (VDEQ).

The Commonwealth of Virginia requires that federal agencies conduct a CZMA Consistency Determination for certain direct federal actions, federal permits and licenses, and federal assistance programs that occur within the state's designated coastal zone and have the potential to affect the state's coastal zone resources.

Virginia's Coastal Zone Management Area includes most of Tidewater Virginia, as defined by the Code of Virginia § 28.2100. In addition, the coastal zone includes coastal waters extending to 5.6 km (3 nautical miles [NM]) into the Atlantic Ocean.

The Navy AFAST activities encompass direct federal activities that would take place inside the Commonwealth of Virginia's coastal zone and at the Navy's homeport in Norfolk, Virginia. Based on analysis within the EIS/OEIS, the scope of activities requires a CZMA Consistency Determination because the activities have the potential to impact federally-listed threatened or endangered species. In accordance with Code of Virginia § 29.1-568, an enforceable policy of the VCP, the "*taking of any fish or wildlife species appearing on any list of threatened or endangered species published by the United States Secretary of the Interior pursuant to the provisions of the federal Endangered Species Act of 1973 (P.L. 93-205), or any modifications or amendments thereto, is prohibited except as provided in § 29.1-568.*"

Activities that have the Potential to Impact Virginia's Coastal Zone

Under the Proposed Action, the following activities have the potential to impact Virginia's coast:

- Surface ship object detection/navigational training in the shallow water port entrance and exit lanes for Norfolk.
- Submarine object detection/navigational training in the established submarine transit lanes entering/exiting Norfolk.
- Surface ship sonar maintenance pier side in Norfolk.

- Submarine sonar maintenance pier side in Norfolk.

Proposed Federal Agency Action

The Proposed Action is for the Navy to designate areas where mid- and high-frequency active sonar and improved extended echo ranging (IEER) system training, maintenance, and RDT&E activities will occur within and adjacent to existing operating areas (OPAREAs), and to conduct these activities. These areas are located in the ocean along the East Coast and within the Gulf of Mexico (refer to Chapter 2 of the AFAST EIS/OEIS for specific locations of Navy OPAREAs). Navy OPAREAs include designated ocean areas near fleet concentration areas (i.e., homeports). OPAREAs are where the majority of routine Navy training and RDT&E takes place. However, Navy training exercises are not confined to the OPAREAs. Some training exercises or portions of exercises are conducted seaward of the OPAREAs and a limited amount of active sonar use is conducted in water areas shoreward of the OPAREAs.

The purpose of the Proposed Action is to support the requirements of the Fleet Readiness Training Plan (FRTP) and stay proficient in Anti-Submarine Warfare (ASW) and Mine Warfare (MIW) skills. The FRTP is the Navy's training cycle that requires naval forces to build up in preparation for operational deployment and to maintain a high level of proficiency and readiness while deployed. Basic combat skills are learned and practiced during Independent Unit Level Training (ULT) activities. These basic skills are then refined at the Coordinated ULT and Strike Group training activities as progressively more difficult, complex, and larger-scale "integrated training" exercises are conducted at an increasing tempo.

Surface ships and submarines participating in the training also must conduct active sonar maintenance pier side and during transit to the training exercise location. Active sonar maintenance is required to ensure that the sonar system is operating properly before engaging in the training exercise or when the sonar systems are suspected of operating at levels below optimal performance. Active sonar maintenance includes both pier-side and at-sea activities. These activities are required before deployment, after major sonar array maintenance, and when the systems are suspected of not operating at optimal levels. Submarine sonar maintenance activities are generally conducted in shallow water near the submarine's homeport of either Groton, Connecticut; Norfolk, Virginia; or Kings Bay, Georgia. Surface ship sonar maintenance activities are generally conducted in shallow water near the homeports of Mayport, Florida or Norfolk, Virginia.

Under the Navy's Preferred Alternative described in the EIS/OEIS, the No Action Alternative, the Navy would continue conducting active sonar activities year-round within and adjacent to existing OPAREAs, rather than designate active sonar areas or areas of increased awareness. Locations where AFAST activities could occur are summarized below.

ASW Training Areas

ASW activities for all platforms could occur within and adjacent to existing East Coast OPAREAS beyond 22.2 km (12 NM) with the exception of sonar dipping activities: however, most ASW training involving submarines or submarine targets would occur in waters greater than 183 m (600 ft) deep due to safety concerns about running aground at shallower depths. ASW active sonar activities occurring in specific locations are discussed below.

Helicopter ASW ULT Areas

The helicopter ASW ULTs are the only ASW activity that could occur within 22 km (12 NM) of shore. This activity would be conducted in the waters of the East Coast OPAREAs while embarked on a surface ship. Helicopter ASW ULT events are also conducted by helicopters deployed from shore-based Jacksonville, Florida, units. These helicopter units use established sonar dipping areas offshore Mayport (Jacksonville), Florida, which are located in territorial waters and within the southeast North Atlantic right whale critical habitat.

SEASWITI Areas

This training exercise generally occurs in deep water off the coast of Jacksonville, Florida.

Group Sail Areas

These events typically take place within and seaward of the VACAPES, CHPT, and JAX/CHASN OPAREAs.

Submarine Command Course Operations Areas

This training exercise typically occurs in the JAX/CHASN and Northeast OPAREAs in deep ocean areas.

Torpedo Exercise Areas

TORPEX can occur anywhere within and adjacent to East Coast and GOMEX OPAREAs. The exception is in the Northeast OPAREA where the North Atlantic right whale critical habitat is located. TORPEX areas that meet current operational requirements for proximity to torpedo and target recovery support facilities were established during previous consultations. Therefore, TORPEX activities in the northeast North Atlantic right whale critical habitat are limited to these established areas.

MIW Training Areas

MIW Training could occur in territorial or non-territorial waters. Independent and Coordinated MIW ULT activities would be conducted within and adjacent to the Pensacola and Panama City OPAREAs in the northern Gulf of Mexico and off the east coast of Texas in the Corpus Christi OPAREA.

The Squadron Exercise (RONEX) or GOMEX Exercise would be conducted in both deep and shallow water training areas.

Object Detection/Navigational Training Areas

Surface Ship training would be conducted primarily in the shallow water port entrance and exit lanes for Norfolk, Virginia and Mayport, Florida. The transit lane servicing Mayport, FL crosses through the southeast North Atlantic right whale critical habitat.
Submarine training would occur primarily in the established submarine transit lanes entering/exiting Groton, Connecticut, Norfolk, Virginia, and Kings Bay, Georgia. The transit lane servicing Kings Bay, GA crosses through the southeast North Atlantic right whale critical habitat.

Maintenance Areas

Maintenance activities could occur in homeports located in territorial waters, or in the open ocean within non-territorial waters.

Surface Ship Sonar Maintenance Areas

Surface ships would be operating their active sonar systems for maintenance while pierside within their homeports, located in either Norfolk, Virginia or Mayport, Florida. Additionally open ocean sonar maintenance could occur anywhere within the non-territorial waters of the AFAST Study Area as the system’s performance may warrant.

Submarine Sonar Maintenance Areas

Submarines would conduct maintenance to their sonar systems pierside in their homeports of either Groton, Connecticut; Norfolk, Virginia; or Kings Bay, Georgia. Additionally, sonar maintenance could occur anywhere within the non-territorial waters of the AFAST Study Area as the system’s performance may warrant.

RDT&E Areas

For RDT&E activities included in this analysis, active sonar activities occur in similar locations as representative training events.

Federal Consistency Review

Table F-6 addresses the enforceable policies of the VCP, which were considered in the consistency review and in the Proposed Action. The U.S. Navy has determined that the AFAST activities are consistent to the maximum extent practicable with the enforceable policies of the VCP based on the following information, data, and analysis (given as a summary in the table and presented as comprehensive analysis in Chapter 4 of the EIS/OEIS).

Pursuant to 15 CFR § 930.41, the Commonwealth of Virginia has 60 days from the receipt of this letter in which to concur with or object to this Consistency Determination, or to request an extension under 15 CFR § 930.41(b). Virginia's concurrence will be presumed if its response is not received by the U.S. Navy (Atlantic Fleet) by the 60th-day from receipt of this determination. The Commonwealth's response should be sent to Naval Facilities Engineering Command, Atlantic, Attn: Code EV22 (AFAST Project Manager), 6506 Hampton Blvd., Norfolk, Virginia

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Table F-6. Virginia Coastal Management Program Consistency Review

Enforceable Policies (Code of Virginia)	Consistency	Scope
§ 28.2-200 to § 28.2-713; § 29.1-100 to § 29.1-750; § 3.1-249.59 to § 3.1-249.62 *Fisheries Management*	The Proposed Action would not impact the management of fishery resources or involve the use of Tributylin. A NOTAM and NOTMAR would be provided as required prior to AFAST exercises. Temporary disruptions to recreational and commercial fisheries could occur, but would be localized and for a short duration. No long-term effects to these resources would occur. Effects to endangered wildlife resources (sea turtles and ESA-listed marine mammals) would be addressed through the federal consultation processes (a Biological Evaluation [Appendix I of the EIS/OEIS] and a Letter of Authorization) with the National Marine Fisheries Service.	Addresses conservation of fishery resources including finfish and shellfish and preservation of fisheries for food and recreation. Includes the Tributylin program to monitor boat activities and painting for compliance with regulations.
§ 28.2-1200 to § 28.2-1213 *Subaqueous Land Management*	The Proposed Action would not impact state-owned bottomlands. Furthermore, the Proposed Action would not impact the management of subaqueous lands.	Presents conditions to grant or deny permits to use state-owned bottomlands.
§ 28.2-1301 to § 28.2-1320; § 62.1-44.15.5 *Tidal and Nontidal Wetlands Management*	The Proposed Action would take place in coastal and offshore waters. No terrestrial actions are associated with the activities. Therefore, wetlands would not be impacted.	Encompasses the tidal wetlands program and the Virginia Water Permit Protection Permit Program (tidal and non-tidal wetlands). The programs ensure wetland preservation and prevention from destruction.
§ 28.2-1400 to § 28.2-1420 *Dunes Management*	The Proposed Action would not impact dunes or dune management. No land activities will occur.	Prevents the destruction and alteration of primary dunes in accordance with the Coastal Primary Sand Dune Protection Act.

Table F-6. Virginia Coastal Management Program Consistency Review Cont'd

Enforceable Policies (Code of Virginia)	Consistency	Scope
§ 10.1-560 *et.seq*. *Non-point Source Pollution Control*	No soil-disturbing projects would be initiated with the Proposed Action. U.S. Navy training occurs in coastal and offshore waters; activities do not include any construction.	Ensures that project designs reduce soil erosion and sediments and nutrients into rivers, bays, and waters.
§ 62.1-44.15 *Point Source Pollution Control*	The U.S. Navy follows the standards for incidental liquid discharges from vessels of the Armed Forces, effective 9 June 1999. An NPDES permit is not required for: ● Effluent from properly functioning oil/water separators; ● Sewage (when discharge is necessary); ● Graywater; ● Cooling water; ● Boiler and steam generator blowdown; ● Weather deck runoff, including fresh water washdowns, and, ● Ballast water. AFAST activities would not result in the generation of significant quantities of hazardous materials. Small quantities of standard maintenance and repair materials (e.g., solder flux, flux remover, isopropyl alcohol, and petroleum products) may be used as needed and would be disposed of in accordance with all applicable regulations.	Implements the Virginia Pollutant Discharge Elimination System permit program, the state's NPDES program pursuant to Section 402 of the Clean Water Act.
§ 32.1-164 through § 32.1-165 *Shoreline Sanitation*	The Proposed Action would not impact shoreline sanitation and does not include any construction or installation activities.	Regulates septic tank installation including suitable soil types and minimum distances from water bodies.
§ 10-1.1300 *Air Pollution Control*	The Proposed Action would not impact air quality. The use of active sonar has no potential for effects to air quality. Potential air quality effects associated with airborne transportation (i.e., airplanes or helicopters) is being analyzed under the individual TAP EIS/OEISs.	Provides the enforceable State Implementation Plan for maintenance and attainment of the National Ambient Air Quality Standards pursuant to the federal Clean Air Act.
§ 10.1-2100 through § 10.1-2114; 9 VAC 10-20-10 *et seq.* *Coastal Lands Management*	The act and its regulations apply to local governments. Furthermore, the Proposed Federal Action will not impact the water quality and economic resources of the Chesapeake Bay.	Implements the Chesapeake Bay Preservation Act and the Chesapeake Bay Preservation Area Designation and Management Regulations.

AFAST = Atlantic Fleet Active Sonar Training; ESA = Endangered Species Act; EIS = Environmental Impact Statement; IEER – Improved Extended Echo Ranging; NOTAM = Notice to Airmen; NOTMAR = Notice to Mariners; NPDES = National Pollutant Discharge Elimination System; OEIS = Overseas Environmental Impact Statement; SHPO = State Historic Preservation Officer; TAP = Theater Assessment Program; U.S. = United States; VAC = Virginia Administrative Code

APPENDIX G

UNDERWATER SOUND CONCEPTS

UNDERWATER SOUND CONCEPTS

G.1 WHAT IS SOUND?

Subjectively, the term *sound* refers to what is heard with the ears. Objectively, sound is a time-varying mechanical disturbance in an elastic medium. In modern usage, sound refers not only to the phenomenon in air that one hears, but also to whatever else is governed by the same physical principles (Pierce, 1989).

Sound is produced when an elastic medium is set into motion, often by a vibrating object within the medium. As the object vibrates, its motion is transmitted to adjacent "particles" of the medium. The motion of these particles is transmitted to adjacent particles, and so on. The result is a mechanical disturbance (the "sound wave") that moves away from the source and propagates at a medium-dependent speed (the "sound speed"). As the sound wave travels through the medium, the individual particles of the medium oscillate about their static positions but do not propagate with the sound wave. As the particles of the medium move back and forth they create small changes, or perturbations, about the static values of the medium density, pressure, and temperature.

G.2 PHYSICAL AND SUBJECTIVE ATTRIBUTES OF SOUND

Sounds may be described in terms of physical and subjective attributes. Physical attributes may be directly measured. Subjective (or psychophysical) attributes may not be directly measured and require a listener to make a judgment about the sound. Physical attributes of a sound at a particular point in space are normally quantified by measuring perturbations in the pressure of the medium that accompany the passage of a sound wave. Two of the most important physical attributes are frequency and amplitude.

Frequency is the physical attribute most closely associated with the subjective attribute ***pitch***; the higher the frequency, the higher the pitch. Frequency is related to the speed at which the medium particles oscillate about their static positions. Frequency is the number of times that the medium pressure varies from its static pressure through a complete cycle in unit time (Galloway, 1988). The unit of frequency is hertz (Hz); 1 Hz is equal to 1 cycle per second. Pure tones have a constant, single frequency. Complex tones contain sound energy at multiple, discrete frequencies, rather than a single frequency (ANSI, 1994).

Amplitude is the physical attribute most closely associated with the subjective attribute ***loudness***. Amplitude is related to the amount that the medium particles vary about their static positions. As the amplitude increases, the loudness also increases.

G.3 IMPULSIVE AND CONTINUOUS – TYPE SOUNDS

Although no standard definitions exist, sounds may be broadly categorized as ***impulsive*** or ***continuous-type***. All non-impulsive sounds (e.g., continuous, varying, intermittent) are collectively referred to as "continuous-type" (NIOSH, 1998). Impulsive sounds feature steep rises and high peaks in the medium pressure, followed by rapid return to the static pressure.

Impulsive sounds have short durations and broad frequency content. Impulsive sounds are often produced by processes involving a rapid release of energy (e.g., chemical explosions) or mechanical effect (e.g., mechanical punch press or pile driving) (Hamernik and Hsueh, 1991).

Although they may have brief durations, most sonar “pings” may be considered to be continuous-type sounds because their durations are relatively long compared to their harmonic period — the time for the medium pressure to move through one complete cycle.

G.4 SOUND METRICS

G.4.1 Sound Pressure

Sound pressure is the incremental variation in a medium’s static pressure as a sound wave travels through it. The unit of sound pressure is the pascal (Pa) (1 Pa = 10 µbar = 1.45×10^{-4} psi).

Instantaneous sound pressure $p(t)$ is the total instantaneous pressure at a point minus the static pressure at that point (ANSI, 1994). Figure G-1 shows instantaneous sound pressures for a hypothetical (a) pure tone and (b) impulsive sound. Instantaneous sound pressure is a time-varying quantity. Standard descriptors used for time-varying quantities, such as the peak value or root-mean-squared value, are also used to describe the instantaneous sound pressure.

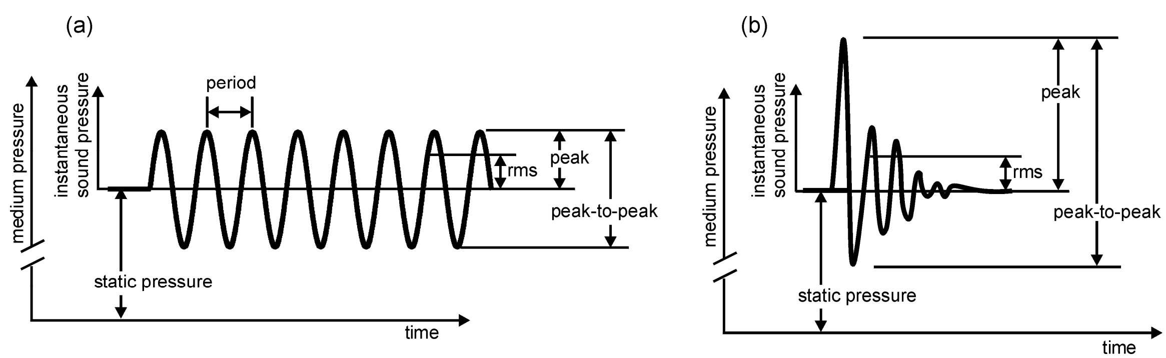

Figure G-1

Peak sound pressure is the maximum absolute value of the instantaneous sound pressure during a specified time interval (ANSI, 1994). The ***peak-to-peak (p-p) sound pressure*** is the difference between the maximum and minimum values of the instantaneous sound pressure.

The ***mean-squared sound pressure*** $\overline{P^2}$ is

$$\overline{P^2} = \frac{1}{T}\int_0^T p^2(t)\,dt\,, \qquad \text{(G-1)}$$

where T is the time over which $p^2(t)$ is integrated. For impulsive sounds the “effective duration” may be defined using different criteria (see Hamernik and Hsueh, 1991). For periodic sounds it is common to integrate over an integral number of periods. For other continuous-type sounds it is common to integrate over long time periods. The unit of $\overline{P^2}$ is pascal-squared (Pa^2).

Since $\overline{P^2}$ does not have the same physical units as $p(t)$, the ***root-mean-squared* (*rms*) *sound pressure*** is often used instead. The rms sound pressure $\overline{P}$ is the square-root of the mean-squared sound pressure:

$$\overline{P} = \sqrt{\frac{1}{T}\int_0^T p^2(t)\,dt}\;. \tag{G-2}$$

For pure tones (with T equal to an integral number of periods), Eq. (B-2) simplifies to $\overline{P} = P_p / \sqrt{2}$, where P_p is the peak sound pressure. This relation may not hold for more complex sounds. In general, $\overline{P}$ must be calculated from Eq. (B-2) using $p(t)$ for the specific sound of interest.

G.4.1.1 Sound Levels and Decibels

Because mammalian ears possess a large dynamic range and humans judge the relative loudness of sounds by the ratio of the sound pressures (a logarithmic behavior), it is common to describe physical attributes of sounds with logarithmic units called ***sound levels*** (Kinsler *et al*., 1982). The term "level" indicates the logarithm of the ratio of a given quantity divided by some reference quantity with the same units (ANSI, 1994; Young, 1988). The use of a logarithmic scale compresses the range of numerical values that must be used.

When using logarithmic units, the base of the logarithm and the reference value must be specified. Typically, the logarithm is taken to the base 10, so the logarithm is written as $\log_{10}$. The logarithm of a number y to a base b is the exponent x required so that b raised to the $x = y$: if $x = \log_b y$, then $y = b^x$. As an example, $\log_{10}(100) = 2$, since $10^2 = 100$. Some important mathematical relations involving logarithms are:

- $\log_b(xy) = \log_b x + \log_b y$
- $\log_b(x/y) = \log_b x - \log_b y$
- $\log_b x^a = a\log_b x$

Sound levels are normally expressed in ***decibels***. A decibel is 1/10 of a bel, a unit of level when the logarithm is to the base ten and the quantities concerned are proportional to power (ANSI, 1994).

To express a quantity X in decibels using a reference X_{ref}, the equation is

$$10\log_{10}\left(\frac{X}{X_{ref}}\right), \tag{G-3}$$

if X and X_{ref} have units of power or energy, or

$$20\log_{10}\left(\frac{X}{X_{ref}}\right)=10\log_{10}\left(\frac{X^2}{X_{ref}^2}\right), \tag{G-4}$$

if X and X_{ref} have units of pressure, force, velocity, voltage, or a similar quantity. The use of X^2 and X_{ref}^2 arises because power is related to the product of pressure and velocity, force and velocity, voltage and current, etc.

When a numeric value is presented in decibels, it is important to also specify the numeric value and units of the reference quantity. Normally the numeric value is given, followed by the text "re", meaning "with reference to", and the numeric value and unit of the reference quantity (Harris, 1998). For example, a pressure of 1 Pa, expressed in decibels with a reference of 1 µPa, is written 120 dB re 1 µPa.

G.4.1.2 Sound Pressure Level

The most common sound level is ***sound pressure level*** (SPL). SPL is defined as

$$SPL = 10\log_{10}\left(\frac{\overline{P^2}}{P_{ref}^2}\right) = 20\log_{10}\left(\frac{\overline{P}}{P_{ref}}\right). \tag{G-5}$$

The standard reference pressure P_{ref} is 1 µPa for water (and media other than gases) and 20 µPa for air (and other gases) (ANSI, 1994). The different reference pressures for air and water means that the same sound pressure will result in different numeric values of SPL in-air and underwater.

G.4.2 Impulse

Impulse is the time integral of a force over the time that the force is applied (ANSI, 1994). ***Acoustic impulse*** I_a, or "impulse per unit area of $p(t)$" (Hamernik and Hsueh, 1991), is defined as

$$I_a = \int_0^T p(t)\,dt\,, \tag{G-6}$$

where T is the effective duration of the waveform. Often the "A-duration", defined as the time required for the instantaneous sound pressure in the initial wave to reach the peak pressure and then return to zero, is used (Hamernik and Hsueh, 1991). Impulse is often used in structural mechanics where the effects of impulsive loads must be taken into account (Hamernik and Hsueh, 1991), in certain source modeling situations (Marshall, 1996), and characterizing some effects of impulsive sounds on marine animals (Marshall, 1996; Yelverton *et al*., 1975). The unit of impulse is the pascal-second (Pa-s).

G.4.3 Sound Intensity

Sound energy transfer and power flow are often described in terms of the sound intensity. ***Sound intensity*** is the average rate of sound energy transported in a specified direction through a unit area perpendicular to the propagation direction. Power is energy per time, so sound intensity is equivalent to ***sound power flux density*** — a measure of the sound power transported through a unit area perpendicular to the propagation direction (Fahy, 1995). The units of sound intensity are watts per square-meter (W/m^2).

Instantaneous sound intensity is the product of the instantaneous sound pressure and instantaneous particle velocity. The instantaneous intensity consists of two parts: the *active intensity* associated with the particle velocity component in-phase with the sound pressure and the *reactive intensity*, which is associated with the particle velocity component in-quadrature (90º out-of-phase) with the sound pressure (Fahy, 1995). The term ***sound intensity*** normally refers to the time-averaged (mean) active intensity (Kinsler *et al*., 1982; Fahy, 1995); this quantity corresponds to local net transport of sound energy. In contrast, the reactive intensity represents local oscillatory transport of energy and has a mean of zero.

For a free plane or spherical wave, the sound intensity in the direction of propagation, I, is

$$I = \frac{\overline{P}^2}{\rho c}, \tag{G-7}$$

where ρ is the medium density and c is the sound speed (ANSI, 1994). Equation (G-7) is only valid for plane and spherical waves and does not apply to the general case, for which both sound pressure and particle velocity must be known to calculate sound intensity.

Sound intensity level (IL) is

$$IL = 10\log_{10}\left(\frac{I}{10^{-12}\ \mathrm{W/m^2}}\right), \tag{G-8}$$

where I is the sound intensity in a given direction (ANSI, 1994).

G.4.4 Sound Energy Flux Density

G.4.4.1 Energy Flux Density

Sound energy can also be described by the ***sound energy flux density*** (EFD). In contrast to sound intensity, which is sound *power* flow per unit area, EFD is the sound *energy* flow per unit area. EFD is defined as:

$$E = \int_0^T I(t)\, dt\,, \tag{G-9}$$

where E is the energy flux density, $I(t)$ is the instantaneous acoustic intensity in a given direction and T is the duration of the sound (Urick, 1983). In practice, Eq. (G-9) is rarely used and plane waves are assumed. This makes $I(t) = p^2(t)/\rho c$ and

$$E = \int_0^T \frac{p^2(t)}{\rho c}\, dt\,. \tag{G-10}$$

The units of EFD are joules per square-meter (J/m^2).

Note that Eq. (G-10) is only valid for plane waves. The plane wave assumption may not be valid under some conditions, especially underwater at low frequencies close to a sound source or in an enclosed space. Equation (G-10) is also problematic because sound speed may vary substantially underwater.

G.4.4.2 Energy Flux Density Level

Energy flux density level (EL) is calculated from

$$EL = 10\log_{10}\left(\frac{E}{E_{ref}}\right) = 10\log_{10}\left(\frac{\int_0^T p^2(t)/\rho c\, dt}{P_{ref}^2 T_{ref}/\rho c}\right), \qquad \text{(G-11)}$$

where E_{ref} is the EFD of a plane wave with rms pressure P_{ref} and duration T_{ref}, in the same environment, so the factor ρc in E and E_{ref} cancel. For underwater applications, the reference quantities P_{ref} and T_{ref} are normally taken to be 1 µPa and 1 s, respectively (Marshall, 1996), so Eq. (G-11) becomes

$$EL = 10\log_{10}\left(\frac{\int_0^T p^2(t)\, dt}{(1\,\mu\text{Pa})^2(1\,\text{s})}\right), \qquad \text{(G-12)}$$

and EL is in dB re 1 µPa^2-s. For airborne applications, P_{ref} = 20 µPa and EL is expressed in dB re (20 µPa)^2-s.

G.4.4.3 Relationship between EL, SPL, and Exposure Duration

Since $\overline{P^2} = 1/T\int_0^T p^2(t)\,dt$, Eq. (G-12) may be written

$$\begin{aligned} EL &= 10\log_{10}\left(\frac{\overline{P^2}T}{P_{ref}^2 T_{ref}}\right) \\ &= 10\log_{10}\left(\frac{\overline{P^2}}{P_{ref}^2}\right) + 10\log_{10}\left(\frac{T}{T_{ref}}\right) \\ &= SPL + 10\log_{10}\left(T/T_{ref}\right) \end{aligned} \qquad \text{(G-13)}$$

If T_{ref} = 1 s, and T is the sound duration in seconds,

$$EL = SPL + 10\log_{10}(T). \tag{G-14}$$

Equation (G-14) reveals some important relationships between EL, SPL, and the sound duration:

- $\log_{10}(1) = 0$, so if the sound duration is 1 second, SPL and EL have the same numeric value (but not the same reference quantities). For example, a 1-second sound with an SPL of 100 dB re 1 µPa has an EL of 100 dB re 1 µPa^2-s.
- If the sound duration is constant but the SPL changes, EL will change by the same number of decibels as the SPL.
- If the SPL is held constant and the duration changes, EL will change as a function of $10\log_{10}(T)$:
    - $10\log_{10}(10) = 10$, so **increasing duration by a factor of 10 raises EL by 10 dB**.
    - $10\log_{10}(0.1) = -10$, so **decreasing duration by a factor of 10 lowers EL by 10 dB**.
    - Since $10\log_{10}(2) \approx 3$, **doubling the duration increases EL by 3 dB**.
    - $10\log_{10}(1/2) \approx -3$, so **halving the duration lowers EL by 3 dB**.

G.4.4.4 Total EFD for Multiple Exposures

The ***total energy flux density*** for multiple exposures is found by summing the energy flux densities of the individual exposures:

$$E = \sum_{n=1}^{N} E_n = \sum_{n=1}^{N} \left[\int_0^{T_n} \frac{p_n^2(t)}{\rho c}\, dt \right], \tag{G-15}$$

where N is the number of exposures and E_n, $p_n(t)$, and T_n are the energy flux density, instantaneous sound pressure, and duration of the n^{th} exposure, respectively.

Total energy flux density level is similarly defined:

$$EL = 10\log_{10}\left(\frac{\sum_{n=1}^{N} E_n}{P_{ref}^2 T_{ref}} \right). \tag{G-16}$$

Figure G-2 illustrates the summation of energy for a succession of sonar “pings”. In this hypothetical case, each ping has the same duration and SPL. The EL at a particular location from each individual ping is 100 dB re 1 µPa^2-s (red circles). The upper, blue curve shows the running total or cumulative EL.

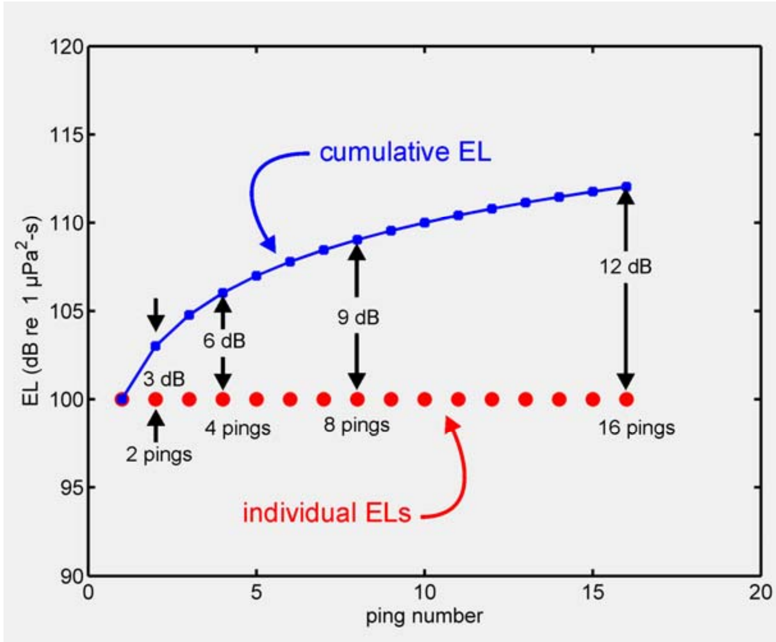

Figure G-2

After the first ping, the cumulative EL is 100 dB re 1 µPa^2-s. Since each ping has the same duration and SPL, receiving two pings is the same as receiving a single ping with twice the duration. The cumulative EL from two pings is therefore 103 dB re 1 µPa^2-s. The cumulative EL from four pings is 3 dB higher than the cumulative EL from two pings, or 106 dB re 1 µPa^2-s. Each doubling of the number of pings increases the cumulative EL by 3 dB.

Figure G-3 shows a more realistic example where the individual pings do not have the same SPL or EL. These data were recorded from a stationary hydrophone as a sound source approached, passed, and moved away from the hydrophone. As the source approached the hydrophone, the received SPL from each ping increased, causing the EL of each ping to increase. After the source passed the hydrophone, the received SPL and EL from each ping decreased as the source moved further away.

Although the cumulative EL increases with each additional ping received, the main contributions are from those pings with the highest individual ELs. Individual pings with ELs 10 dB or more below the ping with the highest level contribute little (less than 0.5 dB) to the total cumulative EL. This is shown in Fig. B-3 where only a small error is introduced by summing the energy from the 8 individual pings with EL greater than 185 dB re 1 µPa^2-s (black line), as opposed to including all pings (blue line).

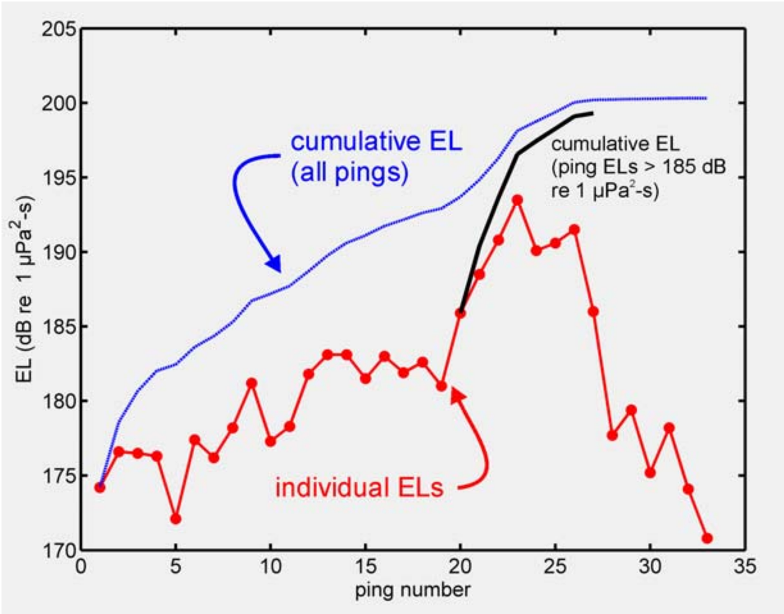

Figure G-3

G.4.5 Sound Exposure

Sound exposure (SE) is defined as

$$SE = \int_0^T p^2(t)\, dt\,, \tag{G-17}$$

and has units of pascal-squared seconds (Pa²-s). Sound exposure and sound energy flux density are closely related and differ only by the factor of ρc.

The level quantity for sound exposure is called the ***sound exposure level*** (SEL):

$$SEL = 10\log_{10}\left(\frac{\int_0^T p^2(t)\, dt}{P_{ref}^2 T_{ref}}\right). \tag{G-18}$$

If P_{ref} = 1 µPa and T_{ref} = 1 s, Eq. (G-18) is identical to Eq. (G-12).

An expression analogous to Eq. (G-14) may also be developed for SEL, yielding

$$SEL = SPL + 10\log_{10}(T), \tag{G-19}$$

where T is in seconds.

Sound exposure and sound exposure level are often used in airborne applications. In these situations, $p(t)$ is normally replaced with the instantaneous A-weighted sound pressure and the reference pressure P_{ref} = 20 µPa (ANSI, 1994).

G.5 SOUND PROPAGATION

G.5.1 Reflection and Refraction

When a sound wave propagating in a medium encounters a second medium with a different density or sound speed, part of the incident sound will be ***reflected*** back into the first medium and part will be ***transmitted*** into the second medium. If the second medium has a different sound speed than the first, the propagation direction will change as the sound wave enters the second medium; this phenomenon is called ***refraction***. Refraction may also occur within a single medium if spatial gradients exist in the sound speed.

Refraction of sound resulting from spatial variations in the sound speed is one of the most important phenomena that affects sound propagation in water. The sound speed in the ocean primarily depends on hydrostatic pressure (i.e., depth) and temperature. Sound speed increases with both hydrostatic pressure and temperature. In seawater, temperature has the most important effect on sound speed for depths less than about 300 m. Below 1500 m, the hydrostatic pressure is the dominant factor because the water temperature is relatively constant. The variation of sound speed with depth in the ocean is called a sound speed profile. Although the actual variations in sound speed are small, the existence of sound speed gradients in the ocean has an enormous effect on the propagation of sound in the deep ocean.

G.5.2 Diffraction, Scattering, and Reverberation

Sound waves experience diffraction in much the same manner as light waves. ***Diffraction*** may be thought of as the bending of a sound wave around an obstacle. Common examples include sound heard from a source around the corner of a building and sound propagating through a small gap in an otherwise closed door or window.

An obstacle or inhomogeneity (for example, smoke, suspended particles, or gas bubbles) in the path of a sound wave causes ***scattering*** if, secondary sound spreads out from it in a variety of directions (Pierce, 1989). Scattering is similar to diffraction. Normally *diffraction* is used to describe sound bending or scattering from a single object and *scattering* is used when there are multiple objects.

Reverberation refers to the prolongation of a sound that occurs when sound waves in an enclosed space are repeatedly reflected from the boundaries defining the space, even after the source has stopped emitting.

G.5.3 Sound Attenuation and Transmission Loss

As a sound wave passes through a medium, the intensity decreases with distance from the sound source. This phenomenon is known as attenuation or propagation loss. The effects of sound attenuation may be described using the ***transmission loss*** (*TL*), defined as

$$TL = 20\log_{10}\frac{P(1)}{P(r)}, \qquad \text{(G-20)}$$

where $P(1)$ is the sound pressure at a distance of 1 m from the source and $P(r)$ is the sound pressure at a distance r (Kinsler *et al*., 1982). The units of transmission loss are dB. The transmission loss is used to relate the ***source level*** (*SL*), defined as the *SPL* produced by a sound source at a distance of 1 m, and the ***received level*** (*RL*) at a particular location:

$$RL = SL - TL. \tag{G-21}$$

The main contributors to sound attenuation are:

geometrical spreading or divergence of the sound wave as it propagates away from the source,

- ***sound absorption*** (conversion of sound energy into heat),
- *scattering*, *diffraction*, *multipath interference*, *boundary effects*, **and other non-geometrical effects (Kinsler *et al*., 1982; Urick, 1983).**

G.5.3.1 Spreading Loss

Spreading loss or divergence loss is a geometrical effect representing a regular weakening of a sound wave as it spreads out from a source (Urick, 1983). Spreading describes the reduction in sound pressure caused by the increase in surface area as the distance from a sound source increases. Spherical and cylindrical spreading are common types of spreading loss.

A point sound source in a homogeneous, lossless medium without boundaries will radiate spherical waves — the acoustic energy spreads out from the source in the form of a spherical shell. As the distance from the source increase, the shell surface area increases. If the sound power is fixed, the sound intensity must decrease with distance from the source (intensity is power per unit area). The surface area of a sphere is $4\pi r^2$, where r is the sphere radius, so the change in intensity is proportional to the radius squared. For spherical waves, $I = \overline{P}^2 / \rho c$, so the pressure decreases as the inverse of radial distance. This prediction is known as the ***spherical spreading law***. The transmission loss for spherical spreading is

$$TL = 20\log_{10} r, \tag{G-22}$$

where r is the distance from the source. This is equivalent to a 6 dB reduction in *SPL* for each doubling of distance from the sound source.

In ***cylindrical spreading***, spherical waves expanding from the source are constrained by upper and lower boundaries and take on a cylindrical shape. In this case the sound wave expands in the shape of a cylinder rather than a sphere and the transmission loss is

$$TL = 10\log_{10} r. \tag{G-23}$$

Cylindrical spreading is an approximation to wave propagation in a water-filled channel with horizontal dimensions much larger than the depth. Cylindrical spreading predicts a 3 dB reduction in *SPL* for each doubling of distance from the source.

G.5.3.2 Multipath Loss

Multipath refers to sound waves from a single source traveling multiple sound paths before reaching a single receiver. Multipath propagation is common when a source is located relatively close to a boundary and, in underwater applications, when the depth is small relative to the horizontal propagation distance. In multipath propagation, sound may not only travel a direct path from source to receiver, but also be reflected from the surface and/or bottom multiple times before reaching the receiver. The existence of multipaths results in a condition that permits constructive and destructive interference between sound waves propagating in the different paths and the received sound amplitude may be reduced as a result.

G.5.3.3 Surface and Bottom Effects

Because it reflects and scatters sound, the sea surface has a major effect on the propagation of underwater sound in applications where either the source or receiver is at shallow depth. If the sea surface is smooth, the reflected sound pressure is nearly equal to the incident sound pressure; however, if the sea surface is rough, the amplitude of the reflected sound wave will be reduced.

For a particular sound source, the relationship between the “direct” sound wave, which propagates directly from the source to the receiver, and the reflected wave depends on the depth of the source and the distance to the receiver. At some distances the reflected wave will be in-phase with the direct wave (their waveforms add together) and at other distances the two waves will be out-of-phase (their waveforms cancel). This results in constructive and destructive interference between the surface reflected sound wave and produces an interference pattern in the underwater sound field. This phenomenon is called the ***Lloyd mirror effect*** and is an example of multipath propagation loss. In this case the resulting sound field contains an alternating series of sound pressure maxima and minima.

The sea bottom is a reflecting and scattering surface, similar to the sea surface. Sound interaction with the sea bottom is more complex, however, primarily because the acoustic properties of the sea bottom are more variable and the bottom is often layered into regions of differing density and sound speed. The Lloyd mirror effect may also be observed from sound sources located near the sea bottom. For a “hard” bottom such as rock, the reflected wave will be approximately in-phase with the incident wave. Thus, near the ocean bottom, the incident and reflected sound pressures may add together, resulting in an increased sound pressure near the sea bottom.

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APPENDIX H

SUMMARY OF ACOUSTIC MODELING RESULTS

SUMMARY OF ACOUSTIC MONITORING RESULTS

H.1 ACTIVE SONAR MODELING

Active sonar operation has the potential to injure or otherwise harass marine animals in the neighboring waters. The number of animals exposed to potential harm or harassment in any such action is dictated by the propagation field and the manner in which the sonar is operated (i.e., source level, depth, frequency, pulse length, directivity, platform speed, and repetition rate). The measurements of potential injury or harassment to the marine wildlife due to sonar operations are the accumulated (summed over all source emissions) energy flux density (for temporary or permanent threshold shift) or the maximum received sound pressure level received by the animal over the duration of the activity (for behavioral harassment).

Estimating the number of animals that may be injured or otherwise harassed in a particular environment entails the following steps.

(1) Each source emission is modeled according to the particular operating mode of the sonar. See Table H-1 for a description of sources modeled. The "effective" energy source and sound pressure level is computed by integrating over the bandwidth of the source, scaling by the pulse length, and adjusting for gains due to source directivity. The location of the source at the time of each emission must also be specified.

(2) For the relevant environmental acoustic parameters, transmission loss (TL) estimates are computed, sampling the water column over the appropriate depth and range intervals. TL data are sampled at the typical depth(s) of the source and at the nominal frequency of the source. If the source is relatively broadband, an average over several frequency samples may be appropriate.

(3) The accumulated energy and maximum received sound pressure level within the waters in which the sonar is operating is sampled over a volumetric grid. At each grid point, the received sound from each source emission is modeled as the effective energy source and sound pressure level reduced by the appropriate propagation loss from the location of the source at the time of the emission to that grid point.

(4) For energy criteria, the zone of influence (ZOI) for a given threshold (that is, the volume for which the accumulated energy level exceeds the threshold) is estimated by summing the incremental volumes represented by each grid point for which the accumulated energy flux density exceeds that threshold. For the sound pressure level, the maximum received sound pressure level is compared to the appropriate dose response function for the marine mammal group and source frequency of interest. The percentage of animals likely to respond corresponding to the maximum received level is found, and the volume of the grid point is multiplied by that percentage to find the adjusted volume. Those adjusted volumes are summed across all grid points to find the overall ZOI.

Finally, the number of takes is estimated as the "product" (scalar or vector, depending upon whether an animal density depth profile is available) of the ZOI and the animal densities.

Table H-1. Acoustic Sources Modeled or Considered

SYSTEM	CENTER FREQUENCY	SOURCE LEVEL (re 1µPa)	ANALYSIS
AN/SQS-53 – Surface ship sonar	3.5 KHz	235 dB	Full Acoustic Modeling
AN/SQS-56 – Surface ship Sonar	7.5 KHz	225 dB	Full Acoustic Modeling
AN/BQQ-5 or 10 – Submarine Sonar	Classified (MF)	Classified	Full Acoustic Modeling
AN/AQS-22 or 13 – Helicopter Dipping Sonar	4.1 KHz	217 dB	Full Acoustic Modeling
MK-48 – Heavyweight Torpedo	Classified (HF)	Classified	Full Acoustic Modeling
MK-46/54 – Lightweight Torpedo	Classified (HF)	Classified	Full Acoustic Modeling
DICASS – Sonobuoy	8 KHz	201 dB	Full Acoustic Modeling
IEER – Explosive Source Sonobuoy	Classified	Classified	Full Acoustic Modeling
AN/SLQ-25A (NIXIE) – Countermeasure	Classified	Classified	Full Acoustic Modeling
Acoustic Device Countermeasure	Classified	Classified	Full Acoustic Modeling
AN/SQQ-32 – Mine Hunting Sonar	Classified (HF)	Classified	Full Acoustic Modeling
AN/SQS-53 or 56 Kingfisher Mode – Object Detection and Navigation	3.5 KHz	235 dB	Full Acoustic Modeling
AN/BQS-15 – Submarine Navigational Sonar	Classified (HF)	Classified	Full Acoustic Modeling
Noise Acoustic Emitter	Classified	Classified	Full Acoustic Modeling
AN/AQS-14/20/24 – Helicopter Towed Mine Hunting Sonar	Greater than 200 KHz	Classified	Not modeled due to frequency greater than 200 kHz

H.1.1 Acoustic Environment

Sound propagation (the spreading or attenuation of sound) in the oceans of the world is affected by several environmental factors: water depth, variations in sound speed within the water column, surface roughness, and the geoacoustic properties of the ocean bottom. These parameters can vary widely with location. To support the modeling of sound propagation in all waters, the United States Naval Oceanographic Office puts models that have been created by other Navy labs through a verification process prior to entering them into the Navy standard library. In this collection, the bathymetry (water depth) database is the most highly sampled, reflecting both the variability of this parameter and the relative ease of measuring it. The sound speed and bottom properties databases are provinced, meaning that relatively large, often irregularly shaped areas are characterized by a single typical parameter set (i.e., a sound speed profile or a set of geoacoustic parameters). For this effort, a set of 36 representative environments was selected from these standard databases to cover the full gamut of conditions that can be observed in these areas. See Table H-2 for a description of the acoustic provinces used in this analysis.

Four types of data are used to define the acoustic environment for each province:

- **Seasonal Sound Speed Profiles (SVPs)** – Seasonal SVPs for the range sites were obtained from the Generalized Digital Environmental Model, Variable resolution of the Oceanographic and Atmospheric Master Library. These data are available through the Naval Oceanographic Office's Data Warehouse. Any single observation taken within the acoustic provinces will necessarily vary from the seasonal mean. The training areas within the study area are subject to the meanders of the Gulf Stream and other oceanographic intrusions such as warm-core rings and estuarine run-off.
- **Seabed Geoacoustics** – The type of sea floor influences how much sound is absorbed and how much sound is reflected back into the water column. Bottom characteristics for the study area were generated from a combination of sources including side-scan and sub-bottom profiler data, which included data that provided information on the roughness of the sea floor; echo-sounder data that provided information on bottom hardness; and bottom sampling to validate the side-scan and echo-sounder geological characterization data. Data on bottom type were also obtained from other sources such as a Woods Hole Oceanographic Institution (WHOI) report and the Navy's compiled data contained within the Marine Resource Assessments.
- **Wind Speeds** – Several environmental inputs, such as wind speed and surface roughness, are necessary to model acoustic propagation on the prospective ranges. Wind speeds were averaged for each season to correspond to the seasonal velocity profiles.
- **Bathymetry data** - Bathymetry data for the training areas were obtained from the National Oceanic and Atmospheric Administration National Data Center Coastal Relief East Coast databases; the National Geophysical Datacenter, Coastal Relief Model (Volume II); and the NAVOCEANO's Digitized Bathymetric Data Base - Variable Resolution. The resulting bathymetry map covers a larger area than the range area to account for acoustic energy propagating off the training area.

Table H-2. Description of Acoustic Provinces

Environmental Province	Representative Water Depth (m)	Bottom Loss Province	Sound Speed Province
1	10	Low Loss	Southern Latitude, Warm Water
2	20	Low Loss	Southern Latitude, Warm Water
3	50	Low Loss	Southern Latitude, Warm Water
4	100	Medium Loss	Southern Latitude, Warm Water
5	200	Medium Loss	Southern Latitude, Warm Water
6	500	Medium Loss	Southern Latitude, Warm Water
7	1,000	Medium Loss	Southern Latitude, Warm Water
8	1,000	High Loss	Southern Latitude, Warm Water
9	2,000	High Loss	Southern Latitude, Warm Water
10	4,000	Medium Loss	Southern Latitude, Warm Water
11	1,000	Low Loss	Southern Latitude, Warm Water
12	500	Low Loss	Southern Latitude, Warm Water
13	200	Low Loss	Southern Latitude, Warm Water
14	100	Low Loss	Southern Latitude, Warm Water
15	2,000	Low Loss	Southern Latitude, Warm Water
16	2,000	Medium Loss	Southern Latitude, Warm Water
17	50	Medium Loss	Southern Latitude, Warm Water
18	10	Medium Loss	Southern Latitude, Warm Water
19	20	Medium Loss	Southern Latitude, Warm Water
20	2,000	Medium Loss	Mid-Latitude, (Sargasso Sea)
21	1,000	Medium Loss	Mid-Latitude, (Sargasso Sea)
22	500	Medium Loss	Mid-Latitude (Sargasso Sea)
23	200	Medium Loss	Northern Latitude, Cold Water
24	4,000	Medium Loss	Mid-Latitude (Sargasso Sea)
25	1,000	Low Loss	Mid-Latitude (Sargasso Sea)
26	500	Low Loss	Mid-Latitude (Sargasso Sea)
27	50	Low Loss	Mid-Latitude (Sargasso Sea)
28	50	Low Loss	Northern Latitude, Cold Water
29	100	Low Loss	Northern Latitude, Cold Water
30	200	Low Loss	Northern Latitude, Cold Water
31	500	Low Loss	Northern Latitude, Cold Water
32	500	Medium Loss	Northern Latitude, Cold Water
33	1,000	Medium Loss	Northern Latitude, Cold Water
34	2,000	Medium Loss	Northern Latitude, Cold Water
35	4,000	Medium Loss	Northern Latitude, Cold Water
36	1,000	Low Loss	Northern Latitude, Cold Water

Provincing the environment implies that the impact of variations in the environment local to the source operations cannot be addressed. At the time of the design of this model, source levels were low enough relative to the thresholds (or equivalently, thresholds were high enough) such that impact ranges seldom extend beyond 10 to 20 kilometers (km). Since this is just slightly greater than the resolution of most Navy-standard environmental databases, range dependence of the environment was viewed as a second-order consideration. Recent action potentially lowering the harassment threshold level increases the impact ranges by a factor of five or more. For the high-power sources (most notably the AN/SQS-53C), this increases impact ranges to 100 km or more and raises the issue of whether the environment can be treated as range independent. Although addressing this issue is beyond the scope of this effort, intuition suggests that the effect of a range-dependent environment will tend to be muted by the averaging required to cover the uncertainty in the positioning of the source track. If this is the case, then the difference between modeling the environment as range-independent versus range-varying will typically be negligible. However, at this time the relative efficacy of range-independent modeling has not been demonstrated.

H.1.2 Acoustic Model

The ability to provide credible results for a set of sonars operating in a variety of (unspecified) modes within ocean environments all along the U.S. East Coast and within the Gulf of Mexico is a design-driving requirement for the model. The requirement to cover a wide range of potential scenarios (environments and source operating modes) motivates a parameterization of the inputs in order to make the number of pre-computations manageable. For the source (e.g., sonar), this means that results are generated for a few selected values that span the domain of each "sonar setting" (e.g., beam widths and steer directions, "effective" energy source levels, ping cycle times, etc.). See Table H-1 for a description of sources modeled. For the environment, this implies a partitioning of the areas into regions (environmental provinces) with relatively homogeneous propagation characteristics. In the case of sonar settings, linear interpolation among the input parameters is used to determine the results for a specific operating mode. The environmental provinces effectively implement a nearest neighbor rule for the environmental acoustics inputs.

Propagation analysis for acoustic harassment estimates is performed using the Comprehensive Acoustic Simulation System (CASS) using the GRAB model. The CASS/GRAB model is an acoustic model developed by Naval Undersea Warfare Center for modeling active acoustic systems in a range-dependent environment. This model has been approved by the Oceanographic and Atmospheric Master Library (OAML) for acoustic systems that operate in the 150 Hz to 100 kHz frequency range. The OAML was originally created in 1984 to provide consistency and standardization for all oceanographic and meteorological programs used by the Navy. Today, the OAML's role is expanded to provide the Navy a standard library for meteorological and oceanographic databases, models, and algorithms.

CASS/GRAB provides detailed multi-path propagation information as a function of range and bearing. GRAB allows range-dependent environmental information input so that, for example, as bottom depths and sediment types change across the range, their acoustic effects can be modeled.

Propagation loss functions for each unique combination (i.e., acoustic source, season, source depth, etc.) are produced at 45-degree bearing angles versus range and depth from three chosen analysis points. For each bearing angle, the maximum receive level curve is used to populate all angles around the source, plus or minus 22.5 degrees. This results in a continuous 360-degree characterization of the receive level from the source. The three representative points are used to characterize acoustic propagation in different depth regimes to reflect the topography of the site. The analysis is performed to a distance of 1 km (3,300 ft) at intervals in distance and depths of 5 m (16 ft) and 2 m (7 ft).

A means of representing propagating sound is by acoustic rays. As acoustic rays travel through the ocean, their paths are affected by absorption, back-scattering, reflection, boundary interaction, etc. The CASS/GRAB model determines the acoustic ray paths between the source and a particular location in the water which, in this analysis, is referred to as a receive cell. The rays that pass through a particular point are called eigenrays. Each eigenray, based on its intensity and phase, contributes to the complex pressure field, hence the total energy received at a point. By summing the modeled eigenrays, the total received energy for a receive cell is calculated. This is illustrated in Figure 4.3-9 (CASS/GRAB Propagation Loss Calculations). The propagation losses are normally less than those predicted by spherical spreading versus range due to the multiple eigenrays present.

The fundamental output of acoustic model is an impact volume. It is computed by considering the contributions at each depth layer of the TL field (and not just the layer with the least TL). Note that the algorithm explicitly computes an impact volume depth profile (that is, the incremental impact volume for each depth layer); this means that conceptually this approach could handle an animal density depth profile that is not uniform. However, the reality is that animal density data are almost always specified per unit area with little, if any, information on the depth distribution. Absent a depth profile, animal densities must be assumed to be uniformly distributed over some depth interval. To accommodate the standard specification of animal density, an impact area is computed by dividing the impact volume by the water depth. This is appropriate as long as the animal distribution is uniform over the entire water column. If this is not the case, then a more conservative estimate of the impact area is obtained by dividing the impact volume by the depth interval over which the animal is distributed.

H.1.3 Criteria and Thresholds for Active Sonar

Tables H-3 through H-5 describes the criteria and threshold used in this analysis for active sonar.

Table H-3. Effects, Criteria, and Thresholds for Active Sonar

Effect	Criteria	Threshold (dB 1 µPa^2-s)	MMPA Effect
Physiological	PTS	215	Level A harassment
Physiological	TTS	195	Level B harassment

dB 1 µPa^2-s = decibel referenced to 1 micropascal squared second; PTS = Permanent Threshold Shift; TTS = Temporary Threshold Shift

Table H-4. SPL Risk-Function Parameters for Behavioral Response to Active Sonar

Animals	Risk-Function Mean (SPL)	Risk Transition Parameter	Basement Receive Level
Odontocetes (except harbor porpoises) and Pinnipeds	165 dB	10	120 dB
Mysticetes	165 dB	8	120 dB

dB = decibel

Table H-5. Behavioral Response to Active Sonar (Harbor Porpoise)

Animals	Effect	Receive Level
Harbor Porpoise	Behavioral	Greater than 120 dB SPL re 1 µPa

dB = decibel; SPL re 1 µPa = sound pressure level referenced to 1 micropascal

H.2 EXPLOSIVE SOURCE SONOBUOY MODELING

H.2.1 Propagation Modeling

The approach begins with a high-fidelity acoustic model that has all of the required properties for the "linear" problem. Since the OPAREAs of interest include shallow-water regions, the selected model must treat range-dependent environments and be able to exploit Navy standard bottom-sediment interaction approaches (e.g., the Navy Standard: OAML, 2002). It must cover a wide frequency band (up to about 10 kHz), and correctly account for caustics, surface cutoff, ducting, low-frequency cutoff, and important diffraction effects. Because of the wide bandwidth for small shots, wave-theory models (such as modal theory or parabolic equation method or finite-element approaches) are usually not practical, so that modified ray theory models are favored. Examples include Navy standard models (CASS/GRAB or ASTRAL) and the model used for long-range, flat-bottom estimates in Churchill and Seawolf — the REFMS model (Britt et al., 1991). The CASS/GRAB model is well suited for small shots and is used in this assessment.

H.2.2 Similitude Formulas for Source Properties

Standard similitude formulas are used to model the free-field source properties close to the source, starting at a nominal source-level range of 1 m (3.3 ft). Weak shock theory is used to estimate the waveform and levels to ranges beyond a few meters. Rather than revert to linear propagation theory when the amplitudes are small, the weak shock is used to all ranges. This is consistent with the Seawolf and Churchill FEISs (although not explicitly stated in the documents). References for similitude and explosive sound propagation include Cole (1948), Arons et al. (1949), Weston (1960), Urick (1983), Goertner (1982), Gaspin (1983), Chapman (1988), Gaspin and Shuler (1971), and Bluy and Payne (1974). The standard similitude formulas used are provided below.

H.2.3 Environmental Provinces and Sound Propagation

For an ideal, deep-water environment (flat pressure-release surface, constant sound speed, no absorption, no bottom interaction, source and receiver away from the surface) and a single explosion, impact ranges associated with the acoustic thresholds can be estimated using standard formulas for shock waves. Injury ranges are approximately 45 m (50 yards) for small animals and 26 m (30 yards) for larger animals.

However, the assumption of an ideal, deep-water environment would not always be appropriate. To estimate impact areas for the variety of deployment sites, Navy standard acoustic models and databases were applied to environmental "provinces" within which the ocean acoustic environments are expected to be similar.

Based on the Navy standard Comprehensive Acoustic Simulation System/Gaussian Ray Bundle (CASS/GRAB) model (OAML, 2002), modified to account for impulse response, shock-wave waveform, and nonlinear shock-wave effects, and on the Navy (OAML, 2002) standard environmental databases (sound speed, wind speed, bottom interaction, and bathymetry), impact ranges were estimated for each applicable season and province. Note that the model is validated for use of the highly specialized bottom sediment databases and for range-varying environments. In addition, test calculations were made to account for bubble pulses.

H.3 ESTIMATED IMPACT RANGES AND AREAS FOR A SINGLE EXPLOSION

For a single 4.1-lb NEW charge, impact ranges are relatively short, and there is little dependence on season, water depth, or bottom properties for the OPAREAs covered.

The impact ranges for TTS based on energy levels are the same for both frequency limits (10 Hz and 100 Hz) in all cases for small explosives because of the broadness of the frequency spectrum. The same is true for behavioral disturbance (without TTS).

There is little variability due to environmental conditions for any of the impact ranges. In fact, the only case for which there is some variability (the TTS range for energy threshold), shows that most of this variability occurs in shallow water (less than 100 m [328 ft]). This result is as expected. However, greater variability is found in the estimation of TTS impact areas for multiple explosives – primarily because of energy accumulation and hence, greater ranges for multiple shots.

H.4 IMPACT VOLUMES FOR VARIOUS METRICS

The impact of explosive sources on marine wildlife is measured by four different metrics, each with its own threshold(s). Two of these metrics, total and peak one-third octave energy, are treated in similar fashion as the energy metric used for active sonar including the summation of energy if there are multiple pings. The other two, peak pressure and positive impulse, are by their nature single ping metrics.

- *Energy flux density (EFD).* For plane waves, as assumed here, energy flux density (EFD) is the time integral of the squared pressure divided by the impedance. It has International System of Units (SI) units of joules per square meter (J/m^2) (but in-lb/in^2 is also used in Churchill). EFD levels have units of dB re 1 μPa^2-s (using the usual convention that the reference impedance is the same as the impedance at the field point).
- *1/3-Octave EFD.* This is the energy flux density in a 1/3-octave frequency band. A 1/3-octave band has upper and lower frequency limits with a ratio of $2^{1/3}$. Hence, the bandwidth is about 25 percent of center frequency.

- *Positive impulse.* This is the time integral of the pressure over the initial positive phase of an arrival. SI units are pascal seconds (Pa-s), but psi-ms are also used. There is no decibel analog for impulse.

- *Peak pressure.* This is the maximum positive pressure for an arrival. Units used here are psi and decibel levels with the usual underwater reference of 1 μPa.

H.5 CRITERIA AND THRESHOLDS FOR INJURY AND HARASSMENT

Criteria and thresholds for estimating the impacts from a single explosive event on marine mammals and sea turtles were established for the Seawolf Submarine Shock Test Final Environmental Impact Statement (FEIS) and subsequently used in the USS Winston S. Churchill (DDG-81) Ship Shock FEIS (DoN, 1998 and DoN, 2001, respectively). These criteria and thresholds were adopted by the NMFS in its Final Rule on unintentional taking of marine animals incidental to the shock testing (NMFS, 2001). The approach to risk assessment for all explosive-related noise in water was derived from the Seawolf/Churchill approach. Since the ship-shock events involve only one large explosive at a time, additional assumptions were made to extend the approach to small explosions. As was the case for Seawolf and Churchill, criteria and thresholds for impact on protected sea turtles are the same as those for toothed whales.

The criteria and thresholds used in *Atlantic Fleet Active Sonar Training EIS/OEIS* are summarized in Table H-6.

Table H-6. Effects, Criteria, and Thresholds for Small Explosives

Effect	Criteria	Metric	Threshold	MMPA Effect
Physiological	Onset extensive lung injury	Goertner modified positive impulse	30.5 psi-ms	Mortality
Physiological	50 percent TM rupture	Energy flux density	1.17 in-lb/in^2 (about 205 dB re 1 μPa^2-s)	Level A Harassment
Physiological	Onset slight lung injury	Goertner modified positive impulse	indexed to 13 psi-ms	Level A Harassment
Physiological	TTS for baleen whales	Greatest energy flux density level in any 1/3-octave band above 10 Hz - for total energy over all exposures	182 dB re 1 μPa^2-s	Level B Harassment
Physiological	TTS for toothed whales and sea turtles	Greatest energy flux density level in any 1/3-octave band above 100 Hz - for total energy over all exposures	182 dB re 1 μPa^2-s	Level B Harassment
Physiological	TTS	Peak pressure over all exposures	23 psi	Level B Harassment
Behavioral	Sub-TTS	Energy flux density	177 dB re 1 μPa^2-s	Level B Harassment

dB 1 μPa^2-s = decibel referenced to 1 micropascal squared second; Hz = hertz; psi-ms = pounds per square inch-millisecond; TM = tympanic membrane; TTS = temporary threshold shift

H.6 CRITERIA AND THRESHOLDS FOR MORTALITY

The criterion for mortality for marine mammals used in the Churchill Final EIS (U.S. Department of the Navy, 2001c) is “onset of severe lung injury.” This is conservative in that it corresponds to a 1 percent chance of mortal injury, and yet any animal experiencing onset severe lung injury is counted as a lethal exposure. The threshold is stated in terms of the Goertner (1982) modified positive impulse with value “indexed to 31 psi-ms.” Since the Goertner approach depends on propagation, source/animal depths, and animal mass in a complex way, the actual impulse value corresponding to the 31-psi-ms index is a complicated calculation. Again, to be conservative, Churchill used the mass of a calf dolphin (at 27 lb), so that the threshold index is 30.5 psi-ms.

H.7 CRITERIA AND THRESHOLDS FOR INJURY (LEVEL A HARASSMENT)

For injury, Churchill uses two criteria: eardrum rupture (i.e., tympanic membrane [TM] rupture) and onset of slight lung injury. These are considered indicative of the onset of injury. The threshold for TM rupture corresponds to a 50 percent rate of rupture (i.e., 50 percent of animals exposed to the level are expected to suffer TM); this is stated in terms of an EFD value of 1.17 in-lb/in^2 (about 205 dB re 1 μPa^2-s). This recognizes that TM rupture is not necessarily a serious or life-threatening injury, but is a useful index of possible injury that is well-correlated with measures of permanent hearing impairment (e.g., Ketten (1998) indicates a 30 percent incidence of permanent threshold shift [PTS] at the same threshold).

The threshold for onset of slight lung injury is calculated for a calf dolphin (12.2 kg [27 lbs]) and an adult dolphin (174 kg [384 lbs]); it is given in terms of the “Goertner modified positive impulse,” indexed to 13 psi-ms and 32 psi-ms respectively. This is a departure from the Churchill approach (but not from the Seawolf approach) in the use of animal mass in the Goertner threshold for slight lung injury. In this assessment, cetaceans are divided into two classes: those with mass greater than 174 kg (384 lb) and those with mass less than 174 kg (384 lb). For those with lower mass, the threshold is indexed to 13 psi-ms, which corresponds to a calf dolphin at 12.2 kg (27 lb). For the greater animal masses, the threshold is indexed to 32 psi-ms, corresponding to the mass of an adult dolphin at 174 kg (384 lb) (as discussed in the Churchill FEIS). It is conservatively assumed then that on average, for each cetacean species and for each season, 30 percent are in the lower mass category and 70 percent in the greater mass category. In this assessment, however, all cetaceans were analyzed using the threshold for small mammals for slight lung injury.

H.8 CRITERIA AND THRESHOLDS FOR TEMPORARY THRESHOLD SHIFT (LEVEL B HARASSMENT)

The Churchill criterion for non-injurious harassment is temporary (auditory) threshold shift (TTS), a slight, recoverable loss of hearing sensitivity (DoN, 2001). In this case, there are two thresholds. A Level B take is assumed to occur if either of the thresholds is exceeded.

H.8.1 Single Explosion-TTS-Energy Threshold

The first threshold is: 182 dB re 1 μPa^2-s maximum EFD level in any 1/3 octave band at frequencies above 100 Hz for toothed whales and in any 1/3 octave band above 10 Hz for baleen whales. For large explosives, as in the case of the Churchill FEIS, the latter cutoffs at 10 and 100 Hz make a difference in the range estimates. For small explosives, as in IMPASS, the spectrum of the shot arrival is broad, and there is essentially no difference in impact ranges for the two classes of animals.

H.8.2 Single Explosion-TTS-Peak Pressure Threshold

The second threshold applies to all cetacean species and is stated in terms of peak pressure at 23 psi (about 225 dB re 1 µPa). This threshold is derived from the Churchill threshold, but is "scaled" to account for applications to small explosives. An explanation of the scaling follows.

The peak-pressure threshold for marine mammal TTS for explosives offers a safety margin for source or animal near the ocean surface. The threshold introduced for Seawolf (at 12 psi for TTS) is based on a study for large explosives (1,200 and 10,000 lbs). For Seawolf and Churchill cases, TTS ranges based on the peak-pressure threshold are about the same as those for the TTS energy threshold.

However, peak pressure and energy scale at different rates with charge weight, so that ranges based on the peak-pressure threshold are much greater than those for the energy metric when charge weights are small – even when source and animal are away from the surface. This scaling is based on the similitude formulas (e.g., Urick, 1983), used in virtually all compliance documents for short ranges.

The approach to scaling of the 12-psi-threshold for TTS for small shots is presented below, and justification based on the intent of the dual threshold offered.

The use of a peak-pressure metric as a safety factor dates to the Navy guidelines for safe levels for divers (Christian and Gaspin, 1974). The concern in that case was that the principal threshold was given in terms of positive impulse (with value 2 psi-ms), and hence yielded very short ranges when the source or diver approached the surface (since positive impulse, as well as energy, approach zero as source or receiver approach the surface). However, peak pressure does not decrease at all until the source or receiver is very close to the surface, so that it offers a safety factor. The peak pressure value for human divers in Christian and Gaspin (1974) is 100 psi.

The original TTS threshold for Seawolf was 182 dB (energy flux density level [EFDL] for maximum in 1/3-octave band). A dual threshold for TTS of 12 psi peak pressure (no bandwidth constraints) was added to the Seawolf FEIS on the basis of data for 1,200- and 10,000-pound explosives. The rationale: energy goes to zero as source or animal approaches surface, but peak pressure does not. Hence, a peak-pressure threshold maintains a safety range whether the source/animal goes to the surface or not. Based on similitude formulas for the free-field case, consider impact ranges as functions of charge weight. Table H-6 depicts the scaled peak-pressure ranges.

Notice that the ratio of ranges is as great as 10 for the very small (0.01 lb) charge, but then decreases to 1 at 10,000 lbs. In order for the range determined from the peak pressure threshold to be of the same order of magnitude as that for the energy threshold, the peak pressure threshold must be scaled, as shown in the right-hand column. That is, the peak pressure threshold for TTS is larger for small shots.

Table H-7. Scaled Peak-Pressure Ranges

Charge Weight (lbs)	Range at which EFDL is 182 dB in 1/3 octave band (m)	Range at which peak pressure = 12 psi (m)	Scaled peak pressure threshold to yield same range as energy threshold (psi)
0.01	8	80	130
0.2	20	110	75
1.8	55	225	50
8	110	360	40
20	180	500	33
500	880	1470	20
1000	1200	1800	18
10000	3950	3950	12

H.8.3 Criteria and Thresholds for Behavioral Disturbance (Level B Harassment) at Levels below Those Causing TTS

For a single explosion, to be consistent with Churchill, TTS is the criterion for Level B harassment. In other words, because behavioral disturbance for a single explosion is likely to be limited to a short-lived startle reaction, use of the TTS criterion is considered sufficient protection.

H.9 DEPTHS OF ANIMALS AND EXPLOSIONS

Animal depths are selected to ensure the greatest direct path for the harassment ranges, and to give the greatest impact range for the injury thresholds; they are thus conservative. The latter is consistent with the approach of Churchill.

H.10 ACOUSTIC ANALYSIS CALCULATIONS

H.10.1 Introduction

The modeling procedures discussed in the above sections were applied to each of the active sonar and sonobuoy systems using the environmental and geospatial data for each of the acoustic provinces within the study area. The modeling output resulted in a comprehensive database of ensonified areas or Zones of Influence (ZOIs) per hour of sonar activity (or per unit as in the case of a sonobuoy or an acoustic device countermeasure) for each of the regulatory acoustic thresholds of interest.

The next step required developing animal density spreadsheets that were seasonal and analysis area specific. The marine species density data provide seasonal (spring, summer, fall, and winter) density estimates for most species of interest (Endangered Species Act [ESA] and Marine Mammal Protection Act [MMPA]) by geographic area. Animals are assumed to be uniformly distributed for the purposes of this analysis, whereby the term "uniformly distributed" means that an equal number of individuals in the population occur within the analysis area. In reality, many species of cetaceans occur in large groups and would likely be sighted prior to mission activities.

Therefore, resulting exposure estimates for these species are higher than what would be expected to actually occur.

By taking into consideration the estimated calendar of the training exercises and their location within the OPAREAs, species presence and density data may be associated (by location and season). The estimates of potential acoustic exposure for each species, by each of the regulatory thresholds, for each of the OPAREAs were calculated by multiplying the appropriate elements together using a Microsoft Excel spreadsheet.

H.10.2 Spreadsheet analysis methods

The use of the system and mode specific ZOI is considered the first step towards estimating the amount of energy or maximum received level a given training event would produce in the specific analysis area, and the potential effects that event would have on protected marine species. The ZOI values represent the area exposed by sonar energy within a one-hour timeframe, by single ping, or by units of a specific device (i.e. sonobuoys).

The occurrence of marine mammals within the study area were found for each analysis area by season with a percent correction factor applied to each density value that accounts for surveyed animals that were not identified to species. The correction factor is specific to each region and differs for each species group (e.g. large whales versus small whales).

The next step of the analysis requires that ZOIs, which are presented according to various operating modes are combined in the correct ratio to reflect the sonar usage that would occur during the training events. For example, for some percentage of time a given sonar may be operated in tracking mode instead of searching mode. The power levels for the modes are different and averaging the sonar ZOIs is required to obtain a more accurate representation of how sonar would be used during the training events.

The Navy specified the amount of sonar operation in hours, pings, or number of buoys (for the Directional Command Activated Sonobuoy System (DICASS) and the Explosive Source Sonobuoy (AN/SSQ-110A) by season. Hours of operation by acoustic province were determined by multiplying hours per season by a percent amount of provinces that comprise each analysis area. The resulting values depicted the amount of hours of sonar operation by season and by province.

The final step is to take the summed event ZOIs and multiply them by the marine mammal and sea turtle densities, yielding the number of animals potentially exposed. Exposures are presented as a number of each species potentially exposed to sonar sound of a given received sound level, corresponding to an impact threshold, by season and by analysis area.

H.10.3 Marine Mammal Exposures

The following tables provide the estimated marine mammal exposures for each training scenario under each alternative, displaying the seasonal exposures by exposure type (PTS, TTS, or behavioral). The analysis did not predict any potential for marine mammal mortalities.

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Table H-8. Estimated Marine Mammal PTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	1	1	1	1	1	1	1	1	4	4	4	4	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Atlantic spotted dolphin	2	2	2	2	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-9. Estimated Marine Mammal PTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	1	1	1	1	1	1	1	1	2	1	2	2	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Atlantic spotted dolphin	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Common dolphin	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-10. Estimated Marine Mammal PTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	1	1	1	1	1	1	1	1	2	3	2	2	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Atlantic spotted dolphin	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
Common dolphin	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-11. Estimated Marine Mammal PTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	1	1	1	1	4	4	4	4	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Atlantic spotted dolphin	1	1	1	1	0	0	0	0	2	2	2	2	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-12. Estimated Marine Mammal PTS Exposures from Coordinated ULT Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	0	0	0	0	2	2	2	2	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic spotted dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act

F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-13. Estimated Marine Mammal PTS Exposures from Coordinated ULT Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic spotted dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-14. Estimated Marine Mammal PTS Exposures from Coordinated ULT Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	0	0	0	0	1	2	1	1	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic spotted dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-15. Estimated Marine Mammal PTS Exposures from Coordinated ULT Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	0	0	0	0	2	2	2	2	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic spotted dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-16. Estimated Marine Mammal PTS Exposures from Strike Group Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	1	1	1	1	2	2	2	2	0	0	0	0	1	0	0	1
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-17. Estimated Marine Mammal PTS Exposures from Strike Group Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	2
Atlantic spotted dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-18. Estimated Marine Mammal PTS Exposures from Strike Group Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	0	0	1	0	1	1	1	1	0	0	0	0	0	0	0	0
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	2
Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-19. Estimated Marine Mammal PTS Exposures from Strike Group Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bottlenose dolphin	0	0	0	0	1	1	1	1	2	2	2	2	0	0	0	0	1	0	0	1
Pantropical spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Atlantic spotted dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Clymene dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Striped dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-20. Estimated Marine Mammal TTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0
Humpback whale*	1	0	1	1	1	0	1	1	4	0	4	2	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	3	4	8	8	0	0	0	0	1	1	2	2	0	0	0	0	0	0	0	0
Kogia spp.	1	1	1	1	1	1	1	1	4	4	3	3	0	0	0	0	0	0	0	0
Beaked whale	1	1	2	2	0	1	0	0	2	2	2	2	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	1	1	1	1	1	1	2	2	2	2	0	0	0	0	0	0	0	0
Bottlenose dolphin	37	41	92	92	83	79	98	98	803	783	684	684	1	1	1	1	5	0	4	4
Pantropical spotted dolphin	14	14	27	27	24	24	26	26	82	82	76	76	0	0	0	0	2	3	3	3
Atlantic spotted dolphin	138	138	305	305	131	131	111	111	558	558	437	437	1	1	1	1	0	0	1	1
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	6	6	13	13	12	12	12	12	39	39	36	36	0	0	0	0	2	2	2	2
Striped dolphin	82	82	191	191	0	0	0	0	0	0	0	0	4	4	4	4	0	0	0	0
Common dolphin	121	121	223	223	0	0	0	0	0	0	0	0	3	3	3	3	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	10	10	22	22	13	13	14	14	76	76	68	68	1	1	1	1	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	14	18	35	35	13	11	16	16	82	74	85	85	2	1	1	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-21 Estimated Marine Mammal TTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	1	0	1	1	1	0	1	1	3	0	3	1	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0*	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	3	3	6	6	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Kogia spp.	0	0	1	1	1	1	1	1	3	3	3	3	0	0	0	0	0	0	0	0
Beaked whale	0	0	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Bottlenose dolphin	54	55	139	139	61	66	67	67	243	180	210	210	1	1	1	1	5	0	4	4
Pantropical spotted dolphin	11	11	21	21	17	17	19	19	58	58	57	57	0	0	0	0	2	4	3	3
Atlantic spotted dolphin	72	72	187	187	44	44	35	35	197	197	136	136	1	1	1	1	0	0	1	1
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	5	5	10	10	8	8	9	9	28	28	27	27	0	0	0	0	2	2	2	2
Striped dolphin	14	14	31	31	0	0	0	0	0	0	0	0	6	6	6	6	0	0	0	0
Common dolphin	154	154	328	328	0	0	0	0	0	0	0	0	5	5	5	5	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	4	4	9	9	1	1	1	1	52	52	50	50	1	1	1	1	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	17	19	40	40	8	8	9	9	60	61	62	62	2	1	1	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-22. Estimated Marine Mammal TTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	1	0	1	1	1	0	1	1	3	0	3	1	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	3	3	6	5	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Kogia spp.	0	0	1	1	1	1	1	1	3	3	3	3	0	0	0	0	0	0	0	0
Beaked whale	0	0	1	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Bottlenose dolphin	54	55	139	92	61	66	85	67	259	339	239	213	1	1	1	1	5	0	4	4
Pantropical spotted dolphin	11	11	21	21	17	17	19	19	62	62	57	57	0	0	0	0	2	4	3	3
Atlantic spotted dolphin	72	72	187	180	44	44	35	35	199	210	145	136	1	1	1	1	0	0	1	1
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	5	5	10	10	8	8	9	9	29	29	27	27	0	0	0	0	2	2	2	2
Striped dolphin	14	14	31	34	0	0	0	0	0	0	0	0	6	6	6	6	0	0	0	0
Common dolphin	154	154	328	270	0	0	0	0	0	0	0	0	5	5	5	5	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	4	4	9	10	1	1	10	1	57	72	70	51	1	1	1	1	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	17	19	40	29	8	8	10	9	66	80	76	63	2	1	1	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-23. Estimated Marine Mammal TTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	1	0	0	2	0	0	0	0	0	0	0	0
Humpback whale*	1	0	1	1	1	0	1	1	4	0	4	2	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	2	2	4	4	0	0	0	0	1	1	2	2	0	0	0	0	1	1	1	1
Kogia spp.	1	1	1	1	1	1	1	1	4	4	3	3	0	0	0	0	0	0	0	0
Beaked whale	1	1	1	1	0	1	0	0	2	2	2	2	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	1	1	1	1	1	1	2	2	2	2	0	0	0	0	0	0	0	0
Bottlenose dolphin	17	21	39	39	68	70	74	74	626	562	530	530	1	1	1	1	5	0	4	4
Pantropical spotted dolphin	13	13	26	26	24	24	24	24	80	80	72	72	0	0	0	0	2	3	3	3
Atlantic spotted dolphin	79	79	172	172	105	105	83	83	560	560	411	411	0	0	0	0	0	0	1	1
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	6	6	12	12	12	12	12	12	38	38	34	34	0	0	0	0	2	2	2	2
Striped dolphin	42	42	84	84	0	0	0	0	0	0	0	0	3	3	3	3	0	0	0	0
Common dolphin	54	54	94	94	0	0	0	0	0	0	0	0	4	4	3	3	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	6	6	13	13	16	16	16	16	78	78	69	69	1	1	1	1	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	10	12	22	22	11	7	13	13	82	75	85	85	2	1	1	1	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-24. Estimated Marine Mammal TTS Exposures from Coordinated ULT Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	3	0	3	1	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde’s whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	3	3	2	2	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Bottlenose dolphin	7	7	16	16	15	14	18	18	559	545	476	476	0	0	0	0	1	0	1	1
Pantropical spotted dolphin	2	2	5	5	4	4	5	5	57	57	53	53	0	0	0	0	0	1	0	0
Atlantic spotted dolphin	25	25	55	55	24	24	20	20	391	391	306	306	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	1	1	2	2	2	2	2	2	27	27	25	25	0	0	0	0	0	0	0	0
Striped dolphin	15	15	34	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	22	22	41	41	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser’s dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso’s dolphin	2	2	4	4	2	2	3	3	53	53	47	47	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	3	3	6	6	2	2	3	3	57	51	59	59	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-25. Estimated Marine Mammal TTS Exposures from Coordinated ULT Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	2	0	2	1	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	1	1	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	2	2	2	2	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Bottlenose dolphin	10	10	25	25	11	12	12	12	168	124	145	145	0	0	0	0	1	0	1	1
Pantropical spotted dolphin	2	2	4	4	3	3	3	3	40	40	39	39	0	0	0	0	0	1	1	1
Atlantic spotted dolphin	13	13	34	34	8	8	6	6	137	137	94	94	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	1	1	2	2	1	1	2	2	19	19	19	19	0	0	0	0	0	0	0	0
Striped dolphin	2	2	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	28	28	59	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	1	1	2	2	0	0	0	0	36	36	35	35	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	3	3	7	7	1	1	2	2	42	42	43	43	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-26. Estimated Marine Mammal TTS Exposures from Coordinated ULT Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	2	0	2	1	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	2	2	2	2	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Bottlenose dolphin	10	10	25	17	11	12	15	12	179	234	164	147	0	0	0	0	1	0	1	1
Pantropical spotted dolphin	2	2	4	4	3	3	3	3	43	43	40	40	0	0	0	0	0	1	1	1
Atlantic spotted dolphin	13	13	34	32	8	8	6	6	138	145	100	94	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	1	1	2	2	1	1	2	2	20	20	19	19	0	0	0	0	0	0	0	0
Striped dolphin	2	2	6	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	28	28	59	49	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	1	1	2	2	0	0	2	0	40	50	48	35	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	3	3	7	5	1	1	2	2	46	56	52	43	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-27. Estimated Marine Mammal TTS Exposures from Coordinated ULT Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	0	0	0	0	3	0	3	1	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Kogia spp.	0	0	0	0	0	0	0	0	3	3	2	2	0	0	0	0	0	0	0	0
Beaked whale	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0
Bottlenose dolphin	3	4	7	7	12	13	13	13	435	390	368	368	0	0	0	0	1	0	1	1
Pantropical spotted dolphin	2	2	5	5	4	4	4	4	55	55	50	50	0	0	0	0	0	1	0	0
Atlantic spotted dolphin	14	14	31	31	19	19	15	15	392	392	287	287	0	0	0	0	0	0	0	0
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Clymene dolphin	1	1	2	2	2	2	2	2	26	26	24	24	0	0	0	0	0	0	0	0
Striped dolphin	7	7	15	15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common dolphin	10	10	17	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Risso's dolphin	1	1	2	2	3	3	3	3	54	54	48	48	0	0	0	0	0	0	0	0
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	2	2	4	4	2	1	2	2	57	52	59	59	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-28. Estimated Marine Mammal TTS Exposures from Strike Group Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	1	0	1	1	2	0	2	1	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	1	2	3	3	0	1	1	1	1	1	2	2	0	0	0	0	3	0	0	2
Kogia spp.	0	0	0	0	1	1	1	1	2	2	2	2	0	0	0	0	3	0	0	2
Beaked whale	0	0	1	1	0	1	1	1	1	2	2	2	0	0	0	0	2	0	0	1
Rough-toothed dolphin	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	6	0	0	5
Bottlenose dolphin	15	15	39	39	87	78	107	107	295	289	272	272	0	0	0	0	136	0	0	105
Pantropical spotted dolphin	3	3	7	7	24	24	28	28	39	39	43	43	0	0	0	0	383	0	0	301
Atlantic spotted dolphin	44	44	109	109	90	90	78	78	105	105	82	82	0	0	0	0	88	0	0	66
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	162	0	0	129
Clymene dolphin	2	2	3	3	11	11	13	13	19	19	20	20	0	0	0	0	59	0	0	47
Striped dolphin	28	28	71	71	0	0	0	0	0	0	0	0	0	0	0	0	32	0	0	26
Common dolphin	26	26	54	54	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Risso's dolphin	3	3	7	7	12	12	14	14	40	40	37	37	0	0	0	0	11	0	0	9
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	9
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	3
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	6	7	14	14	15	13	21	21	62	53	69	69	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	6
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act

F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-29. Estimated Marine Mammal TTS Exposures from Strike Group Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	1	0	1	1	2	0	2	1	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	0	0	1	1	1	1	1	1	0	1	1	1	0	0	0	0	2	0	0	2
Kogia spp.	0	0	0	0	1	1	1	1	2	2	2	2	0	0	0	0	3	0	0	2
Beaked whale	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	2	0	0	1
Rough-toothed dolphin	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	7	0	0	5
Bottlenose dolphin	10	10	25	25	65	72	69	69	168	124	145	145	0	0	0	0	61	0	0	48
Pantropical spotted dolphin	2	2	4	4	21	21	25	25	40	40	39	39	0	0	0	0	430	0	0	304
Atlantic spotted dolphin	13	13	34	34	55	55	42	42	137	137	94	94	0	0	0	0	32	0	0	26
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81	0	0	64
Clymene dolphin	1	1	2	2	10	10	12	12	19	19	19	19	0	0	0	0	58	0	0	46
Striped dolphin	2	2	6	6	0	0	0	0	0	0	0	0	0	0	0	0	26	0	0	21
Common dolphin	28	28	59	59	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Risso's dolphin	1	1	2	2	2	2	2	2	36	36	35	35	0	0	0	0	9	0	0	7
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	9
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	3	3	7	7	8	8	9	9	42	42	43	43	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	6
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act

F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-30. Estimated Marine Mammal TTS Exposures from Strike Group Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	1	0	1	1	2	0	2	1	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	1	1	2	2	1	1	1	1	1	1	1	1	0	0	0	0	2	0	0	2
Kogia spp.	0	0	0	0	1	1	1	1	2	2	2	2	0	0	0	0	3	0	0	2
Beaked whale	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	2	0	0	1
Rough-toothed dolphin	0	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	7	0	0	5
Bottlenose dolphin	21	21	55	36	65	72	86	69	126	172	122	109	0	0	0	0	61	0	0	48
Pantropical spotted dolphin	3	3	6	6	21	21	25	25	39	39	40	40	0	0	0	0	430	0	0	304
Atlantic spotted dolphin	29	29	76	73	55	55	42	42	74	80	56	51	0	0	0	0	32	0	0	26
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	81	0	0	64
Clymene dolphin	1	1	3	3	10	10	12	12	19	19	19	19	0	0	0	0	58	0	0	46
Striped dolphin	2	2	7	8	0	0	0	0	0	0	0	0	0	0	0	0	26	0	0	21
Common dolphin	18	18	47	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Risso's dolphin	1	1	2	2	2	2	10	2	30	39	38	28	0	0	0	0	9	0	0	7
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	9
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	6	7	15	11	8	8	10	9	42	47	49	42	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	6
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-31. Estimated Marine Mammal TTS Exposures from Strike Group Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback whale*	0	0	0	0	1	0	1	1	2	0	2	1	0	0	0	0	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	1	1	2	2	0	1	1	1	1	1	2	2	0	0	0	0	2	0	0	2
Kogia spp.	0	0	0	0	1	1	1	1	2	2	2	2	0	0	0	0	3	0	0	2
Beaked whale	0	0	0	0	1	1	1	1	1	2	2	2	0	0	0	0	0	0	0	0
Rough-toothed dolphin	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	2	0	0	1
Bottlenose dolphin	7	8	16	16	71	69	80	80	263	249	245	245	0	0	0	0	152	0	0	117
Pantropical spotted dolphin	3	3	7	7	24	24	27	27	39	39	42	42	0	0	0	0	353	0	0	269
Atlantic spotted dolphin	28	28	65	65	71	71	57	57	105	105	78	78	0	0	0	0	71	0	0	52
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	162	0	0	128
Clymene dolphin	2	2	3	3	11	11	13	13	19	19	20	20	0	0	0	0	59	0	0	47
Striped dolphin	11	11	23	23	0	0	0	0	0	0	0	0	0	0	0	0	45	0	0	35
Common dolphin	9	9	17	17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2
Risso's dolphin	2	2	4	4	15	15	16	16	40	40	37	37	0	0	0	0	15	0	0	12
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	0	0	9
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	1
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	3
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	4	4	9	9	14	8	17	17	62	53	69	69	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8	0	0	6
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-32. Estimated Marine Mammal Behavioral Exposures for ULT, RDT&E, and Maintenance Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	8	0	6	21	4	0	2	7	63	0	0	126	23	14	33	161	0	0	0	0
Humpback whale*	117	0	268	134	176	0	292	146	675	0	963	481	176	19	808	474	0	0	0	0
Minke whale	4	4	9	9	6	6	10	10	23	23	33	33	30	30	166	166	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	639	316	181	935	0	0	0	0
Fin whale*	9	9	23	23	0	0	0	0	0	0	0	0	107	107	534	534	0	0	0	0
Sperm whale*	558	652	1739	1739	51	67	107	107	245	231	538	538	279	324	3466	2373	8	9	11	11
Kogia spp.	75	75	197	197	110	110	214	214	424	424	714	714	102	102	413	413	6	6	7	7
Beaked whale	160	167	98	98	69	115	33	33	299	378	134	134	391	424	0	0	4	2	0	0
Rough-toothed dolphin	36	36	94	94	52	52	102	102	202	202	339	339	48	48	195	195	45	45	49	49
Bottlenose dolphin	5485	5598	18211	18211	12286	10406	24239	24239	80388	80503	119648	119648	3673	3335	15533	15293	1952	1369	2254	2254
Pantropical spotted dolphin	1647	1647	4348	4348	2420	2420	4724	4724	9350	9350	15728	15728	2233	2233	9044	9044	980	997	1238	1238
Atlantic spotted dolphin	16491	16491	53003	53003	4681	4681	7095	7095	26111	26111	29801	29801	2270	2257	11431	11431	1391	1391	1743	1743
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	365	365	502	502
Clymene dolphin	787	787	2077	2077	1156	1156	2257	2257	4467	4467	7514	7514	1067	1067	4321	4321	254	254	288	288
Striped dolphin	14826	14826	43249	43249	10	10	21	21	0	0	0	0	22430	22430	93741	93741	68	68	91	91
Common dolphin	5895	5895	20582	20582	12	12	17	17	0	0	0	0	9667	9667	43386	43386	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	11	12	12
Risso's dolphin	1296	1296	3973	3973	1444	1444	2789	2789	11323	11323	17888	17888	3471	3471	16152	16152	34	34	42	42
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	2385	2385	14698	14698	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	51	51	57	57
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	8	8
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	15	17	17
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2
Pilot whales	2281	2948	7309	7309	2314	1934	4673	4673	15052	13282	26710	26710	3736	3056	14870	12571	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	35	40	40
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	14513	17204	126704	126704	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	3314	3314	15454	15454	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	3087	2799	31717	31717	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-33. Estimated Marine Mammal Behavioral Exposures for ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	6	0	4	16	0	0	0	0	38	0	0	90	3	1	0	0	0	0	0	0
Humpback whale*	123	0	265	133	187	0	322	161	694	0	1055	528	213	2	863	432	0	0	0	0
Minke whale	4	4	9	9	6	6	11	11	24	24	36	36	10	10	30	30	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	309	384	273	672	0	0	0	0
Fin whale*	9	9	26	26	0	0	0	0	0	0	0	0	54	54	242	242	0	0	0	0
Sperm whale*	447	472	1288	1288	65	86	139	139	123	146	257	257	418	480	1870	1742	6	8	9	9
Kogia spp.	80	80	194	194	119	119	235	235	442	442	783	783	136	136	529	529	5	6	7	7
Beaked whale	82	64	48	48	20	38	10	10	162	237	70	70	130	144	0	0	2	1	0	0
Rough-toothed dolphin	38	38	92	92	57	57	112	112	210	210	372	372	65	65	251	251	38	38	40	40
Bottlenose dolphin	9081	9281	28216	28216	9112	9183	17835	17835	40991	31777	62994	62994	5775	4354	23609	23620	1212	812	1230	1230
Pantropical spotted dolphin	1755	1755	4279	4279	2622	2622	5187	5187	9734	9734	17257	17257	3000	3000	11654	11654	829	927	1141	1141
Atlantic spotted dolphin	12394	12394	38659	38659	4082	4082	6377	6377	27235	27235	34273	34273	5240	5240	14251	14251	507	507	517	517
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	237	237	326	326
Clymene dolphin	839	839	2044	2044	1253	1253	2478	2478	4650	4650	8245	8245	1433	1433	5568	5568	242	242	273	273
Striped dolphin	1281	1281	4176	4176	4	4	8	8	0	0	0	0	42969	42969	162892	162892	60	60	82	82
Common dolphin	10523	10523	35907	35907	0	0	0	0	0	0	0	0	19952	19952	88378	88378	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10	11	11
Risso's dolphin	450	450	1370	1370	159	159	301	301	8991	8991	15392	15392	3560	3560	14864	14864	28	28	35	35
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	10	10	45	45	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48	54	54
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	8	8
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	16	16
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2
Pilot whales	2789	3366	8272	8272	1337	1402	2754	2754	10592	10313	19169	19169	3342	3468	11750	11468	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	33	38	38
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	3	0	12	12	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	17700	17700	70840	70840	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	8	2	5	5	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-34. Estimated Marine Mammal Behavioral Exposures for ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	6	0	4	15	0	0	0	0	38	0	0	90	3	1	0	0	0	0	0	0
Humpback whale*	123	0	265	133	187	0	322	161	749	0	1063	531	213	2	863	432	0	0	0	0
Minke whale	4	4	9	9	6	6	11	11	26	26	37	37	10	10	30	30	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	309	384	273	672	0	0	0	0
Fin whale*	9	9	26	25	0	0	0	0	0	0	0	0	54	54	242	242	0	0	0	0
Sperm whale*	447	472	1288	1071	65	86	132	139	128	168	293	258	418	480	1870	1742	6	8	9	9
Kogia spp.	80	80	194	194	119	119	235	235	477	477	791	791	136	136	529	529	5	6	7	7
Beaked whale	82	64	48	12	20	38	9	10	178	188	60	70	130	144	0	0	2	1	0	0
Rough-toothed dolphin	38	38	92	92	57	57	112	112	227	227	376	376	65	65	251	251	38	38	40	40
Bottlenose dolphin	9081	9281	28216	18511	9112	9183	23043	17835	43899	60822	71586	63601	5775	4354	23609	23620	1212	812	1230	1230
Pantropical spotted dolphin	1755	1755	4279	4279	2622	2622	5187	5187	10515	10515	17420	17420	3000	3000	11654	11654	829	927	1141	1141
Atlantic spotted dolphin	12394	12394	38659	37218	4082	4082	6312	6377	27538	29536	37084	34336	5240	5240	14251	14251	507	507	517	517
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	237	237	326	326
Clymene dolphin	839	839	2044	2044	1253	1253	2478	2478	5023	5023	8323	8323	1433	1433	5568	5568	242	242	273	273
Striped dolphin	1281	1281	4176	4751	4	4	8	8	0	0	0	0	42969	42969	162892	162892	60	60	82	82
Common dolphin	10523	10523	35907	23865	0	0	0	0	0	0	0	0	19952	19952	88378	88378	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10	11	11
Risso's dolphin	450	450	1370	1565	159	159	2863	301	9965	12644	21543	15595	3560	3560	14864	14864	28	28	35	35
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	10	10	45	45	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	48	48	54	54
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	8	8
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	16	16
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2
Pilot whales	2789	3366	8272	5659	1337	1402	2920	2754	11643	13959	23529	19388	3342	3468	11750	11468	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	33	38	38
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	3	0	12	12	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	17700	17700	70840	70840	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	8	2	5	5	0	0	0	0

* Model results indicate that the likelihood of exposure is so low that it is discountable
** Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-35. Estimated Marine Mammal Behavioral Exposures for ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	8	0	6	21	4	0	2	7	67	0	0	139	13	10	32	98	0	0	0	0
Humpback whale*	123	0	263	131	181	0	293	146	687	0	976	488	163	15	745	425	0	0	0	0
Minke whale	4	4	9	9	6	6	10	10	24	24	34	34	40	40	220	220	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	484	261	96	581	0	0	0	0
Fin whale*	7	7	16	16	0	0	0	0	0	0	0	0	79	79	404	404	0	0	0	0
Sperm whale*	391	406	1037	1037	49	68	104	104	245	231	538	538	229	279	3322	2223	6	7	9	9
Kogia spp.	79	79	193	193	114	114	215	215	432	432	725	725	96	96	396	396	6	6	8	8
Beaked whale	142	146	81	81	76	125	35	35	299	378	134	134	91	139	0	0	1	0	0	0
Rough-toothed dolphin	37	37	92	92	54	54	102	102	206	206	344	344	45	45	187	187	33	33	34	34
Bottlenose dolphin	2962	3323	8195	8195	10361	9472	19626	19626	75835	73719	114668	114668	2677	2070	12835	12466	1978	1549	2321	2321
Pantropical spotted dolphin	1730	1730	4254	4254	2503	2503	4737	4737	9527	9527	15964	15964	2100	2100	8655	8655	776	854	1108	1108
Atlantic spotted dolphin	11928	11928	33400	33400	3665	3665	5035	5035	30178	30178	34920	34920	769	761	5290	5290	1323	1323	1675	1675
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	369	369	517	517
Clymene dolphin	826	826	2032	2032	1196	1196	2263	2263	4552	4552	7627	7627	1003	1003	4135	4135	244	244	285	285
Striped dolphin	8280	8280	20526	20526	10	10	21	21	0	0	0	0	16805	16805	78677	78677	89	89	124	124
Common dolphin	1650	1650	5565	5565	9	9	11	11	0	0	0	0	10748	10748	53247	53247	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	10	12	12
Risso's dolphin	810	810	2195	2195	1715	1715	3148	3148	11557	11557	18175	18175	2987	2987	14966	14966	38	38	50	50
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	3170	3170	19275	19275	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	49	57	57
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	8	8
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	15	17	17
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2
Pilot whales	1821	2336	4983	4983	2103	1247	4111	4111	15072	13331	26735	26735	3436	2668	14032	12966	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	34	34	39	39
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	23383	29094	202482	202482	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	3254	3254	15682	15682	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-36. Estimated Marine Mammal Behavioral Exposures from Coordinated ULT Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	1	1	0	0	1	23	0	0	33	0	0	0	1	0	0	0	0
Humpback whale*	7	0	11	6	12	0	14	7	187	0	181	91	1	0	3	2	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	6	6	6	6	0	0	1	1	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	2	1	1	3	0	0	0	0
Fin whale*	1	1	1	1	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0	0
Sperm whale*	21	25	74	74	2	3	5	5	43	41	100	100	1	1	12	9	0*	1	1	1
Kogia spp.	3	3	9	9	6	6	11	11	96	96	139	139	0	0	1	1	0	0	0	0
Beaked whale	6	6	17	17	3	5	6	6	59	71	88	88	1	2	0	0	0	0	0	0
Rough-toothed dolphin	1	1	4	4	3	3	5	5	46	46	66	66	0	0	1	1	31	31	30	30
Bottlenose dolphin	227	236	779	779	610	536	1116	1116	19185	19013	23597	23597	13	12	56	55	902	775	873	873
Pantropical spotted dolphin	67	67	192	192	129	129	235	235	2118	2118	3060	3060	8	8	33	33	23	44	43	43
Atlantic spotted dolphin	751	751	2356	2356	448	448	514	514	7848	7848	7641	7641	8	8	41	41	485	485	469	469
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	13	13
Clymene dolphin	32	32	92	92	62	62	112	112	1012	1012	1462	1462	4	4	16	16	30	30	30	30
Striped dolphin	553	553	1874	1874	0	0	1	1	0	0	0	0	81	81	337	337	2	2	2	2
Common dolphin	464	464	1066	1066	1	1	1	1	0	0	0	0	35	35	156	156	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Risso's dolphin	56	56	177	177	78	78	135	135	2579	2579	3338	3338	12	12	58	58	3	3	3	3
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	9	9	53	53	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	6	6
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	91	115	314	314	105	89	210	210	3124	2797	4891	4891	13	11	53	45	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	50	59	450	450	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	12	12	56	56	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	11	10	114	114	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-37. Estimated Marine Mammal Behavioral Exposures from Coordinated ULT Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	9	0	0	15	0	0	0	0	0	0	0	0
Humpback whale*	7	0	11	6	12	0	14	7	179	0	187	93	1	0	3	2	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	6	6	6	6	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	0	0	0	0
Fin whale*	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Sperm whale*	17	18	57	57	2	3	6	6	25	30	48	48	1	2	7	6	1	1	1	1
Kogia spp.	3	3	9	9	5	5	11	11	93	93	143	143	0	0	2	2	0	0	0	0
Beaked whale	3	2	8	8	1	2	2	2	34	50	46	46	0	1	0	0	0	0	0	0
Rough-toothed dolphin	1	1	4	4	3	3	5	5	44	44	68	68	0	0	1	1	31	31	30	30
Bottlenose dolphin	356	361	1219	1219	433	449	823	823	8169	6017	10958	10958	21	16	85	85	902	775	873	873
Pantropical spotted dolphin	62	62	188	188	117	117	240	240	2044	2044	3148	3148	11	11	42	42	22	49	48	48
Atlantic spotted dolphin	483	483	1669	1669	242	242	318	318	5451	5451	5809	5809	19	19	51	51	485	485	469	469
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	13	13
Clymene dolphin	30	30	90	90	56	56	115	115	976	976	1504	1504	5	5	20	20	30	30	30	30
Striped dolphin	68	68	195	195	0	0	0	0	0	0	0	0	154	154	586	586	2	2	2	2
Common dolphin	677	677	1759	1759	0	0	0	0	0	0	0	0	72	72	318	318	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Risso's dolphin	21	21	63	63	7	7	14	14	1952	1952	2814	2814	13	13	53	53	3	3	3	3
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	6	6
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	110	127	364	364	59	62	125	125	2259	2217	3516	3516	12	12	42	41	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	64	64	255	255	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W – Winter

Table H-38. Estimated Marine Mammal Behavioral Exposures from Coordinated ULT Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	9	0	0	15	0	0	0	0	0	0	0	0
Humpback whale*	7	0	11	6	12	0	14	7	194	0	187	94	1	0	3	2	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	7	7	6	6	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	0	0	0	0
Fin whale*	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Sperm whale*	17	18	57	47	2	3	6	6	26	35	54	48	1	2	7	6	1	1	1	1
Kogia spp.	3	3	9	9	5	5	11	11	102	102	144	144	0	0	2	2	0	0	0	0
Beaked whale	3	2	8	2	1	2	1	2	38	40	40	46	0	1	0	0	0	0	0	0
Rough-toothed dolphin	1	1	4	4	3	3	5	5	48	48	68	68	0	0	1	1	31	31	30	30
Bottlenose dolphin	356	361	1219	800	433	449	1059	823	8890	12459	12459	11012	21	16	85	85	902	775	873	873
Pantropical spotted dolphin	62	62	188	188	117	117	240	240	2238	2238	3163	3163	11	11	42	42	22	49	48	48
Atlantic spotted dolphin	483	483	1669	1607	242	242	315	318	5526	5965	6313	5815	19	19	51	51	485	485	469	469
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	13	13
Clymene dolphin	30	30	90	90	56	56	115	115	1069	1069	1511	1511	5	5	20	20	30	30	30	30
Striped dolphin	68	68	195	220	0	0	0	0	0	0	0	0	154	154	586	586	2	2	2	2
Common dolphin	677	677	1759	1239	0	0	0	0	0	0	0	0	72	72	318	318	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Risso's dolphin	21	21	63	72	7	7	130	14	2193	2782	3910	2832	13	13	53	53	3	3	3	3
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	6	6
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	110	127	364	248	59	62	133	125	2520	3045	4286	3535	12	12	42	41	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	64	64	255	255	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W – Winter

Table H-39. Estimated Marine Mammal Behavioral Exposures from Coordinated ULT Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	1	0	0	1	1	0	0	1	23	0	0	34	0	0	0	0	0	0	0	0
Humpback whale*	7	0	11	6	13	0	14	7	188	0	182	91	1	0	3	2	0	0	0	0
Minke whale	0	0	0	0	0	0	0	0	6	6	6	6	0	0	1	1	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	2	0	0	0	0
Fin whale*	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Sperm whale*	14	14	45	45	2	3	5	5	43	41	100	100	1	1	12	8	0	1	1	1
Kogia spp.	3	3	9	9	6	6	11	11	97	97	140	140	0	0	1	1	0	0	0	0
Beaked whale	5	5	14	14	3	6	6	6	59	71	88	88	0	0	0	0	0	0	0	0
Rough-toothed dolphin	1	1	4	4	3	3	5	5	46	46	66	66	0	0	1	1	31	31	30	30
Bottlenose dolphin	110	124	356	356	507	481	906	906	17187	16318	21707	21707	10	7	46	45	900	775	872	872
Pantropical spotted dolphin	68	68	190	190	131	131	235	235	2131	2131	3075	3075	8	8	31	31	20	42	42	42
Atlantic spotted dolphin	476	476	1484	1484	356	356	381	381	8579	8579	8381	8381	3	3	19	19	485	485	469	469
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	14	13	13
Clymene dolphin	33	33	91	91	63	63	112	112	1018	1018	1469	1469	4	4	15	15	30	30	29	29
Striped dolphin	291	291	919	919	0	0	1	1	0	0	0	0	60	60	283	283	2	2	2	2
Common dolphin	184	184	342	342	1	1	1	1	0	0	0	0	38	38	191	191	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Risso's dolphin	34	34	101	101	94	94	155	155	2633	2633	3392	3392	11	11	54	54	3	3	3	3
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	11	11	69	69	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	6	6	6
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	2
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pilot whales	67	84	218	218	94	55	185	185	3128	2808	4895	4895	12	10	50	47	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	80	100	719	719	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	12	12	56	56	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	13	12	140	140	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-40. Estimated Marine Mammal Behavioral Exposures from Strike Group Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	1	2	0	1	2	6	0	0	8	0	0	0	0	0	0	0	0
Humpback whale*	10	0	18	9	73	0	97	48	147	0	171	86	0	0	0	0	0	0	0	0
Minke whale	0	0	1	1	3	3	3	3	5	5	6	6	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	9
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	1	1	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	43	52	159	159	16	21	43	43	54	51	145	145	0	0	0	0	165	0	0	180
Kogia spp.	4	4	14	14	35	35	74	74	75	75	131	131	0	0	0	0	159	0	0	160
Beaked whale	9	10	29	29	20	33	40	40	61	80	115	115	0	0	0	0	105	0	0	45
Rough-toothed dolphin	2	2	7	7	17	17	35	35	35	35	62	62	0	0	0	0	346	0	0	339
Bottlenose dolphin	487	495	1806	1806	3575	3059	6776	6776	12513	12459	16820	16820	0	0	0	0	6094	0	0	5991
Pantropical spotted dolphin	96	96	314	314	765	765	1634	1634	1643	1643	2895	2895	0	0	0	0	23804	0	0	23112
Atlantic spotted dolphin	1371	1371	4855	4855	1737	1737	2146	2146	2125	2125	2113	2113	0	0	0	0	2526	0	0	2459
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9886	0	0	9773
Clymene dolphin	46	46	150	150	366	366	781	781	785	785	1383	1383	0	0	0	0	3664	0	0	3607
Striped dolphin	977	977	3546	3546	3	3	10	10	0	0	0	0	0	0	0	0	2007	0	0	1981
Common dolphin	609	609	1770	1770	4	4	5	5	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	153	0	0	151
Risso's dolphin	97	97	341	341	437	437	821	821	2047	2047	2666	2666	0	0	0	0	686	0	0	676
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	728	0	0	717
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	105	0	0	103
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	219	0	0	216
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	28
Pilot whales	186	223	690	690	673	561	1409	1409	2952	2574	5162	5162	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	504	0	0	496
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-41. Estimated Marine Mammal Behavioral Exposures from Strike Group Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	9	0	0	15	0	0	0	0	0	0	0	0
Humpback whale*	7	0	11	6	72	0	97	49	179	0	187	93	1	0	3	2	0	0	0	0
Minke whale	0	0	0	0	2	2	3	3	6	6	6	6	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	9
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	0	0	0	0
Fin whale*	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Sperm whale*	17	18	57	57	19	24	54	54	25	30	48	48	1	2	7	6	128	0	0	158
Kogia spp.	3	3	9	9	34	34	75	75	93	93	143	143	0	0	2	2	171	0	0	181
Beaked whale	3	2	8	8	5	9	9	9	34	50	46	46	0	1	0	0	101	0	0	50
Rough-toothed dolphin	1	1	4	4	16	16	36	36	44	44	68	68	0	0	1	1	406	0	0	399
Bottlenose dolphin	356	361	1219	1219	2327	2473	4366	4366	8169	6017	10958	10958	21	16	85	85	3759	0	0	3705
Pantropical spotted dolphin	62	62	188	188	748	748	1646	1646	2044	2044	3148	3148	11	11	42	42	26694	0	0	23311
Atlantic spotted dolphin	483	483	1669	1669	1526	1526	1912	1912	5451	5451	5809	5809	19	19	51	51	1990	0	0	1959
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4942	0	0	4880
Clymene dolphin	30	30	90	90	357	357	786	786	976	976	1504	1504	5	5	20	20	3615	0	0	3555
Striped dolphin	68	68	195	195	1	1	4	4	0	0	0	0	154	154	586	586	1592	0	0	1569
Common dolphin	677	677	1759	1759	0	0	0	0	0	0	0	0	72	72	318	318	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	151	0	0	149
Risso's dolphin	21	21	63	63	53	53	114	114	1952	1952	2814	2814	13	13	53	53	577	0	0	568
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	719	0	0	707
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	103	0	0	102
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	216	0	0	213
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	27
Pilot whales	110	127	364	364	308	320	672	672	2259	2217	3516	3516	12	12	42	41	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	497	0	0	489
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	64	64	255	255	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W – Winter

Table H-42. Estimated Marine Mammal Behavioral Exposures from Strike Group Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	0	0	0	0	0	4	0	0	7	0	0	0	0	0	0	0	0
Humpback whale*	10	0	18	9	72	0	97	49	163	0	172	86	0	0	0	0	0	0	0	0
Minke whale	0	0	1	1	2	2	3	3	6	6	6	6	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	9
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	32	34	112	97	19	24	53	54	33	40	70	66	0	0	0	0	128	0	0	158
Kogia spp.	4	4	14	14	34	34	75	75	85	85	133	133	0	0	0	0	171	0	0	181
Beaked whale	5	5	14	4	5	9	8	9	33	37	42	47	0	0	0	0	101	0	0	50
Rough-toothed dolphin	2	2	7	7	16	16	36	36	40	40	63	63	0	0	0	0	406	0	0	399
Bottlenose dolphin	712	715	2567	1674	2327	2473	5584	4366	5916	8586	8571	7540	0	0	0	0	3759	0	0	3705
Pantropical spotted dolphin	89	89	305	305	748	748	1646	1646	1868	1868	2919	2919	0	0	0	0	26694	0	0	23311
Atlantic spotted dolphin	986	986	3555	3423	1526	1526	1897	1912	2768	3086	3240	2886	0	0	0	0	1990	0	0	1959
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4942	0	0	4880
Clymene dolphin	43	43	146	146	357	357	786	786	892	892	1395	1395	0	0	0	0	3615	0	0	3555
Striped dolphin	85	85	307	360	1	1	4	4	0	0	0	0	0	0	0	0	1592	0	0	1569
Common dolphin	617	617	2224	1116	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	151	0	0	149
Risso's dolphin	29	29	104	121	53	53	713	114	1556	1983	2773	2005	0	0	0	0	577	0	0	568
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	719	0	0	707
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	103	0	0	102
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	216	0	0	213
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	27
Pilot whales	203	235	722	500	308	320	711	672	2067	2334	3641	3107	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	497	0	0	489
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

* Denotes species listed in accordance with the Endangered Species Act
F – Fall; Spr – Spring; Smr – Summer; W - Winter

Table H-43. Estimated Marine Mammal Behavioral Exposures from Strike Group Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
North Atlantic right whale*	0	0	0	1	2	0	1	2	6	0	0	8	0	0	0	0	0	0	0	0
Humpback whale*	10	0	18	9	74	0	97	48	148	0	171	86	0	0	0	0	0	0	0	0
Minke whale	0	0	1	1	3	3	3	3	5	5	6	6	0	0	0	0	0	0	0	0
Bryde's whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13	0	0	9
Sei whale*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fin whale*	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sperm whale*	25	27	88	88	15	21	42	42	54	51	145	145	0	0	0	0	106	0	0	143
Kogia spp.	4	4	14	14	35	35	74	74	75	75	132	132	0	0	0	0	177	0	0	175
Beaked whale	7	9	22	22	22	36	43	43	61	80	115	115	0	0	0	0	21	0	0	4
Rough-toothed dolphin	2	2	7	7	17	17	35	35	35	35	63	63	0	0	0	0	86	0	0	85
Bottlenose dolphin	230	255	799	799	2961	2733	5500	5500	12019	11796	16356	16356	0	0	0	0	7766	0	0	7662
Pantropical spotted dolphin	98	98	310	310	774	774	1631	1631	1646	1646	2898	2898	0	0	0	0	21585	0	0	20605
Atlantic spotted dolphin	925	925	3158	3158	1317	1317	1480	1480	2292	2292	2277	2277	0	0	0	0	2444	0	0	2389
Spinner dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9837	0	0	9738
Clymene dolphin	47	47	148	148	370	370	779	779	786	786	1384	1384	0	0	0	0	3597	0	0	3560
Striped dolphin	394	394	1320	1320	3	3	10	10	0	0	0	0	0	0	0	0	2732	0	0	2704
Common dolphin	179	179	389	389	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0
Fraser's dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	150	0	0	149
Risso's dolphin	55	55	179	179	511	511	921	921	2060	2060	2679	2679	0	0	0	0	912	0	0	902
Atlantic white-sided dolphin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Melon-headed whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	715	0	0	708
Pygmy killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	103	0	0	102
False killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	215	0	0	213
Killer whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	28	0	0	27
Pilot whales	132	150	459	459	604	359	1256	1256	2953	2577	5163	5163	0	0	0	0	0	0	0	0
Short-finned pilot whale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	495	0	0	490
Harbor porpoise	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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F – Fall; Spr – Spring; Smr – Summer; W – Winter

H.10.4 Sea Turtle Exposures

Based on the best available scientific data, the sensitive hearing ranges for sea turtles range from 200 Hz up to 700 Hz, with their sensitivity falling off considerably below 200 Hz. The operational frequencies of the mid-frequency and high-frequency sonar systems used during training events would fall outside the optimal hearing range for sea turtles. Therefore, only impulsive sound from the explosive source sonobuoy (AN/SSQ-110A) was considered in the sea turtle exposure analysis. The following tables list the estimated sea turtle exposures for each training scenario and under each Alternative, displaying the seasonal exposures by exposure type (PTS or TTS). The analysis did not predict any potential for sea turtle mortalities.

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Table H-44. Estimated Sea Turtle PTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-45. Estimated Sea Turtle PTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-46. Estimated Sea Turtle PTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-47. Estimated Sea Turtle PTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-48. Estimated Sea Turtle PTS Exposures from Coordinated ULT Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-49. Estimated Sea Turtle PTS Exposures from Coordinated ULT Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-50. Estimated Sea Turtle PTS Exposures from Coordinated ULT Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-51. Estimated Sea Turtle PTS Exposures from Coordinated ULT Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-52. Estimated Sea Turtle PTS Exposures from Strike Group Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-53. Estimated Sea Turtle PTS Exposures from Strike Group Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-54. Estimated Sea Turtle PTS Exposures from Strike Group Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-55. Estimated Sea Turtle PTS Exposures from Strike Group Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-56. Estimated Sea Turtle TTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-57. Estimated Sea Turtle TTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-58. Estimated Sea Turtle TTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-59. Estimated Sea Turtle TTS Exposures from ULT, RDT&E, and Maintenance Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-60. Estimated Sea Turtle TTS Exposures from Coordinated ULT Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter

1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-61. Estimated Sea Turtle TTS Exposures from Coordinated ULT Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter

1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-62. Estimated Sea Turtle TTS Exposures from Coordinated ULT Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-63. Estimated Sea Turtle TTS Exposures from Coordinated ULT Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-64. Estimated Sea Turtle TTS Exposures from Strike Group Active Sonar Activities Under the No Action Alternative

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter

1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-65. Estimated Sea Turtle TTS Exposures from Strike Group Active Sonar Activities Under Alternative 1

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter

1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-66. Estimated Sea Turtle TTS Exposures from Strike Group Active Sonar Activities Under Alternative 2

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

Table H-67. Estimated Sea Turtle TTS Exposures from Strike Group Active Sonar Activities Under Alternative 3

Species	Southeast												Northeast				Gulf of Mexico			
	VACAPES OPAREA				CHPT OPAREA				JAX/CHASN OPAREA				Northeast OPAREA				GOMEX			
	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W	Spr	Smr	F	W
Loggerhead sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Kemp's ridley sea turtle[1]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Leatherback sea turtle	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hardshell sea turtles[2]	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

F – Fall; Spr – Spring; Smr – Summer; W – Winter
1. This category does not include Kemp's ridley sea turtles in the Gulf of Mexico. They are included in the hardshell sea turtle class.
2. This category includes green, hawksbill, and unidentified hardshell species for all regions. It also includes Kemp's ridley sea turtles in the Gulf of Mexico, and may include extralimital occurrences of olive ridley turtles along the Atlantic coast.

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APPENDIX I

SUMMARY FOR BIOLOGICAL EVALUATION

BIOLOGICAL EVALUATION FOR FEDERALLY LISTED THREATENED AND ENDANGERED SPECIES SECTION 7 CONSULTATION FOR ATLANTIC FLEET ACTIVE SONAR TRAINING ACTIVITIES

This Biological Evaluation (BE) appendix serves to initiate formal consultation pursuant to Section 7 of the Endangered Species Act (ESA) with the National Marine Fisheries Service (NMFS). The U.S. Navy prepared this appendix to consolidate and provide information on the potential environmental effects to Federally-listed species associated with the implementing the proposed action analyzed in this Atlantic Fleet Active Sonar Training (AFAST) Environmental Impact Statement/Overseas Environmental Impact Statement (EIS/OEIS).

I.1 PURPOSE AND NEED OF THE PROPOSED ACTION

The Navy seeks to designate areas where mid- and high-frequency active sonar and the improved extended echo ranging (IEER) system training, maintenance, and research, development, test, and evaluation (RDT&E) activities will occur within and adjacent to existing operating areas (OPAREAs), and to conduct these activities. These areas are located in the ocean along the East Coast and within the Gulf of Mexico. Navy OPAREAs include designated ocean areas near fleet concentration areas (i.e., homeports). OPAREAs are where the majority of routine Navy training and RDT&E takes place. However, the Navy's training exercises are not confined to the OPAREAs. Some training exercises or portions of exercises are conducted seaward of the OPAREAs, and a limited amount of active sonar use is conducted in water areas shoreward of the OPAREAs.

The purpose of the Proposed Action is to provide mid- and high-frequency active sonar and IEER system training for U.S. Navy Atlantic Fleet ship, submarine, and aircraft crews, as well as to conduct RDT&E activities to support the requirements of the Fleet Readiness Training Plan (FRTP) and stay proficient in ASW and MIW skills. The FRTP is the Navy's training cycle that requires naval forces to build up in preparation for operational deployment and to maintain a high level of proficiency and readiness while deployed. All phases of the FRTP training cycle are needed to meet Title 10 requirements.

The Navy's need for training and RDT&E is found in Title 10 of the United States Code (U.S.C.), Section 5062 (10 U.S.C. 5062). Title 10 U.S.C. 5062 requires the Navy to be "organized, trained, and equipped primarily for prompt and sustained combat incident to operations at sea." The current and emerging training and RDT&E activities addressed in the AFAST Environmental Impact Statement (EIS)/Overseas Environmental Impact Statement (OEIS) are conducted in fulfillment of this legal requirement.

- Section 1.1, *Purpose,* of this AFAST EIS/OEIS provides further information on the purpose of the proposed action.
- Section 1.2, *Need*, provides further information on the need for the proposed action.

I.2 DESCRIPTION OF AFAST TRAINING ACTIVITIES

AFAST activities involve active sonar technology and the IEER system. The activities encompass maintenance and research, as well as RDT&E for active sonar activities similar to Atlantic Fleet training. These RDT&E activities have not been previously evaluated in other environmental planning documents. Training and RDT&E activities involving active sonar and the IEER system are collectively described as active sonar activities. The activities involving active sonar are not new and do not involve significant changes in systems, tempo, or intensity from past activities.

The systems used during training include active and passive systems mounted to surface ships and submarines or deployed by military patrol aircraft and helicopters. Other systems include torpedoes and acoustic device countermeasures.

- Section 2.2 of this AFAST EIS/OEIS, *ASW and MIW Training Activities*, for an overview of the types of Navy training.
- Section 2.3, *Sonar Systems*, provides specific information on the systems employed during AFAST proposed activities.
- Section 2.4, *Representative Active Sonar Use and Acoustic Sources*, provides specific information about the active sonar training events and the usage of each system.

I.3 AFAST ACTIVITY LOCATIONS

Active sonar use was distributed throughout the AFAST Study Area based on actual reported usage. The U.S. Navy compiled the information and grouped similar events to form representative scenarios. The scopes of these activities, which are presented in the EIS/OEIS also form the basis of the Section 7 ESA consultation. They Navy's preferred alternative is to continue conducting active sonar activities within and adjacent to existing OPAREAs rather than designate active sonar areas or areas of increased awareness.

- Refer to Section 2.8.1, *No Action Alternative (Preferred Alternative)* of this EIS/OEIS for specific information on the proposed location of U.S. Navy active sonar training along the East Coast and Gulf of Mexico

I.4 STATUS OF LISTED SPECIES AND CRITICAL HABITAT

Fifteen species listed under the ESA potentially occur in the AFAST Study Area. Seven of these species are marine mammals, five are sea turtles, and three are fish. Table I-1 gives the names, status, and locations for these threatened and endangered species. Critical habitat has been designated for the North Atlantic right whale and the Gulf sturgeon.

Table I-1. ESA-listed Species Along the East Coast and in the Gulf of Mexico

Common Name	Scientific Name	ESA Status	Possible Location
North Atlantic right whale	*Eubalaena glacialis*	Endangered	East Coast
Humpback whale	*Megaptera novaeangliae*	Endangered	East Coast
Sei whale	*Balaenoptera borealis*	Endangered	East Coast
Fin whale	*Balaenoptera physalus*	Endangered	East Coast and Gulf of Mexico
Blue whale	*Balaenoptera musculus*	Endangered	East Coast
Sperm whale	*Physeter macrocephalus*	Endangered	East Coast and Gulf of Mexico
West Indian manatee	*Trichechus manatus*	Endangered	East Coast and Gulf of Mexico
Green sea turtle	*Chelonia mydas*	Threatened[1]	East Coast and Gulf of Mexico
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered	East Coast and Gulf of Mexico
Loggerhead sea turtle	*Caretta caretta*	Threatened	East Coast and Gulf of Mexico
Kemp's ridley sea turtle	*Lepidochelys kempii*	Endangered	East Coast and Gulf of Mexico
Leatherback sea turtle	*Dermochelys coriacea*	Endangered	East Coast and Gulf of Mexico
Shortnose sturgeon	*Acipenser brevirostrum*	Endangered	East Coast
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	Endangered	Gulf of Mexico
Smalltooth sawfish	*Pristis pectinata*	Endangered	Gulf of Mexico

1. As a species, the green sea turtle is listed as threatened. However, the Florida and Mexican Pacific coast nesting populations are listed as endangered. It should be noted that green sea turtles found in the East Coast OPAREAs and eastern Gulf of Mexico might not all be from the Florida population.
Sources: DON, 2001, 2002a, 2002b, 2005, 2007a, 2007b, 2007c, and 2007d

Description, status, diving behavior, acoustic and hearing, and distribution information about Federally-listed species is contained in this AFAST EIS/OIES in the following sections:

- North Atlantic right whale, Section 3.6.1.1.1
- Humpback whale, Section 3.6.1.1.2
- Sei whale, Section 3.6.1.1.5
- Fin whale, Section 3.6.1.1.6
- Blue whale, Section 3.6.1.1.7
- Sperm whale, Section 3.6.1.2.1
- West Indian manatee, Section 3.6.1.4.1
- Green sea turtle, Section 3.7.2.1
- Hawksbill sea turtle, Section 3.7.2.2
- Loggerhead sea turtle, Section 3.7.2.3
- Kemp's ridley sea turtle, Section 3.7.2.4
- Leatherback sea turtle, Section 3.7.2.5
- Shortnose sturgeon, Section 3.9.4.1
- Gulf sturgeon, Sections 3.9.4.2 and 3.9.4.3
- Smalltooth sawfish, Section 3.9.4.4

Additional information pertaining to these species ESA status is contained in Section 3.6.2, *Threatened and Endangered Marine Mammals*; Section 3.7.3, *Threatened and Endangered Sea Turtles*; and Section 3.9.4, *ESA Listed Fish Species*.

I.5 DETERMINATION OF IMPACTS TO LISTED SPECIES AND CRITICAL HABITAT

The potential exists for direct and indirect effects to occur to threatened and endangered species, including marine mammals, sea turtles, and fish, as a result of exposure to in-water sound; entanglement with expended materials; direct strike with torpedoes, training targets, or sonobuoys; or vessel strike. The EIS/OEIS includes a quantitative analysis to determine the potential impacts to marine mammals and sea turtles associated with the use of active sonar and explosive source sonobuoys.

- Refer to Section 4.4.2, *Analytical Framework for Assessing Marine Mammal Response to Active Sonar*, through Section 4.4.9, *Acoustic Effects Analysis*, of this AFAST EIS/OEIS for detailed information on the acoustic methodology and analysis for marine mammals.
- Refer to Section 4.4.119, *Summary of Potential Acoustic Effects by Marine Mammal Species*, contains acoustic exposure estimates for all species of marine mammals in the study areas including Federally-listed species.
- Refer to Section 4.4.11.1, *Potential Effects to ESA-Listed Species*, for specific information about the potential acoustic effects from AFAST activities to Federally-listed marine mammals.
- Refer to Section 4.4.12, *Other Potential Acoustic Effects to Marine Mammals*, for information on the potential for acoustically mediated bubble growth, resonance, likelihood of prolonged exposure, likelihood of masking, potential for long-term effect, and sound in the water from in-air sound.
- Refer to Section 4.5.2, *Explosive Source Sonobuoy*, for information on the acoustic methodology, analysis, and potential acoustic exposures to sea turtles.

Information about the potential effects to marine mammals and sea turtles from expended materials, direct strike, and vessel strike is contained within the body of the AFAST EIS/OEIS.

- Refer to Section 4.4.13, *Potential Nonacoustic Effects to Marine Mammals*, for detailed information on the potential marine mammal entanglement with expended materials; direct strike by a torpedo, exercise target, or sonobuoy; and the potential for ship strike.
- Refer to Section 4.5.3, *Potential Nonacoustic Effects to Sea Turtles*, for detailed information on the potential sea turtle entanglement with expended materials; direct strike by a torpedo, exercise target or sonobuoy; and the potential for ship strike.

Information on the potential acoustic impacts to fish from proposed active sonar and explosive source sonobuoys is contained within the AFAST EIS/OEIS.

- Refer to Section 4.7, *Marine Fish*, for detailed information on the potential acoustic impacts to fish.
- Refer to Section 4.7.3, *ESA-Listed Fish Species*, for details on the effects to ESA-Listed species.

Northeast North Atlantic right whale critical habitat is listed as such due to being some of the known primary feeding grounds. North Atlantic right whales primarily feed on zooplankton.

Effects to zooplankton from the proposed active sonar and explosive source sonobuoys are contained within the AFAST EIS/OEIS in Section 4.9, *Marine Invertebrates*.

I.6 CUMULATIVE EFFECTS

Regulations for ESA Section 7 require that the U.S. Navy analyze cumulative effects during formal consultations. The Biological Opinion (BO) issued by NMFS in response to the federal action agency must consider these cumulative effects. Cumulative effects include the effects of future state, tribal, local and private actions, not involving federal actions that are reasonably certain to occur in the action area under consideration. Future federal actions that are unrelated to the Proposed Action are not considered because they require separate consultation pursuant to Section 7 of the ESA.

- Section 6.2, *Past and Present Actions*, provides a comprehensive, detailed description of the activities in the AFAST Study Area.
- Section 6.4, *Discussion of Cumulative Impacts Relative to the Proposed Action*, and Section 6.5, *Assessing Individual Past, Present, and Future Impacts,* discuss the cumulative effects of other actions added to the proposed AFAST activities.

I.7 MITIGATION MEASURES

The U.S. Navy has developed mitigation measures that would be implemented as part of the Proposed Action to protect ESA-listed species during AFAST training. The mitigations presented in Chapter 5, Mitigation Measures, of the EIS/OEIS address actions specific to active sonar training activities, use of explosive source sonobuoys, and vessel transits. Many of these mitigation measures are the same as the protective measures that have been in place for Navy at-sea training since 2004.

- Refer to Section 5.1, *Mitigation Measures Related to Acoustic Effects,* for mitigation measures used during active sonar training.
- Refer to Section 5.2, *Mitigation Measures Related to Explosive Source Sonobuoys,* for mitigation measures used during the deployment of explosive source sonobuoys.
- Refer to Section 5.3, *Mitigation Measures Related to Vessel Transit and North Atlantic Right Whales,* for mitigation measures used to reduce the likelihood of striking a north Atlantic right whale with a Navy vessel.
- Refer to Section 5.4, *Alternative Mitigation Measures Considered but Eliminated,* for a discussion of mitigation measures that were considered infeasible.

I.8 LIST OF PREPARERS

Refer to Section 7 of the AFAST EIS/OEIS for a list of document preparers**.**

I.9 REFERENCES

Refer to Section 8 of the AFAST/EIS/OEIS for a list of references cited.